Entries are indicated by volume and page numbers: italic numbers indicate volumes; numbers that follow colons indicate pages. Page references in bold type indicate primary articles. References followed by “t” indicate material in tables.

A15 structure, intermetallic
- superconductors with, 23:831
AABB polymers, 19:739, 740–741
AAL-toxin, 13:356
A&D Weighing SV-10 viscometer, 21:739
AATCC Buyer’s Guide, 9:359
Abaca, 11:295
- uses of, 11:299t
Abalone, aquaculture, 3:189
Abbe, Ernst, 16:471–473, 489
Abbe constant, of vitreous silica, 22:432
Abkokinase, 5:177
- molecular formula and structure, 5:172t
Abbreviated New Animal Drug Applications (ANADAs), 21:579
Abbreviated New Drug Application (ANDA) process, 21:575
Abbreviations, 1:xvii–xxiv; 2–26:xxv–xxii
ABCD fiber categorizing system, 9:199
Abciximab, 4:104t; 5:173
- molecular formula and structure, 5:171t
AB diblock copolymers, 20:485–487
AB diblock polyampholytes, 20:478
Abierixin, 20:132

Ab initio methods/techniques, 14:628, 16:737–738
Ab initio theory, 16:738–739
Abiogenesis, 11:7
Ablated particles
- high kinetic energy, 24:741
- laser wavelength and, 24:742
Ablative antifouling coatings, 7:158
Aboveground stocks, of silver, 22:641–645
Aboveground storage tank (AST) facilities, 24:280
- leaks and spills from, 24:305–312
AB polymers, 19:739
Abrasion cleaning, for electroplating, 9:780
Abrasion resistance
- of acrylic fibers, 11:211
- fillers and, 10:434
- of limestone, 15:39–40
- of paint, 18:71
Abrasion-resistant white cast irons, molybdenum in, 17:17
Abrasive Grain Association (AGA), silicon carbide standards by, 22:537, 538
Abrasive materials, phenolic resins in, 18:786–787
2 ABRASIVES

Abrasives, 1:1–25. See also Abrasive materials
calcined alumina applications, 2:413
as deicing substitutes for salt, 22:814
diamond applications, 8:527–528
information sources for, 15:763
metal-working fluids, 1:22
physical properties of, 1:3t, 3–5
shaping, 1:10
silica in, 22:376
silicon carbide in, 22:540
sizing, 1:9–10
in specialty soaps, 22:746
testing, 1:10
types of, 1:10–21
Abrasives, 15:206
fillers and, 22:572
Abrasion, 11:304
Abrikosov lattice, 23:813
Abrikosov vortices, 23:826, 827
Abrupt interfaces, in ternary semiconductor alloy preparation,
22:159–160
Abscisic acid (ABA), 13:305
Abscission agent, ascorbic acid as, 25:761
ABS (acrylonitrile–butadiene–styrene) materials, producers and trademarks of, 10:207t. See also ABS polymers; ABS resins; Acrylonitrile–butadiene–styrene entries; MABS polymers
Absolute energy resolution, 24:102–103
Absolute humidity, 9:97
Absolute pressure, 20:644–645, 646
measuring, 20:649–650
Absolute pressure-measuring meter bodies, 20:656
Absolute pressure transducers, 20:657
Absolutes, in perfumes, 18:365
Absolute system of dimensions, 8:584
Absolute temperature scale, 24:283
Absolute viscosity, exponents of dimensions in absolute, gravitational, and engineering systems, 8:584t
Absorbable sutures
biochemical delivery via, 24:222
degradation images of, 24:221
materials for, 24:207
strength and mass loss profiles of, 24:220
surface morphology of, 24:220–222
synthetic, 24:205–206
Absorbance detectors
capillary electrophoresis, 4:635
liquid chromatography, 4:622
Absorbance spectra, quantitative measurements of, 14:238
Absorbents
polygorskite/sepiolite application, 6:700
smectite application, 6:698
Absorber oil units, 12:375–376
Absorbers, selective, 23:1
Absorption, 1:26–99
capillary electrophoresis, 4:635
career limitations of packed columns, 1:80–83
case studies, 1:71–80
capability of coproduct acetylene from steam cracking, 1:208–209
design of bubble tray columns, 1:83–90
design of packed columns, 1:48–71,
80–83
gas solubility, 1:29–36
in heterogeneous photocatalysis, 1:974
mass transfer, 1:36–48
nonisothermal, 1:58–61, 76–80, 86–87
for odor control, 26:724
in photocatalysis, 1:971
polytetrafluoroethylene, 18:297–298
of printing inks, 1:47–48, 71–76
in sodium nitrite production, 22:855
typical commercial gas processes, 1:26t
of water-soluble pollutants, 26:687
Absorption bands, in vitreous silica,
22:431–432, 436–437
Absorption bleaching, 10:808–809
Absorption centers, in vitreous silica,
22:435–436
Absorption characteristics, of hydrogenated amorphous silicon films, 22:133–134
Absorption coefficients, 23:126
Absorption–desorption towers, 10:614
Absorption maxima, vinylene shifts of,
20:506–508
Absorption maximum wavelengths, correlation equations for, 20:508t
Absorption, metabolism, distribution, and excretion (ADME), predicting using diversity analysis, 6:18
Absorption properties, of sutures, 24:218–223
Absorption refrigeration, dessicant applications, 8:356t
Absorption refrigeration systems (ARS), 21:550–552
advantages of, 21:551
industrial and domestic use of, 21:552
Absorption separation systems, design of, 20:751
Absorption spectra, 23:3
of fats and oils, 10:822–823
of polymethine dyes, 20:506–512
Absorption spectroscopy, infrared reflection, 24:114–116
Absorption towers, in sulfuric acid manufacture, 23:779
Absorptive probes, 11:150
ABS polymers, 10:205–207. See also ABS (acrylonitrile–butadiene–styrene) materials
ABS resins, 23:370, 371. See also Acrylonitrile–butadiene–styrene resins
Abutilon theophrasti, 11:295
Abzymes, 11:4
AC7230, 20:131
Acacia gum, 4:727; 13:70–71
Academic research, federal funding of, 24:355
Acaricides
acting on mitochondrial respiration, 14:348–349
synthetic, 14:348
Acaroid resin, 3:625
ACAT (Acyl coA:cholesterol acyltransferase) inhibitors, as antilipemic agents, 5:140t, 143–144
ACCEL, 13:37–38
Accelerated drug approval, 18:700–701
Accelerated life testing, for reliability, 26:991
Accelerated solvent extraction (ASE), capillary chromatography sample preparation, 4:609, 610
Accelerated temperature, humidity, and bias (THB) tests, 10:9
Accelerated weathering tests, 19:584
Acceleration, exponents of dimensions in absolute, gravitational, and engineering systems, 8:584t
for cement, 5:485
cobalt applications, 7:247
for epoxy adhesives, 1:535
epoxy system, 10:420–421
in polychloroprene latex compounding, 19:858
in rubber vulcanization, 21:795–799
in vinyl chloride manufacture by pyrolysis, 25:643
Accelerometers, 22:267
Acceptable daily intake (ADI), 12:37; 18:541; 25:238–239
Acceptor atoms, in silicon-based semiconductors, 22:236
Acceptor molecules
in organic semiconductors, 22:203–204, 205–206t, 210
synthesis and manufacture of, 22:212, 213
Acceptor number (AN), 23:87
Accident prevention, safer chemistry for, 12:805
Accidents
scenario identification for, 13:165
steel industry, 23:311
Accordis Tencel process, 11:267, 268, 269
Accra cocoa beans, fatty acid composition, 6:371t
Accumulative proportioning, 26:249
Accumulators, in refrigeration systems, 21:539
Accupril, molecular formula and structure, 5:151t
Accutrim, 3:90
Acecor, molecular formula and structure, 5:94t
ACE film, 19:312, 314, 315
ACE inhibitors, 5:148, 158
antihypertensive agents, 5:149–151t
for congestive heart failure, 5:185–186
Acenthaphene, 17:85
Aceon, molecular formula and structure, 5:151t
Acequinocyl, 14:349
Acesulfame-K–aspartame blends, 24:233
Acetalation, carbohydrate hydroxyl groups, 4:712
acetylene-derived, 1:180, 219, 229
annual consumption by region, 2:67t
in beer, 3:582t
catalytic aerogels for partial oxidation to acetic acid, 1:763t
derivation from ethanol, 10:554
economic aspects of, 1:109–110
effect of unsaturation on toxicity, 2:69t
formation of, 10:642
health and safety factors related to, 1:111; 2:67
hemoglobin modifier, 4:117
isomerization to, 10:663
manufacture of, 1:106–109
oxidation to acetic acid, 1:120–122
oxidation to acetic anhydride, 1:150–151, 155
as a PET polymerization by-product, 20:49
physical properties of, 1:99–101, 100t; 2:60t
platinum-group metal catalysts and, 19:622
reactions of, 1:102–106
reaction with acetic anhydride, 1:148
solubility of gases in liquid, 1:101t
specifications, analytical and test methods, 1:110
spectroscopic properties of, 2:62t
uses of, 1:111
vapor pressure of aqueous solutions, 1:101t
vapor pressure of pure, 1:101t
Acetaldehyde diethyl acetal, anesthetic properties of, 2:69
Acetaldehyde hydrate, 1:102
Acetaldehyde trifluoroborane, 4:144t
Acetaldol, production from acetaldehyde, 1:103
Acetal formation, microwaves in, 16:557
Acetalization, of PVA, 25:602–603
Acetal polymerization, 14:271
Acetal resins, 10:183–185
Acetal resins, formaldehyde in, 12:122
Acetals, 2:64; 10:529
aroma chemicals, 3:253
inorganic pigment applications, 7:372t
organic pigment applications, 7:368t
typical soluble dye applications, 7:376t
Acetaminophen, 4:701. See also N-Acetyl-p-aminophenol (acetaminophen)
Acetanol, molecular formula and structure, 5:94t

Acetarsone, 2:667–668
physical properties of, 2:666t
Acetate esters, 10:472, 484–482
production from acetaldehyde, 1:111
production from acetic acid, 1:133
Acetate fibers, 24:614
dyeing, 9:197
Acetate pyrolysis, 21:142
Acetate rayon fibers, 4:716
Acetates, 10:472, 512, 522
iron, 14:532
soluble dyes, 7:373t
Acetatohydroxotricyclohexylantimony, 3:77
Acetazolamide, 5:169
Acetic acid, 1:115–136; 5:27; 10:596; 12:44.
See also Glacial acetic acid; Vinegar
acetic anhydride production from, 1:115, 133, 149–150
buffer for ion-exchange chromatography, 3:830t
catalytic aerogels for preparation by partial oxidation, 1:763t
chiral derivatizing agent, 6:96t
Clarke–Othmer process for acetic acid–water separation, 8:834
in cocoa shell from roasted beans, 6:357t
condensation with formaldehyde, 1:358–359
continuous esterification of, 10:480–481
density of aqueous, 1:116t
density of liquid, 1:116t
dissociation coefficient in air at 0°C, 1:70t
diffusion constant, 5:40t
economic aspects of, 1:128–130
freezing points of aqueous solutions of, 1:116t
halogenated derivatives of, 1:136–146
health and safety factors related to, 1:131–132
herbicides, 13:315
international producers of, 1:130t
manufacture of, 1:120–127
in methyl acetate manufacture, 10:481–482
in methyl acetate separations system, 22:333–337
North American producers of, 1:129t
physical properties of, 1:115–117; 5:29t
production from acetaldehyde, 1:102, 111
production from acetylene, 1:219
production from carbon monoxide, 5:4–5
production of, 16:299; 24:265
reactions of, I:118–120
recovery from water using
  heterogeneous azeotropic extraction, 8:819
separation from acetic acid-n-butyl acetate mixtures, 8:828, 841–845
separation from acetic acid-isopropyl acetate mixtures, 8:836–841
shipping and handling of, I:128
solubility of boric acid in, 4:253t
solubility of chlorine in, 6:133t
specifications and analysis of, I:130–131
specific conductance of aqueous, I:119t
standards for, U.S. and international, I:132t
uses of, I:133; 16:315
vapor pressure of, I:116t
Acetic acid synthesis, platinum-group metal catalysts in, I:169, 921
Acetic acid trifluoroborane, 4:144t
Acetic anhydride, I:146–160
  in acetylsalicylic acid manufacture, 22:19
  carbon monoxide in production of, 5:5
  economic aspects of, I:156
  health and safety factors related to, I:157
  manufacture of, I:149–156
  North American producers of, I:156t
  physical properties of, I:147–149
  production of, 10:481
  production using acetaldehyde, I:102, 111
  reactions of, I:147–149
  specifications and analysis of, I:156–157
  uses of, I:157–158
Acetic anhydride trifluoroborane, 4:144t
Acetoacetic acid arylides, 9:408
Acetoacetoxyethyl methacrylate, 16:242
Acetoacetyl, role in cholesterol synthesis, 5:142
Acetoacetyl-CoA, 20:253. See also Acetyl-coenzyme A (CoA)
Acetobacter, 11:4–5, 7
Acetobacter oxydans, 11:8
Acetobacter suboxydans
  in ascorbic acid production, 25:753, 757
  fermentations, 15:690–691
Acetobacter xylinum
  cellulose biosynthesis, 5:364, 365–366
  cellulose source, 5:363
molecular genetics of cellulose biosynthesis, 5:366
Acetobromoglucose, 4:705
Acetobutolol, 5:102
  molecular formula and structure, 5:94t
Acetochlor, 13:319–320
Acetogenic bacteria, 1:127
\( \alpha \)-Acetolactate decarboxylase, 10:293
Acetolactate synthase (ALS) inhibitors, 13:301, 361
Acetone, I:160–177; 14:562, 570, 582
  acrylamide solubility in, I:290t
  aldol condensation of, 16:332
  in association reactions, 10:682
  aze trope with chloroform, 8:747
  azeotrope with water and 2-propanol, 8:795–796
  as cellulose solvent, 11:273–274
  condensation reactions of, 14:585–586
  cumene as feedstock for, 8:155
  diffusion coefficient for dilute gas in water at 20° C, I:67t
  diffusion coefficient in air at 0° C, I:70t
  economic aspects, I:169–171
  extractive distillation solvent, 8:802
  gas bulk separation of vent streams, I:618t
  health and safety factors related to, I:172–173
  manufacture of, I:164–168
  nonisothermal absorption into water, I:60
  one-step MIBK process from, 16:338–340
  physical properties of, I:161–162
  production from acetaldehyde, I:106
  production from acetylene, I:180, 219
  production of, 10:558
  for purification of hydrocarbon-derived acetylene, I:203, 216
  reactions of, I:162–164
  reaction with acetic anhydride, I:148
  shipping and handling of, I:168–169
  solubilities of alkanoic acids in, 5:39t
  solubilities of fatty acids in, 5:40t
  solubility of acetylene in, I:178t
  solubility of aminophenols in, 2:653t
  solubility of benzoic acid in, I:626t
  solubility of boric acid in, 4:253t
  solubility of butanediol in, I:235t
  solubility of cellulose acetates in, 5:417t
  solubility of chloroacetic acid in, I:137t
  solubility of dispersant tails in, 8:685
solubility of methylenedianiline in, 2:794t
solubility of trichloroacetic acid in, 1:141t
solvent for cosmetics, 7:832
specifications and analysis of, 1:171–172
spectral parameters, 1:162t
terpenoids from, 24:480
thermodynamic properties of, 1:162t
typical commercial gas absorption process, 1:26t
uses of, 1:173–175
U.S. producers/production of, 1:166t, 170t
wartime production of, 11:8
in water–acetone–chloroform azeotrope, 8:821
world production of, 1:170–171t
Acetoneazine, 13:580, 581
Acetone cyanohydrin (ACH), 1:163, 174; 8:174; 17:229
methyl methacrylate from, 16:246–248
Acetone cyanohydrin-based (C-3) process, for methyl methacrylate production, 16:243, 245, 246–252
Acetone dehydration, 18:515
Acetone sodium bisulphite, 1:163
Acetone trifluoroborane, 4:144t
Acetonitrile, 17:228, 231–233
acrylamide solubility in, 1:290t
azeotrope with water, 8:818
colorimetric response in, 24:45
extractive distillation solvent, 8:802
health and safety factors related to, 17:233
shipping and storage of, 17:232–233
solubility of acetylene in, 1:178t
solubility of aminophenols in, 2:653t
solubility of dispersant tails in, 8:685
specifications for, 17:232t
use in reversed-phase chromatography, 3:840
uses for, 17:233
Acetophenone, 3:603; 14:592–593; 20:805–806
acetic anhydride used in synthesis, 1:148
Acetophenone trifluoroborane, 4:144t
Acetous acid, 1:117
Acetoxy-based RTV silicones, 22:595
Acetoxylation, 21:249
Acetoxypropylcellulose, liquid crystals, 5:385
Acetoxyamines, in silicone chemistry, 22:555
3-O-Acetyl-2,6-di-O-pentyl-derivated cyclodextrin, 6:98
Acetyleceton, 1:148–149, 164; 14:596–598
molecular formula, 5:712t
N-Acetylacrylamide, 1:293
Acetyl anchoring groups, 8:683t
Acetylated cyclodextrin-based chiral stationary phase, 6:87
Acetylated lanolin, cosmetically useful lipid, 7:833t
Acetylated starches, 20:562
4-Acetylated thioether, 12:175
Acetylation, 10:550
acetic acid, 1:119–120
acetic anhydride used in, 1:157–158
Acetylcaryophyllene, 24:543
Acetyl chloride, production from
acetone, 17:248
acetic acid, 1:111–112
addition of hydrogen chloride to, 13:821
from calcium carbide, 4:532, 548
carbometalation of, 25:117
catalyst poison, 5:257t
catalysts from, 1:227–265
decomposition of, 10:614
diethylamine adduct from
cyclopentadiene, 8:222t
direct polymerization, 7:514
economic aspects of, 1:216–217
explosive behavior of, 1:181–187
as fuel, 1:221–222
health and safety factors related to, 1:219
hydration to acetaldehyde, 1:107–109
hydrogenation of, 10:613–614
ignition energy of gaseous at various pressures, 1:182t
manufacture as coproduct from steam cracking, 1:187, 208–210, 216
manufacture from calcium carbide, 1:204–208, 216, 218, 228
manufacture from coal, 1:189, 210–213
manufacture from hydrocarbons, 1:187–204, 216, 218
minimum ignition energy of liquid, 1:187t
in oxygen, 17:760
physical properties of, 1:178
process technology, 1:191t
reactions of, 1:178–181
reaction with sulfur to produce carbon disulfide, 4:832
removal in vinyl chloride manufacture, 25:643
Reppe route to acrylates, 1:355–357
shipping and handling of, 1:213–216
solubility in acetaldehyde, 1:101t
solubility in selected organic liquids, 1:178t
specifications and analysis, 1:217–218
N-substituted acrylamide preparation, 1:295
uses of, 1:219–222
U.S. producers of, 1:217t
in vinyl chloride manufacture, 25:633, 634
Acetylene–air mixtures, explosive behavior of, 1:186
Acetylene blacks, 1:220; 4:762, 775; 19:409
composition of, 4:765t
manufacture of, 4:786
Acetylene cylinders, 1:213–216
Acetylene-derived chemicals, 1:227–265
ethynylation reaction products, 1:231–249
miscellaneous alcohols and diols, 1:249–253
vinylation reaction products, 1:253–258
Acetylenediacetonitrile, Diels–Alder adduct from cyclopentadiene, 8:222t
Acetylene hydrate, 1:178
Acetylene–oxygen mixtures, explosive behavior of, 1:186
Acetylenic acids, 5:28, 34t
Acetylenic alcohols, 1:249–250; 12:112
Acetylenic compounds, acylation of, 12:186–187
Acetylenic fatty acids, 5:34t
Acetylenic glycols, 1:249–250
physical properties of, 1:250t
N-Acetylenolamine, physical properties of, 2:124t
N-Acetyl group, 9:282
Acetylides, 4:650
Acetylium tetrafluoroborate, 4:144t
N-Acetyl-p-aminophenol (acetaminophen), acetic anhydride used in production of, 1:158. See also Acetaminophen
Acetyl perchlorate, 1:157
Acetylsalicylic acid (aspirin), 22:17–21
acetic anhydride used in production of, 1:158
applications of, 22:20–21
economic aspects of, 22:19
health and safety factors related to, 22:20
manufacture and production of, 22:19
physical properties of, 22:19
specifications for, 22:19–20
synthesis of, 22:17–19
N-Acetylserotonin, 2:819
N-Acetylsulfanilyl chloride action, preparation of sulfonamides by, 23:507
Acetyl sulfisoxazole, year of disclosure or market introduction, 3:6t
Acetyl tri-2-ethylhexyl citrate, physical properties, 6:649t
Acetyl triethyl citrate, physical properties, 6:649t
Acetyl tri-n-butyl citrate, physical properties, 6:649t
o-Acetylxybenzoic acid, 22:17. See also Acetylsalicylic acid
Acheson, Edward, 22:524, 525
Acheson furnace, 12:738–739
Acheson process, 22:524, 532, 533, 534, 535
Achiral, C₃ₖ-symmetric unbridged metalloccenes, 16:104
Achiral hydroborating agents, 13:667
Achiral molecules, 6:73
Acicular reinforcement, 5:554
Acid acceptors, in VDC polymer stabilization, 25:719
Acid-activated bentonites, 6:680–681
Acid amide herbicides, 13:319–320
Acid anhydrides, 10:403–406, 484
reactions with alkanolamines from olefin oxides and ammonia, 2:127
Acid–base catalysis, 5:205–209
Acid–base chemistry
acetic acid, 1:119
adhesion and, 1:503
alkanolamines from nitro alcohols, 2:115
alkanolamines from olefin oxides and ammonia, 2:125–126
aluminum compounds, 2:348–349
Acid–base colorimetric indicator, 13:426
Acid–base components, in the hydrogeochemical cycle, 26:10–12
Acid–base equilibria, 9:354
Acid–base indicators, 14:32t
Acid/base interactions, in solvent–solute interactions, 23:96
Acid–base reactions, anhydrous hydrazine, 13:567–568
Acid Black 63, 6:559
Acid blue, herbicide/algicide for aquaculture in U.S., 3:214t
Acid catalysis, deep-ultraviolet chemically amplified resists based on, 15:163–181
Acid catalysts, 10:493. See also Acidic catalysts
for novolac resins, 18:760–761
in spontaneous styrene polymerization, 23:378–379
supported, 5:326–334
Acid-catalyzed chemistry, 15:168–169
in negative-tone photoresists, 15:170–172
in positive-tone photoresists, 15:169–170
Acid-catalyzed dichloromethane polymerization, 23:733
Acid-catalyzed ketone condensation, 14:570
Acid catalyzed mechanism, silicone network preparation via, 22:568
Acid-catalyzed resins, 18:760
Acid chloride formation, amino acids, 2:568
Acid chlorides, 10:485; 23:649
Acid chloride zinc plating, 9:828t
Acid cleaners, ethylene oxide polymers in, 10:689
Acid containers, shipping, 23:793
Acid content, of wine, 26:310
Acid coolers, in sulfuric acid manufacture, 23:779–780
Acid copper chromate, composition and specifications for, 6:558t
Acid copper plating, 9:807–811
preparing solution for, 9:808
Acid coupling, 9:358–359
Acid deposition, 1:805
pH measurements across U.S., 1:806
Acid dips/pickles, 9:787–788
Acid distributors, in sulfuric acid manufacture, 23:779
Acid dosing, for controlling scale formation, 26:72–73
Acid dye affinity, 19:759
antraquinone, 9:301, 327–329
azo, 9:389–394
Acid dyestuffs, 9:223
Acid extractants, 10:750
Acid fixing reactive dyes, 9:478–481
Acid foods, heat preservation of, 12:80
Acid functional polyesters, 10:402
Acid gas constituents, 12:376–378
Acid gases, 10:612–613
in thermal waste treatment, 25:832
Acid gas removal processes, solvents for, 12:376–377
Acid-grade feldspar, aluminum fluoride production from, 2:357–358
Acid-grade fluorspar, 4:579, 580
analysis, 4:577t
Acid halides, 12:188–190
Acid hydrolysis. See also Acidic hydrolysis
of wood, 26:358
of wool, 26:376
Acid hydrolysis lignin, 15:21
Acidic catalysts, 10:556. See also Acid catalysts
Acidic cation-exchange resins, 12:191
Acidic corrosion, in industrial water treatment, 26:130–131
Acidic donors, 10:421
Acidic extractants, of rare-earth elements, 14:641–642
Acidic gases, limestone reaction with, 15:33
Acidic halide catalysts, 12:167
Acidic hydrolysis, 10:502. See also Acid hydrolysis
Acidic ion-exchange resins, 10:485
Acidic oxides, 12:190–191
Acidic papers, preservation of, 11:414
Acidic properties, of titania–silica, 1:764
Acidic silicate solutions, 22:458
Acidic zeolites, 16:825
Acid industrial refractories, 21:515
Acidity, biofiltration system, 10:76–77
Acidity analysis, of water, 26:36–37
Acid leveling dyes, 9:184, 185
Acid milling dyes, 9:184, 185
Acid mist eliminators, 23:781
Acid-modified starches, 4:720
Acid–mordant dyes, 9:337
Acid neutralization using quicklime, 15:44
using slaked lime, 15:45
Acid-neutralizing capacity (ANC), 26:10
Acid oxidation, of lead, 14:731
Acid products, color and turbidity of, 23:792
Acid pulping reactions of carbohydrates during, 21:29
reactions of lignin under, 21:26
Acid rain, 26:8–10
genesis of, 26:11
measurement of pH in, 14:27
Acid rain emissions, and coal gasification, 6:808–810
Acid refractory furnace linings, 12:300
Acid resistant nanofiltration membranes, 21:635t
Acid roasting technology, selenium recovery via, 22:81–83
Acids
L-ascorbic acid and, 25:751
catalytic esterification of, 10:482
in cationic polymerization of cyclic siloxanes, 22:560
cellulose as, 11:266
α-chiral and homologated, 13:669
control methods for, 26:687–690
derived from halogen fluorides, 13:128t
esterifiable, 10:490
ethylene oxide reaction with, 10:637–638
as ethylene hydration catalysts, 10:540
for fermentation, 11:38
fluorinated, 11:867
grades of, 23:792
hazards of, 21:833
leavening, 12:66
limestone heat of reaction with, 15:33
metal chloride decomposition by, 13:822–824
quaternary ammonium compounds from reduction, 2:772
reactions with boron trifluoride, 4:144t
reactions with bromine, 4:302
reaction with ozone, 17:780
reactivity of, 10:492
selenium, 22:88–89
selenium reactions with, 22:76–77
in silanol polycondensation, 22:557, 558
in silicone polymerization, 22:556
silicon solubility in, 22:491
sodium reactions with, 22:766
used for anodizing, 16:221
VDC polymer degradation and, 25:718
vitreous silica resistance to, 22:417
Acid slags, 21:515
Acid soak cleaners, for electroplating, 9:783
Acid soap, 22:728
Acid soluble dyes, 7:373t
Acid solutions
hydrazine, 13:587
in leaching chemistry, 16:152
Acid sulfite process, 23:540–541
Acid sulfite pulping, 21:22–23, 26
Acid treatment, in petroleum refining, 18:661
Acidulants, 12:44–46
encapsulation of, 16:455
use in foods, 11:523
Acid yellow (Aquashade), herbicide/algicide for aquaculture in U.S., 3:214t
Acitretin, 25:790
a-c Josephson effect, 15:750
Aclame, 24:232
ac losses, 23:845–846
Acne, vitamin A treatments for, 25:789
cis-Aconitic acid, in citric acid cycle, 6:633
Aconitine, 2:103
Acoustic emission (AE) technique, in nondestructive evaluation, 17:425
Acoustic fields, filtration and, 11:324
Acoustic methods, of emulsion characterization, 10:128
Acoustic microscope, 16:505
working principle of, 17:436–437
Acoustic microscopy in nondestructive evaluation, 17:434–437
uses for, 17:436
Acoustic perturbation methods, 14:617
Acoustic streaming, 9:59, 81
Acoustic wave gravimetric technique, acoustic wave sensors and, 22:270.
See also Gravimetric techniques
Acoustic waves, sensors using, 22:269–270
Acoustooptic (AO) modulators, 14:676
Acousto-ultrasonics, in nondestructive evaluation, 17:425–426
Acquired Immunodeficiency Syndrome (AIDS), 3:135; 25:500. See also Anti-HIV drug candidates; HIV entries; Nevirapine entries
Acridinium esters, chemiluminescence reagent, 5:846
Acridine chemiluminescence reagent, 5:845–846 soluble dyes, 7:373t
Acridinium esters, chemiluminescence reagents, 5:846
Acrolan, 11:188
Acrolein, 12:110. See also Acrolein and derivatives
Acronyms regulatory, 21:593–595 as trademarks, 25:258
Acropal, 24:485
Acrylamide-based products, in paper manufacture, 18:115
Acrylamide copolymers, functional monomers used in, 11:628
Acrylamide gels, 1:680
Acrylamide graft copolymers, 18:625
as dispersions, 11:629
economic aspects, 1:331–333
health and safety factors, 1:330–331
Mark–Houwink–Sakurada correlations, 1:309, 310t
physical properties of solid, 1:306t
physical properties of solutions, 1:307t
solution rheology, 1:309t, 309–311
specifications, shipping, and storage, 1:330
structural modifications, 1:311–316
suppliers, 1:331–332t
Acrylamide sulfate, 1:400
Acrylamide transition metal complexes, 1:293
2-[(Acrylamido)-2-methylpropanesulfonate (AMPS), 23:721
copolymers synthesized from, 23:722
2-Acrylamido-2-methylpropanesulfonic acid, 1:295, 411
2-Acrylamido-2-methyl-propanesulfonic acid (AMPSA), 20:468
2-Acrylamido-2-methylpropanesulfonate 7A (AMPS), 20:468
3-Acrylamidopropionamide, 1:292
Acrylate esters, 10:512
Acrylates, 1:342–343; 18:57
acetylene-derived, 1:229
copolymerization of, 16:240
epoxy, 10:382–383
manufacture, 1:349–360
Acrylic acid, 1:342–369; 20:213
acetylene-derived, 1:229
from acrolein, 1:265, 268, 270
acute toxicity, 1:363t
analysis, 1:361–362
comonomer with acrylonitrile, 1:451t
copolymerization with acrylic monomers, 1:380t
economic aspects, 1:361
health and safety factors, 1:363–364
homo- and copolymers of, 24:171–172
polymerization of, 20:461–462
physical properties of, 1:343t; 5:31t, 37t
regulations, 1:364–365
storage and handling, 1:362–363
uses of, 1:365
U.S. producers and capacities, 1:361t
vapor pressure of important, 1:346t
Acrylic acid derivatives, 1:342–369
analysis, 1:361–362
economic aspects, 1:361
manufacture, 1:349–360
physical properties of, 1:343, 343t
reactions, 1:344–349
regulations, 1:364–365
Acrylic acid nitrile. See Acrylonitrile (AN)
Acrylic adhesives, 1:537–540
Acrylic anhydride, 1:344
physical properties of, 1:343t
Acrylic anion exchangers, 14:391
Acrylic diluents, 10:429
Acrylic elastomers, 9:561
Acrylic ester monomers, 1:375–377
anionic polymerization, 1:387
bulk polymerization, 1:381
emulsion polymerization, 1:383–385
functional monomers for
copolymerization, 1:380t
graft polymerization, 1:386
living polymerization, 1:386
radiation-induced polymerization,
1:386–387
radical polymerization, 1:377–380
solution polymerization, 1:381–383
suspension polymerization, 1:385–386
Acrylic ester polymers, 1:369–397
health and safety factors, 1:388
inorganic pigment applications, 7:372t
organic pigment applications, 7:368t
physical properties of, 1:369–374
reactions, 1:374–375
specifications and analysis, 1:387–388
typical soluble dye applications, 7:376t
uses of, 1:388–390
Acrylic esters, 1:344–346; 10:492
dimerization, 1:349
physical properties of, 1:345t
polymerization, 1:342
properties of commercially important,
1:344t
speciality, 1:360–361
vapor pressure of important, 1:346t
Acrylic fiber production, economic aspects of, 11:220
See also Acrylonitrile
abrasion resistance of, 11:211
characterization of, 11:196
chemical properties of, 11:193–194
commercial products from, 11:211–219
dyeing, 9:192–194
dyesite content of, 11:195
flammability of, 11:194, 195t
modifying properties of, 11:211
molecular weights of, 11:195–196
physical properties of, 11:189–193
polymer analysis of, 11:195–196
production of, 11:188–189
solution spinning of, 11:204–211
synthesis of, 11:188–189
worldwide production of, 11:216–218, 220

Acrylic filament yarns, 11:212
Acrylic flame-resistant fibers, 11:214
Acrylic–GMA powder coatings, 10:447, 449
Acrylic/methacrylic acid hydrogels, 13:734
Acrylic monomers, as flocculating agents, 11:628–631
Acrylic paint, degradation of, 11:415
Acrylic pigmented fibers, 11:213
Acrylic polymers, 11:628. See also Acrylics
etch resistance of, 15:179
for 193-nm resists, 15:178–179
Acrylic powder coatings, 7:52–53
physical and coating properties, 7:42t
1998 production, 7:49
Acrylic producer-dyed fiber, 11:212–213
Acrylic resin coatings, 17:845
Acrylic resins, 10:199–201; 14:385
casting resins, 7:103–104; 17:845
dental applications, 8:319–323
properties in powder coating, 7:43t
Acrylic rubber, in rubber compounding,
21:769–771
Acrylics, casting of, 19:556. See also Acrylic polymers
Acrylic sealants, 22:41–43, 48t
silicone latex sealants versus, 22:34
Acrylic specialty fibers, 11:215–219
Acrylic strong base anion exchangers,
14:390
Acrylic tow, 11:212
Acrylic weak base resins, 14:389
Acrylonitrile (AN), 1:397–414; 10:665–666;
11:5; 17:228; 24:272
acetylene-derived, 1:229
Alfrey–Price parameters, 7:617t
azeotropes, 1:399t
copolymerization with VDC, 25:697, 698,
700, 701, 706–707
economic aspects, 1:405–406
health and safety factors, 1:408–409
hydration to acrylamide, 1:293–295
hydrolysis to acrylates, 1:357
manufacture, 1:400–407
monomer, 20:46
as a nucleating agent for high contrast
PTG films, 19:350
physical properties of, 1:397–400, 398t
production from acetaldehyde, 1:105
production from acetylene, 1:180
propylene in, 20:783–784
radiation grafting of, 19:764
reactions with alkanolamines from olefin
oxides and ammonia, 2:128–129
solubilities in water, 1:399t
specifications and analysis, 1:407t, 407–408
storage and transport, 1:408
thermodynamic properties of, 1:398t
uses of, 1:409–411
U.S. exports, 1:406t
U.S. producers, 1:406t
VDC polymer degradation and, 25:717
worldwide demand, 1:407t
worldwide production, 1:406t
worldwide uses and consumption, 1:410t
copolymerization of, 11:202–204
polymerization of, 11:197–204
synthesis of, 11:188

Acrylonitrile barrier polymers
diffusion of oxygen and carbon dioxide
in, 3:382t
good barrier-to-permanent gases, 3:384, 385
oxygen permeability at 25°C, 3:400
Acrylonitrile–butadiene–styrene (ABS),
from butadiene, 4:375, 384t. See also
ABS entries
Acrylonitrile–butadiene–styrene
copolymers, 23:325, 348, 359, 368–371
inorganic pigment applications, 7:372t
organic pigment applications, 7:368t
typical soluble dye applications, 7:376t
Acrylonitrile–butadiene–styrene polymers,
1:414–438; 20:360. See also ABS entries
analysis, 1:430–432
chemical properties of, 1:417–419
compounding, 1:423
economic aspects, 1:428–430
health and safety factors, 1:432
manufacture, 1:419–423
physical properties of, 1:415t, 415–416
processing, 1:423–428
uses of, 1:432
worldwide capacity for ABS plastics, 1:429t
worldwide capacity of leading producers, 1:429t
Acrylonitrile–butadiene–styrene resins, 1:409, 439
producers and capacities, 1:429t
recovery, 1:421
Acrylonitrile copolymers, 16:23–22
Acrylonitrile copolymer with styrene (SAN), 23:366
Acrylonitrile–ethylene–styrene (AES) materials, 23:371
Acrylonitrile manufacture, off-gases from, 10:106
Acrylonitrile polymers, survey and styrene–acrylonitrile (SAN), 1:439–463
Acrylonitrile–styrene–acrylate (ASA) materials, 23:371
Acryloyl chloride, 1:344
physical properties of, 1:343t
in polyhydric alcohol formation, 2:46
ACS Reagent Grade Pyridine, specifications for, 21:117t
ACT coating technology, 19:630
Actilight, 23:450
Actin, role in heart excitation and contraction coupling, 5:81
Actinide carbides, 4:689
Actinide carbonate, 25:430–431
Actinide–gallium compounds, 12:355
Actinide oxides, 24:761
Actinide peroxides, 18:410
Actinides, 13:569. See also Actinides and transactinides; Actinide series absorption and fluorescence spectra, 1:490
binary compounds, properties and crystal structure of important, 1:484–488t
coordination compounds of, 7:584
crystal structure, 1:483, 484–488t, 490
electronic configurations, 1:474t
ionic radii, 1:483, 489t, 490
ion stability in aqueous solution, 1:480t
ion types and colors, 1:477t
long-lived nuclides available in weighable amounts, 1:471t
metallic state, 1:481
oxidation states, 1:475–479, 476t
peroxide complexes of, 25:429
practical applications, 1:483, 490–491
solid compounds, 1:481–482
sources, 1:465–472
Actinides and transactinides, 1:463–501
Actinide sequestering agents, 24:769–770
Actinide series, 25:392. See also Actinides; Actinides and transactinides
Actinium (Ac), 1:463–491, 464t
electronic configuration, 1:474t
ion type and color, 1:477t
metal properties of, 1:482t
Actinolite, 1:803; 3:288, 289
fiber morphology, 3:294t
world production in 2000, 3:289t
Actinomycetales, 20:136
Actinomycetes, 20:132
indoor air pollutant, 1:804
Activase, 5:176
cell culture technology product, 5:346t
molecular formula and structure, 5:172t
See also Active alumina
adsorption capacity versus years of service, 1:630
adsorption equilibrium isotherm, 1:590
adsorption isotherm for water, 1:622, 623
for arsenic removal, 3:280t, 282
as desiccants, 1:589, 590; 8:359, 367–370
economic aspects, 2:398
hydrophilic adsorbent, 1:584–585
manufacture, 2:395–398
physical and chemical properties of, 2:391–395
polar adsorbent, 1:674
preparation, 1:586
properties and applications, 1:587t
safety and handling, 2:398
U.S. and international exposure limits, 2:398t
uses of, 2:399–401
Activated carbon, 1:587–588, 652; 4:741–761. See also Activated charcoal; Activated coke; Carbon entries
adsorption isotherm for hydrocarbons on coconut-shell, 1:635t
chemical properties of, 4:741–743
economic aspects, 4:748
environmental concerns, 4:750
forms of, 4:747
gas-phase applications, 4:754–757
gas-phase properties of, 4:743t
for gas separation, 1:618t
health and safety factors, 4:749–750
hydrophobic adsorbent, 1:585
for indoor air cleaning, 1:833–834
liquid-phase applications, 4:750–754
liquid-phase properties of, 4:743t
manufacture by chemical activation processes, 4:747
manufacture by thermal activation processes, 4:744–747
nonpolar adsorbent, 1:674
physical properties of, 4:741–743
in phosgene manufacture, 18:806
poor size distribution of typical, 1:586–587
preparation, 1:631–632
properties and applications of large pore, 1:587t
properties and applications of small pore, 1:587t
properties of selected, 4:743t
for purifying carbon dioxide streams, 4:815–816
shipment and storage, 4:747–748
simulated moving bed liquid adsorption processes, 1:669
specifications and analysis of, 4:748–749, 749t
U.S. producers of, 4:748t
Activated carbon adsorption, as advanced wastewater treatment, 25:909
Activated catalyst layer, 10:40–42
Activated charcoal, 13:461
Activated coke, for SO<sub>2</sub> and NO<sub>x</sub> removal, 11:720
Activated magnesium, 12:835
Activated monomer mechanism, for lactide polymerization, 20:300
Activated sludge, 12:24
in biological waste treatment, 25:827–830
Activated sludge process in biological wastewater treatment, 25:896–898, 899, 900, 901t, 903–905
performance of, 25:904t
Activation energy, 14:278
Activation losses, in fuel cell voltages, 12:207
Activation parameters
in free radical formation, 14:278
in kinetic studies, 14:627–628
Activation polarization, batteries, 3:425–426
Activator processes, in photography, 19:211
Activators, 10:713
in finish removers, 18:79
in froth flotation, 14:733; 16:645
of hemostatic system, 4:83, 88–89
vulcanization, 21:798–799
Active aldehyde, in microarray fabrication, 16:384
Active alumina, 2:391. See also Activated alumina
“Active-anion” doping, 13:546
Active catalyst sites, diffusion of pollutants to, 10:47–48
Active composting, 25:874
Active dry yeast (ADY), 26:460–461
Active electroanalytical techniques, 9:568–581
“Active” EP additives, 15:224
Active mass, 3:409
Active-matrix components, in fluid cracking catalysts, 11:680
Active matrix liquid-crystal displays (AMLCDs)
hydrogenated amorphous silicon in, 22:136, 138–139
silicon-based semiconductors in, 22:259
Active mixers, in microfluidics, 26:966–967
Active nondestructive tests, 17:415–416
Active Oxygen method (AOM), 10:827
Active pharmaceutical ingredients (APIs)
chiral, 18:725–726
guidelines for, 21:168, 169
production of, 18:722
scale-up of, 18:722–736
Active pixel sensors (APS), 19:154–155
Active regions, in HBTs, 22:167–168
Active sensing materials, 22:706
Active smart textiles, 24:625
Active substances, markets for, 11:445
Activity, of radioactive waste, 25:851
Activity coefficient, 23:91
Activity of a species, 24:679
Actuating materials, 22:707
Actuators, 22:708t, 709, 717–719, 721t
liquid-crystal, 22:718
smart materials as, 22:709
Acumycin, 15:294
Acute coronary syndrome (ACS), 4:86, 93
Acute exposure, 25:203
Acute exposure guidelines, information on, 25:239, 240–241t
Acute MI (myocardial infarction), 5:107
antianginal agents for, 5:110t
and coronary arterial thrombosis, 5:170
Acute myelogenous leukemia (AML), and benzene exposure, 3:616
Acute oral toxicity
of diorganotins, 24:829, 830t
of triorganotins, 24:828–829
Acute renal failure (ARF), 26:813
Acute thallium intoxication, 24:638
Acute toxic effects, 25:203, 204t
Acute toxicity, of organic pigments, 19:452
Acute toxicity studies, 25:217
Acute toxicology. See also Toxicology of pyridine, 21:117
of pyridine derivatives, 21:118
Acyclic diastereoselection, 13:664
Acyclic diene metathesis (ADMET), 26:921, 924
Acyclic diperoxeketals, 14:287; 18:457
Acyclic diyne metathesis (ADIMET), 26:951
Acyclic monoterpenes, aroma chemicals, 3:237
Acyclic podands, 24:41
Acyclic sesquiterpenes, aroma chemicals, 3:239
Acyclo-retinoic acid, 17:662
Acylaminoanthraquinone dyes, 9:333, 334
Acylated plasminogen–streptokinase activator complex, 5:175, 177–178
Acylates, titanium, 25:96
Acylating agents, 12:174
of aliphatic compounds, 12:184–188
amine oxides, 2:468–469
aminophenols, 2:657
aniline, 2:786
of aromatic compounds, 12:173–181
carbonates, 6:309–310
chloroformates, 6:296–297
maleic anhydride, 15:486
stereoselective, 12:176–177
N-Acylation, amino acids, 2:567
Acylation reactions, analogues of, 12:181–184
Acylation reactions, analogues with, 13:657–658
Acyl fluoride–Lewis acid complexes, 12:176
Acyl groups, systematic names of, 17:398
Acyl halides ethylene oxide reaction with, 10:638–639
reactions with alkanolamines from olefin oxides and ammonia, 2:126
Acyl lipids, 13:295
Acylins, preparation of, 10:506
Acyl organosulfonyl peroxides, 18:475, 478
Acyloxy radicals, 14:283, 284
Acyl peroxides, 18:467–478
properties of, 18:467–476
synthesis of, 18:476–478
N1-Acylsulfanilamides, 23:508
Acyltitaniums, 25:120
1-Adamantylamine, physical properties of, 2:499t
Adams–Nickerson color space, 7:320
Adapalene, 25:789
Adapress, molecular formula and structure, 5:128t
Adaptive control system, 20:698
Adaptive sampling techniques, 26:1016–1019
A/D converter (ADC), 20:677. See also Analogue-to-digital converter (ADC)
Addition agents, in steelmaking, 23:262–263
Addition-cured model systems, of silicone networks, 22:569
Addition-curing silicones, 22:35
Addition-fragmentation mechanism, of chain-transfer (CT) agents, 23:383–384
Addition polymerization, 14:274–275;
20:391, 408–409
Addition reactions, 20:243. See also Electrophilic addition reactions aldehydes, 2:63–64
allyl alcohol, 2:234–239
butadiene, 4:368–370
carboxylic acids, 5:44–45
ethylene, 10:597–598
quinoline, 21:184
quinone, 21:246–261
toluene, 25:165
in VDC emulsion polymerization, 25:723–724
of vinyl chloride, 25:631–632
polyimide synthesis via, 20:273–276
Addition silicones, 8:332
Additions, to fullerene, 12:238–241
Additive bromination, 4:345
Additive color films, 19:308–309
Additive color photography, 19:284
Additive flame retardants, brominated and chlorinated, 11:461–470
Additive mixing, in color photography, 19:240–241
Additive organic phosphorus flame retardants, 11:488–489
Additives. See also Flocculating agents; Food additives
to continuous-filament yarns, 19:757–758
drilling fluid, 9:30t
in the extrusion process, 19:539
in filled polymers, 11:306
fire-retardant, 11:450, 451, 452–453
fluoride in food salt, 22:816
gasoline, 12:406, 408–410
in graphite manufacturing, 12:726
for inks, 14:318
iodine in food, 22:815–816, 827
iron in food salt, 22:816
for lubricating oil and grease, 15:219–226
in paint, 18:60
in paper, 18:98
in paper coating formulations, 18:125
in paper manufacture, 18:114–117
phosphorus-containing, 11:485
in plastic encapsulant materials, 17:839–840
in polyamide plastic manufacture, 19:784–786
for PVC polymers, 25:670–676, 682
for RTV silicones, 22:596
sodium iodide in food, 22:827
standards for salt, 22:808–810
sulfur reduction, 11:688–689
workover/completion fluid, 9:29t
used in styrene plastics, 23:400
Additive shrink-resist treatments,
26:391–392, 393
Additive toxic effects, 25:213–214
Adducts, of vinyl chloride, 25:632
Adenine, 8:174. See also ADP entries
Adenocarcinoma, molecular formula and structure, 5:98t
Adenocor, molecular formula and structure, 5:98t
Adenoscan, molecular formula and structure, 5:98t
Adenosine, 5:104–105
molecular formula and structure, 5:98t
Adenosine triphosphate (ATP), 4:85; 13:286. See also ATP entries
hydrolysis of, 16:553; 20:641
production of, 13:288
Adenosylcobalamin, 25:804
Adenoviruses, 3:136
Adequate Intake (AI), 25:784, 785t
Adern, E., 11:8
Adherends, 1:501, 524
Adhesion, 1:501–524. See also Adhesive entries; Pressure-sensitive adhesives (PSAs)
ceramics, 5:631–632
coatings, 7:90–92
coatings for corrosion protection, 7:168–171
covalent bonding and, 1:510–511
of dust on self-cleaning surfaces, 22:115–116
epoxy, 10:427–428
of ethylene–acrylic elastomers, 10:702
interdiffusion and, 1:508–509
intermolecular forces of, 21:602–604
linear elastic fracture mechanics, 1:509–510
mechanical roughness and, 1:511–512
of moisture-curing sealants, 22:34
practical strength of adhesive bonds, 1:517–521
priming, 1:513
of PVA sizing, 25:615, 616
of sealants, 22:27–28
silane coupling agents and, 22:702
surface preparation, 1:512–513
of urethane sealants, 22:37
of VDC lacquer-resin coatings, 25:735
wetting and, 1:507–508
work of cohesion/adhesion, 1:506–507
Adhesion/adhesive properties
of paint, 18:73
of pressure-sensitive adhesives, 22:591
Adhesion forces
strength of materials and, 1:502–504
surface energy and, 1:504–506
Adhesion life, of sealants, 22:31–32
Adhesion parameter (θ), 22:116
Adhesion promoters, for RTV silicones, 22:596
Adhesion promoting silanes, 22:41
Adhesion tests, 9:790–791
Adhesive bonds, 1:501–502
  breaking, 1:513–517
  practical strength of, 1:517–521
Adhesive compositions, 1:524–525
Adhesive joints, 1:501–502
Adhesive polychloroprene grades, 19:852
Adhesive resins, amino acid resins, 2:627–630
Adhesives, 1:501–502, 524–553. See also
  Adhesion; Pressure-sensitive
  adhesives (PSAs)
acrylic ester polymers, 1:390
alkanolamines from olefin oxides and
  ammonia, 2:135
anthropogenic silicas and silicates in,
  22:472
asbestos applications, 3:312
butyl rubber applications, 4:454
calcium carbonate applications, 4:555
cellulose ester applications, 5:403–404
chlorinated paraffins applications, 6:128
classification, 1:526–527
CMC applications, 5:452t
cobalt applications, 7:246
combining with melamine resins, 15:791
corrugator starch, 18:17–18
defoamer applications, 8:245
dental application, 8:335
direct bonding, 1:548
EC and HEEC applications, 5:461t
  in electronic materials packaging, 17:830
epoxy-based, 10:458–459
ethylene oxide polymers in, 10:689
  in fine art examination/conservation,
    11:410
  folding carton, 18:22
forms and types, 1:527–528
formulation and design, 1:548–549
high performance, 1:545
hot-melt, 1:530–532
kaolin application, 6:688t, 696
made from natural products, 1:545–548
market economics, 1:525–526
methylcellulose applications, 5:459t
organic titanium compounds in, 25:122
palygorskite/sepiolite application, 6:700
  paper bag, 18:21
phenolic resin, 18:783–784
polychloroprene latexes in, 19:859
polyimide matrix, 20:284–285
polyurethane, 25:475
pressure-sensitive, 1:528–530
PVA in, 25:617
setting speed of, 25:579–580
smectites application, 6:697t
solution, 1:532–534
structural, 1:534–545
styrenic block copolymers in, 24:714
use of latex in, 14:711–712
vinyl acetate polymers in, 25:578–583
viscosity of, 25:581
water-borne, 25:475
Adhesive systems, microencapsules in,
  16:460
Adhesive transfer processes, release agents
  in, 21:606–607
Adhesive wear, 15:205–206
Adhesive wear tests, 9:713, 716
Adiabatic converters, in methanol
  synthesis, 16:309
Adiabatic cracking reactor, 10:617–618
Adiabatic decomposition, of hydrogen
  peroxide, 14:61–62
Adiabatic dehydrogenation, 23:337
Adiabatic dehydrogenation unit, 23:339
Adiabatic evaporation, general separation
  heuristics for, 22:319
Adiabatic flame temperature, 12:322
Adiabatic flash calculation, 24:681
Adiabatic nitration process, 17:253–255
Adiabatic pressure-reducing valve,
  24:647–648
Adiabatic saturation humidity, 9:100, 101
Adiabatic saturation temperature, 9:96
Adipamide, from acrylamide, 1:292
Adipates, 10:512
Adipex-P, 3:91, 93t
Adipic acid, 1.553–582; 9:679; 12:44;
  17:174; 24:174
  in adiponitrile production, 17:235
  barium salt (anhydrous), 1:556t
  barium salt (monohydrate), 1:556t
  from benzene, 3:620
  bulk phase handling properties of, 1:555t
  calcium salt (anhydrous), 1:556t
  calcium salt (monohydrate), 1:556t
  carbon monoxide in production of, 5:7
  chemical properties of, 1:553, 554t
  comparison of traditional and new
  heterogeneous metal-catalyzed
  manufacture, 5:339t
di-(2-butoxyethyl) ester, 1:556t
di-2-ethylhexyl ester, 1:556t
diammonium salt, 1:556t
Adiponitrile

diethyl ester, 1:556t
dimethyl ester, 1:556t
di-n-butyl ester, 1:556t
di-n-decyl ester, 1:556t
di-n-nonyl ester, 1:556t
di-n-propyl ester, 1:556t
dipotassium salt, 1:556t
disodium salt (hemihydrate), 1:556t
di-tridecyl ester, 1:556t

economic aspects, 1:556t

esters, 1:556t

health and safety factors, 1:572–573
manufacture, 1:557–569
monoethyl ester, 1:556t
monomethyl ester, 1:556t
monomethyl ester, 1:556t

nitrogen dioxide abatement technology practiced at major production sites, 1:573t

octyl decyl ester, 1:556t
physical properties of, 1:553, 554t
preparation by nitric acid oxidation of cyclohexanol (one), 1:564–568
preparation of KA by oxidation of cyclohexane, 1:557, 558–562
preparation of KA from phenol, 1:562–564
reactions, 1:553–557
solubility of salts, 1:556t
solution properties of, 1:555t
specifications and analysis, 1:571t, 571–572
storage, handling, and shipping, 1:569
uses of, 1:574
worldwide capacities, 1:570t

Adiponitrile, 1:574; 17:233–237
from acrylonitrile, 1:400, 410
from butadiene, 4:369, 383, 384t
electrohydrodimerization (EHD) of, 9:674–676

health and safety factors related to, 17:237
mixture with adipic acid, 1:557
physical properties of, 17:234t
processes for, 17:234–236
production of, 17:122, 235–237
shipment of, 17:235–237
uses for, 17:237

Adipoquamanine, 17:237

Adipoyl chloride, 1:575

ADI process, in biological waste treatment, 25:902

Adizem, molecular formula and structure, 5:97t, 118t

Adjunct mash, 3:574, 577
Adjuncts, brewing with, 10:291–292
Adjustable speed pumps, 20:686–687

Adjuvants, 9:49

in vaccine technology, 25:503

A. D. Little flavor profile analysis, 11:514

Administration, of materials standards, 15:743–744
Administrative controls, 21:833

Admiralty brass
antimony addition to, 3:53
arsenic addition to, 3:272
in galvanic series, 7:805t

Admon, molecular formula and structure, 5:129t

A-DNA, 17:605–606. See also Deoxyribonucleic acid (DNA)

ADP (adenine dinucleotide phosphate), 4:85

ADP glucose, 12:490
ADP glucose pyrophosphorylase (ADPGPP), in starch biosynthesis, 12:491–492

ADPGPP genes, expression of, 12:492

Adrenal glands, ascorbic acid and, 25:771

Adrenalin, chloroacetyl chloride in production of, 1:142

β-Adrenergic agonists
as animal growth regulators, 13:14–17
genotype, gender, and nutritional interactions related to, 13:16
mechanism of action of, 13:17

Adrenergic neuronal blockers, antihypertensive agents, 5:156t, 159

α-Adrenoceptor blockers, antihypertensive agents, 5:155–156t, 157t, 160

β-Adrenoceptor blockers, antihypertensive agents, 5:156–157t, 160, 167

ADSIM, 1:652

Adsorbate–adsorbent interactions, 1:672–673
gas adsorption, 1:619
AdSORBED solution theory, 1:594

AdSORBED spectral sensitizing dyes, 19:194–195
Adsorbents
activated alumina applications, 2:400
applications, 1:611–615
capillary chromatography sample
preparation, 4:609
classification by pore size distribution
and surface polarity, 1:586
factors governing choice of regeneration
method, 1:614t
liquid phase adsorption, 1:673–675
loaded, 1:590
reactions on, 1:629–630
types of, 1:585–590
Adsorption, 1:582–617. See also
Desorption; Displacement desorption;
Gas separation adsorption; Liquid
separation adsorption; Pressure swing
adsorption; Thermal swing adsorption
asbestos fibers, 3:304
for bioremediation, 3:782
capillary condensation, 1:585, 591
dessicants and, 8:375–377
detergency and, 8:428–429
in dispersions, 8:707
filler measurement via, 22:571
general separation heuristics for,
22:321–322
in heterogeneous photocatalysis, 19:74
hydrophilic and hydrophobic surfaces,
1:584–585
ideal adsorbed solution theory, 1:594
in ion exchange, 14:409
mixtures, 1:583–594
in molecular sieves, 16:821–823, 837
for odor control, 26:725
parameters of physical adsorption and
chemisorption contrasted, 1:583t
in photocatalysis, 19:101
process design, 1:614–615
selectivity, 1:583, 584
of silicates on oxides, 22:460
for VOC control, 26:680–683
in wastewater treatment, 25:889t,
891–892
Adsorption chromatography, 1:610–611;
6:374–375
Adsorption columns, 1:601–609
length of unused bed, 1:605–607, 614
Adsorption corrosion inhibitors, 26:144,
145–146
Adsorption/desorption profiles, 9:109
Adsorption effluent treatment, 9:432
Adsorption equilibrium, 1:591–594
Adsorption forces, 1:583–584
gas adsorption, 1:619–621
Adsorption free energy, contributions to,
24:139
Adsorption isobars, 1:622–623
Adsorption isotherms, 1:591–593; 26:680,
681, 682
Brunauer classification, 1:591
and column performance, 1:604–606
gas adsorption, 1:622–623, 626–629
of nonionic surfactants, 24:142–143
predicting, 24:139–140
Adsorption kinetics
batch systems, 1:599–601
and equilibrium in adsorption columns,
1:603
external fluid film resistance, 1:595–596
intrinsic kinetics, 1:595
macropore diffusion, 1:596–597
micropore diffusion, 1:597–599
in zeolite, 16:824
Adsorption separations, molecular-sieve,
16:823–824
Adsorption technology, 13:794–795
Adsorptive air separation, 17:753
Adsorptive bubble separation effluent
treatment, 9:432
Adulteration, of spices, 23:160–163
Adult immunizations, cost-benefit analyses
for, 25:506–507
Advanced bioceramics, hydrothermal
processing of, 14:102–104
Advanced BWR (ABWR) reactor design,
17:554
Advanced cake filtration modeling,
11:336–337
Advanced ceramics, 1:703–710
hydrothermal processing of, 14:100–111
U.S. market trends, 1:703t
Advanced Chemistry Development (ACD
Labs) software, 17:401
Advanced coal gasification processes,
13:845–846
Advanced coatings, 1:694, 710–716
U.S. market trends, 1:716t
Advanced composites, 26:751
Advanced cracking reactor (ACR), 10:617
Advanced cracking techniques, propylene,
20:778–779
Advanced depth filtration modeling, 11:341
Advanced Fiber Information System (AFIS), 8:14

Advanced Fuel Cycle Initiative (AFCI), 17:557

Advanced glycation end-products, 2:810, 811–812

Advanced heat-transfer fluid, 13:276–278

Advanced image processing software, 16:487

Advanced inorganic materials, hydrothermal synthesis of, 14:97–99

Advanced lightwater reactors (ALWRs), 17:554, 594, 595

safety objectives for, 17:556

Advanced lipoxidation end-products, 2:812

Advanced materials commercialization process, 1:696–698

economic evaluation, 1:691–730

evolutionary patterns and market strategies, 1:698–700

hydrothermal processing of, 14:79

industry structure, 1:694–696

U.S. market trends, 1:700t, 703t

world market trends, 1:701t

Advanced materials science, surfaces and interfaces in, 24:71

“Advanced metallocenes,” 16:107

Advanced oxidation processes (AOPs), 17:773, 779

in wastewater treatment, 25:910–911

Advanced Oxidation Technologies (AOT), 19:73

Advanced Photon Source (APS), 26:412

Advanced Photo System (APS), 19:266

Advanced power reactors, 17:594–595

Advanced SclairTech dual-reactor system, 20:197

Advanced selectively solar-absorbing surfaces, 23:13

Advanced thin films, 1:723–726

U.S. market trends, 1:726t

Advanced visual technology, 15:469–470

Advanced waste recycling, 21:454

Advancement process, 10:361–364, 387

Advancement reaction catalysts, 10:362–363

Adverse Reaction Monitoring System (ARMS), 12:35

Adverse tissue reactions, to sutures, 24:218

Advertising, technical service personnel and, 24:343

Advicor, 5:146

Advisory Committee on Immunization Practices (ACIP), 25:487

Advisory Committee on Investigational Drugs, 18:685

Aerated concrete, quicklime in, 15:62

Aerated lagoons, 19:217–218

in biological waste treatment, 25:901t, 903, 904

Aerated power draw, during fermentation, 11:39–40

Aeration

in biological waste treatment, 25:827, 828–829, 830

through polymer tubing, 15:718–723

recirculating aquaculture biofiltration, 3:197–198

submerged, 15:696–714

surface, 15:690

target, 15:694

Aeration basins, in biological waste treatment, 25:827

Aeration biotechnology, 1:730–747

applications, 1:743–745

oxygen demands of biological species, 1:730t

oxygen mass transfer, 1:732–737

Aeration equipment, oxygen transfer efficiency of, 26:170

Aeration systems, diffused-air, 26:163

Aeration water treatment, 26:153–171

gas diffusion in, 26:154–158

oxygen solubility in, 26:153–154

Aerators, water treatment, 26:156, 158–170

Aerobes, in nitrogen fixation, 17:301

Aerobic aerated lagoon, 25:904

Aerobic conditions, defined, 3:757t

Aerobic microbial growth, miniaturized culturing systems for, 16:406

Aerobic process, in wastewater treatment, 25:889t, 896, 897, 899, 901t

Aerobic systems, in bioremediation, 25:837

Aerobic wastewater treatment, biological, 1:744–745

Aero-derivative systems, 10:142

Aerodynamic diameter, of a particle, 26:694

Aerodynamic web formation, 17:502–504

Aerogels, 1:748–769; 23:56

ambient preparations, 1:755–758

catalytic applications, 1:762–764, 763t

important historical developments in preparation of, 1:754t
inorganic materials, 1:749–750
inorganic–organic hybrids, 1:752–753
as insulation materials, 23:8, 9
organic materials, 1:750–752
physical properties of, 1:758–760
preparation and manufacture, 1:753–758
silica, 22:370, 474
sol–gel chemistry, 1:749–753
supercritical drying, 1:748, 753–754
thermal insulation applications,
1:760–762
Aeromonas, 769–787, 8:697
economic aspects, 1:786
filling, 1:785–786
formulation, 1:771–780
product concentrate, 1:772–775
propellants, 1:775–781
Aerosol solutions, 1:772–773
Aerosol spray delivery, 23:196
Aerosol sprays, 1:773–774
Aerospace applications
aluminum alloys, 2:340
artificial graphite in, 12:740–741
for high performance fibers, 13:397–398
of liquid-crystal polymers, 20:85
metal–matrix composites in, 16:191
polyimide matrix composites in, 20:284
Aerospace bearings, corrosion resistance of,
14:452
Aerospace industry
electroless deposition in, 9:700
graphite fiber-reinforced composites in,
10:451
noble gases in, 17:376
tin alloys in, 24:799
titanium in, 24:838–839, 861–862,
866–867, 868t
Aerospace Materials Specification (ASM),
for titanium alloys, 24:864
Aerozine-50, 13:597
AES instrumentation, 24:100–107. See also
Auger electron spectroscopy (AES)
AF commercial defoamer, 8:241t
Affinity biosensors
DNA biosensors, 3:805–808
immunosensors, 3:800–805
Affinity chromatography, 3:846–847; 6:387,
390–407, 12:137; 14:145
immobilization methods, 6:395–397, 396t
principles, 6:392–399
types, 6:399–405
Affinity driven molecular transfer (ADMT)
system, 18:264–265
Affinity ligands, 6:390
types of, 6:393–394, 396t
Affinity method, 10:339
Affinity resins, 20:197
Affinity-selected libraries, 12:515–517
Affymatrix GeneChip HFV PRT, 16:390
Aflatoxins, 12:84
and cotton production, 8:9
A-form helical oligonucleotide structure,
17:607
Africa
natural graphite in, 12:779–780
tin mining in, 24:800
African catfish, common and scientific
names, 3:187t
African Intellectual Property Organization
(OAPI), 18:198
African Regional Industrial Property
Organization (ARIPO), 18:198
African trypanosomiasis
(sleeping sickness), 14:338
Aftcrhrome dyeing, 9:399
Afterload-systolic pressure, 5:108
After-shaves, 7:851
Aftertack, 9:150
AgAr(s), 4:724t, 725–726; 12:53; 13:67–68
dental impression material,
8:327–329
properties of, 13:74t
Agar, 20:569–570; 13:68
classification by structure, 4:723t
electrophoresis, 9:749
gels, 3:846–847
Agave cantala, 11:296
Agave fourcroydes, 11:296
Agave funkiana, 11:296
Agave lophantha, 11:296
Agave sisalana, 11:297
AgBr, light sensitivity of, 19:360. see also silver bromide
AGDOC service, 18:244
Age. See also Aging; Dating
influence on toxicity, 25:212
using radioactive decays to determine,
21:316
Age-hardened alloys, 17:102–103
Age hardening, of aluminum alloys, 2:332t
Age-hardening precipitates, 13:512
Agency for Toxic Substances and Disease Registry, 16:51
Agenda 21 (UNCED), 24:162, 163, 164, 167, 176
demands made by, 24:191
risk assessment and, 24:185–186
Mo toxic chemicals management and,
24:184–185
Agent BZ, 5:822–823
Age-related conditions, 2:811
Age-related macular degeneration (AMD), 17:656–660
prevalence of, 17:659
risk factors for, 17:659
Age-resistant elastomers, 9:559–560
Agfa-Gevaert instant reprographic processes, 19:293–294
Agglomerate fed roasters, 26:564–565
Agglomeration, 16:655
in crystallization, 8:95
of synthetic zeolite powders, 16:834–835
in water treatment, 26:106
Agglomeration agents, in paper recycling, 21:440
Agglutination–precipitation immunoaassays, 14:140
Aggrastat, 4:104t, 105; 5:173–174
molecular formula and structure, 5:171t
Aggregates, of fillers, 11:303–304
Aggregation
of colloidal silica and silica sols, 22:392, 393–394
of surfactants, 22:725
Aggregation number, 24:124
AGibbsite, 2:345t, 347, 421, 422–425
activation, 2:394, 396
calcination, 2:403, 407–410
classification, 2:422
composition in bauxite used for alumina production, 2:346t
decomposition sequence, 2:392
from gelatinous boehmite, 2:427
mineralogical and structural properties of, 2:423t
thermodynamic data, 2:423t
Aging, 2:810
in beer making, 3:584
of metal–matrix composites, 16:183–184
PVA viscosity and, 25:597
of regenerated cellulose fibers, 11:253
of silica gel, 22:396
in the sol–gel process, 23:60, 64–66
tire compounds, 21:811–812
Aging failure, 26:982
Aging properties, in ethylene–acrylic elastomers, 10:698
Ag+ intermediate complexes. See also Silver entries
thermal generation of, 19:355
thermal migration to latent image, 19:355–358
Agitated column contactors, 10:767
Agitated drying systems, 18:732
Agitated tanks, heat transfer in, 16:716–719
Agitation, pilot plant, 18:730–731
Agitation leaching, 16:153
Agitation process, 9:165
Agitator dryers, 9:131–133
Agitatortors
for aeration, 1:738–740, 743
in fermentation scale-up, 11:43
Agycones, 15:290, 298
bioconversions of, 15:301–302
tylosin-type, 15:299t
AGN-201 research and training reactor, 17:593
Agon, molecular formula and structure, 5:126t
Agouti-related peptide (AGRP), target of antiobesity drugs, 3:97
Agricultural animals, cloning, 12:451–452
Agricultural applications
magnesia in, 15:414
for microwave technology, 16:529–530
Agricultural carriers
palygorskite/sepiolite application, 6:700t
smectites application, 6:697t, 699
Agricultural chemicals, 12:808
arsenic applications, 3:271
arsenic demand pattern in U.S., 3:270t
bioseparation of value-added, 3:816
C30 alcohol for, 2:21
carbon disulfide application, 4:837
emulsion use in, 10:130–131
fatty acid amides for, 2:459
fatty amines, 2:534
maleic anhydride in the manufacture of, 15:513
nickel compounds in, 17:125
plasticizer alcohols for, 2:23
quinolines as, 21:194–195
Agricultural commodity by-products, in ruminant feeds, 10:864
Agricultural ecosystems, 13:350
Agricultural-grade potassium phosphates, 20:637
Agricultural lime, 15:26
Agricultural Pesticides Directive, 13:51
Agricultural products
aminopyridines in, 21:121–123
mercury in, 16:52–53
U.S. exports sales of, 20:639
Agricultural residues, as biomass, 3:684
Agricultural spraying, 23:197
Agricultural vehicles, heavy duty diesel engine oils for, 15:233–235
Agriculture
ascorbic acid in, 25:761
citric acid application, 6:646–647
cobalt applications, 7:246
controlled release technology, 7:551–573
dispersant applications, 8:692
high performance fibers in, 13:393–394
hydrazine use in, 13:593–595
hydrocarbon use in, 13:688
insecticides in, 14:340
iodine in, 14:373–374
limestone in, 15:38, 65
precision, 26:269–270
radioactive tracers in, 21:282
runoff for, 26:3
salt in, 22:816–817
selenium in, 22:99
silica in, 22:375
slaked lime in, 15:65
sodium nitrate in, 22:852
sulfur use in, 23:589–590
superabsorbent polymers in, 13:753
uses of succinic acid and succinic anhydride in, 23:427t
water for, 26:57–58
Agrobacterium-meditated gene introduction, 12:485

Agrobacterium tumefaciens
transformation, 12:491
system, 12:488
Agro-based fibers, 21:17–18
Agrochemical market, profitability in, 13:285
Agrochemical products, vanillin in, 25:554–555
Agrochemicals, chloropyridines in, 21:123
Agroclavine, 2:75, 93
Agroecosystems, management of, 13:329
AGR reactor, 17:570–571
AGR system, 16:705
AgX/Ag carboxylate material, 19:353–354
AgX zeolite. See Zeolite AgX
“A-HB” theory, 24:247
AH–B–X sweetness theory, 23:438
AHC-52, 5:189
AHC-93, 5:189
Ahydrous aluminum chloride, dimer, 2:380
AIDS. See Acquired Immunodeficiency Syndrome (AIDS)

Air. See also Atmosphere
diffusion coefficients of gases, 1:70t
distillation of, 17:358–360
for fermentation, 11:44–45
gaseous composition of, 17:751t
gas purification, 1:618t
mercury releases to, 16:47–49
mixtures with acetylene, 1:186
monitoring phosgene content in, 18:808
ozone generation from, 17:795–796
separation into component gases, 22:300
solvents in, 23:111
Air-atmosphere furnaces, 12:290–291
Air atomization, in spray coating, 7:70–72
Air-atomizing sulfur burners, 23:659–660
Airbags, nylon, 19:766
Air-based balanced vinyl chloride process, 25:637, 640, 641, 645
Air-based ethylene oxidation, 10:643–646
Air bioremediation
halogenated solvents, 3:771–772
hydrocarbons, 3:764
Airblast-type atomizers, 23:191
Airborne ambient sampling, 26:673
Airborne contamination, effect on negative-CA resists, 15:174–175
Airborne organic silicones, 22:603
Airborne silver, environmental limits on, 22:652
“Air breathing” cells, 12:212
Air buoyancy, effect on weighing, 26:242
Air classification, of wheat flour, 26:282
Air cleaners, to improve indoor air quality, 1:820, 831–834
Air cleaning systems, industrial hygiene and, 14:213
Air cooled acid plants, 18:822
Air-cooled condensers, 22:218
in refrigeration systems, 21:537
Air cooler fans, as a source of noise, 19:522
Air core, in hydrocyclones, 22:285, 286
Aircraft
beryllium applications, 3:648
copper applications, 7:715
high throughput experimentation, 7:382t, 414t
oxygen partial pressure in, 17:765
use of nonwoven goods in, 17:517
Aircraft coatings, 7:185–186
Aircraft gas turbines, rhenium in, 21:697
Aircraft industry, electrochemical machining in, 9:602
Aircraft nuclear propulsion (ANP) program, 17:590
Aircraft reactors, 17:589–590
Aircraft sealants, specifications for, 22:46
Air distributor grid, 11:725–726
Air driven bioreactors, 1:741
Air drying
ceramics processing, 5:655
of wood, 26:341
Air emissions
from posttreatment operations, 25:64
from sulfate process wastes, 25:62
from the chloride process, 25:63
from waste treatment processes, 25:64
Air-entraining cement admixtures, 5:485, 493, 501
Air filters, phenolic resins in, 18:790
Airflex, 7:640
Air flow rates, in fermentation, 11:34
Air/fuel charge misfire, 10:53
Air/fuel conditions, TWC catalyst, 10:50
Air/fuel mixture, stoichiometric, 10:57
Air/fuel ratio (AFR), 7:435–436
effect on pollutants, 26:718–719
exhaust gas composition and, 10:36
Air gap coagulation, 11:209
Air gap spinning, 11:209
Air impingement dryers, for coatings, 7:27–29
Air infiltration barrier, spunbonded fabrics in, 17:486
Air inhibition, in unsaturated polyesters, 20:110
Airjet spinning, cotton yarn, 8:17
Airjet textured yarn process, 20:19
Airjet texturing, 19:753
Air-knife chemical finishing, 17:513
Air knife coating, 7:10–11
method summarized, 7:5t
Air-laid processes, 11:179–180
Air legislation (EU), 23:121
Airless atomization, in spray coating, 7:69–70
Airlift bioreactors, 1:740–742, 744
oxygen transfer driving force, 1:735
Airlift devices, estimating shear rates for, 15:689
Airlift reactors, 15:703–709, 726–727
gas–liquid volumetric mass transfer coefficient correlations for, 15:704–705t
solid–liquid mass transfer coefficient in, 15:727t
static mixers in, 15:708–709
on wastewater treatment, 15:713–714
Air limes, 15:26
Air/liquid (A/L) interface, adsorption of surfactants at, 24:133–138
Air mass zero (AM0) spectrum, 23:37
Air monitoring, for hydrazine, 13:589
Air oxidized pan, 11:194
Air-path XRF, in
See also Air pollution control methods
acid deposition, 1:805
activated carbon for protection against, 4:755–756
coatings industries, 10:106–109
defined, 26:667
global warming, 1:806–808
lime industry, 15:75–77
from nuclear power plants, 17:533
reducing, 26:721
regional and global impacts, 1:805
stratospheric ozone depletion, 1:808–811
Air pollution control
from hazardous waste incineration, 13:179–181
indoor, 1:816–839
Air pollution control devices, checklist of applicable, 26:678t
Air pollution control methods, 26:667–729
gaseous emissions control, 26:678–694
hierarchical approach in, 26:675–678
measurement of air pollution, 26:672–675
for mobile source emissions, 26:717–721
national air pollution standards, 26:670–672
for odors, 26:721–725
for particulate matter emissions, 26:694–717
pollutant characteristics and control approaches, 26:667–670
Air pollution control equipment, selecting, 26:676–678
Air pollution dispersion modeling, for odor impacts, 26:725
Air preheater, 19:512
Air products and chem systems, methanol process, 16:310–311
Air quality
and biomass, 3:684
impact on sulfur use, 23:588
indoor, 1:816–820
management of, 1:812–814
in mega-cities, 1:788t
monitoring of, 21:588
urban, 17:814–815
Air Quality and Other Photochemical Oxidants document, 17:814
Air quality standards, 21:583–586
ambient, 26:670t
Air separation
adsorbents, 1:587t
cryogenics applications, 8:43–48;
17:275–278, 752–753
dessicant applications, 8:356t
membrane systems for, 17:278–280
noncryogenic, 17:753
Air separation industry, U.S., 17:754
Air-separation plants, 17:359, 750–751
Air-separation units, krypton and xenon recovery from, 17:362
Air-slaked lime, 15:26
Air slaking, 15:43
Air sparging
in bioremediation, 25:842
defined, 3:758t
Air-standard refrigeration systems, 21:552–554
elements of, 21:553
Air strippers, 25:810
rotary, 10:103–104
Air stripping
as advanced wastewater treatment, 25:908
defined, 3:758t
of groundwater, 10:105
in hazardous waste management, 25:809–811
Air supply, in thermal waste treatment, 25:832–833
Air–water flow regimes, 11:773
Air–water interface, molecular recognition at, 16:799–800
AISI 403 alloys, 13:511
AISI alloy steels, 23:299–300
Ajmalicine, 2:94, 95, 96, 100
Ajmaline, 2:94, 95, 96–97
AK-UFVE contactor, 10:768
Al₂O₃ surface scale, 13:507–508
Alabaster, 4:583
Alachlor, chloroacetyl chloride in production of, 1:142
ALADDIN, 6:11
Alanates, hydrogen storage and, 13:851
Alanine
content in cocoa and chocolate products, 6:368t
production from acetaldehyde, 1:105
systematic name, formula, and molecular weight, 2:555t
taste profile, 2:605
D-Alanine, systematic name, formula, and molecular weight, 2:555t
DL-Alanine
chemical synthesis, 2:596
systematic name, formula, and molecular weight, 2:555t
L-Alanine, systematic name, formula, and molecular weight, 2:555t
Alar, 13:40t
as a plant growth regulator, 13:39–46
Alarms, 20:671–672
Albemarle \( \alpha \)-olefin manufacture, 17:713, 714, 715, 716
AlBeMet (beryllium–aluminum), 3:648–649, 649t, 650t
Alberger process, 22:805
Alborixin, 22:865
Alcalase, 20:131, 137
Albumin. See also Egg albumen as blood substitute, 4:111
processes, 12:146
properties of, 12:151t
worldwide use of, 12:147–148
Alcalase, 10:252
Alcan multipolar cell, 15:337
Alcogel, 23:56
Alcohol(s), 10:488. See also C12 alcohol;
Detergent range alcohols; Ethanol;
Fuel alcohol; Higher aliphatic alcohols;
Plasticizer range alcohols; Polyhydric alcohols
acetates of, 10:472
achiral derivatizing agents, 6:96t
adsorbent affinity, 1:674
amination, 2:544–545
aroma chemicals, 3:241–246
aroma compounds in roasted coffee, 7:256t
in beer, 3:582t
bicyclic monoterpenoid, 24:527–528
catalytic esterification of, 10:482
chemiluminescence reagents for determination, 5:851–853
chiral derivatizing reagents, 6:76t
in cosmetic molded sticks, 7:840t
dispersant moieties, 8:706t
esterification of organic acids with, 10:472–478
ethylene oxide reaction with, 10:637
as gasoline blending agents, 12:405
hydroxybenzoic acids and, 22:4
from indirect coal liquefaction, 6:865–866
d-lower primary as feedstocks for higher aliphatic alcohols, 2:27t
monocyclic monoterpenoid, 24:509–527
monoterpenoid, 24:500–528
oxidation of, 26:894–896
ozonation of, 17:780
polarity relative selected molecules, 8:813t
polyhydric, 2:46–58
reaction of phosgene with, 18:805
reactions with acetaldehyde, 1:104–105
reactions with acetone, 1:163
reactions with acetylène, 1:181
reactions with aluminum, 2:285
reactions with boron trifluoride, 4:144t
reactions with bromine, 4:303
reactions with carbon monoxide, 5:9–10
reactions with carbonates, 6:306–307
reactions with chloroformates, 6:294
reaction with acrylamide, 1:289
reaction with aldehydes, 2:64
reduction to chloroform, 6:284
salicyl, 22:1, 23–25
silicon reactions with, 22:551–552
sulfating, 23:539–540
in waxes, 26:206
Alcoholate catalysts, 10:488
Alcohol autodissolution, 14:52
Alcohol concentration ranges, 10:532
Alcohol content, units of, 10:548
Alcohol dehydrogenases, 3:672
cofactor regenerating systems, 3:673
Alcohol ether sulfates, 23:415
Alcohol ethoxylates, 2:19–20, 24:149, 154
rat oral LD50 values, 8:445
as soap bar additives, 22:745
Alcohol ethoxylate sulfates (AES), 23:516, 526
Alcohol ethoxysulfates, in mobility control, 18:627
Alcohol fuels, emissions control for, 10:60
Alcohol group, acylation of, 14:118
Alcoholic beverage industries, regulation of, 26:328–329
Alcoholic beverages
distilled, 26:469–470
production of, 11:7
Alcoholic gel systems, syneresis in, 23:64
Alcoholometry, 10:550
Alcohol oxidation, microwaves in, 16:567–570
Alcohol poisoning/intoxication, 10:552
Alcohol production, 13:768, 798
Alcohol sulfates, 2:19, 20
rat oral LD50 values, 8:445
Alcohol sulfation, 23:536–537
Alcohol testing, 12:96
Alcoholysis, 10:490, 499, 503; 18:519
in silicone chemistry, 22:554
in vinyl alcohol polymerization, 25:608–609
Aldactazide, molecular formula and structure, 5:165t
Aldactone, 5:166
molecular formula and structure, 5:165t
Aldehyde diacetate deprotection, microwaves in, 16:558–559
Aldehyde reactions, 17:792
Aldehydes
Aldehydes, 2:58–71; 10:488. See also Ketones
allylboration of, 13:669–671
α-chiral and homologated, 13:669
analysis, 2:67
annual consumption by region, 2:67t
aroma chemicals, 3:247–249
aroma compounds in roasted coffee, 7:256t
in beer, 3:582t
in carbohydrates, 4:696
carbonylation, 2:573
chemical reactions, 2:62–65
economic aspects, 2:67–68
enolboration of, 13:672
health and safety factors, 2:68–70
from indirect coal liquefaction, 6:866
indoor air pollution, 1:804
manufacture of, 2:65–66
monoterpenoid, 24:529–536
nomenclature of, 2:58, 59t
physical properties of, 2:59–62, 60–61t
in photochemical smog, 1:789
polarity relative selected molecules, 8:813t
predicted deviations from Raoult’s law based on hydrogen-bonding interactions, 8:814t
producers of, 2:68t
PVA reactions with, 25:600
reactions with acetaldehyde, 1:103–104
reactions with acetone, 1:163
reactions with acrylamide polymers, 1:315
reactions with alkanolamines from olefin oxides and ammonia, 2:127–128
reactions with alkylphenols, 2:208–210
reactions with aluminum, 2:285
reactions with boron trifluoride, 4:144t
reactions with bromine, 4:302
reactions with chloroformates, 6:295
reaction with phenol, 18:759
separation from ethylene oxide, 10:652
spectroscopic properties of, 2:59, 62, 62t
syntheses of, 12:177–179; 13:571
uses of, 2:70
N-Aldehydes, platinum-group metal catalysts and, 19:621
Aldehydic floral perfumes, 18:357
Aldehydic odor, 3:227t
Aldehyde sugars, 4:699
Alder, biomass production by, 17:298–299
Aldgamycins, 15:297t, 298
Aldicarb, 3:777, 778
Aldoclor, molecular formula and structure, 5:161t
Aldol addition, 2:63–64
acetone, 1:164
Aldolases, 3:675; 4:711
Aldol process, for higher alcohol manufacture, 2:27t, 41–43
Aldonic acid, 14:132
Aldoses, 4:696
conversion from open-chain to ring forms, 4:699
Fischer formula, 4:697
D-Aldoses, 4:698
Aldosterone receptor antagonists, as antihypertensive agents, 5:154t, 159
Ale fermentations, 26:466
Alepric acid, 5:36t
Alepric acid, 5:36t
Aleprolic acid, 5:36t
Aleprylic acid, 5:36t
Alerting abstracts, in patent literature, 18:223
Alerting patent information searches, 18:235–236
Aleuritic acid, physical properties of, 5:35t
Aleurone layer, 3:567
Alexandrite, color of, 7:331
Ale yeast, 3:580
Alfadat, molecular formula and structure, 5:128t
Alfa-Laval extractor, 10:781
Alfol 6, chain length and linearity, 2:12t
Alfol 18, chain length and linearity, 2:10t
Alfol alcohols, 2:8t
Alfrey–Price parameters, 7:617t
AlGaAs–GaAs heterojunction, in SETs, 22:171, 172
AlGaAs semiconductor
in laser diodes, 22:179
in LED technology, 22:175
in near-IR VCSELs, 22:180
Algae (seaweeds), 20:568. See also Algicides
alkaloids in, 2:75
common and scientific names, 3:188t
indoor air pollutant, 1:804
in industrial water treatment, 26:147
AlGaInN compounds, 14:832
AlGaInP semiconductor
in laser diodes, 22:179
in LED technology, 22:175
Algal extract gums, 13:63t
Algal polysaccharides, 20:453–454
Algebraic stress models (ASMs), 11:780
Algicides, for swimming pool/spa water
treatment, 26:188–189, 196
Alginate-based irreversible hydrocolloids, 8:328
properties of, 13:74t
Algic acid, 4:725; 13:67; 20:453
Alginate, 6:707t
Algin, 4:724t, 724–725; 13:67
properties of, 13:74t
classification by structure, 4:723t
Algocor, molecular formula and structure, 5:119t
Algorithms, for separation synthesis,
22:312–316
Alicyclic diols, 20:113
Aliphatic alcohols, aroma chemicals,
3:241
Aliphatic aldehydes, 13:571
physical properties of, 2:60t
syntheses of, 12:187
Aliphatic α-hydroxy acids, 14:130
Aliphatic amine/polysulfide co-curing agent
systems, 10:410
Aliphatic amines, 10:393–394. See also
Higher aliphatic amines
Aliphatic carboxylic acids, syntheses of,
12:187
Aliphatic-carboxylic herbicides, 13:324
Aliphatic chemicals, hydrocarbon use in,
13:687
Aliphatic compounds, 13:105–108
acylation of, 12:184–188
alkylation of, 12:171–172
biodegradability of, 25:826
Aliphatic diesters, for PVC polymers,
25:674
Aliphatic disocyanates, toxicity of, 25:
479–480
Aliphatic dissolution inhibitors, low
molecular weight, 15:177
Aliphatic endoperoxides, 18:442, 443
Aliphatic fluorocarbon production
Europe, 11:870–871
Pacific Rim/India, 11:871
United States, 11:869–870
Aliphatic fluorocarbons, surface energy of,
21:604
Aliphatic glycidyl ethers, 10:376–377
Aliphatic hydrocarbons. See also Aliphatics
photochemical chlorination of, 19:113
separation of, 10:782–785
Aliphatic hydroxyl, replacement with
chloride, 13:821
Aliphatic iodine derivatives, 14:376
Aliphatic ketones, 14:563, 571, 581–585
reactions of, 16:331–332
Aliphatic monothiopolysters, 23:739
Aliphatic nitrations, 12:187
Aliphatic peroxycyacids, 18:464
Aliphatic peroxycarboxylic acids, 18:463
Aliphatic phosphines, 19:60
Aliphatic polyamides (PA), 10:207–210;
19:713, 739. See also Aromatic
polyamides; PA entries
producers of, 10:210
properties of, 10:208, 209t
Aliphatic polycarbonates, 24:703
preparation of, 19:798
Aliphatic polyketones (PK), 10:197
costs of, 10:222
properties of, 10:198t
Aliphatic poly(monomersulfide)s, 23:702–704
Aliphatic polyphosphonate dyes, 9:480
Aliphatic poly(sulfide)s, 23:711
Aliphatic poly(sulfides), 23:734
Aliphatic polysulfides, 23:733
miscibility of, 23:735
Aliphatic polyurea preparation, carbonyl
sulfide in, 23:625
Aliphatics, 18:674–678. See also Aliphatic
hydrocarbons
industrial use of, 24:254
Aliphatic solvents, alkyllithium compounds and, 14:250–251
Aliphatic sulfonates, 26:145
Aliquot samples, 13:413–415
analysis of, 13:416
Aliskren, 5:158
Alitame, 12:42; 24:232
Alitine, phase in Portland cement clinker, 5:471, 472t, 473t
Alitretinoin, 25:790
Alizarin, color of, 7:331
Alizarin derivatives, 9:337
Alizarin pure Blue B, 4:361t
Alkadienes, metathesis of, 26:923
Alkali/alkaline-earth cation recognition, 16:777–778
Alkali aluminate (5-calcium disilicate monosulfate), phase in Portland cement clinker, 5:472t
Alkali aluminate (8-calcium disodium trialuminate), phase in Portland cement clinker, 5:472t
Alkali belite, phase in Portland cement clinker, 5:472t
Alkali blue toners, 14:318
Alkali borate glasses, 12:572, 573, 584
Alkali catalysed pad-dry-bake procedure, 9:485
Alkali cellulose, 4:716
Alkali earth metal nitrides, 17:206–207
Alkali flame-ionization detector (AFID), gas chromatography, 6:381
Alkali–gravity–viscosity (AGV) charts, for silicate glasses, 22:462, 463
Alkali halide disk method, 14:229
Alkali-immobile compounds, dye release from, 19:288
Alkali-immobile dye-releasing quinone compounds, 19:293–294
Alkali lignins, 15:19–20
Alkali manganate(VI) salts, 15:596
Alkali manganates(V), 15:592
Alkali-metal alkoxide catalysts, 10:491
Alkali-metal alkoxides, effects of, 14:252
Alkali-metal alkylstannonates, 24:824
Alkali-metal fluoroxyenates, 17:329–330
Alkali-metal hydrides, 13:608
Alkali-metal hydrides, carbonyl sulfide reaction with, 23:622
Alkali-metal metatungstates, 25:383
Alkali-metal perchlorates, 18:277
Alkali-metal peroxides, 18:393
Alkali-metal phosphates, manufacture of, 18:853
Alkali-metal phosphides, 19:59
Alkali metals, 14:248; 20:597, 598
as anionic initiators, 14:245–248
cation binding of, 24:41
soaps and, 22:723
in sodium analytical methods, 22:775
vitreous silica optical properties and, 22:431
Alkali-metal salts, 24:145
Alkali-metal tellurides, 24:417
Alkali-metal thermal electric conversion (AMTEC), 22:773–774
Alkali-metal titanates, 25:43–44
Alkaline autoclaving, selenium recovery via, 22:81
Alkaline baths, in tin refining, 24:789
Alkaline batteries, 15:611
Alkaline catalysts, in phenolic resin polymerization, 18:762–765
Alkaline cleaners, for metal surfaces, 16:211–212
Alkaline coupling, 9:358
Alkaline deoxidizers, 16:223
Alkaline derusting, 9:785
Alkaline-earth carbonate catalysts, 10:683
Alkaline-earth metal hydrides, 13:610–611
physical properties of, 13:610t
Alkaline-earth metal peroxides, 14:40–41
Alkaline-earth metal stannates, 24:806
Alkaline-earth perchlorates, 18:278
Alkaline earths, cation binding of, 24:41
Alkaline-earth tellurides, 24:417
Alkaline-earth titanates, 25:43t, 44–46
properties of, 25:45t
Alkaline electrolyte fuel cell (AFC), 12:203, 214–216
Alkaline floating
in enhanced oil recovery, 18:629–630
surfactant-enhanced, 18:630
Alkaline fuel cells (AFC), 13:858
Alkaline hydrogen peroxide solutions, 14:39–40
Alkaline lithium recovery process, 15:126
Alkaline primary cells
companies manufacturing, 3:469t
cylindrical, 3:441–449
miniature, 3:449–459
world market estimated, 3:410t
Alkaline pulping, 21:21–22
condensation reactions during, 21:25
peeling and stopping reactions in, 21:28
reactions of carbohydrates during, 21:27–29
reactions of lignin under, 21:23–25
Alkaline secondary cells, 3:471–475
electrolyte, 3:518–519
health and safety factors, 3:519–520
hydrogen–oxygen cells, 3:516–518
iron–air cells, 3:515–516
nickel–cadmium cells, 3:475–491
nickel–hydrogen cells, 3:505–512
nickel–iron cells, 3:491–493
nickel–zinc cells, 3:502–505
rechargeable systems, 3:472
recycling, 3:520
silver–cadmium cells, 3:500–501
silver–hydrogen cells, 3:512
silver–iron cells, 3:501–502
silver–zinc cells, 3:493–500
zinc–air cells, 3:512–515
zinc–oxygen cells, 3:512–515
Alkaline sizes, in paper manufacture, 18:112–113
Alkaline soaps, 22:723, 726, 727, 728, 729, 757
Alkaline solutions
effect on wood, 26:352
in leaching chemistry, 16:152
sodium nitrite in, 22:853–854
Alkaline sulfite pulping, 21:22, 25
Alkalinity
beet juice purification, 23:462
of caustic soda solutions, 22:831–832
determining soap, 22:754
as a property of water, 26:30
of silicate solutions, 22:461
swimming pool, 26:183–184, 185
Alkalinity analysis, of water, 26:36
Alkalinity control agents, 9:19
Alkalinity reduction water softening method, 26:121
Alkali oil refining, 10:807–808
Alkali refining, in soap making, 22:735
Alkali-resistant glass polyacrylonitrile (PAN), asbestos substitute, 3:314t
Alkalis. See also Bases
as food additives, 12:62
selenium reactions with, 22:76–77
sodium carbonate as, 22:795
vitreous silica devitrification and, 22:420
vitreous silica resistance to, 22:417
Alkali salts, hydroxybenzoic acids and, 22:4
Alkali silicate glasses, 12:571–572, 584, 585
studies of, 12:577
Alkali silicates, 22:452
in chemical processing industry, 22:473
crystalline, 22:454–455
dissolution of, 22:455–456
Alkali silicate solutions, in precipitated silica manufacture, 22:368
Alkali treatment, in petroleum refining, 18:660–661
Alkalization, 19:761–762
Alkaloids, 2:71–113
in coffee, 7:253
economic aspects, 2:107–109
lysine-derived, 2:80–82
major orders bearing, 2:75
miscellaneous types, 2:106–107
nitrogen introduction into terpenoid skeleton, 2:100–105
occurrence, detection, and isolation, 2:75–77
ornithine-derived, 2:79–80
phenylalanine-derived, 2:83–92
physical properties of, 2:77
purine-derived, 2:105–106
reversed-phase process chromatography, 3:842
tobacco alkaloids, 2:82–83
tryptophan-derived, 2:92–99
tyrosine-derived, 2:83–92
Alkanes. See also Paraffins
alkylation of, 12:171–172
alkylation with, 12:164–165
autoxidation of, 18:447
chlorinated and chlorosulfonated, 23:653
flash vacuum pyrolysis and, 21:141–142
fluorinated, 11:866–868
isomerization of, 12:172
oligocondensation of, 12:188
reaction with ozone, 17:779
Alkanet, colorant in cosmetics, 7:835
Alkanethiols, vinyl chloride reactions with, 25:630–631
Alkanoic acids, 5:27–28
physical properties of selected straight-chain, 5:29–30t
Alkanolamides, 2:445–446
emulsifiers, detergents, and dispersants, 8:710t
nitrosamines in, 2:449–451
Alkanolamine chelates, 25:92–95
Alkanolamine parameters, 23:600t
Alkanolamines
chemical reactions, 2:115–117, 125–129
dispersants, 8:710t
economic aspects, 2:117, 118t, 130–131
health and safety factors, 2:118–119,
133–134
manufacture, 2:117, 129–130
from nitro alcohols, 2:113–122
from olefin oxides and ammonia,
2:122–147
physical properties of, 2:114t, 114–115,
122–125, 123t
physical properties of substituted, 2:124t
removal of H₂S and CO₂ by, 23:597–600
specifications and analysis, 2:118t,
131–132, 132t
storage and handling, 2:132–133
U.S. capacity, 2:130t
uses of, 2:119–120, 134–140
U.S. prices, 2:118t
Alkanolamine titanates, 25:128
Alk-cell, 11:252, 253, 254
Alkenated toluenediamines, 25:197
Alkene functionalization, microwaves in,
16:545
Alkene metathesis, 26:924–937
industrial applications of, 26:937–948
Alkenes
acylation of, 12:184–185
autoxidation of, 18:434–435
carbonylated, 12:187
catalytic hydroborations of, 13:646
cationic polymerizations of, 14:268
flash vacuum pyrolysis and, 21:142–144
heterogeneous permanganate oxidation
of, 15:610
hydroborations of, 13:640, 643
oxidation of, 15:607
reaction with ozone, 17:781–782
solubility in ionic liquids, 26:863
sulfation of, 23:538
Alkene synthesis, 13:652–653
microwaves in, 16:545
Alkenoic acids, 5:28
physical properties of selected
straight-chain, 5:31–32t
Alkenylbenzene by-products, 23:335
Alkenylborates, 13:653
Alkenyl coupling, 13:653
Alkenyl halides, 12:167
Alkenylpyridine derivatives, physical
properties of, 21:94t
Alkenylsuccinic anhydride (ASA),
18:112–113. See also Alkenylsuccinic
anhydrides
production of, 17:726
Alkenylsuccinic anhydrides, 15:490
Alkoxidation, higher aliphatic alcohols, 2:5
Alkoxide catalysts, 10:683
Alkoxide-derived silica gels, structure of,
23:73
Alkoxide gels, 23:60
Alkoxide gels, in optical fiber
manufacturing, 11:145
Alkoxide initiators, 14:259
Alkoxide ligands, thorium, 24:770
Alkoxides, 12:190; 25:72–86
generated hydrolysis of, 23:56
iron, 14:533
mixed-metal, 25:100
titanium, 25:82
uranium complexation with,
25:436–437
zirconium, 26:650–651
Alkoxolation, of Ti–OH groups, 25:130
Alkoxyalkyl alkyl peroxyxides, 18:454
Alkoxyalkyl hydroperoxides, 18:452–453
Alkoxyalkyl sulfates, 23:537
Alkoxyaluminoxyhydrildes, 13:624
Alkoxy-based RTV silicones, 22:595
Alkoxyborohydrildes, 13:613
Alkoxy-carboxyloxy radical, 14:286
Alkoxyfluorides, titanium, 25:86
Alkoxy halides, titanium, 25:83–86
Alkoxyated alkyl phenol formaldehyde
condensates, polymeric surfactants
based on, 24:153
Alkoxylation, 9:282
2-(Alkoxy methyl)acroleins, 1:271
Alkoxypropionaldehyde acetals, from
acrolein, 1:271, 275t
Alkoxypropionaldehydes, from acrolein,
1:270, 271, 272t
β-Alkoxypropionates
alcohol elimination, 1:359
dehydrogenation, 1:359–360
Alkoxy radicals, 14:284
tert-Alkoxy radicals, 14:281
Alkoxysilanes

as hydrophobic silylating agents, 22:697
as metal protectants, 22:701
in silicone chemistry, 22:554
Alkoxy-substituted ionic liquids, 26:866
Alkoxynium compounds, 25:95
1-Alkoxytitanatranes, 25:93
Alkoxytitanium chlorides, 25:83
Alkoxytitanium fluorides, 25:83
Alkoxytitanium halide, 25:106
Alkoxytitanium tris(2-ethylhexanoate), 25:97
Alkyaryl sulfonates, emulsifiers, detergents, and dispersants, 8:710t
Alkyd coatings, 18:59
for corrosion protection, 7:199–200
Alkyd resin-based coatings, 18:56
Alkyd resin production, propylene glycol in, 12:669
Alkyd resins, 2:147–169
benzoic acid application, 3:630
coating resins, 7:106–107
epoxy esters, 2:165–166
modified, 2:148, 158–160
nonoxidizing alkyds, 2:148, 160
oxidizing alkyds, 2:148–156
synthesis, 2:161–164
urethane derivatives, 2:164–165
uses of, 2:166–168
waterborne, 2:156–158
N-Alkyl-2-/4-pyrindones, 21:104–105
N-Alkyl-2-/4-pyrindines, 21:104–105
3-Alkyl-2,5-diiodothiophene, conducting, 7:517
1-Alkyl-3-methylimidazolium salts, long-chain, 26:867
2-Alkyl-3-pyridinols, 21:111
N-Alkylacrylamides, VDC copolymers with, 25:707
Alkyl acrylates
copolymerization with VDC, 25:697, 698, 701
VDC polymer degradation and, 25:717
2-Alkyl-alcohols. See Guerbet alcohols
Alkylalkanolamines, 2:140
Alkylaluminum compounds, 2:285
Alkylaluminum halides, 2:358
Alkylaluminum reagents, in triorganotin preparation, 24:815–816
Alkyl amino acids, protonated, 17:780
Alkylaminomethanols, 12:112
N-Alkyl amino propionates, 24:148
Alkyl anthrahydroquinone/alkyl anthraquinone in situ process, 24:173
Alkylanthrahydroquinones, 14:43, 44
oxidation of, 14:50
transannular tautomerization of, 14:45
Alkylanthraquinone, 14:43, 44
hydrogenation of, 14:47
Alkylaromatic sulfonates, in mobility control, 18:627–628
Alkyl aryl sulfonates, 24:146
use in cosmetics, 7:849
Alkylated aromatics, 23:525–526
Alkylated toluenediamines, 25:197
Alkylate sulfonation processes, batch and continuous, 23:542t
Alkylating agents, 12:161
of aliphatic compounds, 12:171–172
aluminum chloride-based, 23:333
of aromatic compounds, 12:160–161
of amine oxides, 2:468
of aminophenols, 2:657
of aromatic amines, 2:197–198
of aromatic hydrocarbons, 2:177–196
of benzene, 3:603; 23:328
of butylenes, 4:407–408
of carbonates, 6:309
cycloalkylation, 12:168–170
doxylation and dicyclopentadiene and
cyclopentadiene, 8:226
 haloalkylation, 12:166–168
health and safety factors related to, 2:198
in higher olefins, 17:713
hydrogen fluoride in, 2:173–175, 176t; 14:19–20
intramolecular, 14:268
of maleic anhydride, 15:486
mechanism of, 12:161–162
of naphthalene, 17:74–75
nomenclature of, 2:170
orientation in, 12:163
of paraffin hydrocarbons, 2:170–177
in petroleum refining, 18:659
of phenols, 2:196–197, 212–214
of propylene, 20:782
of pyridine, 2:197–198
of quinoline, 21:186–187
of salicylic acid, 22:5
stereoselective, 12:165–166
sulfuric acid alkylation, 2:171–173
with alkanes, 12:164–165
zeolite-based, 23:331–333
\(\alpha\)-Alkylation, of carbonyl compounds, 13:658
\(N\)-Alkylation, 9:279
aniline, 2:785–786
Alkylation reactions
in HDPE production, 20:152
of isobutane, 13:698
microwaves in, 16:546
Alkylation technology, advance in, 23:346
Alkylator, side reactions in, 23:329
Alkylbenzene(s), 12:162, 163, 169; 23:329
from benzene, 3:619t, 620
biodegradation, 3:763t
by-products, 23:335
dispersant moieties, 8:706t
formylation of, 12:178
oxidation of, 26:894–896
Alkylbenzenesulfonates, rat oral LD50 values, 8:445
Alkylbenzene sulfonic acid, quality optimization of, 23:552
Alkyl (C12–C15) benzoate, 3:635
Alkylbenzyldimethylammonium chlorides, 2:21
\(N\)-Alkyl betaines, 24:148
Alkylboranes, 13:632
coordination with carbanions, 13:656–657
Alkylbromoboranes, 13:639
Alkyl catalysts, 10:683
Alkyl chlorides, reactions with tin, 24:821
Alkylchloroboranes, 13:639
Alkyl complexes, zirconium, 26:655
Alkyl cross-coupling reactions, 12:835
\(OO\)-tert-Alkyl dialkyl monoperoxyphosphates, 18:487
Alkyl dimethyl benzyl ammonium chloride, 24:147
Alkyl dimethyl glycinates, 24:148
Alkyl diphenyl phosphates, 11:494
Alkyl dithiocarbazate esters, 13:568
Alkyleneamine, \(pK\) values, 8:487t
Alkylenediamines, 8:485
Alkyleneterephthalate polymers, 20:32
Alkyl ether phosphates, 24:146
Alkyl ethers, 10:574, 575
uses for, 10:580–581
Alkyl fumarates, 15:491
Alkyl glycercyl ether sulfonates (AGES), 2:19, 20
Alkyl halide initiating system, 14:266
Alkyl halides, 10:485, 530
amination, 2:547
condensation with olefinic hydrocarbons, 12:172
hydrolysis, 6:234
reactions with alkanolamines from olefin oxides and ammonia, 2:128
in salicylic esterification, 22:12
Alkylhydrazines, 13:571–573
substituted, 13:572
Alkyl hydroperoxides, 18:427–430
decomposition rates for, 18:431
properties of, 18:428–429t
reactions of, 18:430–431
thermal decomposition of, 18:432
tert-Alkyl hydroperoxides, 18:456
as free-radical initiators, 14:290–291
reactions of, 18:432
Alkyl hydrotetroxides, 18:436
Alkylidyne complexes, 26:948
Alkyl isoquinolines, 21:205
3-Alkyliisoquinolines, 21:203
Alkyketene dimer (AKD), 18:112, 113
size of, 18:130
Alkyl lithium compounds
as anionic initiators, 14:248–255
initiation reaction kinetics of, 14:250
as polymerization initiators, 14:251
Alkyl lithium initiators
association numbers and fractional kinetic orders for, 14:249t
hydrocarbon-soluble, 14:249
Alkyl lithium initiator solutions, quantitative analysis of, 14:251–252
Alkyl lithium reagents, 14:260
Alkylnaphthalenes, dispersant moieties, 8:706t
Alkylnaphthalene sulfonates, 24:146
Alkylnickel, \(\pi\)-complexes of, 17:116
Alkylnitrites, formation of, 17:165–166
Alkylonium salt hydrates, 14:171
Alkyl orthophosphate triesters, 19:41
	tert-Alkyl peroxyesters, 18:478–487
decomposition of, 18:486
Alkyl peroxyesters, 18:478–487
chemical properties of, 18:480–487
physical properties of, 18:480
primary and secondary, 18:485
synthesis of, 18:478–480
synthetic routes to, 18:479
tert-Alkyl peroxyesters, 18:480–484, 485
as free-radical initiators, 14:284–286
properties of, 18:481–483t
uses of, 18:487
Alkylperoxy radical, 14:291
Alkyl phenol ethoxylates, 8:678, 693;
24:149, 155
Alkylphenols, 2:203–233
chemical reactions, 2:206–212
commercially important, 2:205t
derivatives, 2:219–231
economic aspects, 2:218–219
ethylene-oxide condensates as
emulsifiers, detergents, and
dispersants, 8:710t
health and safety factors, 2:219, 220t
manufacture, 2:212–217
nomenclature, 2:203–204
physical properties of, 2:204–206, 205t
shipment, 2:217–218
uses of, 2:219–231
Alkyl phosphates, 24:146
halogenated, 11:489–496
Alkyl phosphines, 19:60
Alkyl phosphonates, 19:37
production of, 19:53
Alkylphosphonic esters, 19:29
Alkylpolyglucosides (APGs), 2:19, 20;
24:168
Alkyl polyglucoside surfactants, 24:152
Alkylpyridines, 21:92, 93, 112, 113, 114,
119
physical properties of, 21:94t
Alkylpyridinium salts, 21:120
Alkyl quinolines, 21:196, 198
Alkyl radicals, 14:277, 288
Alkyls
metal, 12:190
palladium, 19:652
rhenium, 21:700
Alkyl silylating agents, 22:697–698
Alkylstannonates, alkali-metal, 24:824
Alkyl-substituted MDAs, 10:396
Alkyl-substituted phenyl arylene
diphosphates, 11:495
Alkyl-substituted silicon peroxides, 18:444
Alkyl sulfates, 23:537
use in cosmetics, 7:849
Alkylsulfones, O-alkylation and, 9:280
Alkyl sulfoxide, micellization of, 24:132t
Alkyl tertiary alkyl ethers, 10:575
Alkythexylboranes, 13:639
Alkyl-thiols, 17:57
4-Alkylthiosemicarbazides, 13:575
Alkyl–tin catalysts, 20:40
Alkyltitanium halides, 25:108–109
Alkyltitaniums, 25:106
higher, 25:116
Alkyl trimethyl ammonium chloride,
24:147
emulsifiers, detergents, and dispersants,
8:710t
tert-Alkyl-type radicals, 14:293
Alkyl vinyl ethers, 18:331
Alkyne cross-metathesis (ACM), 26:951
Alkyne metathesis, 26:948–953
role of high valent metal centers in,
26:950
Alkynes
flash vacuum pyrolysis and, 21:144–145
polymerization by chain growth,
26:952
reaction with ozone, 17:783
Alkynoic acids, 5:28
Alkynols, ethylated, 25:117
2-Alkynyl-5-alkyl-1,4-benzoquinones,
21:253
All-x-proteins, 20:826–827
All-β-proteins, 20:827–828
Alleles, floxed, 12:461
Allelochemicals, as herbicide leads,
13:355–357
Allelopathic companion crops, 13:352
Allelopathic compounds, as herbicides,
13:329–331
Allelopathic crops, effectiveness of, 13:356
Allelopathic smother crops, 13:352
Allelopaphy
biotechnology research on, 13:355
control of weeds with, 13:352–357
improving, 13:353–355
Allenes, flash vacuum pyrolysis and, 21:149
Allenylboration, 13:659–660
Allergic effects, of solvents, 23:120
Allergic reactions, from vanillin, 25:556
Allo-ocimenols, isomeric, 24:24:
Allo-ocimene epoxide, 24:
Allo-ocimene, Allomone, ‘’24:
Allo-ocimene diepoxide, 24:
Allocation methods, in life cycle assessment, 14:815
Allomone, 24:473
Allo-ocimene, 24:490, 495
oxidation of, 24:491
Allo-ocimene diepoxide, 24:491
Allo-ocimene epoxide, 24:491
Allo-ocimenols, isomeric, 24:490
“All-organic” transistors, 22:222–223

D-Allose, 4:698
Allosteric coupling, 16:788–789
Allosteric effect, 20:829, 830
Allosteric site, 10:255
Allotropes
sulfur, 23:564
tin, 24:786
titanium, 24:838
Alloy 20, 23:784
Alloy 42, 17:841
Alloy broadening, 14:836, 837
Alloy C-276, 23:784
Alloying. See also Alloys
in interstitial solid solutions, 13:498
in substitutional solid solutions, 13:497–498
Alloying elements, in carbon steels, 23:297
Alloy piping, 19:494
Alloy rayon, 11:262–263
N-Allylaza[crown-5], 24:41

Allylboration, 13:659–660
  asymmetric, 13:669–671
  reagents, 13:670

Allyl bromide, physical properties of, 4:350t

Allyl chloride, 6:241–242, 250
  chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
  end use of chlorine, 6:134t
  in integrated manufacturing process, 6:237t
  physical properties of, 2:244, 345

Allyl chloroformate
  DOT regulations for shipment, 6:301t
  molecular formula, 6:291t
  toxicity, 6:302t

Allyl complexes
  of platinum, 19:656
  of thorium, 24:773

Allyl diglycol carbonate, molecular formula, 6:305t

Allyl ethers, 2:246

Allyl formate, physical properties, 6:292t

Allyl glycidyl ester (AGE), physical properties of, 2:244, 246

Allyl glycidyl ether, 2:267–268

Allylic derivatives, hydroboration of, 13:641

Allylic hydrogens, in propylene, 20:773–774

Allylic hydroperoxides, 18:435

Allylic organoboranes, 13:661–662

Allylic polymers, as flocculating agents, 11:631

Allyl methacrylate, 2:264
  physical properties of, 2:244, 246

Allyl monomers and polymers, 2:250–273
  allyl compound reactivity, 2:251–252

Allyl phenyl ethers, 10:574

Allylsilanes, 12:186
  synthesis of, 13:654

Allyl–vinyl compounds, 2:264

ALMA fluidized-bed process, 15:502–504

Almond, benzaldehyde as oil of bitter, 3:590t, 594

Alnico-magnets, M-type ferrites versus, 11:86

Alopecia, 2:816

Alpha-1-proteinase inhibitor, 12:147
  z-adrenoceptor blockers, antihypertensive agents, 5:155–156t, 157t, 160
  z-agostic interactions, 16:97
  z-alkylation, of carbonyl compounds, 13:658
  z,z,z-trifluoro-2,6-dinitro-N, N-dipropyl-p-toluidine, 2:550t
  x,x'-dinitroantraquinones, 9:315–316
  z-alumina, 2:406t; 14:103. See also Corundum
    transition to, 2:403
  z-aluminum–iron–silicon alloys, 2:317
  intermetallic phases, 2:316t
  z-aluminum oxide-hydroxide.
    See Boehmite
  z-aluminum trihydroxide. See gibbsite
  z-ambrinol, 24:575–576
  z-amido-dialkyl peroxides, 18:460
  z-amino acids
    formula, 2:554
    optical configuration, 2:564–565
    optical resolution, 2:573–578
    synthesis, 2:570–578
    toxicity, 2:601–603
  z-aminonitriles, 17:237–239
    health and safety factors related to, 17:239
    physical properties of, 17:238
    uses for, 17:239
  z-amylases, 10:288; 12:64. See also Amylases
    attack on amylose in beer making, 3:568, 576, 577
    fungal, 10:292, 297
  z-amylcinnamaldehyde, 3:595
  z/β-proteins, 20:828
  z-bisabolol, 24:548
  z-bromination transfer, in organoboranes, 13:658–659
  z-carotene, 24:558
  z-carotin, 17:657

Alpha-cellulose, 4:716; 5:362
  z-chiral ketones, synthesis of, 13:669

Alpha-chloromethyl ether, 12:112
  z-cyclocitrylidenebutanone, 24:565
  z-damascone, 24:569
  z-decay, 21:304
  z-diazocarbonyl compounds, 13:658
  z'-dicalcium silicate, phase in Portland cement clinker, 5:472t
  z-eleostearic acid, physical properties, 5:33t
  z-fenchol, 24:510
  z-ferrite, 23:274
\(\alpha\)-substituted anthraquinone derivatives

\(\alpha\)-form cadmium iodide, physical properties of, 4:508t
\(\alpha\)-form cadmium selenide, physical properties of, 4:509t
\(\alpha\)-form silicon carbide, 22:527
fibers of, 22:534
platelets, 22:535
radiation effects on, 22:530
resistivity of, 22:528
\(\alpha\)-form succinic acid, 23:417
\(\alpha\)-glycol values, 10:361
\(\alpha\)-halogeno carboxylic acids, amination, 2:571
\(\alpha\)-hexylcinnamaldehyde, 3:595
\(\alpha\)-hydroxyadipaldehyde, 1:279
\(\alpha\)-hydroxycarboxylic acid complexes, 25:88–89
\(\alpha\)-ionone, 24:563–564
\(\alpha\)-iso-methylionone, 24:562, 566
\(\alpha\)-isophorone, 14:585
\(\alpha\)-keto acids, amination, 2:572
\(\alpha\)-ketoglutaric acid, in citric acid cycle, 6:633
\(\alpha\)-ketoxime, reduction, 2:572
\(\alpha\)-lactalbumin, properties of standard, 3:836t
Alpha LFW-1 ring/block test, 9:714
(R)-\(\alpha\)-lipoic acid, 17:672
\(\alpha\)-melanocyte-stimulating hormone (\(\alpha\)-MSH), target of antiobesity drugs, 3:97
\(\alpha\)-methoxy-\(\alpha\)-trifluoromethylphenylacetyl chloride, chiral derivatizing reagent, 6:76t
\(\alpha\)-methylbenzyl isocyanate, chiral derivatizing reagent, 6:76t
\(\alpha\)-methylbenzyl isothiocyanate, chiral derivatizing reagent, 6:76t
\(\alpha\)-methylcinnamaldehyde, 3:595
\(\alpha\)-methyl reactions, 16:239
\(\alpha\)-methylstyrene (AMS), 13:325; 18:749; 23:354–355
comonomer with acrylonitrile, 1:451t
cumene as feedstock, 8:156
\(\alpha\)-methyl substituents, in chiral metallocene catalysts, 16:106
\(\alpha\)-monochlorobutanoic acid (MBA), 20:742–744
\(\alpha\)-naphthol derivatives, 21:145
\(\alpha\)-nitro carboxylic acid, reduction, 2:572
\(\alpha\)-n-methylionone, 24:565
Alphanumeric LCDs, 15:115–116
\(\alpha\)-olefin insertion
regioselectivity in, 16:98–99
stereoselectivity in, 16:99–102
\(\alpha\)-olefins, 17:709–710
copolymerization with ethylene, 7:631
in detergents, 17:725–726
epoxidation of, 10:380
feedstocks for higher aliphatic alcohols, 2:29t, 30t
handling, 17:727
homopolymerization of, 16:110
manufacture of, 17:713–724
metathesis of, 26:923
polymerization of, 20:424
production of, 10:598
\(\alpha\)-olefin sulfonate(s) (AOS), 17:725–726; 23:526–527; 24:146
in cosmetics, 7:849
in oil displacement efficiency, 18:628
\(\alpha\)-olefin waxes, polymerized, 26:221
\(\alpha\),\(\omega\)-diolefins
from butadiene, polymerized, 26:221
\(\alpha\),\(\omega\)-diolefins
uses for, 21:119
\(\alpha\)-oxoketenes, 21:149
\(\alpha\)-parinaric acid, physical properties, 5:33t
\(\alpha\)-peroxy lactones, 18:484
Alpha phase titanium, 24:838
in alloys, 24:854–856
properties of, 24:840, 841
\(\alpha\)-phellandrene, 3:230; 24:493
\(\alpha\)-phenyl-\(t\)-tert-butyl nitrone, 2:814
\(\alpha\)-picoline, 21:92, 101
synthesis of, 21:109
uses for, 21:119
\(\alpha\)-pinene, 3:230; 24:494–496
acid-catalyzed isomerization of, 24:495
epoxidation of, 24:496
as natural precursor for aroma chemicals, 3:231
pyrolysis of, 24:495
terpenoids from, 24:477–478
Alphapress, molecular formula and structure, 5:165t
Alpha process, 25:170
\(\alpha\)-quartz, growth of, 14:93
Alpha (\(\alpha\)) rays, 21:285
\(\alpha\)-santonin, 24:549–550
\(\alpha\)-SO\(_3\) crystals, 23:756
Alpha spectrometry, in thorium analysis, 24:774
\(\alpha\)-substituted anthraquinone derivatives, 9:301
α-TERPINEOL

α-terpineol, 3:231; 24:477, 509–512
hydrogenation of, 24:512
α-terpinyl acetate, 24:512
α-terpinyl chlorides, 24:479
α-terpinyl esters, 3:231
α-tocopherol, 17:652, 653; 25:793
in cocoa beans and chocolate products, 6:370t
α-tocotrienol, 25:793
α-trialkylsiloxyhydroperoxides, 18:452
Alpha value, 24:448
Alpine Mikroplex Spiral classifier, 22:289
Al-Sol catalysts, 11:690
-al suffix, 2:58
ALT-946, antiaging agent, 2:812
Altace, molecular formula and structure, 5:151t
-alt- designation, 7:609t
Alteplase (TPA), 5:176
molecular formula and structure, 5:172t
Alternating copolymers, 7:644–645
classification in terms of monomer sequence distribution, 7:608t
IUPAC source-based classification, 7:609t
Alternating current (ac) losses, hysteretic, 23:815–818
Alternating polarity drum separators, 15:453
Alternative fuels, emissions control for, 10:59–60
Alternatives formulation, EIA methods for, 10:241–242t
Alternative sweeteners, 24:225
Al-to-transition-metal ratios (Al/M), 16:85.
See also Aluminum entries
d-Altrose, 4:698
Alum. See Aluminum sulfate
Alum cake, 2:357
Alumina, 2:345t; 5:582. See also Activated alumina; Aluminum oxide (alumina); Bauxite(s); Calcined alumina; Fused alumina; Tabular alumina
in the activated catalyst layer, 10:41
adsorption capacity vs. years of service, 1:630
advanced ceramics, 1:704
blue alumina, 5:334–335
calcined, tabular, and aluminate cements, 2:403–421
carbon monoxide compatibility with, 5:4t
catalytic aerogels, 1:763t
ceramic insulator, 5:593
chemical degradation, 5:578
with coated carbide tools, 4:664
composition of, 21:494t
in dental ceramics, 8:276
dusting problems, 2:304
elastic properties, 5:614t
electrolysis, 2:287–294
energy gap at room temperature, 5:596t
fiber reinforcement for ceramic–matrix composite, 5:558t
for gas separation, 1:618t
hardness compared to metals, 5:627t
for indoor air cleaning (potassium permanganate-permeated), 1:834
liquid chromatography stationary phase, 4:623
matrix for ceramic–matrix composites, 5:553t, 554t
partially hydroxylated, 2:391
platelet reinforcement for ceramic–matrix composites, 5:556t
preparation, 4:676, 677
properties of metallurgical grade, 2:286t
purification, 5:644
R-curve behavior, 5:620
as a refractory raw material, 21:489
sintering, 5:273–274
sol–gel-derived, 23:76–78
strength, 5:517t
sulfate-contaminated, 23:608–609
tabular, 21:489
thermal shock resistance parameters, 5:633t
whisker reinforcement for ceramic–matrix composites, 5:557t
widely used support material, 5:324t
zirconia toughened alumina, 5:571
α-Alumina, 2:406t; 14:103.
See also Corundum
transition to, 2:403
β-Alumina, 2:408
γ-Alumina, 2:391, 403, 404, 406t
γ-Alumina, 2:403, 404, 406t
δ-Alumina, 2:404, 406t
θ-Alumina, 2:404, 406t
κ-Alumina, 2:404, 406t
ρ-Alumina, 2:394–395
Alumina–aluminum titanate, 5:570
Alumina–chromia–thoria, catalytic aerogels, 1:763t
Alumina fibers, asbestos substitute, 3:314t
Alumina gel(s), 2:422, 427–428
drying of, 23:66–67, 78
Alumina hydrates, 2:421, 428
crystalline, 2:422–426
economic aspects, 2:432
gelatinous, 2:426–427
health and safety factors, 2:432
manufacture, 2:428–431
properties of normal coarse grade, 2:429t
shipping and analysis, 2:431–432
uses of, 2:432
Alumina hydroxides
economic aspects, 2:432
health and safety factors, 2:432
physical data, 2:423t
uses of, 2:432
Alumina refractory brick, physical properties of, 21:495t
Alumina–sodium borohydride, reduction of carboxyl compounds with, 16:572–573
Alumina sols, gelation of, 23:77
Alumina-supported iodobenzene diacetate (IBD), 16:570
oxidation of sulfides to sulfoxides by, 16:570
Aluminate cement, 2:415–416
Aluminate ions, silica sols and, 22:394s
Aluminates, 2:273–279
analysis, 2:275–276
chemical reactions, 2:273–274
dispersants, 8:710t
economic aspects, 2:275
health and safety factors, 2:276
manufacture, 2:274–275
physical properties of, 2:273–274
uses of, 2:276–277
Alumina trihydrate (ATH), 2:274
in synthetic fillers, 11:314–315
Alumina whisker reinforcement, 5:574t
Alumina xerogels, X-ray diffraction of, 23:78
Aluminide alloys, 13:530
Aluminium powder, 10:738. See also Aluminum entries
Aluminohydride derivatives, 13:624
Aluminohydrides, 13:621–624
Aluminophosphate zeolites, 14:98
Aluminosilicate gels, 16:830
Aluminosilicate glass, matrix for ceramic–matrix composites, 5:553t
Aluminosilicate glass–ceramics, 12:578
Aluminosilicate refractories, 12:600
asbestos substitute, 3:314t
Aluminosilicate zeolites, 14:98
Aluminothermic process, for pure vanadium, 25:519–520, 521
Aluminum (Al), 2:279–343. See also Al2O3
surface scale; AlGa entries; α-alumina;
Al-to- transition-metal ratios (Al/M);
Lead–calcium–aluminum alloys;
Nickel–aluminum catalyst;
Nickel–iron–aluminum catalyst
for aerosol containers, 1:781–782
aluminothermal reduction of calcium oxide, 4:526
analysis, 2:299–302
average price 1966–2001, 2:301t
barium alloys with, 3:344
in bearing metals, 24:797–798
in carbon steels, 23:297
caustic soda in extracting, 22:831
in ceramic–matrix composites, 5:553t
chemical reactions, 2:283–285
chemical vapor deposition precursor, 5:805t
in coal, 6:718
density of 99.996%, 2:281t
dental applications, 8:315
economic aspects, 2:299
effect on copper resistivity, 7:676t
effect on stainless steel corrosion resistance, 7:809
elastic properties, 5:614t)
electrical resistivity, 2:282t
electrolytic coloring of, 22:686
electrolytic purification processes, 2:297t
electrowinning of, 16:161–162
energy consumption per ton produced by Hall–Héroult process, 2:291t
environmental considerations, 2:302–304, 304t
finishes, 2:338–339
health and safety factors, 2:305
heat capacity, 2:281t
hydrometallurgical treatment of, 16:156
manufacture of, 2:285–298
manufacture of high purity, 2:296–298
in M-type ferrites, 11:66, 69, 70
physical properties of, 2:280t, 280–287
production growth compared to other metals, 2:301t
pyrometallurgical recycling of, 21:390–392
reaction of chlorocarbons with, 6:235
reaction with VDC, 25:694
recycling of, 25:871
silicon solubility in, 22:502
silicone chemistry and, 22:549
silver alloyed with, 22:658
sodium alloyed with, 22:780
solubility limits and electrical conductivity effects on copper, 7:750t
solubility of hydrogen in at various temperatures, 2:283t
in spheroidal iron production, 22:516–517
thermal conductivity, 2:282t
in titanium alloys, 24:856
uses of, 2:339–341
U.S. imports and exports by country, 2:302t
U.S. primary annual capacity, 2:300t
U.S. shipments by market, 2:339t
world smelter production and capacity, 2:298t
in zinc die-casting alloys, 26:587
Aluminum acetate, astringent, 7:847
Aluminum acid phosphates, 18:839
Aluminum–air cells, in development, 3:431t
Aluminum alkoxide gels, phase transformations and properties of, 23:78
Aluminum alkoxides
hydrolysis and condensation reactions of, 23:76
reduction of carbonyl compounds with, 16:572
Aluminum alkoxide sols, peptization of, 23:77
Aluminum alkyls, 10:598
in propylene polymerization, 20:529
Aluminum alloys, 2:305–343
for aerosol containers, 1:781–782
anticorrosion coatings, 1:714
binary, 2:307–316
bismuth addition, 4:12
casting, 2:333–334
cerium addition, 5:682–683
dispersoid formers, 2:325–326
electrode potentials of solid solutions and intermetallics, 2:337t
environmentally induced cracking, 7:812–813
fabricating, 2:335–336
finishes, 2:338–339
in galvanic series, 7:805t
intermetallic phases in ternary, 2:316t
melting, 2:333–334
phase transitions in binary, 2:308t
pickling, 16:223
preparing for electroless deposition, 9:718
quaternary and higher, 2:323–329
shaping, 2:333–334
silicon in, 22:499, 508, 509, 510
temper designations, 2:326t, 330t, 332–333
ternary, 2:316–323
thermal treatment, 2:329–333
uses of, 2:339–341
U.S. shipments by market, 2:339t
Aluminum-Aluminum Lap Shear test, 20:285
Aluminum antimonide, 3:53, 58
Aluminum arsenide, 3:270
Aluminum–beryllium alloys, 3:659
Aluminum beverage containers,
18:37–38
Aluminum carbide, 2:284
effect of formation on aluminum yield in Hall process, 2:295
Aluminum carbide (4:3), 4:649t
Aluminum chlorohydrate (ACH), 2:345t
Aluminum chloride, 2:379–385; 12:189
antiperspirant ingredient, 7:848t
choice of solvent for support, 5:325
supported, 5:327–328
in organic reactions, 12:159–160
reduction, 2:279
roasting, 2:395
Aluminum(I) chloride, 2:345t
Aluminum(III) chloride, 2:345t
Aluminum chloride-based alkylation, 23:333
Aluminum chloride hexahydrate, 2:345t,
379, 384–385
production, 2:357
Aluminum chloride hydroxide, as a
flocculating agent, 11:626
Aluminum chorohydrate
antiperspirant ingredient, 7:848t
function as ingredient in cosmetics,
7:829t
Aluminum–chromium alloys, 2:312–313
phase transitions, 2:308t
Aluminum complexes, stereoelective,
20:304–305
Aluminum composites. See also
Aluminum-filled composites
maximum packing fraction of, 10:25–26
spatial charge carriers in, 10:22
weight gain during relative humidity
aging, 10:24
Aluminum compounds. See also Bauxite(s)
chemical reactions, 2:348–349
commercially significant, 2:356–359
in paper manufacture, 18:111
prepolymerized, 11:626
survey, 2:344–360
Aluminum compounds, survey, 2:344–360
Aluminum–copper alloys, 2:309–310
sodium and, 22:780
Aluminum–copper–lithium alloys, 2:321
equilibrium and metastable phases, 2:322t
S-Aluminum–copper–magnesium alloy,
2:318–320
T-Aluminum–copper–magnesium alloy,
2:318–320
Aluminum–copper–magnesium alloys,
2:318–320
hydrogen diffusion into, forming blisters,
2:329
intermetallic phases, 2:318t
natural aging, 2:332
transmission electron micrograph, 2:307
Aluminum–copper–magnesium–zinc
alloys, 2:323–324
corrosion resistance, 2:337
hydrogen diffusion into, forming blisters,
2:329
Aluminum dichlorohydrate, antiperspirant
ingredient, 7:848t
Aluminum difluoride, 2:360, 361
Aluminum electrodes, standard potential,
3:413t
See also Aluminum composites
bimodal, 10:25–28
dielectric constant of, 10:19–21, 23–24
die shear strength of, 10:24, 25
dissipation factor of, 10:19–21
experimental procedures related to,
10:17–18
frequency dependence of, 10:21
leakage current versus voltage of,
10:23
unimodal, 10:18–24
Aluminum fluoride, 4:579t
Aluminum(I) fluoride, 2:345t
Aluminum(III) fluoride, 2:345t
in cryolite process, 2:286–287
production, 2:357–358
Aluminum fluoroborate, 4:154
Aluminum foil, 2:340
Aluminum foundry alloys, 2:325t, 326–327
mechanical properties of, 2:326t
Aluminum gallium nitride (AlGaN), 17:224
Aluminum halides, 2:357–358, 360–391
Aluminum hydride, 13:612. See also
Aluminohydride entries
Aluminum hydride(s), 2:345t
activation, 2:394–395
classification, 2:422
formation, 2:284
gels, 2:426–427
hydrated aluminas, 2:421–432
properties of commercial grade, 2:429t
reactions, 2:349
shipping and analysis, 2:431–432
Aluminum industry
hydrogen fluoride in, 14:21
refractories in, 12:765–766
silicon consumption by, 22:508, 509–510
Aluminum iodide, 2:345t, 386
Aluminum iodide hexahydrate, 2:386
Aluminum iodide pentadecahydrate, 2:386
Aluminum–iron alloys, 2:308–309
Aluminum–iron–silicon alloys, 2:316–317
\(\alpha\)-Aluminum–iron–silicon alloys, 2:317
intermetallic phases, 2:316t
\(\beta\)-Aluminum–iron–silicon alloys, 2:317
intermetallic phases, 2:316t
Aluminum-killed steel, continuous-cast, 23:270
Aluminum–lead alloys, 2:314
phase transitions, 2:308t
Aluminum–lithium alloys, 2:312, 313;
15:134–135
Aluminum–lithium–magnesium alloys, 2:321–323
Aluminum–magnesium alloys, 2:311
chemical industry applications, 2:341
corrosion resistance, 2:336
finishes, 2:338
Aluminum–magnesium–manganese alloys, 2:318
Aluminum–magnesium phase diagram, 15:363
Aluminum–magnesium–silicon alloys, 2:317–318
corrosion resistance, 2:336
finishes, 2:338
quenching, 2:331
T-Aluminum–magnesium–zinc alloy, 2:320t
intermetallic phases, 2:320t
quenching, 2:331
Aluminum–magnesium–zinc phase
diagram, 15:364
Aluminum–manganese alloys, 2:309;
15:563
Aluminum monofluoride, 2:360, 361
Aluminum nitrate, 2:386
for activated alumina gel formation, 2:397
Aluminum nitrate nonahydrate, 2:386
Aluminum nitride (AlN), 2:284; 5:582;
17:206
annual production of, 17:215
carrier mobility at room temperature, 5:597t
ceramic insulator, 5:593
as diamondlike carbide, 4:654
effect of impurities in, 17:212–213
manufacture of, 17:210–213
physical properties of, 4:653t
powder, 17:216
as a substrate material, 17:827
synthesis of, 17:202–203
Aluminum oxide (alumina), 2:379. See also
Activated alumina; Alumina entries
accelerator for dental cements, 8:285
adsorption energy to pigments or fillers, 8:683t
in cement, 5:468
calcined, tabular, and aluminate
cements, 2:403–421
hydrated, 2:421–433
in SiC-ceramic fabrication, 22:535
as a substrate material, 17:827
Aluminum(II) oxide, 2:345t
\(\alpha\)-Aluminum oxide-hydroxide.
See Boehmite
\(\beta\)-Aluminum oxide-hydroxide. See Diaspore
Aluminum oxide-hydroxides, 2:421.
See also Alumina hydroxides
classification, 2:422
Aluminum particle size, 10:22–23
Aluminum perchlorate, 18:278
Aluminum phosphide, 2:284; 19:58
Aluminum–polyphenylenedioxy–ITO, in
photovoltaic devices, 22:221
Aluminum production, 9:639–640
Aluminum recycling, 2:305; 21:371–372
economic aspects of, 21:402
remelting, 2:333–334
Aluminum reduction, of ferrovanadium, 25:518
Aluminum-rich zeolites. See Zeolite 4A;
Zeolite 13X
Aluminum salts, acidic, 12:57
Aluminum sesquichlorohydrate,
antiperspirant ingredient, 7:848t
Aluminum silicate, 2:345t
powder used in cosmetics, 7:841t
Aluminum–silicon alloys, 2:311–312
phase transitions, 2:308t
sodium and, 22:780
Aluminum suboxide, effect of formation
on aluminum yield in Hall process, 2:295
Aluminum substrates, 9:709
Aluminum sulfate (alum), 2:345t, 357, 277. See also Alums
astringent, 7:847
as a flocculating agent, 11:625–626
neutralization, 2:430
in papermaking, 18:98, 116–117
in water treatment, 26:110
Aluminum sulfate octadecahydrate, 2:345t
Aluminum sulfide, 2:284
Aluminum titanate, 5:570, 578; 25:46
Aluminum triacetylhydride, 1:179
Aluminum trifluoride, 2:360, 361–362, 377
health and safety factors, 2:363
high purity, 2:363
specifications for commercial, 2:363t
Aluminum trifluoride monohydrate, 2:360, 363
Aluminum trifluoride nonahydrate, 2:360, 363
Aluminum trifluoride trihydrate, 2:361
$\alpha$-Aluminum trihydroxide. See Gibbsite
$\beta$-Aluminum trihydroxide. See Bayerite
Aluminum trihydroxides, 2:421
classification, 2:422
Aluminum tris(tetrahydroborate), 4:196
Aluminum wire, 17:833
Aluminum wrought alloy 1100, 2:328t
chemical industry applications, 2:341
weathering, 2:336t
Aluminum wrought alloy 1350, 2:328t
overhead transmission line application, 2:341
Aluminum wrought alloy 2024, 2:328t
age hardening after heat treatment
and quench, 2:332t
Aluminum wrought alloy 2036-T4
precipitation treatment effect, 2:332
Aluminum wrought alloy 3003, 2:328t
chemical industry applications, 2:341
construction application, 2:340
weathering, 2:336t
Aluminum wrought alloy 3004, 2:328t
construction application, 2:340
disperdoids in, 2:306, 307
weathering, 2:336t
Aluminum wrought alloy 3105, 2:328t
construction application, 2:340
Aluminum wrought alloy 6060,
construction application, 2:340
Aluminum wrought alloy 6061, 2:328t
age hardening after heat treatment
and quench, 2:332t
chemical industry applications, 2:341
Aluminum wrought alloy 6063, 2:328t
chemical industry applications, 2:341
construction application, 2:340
Aluminum wrought alloy 6201, 2:328t
overhead transmission line application, 2:341
Aluminum wrought alloy 7075-T6, 2:330t
longitudinal yield strength, 2:329
Aluminum wrought alloys, 2:327–329
corrosion susceptibility of, 7:813t
long transverse properties of, 2:330t
typical compositions, 2:328t
Aluminum–zinc alloys, 2:314, 315
Aluminum–zirconium alloys, 2:314
Aluminum zirconium octachlorohydrate, antiperspirant ingredient, 7:848t
Aluminum zirconium pentachlorohydrate, antiperspirant ingredient, 7:848t
Aluminum zirconium tetrachlorohydrate, antiperspirant ingredient, 7:848t
Aluminum zirconium trichlorohydrate, antiperspirant ingredient, 7:848t
Alumoxanes, 16:91
Alums, selenate, 22:89. See also Aluminum
sulfate (alum)
Alundum, 10:649
Alunite, 2:345t
Alzak process, fluoroboric acid application, 4:153)
Alzheimer’s disease (AD), 2:810
aluminum and, 11:640
apo E gene and LDL level, 5:136
inhibitors of, 2:817–820
AM1.5 spectrum, 23:38
Amalgams
calcium, 22:773
mercury, 16:33
silver, 22:657, 660
sodium, 22:772–773, 775
tin in, 24:798
Amaryllidaceae, alkaloids in, 2:75
Amator, gold-based dental alloy, 8:307t
Amator 2, gold-based dental alloy, 8:307t
Amber, chemical analysis of provenance,
5:751–752
Ambergris, 18:380; 24:572
analogues of, 24:576
components of, 24:573
Amberketal, 24:576
Amberlite IRA-400, 14:365
Amberlyst A27, 26:842–843
Ambient air ozone limits (EPA), 17:815
Ambient air pollution standards, 26:670
Ambient ozone concentration of, 17:790–791
environmental impact of, 17:814
Ambient radiation as the basis for solar energy materials, 23:2–4
spectral selectivity of, 23:4
Ambient temperature cure applications, 10:439
Ambient temperature lithium cells, 3:541–549
Ambient thermal radiation, analysis of, 23:142
Ambient water limits, for silver, 22:651–652
Ambient Water Quality Criteria, for silver, 22:683–684
Amblygonite, 15:123
Ambra oxide, 24:576
Ambreine degradation products, 24:572–576
Ambrettolic acid, physical properties, 5:35t
a-Ambrinol, 24:575–576
Ambrocenide, 24:544
Amcymidol, 13:46
American Academy of Industrial Hygiene (AAIH), 14:203. See also United States entries; U.S. entries
American Association of Feed Control Officials (AAFCO), 10:847, 848
American Association of Textile Chemists and Colorists (AATCC), 9:227, 237
American Boiler Manufacturers’ Association (ABMA), recommendations for boiler-water limits, 23:221t
American Chemical Society Committee on Nomenclature and Notation, 17:385
American Chemistry Council (ACC) 14:204 codes of management practices, 21:580
Process Safety Code, 21:831
Responsible Care® initiatives, 25:337
threshold limits, 14:202
threshold limit value of lead, 14:765
threshold limit value for maleic anhydride, 15:510
on vinyl chloride, 25:651
on vinylidene chloride, 25:694
American Electroplaters and Surface Finishing Society (AESF), 9:762, 763
American Forest and Paper Association (AF&PA), 18:90
American Industrial Hygiene Association (AIHA), 14:203; 21:837; 23:795
American Institute of Chemical Engineers, 15:766
American Institute of Steel Construction (AISC) design manual, 19:482
American Insurance Association (AIA), 15:767
American Iron and Steel Institute (AISI), 23:291, 299. See also AISI alloy steels
American Iron and Steel Institute and Department of Energy (AISI-DOE) process, 14:521
American lobster, aquaculture, 3:189
American National Metric Council, 15:768
American National Standard Abbreviations for Use on Drawings and in Text (ANSI Y1.1), 1:xvii; 2–26:xv
American National Standard Letter Symbols for Units in Science and Technology (ANSI Y1.1), 1:xvii; 2–26:xv
American National Standards Institute, Inc. (ANSI), 15:762, 767; 21:64–65. See also ANSI entries
American Pima cotton, 8:2
American Public Health Association, 15:767
Americans, sodium intake by, 22:812–813. See also United States
American Society for Testing Materials (ASTM), 10:825; 13:266. See also ASTM entries
American Society for Testing Materials (ASTM), 10:825; 13:266. See also ASTM entries
American Society for Testing Materials (ASTM), 10:825; 13:266. See also ASTM entries
atomizing device terminology standard, 23:175
fire test lists, 11:456
solid waste standards of, 25:866
specification for electroless nickel deposits, 9:692–693
specifications, 18:642
American Society of Mechanical Engineers (ASME), 13:266; 15:767. See also
ASME entries
Pressure Vessel Code, 21:850
on PVC waste incineration, 25:680
American Society of Safety Engineers, 15:767
American Society of Testing and Materials (ASTM), 15:228, 762. See also ASTM
entries
gold specifications, 12:696–697
refractories classification and specifications, 21:508–511
refractories test methods, 21:512t
reheat test, 21:499
volatility classes, 12:399
American Spice Trade Association, 23:153,
160, 163
Self Regulation Program of, 23:161
Americans with Disabilities Act (ADA), 21:478
American Viticultural Areas (AVA), 26:302, 329
American Water Works Association
(AWWA)
piping standards, 19:481
Water Quality Goals, 26:115
Americans, silver in, 22:637, 641, 648. See also
North America; South America
Americium (Am), 1:463–491, 464t
electronic configuration, 1:474t
ion type and color, 1:477t
metal properties of, 1:482t
Ame mutagenicity test, 19:452
Amethyst, color of, 7:337
Amex process, 10:789–790
Angard NK, 11:488–489
Amgen, 11:12
Amias, molecular formula and structure,
5:152t
Amidated pectins, 13:69
properties of, 13:74t
Amidation
amino acids, 2:568
maleic anhydride, 15:486–487
Amide anchoring groups, 8:683t
Amides, 10:485; 12:180. See also Fatty acid
amides
achiral derivatizing agents, 6:96t
chlorination of, 13:106
heterocyclic glycidyl, 10:375
of hydroxybenzoic acids, 22:4
predicted deviations from Raoult’s law
based on hydrogen-bonding interactions, 8:814t
reactions with acetylene, 1:181
reactions with bromine, 4:302
reaction with phosgene, 18:805
titanium, 25:100
Amide-salt process, synthesis of
polyamides via, 20:270–271
Amidinium ion system, 19:193
N-Amidino-L-proline, 2:815–816
Amidoamines, 2:446–447; 10:400
Amidochlor, 13:40t, 46
z-Amido-dialkyl peroxides, 18:460
Amikacin, bacterial resistance mechanisms, 3:32t
Amiloride HCl, 5:168
molecular formula and structure, 5:165t
Amination, 9:278–279; 12:184
of alcohols, 2:544–545
of alkyl halides, 2:547
of amyl alcohols, 2:769
of isoquinoline, 21:200
of olefins, 2:547
asymmetric, 16:402
Amine carbamates, 16:359
Amine catalysts, resole resins from, 18:764
Amine complexes, platinum, 19:655
Amine-containing monomers, chemical
structures of, 20:470
Amine-containing polymethacrylates,
synthesis of, 20:469
Amine-containing styrenic monomers,
20:473–475
aqueous solution characteristics of,
20:474
poly(ethylene imine), 20:474
polyvinylamine, 20:474–475
Amine counter ions, in soap–water system,
22:727
Amine cured systems, primary
and secondary, 10:418
Amine curing agents, commercial,
10:397–398t
<table>
<thead>
<tr>
<th>Term</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amine–epoxy resin systems</td>
<td>10:443</td>
</tr>
<tr>
<td>Amine equivalent weight (AEW)</td>
<td>10:399</td>
</tr>
<tr>
<td>Amine ethoxylates</td>
<td>24:150–151</td>
</tr>
<tr>
<td>Amine extractants</td>
<td>10:791</td>
</tr>
<tr>
<td>Amine functional curing agents</td>
<td>10:392–401</td>
</tr>
<tr>
<td>Amine Guard</td>
<td>4:813</td>
</tr>
<tr>
<td>Amine hydrates</td>
<td>14:171</td>
</tr>
<tr>
<td>Amine oxides</td>
<td>2:463–476</td>
</tr>
<tr>
<td>- as cellulose solvents</td>
<td>11:266</td>
</tr>
<tr>
<td>- chemical reactions</td>
<td>2:466–469</td>
</tr>
<tr>
<td>- commercial</td>
<td>2:464t</td>
</tr>
<tr>
<td>- economic aspects</td>
<td>2:471</td>
</tr>
<tr>
<td>- health and safety factors</td>
<td>2:472</td>
</tr>
<tr>
<td>- manufacturing and processing</td>
<td>2:469–471</td>
</tr>
<tr>
<td>- physical properties of</td>
<td>2:463–466</td>
</tr>
<tr>
<td>- specifications and analysis</td>
<td>2:471–472</td>
</tr>
<tr>
<td>- uses of</td>
<td>2:472–473</td>
</tr>
<tr>
<td>Amine phosphates</td>
<td>11:488</td>
</tr>
<tr>
<td>Amine preparation, using ketones</td>
<td>14:570</td>
</tr>
<tr>
<td>Amine processes, for acid gas removal</td>
<td>12:377</td>
</tr>
</tbody>
</table>

Amines. See also Amines by reduction:
- Cycloaliphatic amines; Fatty amines;
- Higher aliphatic amines; Lower aliphatic amines
- achiral derivatizing agents, 6:96t
- adsorbent affinity, 1:674
- adsorbents for removal of light, 1:587t
- aroma chemicals, 3:258
- chemiluminescence reagents for determination, 5:848–849
- chiral, 18:725
- chiral derivatizing reagents, 6:76t
- chlorination of, 13:105–106
- ethylene oxide reaction with, 10:638
- low molecular weight, 14:390
- polarity relative selected molecules, 8:813t
- as potassium chloride collectors, 20:618
- product design of improved for gas scrubbing, 5:759
- reactions with acetaldehyde, 1:104
- reactions with acetic anhydride, 1:148
- reactions with acetone, 1:163
- reactions with acetylene, 1:181
- reactions with acrylamide, 1:289, 291
- reactions with acrylamide polymers, 1:315
- reactions with acrylic acid derivatives, 1:346–347, 348
- reactions with carbonates, 6:308–309
- reactions with carboxylic acids, 5:43–44
- reactions with chloroformates, 6:295–296
- reactions with higher aliphatic alcohols, 2:5
- secondary, 13:649
- in silicone network preparation, 22:565
- silver(1) complexes with, 22:674
- as soap bar additives, 22:745
- solvent in commercial gas absorption processes, 1:26t
- synthesis and manufacture, 2:739
- synthesis of, 13:667–668
- VDC polymer degradation and, 25:718
- zwitterion-containing, 9:351

Amines by reduction, 2:476–498
- Béchamp process, 2:488–490
- catalytic hydrogenation, 2:477–488
- electrolytic, 2:492
- environmental and safety issue, 2:494–495
- intermediates from reduction of nitro compounds, 2:493–494
- metal amalgams, 2:492–493
- metal hydrides, 2:493
- ring reduction of aromatic amines, 2:493
- sodium bisulphite, 2:491
- zinin reduction, 2:490–491

Amine scrubbers, 1:72–76
- nonisothermal, 1:76–80

Amine soaps, 22:757

Amine-type antioxidants, 15:221

Aminimides, 13:572–573

2-Amino-1-butanol
- commercial alkanolamine, 2:114t
- physical properties of, 2:114t

2-Amino-1-hydroxybenzene.
- See 2-Aminophenol

3-Amino-1-hydroxybenzene.
- See 3-Aminophenol

4-Amino-1-hydroxybenzene.
- See 4-Aminophenol

5-Amino-2,3-dihydro-1,4-phthalazinedione.
- See Luminol

1-Amino-2,4-dibromoanthraquinone, 1:21
- physical properties of, 4:353t

1-Amino-2-alkoxy-4-hydroxyanthraquinones, 9:322
1-Amino-2-bromo-4-(4’-methylphenylsulfamido)-anthraquinone, physical properties of, 4:353t
1-Amino-2-bromo-4-hydroxyanthraquinone, physical properties of, 4:353t
1-Amino-2-bromo-4-hydroxyanthraquinone, 9:310
1-Amino-2-chloro-4-hydroxyanthraquinone, 9:303, 304, 310–311
2-Amino-2-ethyl-1,3-propanediol commercial alkanolamine, 2:114t
physical properties of, 2:114t
4-Amino-2-hydroxybenzoic acid, 2:668–669
physical properties of, 2:666t
2-Amino-2-(hydroxymethyl)-1,3-propanediol commercial alkanolamine, 2:114t
physical properties of, 2:114t
2-Amino-2-methyl-1-propanol (AMP) for absorption of hydrogen sulfide from CO₂-rich sour gases, 1:72
commercial alkanolamine, 2:114t
physical properties of, 2:114t
2-Amino-2-methyl-1,3-propanediol commercial alkanolamine, 2:114t
physical properties of, 2:114t
2-Amino-2-methyl-1-propanol (AMP) for absorption of hydrogen sulfide from CO₂-rich sour gases, 1:72
commercial alkanolamine, 2:114t
physical properties of, 2:114t
2-Amino-3-bromo-5-nitrobenzonitrile, physical properties of, 4:352t
2-Amino-3-bromo-anthraquinone, physical properties of, 4:353t
4-Amino-3-nitrophenol, intermediate used in oxidation hair dyes, 7:858t
2-Amino-4,6-dichlorophenol, 2:667
physical properties of, 2:666t
2-Amino-4,6-dinitrophenol, 2:665
physical properties of, 2:666t
1-Amino-4-hydroxyanthraquinone, 9:311 derivatives of, 9:322
4-Amino-4-methyl-2-pentanone, production from acetone, 1:163
2-Amino-4-nitrophenol, 2:665
physical properties of, 2:666t
7-Amino-8-chloro-6-demethyl-6-deoxytetracycline, 24:598
9-Amino-8-chloro-6-demethyl-6-deoxytetracycline, 24:598
Amino acid analogs, “unnatural,” 24:60
Amino acid analogue herbicides, 13:325–326
Amino acid anchoring groups, 8:683t
Amino acid composition, of merino wool, 26:377t
Amino acid duplications, in sulfonamide resistance, 23:505
Amino acid inhibitors, 13:300–302
Amino acid racemization dating, 5:752
Amino acid residues, 9:494; 26:376
Amino acids, 2:554–618; 20:447
achiral derivatizing agents, 6:96t
analysis, 2:596–600
analysis in green coffee, 7:253t
analysis in roasted, brewed, and instant coffee, 7:255t
breeding of amino acid producers by gene technology, 2:588–589t
chemical structures of, 20:448
chemical synthesis, 2:596
chemiluminescence reagents for determination, 5:848–849
content in cocoa and chocolate products, 6:368t
diamide chiral separations, 6:96–97
direct fermentation process, 2:578–589, 582–586t
economic aspects, 2:596
enzymatic process, 2:590–595, 591–593t
essential and nonessential, 2:600
as fermentation products, 11:2–3
in gelatin, 12:436–437
N-halo-α-amino acids, 13:107
health and safety factors, 2:600–604
induction of asymmetry by, 2:570
laboratory hydrothermal synthesis of, 14:84–85
liquid separation adsorption, 1:678
manufacture and processing, 2:578–596
metabolism, 2:603
microfluidic assays of, 26:969–970
modification in proteins, 2:603–604
as neurotransmitters, 2:603
physical properties of, 2:560–567
pK and pI, 2:566t
production from hydrocarbons, 2:587t
protein hydrolysis, 2:597–598
reactions depending on both amino and carboxyl groups, 2:568–570
reactions of amino group, 2:567–568
reactions of carboxyl group, 2:568
in silk, 22:628t, 629
semi-fermentation process, 2:590, 590t
taste profiles, 2:605t
U.S. demand for, 2:597t
uses of, 2:604–608
worldwide sales of, 11:21
α-Amino acids
formula, 2:554
optical configuration, 2:564–565
optical resolution, 2:573–578
synthesis, 2:570–578
toxicity, 2:601–603
d-Amino acids, 2:554
l-Amino acids, 2:554, 559
Amino acid sequences, linking to enzyme properties, 10:260–261
Amino acid side chains, in protein, 20:823
Amino acid sugar reactions, 11:581
Amino alcohols, 2:
chelating agents, 5:712
reactions with chloroformates, 6:296
β-Amino alcohols, 2:113
Aminooxyacetate, 13:299
6-Aminopenicillanic acid (6-APA), 16:400
2-Aminophenol, 2:652
acid dissociation constant, 2:655
derivatives, 2:665–668
physical properties of, 2:653
salts, 2:656
spectral properties of, 2:654
3-Aminophenol, 2:652
acid dissociation constant, 2:655
derivatives, 2:668–669
physical properties of, 2:653–654
salts, 2:656
spectral properties of, 2:654
o-Aminophenol, intermediate used in oxidation hair dyes, 7:858
Aminophenol, intermediate used in oxidation hair dyes, 7:858
Aminophenols, 2:652–678
analysis, 2:661–662
chelating agents, 5:712t
chemical reactions, 2:656–658
derivatives, 2:664–671
economic aspects, 2:661
health and safety factors, 2:663–664
manufacture and processing, 2:658–661
physical properties of, 2:653–656, 666t
reactions with chloroformates, 6:296
salts, 2:656t
spectral properties of, 2:654t
uses of, 2:664
Aminoplasts, 2:620
Aminopyridines, 21:118–119
uses for, 21:121–123
2-Aminopyrimidine, 8:160
2-Aminoquinoline-3-carboxylate esters, 21:191–192
Aminoquinolines, 21:185, 199
Amino resins, 10:409. See also Amino resins and plastics
coating resins, 7:96–98
formaldehyde in, 12:121
Amino resins and plastics, 2:618–652
chemistry of resin formation, 2:624–627
economic aspects, 2:649–650
manufacture, 2:627
raw materials, 2:621–624
regulatory concerns, 2:649
uses of, 2:627–649
p-Aminosalicylic acid, 22:17
Aminosiloxanes
in fiber finishing, 22:593
in hair treatments, 22:594
2-Amino substituted isoflav-3-enes, 16:575–576
microwave-assisted synthesis of, 16:575–576
5-Aminotetrazole, 13:597
Aminothiazoles, 9:289
2-Aminothiophenes, 9:290
Aminotransferases, 3:670–671
biocatalysis mechanism, 3:676–681
Aminotri(methyleneephosphonic acid), 19:53
Amino-tRNA synthetases, 17:618
Amiodar, molecular formula and structure, 5:95t
Amiodarone, 5:102–103
molecular formula and structure, 5:95t
Amiridine, 2:817–818
Amisalin, molecular formula and structure, 5:90t
Amlodipine besylate, 5:123
molecular formula and structure, 5:124t
Amlodipine maleate, molecular formula and structure, 5:124t
AM-MAR metal waste recovery concept, 10:791
Ammonia (NH₃), 2:678–710; 18:678.
See also Ammonium compounds;
Anhydrous ammonia
for activated alumina gel formation, 2:397
adsorbents for removal, 1:587t
alkanolamines from (with olefin oxides), 2:122–140
as an alternative refrigerant, 21:532
analysis, 2:706
carbon dioxide production with, 4:808
catalytic conversion to, 17:294–295
chemical reactions, 2:683–686
density of aqueous at 15°C, 2:680t
diffusion coefficient for dilute gas in
water at 20°C, 1:67t
diffusion coefficient in air at 0°C, 1:70t
economic aspects, 2:704–705
electrostatic properties of, 1:621t
environmental concerns, 2:706–707
estimated 1998 global capacity by region, 2:687t
estimated manufacturing cost, 2:705t
ethylene oxide reaction with, 10:638
fluorine reactivity with, 11:830
gas bulk separation, 1:618t
grades and specifications, 2:705–706
health and safety factors, 2:707–708
hydrogen synthesis gas and, 13:777
Mollier diagram, 2:681t
in nitrogen fertilizers, 11:115–116
nitrogen in coal gasification converted to, 6:772
occurrence, 2:679
physical properties of, 2:680–683
pK values, 8:487t
predicted deviations from Raoult’s law
based on hydrogen-bonding
interactions, 8:814t
production from coal gasifier syngas, 6:776
production of, 13:768; 18:566, 567
reactions with acetaldehyde, 1:104
reactions with acrylic acid derivatives, 1:346, 348
reactions with carbonates, 6:308–309
reaction with acrylamide, 1:289
reaction with carboxylic acids, 5:43
reaction with fatty acids, 2:445
reaction with phosgene, 18:804
recovery from coal, 11:114, 115
in the SCR process, 10:99
separation from carbide-generated acetylene, 1:207
silver(I) complexes with, 22:674
sodium in liquid, 22:763
solid-state reaction with benzoic acid, 8:87–88
source and supplies, 2:686–688
storage and shipment, 2:701–704
synthesis by heterogeneous catalysis, 5:235–237
synthesis of, 11:113–114
typical commercial gas absorption process, 1:26
uses of, 2:708–709
U.S. producers and capacities, 2:687t
vapor pressure of aqueous solution, 2:683
vapor–liquid equilibrium of ammonia–water system, 2:682
wartime production of, 11:8
Ammonia–air dilution system, 10:97
Ammonia analysis, of water, 26:41–42
Ammoniacal cuprous chloride solution, solvent in commercial gas absorption processes, 1:26
Ammonia chloramines, 26:181
Ammonia combustion, in direct strong nitric processes, 17:184–185
Ammonia conversion, in nitric acid production, 17:179–181
Ammonia-forming reactions, 17:313
Ammonia gas, in sodium carbonate recovery, 22:790–791
Ammonia injection grid (AIG), 10:97
Ammonia oxidation, hydrogen peroxide in, 13:582
Ammonia oxidation process, of nitric acid production, 17:170–171
Ammonia oxidation reactions, 10:98
Ammonia plant functions of, 17:293
as reliability example, 26:994–997
Ammonia production, 22:792
steam-methane reforming in, 23:239
Ammonia production centers, 17:315–316
Ammonia removal, recirculating aquaculture systems, 3:196
Ammonia scrubbing, 23:770
Ammonia–soda calcium chloride process, 4:560
Ammonia synthesis, 17:293–294, 313
canstraints and problems related to, 17:295
platinum-group metal catalysts in, 19:621
Ammoniated superphosphates, 11:120
Ammoniates, 2:686
(1R)-(−)-Ammonium-10-camphorsulfonic acid, 6:77, 78
Ammonium acetates, 2:711–712
Ammonium alum calcination, 2:395
neutralization, 2:430
Ammonium benzoate, 3:634
Ammonium bicarbonate, 2:712–713
Ammonium bifluoride, 2:717–718
Ammonium bisulfate formation, 10:98
Ammonium bromide, 2:714
manufacture and uses of, 2:719;
4:323–325
physical properties of, 4:322t, 327
solubility in water, 4:322t
Ammonium carbamate, 4:807
Ammonium carbonates, 2:686, 712–713
Ammonium chloride, 2:679, 714; 26:573
manufacture, 2:715–717
in sodium carbonate recovery, 22:792
volatility in steam systems, 23:211
Ammonium chromate, molecular formula, properties, and uses, 6:561t
Ammonium chromium (II) sulfate hexahydrate, physical properties, 6:528t
Ammonium citrate, 2:713
molecular formula, 6:638t
Ammonium compounds, 2:711–761.
See also Quaternary ammonium compounds
Ammonium cyanide, 8:194
Ammonium derivatives, quaternary, 24:45
Ammonium dichromate, 6:538
manufacture, 6:541
Ammonium dichromate(VI), physical properties, 6:528t
Ammonium dinitramide (AND), 10:739, 742
Ammonium dithiocarbamate, 4:826
Ammonium dithiocyanatoaurate(I), 7:596
Ammonium fluoride, 2:714
Ammonium fluoroborate manufacture, 4:155
physical properties of, 4:152t
thermodynamic properties of, 4:154t
uses of, 4:156–157
Ammonium fluorohafnate, 13:91–92
Ammonium glycyrrhizinate, 12:49;
24:240
Ammonium halides, 2:714–715
vapor pressure, 2:715t
Ammonium hydrosulfide, 2:728
Ammonium hydroxide, for fermentation, 11:38
Ammonium ion, 2:711;
24:43
in pool water, 26:181
Ammonium ion removal, molecular sieves in, 16:846–847
Ammonium lactate, 14:117
Ammonium laureth sulfate, cosmetic surfactant, 7:834t
Ammonium magnesium fluoride, 15:396
Ammonium metatungstates, 25:383
uses for, 25:388
Ammonium metavanadate (AMV), 25:517, 536
Ammonium nitrate, 2:684, 708, 719–720;
10:738
boiling point of solutions, 2:721t
crystallize forms, 2:721t
economic aspects, 2:726
health and safety factors, 2:725–726
heat of solution, 2:721t
manufacture of, 2:722–725; 17:192
in nitrogen fertilizers, 11:116
physical and chemical properties of, 2:720–722
solubility, 2:720t
uses of, 2:726
vapor pressure of solutions, 2:720t
Ammonium nitrate fertilizer, 2:719–720, 726
Ammonium nitrate–fuel oil (ANFO) mixture, in salt mining, 22:806
Ammonium nitrate limestone, 2:726
Ammonium nitrate sulfate, 2:724–725
Ammonium nitrate, 2:726
Ammonium paratungstate (APT), 4:693;
25:358, 361, 363
reduction to metal powder, 25:363
uses for, 25:388
Ammonium pentaborate tetrahydrate, 4:242t, 276
Ammonium perchlorate, 18:274, 276–277
manufacture of, 18:277, 281–282
uses for, 18:284
Ammonium peroxodisulfate, 18:408
Ammonium perrhenate, 21:688, 690
rhenium content in, 21:695
specifications for, 21:693t
Ammonium phosphates, 2:684, 708;
11:120–121, 487; 18:835–836
in nitrogen fertilizers, 11:116
manufacture of, 18:854
Ammonium polyphosphates, 11:121; 18:848
insoluble, 11:487–488
manufacture of, 18:859
Ammonium salts, salicylic acid and, 22:11
Ammonium sulfamate, 13:325
Ammonium sulfate, 2:678, 684, 708,
726–727
economic aspects and uses of, 2:727–728
health and safety factors, 2:728
manufacture, 2:727
in nitrogen fertilizers, 11:116
production of, 23:590
Ammonium sulfate fertilizer, 2:727
Ammonium sulfides, 2:728
Ammonium sulfide solution, 23:679
Ammonium tetrachloroferrate, in vinyl chloride manufacture, 25:634
Ammonium tetrafluorobismuthate(III), 4:19
Ammonium tetra(thiocyanato)diamminechromate(III), molecular formula, properties, and uses, 6:562t
Ammonium tetrathiotungstate, 25:385
Ammonium thiocyanate, 23:678–680
analytical methods for, 23:680
economic aspects of, 23:679
grades and specifications of, 23:680
health and safety factors related to, 23:680
manufacture of, 23:679
properties of, 23:678–679
shipment and storage of, 23:679
uses for, 23:680
registered for use in aquaculture in Europe, 3:220t
registered for use in aquaculture in Japan, 3:221t
Amperometric cells, sensors using, 22:271
Amperometric measurements, 14:612
Amphetamine, 3:89–90
Amphibole asbestos, 1:803; 3:288
  crystal structure, 3:297–298
  exposure limits, 3:316
  fiber morphology, 3:294–295
  silicate backbone, 3:296
Amphibole potassium fluorrichterite, glass- ceramics based on, 12:637
Amphiphile–oil–water–electrolyte phase diagram, 16:427–428
Amphiphile–oil–water phase diagrams, 16:421–423
Amphiphile–oil–water system, temperature of, 16:424–426
Amphiphiles, 16:420
  “Amphiphile strength,” 16:424
Amphiphilic chemicals, 17:56
Amphiphilic copolymers, behavior of, 20:483
  well-defined, 20:485–490
Amphiphilic molecules, 15:99–101
Amphiphilic plasticizers, 14:480
Amphiphilic polymer blend, 23:720
Amphiphilic polymers
  statistical, 20:484–490
  stimuli-responsive, 20:482–483
Ampholytes, 9:746–747
Amphoteric cyclopolymer, water-soluble, 23:721
Amphoteric starches, 4:722
Amphoteric (zwitterionic) surfactants, 24:148
Amphoteric water-soluble polymers, 20:475
Ampicillin, registered for use in aquaculture in Japan, 3:221t
AmpliChip CYP450 Test, 16:392
Amplifiers, optical, 11:145–146
Amrinone, 5:186
  molecular formula and structure, 5:181t
Amsco res, 3:383
AMSIM software package, 1:76
AMS Index, 15:765
Amygdalin, 3:590t
Amyl acetates, 2:775–776
  solubility of anhydrous citric acid in, 6:634t
Amyl alcohols, 2:762–782
  azeotropes with water, 2:766
  in beer, 3:582t
  chemical reactions, 2:763, 766–770
  economic aspects, 2:773
  flammability limits, 2:775t
  health and safety factors, 2:773–775
  manufacture, 2:770–772
  physical properties of, 2:763, 764–765t
  shipping and storage, 2:773
  specifications, 2:773, 775
  toxicity, 2:774t
  uses of, 2:775–776
Amyl alcohol, salicylic acid and, 22:6
n-Amyl alcohol. See 1-Pentanol
sec-Amyl alcohol. See 2-Pentanol
tert-Amyl alcohol. See 2-Methyl-2-butanol
Amylamine, 2:538t
  physical and chemical properties of, 2:540t
Amylases, 10:280–281. See also
  \( \alpha \)-Amylases; \( \beta \)-Amylases
  bacterial, 10:251
  fungal, 10:251, 252
\( \alpha \)-Amylases, 10:288. See also Amylases
  attack on amylose in beer making, 3:568, 576, 577
  fungal, 10:292, 297
\( \beta \)-Amylases, 10:288
  attack on amylose in beer making, 3:568, 576, 577
\( \alpha \)-Amylcinnamaldehyde, 3:595
Amylenes, alkylolation, 2:176
n-Amyl bromide, physical properties of, 4:350t
tert-Amyl methyl ether (TAME), 10:574, 576
  uses for, 10:582
Amyl nitrate, 5:113
  molecular formula and structure, 5:110t
Amyloglucosidases, 10:252, 289, 294–295
Amyloid \( \beta \)-peptide fibril, 2:818, 820
Amylopectin(s), 1:547; 4:704, 718–719; 12:494; 20:452; 26:288
  classification by structure, 4:723t
Amylose(s), 1:547; 4:704; 20:452, 562
  classification by structure, 4:723t
  enzymatic breakdown in beer brewing, 3:576, 577
Amylose inclusion compounds, 14:168
Amylosic phases, for chiral separations, 6:88–89
tert-Amyl peroxides, 14:296
**tert-AMYL PEROXYESTERS**

*tert*-Amyl peroxyesters, 14:286

4-tetra-Amylphenol, 2:219–221

health and safety data, 2:220t

physical properties of, 2:205t

Amyl salicylate, physical properties of, 22:13t

(−)-Anabasine, 2:83

Anabolic steroid implants, 13:3–4

Anabolic steroids

as animal growth regulators, 13:3–6

classification of, 13:3

economics of, 13:6

gain response composition for, 13:4–5

growth performance response of, 13:4

mechanism of action of, 13:5–6

Anacorn, molecular formula and structure, 5:95t

Anaerobes

facultative, 17:302

in nitrogen fixation, 17:301

Anaerobic bacteria, 23:569

Anaerobic conditions, defined, 3:757t

Anaerobic contact, in biological waste treatment, 25:902

Anaerobic digestion, 3:701–702

Anaerobic filter, in biological waste treatment, 25:902

Anaerobic/Oxic (A/O) process, as advanced wastewater treatment, 25:907

Anaerobic process

fermentation as, 11:1–2

in wastewater treatment, 25:889t, 899–900, 901t, 902–905

Anaerobic systems, in bioremediation, 25:837

Anaerobic wastewater treatment, 25:889t, 899, 900–902, 902–905

Analgesics, 11:867

Analog(ue)-to-digital converter (ADC), 19:155; 20:677

Analogue control hardware, 20:668

Analogue encoding, 11:130–131

Analogue load cells, 26:233

Analogue oscilloscopes, 14:619

Analyses (analysis)

of dyes, 9:232–234

ion exchange in, 14:423–424

of polyether antibiotics, 20:132

of propylene oxide, 20:810

for reliability, 26:981, 984–986

replication of, 21:162

of solid waste, 25:866

statistical control of, 21:162

in technology transfer, 24:363–366

Analysis activities, EIA, 10:234–236

Analysis/analytical methods

ASTM, 10:508

EIA, 10:241t

for ethylene oxide polymers, 10:684–686

Analyte electrochemistries, 9:581

Analyte mass transport, 9:575

Analytical affinity chromatography, 6:404–405

Analytical balances, 26:245

Analytical chemistry. See also Analytical methods/techniques

in the fragrance industry, 18:379–381

of manganese compounds, 15:611–613

organic titanium compounds in, 25:135

of plutonium, 19:699–700

of thorium, 24:774

Analytical development, in fine chemical research and development, 11:426


See also Analytical test methods

for anthropogenic silicas and silicates, 22:470

for ascorbic acid, 25:759–760

for higher olefin polymers, 20:428–429

for high purity gases, 13:464–468

for hydrazine, 13:588–589

for hydrogen peroxide, 14:59–60

for inorganic titanium compounds, 25:59–60

for iodine, 14:367–368

for LDPE, 20:227–230

for lead, 14:762

for LLDPE, 20:203–205

for maleic anhydride, 15:509–510

for melamine resins, 15:788–790

microfluidic, 26:969–971

for phenol, 18:753–754

for phenolic resins, 18:774–779

for phosgene, 18:807–808

photoassisted chemical, 19:127

for potassium, 20:601–602

for potassium compounds, 20:639

for refractories, 21:511–513

for rubidium, 21:820

for selenium, 22:99–95

for silica, 22:370–373, 374t

for silicon, 22:498–499

for silicon carbide, 22:537–538
crystals, 19:387
in paper, 25:28
pigment, 19:390
Anatoxin-a, 2:73
Anchor-dependent cell cultivation, 11:11
Anchoring, in bismuth alloy applications, 4:12
Ancillary chemicals
for spas/hot tubs, 26:195–196
for swimming pool/spa water treatment, 26:196
Ancymidol, 13:40t, 306
Anderson and McLean experimental design
text, versus other texts, 8:395t
Andgemifloxacin, 21:222
Andreason sedimentation pipette, 8:720
Andreev reflection, 23:821
Androgens, synthetic, 13:3
Anemia
folic acid and, 25:802
lead-induced, 14:765
vitamin B₁₂ and, 25:804
Anemometers
cup and vane, 11:666
hot-wire and hot-film, 11:676
Anesthetic ether, 10:577
Anesthetic properties
of acetaldehyde diethyl acetal, 2:69
of arechloral hydrate, 2:69
Anesthetics, 21:836
promising chemicals for aquaculture, 3:224
registered for aquaculture in U.S., 3:217
registered for use in aquaculture in
Canada, 3:218t
registered for use in aquaculture in
Europe, 3:220t
registered for use in aquaculture in
Japan, 3:221t
Anethole, 3:231, 232
Aneuploidy, 25:206
Angelic acid, physical properties, 5:35t
Angilol, molecular formula and structure, 5:93t
Angina pectoris, 5:107
antianginal agents as prophylactics, 5:110t
treatment, 5:109
types of, 5:108–109
Anginyl, molecular formula and structure, 5:97t, 118t
Angiomax, 4:100t, 101
Angioplasty, 3:712, 714; 5:109
Angiosperm fibers, 11:173
Angiotensin, 5:158
Angiotensin I, 5:158
Angiotensin II, 5:158
Angiotensin II receptor blockers, 5:158
angiotensin-converting enzyme (ACE), 5:158
Angiotensinogen, 5:158
Angizem, molecular formula and structure, 5:97t, 118t
Angle of internal friction, 11:795–796
Angle of repose, 11:795
of quicklime, 15:43
of slaked lime, 15:45
Angle-resolved XPS (ARXPS), 24:90
Angolamycin, 15:292, 293t
Angorpril, molecular formula and structure, 5:118t
Angormin, molecular formula and structure, 5:129t
Angorpil, molecular formula and structure, 5:97t
Angular acceleration, exponents of dimensions in absolute, gravitational, and engineering systems, 8:584t
Angular momentum, 21:290–291
exponents of dimensions in absolute, gravitational, and engineering systems, 8:584t
Angular selective thin films, 23:16, 19
Angular velocity, exponents of dimensions in absolute, gravitational, and engineering systems, 8:584t
Anhalamine, 2:84, 85
Anhydride cure mechanism, 10:404
Anhydride curing agents, 10:401–406, 407t
Anhydrides, 10:499. See also Acid anhydrides
amino acids, 2:568
ethylene oxide reaction with, 10:637–638
Anhydrite, 5:785t
phase in Portland cement clinker, 5:472t
in Portland cement, 5:467
salt deposits and, 22:798
1,6-Anhydro-β-D-glucopyranose, 4:705
1,5-Anhydro-β-D-glucitol, 4:710
Anhydroglucopyranose units (AGU), 21:5, 7
Anhydroglucose units (AGU), in viscose fibers, 11:251, 252
Anhydrotetracycline oxygenase, 24:601
Anhydrotetracyclines, 24:594
Anhydrous acetic acid, extraction of, 10:786
Anhydrous aluminum bromide, 2:385
Anhydrous aluminum chloride, 2:357, 379–384
manufacture, 2:380–382
physical properties of, 2:380t, 383t
reaction with phosgene, 18:804
uses of, 2:384
Anhydrous aluminum nitrate, 2:386
Anhydrous aluminum trifluoride, 2:363
physical properties of, 2:364t
Anhydrous ammonia
physical properties of, 2:680t
for purification of hydrocarbon-derived acetylene, 1:203
reaction with olefin oxides to produce alkanolamines, 2:129
specifications, 2:706t
Anhydrous amorphous silica, 22:380
Anhydrous barium hydroxide, 3:364
Anhydrous barium iodide, 3:364
Anhydrous barium nitrite, 3:366
Anhydrous beryllium sulfate, 3:666
Anhydrous borax, 4:266
Anhydrous boric acid, 4:246
Anhydrous cadmium nitrate, 4:513
Anhydrous cadmium sulfate, 4:515
Anhydrous caustic soda, 22:838
Anhydrous cerous chloride, 5:676
Anhydrous chromium(II) acetate, 6:531
Anhydrous citric acid, solubility in selected solvents, 6:634t
Anhydrous copper(II) sulfate, 7:773
Anhydrous ethanol, production by azeotropic extraction, 8:809, 817
Anhydrous gaseous hydrogen sulfide, 23:633
Anhydrous hydradrazine, 13:562, 585
acid–base reactions of, 13:567–568
explosive limits of, 13:566t
formation of, 13:579
vapor pressures of, 13:564
Anhydrous hydrogen chloride, 13:809–813
physical and thermodynamic properties of, 13:809–813
purification of, 13:824–825
reactions of, 13:818–821
uses for, 13:833–834
Anhydrous hydrogen fluoride, 13:127; 14:1
catalytic activity of, 14:8
dehydrating power of, 14:6–8
properties of, 14:2t
shipping of, 14:16
Anhydrous hydrogen sulfide, 23:635
Anhydrous iron(II) acetate, 14:532
Anhydrous lactic acid, 14:115
Anhydrous lead acetate, 14:792–793
Anhydrous lithium hydroxide, 15:141
Anhydrous magnesium acetate, 15:381–384
Anhydrous magnesium chloride, 15:391–392, 396
producing, 15:393–394
Anhydrous magnesium nitrate, 15:409
Anhydrous magnesium sulfate, 15:416, 419
Anhydrous monocalcium phosphate, 18:837
manufacture of, 18:856
Anhydrous, monomeric formaldehyde, 12:110
Anhydrous nickel chloride, 17:110
Anhydrous nickel fluoride, 17:110
Anhydrous nickel halides, properties of, 17:110t
Anhydrous permanganic acid, 15:596–597
Anhydrous phosphoric acid, 18:817–818
Anhydrous rare-earth salts, 14:634
Anhydrous silica
dissolution of, 22:388
price of, 22:468t
Anhydrous soap, 22:728–729
determining, 22:754
Anhydrous sodium dithionite, 23:674, 675
Anhydrous sodium perborate, 18:401
Anhydrous sodium sulfate, 23:669–670
Anhydrous sodium sulfate, recovery from brine, 5:801
Anhydrous sodium tripolyphosphate, 18:844–845
Anhydrous sodium tungstate, 25:382
Anhydrous stannic chloride, 24:803
Anhydrous stannous chloride, 24:802–803
Anhydrous zinc chloride, 26:617
Anhydrous zinc sulfate, 26:617
Aniline, 2:783–809, 17:250, 259
alkylation, 2:197
Béchamp process, 2:490
from benzene, 3:619t, 620
chemical reactions, 2:783–789
derivatives, 2:783–809
economic aspects, 2:790–791
extractive distillation using, 8:804
health and safety factors, 2:792–793
manufacture and processing, 2:789–790
physical properties of, 2:783, 784t
production of, 13:798
removal of, 13:579
ring reduction, 2:502–503
solubility of boric acid in, 4:253t
specifications and analysis, 2:791t, 791–792
storage and handling, 2:792
table of derivatives, 2:802–805t
uses of, 2:793
U.S. producers, 2:790t
vapor pressure, 2:784t
Aniline dyes, 9:358, 420
Aniline point (AP), in solvent testing, 23:89
Aniline-rich reaction mixtures, 13:548
Anilinium tetrafluoroborate, 4:144t
Animal associations, nitrogen fixation and, 17:301
Animal cell culture
aeration biotechnology applications, 1:743–744
airlifts bioreactors for, 1:740
Animal-derived antimicrobial peptides, 18:253–254
Animal Drug Amendments, 18:685
Animal fats, 5:27, 28
Animal feed binders
palygorskite/sepiolite application, 6:700t
smectites application, 6:697t, 699
Animal feed enzyme applications, 10:300
Animal feed(s)/food
cyanide applications, 8:183
iodine in, 14:371–372
ingredients in, 10:850–851
magnesium sulfate in, 15:420
salt in, 22:816–817
silica in, 22:375
sodium iodide in, 22:827
vanillin in, 25:553
Animal fibers, 24:613
Animal genetic engineering, 12:448–469.
See also Transgenic animals
applications of, 12:463–467
classical methods of, 12:449–452
constructing transgenes for random insertion, 12:453–462
by gene targeting, 12:459
gene therapy in humans, 12:467–468
transgenesis, 12:452–453
Animal growth hormones, from fermentation, 11:12
Animal growth regulators, 13:1–21
age, gender, genotype, and nutritional interactions related to, 13:12
anabolic steroids, 13:3–6
antibiotics, 13:7–9
β-adrenergic agonists, 13:14–17
classes of, 13:2
growth hormone-releasing factor, 13:13–14
health and safety factors related to, 13:17
ionophores, 13:6–7
somatotropin, 13:9–12
Animal growth studies, 13:1
Animal hosts, 11:23
Animalic odor, 3:227t
Animal manures, as biomass, 3:684
Animal nutrition, sulfur use in, 23:591
Animal pharmacology/toxicology studies, for investigational new drug applications, 18:690
Animal polysaccharide, 20:565–568
Animal protein by-products, 10:853
Animals
ascorbic acid biosynthesis in, 25:762–763
environmentally friendly, 12:465–466
mucopolysaccharides of, 20:455–457
pesticide hazards to, 18:547–549
Animal semen, preservation using cryogenics, 8:42
Animal studies, for food additives, 12:35.
See also Aminal growth studies
Animal testing, cosmetics, 7:825
Animal toxicity, lindane and hexachlorocyclopentadiene, 13:146
Animal toxicology
PBDE-related, 13:143
polychlorinated naphthalenes, 13:144–145
Animal uptake, of herbicides, 13:310
Animal viruses, 3:135–136
Animal waxes, 26:203, 206
Anion binding, in supramolecular chemistry, 24:43–47
Anion-exchange membranes, 15:836
Anion exchangers, organic fouling of, 14:416
Anionic carboxylate monomers, 20:468–469
Anionic complexes, tungsten, 25:386–387
Anionic copolymerization, 7:624–626
block copolymers, 7:645
Anionic emulsifiers, in VDC emulsion polymerization, 25:722
Anionic extractants, 10:750
Anionic flotation, 14:497
Anionic gels, 9:59–60
Anionic guest inclusion compounds, 14:170
Anionic halide complexes, 14:540
Anionic initiators, 14:244–265
alkali metals, 14:245–248
alkyllithium compounds, 14:248–255
1,1-diphenylmethylcarbanions as, 14:257–258
fluorenyl carbanions as, 14:258
health and safety factors related to, 14:260
organobarium compounds, 14:257
organomagnesium and organometallic compounds, 14:256–257
organosodium and organopotassium compounds, 14:255–256
Anionic latexes, 19:855
Anionic methacrylate polymerizations, 16:239–240
Anionic organic polyelectrolytes, doping with, 13:546
Anionic PAMAM dendrimers, 26:798
Anionic poly(acrylic acid), 20:465, 466
Anionic polyelectrolytes, 20:465–469
Anionic polymerization, 14:244; 19:836; 20:408–409; 24:706
of acrylic ester monomers, 1:387
of cyclic siloxanes, 22:559–560
of methacrylic ester polymers, 16:290–291
Anionic polymers, low molecular weight, 11:633
Anionic polystyrene (APS), benefits of, 23:385–386
Anionic polystyrene polymerization, 23:372, 384–386
Anionic substrate, recognition of, 16:780–781
Anionic sulfonated reactive dye, 9:483
Anionic surfactants, 14:717; 22:724; 23:516; 24:144–146, 154
effect of fatty acid amides on, 2:453–456
fatty acid amides, 2:453–455
in the phase separation model, 24:128
phosphate containing, 24:146
soap as, 22:725
as soap bar additives, 22:745
Anionic trash reduction, 10:305
Anions
addition to fullerenes, 12:246–247
aromatic radical, 14:246–248
effect on aqueous poly(ethylene oxide)
solution, 10:679
selectivity for, 14:395
Anion salts, hydrogen chloride reactions
with, 13:819–820
p-Anisaldehyde
annual consumption by region, 2:67t
physical properties of, 2:61t
Anise seed, 23:164
Anisole, 14:166, 184, 253
production by alkylation, 2:197
Anisole trifluoroborane, 4:144t
Anisotropic charge-transfer complexes, 23:708
Anisotropic etching
in sensor fabrication, 22:267
Anisotropic fibrous materials, 11:177, 178
Anisotropic Ginzburg-Landau equations,
general solution of, 23:814–815
Anisotropic HTS, 23:819. See also High
temperature superconductors (HTS)
Anisotropic polymer melts, 15:109
Anisotropic properties, silicon, 22:482, 483t
Anisotropic sintered ferrites, 11:85
Anisotropic methyl bromide, 4:359t
Anisotropy
of graphite crystals, 12:714
of graphite products, 12:732
of high temperature superconductors,
23:840–842
during injection molding, 23:379
stress, 11:62–64
ANLAB40 color difference scale, 7:321
ANLAB color difference scale, 7:321
Annatto, 24:561
colorant in cosmetics, 7:835
Annealed copper alloys, 7:723t
Annealing
aluminum alloys, 2:329–331
ceramics processing, 5:664–665
glass, 12:597–598
in ion implantation, 22:186–187
isothermal, 23:288–290
process, 23:290
spheroidization, 23:290
of steel, 23:288–290
transformation diagrams for, 23:289
of vitreous silica, 22:415–416, 426
Annealing temperature schedule, in
stochastic annealing, 26:1029
Annihilation radiation, 21:312–313
Annotinine, 2:82
Annual limit of intake (ALI), 19:701–702
Annual money flows, 9:537–540
Annual reports, in research partnerships,
24:390
Annular film reactor, Chemithon, 23:547
Annular flow, 11:772
Annular shaft kiln, 15:48–49
Annulenes, 12:243
Anode(s)
in chromic acid plating baths, 9:802
defined, 3:408, 409
fluorine cell, 11:835–837
lead, 14:776
lead–antimony alloys in, 14:771
MCFC, 12:222
plating tank, 9:776–778
practical battery system, 3:427
ruthenium dioxide-coated, 19:641
Anode applications, graphite in,
12:758–759
Anode electrochemistry studies, 11:837
Anode filming, 9:807
Anode materials, 9:654–655, 777, 778
Anode performance, improvements in,
11:837
Anodically colored electrochromic inorganic
films, 6:579–580
Anodic cleaning, 9:783, 785
Anodic (passivating) corrosion inhibitors,
26:144
Anodic electrochemical dissolution,
high-rate, 9:604
Anodic electrodeposition (AED), 10:448
Anodic electrodeposition coatings, 10:381
Anodic inhibitors, 7:815
Anodic oxidation, on tantalum, 24:327–330
Anodic oxidation waste treatment, 9:643
Anodic oxide films
electronic leakage in, 24:328–329
heat treatment of, 24:329–330
Anodic passivation, 23:779, 26:144
Anodic reaction rate, 9:611
Anodic stripping voltammetry, 9:569
Anodizing
acids used for, 16:221
of magnesium alloys, 15:374–375
metal surface, 16:220–222
steps in, 16:221
-anol suffix, 2:2
Anomeric effect, 4:705
Anomers, 4:699
Anone-anol, 1:558
Anorectics (appetite suppressants), 3:87–95
Anarthite, 2:345t
phase equilibria in the C–A–S system, 5:468
Anosmia, 11:515
ANOVA (analysis of variance), commercial
experimental design software
compared, 8:398t
Anoxic conditions, defined, 3:757t
ansa-metallocenes, 16:90, 94
ansa-zirconocene catalysts,
C2-symmetrical, 16:114
ansa-zirconocene complexes, 16:107
ANSI-approved standards, 15:760.
See also American National Standards
Institute, Inc. (ANSI)
ANSI Reporter and Standards Action,
15:768
Antacal, molecular formula and structure,
5:124t
Antagonistic toxic effects, 25:214
Antarcticite, 5:785t
Antarctic polar stratospheric clouds, effect
on ozone depletion, 17:788–789
Anteiso acids, 5:28
Antenna effect, 8:263
Antennas, virtual two-way SMA devices in,
22:350
Anterlite, 7:773
Anthanthrone dyes, 9:335–336
Anthemintics, ethyleneamines
application, 8:500t, 506
Anthophylite, 1:803; 3:288, 290
fiber morphology, 3:294t
world production in 2000, 3:289t
Anthracite coal grade (Netherlands),
6:713t
Anthracite coal, 6:703
calcination of, 12:726–727
classification by rank, 6:711t
composition, 6:720t
constitution, 6:718
as a graphite filler material, 12:724
origin, 6:704
rank and heating values, 6:726t
vitrinite reflectance limits and ASTM
c coal rank classes, 6:708t
world reserves, 6:704
meta-Anthracite coal, classification by
rank, 6:711t
meta-Anthracite coal grade (U.S.), 6:713t
Anthracite coal grades, France, U.K., U.S.,
6:713t
Anthracite polantracyt coal grade (Poland),
6:713t
Anthrahydroquinone (AHQ), 21:22, 25
Anthramide Orange, pigment for plastics,
7:367t
Anthranilic acid, 2:107
aroma chemical derived from
naphthalene, 3:235
alkaloid precursor, 2:78
Anthrapyridone Red, colorant for plastics,
7:374t
Anthrapyrimidine dyes, 9:335
Anthrapyrimidine Yellow, pigment for
plastics, 7:366t
Anthraquinone-1-sulfonic acid, 9:313–314
Anthraquinone-α,α'-disulfonic acids,
9:314–315
Anthraquinone autoxidation, 14:42–46
economic operation of, 14:51
Anthraquinoneazole dyes, 9:333–335
Anthraquinone Blue, colorant for plastics,
7:374t
Anthraquinone dyes, 9:253–254,
300–349, 388. See also
Anthraquinones
acid, 9:327–329
acridone dyes, 9:335
color and structure, 9:305–307
disperse, 9:321–327
functional, 9:338–341
health and safety factors, 9:341–343
key intermediates, 9:307–319
manufacturing, 9:302–305
method of synthesis, 9:305
mordant dyes, 9:337
reactive, 9:302, 319–320
thiazole dye, 9:334–335
vat, 9:329–336
Anthraquinone Green, colorant for plastics,
7:374t
Anthraquinone Red, colorant for plastics,
7:374t
Anthraquinones, 21:242, 255. See also
Anthraquinone dyes
colorants for plastics, 7:374t
   typical soluble dye applications, 7:376t
   amination of, 9:279
   spectral data, 9:305t, 306t
   Anthraquinone soluble dyes, 7:373t
   Anthraquinone Violet, colorant for plastics, 7:374t
   Anthraquinone Yellow, colorant for plastics, 7:374t
   Anthrarufin, 9:315
   Anthra system, 14:47–48
   Anthrax detection technology, 22:264
   Anthrax sterilization, 8:667
   Anthrazit coal grade (Germany), 6:713t
   Anthrimide dyes, 9:332
   Anthrimidocarbazole dyes, 9:332–333
   vat dyes, 9:324
   Anthraquinonoid soluble dyes, 7:373t
   Anthrone soluble dyes, 7:373t
   Anthropogenic mercury releases, trends in, 16:47–49
   Anthropogenic silicas and silicates, 22:451–480
   analytical methods for, 22:470
   applications of, 22:470–473
   characteristics of, 22:461
   chemical activity of, 22:459–461
   commercial products containing, 22:465–467
   crystalline structure of, 22:452–455
   derivatives of, 22:473–475
   described, 22:451–452
   disposal of, 22:467–468
   dissolution of, 22:455–458
   economic aspects of, 22:468–470
   handling and storage of, 22:467
   health and safety factors related to, 22:467–468
   manufacture and processing of, 22:461–465
   polymerization of, 22:458–459
   shipment of, 22:467–468, 469t
   toxicology of, 22:467
   worldwide production of, 22:468–469
   Antiacne preparations, 7:844
   Antiaging agents, 2:810–832
   applications, 2:827–828
   calorific restriction, 2:812–813
   cancer prevention, 2:825–827
   cardiovascular system, 2:821–823
   central nervous system, 2:815–817
   hormones, 2:814–815
   musculoskeletal system, 2:824–825
   organ systems, 2:815–825
   reactive oxygen species, 2:813–814
   skin and hair, 2:815–817
   telomeres, 2:814
   Antianginal agents, 5:107–135, 110–111t, 118–120t, 124–124t
   arylalkylamines and benzothiazepins (calcium channel blockers), 5:118–120t
   1,4-dihydropyridine calcium channel blockers, 5:124–129t
   nitrates as vasodilators, 5:110–111t
   Antiarrhythmic agents, 5:86–106,
   90–98t
   antianginal agents, 5:118t, 119t
   class IA, 5:90t, 99–100
   class IB, 5:91t, 100
   class IC, 5:92–96t, 100–101
   class II, 5:101–102
   class III, 5:102–104
   class IV, 5:97t, 104
   current and future trends, 5:105–106
   Antibacterial activity, of fluoroquinolones, 21:218t
   Antibacterial agents, 3:1–23
   classification, 3:7–9
   economic aspects, 3:16–17
   in liquid soap, 22:748
   nomenclature, 3:6–7
   preparation and manufacture, 3:9–16
   promising chemicals for aquaculture, 3:222–223
   registered for use in aquaculture in Canada, 3:218t
   registered for use in aquaculture in Europe, 3:220t
   registered for use in aquaculture in Japan, 3:221t
   registered for use in aquaculture in U.S., 3:210
   therapeutic utility, 3:17–20
   world market for, 3:16t
   year of disclosure or market introduction of selected, 3:6t
   Antibacterial dendrimers, 26:799
   Antibacterial oxazolidinones, 17:728–746
   evolution of, 17:744
   mode of action of, 17:735–736
   structure–activity of, 17:732–735
   synthesis of, 17:736–743
   therapeutic spectrum of, 17:734–735
Antibacterials. See Antibacterial agents; Antibiotics; Antimicrobials; Quinolone antibacterials
Antibacterial sulfones, 23:493
Antiberiberi factor, 25:781
Antibiotic peptides, 18:252–253. See also Antimicrobial peptides synthesis of, 18:254
Antibiotic resistance, 3:23–40
biochemical strategies, 3:30–38 molecular targets for antibiotics, 3:24–30
Antibiotics, 11:867. See also Macrolide antibiotics; Polyether antibiotics; Tetracyclines
registered for use in aquaculture in Canada, 3:218t
Antigen display, on yeast, 26:488
Antigene strategy, 17:627–628
Antigen purification, 25:506
Antigorite, 3:291, 292
Antihalation dyes, 9:513
Anti-HIV drug candidates, 23:725. See also Acquired Immunodeficiency Syndrome (AIDS); HIV entries
Antihypertensive agents, 5:146–170, 149–157t, 161–166t
antianginal agents, 5:118t, 119t
diuretics, 5:161–166t
Anticing additives, in gasoline, 12:408
Antilipemic agents, 5:135–146, 138–141t, 144t
novel potential agents, 5:144t
Antimalarial activity, of polyether antibiotics, 20:135
Antimicrobial acrylic fibers, 11:215–219
Antimicrobial agents, 12:31. See also Antimicrobial compounds
in continuous-filament yarns, 19:758
as preservatives, 12:57–59
silylating agents and, 22:700
as soap bar additives, 22:746
sulfonamides as, 23:494
Antimicrobial compounds, microbiological methods for determining, 20:132
Antimicrobial nanoemulsion technology, 8:630–631
Antimicrobial peptides, 18:252–274
animal-derived, 18:253–254
identification of, 18:253
immune system response and, 18:255–256
indirect antimicrobial activity of, 18:255–256
membranolytic mechanism of, 18:254–255
mode of action of, 18:254–255
properties of, 18:266
specificity concerns for, 18:255
uses for, 18:265
versus antibiotic peptides, 18:252–253
Antimicrobial properties, of hydrogen peroxide, 14:42
See also Antimicrobial agents
Antimicrobial target organisms, 17:729
Antimonate, 3:43, 59
Antimonic acid, 3:59, 65
Antimonin (stibabenzene), 3:72
Antimonious acid, 3:43
Antimonite, 3:43
Antimony (Sb), 3:41–56, 56. See also Group III-Sb system; InAsSb alloy; InSb
photodiode detectors/arrays;
Lead–antimony alloys; Low antimony lead alloys; Stib-entries
in babbitts, 24:797
catalyst poison, 5:257t
chemical reactions, 3:42–44
in coal, 6:718
economic aspects, 3:47–48
effect of micro additions on silicon particles in Al–Si alloys, 2:311–312
effect on copper resistivity, 7:676t
environmental concerns, 3:50
gallium compounds with, 12:360
health and safety factors, 3:51
in pewter, 24:798
physical properties of, 3:42–44, 43t
process metallurgy, 3:44–47
production, import, and export for U.S., 3:48t
quantitative analysis of, 22:684
recycling, 3:51
reported industrial consumption in U.S., 3:50t
solubility limits and electrical conductivity effects on copper, 7:750t
specifications, 3:48–49
in type metals, 24:798
uses of, 3:51–54
U.S. imports by class and country, 3:49t
world mine production, reserves, and reserve base, 3:42t
Antimony(III) acetate, 3:65
Antimony alloys, 3:41–56
compositional ranges, 3:52t
process metallurgy, 3:44–47
selenium and metallurgy of, 22:98
uses of, 3:51–54
Antimony battery grids, composition, 3:52t
Antimony bromide sulfide, 3:63
Antimony chloride oxide, 3:62t
Antimony compounds, 3:56–87
analysis, 3:80–81
environmental impact, 3:81
health and safety factors, 3:81
inorganic, 3:57–67, 62t
organoantimony compounds, 3:67–80
Antimony dichloride trifluoride, 3:62t
Antimony dioxide, 3:59
Antimony graphite fluoride, 3:63–64
Antimony halides, physical properties of, 3:61t
Antimony–halogen synergism, 11:460–461
Antimony hydride, 3:44
Antimony hydrogen bis(thioglycolate), 3:66
Antimony iodide selenide, 3:63
Antimony iodide sulfide, 3:63
Antimony(III) nitrate, 3:65
Antimony oxide addition in ruby glass manufacture, 7:344
for PVC polymers, 25:675
U.S. exports by country, 3:79t
U.S. imports for consumption by class and country, 3:80t
Antimony(III) oxide, 3:43, 58–59
Antimony(III, V) oxide, 3:59
Antimony(V) oxide, 3:43, 59
Antimony oxide flame retardants, 11:486
Antimony pentabromide diethyl ether, 3:62t
Antimony pentachloride, 3:64; 11:862
physical properties of, 3:61t
Antimony pentachloride bis(iodine chloride), 3:62t
Antimony pentachloride sulfur tetrachloride, 3:62t
Antimony pentachloride tetrahydrate, 3:64
Antimony pentachloride tris(iodine chloride), 3:62t
Antimony pentafluoride, 3:65
Antimony pentfluoride. See Antimony trioxide
Antimony pentoxide, 3:65
Antimony pentoxide hydrates, 3:59–60
Antimony(III) perchlorate trihydrate, 3:65
Antimony(III) phosphate, 3:65
Antimony potassium tartrate (tartar emetic), 3:66
Antimony red, 3:44
Antimony selenide, 3:57
Antimony sesquioxide. See Antimony trioxide
Antimony sodium gluconate, 3:67
Antimony sulfate, 3:65
Antimony(III) sulfate, 3:65
Antimony tetroxide, 3:59
Antimony tribromide, 3:63
physical properties of, 3:61t
Antimony trichloride, 3:60–61
physical properties of, 3:61t
Antimony trichloride aniline, 3:62t
Antimony trichloride bisacetone, 3:62t
Antimony trichloride diethyl ether, 3:62t
Antimony trichloride difluoride, 3:62t
(Antimony trichloride)tricarbonylnickel, 3:62t
Antimony trichloride trimethylamine, 3:62t
Antimony trifluoride, 3:60; 11:861
physical properties of, 3:61t
Antimony triiodide, 3:63
physical properties of, 3:61t
Antimony trioxide, 3:43, 54, 58–59; 20:40, 56
Antimony tris(isooctylthioglycolate), for PVC polymers, 25:671
Antimony trisulfide, 3:57, 64–65
Antimussol, commercial defoamer, 8:241t
Antimycin (Fintrol Concentrate), piscicide for aquaculture in U.S., 3:215t
Antimycoytic agents, synthetic, 26:941
Antineutrinos, 21:297, 305
Antibiotesy drugs, 3:87–101
anorectics (appetite suppressants), 3:89–95
centrally acting drugs, 3:97
lipid absorption inhibitors, 3:95–96
peripherally acting drugs, 3:97–98
Antioxidant blends, 3:117–118
Antioxidants, 2:814; 10:828; 12:31, 58, 59–61. See also Polymer antioxidants
ascorbic acid as, 25:761, 769
biological, 17:651–652
with butyl rubber, 4:449
in continuous-filament yarns, 19:758
in cosmetics, 7:828
in gasoline, 12:407
for inks, 14:318
for lubricating oil and grease, 15:219–221
lycopene, 17:661
manufacturing processes for, 12:60t
in oils, 10:806
in pet foods, 10:854–855
in polychloroprene, 19:847, 848
in polychloroprene latex compounding, 19:858
polymer-type, 12:188
quinolines as, 21:194
in rubber compounding, 21:789
secondary, 15:221
as soap bar additives, 22:744–745
test methods for, 21:789–790
in VDC polymer stabilization, 25:719–720
vitamins as, 12:69
Antioxidative systems, herbicide damage to, 13:297–298
Antiozonants, in polychloroprene, 19:847, 848–849
Antiparasiticides
registered for use in aquaculture in Canada, 3:218t
registered for use in aquaculture in Japan, 3:221t
Antiperspirant fragrances, 18:364
Antiperspirants, 7:847–848
Antiphase boundary (APB), 13:499
strengthening of, 13:501
Antiplatelet drugs, 4:103–105, 104t
Antiredeposition agents, 8:422
Antireflection treatment, 23:7–8
Antireflective (AR) coatings
for photovoltaic devices, 23:45
sol–gel-derived, 23:55
vitreous silica in, 22:444–445
Antirestenotic agents, controlled release of, 9:82
Antiselective poisoning, 5:258
Antisense agents, 17:626–627
Antisense compounds, 11:13–14
Antisense mechanism, 17:627
Antisense oligonucleotides, 17:627, 628
Antiseptics, 8:605, 606
antibacterial agents contrasted, 3:1
Antisera, for species identification, 12:103
Antisetting agents, 9:493–498
Anti-shrink efficiency (ASE), 26:354–355
Antisolvent crystallization, 8:135
Antistatic agents
fatty acid amides, 2:457–458
fatty amines, 2:534
Antistatic polystyrenes, 23:366
Antistiction coatings, lotus effect in, 22:123
Anti-Stokes scattering, 16:485–486; 21:323
Antitank guided missile (ATGM), 5:827
Antithetic sampling, 26:1005
Antithrombin, 4:87
Antithrombin III, 12:147
Antithrombolytic agents, 5:170–175, 171–172t
anticoagulants, 5:172t, 174–175
glycoprotein IIb/IIIa receptor antagonists, 5:170, 171t, 173–174
Antithrombotic agents, 5:182t
Antithrombotic drugs, 4:91t
Antithrombotics, 23:722
Antitrust laws, standards development and, 15:754
Antitubercular agents, 3:7
preparation and manufacture, 3:9–10
therapeutic utility, 3:17–18
world market for, 3:16t
Antiviral activity, of polyether antibiotics, 20:133–135
Antiviral agents, 3:135–182; 11:867
HBV therapy, 3:153–159
HCV therapy, 3:159–164
HIV therapy, 3:146–153
nucleoside analogues, 3:142–145
viral infection process, 3:139–142
virus classification, 3:135–138
WNV therapy, 3:164–168
Antiwear lubricant additives, 15:213, 223–224
Antraciti communi coal grade (Italy), 6:713t
Antraciti speciali coal grade (Italy), 6:713t
Antracyt coal grade (Poland), 6:713t
meta-Antracyt coal grade (Poland), 6:713t
Aorta, 5:80
Apatite, 11:118, 119; 14:638
in coal, 6:718
hardness in various scales, 1:3t
Apec polycarbonates, 19:824
Apel, 10:180
Aperiodically stacked layers, in distributed-Bragg reflectors, 14:857
Apex-3D computer assisted molecular modeling package, 6:11; 10:331–333
Apex Germanium Mine, 12:554–555
APEX project, 11:695, 696
Aphemate, 24:488
Aphids, 8:9
Aphthitalite, 5:785t
phase in Portland cement clinker, 5:472t

APHTHITALITE 65
Application buffer, in af

Apple thinning agent,

Aprotic polar polymers,

APSAC-anistreplase,

Appetite suppressants,

Apples, citric acid in,

Applicators, microwave,

Application processes, for unsaturated

Applied research, shift to,

Applied Nanotechnologies, Inc.,

Aptamers,

Appetite depressants,

Aprical, molecular formula and structure,

Apramyl, molecular formula and structure,

Apparel, nylon,

Apparent density, of limestone,

“Apochromatic” objectives, 16:471

Apocynaceae, alkaloids in, 2:75

Apodization process, 14:227

apo E gene, and LDL level, 5:136

Apoglucose oxidase (apo-GOD), 14:148

Apolipoprotein B deficiencies, 17:652

Apparatus, 16:276

Apple thinning agent, 13:57

Application buffer, in affinity chromatography, 6:391

Application processes, for unsaturated polyesters, 20:116–118

Applicators, microwave, 16:521–522

Applied Nanotechnologies, Inc., 1:718

Applied research, shift to, 24:355–356

Appraisal costs, 21:178

Approach flow, of paper stock, 18:106

Apramyl, molecular formula and structure, 5:97t, 119t

Apramyl, molecular formula and structure, 5:165t

Aprical, molecular formula and structure, 5:128t

Apricot kernel oil, cosmetically useful lipid, 7:833t

Aprotic polar polymers, 23:733

APSAC-anistreplase, 5:175, 177–178

molecular formula and structure, 5:172t

Aptamers, 17:621, 631–632

Aquacide, herbicide/algalicide for aquaculture in U.S., 3:215t

Aquaculture, 3:182–208
culture systems, 3:190–198
diseases, 3:206–207
economics, 3:184–185

harvesting, processing, and marketing, 3:207–208

nutrition and feeding, 3:201–205

product design, 5:762–764

regulation, 3:185–186

reproduction and genetics, 3:205–206

species under cultivation, 3:186t, 186–190, 187–188t
top producing nations, 3:189t

water quality requirements for cold and warmwater animals, 3:200t

water quality requirements for marine fishes, 3:201t

water sources and quality, 3:198–201

Aquaculture chemicals, 3:209–225

promising chemicals, 3:222–224

regulation in United States, 3:209–210

regulation outside United States, 3:218–224

Aquaculture ponds, 3:191–193

Aquaflor. See Florfenicol

Aqua-ion size, effect of, 13:443

Aqua-Kleen, herbicide/algalicide for aquaculture in U.S., 3:215t

Aqualinic Powder. See Oxolinic acid

Aquamarine, 3:638

color of, 7:331

Aquatensien, molecular formula and structure, 5:162t

Aquatic ecosystems, release of mercury into, 16:47

Aquatic organisms
pesticide hazards to, 18:549
silver deposition in, 22:681

Aquatic plants, aquaculture, 3:182

Aquatic pollution, from hydrothermal resources, 12:534–535

Aquatic toxicity, of surfactants, 24:154

Aquatic vegetation, fertilizers and, 11:126

Aquatrine, herbicide/algalicide for aquaculture in U.S., 3:214t

Aquazide, molecular formula and structure, 5:163t

Aquazide-H, molecular formula and structure, 5:161t

Aqueous acids, limestone reaction with, 15:33
Aqueous–alcoholic system, in nitrogen fixation, 17:314
Aqueous alkaline electrolysis, 13:784
Aqueous alkaline electrolysis system, 13:783
Aqueous cleaners, for electroplating, 9:781
Aqueous corrosion, ion implantation and, 14:451–452
Aqueous corrosion resistance, 13:513
Aqueous dispersion polymerization, 18:291
of acrylonitrile, 11:197–200
Aqueous dispersions, 18:292. See also Aqueous polytetrafluoroethylene dispersions
phenolic resins in, 18:783
Aqueous electrolyte solutions, 9:595–596
Aqueous electroplating, 24:750
Aqueous ethanolamines, hydrogen sulfide removal using, 23:597–601
Aqueous evaporation, in hazardous waste management, 25:816
Aqueous extraction, two-phase, 10:767
Aqueous formaldehyde, 12:115; 18:759
Aqueous gel systems, syneresis in, 23:64–65
Aqueous hydrazine solutions, materials compatibility for, 13:587t
Aqueous hydrazine specifications, 13:586t
Aqueous hydrochloric acid reaction with metals, 13:826
thermodynamic functions of, 13:816t
uses for, 13:834–835
Aqueous hydrofluoric acid, uses for, 14:20
Aqueous hydrogen peroxide, properties of, 14:37t
Aqueous hydrogen peroxide solutions, analytical methods for, 14:59
Aqueous manganese metal solutions, electrolysis of, 15:557–559
Aqueous media, iodine reactions in, 14:359–360
Aqueous mixed salt systems, 9:36
Aqueous ozonation reactions, rate of, 17:779
Aqueous perchlorate solutions, 18:274
Aqueous plugs, in microfluidics, 26:968
Aqueous polytetrafluoroethylene dispersions, 18:291
Aqueous potassium permanganate solutions, 15:597–600
Aqueous ring-opening metathesis polymerization (ROMP), 15:495
Aqueous sodium bisulfite, 23:673
Aqueous solution characteristics, of amine-containing styrenic monomers, 20:474
Aqueous solution chemistry, plutonium, 19:692–698
Aqueous solutions. See also Water entries of caustic soda, 22:830, 831–832
electrowinning from, 9:637–639;
16:159–161
metal extraction from, 10:791
rheological characteristics of, 20:440
of soda ash, 22:795
of sodium sulfates, 22:864–865
stabilization of, 10:683
Aqueous solution viscosity, for polyox resins, 10:685–686
Aqueous streams, organic separations from, 21:656–661
Aqueous sucrose, osmotic pressure of, 23:441t
Aqueous systems, in nitrogen fixation, 17:314–315
Aqueous two-phase extraction, 15:717
Aqueous U(VI) carbonate system, 25:431
Aqueous uranyl sulfate system, 25:429
Aqueous varnish removal systems, in fine art examination/conservation, 11:413
Aqueous zinc chloride, as cellulose solvent, 11:272
Aquifer bioremediation, defined, 3:758t
Aquifer flow, 12:842
Aquifers, 12:838–839
Aquifer sparging, defined, 3:758t
AraA [9-((β-D-arabinofuranosyl)-9H-purin-6-amine], 4:713
Arabidopsis, molecular genetics of cellulose biosynthesis, 5:366
Arabinanase, 10:300
Arabinans, classification by structure, 4:723t
α-L-Arabinoferanoses units, 4:699
Arabinogalactan(s), 4:717–718
analysis in green coffee, 7:253t, 254
analysis in roasted, brewed, and instant coffee, 7:255t
classification by structure, 4:723t
Arabinoglucuronoxylans, 21:8–9
Arabinose, 4:697
d-Arabinose, 4:698
L-Arabinose, 4:697, 699
Aranoxylans, 4:718 
classification by structure, 4:723t 
L-Araboascorbic acid, 25:749 
Arab oil embargo, 6:783t 
Arachidonic acid (AA), 5:28; 17:663, 665 
arachno designation 
boranones, 4:184–186 
boron hydrides, 4:170, 172–174, 176 
Aragonite, 4:551–552; 5:785t; 15:31, 32 
deposits of, 17:687 
physical properties of, 4:552t 
Aralkyl halides, reactions with 
alkanamines from olefin oxides and 
ammonia, 2:128 
Aral Sea, 5:784 
Aramid fibers, 13:372–373, 395 
asbestos substitute, 3:314t 
chemical resistance of, 19:731t 
consumption of, 19:735t 
mechanical properties of, 13:376 
properties of, 19:729–730t 
as reinforcement materials, 26:756, 760 
Aramid films/papers, properties of, 19:733t 
Aramid polymer device, 16:1 
Aramid products, economic aspects of, 19:735–736 
Aramid, 10:210, 211–212; 19:713. 
See also Aromatic polyamides 
Aranesp 
cell culture technology product, 5:346t 
market, 5:356 
Aranidipine, 5:123, 130 
molecular formula and structure, 5:124t 
Arbanol, 24:528 
Arbitrary marks, 25:257–258 
Arcanite, 5:785t 
phase in Portland cement clinker, 5:472t 
Arc-casting process, 17:10 
Arc-discharge process, 12:229–230 
Arc furnaces, 12:297–306, 748, 749, 753 
applications for, 12:315 
Archaeological materials, 5:739–740 
degradation, 5:752–753 
inorganic types, 5:744–748 
organic types, 5:748–752 
Archaeology, 5:739 
chemical methods in, 5:739–758 
of silver, 22:636–637 
Archard equation, 15:205 
Architectural coatings, 18:55–56 
ecological aspects of, 18:73–74 
Architectural fabrics, 13:394 
Architectural paints, 18:72 
Archives, preservation of, 11:414 
Arch Raschig process flow sheet, 13:578 
Arc melting techniques, 25:522–523 
ARCO process, 23:342 
Arc-resistance furnace, 12:304 
Arc resistance testing, 19:587 
Arctic polar stratospheric clouds, effect on 
ozone depletion, 17:789–790 
Arc vaporization, 24:738 
Arc welding, copper wrought alloys, 7:747 
Ardel polyarylate resins, 10:190 
Ardeparin, 4:95t 
Arduengo carbenes, 95t 
Area, exponents of dimensions in absolute, 
gravitational, and engineering systems, 8:584t. See also 
Cross-sectional area; 
Head- area meters; Surface area; 
Variable-area flowmeters 
Area detectors, 26:431 
Area per surfactant molecule, 24:136 
Arehedral hydrate, anesthetic properties 
of, 2:69 
Arecoline, 2:83 
Arenaviruses, 3:138 
Arenes 
hydrogenation of, 26:880 
oxidation of, 16:571 
ArF laser, 14:692, 693 
Argotobran, 4:100t, 100–101 
Argemonine, 2:90 
Argentite, natural occurrence of, 22:668 
Argentium Sterling, 12:562 
Argentothiosulfate complexes, 19:215 
Argillaceous limestone, 15:26 
Argillic alteration zones, gallium in, 12:341–342 
Arginine 
content in cocoa and chocolate products, 6:368t 
systematic name, formula, 
and molecular weight, 2:556t 
taste profile, 2:605 
d-Arginine, systematic name, formula, 
and molecular weight, 2:557t
DL-Arginine, systematic name, formula, and molecular weight, 2:557t
L-Arginine, systematic name, formula, and molecular weight, 2:557t
Arginine requirements, of cats, 10:855
AR glasses, 13:387
Argon (Ar), 17:343. See also ArF laser
bulk quantities of, 17:363
commercial distribution of, 17:362–363
cryogenic shipping, 8:40
doubly ionized, 14:684–685
economic aspects of, 17:365–366
electrostatic properties of, 1:621t
in ethylene oxidation, 10:651
gas bulk separation, 1:618t
high purity, 13:460, 468
in light sources, 17:371–372
liquefaction, 8:40
liquid from air separation, 8:48–49
in oxygen, 17:756
physical properties of, 17:350
separation and purification of, 17:360
thermophysical properties, 8:41t
uses for, 17:368–370
Argon-40, 17:344
Argonaut research and training reactor,
17:593
Argon fluorohydride, 17:335
Argon helium, commercial specifications
for, 17:367t
Argon ion laser, 14:683–685
Argonne premium coals, 6:744
carbon structural distribution based on
NMR, 6:715t
empirical composition, 6:730t
Argon–oxygen decarburization (AOD)
processes, 17:99, 369, 762; 22:516;
23:264
Argon shielding, 17:368–369
Argon treatment, in ladle metallurgy,
23:264
Argyria, 22:655, 681–682
occupational, 22:682
Argyrol, clinical use of, 22:679
Argyrosis, 22:681–682
Aricept, 2:818
Arima, Kei, 11:49
Aristolochic acid I, 2:72, 73
Arithmetic mean diameter, 23:186
Arixtra, 4:95t, 97
Arizona asphalt modification process,
21:468
Arkshells, world aquaculture production
in 1996, 3:186t
Arlington, California, brackish reverse
osmosis system, 26:82–83
Armor, silicon carbide in, 22:538
Army Corps of Engineers aquaculture
regulation, 3:185
ARNITE, 20:33, 59
Arnitel V, commercial block copolymer,
7:648t
Aroformer process, 25:171
Aroma
in beer, 26:466–467
chemical characterization of, 11:516–521
instability of, 11:517
Aroma analysis, 11:517
instrumental, 11:519
Aroma chemicals, 3:226–262; 18:361,
372–379. See also Aroma compounds
biodegradability, bioaccumulation, and
biotoxicity of, 18:389
costs of, 18:385
as food additives, 12:46
functional groups of, 3:236–238;
18:373–378
general production routes, 3:230–235
market share, 3:226t
odor descriptors, 3:226–227, 227–230
testing of, 18:382
thermal stability of, 18:386
transport in barrier polymers,
3:403–405
Aroma compounds, 11:517
Aroma extract dilution analysis (AEDA),
11:519–520
Aroma isolation, 11:516–521
distillations for, 11:519
solvent extraction for, 11:518
Aroma perception, taste and, 11:522–523
Aroma therapy, 18:354
Aromatic-(poly)cycloaliphatic diphenols,
interfacial condensation of, 23:
723–724
Aromatic aldehydes
from carbon monoxide, 5:11
oxidation of, 26:894
physical properties of, 2:61t
Aromatic alkylation, 12:160–161
ring formation in, 12:168
Aromatic amine antioxidants, 15:221
Aromatic amines, 9:451–452; 10:396
alkylation, 2:197–198
Aromatic ionic polyesters, 23
Aromatic hydroxylation, 12
Aromatic ketones, 14
Aromatic hydrocarbons, 18
Aromatic hydrazines, 9
Aromatic heterocycles, 13
Aromatic glycidyl amine resins, 25
Aromatic carboxylic acids, microbial reduction of, 16

See also Aromatics
acylation of, 12:173–181
amination of, 12:184
arylation of, 12:170–171
cycloalkylation of, 12:169
in diesel fuel, 12:425
formylation of, 12:178
Friedel–Crafts acylation of, 12:174
Friedel–Crafts alkylation of, 12:164
nitrination of, 12:182–183
oxidative coupling of, 19:654
sulfonation of, 12:181
sulfonation reagents for, 23:521–524
Aromatic-containing polymers, sulfonation of, 23:535–536
Aromatic copolymers, 13:372
Aromatic diacyl peroxides, 14:283
Aromatic disocyanates, urethanes obtained from, 25:462–463
Aromatic epoxies, 10:347–348
Aromatic ethers, 10:574
Aromatic fluorocarbon production, global, 11:871–872
Aromatic glycidyl amine resins, 10:372–373
Aromatic heterocycles, 9:283–291
Aromatic heterocyclic bases, chelating agents, 5:712t
Aromatic hydrazines, 13:573
Aromatic hydrocarbons, 18:593
biodegradability of, 25:826
composition of, 25:168
as diluents, 10:430
fluorinated, 11:866
nitrination of, 17:161
separation of, 10:782–785
as solvents for poly(ethylene oxide), 10:675
sulfonation reagents for, 23:521t
Aromatic hydroxylation, 12:183
Aromatic ionic polyesters, 23:722
Aromatic ketones, 14:563, 592–593
Aromatic liquid crystalline polymers, 20:399
Aromatic nitrations, 17:160–161
by-products of, 17:161
kinetics of, 17:162
Aromatic nitriles, 17:243
Aromatic nucleophilic displacement, polyimide synthesis via, 20:273
Aromatic phosphines, 19:60, 62
Aromatic poly(monosulfide ketone)s, 23:709
Aromatic poly(monosulfide)s, 23:706
Aromatic polyamide copolymers, laboratory synthesis of, 19:720
Aromatic polyamide fibers, 24:614
Aromatic polyamides, 10:210–212; 19:713–738. See also Aliphatic polyamides (PA)
analytical and test methods for, 19:718
chemical structure of, 19:715–717
commercial processes for, 19:720–723
commercial products based on, 19:721t
economic aspects of, 19:735–736
economic aspects of, 19:716t
fiber and film properties of, 19:727–728
health and safety factors related to, 19:736
interchain hydrogen bonding in, 10:211
laboratory synthesis of, 19:718–720
molecular weight of, 19:717–718
physical and chemical properties of, 19:717–718
polymerization process for, 19:718–723
polymer properties of, 19:715–718
post-spinning processes for, 19:725–726
processing of, 19:723–726
properties of, 10:212t
solubility of, 19:718
sources of ingredients for, 19:714–715
test methods for, 19:732t
thermal properties of, 19:718
uses for, 19:728–735
Aromatic polycarbonates, derived from bisphenols, 19:806–808t
Aromatic polyester fibers, 20:3
Aromatic polyesters, 10:189
Aromatic polyimides, 20:264, 277
Aromatic polysulfonates, 23:723
Aromatic polythioacetals, 23:732
Aromatic radical anions, 14:246–248
as difunctional initiators, 14:253
Aromatic reaction catalysis, molecular sieves in, 16:844
Aromatic resins, 10:202
Aromatic ring fluorination, 11:866
Aromatic rings, conversion to nonaromatic cyclic structures, 15:5
Aromatics, 18:678
Aromatics. See also Aromatic compounds adsorbent affinity, 1:674
alkylated, 2:177–196; 23:525–526
chlorinated, 6:234; 23:653
in coal, 6:703, 714
consumption patterns for, 24:274–275
deactivation of Claus catalysts by, 23:613
economic evaluation of, 24:274–277
extraction in benzene manufacture, 3:606
flash vacuum pyrolysis and, 21:145–149
gas bulk separation, 1:618t
global supply and demand for, 24:275–276
nitrat ed, 17:159
in the petrochemical industry, 18:556–558
in petroleum naphtha, 18:583
polarity relative selected molecules, 8:813t
predicted deviations from Raoult’s law based on hydrogen-bonding interactions, 8:814t
reaction with carbon monoxide, 5:11
reaction with ozone, 17:783
regional trends related to, 24:276–277
separation from hydrocarbon-derived acetylene, 1:203
styrene and, 23:330
in vacuum gas oils, 18:587
zeolite selectivity in C8 aromatic systems, 1:675t
Aromatic separation, 10:785
Aromatics feedstocks, 18:565–566 from pyrolysis gasoline, 18:566
Aromatics industry, in the United States, 24:277
Aromatic solvents, 18:59
Aromatics plant process flow diagram, 13:204
Aromatic substitution reactions, microwaves in, 16:542
Aromatic toluenediamines, 25:189
Aromatic triazoles, 26:145
Aromatization, in toluene formation, 25:165–166
Aromax process, 1:665; 25:171, 176
Aromizing-Aroformer process, 25:175
Arosolvan process, 3:306
β-Aroylacrylic acids, 15:486
2-Aroylbenzofurans, microwave-assisted synthesis of, 16:578
Array detector, 23:143
Array methodologies, 12:513–517
Arrays, large, 16:390
Array spotting/synthesis, in microarray fabrication, 16:385–387
Arrhenius equation, 10:85; 14:622;
Arrhenius first-order rate equation, 14:278
Arrhenius life-temperature relationship, in reliability modeling, 26:989
Arrhythmias, 3:711. See also Cardiac arrhythmias
cardiac device solutions, 3:712
Arsenaboranes, 4:204
Arsenate, 3:274
Arsenic (As), 3:262–274. See also GaAsP system; Gallium arsenide (GaAs) semiconductor; InGaAsP entries;
Indium–gallium–arsenside (InGaAs) photodiodes
anthropogenic sources of, 3:275–276
bioremediation substrate, 3:783
as catalyst poison, 5:257t, 258
in coal, 6:718
in cotton fiber, 8:20t
determination in environment, 3:278–279
economic aspects, 3:267–268
effect on copper resistivity, 7:676t
environmental impact, health effects, and treatment methods, 3:269–270,
274–288
exposure to, 3:276–277
gallium compounds with, 12:360
health and safety factors, 3:269
in hydrogen fluoride manufacture, 14:11
legislation and economic aspects, 3:285–286
metallurgy, 3:265–266
naturally occurring arsenic-bearing minerals, 3:263t
natural sources of, 3:275
occurrence of, 3:263
Arsenic acid, presence in water and food, 3:264
Arsenical copper alloys, 3:271–272, 272
Arsenic oxide, for oxidizing iron in glass, 7:343
Arsenic peroxides, 18:404
Arsenic removal, in municipal water treatment, 26:124
Arsenic trioxide, 3:264, 265–266
Arsenic vapor, 3:264, 264t
Arsenious acid, presence in water and food, 3:276t
Arsenite, 3:274
Arsenobetaine (AsB), presence in water and food, 3:276t
Arsenopyrite (mispickel), 3:263t
Arsine, 3:264; 13:613
gallium arsenide semiconductor and, 22:152–153, 156
modeling GaAs growth from, 22:154
Arsine complexes, osmium, 19:642
Art conservation, liquid chromatography applications, 6:464
Artemisinin production, from yeast, 26:493–494
Arteriosclerosis obliterans, antianginal agents for, 5:111t
Artenian aquifer, 12:839
Art history, technical, 11:398
Arthritis
boron neutron capture therapy, 4:227
gold salts for, 12:700
and obesity, 3:87
Arthropy, induced by fluoroquinolone, 21:231
Arthroscopy, 3:734
Article of manufacture category, in patents, 18:166
Articulated indexing, 18:239
Artifactual materials standards, 15:742
Artificial aging, of aluminum alloys, 2:333
Artificial blood, 4:109, 126–127
Artificial chromosomes, for passenger DNA insertion, 12:507–508
Artificial endonucleases, 17:636
Artificial flavoring substances, 3:226;
11:569, 571–575; 12:48
specifications for, 11:575
Artificial fruit flavors, 11:574
Artificial graphite, 4:735; 12:713–771
in aerospace and nuclear reactor applications, 12:740–744
baking, 12:733–736
chemical applications of, 12:744–747
chemical properties of, 12:718–720
crushing and sizing, 12:727–729
directional properties of, 12:714
electrical properties of, 12:715–716
electrode applications for, 12:748–759
filler materials for, 12:721–724
impregnation of, 12:736–737
mechanical applications for, 12:747
mechanical properties of, 12:717–718
metallurgical applications of, 12:759–761
mixing and forming, 12:730–733
physical properties of, 12:714–715
processing, 12:727–740
proportioning, 12:729–730
puffing, 12:722, 740
raw materials used in producing, 12:720–721
reactions with, 12:720
refractory applications for, 12:761–766
strength of, 12:718
thermal conductivity of, 12:716–717
Artificial hearts, 3:718–719
Artificial insemination, 12:449
Asbestos, 3:288–319; 5:640
alternatives to, 3:313–315, 314t
analytical methods, 3:304–305
crystal structure, 3:295–298
fiber classification and standard testing methods, 3:309–311
fiber length distribution, 3:299
fiber morphology, 3:291–295
geological occurrence, 3:290, 291t
health and safety factors, 3:315–317
indoor, 1:803–804
industrial applications, 3:311–313, 313t
mining and milling technologies, 3:308–309
production, 3:289t, 305–308
properties of, 3:298–304
regulation, 3:316–317
thermal properties of, 3:300–304
utilization by process, 3:312
world production by country, 1920–2000, 3:306t
Asbestos–cement products, 3:311, 313
alternatives to, 3:315
Asbestos-containing insulation, 14:211
Asbestos diaphragms, in caustic soda manufacture, 22:839
Asbestosis, 3:316

Asbestos, 3:288–319; 5:640
alternatives to, 3:313–315, 314t
analytical methods, 3:304–305
crystal structure, 3:295–298
fiber classification and standard testing methods, 3:309–311
fiber length distribution, 3:299
fiber morphology, 3:291–295
geological occurrence, 3:290, 291t
health and safety factors, 3:315–317
indoor, 1:803–804
industrial applications, 3:311–313, 313t
mining and milling technologies, 3:308–309
production, 3:289t, 305–308
properties of, 3:298–304
regulation, 3:316–317
thermal properties of, 3:300–304
utilization by process, 3:312
world production by country, 1920–2000, 3:306t
Asbestos–cement products, 3:311, 313
alternatives to, 3:315
Asbestos-containing insulation, 14:211
Asbestos diaphragms, in caustic soda manufacture, 22:839
Asbestosis, 3:316
Asbolite, 7:209t
Ascharite, 4:133t
Ascorbate free radical, 25:769
Ascorbic acid, 12:60, 61; 25:745–781, 804–805. See also L-Ascorbic acid; Vitamin C
absorption, transport, and excretion of, 25:771
analytical methods for, 25:759–760
antioxidant useful in cosmetics, 7:830t
biochemistry of, 25:766–773
chemical properties of, 25:746, 804–805
common cold and, 25:747–748
deficiency of, 25:770–771
derivatives of, 25:761–762
economic aspects of, 25:759
environmental considerations related to, 25:758–759
fermentation synthesis of, 25:758–759
function as ingredient in cosmetics, 7:829t
history of, 25:746–747
isolation of, 25:746
manufacture of, 25:755–758
mobilization and metabolism of, 25:771
molecular structure of, 25:748–749
packaging of, 25:758
physiology of, 25:766–773
production of, 25:752–754
properties of, 25:749–752
purification of, 25:755
RDA of, 25:772
scurvy and, 25:745–747
sources of, 25:764–765, 767t
specifications for, 25:759
synthesis of, 25:747, 752–755
toxicity of, 25:772–773
uses of, 25:760–761
L-Ascorbic acid, 25:745–748. See also Ascorbic acid
packaging of, 25:758
purification of, 25:755
Ascorbic acid palmitate, 25:804, 805
Ascorbyl palmitate, antioxidant useful in cosmetics, 7:830t
Aseptic fermentation, 11:8
Aseptic food processing systems, 12:81
Aseptic package filling systems, 12:81
Aseptic packaging, 18:32–33
Aseptic techniques, in parenteral product packaging, 18:715
Ash
analysis in green coffee, 7:253t
analysis in roasted, brewed, and instant coffee, 7:255t
in cotton fiber, 8:19t
determination in sugar, 23:472, 477–478
fusion temperature, 6:727, 754, 826
in thermal waste treatment, 25:831
Ash content
in diesel fuel, 12:425
in wood, 26:335
Ashing, recovery of silver via, 22:653
Ash melting point, coal, 6:727, 781–782
Ash properties, of coals, 12:324t
ASHRAE Standard 55 thermal comfort guidelines, 1:818
Asia
chemical production in, 24:264–265
epoxy industry in, 10:352
ethylene production in, 24:270
natural graphite in, 12:780
production and consumption of regenerated cellulose fibers in, 11:275, 276t
PVC capacity of, 25:676
rice-growing in, 26:284
silver reserves in, 22:637
tin mining in, 24:800
tin smelting in, 24:788
Asian Chemical Marketing Research Association (ACMRA), 15:646
Asiatic clams, as macrofouling organisms, 26:149–150
As low as reasonably achievable (ALARA) exposure, 17:533, 551, 552
exposure to radioactive waste, 25:853
principle, radioactive release and, 21:279; 25:853
risk, 14:219
ASME B31 Pressure Piping Code, 19:480. See also American Society of Mechanical Engineers (ASME)
Asparagine
systematic name, formula, and molecular weight, 2:558t
taste profile, 2:605
D-Asparagine, systematic name, formula, and molecular weight, 2:558t
DL-Asparagine, systematic name, formula, and molecular weight, 2:558t
L-Asparagine, systematic name, formula, and molecular weight, 2:558t
Asparaginase, citric acid in, 6:632t
Aspartame, degradation of, 24:227–229
FDA approval of, 24:227
maleic anhydride in the manufacture of, 15:513
pH and stability of, 24:227
safety of, 24:231
synthesis of, 24:229–230
synthesis with microorganisms, 24:230–231
Aspartic acid
content in cocoa and chocolate products, 6:368t
systematic name, formula, and molecular weight, 2:558t
taste profile, 2:605
D-Aspartic acid, systematic name, formula, and molecular weight, 2:558t
DL-Aspartic acid, systematic name, formula, and molecular weight, 2:558t
L-Aspartic acid, systematic name, formula, and molecular weight, 2:558t
Aspect ratios
of fibers, 11:163–164
of fillers, 11:303
of resist features, 15:185
AspenPlus software, 26:1040
AspenTech, 20:763, 764
Aspergillus fermentation, 26:470–471
Aspergillus nidulans, 12:479
Aspergillus niger, 11:8, 9; 12:479, 480
citric acid fermentation, 6:639
Aspergillus oryzae, 11:7
critical oxygen concentration for selected organisms, 1:731t
mycelial fermentation, 1:743
Asperity height (σ), 22:116
Asphalt(s)
asbestos as additive to, 3:313
blends with styrenic block copolymers, 24:715
emulsions, 18:673
modification of, 21:467–469
palygorskite/sepiolite application, 6:700t, 701
from petroleum, 18:641, 671–673
recycling, 23:592
soap and, 22:757
Asphalt chemicals, ethyleneamines
application, 8:500t, 506
Asphalt emulsifier
amine oxides, 2:473
fatty acid amides, 2:458
Asphalt emulsions, 10:131
Asphaltenes, in petroleum vacuum residua, 18:589–590
Asphyxiants, 21:836
Aspirating aerators, compressed, 26:168–169
propeller driven, 26:168
submersible, 26:169, 170t
subsurface, 26:168
Aspiratory, 11:236–237
See also Acetylsalicylic acid
as trade name, 22:19
for cancer prevention, 2:826
Aspirin resistance, 4:104
ASP oil recovery process, 23:532–533
Assay format, competitive, 14:142
Assay limits, in Investigational New Drug Applications, 18:692
Assays, for silver, 22:650. See also Biological assays; Chemical analysis
Assembly techniques, for polyamide plastics, 19:791
Assessment
of environmental impacts, 24:176–190
of ideas in chemical product design, 5:772
Assets, identifying functions of, 15:476
Association complexes, ethylene oxide polymer, 10:682
Association constant, for antibody-antigen reactions, 14:137
Association–dissociation equilibrium, in micellization, 24:128, 129–131
Association for the Advancement of Medical Instrumentation (AAMI) Standards, 26:818–819
Association of American Feed Control Officials (AAFCO), 10:856
Nutrient Profiles, 10:857, 858–859t
Association of Assessment and Accreditation of Laboratory Animal Care (AAALAC), 25:223
Association of Lighting and Mercury Recyclers, 16:41
Association of Manufacturers and Formulators of Enzyme Products (AMFEP), 10:309
Association of Official Analytical Chemists International (AOAC), 23:471; 26:324
Association of the Nonwoven Fabrics Industry (INDA), test methods, 17:480, 481
Association of University Technology Managers (AUTM), 24:368, 391
Association phenomenon, in anionic polymerization of cyclic siloxanes, 22:559
Associative symbioses, in nitrogen fixation, 17:300
Asthenic vegetative syndrome, 16:50–51
Asthma, indoor air pollution aggravates, 1:817
Asthmatic bronchitis, effect on heart, 5:107
ASTM analysis methods, 10:508. See also American Society for Testing Materials (ASTM)
ASTM C920 sealant specification, 22:46
ASTM classification, of pig tin, 24:790, 791t
ASTM coal classification system, 6:710, 712
ASTM coating standards, 9:717
ASTM copper strip test, 23:624
ASTM D 381 chemical stability test, 12:400. See also American Society of Testing and Materials (ASTM)
ASTM Heavy Duty Engine Oil Classification Panel (HDEOCP), 15:233
ASTM Sequence IIIG test, 15:230
ASTM Sequence IVA test, 15:230–232
ASTM Sequence VG test, 15:230
ASTM Sequence VIB test, 15:232
ASTM Sequence VIII test, 15:232
ASTM specifications for titanium alloys, 24:862–864
for titanium sponge, 24:853t
ASTM Standardization News, 15:768–769
ASTM standard procedures, for measuring epoxy resin system properties, 10:426t
ASTM standards for flax fiber, 11:614–615, 617
for polyamides plastics, 19:793
ASTM water leach test, of solid waste, 25:868
Astrakanite, 5:785t; 22:846, 863
Astringents, 7:847–848
Astronomy, vitreous silica applications in, 22:443–444
Astroquartz, fiber reinforcement for ceramic–matrix composite, 5:558t
Asymmetric allylboration, 13:669–671
Asymmetric cellulose acetate membranes, 21:633
Asymmetric hydroboration, 13:665–667
Asymmetric hydrogenation, 5:210–212; 26:880–881
Asymmetric membranes, 15:800, 804–813; 16:4, 5
Asymmetric microbial acyloin condensation, 16:402
Asymmetric oxidation, 23:735
Asymmetric ring-closing metathesis (ARCM), 26:922
Asymmetric ring-opening cross-metathesis (AROCM), 26:922
Asymmetric RO membranes, 21:633
Asymmetric rotating disk (ARD) contactor, 10:778
Asymmetric substrate, 13:664–665
Asymmetric synthesis, via chiral organoboranes, 13:664–671
AT1 receptor, 5:158
Atacama Desert, sodium nitrate in, 22:844–845
Atacamite, 7:769
Atacand, molecular formula and structure, 5:152t
Atactic polymethacrylate esters, glass transition temperatures of, 16:273t
Atactic polypropene, 16:104; 20:524
Atactic polystyrene, 10:180, 182
Atactic propylene polymers, 17:704, 705
Atactic PSSA, 20:468
Atenolol, 5:102, 160
molecular formula and structure, 5:94t
Atherosclerosis
ascorbic acid and, 25:767–768
cardiac device solutions, 3:712
Atisine, 2:103
Atlantic halibut, common and scientific names, 3:187t
Atlantic salmon
aquacultural chemical needs, 3:209
aquaculture, 3:188
common and scientific names, 3:187t
nutrition and feeding, 3:202
world aquaculture production in 1996, 3:186
Atlantis Deep deposit, 17:690
Atmosphere. See also Air entries
circulation of water with, 26:7–12
natural photocatalytic reactions in, 19:100
photochemistry of, 17:785
separation of noble gases from, 17:358
Atmospheric melting, 23:253–254
Atmosphere–water interaction, 26:8
Atmospheric boiling point, 24:284
Atmospheric distillation, in petroleum processing, 18:646
Atmospheric dryers, 9:129–130
Atmospheric emissions, from hydrothermal energy sources, 12:534
Atmospheric equivalent boiling points (AEBFs), 18:590
scale for, 18:579
Atmospheric flash drying, in bar soap manufacture, 22:750–751
Atmospheric fluorine, detection of, 11:843
Atmospheric monitoring, 23:139
Atmospheric nitrogen, biological fixation of, 11:111–112
Atmospheric plant discharge, 21:849–850
Atmospheric pollutants, 10:30
Atmospheric pressure, 24:285–287
Atmospheric pressure chemical vapor deposition (APCVD), 5:807, 811, 812
Atmospheric pressure “flow” pyrolysis, 21:134
Atmospheric pressure fluidized-bed boilers, 7:465–467
Atmospheric pressure ionization, 15:653, 654
Atmospheric pressure ionization mass spectrometers, 13:468
Atmospheric pressure chemical ionization (APCI) liquid chromatography, 4:625
Atmospheric Pressure MALDI, 15:658
Atmospheric stability, of organic semiconductors, 22:210
Atmospheric sulfur dioxide, corrosion by, 23:663
Atmospheric tanks, 24:288
Atmospheric vanadium, concentration of, 25:541
Atofina, 7:641
Atom–atom mapping, 10:333
Atom economy, 12:803–804
Atom efficiency, 12:810–811
Atomic absorption (AA), 25:370
Atomic absorption spectroscopy, 15:348
of archaeological materials, 5:742
determining trace mercury using, 16:44–45
of silicones, 22:600
silver analysis via, 22:651
Atomic decays, 21:309–312
Atomic Energy Commission (AEC), 17:562;
25:852
fluorine cell designs, 11:833, 834–835
Atomic energy levels, 23:128–130
Atomic Energy of Canada, Ltd. (AECL), 17:585
Atomic force microscopy (AFM), 3:319–341;
16:466, 496, 499–501; 19:175, 181, 563;
24:74, 80
contact mode, 3:320–325
electric/magnetic force microscopy, 3:332
force modulation microscopy, 3:332
intermittent-contact mode, 3:326
for ionomer morphologies, 14:465–466
Kelvin probe microscopy, 3:332
lateral force microscopy, 3:332
membrane performance and, 21:634–635
as a nanotechnology tool, 17:62–63
noncontact mode, 3:325–326
polymer analysis using, 19:567, 568–569
resolution, 3:324–325
scanning capacitance microscopy, 3:326–327
scanning spreading resistance microscopy, 3:331–332
scanning thermal microscopy, 3:332–333
silica surface chemistry and, 22:373
in surface and interface analysis, 24:82–84
tunneling atomic force microscopy (TAFM; TUNA), 3:327–331
variants, 3:326–333
Atomic force microscopy probes, 17:49
Atomic hydrogen reactions, 13:771–772
78

ATOMIC LEVELS

Atomic levels, 21:294–295
Atomic masses, 15:649–650
accurate, 15:666
Atomic models, 21:288–290
Atomic numbers, 17:386
Atomic probe field ion microscopy (APFIM), 16:503
Atomic processes, ballistic-like, 14:426, 427
Atomic properties
of plutonium, 19:671–673
of thorium, 24:755
of uranium, 25:394
Atomic ratios, relative, 24:93–94
Atomic spectrometric methods, for silicones, 22:599t
Atomic systems, in lasers, 14:666–669
Atomic Vapor Laser Isotope Separation (AVLIS) process, 25:416
Atomic weight, 15:748
Atomization, 11:774–775
in spray coating, 7:69–74
technology of, 23:175
Atomizer operation, concerns related to, 23:195
Atomizer performance, correlation with spray parameters, 23:189–190
Atomizers, 23:172–173
classification of, 23:175–176
design of, 23:174, 198
for liquid fuel combustion, 7:460–461
manufacturers of, 23:195
spray-drying, 11:539
types and design features of, 23:177–178t
Atomizer sprays, 23:198t
Atomizing-spray burners, 23:659
Atoms
hydrogen bonding to, 13:767
isotopic abundances of, 15:652t
numerical terms for, 17:399
oxidation states of, 17:392; 24:91
sputtered, 14:437
Atom utilization, 12:803
Attonik, 13:25t, as a plant growth regulator, 13:37
Atorvastatin, 2:821–822
Atorvastatin, 5:142
metabolism by cytochrome P450, 5:137
value added chain for, 11:424, 425t
ATP complexation, 24:44. See also Adenosine triphosphate (ATP)
ATP-synthase inhibitors, 13:299–300
ATP synthesis, 13:288
Atrazine, 2:549t; 3:777, 778; 13:284, 321
Atria, 5:79, 80
Atrial fibrillation, 5:88, 99, 101, 103, 108
Atrial flutter, 5:88, 99, 101, 103, 108
Atrial muscle, 5:80
Atrial natriuretic peptide (ANP), 5:186–187
Atrial tachycardia, 5:101, 104, 108
Atrioventricular node, 5:80
Atromid-S, 5:145–146
molecular formula and structure, 5:141t
Atropine, 2:79–80
economic aspects, 2:107–108
for medical defense against chemical warfare agents, 5:836
Atropisomers, 6:73
Atrovastatin calcium, molecular formula and structure, 5:138t
ATR spectroscopy devices, 24:114. See also Attenuated total reflection (ATR)
Attachment materials
electrical and thermal properties of, 17:831t
in electronic materials packaging, 17:830–837
mechanical properties of, 17:832t
Attainment areas, 1:812
Attalea funifera, 11:298
Attapulgite, 9:12. See also Palygorskite
asbestos substitute, 3:314t
discouraged as mineral name for palygorskite, 6:666
powder used in cosmetics, 7:841t
Attemporation, in steam-generating systems, 23:227
Attenuated total reflectance (ATR) cells, 14:231
Attenuated total reflectance spectroscopy, 14:230–231
Attenuated total reflection (ATR), 23:139; 24:112–113, 114
Attenuated total reflectance-Fourier transform infrared spectroscopy (ATR-FTIR), 24:111–114
Attenuation, 11:132–133
Attenuation length (AL), 24:87–89
Attrition, catalyst deactivation mechanism, 5:256t
Attrition mills, 16:615
AUTOMATICITY, OF MYOCARDIAL CELLS

79

Attritors, 8:704
Attritus, 6:705
A-type gravure inks, 14:324
Audemars, George, 11:248
Audits, nuclear power facility, 17:539
Auger electrons, 21:312; 24:85, 94
energy of, 24:95
Auger electron spectroscopy (AES), 16:495; 24:84–87, 94–97. See also AES
instrumentation
archaeological materials, 5:744
quantitative, 24:98
Auger sensitivity factors, 24:96
Auger spectra, 24:95–97, 98
Auger transitions, 24:95
Augite, in coal, 6:718
Au(III) halides, 12:706. See also Gold(III)
entries
Aurantin, molecular formula and
structure, 5:91t
Ausimont, 7:641
Austempering, 23:287
Austenite, 23:272, 273, 275
decomposition of, 16:197–198
grain size of, 23:276–277
in hardening of steels, 16:196–197
phase transformations in, 23:277
transformation rates of, 23:282–283
Austenite phase, in martensite
transformation, 22:339, 340, 341, 344,
711–713
Austenitic iron–chromium–nickel alloys,
23:301
Austenitic manganese steels, 15:562–563
Austenitic nickel cast iron, in galvanic
series, 7:805t
Austenitic nitrocarburizing, case
hardening by, 16:211
Austenitic stainless steels, 23:305–306
Austenitic steels, 23:243–244, 301
Austenitization, 23:284–285
Australia
aquaculture chemicals registered in,
3:219, 221, 222t
hot dry rock operations in, 12:544
tin mining in, 24:800
Australian Hazardous Substance
Regulation, 24:186
Australian vanadium–uranium ore,
25:539
Austria
bioengineering research program, 1:702
nanoceramics research, 1:706
natural graphite in, 12:780
Autoacceleration, of VDC copolymerization,
25:698–699
Auto cascading refrigeration systems,
21:547–548
Autocatalysts
platinum emissions from, 19:618
platinum-group metals as, 19:623–625
Autocatalyst technology, 19:624
Autocatalytic systems, 9:685, 686, 689
Autochrome Plate process, 19:240–241
Autoclave designs, popular, 14:89, 90–91t
Autoclaved lime, 15:26
Autoclave molding, 26:768–769
Autoclave reactor, stirred, 20:216
Autoclave resins, 20:215–216
Autoclaves, 9:209; 14:88–92
commonly used, 14:89t
ideal characteristics of, 14:88
selecting, 14:88–89
Autoclaving, 24:409
selenium recovery via, 22:81
AutoDOCK, 6:13
Autogenous dense medium separators,
16:634
Autoignition, sources of, 23:116–118
Autoignition temperature, 23:117–118
Auto manufacturing, magnesium in,
15:351–353
Automated DNA synthesizer, 17:624
Automated immunoanalyzers, 14:150
Automated immunoassay analyzers,
14:144
Automated manufacturing processes, 10:12
Automated oligonucleotide synthesizers,
17:623
Automated roller bottle cell culture
systems, 5:351t
Automated sequencing systems, 12:510
Automatic Chemical Agent Detector and
Alarm, 5:830–831
Automatic discharging suspended
magnets, 15:438–439
Automatic dishwashing (ADW), 10:285
Automatic dishwashing detergents (ADDs),
10:274, 285
acute oral LD50 ranges, 8:446t
Automatic implantable cardioverter
defibrillator (AICD), 3:713, 716
Automatic indicating scales, 26:229
Automaticity, of myocardial cells, 5:81
Automatic transmission fluids (ATFs), 15:235–236
  specifications for, 15:236
Automation
  of fermentation, 11:40–41
  of filter presses, 11:360–361
  in fine chemical production, 11:431
Automated process, 26:938
Automerization reactions, flash vacuum pyrolysis and, 21:138–139
Automobile battery grids, 14:770
Automobile convenience switches, mercury, 16:40–41
Automobile recycling, 21:416–417
Automobile refinish paints, 7:144–145
Automobiles
  high performance textiles in, 13:391
  scrapped, 23:261
  spunbonded nonwoven fabrics in, 17:486
  titanium in, 24:867–868
  virtual two-way SMA devices in, 22:348
Automobile scrap, 21:411
  recycling, 21:389–390
Automotive applications
  of ethylene–acrylic elastomers, 10:702
  of ethylene–propylene polymers, 10:716
  metal–matrix composites in, 16:191
  for polyamide plastics, 19:794
  for polycarbonates, 19:820, 825
Automotive brake elements, friction elements in, 18:788
Automotive catalysts, as a source of platinum–group metals, 19:611–612
Automotive coatings, 10:447–449;
  12:608–609
Automotive emission control, 10:30–67
  for alternative fuels, 10:59–60
  alternative systems, 10:58–59
  catalytic converter chemical reactions and surface chemistry, 10:46–50
  catalytic converter design, 10:39–46
  diesel engine, 10:60–62
  emission control system, 10:38–39
  emission regulation and testing, 10:31–35
  exhaust gas composition, 10:35–38
  long term durability factors, 10:50–55
  oxygen sensor and closed loop fuel metering, 10:55–58
Automotive emissions, accumulation of, 10:35
  Automotive exhaust catalysts, activated alumina applications, 2:399
  Automotive fuels, toluene in, 25:179–180
  Automotive gear oils, 15:236–237
  Automotive industry
    carbon black applications, 4:793, 795–796
    copper applications, 7:715
electroless deposition in, 9:701
  propylene in, 20:779
  silicon applications in, 22:508
  Automotive lighting, noble gases in, 17:371
  Automotive quality, Japanese, 21:171
  Automotive rearview mirrors, electrochromic materials for, 6:572, 573
  Automotive refinishing, 7:185
  Autonomic nervous system, role in hemostatic system, 4:89–90
  AUTONOM program, 17:400
  Auto/Oil Air Quality Improvement Research Program (AQIRP), 12:418
  Autoradiography, 21:277
  Autothermal reforming, 13:845
  Autotrophic conditions, defined, 3:757t
  Autotuning, 20:698
  of alcohol, 14:52
  of aldehydes, 18:465–466
  of anthrahydroquinone, 14:42–46
catalysis of, 9:147–148
  Autodestruction methods, for hydrogen peroxide manufacture, 14:42–52
  Auxigro, 13:32
  Auxiliaries, dyeing, 9:166
  Auxiliary devices, in refrigeration systems, 21:538–540
  Auxin-like herbicides, 13:305
  Auxins, 13:35, 38, 284, 304
  Auxochromes, 19:425
  Auxotrophic mutations, in yeast, 26:482
  Auxotrophic plant pathogens, 13:350–351
  Available Chemicals Directory (ACD), 6:19–20
  Available lime, 15:26
  Available net positive suction head (NPSHA), 21:85
  Avakine, cell culture technology product, 5:346, 346t
Avalanche breakdown  
in power semiconductors, 22:260  
in silicon-based semiconductors,  
22:244–245
Avalanche multiplication, in compound  
semiconductors, 22:151–152
Avalanche photodiodes (APDs), 14:619;  
19:153; 22:182
Avalide, molecular formula and structure,  
5:152t
Avapro, molecular formula and structure,  
5:152t
Avasimibe (CI-1011), novel potential  
antihyperlipemic agent, 5:144t
Average bulk density (ABD), 11:684
Average piece weight (APW), 26:252
Average pinning force, 23:826
Averaging pitot-tubes, 11:782
AVG, 13:23t  
as a natural plant growth regulator,  
13:22
Avian leukosis virus, 3:136
Aviation gasoline, 18:666
Aviation turbine fuel, from coal gasifier  
syngas, 6:778
Avidin, 25:800
Avidity constant, 14:137
Avionics, with fiber-optic smart structures,  
11:156–157
AV nodal reentry, 5:108
AV node, 5:80  
and cardiac arrhythmias, 5:86–88
Avonex, cell culture technology product,  
5:346t
AV reciprocating tachycardia, 5:108
Axial dispersion coefficient, 10:762
Axial dispersion/mixing, 10:762–763  
in adsorption columns, 1:604  
in bubble tray absorbers, 1:88–89  
chromatographic adsorption, 1:610  
in packed column absorbers, 1:61–65
Axial dissolved oxygen profiles, 15:707–708
Axial filtration, 11:385–386
Axial-flow angular-momentum flowmeter,  
11:672–673
Axial flow impellers, 16:672–673, 684
Axial-flow propeller-type pumps, 21:67, 68
Axially split pumps, 21:67, 68
Axial Peclet number, 10:763
Axial undulations, in hemodialysis,  
26:830–831
Axial velocity, in hydrocyclones, 22:285, 286
Axle and collar molecular structure,  
17:60–61
Axokine, 3:97
Azaboranes, 4:170, 204
Azacarbocyanine dyes, 9:257
Aza[18]crown-6, 24:41
Aza[18]crown-6 appended x-helical  
“barrels”/“rods,” 24:58
Azacrown ethers, 24:44
Azacrowns, 24:41
Azacryptands, 24:42
Azadirachtin, 24:474
Azafullerenes, 12:231, 232, 243
Azahomofullerenes, 12:243
Azaindene compounds, 19:197
Azalactone method (for Emphaze  
supports), for covalent ligand  
immobilization, 6:396t
Azamethiphos (salmosan)  
registered for use in aquaculture in  
Canada, 3:218t  
registered for use in aquaculture in  
Europe, 3:220t
Aza-Nenitizescu reaction, 21:258
Azatitanatranes, 25:94
Azelaic acid, 2:815–816
Azeotropes, 8:747
acrylonitrile, 1:399t  
adsortion and, 1:594  
in IPA–water system, 22:322–325  
maximum boiling, 8:807–808  
in methyl acetate separations system,  
22:333–336
methylene chloride–water, 22:329, 330  
methyl isobutyl ketone, 16:329, 331t  
minimum boiling, 8:802–807
naphthalene, 17:71, 72t  
reactive, 22:331–332  
selenium–tellurium, 22:85  
in separating nonideal liquid mixtures,  
use in water removal, 10:476–477  
in water–IPA–hexane system, 22:325,  
326
Azeotropic benzene nitration, 17:255
Azeotropic composition, 24:684
Azeotropic and extractive distillation,  
8:786–852; 18:647; 20:751; 22:44–45;  
23:550. See also Distillation(s);  
Extractive distillation(s)  
binary mixtures, 8:824–825  
exttractive, 8:801–815
Aziridinomitosene, 21:15:
Azithromycin, Azlon
Azobenzene, photochromic material, 6:2,2
Azobisisobutyronitrile (AIBN), 11:82
AZEOTROPIC MIXTURES
Azobisnitriles, 23:17:
Azo dyes, Azo condensation pigments,
Azo coupling, 9:9:
Azine soluble dyes, 7:373t
Azine dyes, 9:503
Azines, 13:576
Azine soluble dyes, 7:373t
Aziridinomitosene, 21:239
Azithromycin, 15:286, 302
Azlon fibers, 24:614
Azobenzene, photochromic material, 6:593
Azobisisobutyronitrile (AIBN), 11:200, 202
2,2’-Azobisisobutyronitrile (AIBN), 1:377
production from acetone, 1:163
Azobismithritles, 17:239–242
health and safety factors related to, 17:241–242
properties of, 17:240t
shipping and storage of, 17:241
uses for, 17:242
Azo compounds, 23:379
as free-radical initiators, 14:293–296
Azo condensation pigments, 19:438
Azo coupling, 9:352–359
Azo dyes, 13:591–593
Azo dye developer, 19:287
See also Azo pigments
acid, 9:389–394
alternative routes to, 9:359–360
basic (cationic), 9:421–424
carbocyclic, 9:251
chemistry of synthesis, 9:350–360
classification/designations, 9:349–350,
360–363, 389–425
degradation, 9:364, 381–384
direct, 9:401
disperse, 9:304, 411–420
economic aspects, 9:426–427
heterocyclic, 9:251–252
metal catalysis, 9:381–384
metal complexes of, 9:394–401
metallized, 9:250–251, 446–447
nonmutagenic, 9:451–452
oil soluble, 9:420–421
oxidation, 9:365–376
photocatalytic removal of, 19:92–94
photofading, 9:384–389
photoreductive cleavage, 9:388
reactivity, 9:364–389
reduction, 9:380
reductive and radical reactions,
9:376–381
safety profiles for, 9:426t
spirit soluble, 9:421
structural representation, 9:361–363
synthesis of, 9:245–247
Azoheterocycle Orange, pigment
for plastics, 7:367t
Azohydroquinone dye developers, 19:285
24:620
Azoic soluble dyes, 7:373t
Azo initiators, 14:293, 294–295t
handling, 14:296
worldwide producers of, 14:303
Azolla, in nitrogen fixation, 17:299
Azo-methine dyes, 9:503
Azomethine ylides, 17:51, 56
Azonitriles, 14:293
Azo pigments, 9:424–425; 19:430–431,
448–449. See also Azo dyes
nickel, 17:124–125
Azopyridone yellow dyes, 9:253
Azo reds/maroons, 19:435–437
Azos, typical soluble dye applications,
7:376t
Azo soluble dyes, 7:373t
Azo tautomeric form, 9:366–367
Azotobacter nitrogenases, 17:303–304
Azotobacter vinelandii, critical oxygen
concentration for selected organisms,
1:731t
Azoxybenzene, 17:250–251
Azo Yellow, colorant for plastics, 7:374t
AZT (30-azido-30-deoxythymidine), 4:713
Azomelene, 4:360t
Azurite, 7:768
color, 7:331
BABAR-phos compounds, 13:645
Babbitt, Isaac, 24:796
Babbitts, 3:52–53; 24:796–797
composition of, 3:52t
Babbitt-type alloys, 24:426
Babcock and Wilcox boiler, 12:320
Baby foods, estimated maximum oxygen
tolerance, 3:381t
Baby preparations, 7:842t
Bacillus, as a host system for gene
expression, 12:477
Bacillus anthracis, 8:667
Bacillus coagulans, 12:79–80
exposure to ethylene–dichlorodifluoro-
methane mixture, 8:635t
Bacillus licheniformis, 12:477
Bacillus species
thermal resistance characteristics,
8:634t
Bacillus stearothermophilus, 11:35, 48
thermal resistance characteristics,
8:634t
thermophilic, 8:632
Bacillus subtilis, 11:9; 12:470, 477
thermal resistance characteristics,
8:634t
uv disinfection, 8:652t
Bacillus subtilis (ATCC 9524)
exposure to ethylene–dichlorodifluoro-
methane mixture, 8:635t
Bacillus subtilis spores, uv disinfection,
8:652t
Bacillus thuringiensis (Bt), 7:570;
11:4, 11
Bacillus thuringiensis kurastaki gene
(BtK gene), 12:486
Bacillus thuringiensis toxins, 13:284;
18:533–534
Back contact solar cell, 23:46
Back-end volatility, 12:398–399
Backflow, 11:323
Backflow bag filters, 26:709
Background-limited IR photodetector
(BLIP), 19:135
Background ozone, factors affecting,
17:790–791
Background radiation, 21:313
Background rights, in technology transfer,
24:377–378
Background spectrum correction,
6:62–66
Background variables, 8:386–388
Back-pressure turbines, 10:146–147
steam, 10:140–141
Backscattered electron images, 24:76–77
Backscattered primary ions, 24:106
Back-scatter electron detectors, in fine art
examination/conservation, 11:406
Backstaining, 10:303
Backus process, 4:810
Backward approach, to qualitative
reliability analysis, 26:984
Backwash, 11:323
in ion exchange, 14:409–410
Backwashing, resin-bed, 14:400
Backwash towers, 14:407
Bacon, Francis T., 854
Bacteria. See also Bacillus entries
antibiotic resistance, 3:23–38
as antimicrobial target organisms,
17:729
aquatic animals susceptible to, 3:206
as host cells, 11:23–24
in biodegradation, 25:835–836
biodeterioration via, 11:409
for cellulose conversion, 10:536
in composting, 25:873
control in recirculating aquaculture
biofiltration, 3:196
drug resistance of, 17:728–729
in fermentation, 11:7–8
heat inactivation of, 12:75–76
indoor air pollutant, 1:804–805
in industrial water treatment, 26:146
multidrug resistant, 18:252
oxygen demands, 1:730t
photosynthetic, 17:302
in PVA biodegradation, 25:604, 605
in spices, 23:157
waxes in, 26:205
Bacterial ADPGPP enzymes, 12:491
Bacterial z-amylases, 10:280
Bacterial artificial chromosome (BAC)
vectors, 12:508
Bacterial cellulose, 20:557
Bacterial genera, nitrogen fixation by,
17:295–296
Bacterial genomes, 3:24
Bacterial growth, macrolide inhibition of, 15:303
Bacterial mutants, glyphosate-tolerant, 12:488
Bacterial PHA, 20:251
Bacterial polysaccharides, 20:455, 573
Bacterial septicemia, sulfonamides for, 23:498
Bactericides
  coordination compounds, 7:593
    salt as, 22:815
    silver as, 22:657, 660
    silver-coated, 22:656
    silver compounds as, 22:668–669
    silver ions as, 22:668–669, 677–682
Bacteriocins, 12:86. See also Bacteriosins
Bacteriological analysis
  of pool water, 26:193
  of water, 26:45–46
Bacteriological standards, for gelatin, 12:441
Bacteriological sulfur, 23:577–578
Bacteriophages, 3:135; 12:474
  in fermentation, 11:46
Bacteriorhodopsin, 20:826, 840
  photochromic material, 6:603
Bacteriosins, 12:76. See also Bacteriocins
Bacteriostatic water, 18:714
Bacterium lactis, 11:7
Baculovirus expression system, 5:346
Baddeleyite, 21:489; 26:623–624
  colorants for ceramics, 7:346t
Badische Anilin und Soda Fabrik (BASF)
  terpenoid manufacture process, 24:481
Bayer–Villiger oxidation reactions, 14:592
  chiral recognition by enzymes, 3:675
  microbial, 16:401
Baffled shellside flow, 13:262
Baffles, in stirred tank geometries,
  16:669–670
Baffle source, 24:726
Baffle-tube support plate area, in thermal design, 13:258
Bafilomycin A, 2:817
Bag and drum filling, industrial hygiene and, 14:209
Bagasse, 23:444, 447
  burning, 23:449–450
  uses for, 23:483
Bag cleaning
  in fabric filtration, 26:707–709
Baghouses, 13:179; 26:706–707
  maximum recommended filtering velocities in, 26:710t
  operation and cleaning of, 26:707–709
  types of, 26:708
Bag molding methods, 26:768
Bags
  filling and closing, 18:12
  as industrial materials packaging, 18:10–12
  U.N. packaging codes for, 18:12t
Bahia cocoa beans
  composition, 6:369t
  fatty acid composition, 6:371t
  minerals content, 6:371t
  tocopherols, 6:370t
  vitamin content various samples, 6:370t
Bainite, 23:273, 278
  constituent properties of, 23:280
Baked carbon, 4:735
Baked goods
  packaging, 18:34–35
  salt in, 22:815
  yeast in, 26:461
Bakelite, 1:544; 18:756–757; 26:750
Bakelite resin, 11:302–303
Bakerbond resins, 3:827
Bakers’ inactive dry yeast, 26:472–473
Bakers’ yeast, 26:452
  growth of, 26:458–459
  production of, 26:457–459
  strains of, 26:457–458
Bake sulfonation, 9:274–275
Baking, 9:712. See also Heat treatment
  vanillin in, 25:552
Baking chocolate, theobromine and caffeine content, 6:367t
Baking enzymes, 10:297
Baking furnaces, 12:734–735
Balanced vinyl chloride processes, in vinyl chloride manufacture, 25:634, 635, 636, 637, 646
Balance equations, for a mixture,
  24:669–671
Balances; 26:227
  analytical, 26:245
  precision, 26:245
Balk process, 17:139
B-Alkyl-9-BBN derivatives, 13:658
B-Alkylcatecholboranes, free-radical oxidations of, 13:648
“Ball and chain” structures, fullerene, 12:252
“Ball and ring” method, 10:387  
Ball clay, 6:686  
for ceramics, 6:688  
Ballestra multistirred tank continuous SO₃  
cascade Sulphorex sulfonation system,  
23:552–553  
“Ballistic approximation,” 20:332  
Ball milling  
ceramics processing, 5:644  
Ball mills, 8:703; 9:292; 16:613–614; 18:64  
Balloon angioplasty, 3:714  
Ball-point inks, 14:328  
Ball valve, 19:474  
Balsamic odor, 3:227t  
Bamford-Stevens reaction, 13:571  
Banana-shaped liquid crystals, 15:98  
Bancroft’s rule, 10:125  
Banded coals, 6:703, 706  
Band gap energies, 5:596; 14:834; 19:187  
Band gaps, 5:595–598  
for binary compound semiconductors,  
22:145, 146–147t  
LEDs and semiconductor, 22:174–175  
in organic semiconductors, 22:201, 202  
silicon, 22:485, 488  
silicon carbide, 22:530  
Band gap transition type, for binary  
compound semiconductors, 22:145,  
146–147t  
Band structure  
in organic semiconductors, 22:201, 202  
of zincblende direct gap semiconductors,  
22:142–144  
Band theory, of electrical behavior,  
22:232–235  
Bandwidth, of fiber optics, 11:128–129  
Bangladesh, aquaculture production,  
3:189t  
Barbados sugar, 23:482  
Barbaralane, thermochromic material,  
6:625  
Barbertonite, 6:471t  
Barbiturate receptors, derived from crown  
ethers, 24:47  
Barbiturates, 10:529  
as targets for molecular recognition,  
16:792  
Bar copper, 7:693  
Bardeen, Cooper, and Schrieffer (BCS)  
theory, 23:804, 836  
Bareboat charters, 25:327  
Barex, composition of, 3:386t  
Barex 210 resin, 1:450t  
Barex 218 resin, 1:450t  
Barex resins, 1:449–452  
properties of, 1:450t  
“BARF” anions, 16:95  
Bar gene, 13:360, 361t  
Barge transport, 25:327  
Barite, 3:343, 351, 352–355; 17:691  
in barium carbonate manufacture, 3:356  
as drilling fluid material, 9.9–10  
production and consumption, 3:353  
uses of, 3:353–355  
U.S. production–consumption balance,  
3:354t  
world mine production, reserves, and  
reserve base, 3:354t  
Barium (Ba), 3:342–349, 351. See also  
Barium compounds  
analysis, 3:346  
chemical analysis of commercial, 3:347t  
chemical reactions, 3:343–344  
economic aspects, 3:346  
environmental concerns, 3:346–347  
grades, specifications, and quality  
control, 3:346  
health and safety factors, 3:347–349  
manufacture, 3:344–345  
in M-type ferrites, 11:66, 69, 71t  
physical properties of, 3:343, 344t  
recycling and disposal, 3:347  
shipping, storage, and handling,  
3:345–346  
uses of, 3:349  
Barium(II), concentration formation  
constant of chelates, 5:717t  
Barium 2-ethylhexanoate, 3:362  
Barium acetate, 3:355  
Barium acetate monohydrate, 3:355  
Barium alloys, 3:344  
Barium–aluminum evaporation getters,  
3:349  
Barium-bearing manganese silicon, 22:519  
Barium β-alumina, 2:406t  
Barium bromate, 4:335  
Barium bromide, 3:355  
physical properties of, 4:328  
solubility in water, 4:322t  
Barium bromide dihydrate, 3:355  
Barium bromite, 4:333  
Barium carbide, 3:345  
Barium carbonate, 3:343, 355–356  
acute lethal doses, 3:372t
Barium chlorate monohydrate, 6:116
Barium chloride, 3:362
  acute lethal dose, 3:372t
Barium chloride dihydrate, 3:362
Barium chromate(V), physical properties, 6:528t
Barium chromate(VI)
  molecular formula, properties, and uses, 6:561t
  physical properties, 6:528t
Barium compounds, 3:351–372
  acute lethal doses, 3:372t
  analysis, 3:369–370
  health and safety factors, 3:370–372
Barium cyanide, 8:194
Barium dichromate, molecular formula, properties, and uses, 6:561t
Barium ferrate, 14:543
Barium ferrite, 3:361; 11:58
Barium fluoride, 3:363
  acute lethal dose, 3:372t
  transference number of cations, anions, and electrons or holes, 5:586t
Barium fluoroborate dihydrate, 4:153
Barium hydrate, 3:363–364
Barium hydride, 3:343; 13:613
Barium hydrosulfide, 3:363
Barium hydrosulfide tetrahydrate, 3:363
Barium hydroxide, 3:343, 363–364
Barium hydroxide monohydrate, 3:364
Barium hydroxide octahydrate, 3:364
Barium hydroxide sulfide hydrate, 3:368
Barium iodide, 3:364–365
Barium iodide dihydrate, 3:364
Barium iodide hexahydrate, 3:364
Barium lithol red, 3:362
Barium metaborate, 3:365; 4:282
Barium metaborate hydrate, 4:242t
Barium metaborate monohydrate, 3:365
Barium metaborate pentahydrate, 4:282
Barium metaborate tetrahydrate, 4:282
Barium nitrate, 3:365–366
  acute lethal dose, 3:372t
Barium nitride, 3:343
Barium nitrite, 3:366
Barium nitrite monohydrate, 3:366
  Barium octanoate, 3:362
  Barium octoate, 3:362
  Barium orthotitanate, 25:44
Barium oxide, 3:366–367
  acute lethal dose, 3:372t
  carrier mobility at room temperature, 5:597t
  dessicant, 8:359
  energy gap at room temperature, 5:596t
  reduction to produce barium, 3:344–345
Barium oxide borate, 3:365
Barium perchlorate, dessicant, 8:360
Barium peroxide, 3:366–367; 18:397
Barium potassium chromate, molecular formula, properties, and uses, 6:561t
Barium selenate, 22:5
Barium sulfate, 3:366
Barium stearate, 3:362
Barium sulfide, 3:367
  filler for dental cements, 8:287
  filler for powder coatings, 7:45
  pigment used in makeup, 7:836t
Barium sulfide hexahydrate, 3:367
Barium titanate, 3:361, 368–369; 5:583; 25:44
  energy gap at room temperature for, 5:596t
  ferroelasticity, 5:623
  as ferroelectric, 5:605–608
  thin films, 25:100
Barium tribismuthide, alloy-like superconducting compound, 4:18t
Barium–zinc stabilizers, for PVC polymers, 25:672
Barizin, molecular formula and structure, 5:128t
Barley
  breeding of, 15:531
  cleaning and grading, 15:525–527
  germination of, 15:528–529
  investment, costs, and prices for, 15:534
  in malting, 3:565
  malting-grade, 15:523–525
  roasting for beer, 3:574
  steeping of, 15:527–528
  varieties of, 15:525
Barley grain, 26:271, 273
Barley production
U.S., 15:524t
world, 15:525t
Barnes, A. C., 22:679
Bar.blogine, 5:130
molecular formula and structure, 5:124t
Barometric pressure, 20:645; 24:285, 286
Barophilic enzymes, 3:669
Barrel (bbl), in crude oil production, 18:592
Barrel cleaning, of metal surfaces, 16:213
Barrel plating, 9:768–769, 807
Barrel reactor, 22:154–155
Barrels, wooden, 18:8–9
Barrett-Joyner-Halendar (BJH) method,
specific surface of silica and, 22:371
Barrier bottles, 20:52
Barrier coatings, 18:125–126
Barrier coating systems, 7:183–184
Barrier latex
in landfill design, 25:879
properties of, 25:736t
Barrier layers, in Polacolor film,
19:298–299
Barrier polymers, 3:375–405
applications, 3:405
barrier structures, 3:394–399
carbon dioxide transport, 3:403
flavor and aroma transport, 3:403–405
health and safety factors, 3:405
immiscible blends, 3:396–398
large molecule permeation, 3:388–390
layered structures, 3:394–396
miscible blends, 3:398–399
oxygen transport, 3:402
permanent gas permeation, 3:380–383
permeability prediction, 3:399–401
permeation process, 3:376–380
physical factors affecting permeability,
3:390–393
polymers with good barrier-to-
permanent gases, 3:383–388
property measurement, 3:401–405
small molecule permeation, 3:380–388
water transport, 3:403
Barrier properties, of VDC copolymers,
25:707–711, 712t
Barrier resins, 18:298
Barriers, in radioactive waste disposal,
25:856, 857
Barrier type aerosol system, 1:784–785
Bar soap, 22:727–728, 748–752. See also
Soap bar entries
Barthlott, Wilhelm, 22:108
Bartles-Mozley concentrator, 16:631
Baryte, as filler, 11:311
Basan, molecular formula and structure,
5:94t
Basazol dyes, 9:489–490
Base-catalyzed coupling, 10:356
Base-catalyzed ketone condensation,
14:570
Base chemicals, 24:164, 168, 173–174, 196
production of, 24:175
Base-collector (BC) junctions, 22:246–249
Base-emitter (BE) junctions, 22:246–249
Basel Convention, 21:416
Baseline analysis, EIA, 10:234–236,
239–240t
Base liner, in landfills, 25:877
Base manufacture, of soap, 22:736–741
Base metal catalysts, 10:47
Base metal oxide catalysts, 10:100
Base-metal thermocouples, 24:461
Base oils, 15:215
Base plate dental wax, 8:298
specification, 8:300t
Bases. See also Alkalis; Basic entries
cellulose as, 11:266
derived from halogen fluorides, 13:128t
for fermentation, 11:38
VDC polymer degradation and, 25:718
in silanol polycondensation, 22:557, 558
in silicone polymerization, 22:556
Base-soluble resins, coprecipitation with
diarylides, 19:433
Base-stock paperboard, 18:130–131
Base stock slate, 15:214
Base units, in SI system, 1:xi; 2–26:ix
BASF (Badische Anilin- und Soda-Fabrik;
Baden Aniline and Soda Factory)
bioengineering research programs, 1:703
silica aerogel research, 1:762
BASF capillary gap cell, 9:664–665
BASF process, 12:809, 810
Basic aluminum chlorides, 2:385
Basic catalysts, supported, 5:334–337
Basic chrome acetate, molecular formula,
properties, and uses, 6:562t
Basic chrome chloride
molecular formula, properties, and uses,
6:562t
specifications, 6:547t
Basic chrome formate, molecular formula,
properties, and uses, 6:563t
Basic chrome sulfate, 6:543
Basic copper chromate, molecular formula, properties, and uses, 6:561t
Basic detergents, 15:222
Basic dyestuffs, 9:224
Basic extractants, of rare-earth elements, 14:642
Basic hydrolysis, 10:502–503
Basic industrial refractories, 21:515
Basic lead acetate, 14:793
Basic lead carbonate, 14:794
Basic lead silicochromates, 6:557t, 558 prohibited pigment in anticorrosive coatings, 7:195t
Basic lead sulfate, 14:790
Basic-oxygen process (BOP), 23:255
Basic oxygen steelmaking (BOS) process, use of quicklime in, 15:61
Basic Red 76, semipermanent hair dye, 7:857t
Basic Violet 3, semipermanent hair dye, 7:857t
Basidiomycetes, reproduction in, 26:452
Basil leaf, 23:164
Basin-type solar still, 26:91
Basket centrifuge, 11:389–390
conical, 11:391
Bast fiber plants, 11:594
Bastnaesite (bastnasite), 5:671; 14:636, 638 digestion of, 14:639 processing, 5:672–673
Batac jig, 16:629
Batch carbon dioxide foaming, 24:21
Batch chromatography, for enantiomeric purification of pharmaceutical intermediate, 1:685t
Batch compartment dryers, 9:118–119
Batch compression filters, mechanical, 11:370–373
Batch condensation reactions, of ethyl and propyl alcohols, 18:516–518
Batch–continuous crystallization, 8:95
Batch control system information, 20:704
Batch crystallization, 8:130–134
Batch crystallizers, 23:464
Batch dechlorination, 21:672
Batch desilverizing, 14:751
Batch distillation, in hazardous waste management, 25:813–814
Batch dryer, 9:116
Batch dyeing fixation in, 9:213 machinery for, 9:205–211
Batch emulsion polymerization, of VDC, 25:722–724
Batch esterification, 10:478–480
Batch experimental reactor, 21:352
Batch extraction, 10:756
Batch extractor, holdup in, 10:764
Batch fermentation, 10:267
Batch filter cycles, 11:344, 345–346
Batch furnaces, 12:288–289
Batch gasoline blending, 12:413
Batch hydrogenation, 10:811
Batching, ceramics processing, 5:648
Batch injection analysis (BLA) technique, 9:586–587
Batch latex manufacturing, 14:721
Batch membrane system, 21:638
Batch microcarrier cell culture systems, 5:350, 352–354
Batch microwave reactors, reactions in, 16:554–555
Batch mixers, 16:721
Batch mononitrotoluene process, 17:265
Batch multipurpose plants, for fine chemical manufacture, 11:427
Batch nitrobenzene process, 17:252
Batch-operated settling tanks, 22:59
Batch pilot plants, 19:458
Batch plants, certified, 20:703
Batch polymerization, of vinyl acetate, 25:608
Batch preparation, in glass manufacturing, 12:594–596
Batch pressure filters, 11:358–373
Batch process control hierarchy, 20:703–705, 723
Batch process equipment, for food processing, 12:80–81
optimal scheduling, design,
and operation of, 20:762
Batch processing
of organic peroxides, 18:487
of phosphorus pentachloride, 19:42–44
problems with, 20:724
production steps in, 20:725
for sensors, 22:266
Batch production management, 20:704
Batch proportioning methods, 26:249–251
Batch reactions, niobium, 17:136
Batch reactors, 21:332, 353
defined, 3:758
Batch saponification, in vinyl alcohol
polymerization, 25:610
Batch scale up, pilot plant, 19:460
Batch sequencing and logic control,
20:703–704
Batch sterilization, in fermentation,
11:35
Batch stirred tank H2SO4/oleum aromatic
sulfonation processes, 23:541
Batch stirred tank SO3 sulfonation
processes, 23:543
Batch structural models, 20:705
Batch sulfonation, 14:387
Batch suspension cell culture systems,
5:349–352
pros and cons of, 5:351
Batch suspension polymerization, of VDC,
25:724–725
Batch systems
adsorption kinetics, 1:599–601
cyclic batch adsorption, 1:613
liquid adsorption, 1:664–665, 683
Batch-to-batch control, 20:704–705
Batch-type fixation, 9:215
Batch ultrahigh pressure food
preservation, 12:87
Bathing, detergent systems for, 8:413
Bathochromic shifts, in polymethine dyes,
20:510
Bath towels (terry), number produced
from one bale of cotton, 8:133
Bathtub failure rate, 26:988
Batik printing, 9:219
Batteries, 3:407–434. See also Alkaline
cells; Carbon–zinc cells; Lead–acid
batteries; Lithium cells; Primary
batteries; Secondary batteries
chromium application, 6:565
cobalt applications, 7:247
conducting polymer applications,
7:538–539
economic aspects, 3:410
electrical double layer, 3:418–420
electrolytes, 3:415–418
ethylene oxide polymers in, 10:689–690
experimental techniques, 3:424–426
graphite in, 12:797
high energy systems (theoretical), 3:432
ionic liquids in, 26:877–878
kinetics, 3:421–423
lead–acid, 14:766
lead–calcium alloy, 14:772, 774
manganese compounds in, 15:615–618
mercury, 16:51
organic semiconductors used in,
22:223–224
practical systems, 3:426–432
silver compounds in, 22:684
silver in, 22:659
sodium in, 22:778
speciality for military and medical use,
3:430
systems in development, 3:431
terms defined, 3:409–410
thermodynamics, 3:410–415
transport processes, 3:423–424
World market 2000 estimated, 3:410
Battery breaking technologies, 14:757–759
Battery electrodes, molybdenum
compounds in, 17:39
Battery expanders, lignosulfonates as,
15:18
Battery limit, 19:493
Battery-limits plants, 9:528
Battery recycling, 14:757
Battery separator, product design, 5:759
Battledress overgarment (BDO), 5:834
Bauer–McNett (BMN) classification,
asbestos, 3:310
Baumann, E., 25:628
Baumé scale, 23:759
Bauxite(s), 2:285, 345
composition used for alumina
production, 2:346
economic aspects, 2:355–356
gallium in, 12:339–340
occurrence, 2:344–348
precursor to activated alumina,
2:350–355, 396
production, 2:350–355
raw material for cement, 5:475
as refractory raw materials, 21:488
world mine production, 2:347t
Bauxitic kaolins, as refractory raw materials, 21:488
Bayard-Alpert gauge, 20:661
Bayberry wax, 26:211
Baycol, 5:142
molecular formula and structure, 5:138t
Bayer, nanocomposite development by, 1:717
Bayer alumina, 1:6
Bayer alumina hydrate, 2:428
properties of normal coarse grade, 2:429t
BayeRITE, 2:421, 425
activation, 2:394
classification, 2:422
decomposition sequence, 2:392
from gelatinous boehmite, 2:427
production, 2:431
structural properties of, 2:423t
thermodynamic data, 2:423t
Bayer ketazine process, 13:576,
580–581
Bayer liquor, recovery of gallium from,
12:345
Bayer Lustran 31-2060, physical properties and test methods, 1:440t
Bayer process, 2:348; 11:624, 635;
16:156
described, 2:350–355
thickener for, 22:65–66
Bayesian inference, 26:1017
Bayesian sampling techniques, 26:1016–1019
Bayes theorem, 26:1017
Bay leaves, 23:164
Baylis-Hillman reaction, 16:545
Baypress, molecular formula and structure, 5:129t
Bay scallop, common and scientific names, 3:188t
B–B stream, 4:402
BCUT parameters, 6:15
B-DNA, 17:604–605, 606. See also Deoxyribonucleic acid (DNA)
Bead filler compound, in tire compounding, 21:805
Bead-roll coater, 7:11–12
Beam dyeing, 9:207
Beamline, in ion implantation systems, 14:443–444
Beam scale, 26:228
Beam splitter, 14:225–226
Bearing corrosion, 14:452
Bearing lubrication, cryogenic, 15:254
Bearing metals, 24:796–798
Bearings
gas lubrication of, 15:252
for hydrodynamic lubrication, 15:211
indium in, 14:195
silver in, 22:641, 661–662
Bearing specifications, for wet drum ore concentrator, 15:449
Beavon process, 23:633
B–B champ process, 2:488–490
Beck and Guthke cell, 9:664–665
Beck dyeing, 9:208
Becker, R. O., 22:679–680
Beckmann rearrangement, 16:566
microwaves in, 16:567
Becquerel, 25:851
Becquerel, Henri, 21:285
Bedding, spunbonded fabrics in, 17:485
Bed purge, 25:64
Bedranol, molecular formula and structure, 5:93t
Bed-to-surface heat transfer, 11:809–810
Beer, 3:561–589. See also Beer brewing; Brewing entries
brewing process for, 3:563, 564, 574–579
chemical compounds found in, 3:582t
composition of whole dried hops, 3:571t
economic aspects, 3:588
estimated maximum oxygen tolerance in beer, 3:381t
fermentation and, 3:563, 564, 572–574, 579–583; 11:7, 8
finishing, 3:563, 564, 584
flavor and aroma in, 26:466–467
health value of, 3:588
hops, 3:563, 564, 569–572
malting, 3:563, 564, 565–569, 574
packaging, 3:584–585; 18:35
pasteurizing, 3:585, 588
secondary fermentation, 3:583–584
typical malt analysis, 3:569t
water for, 3:573
worldwide production by country, 3:586–587t
Beer brewing
enzymes in, 10:291–294
yeasts in, 26:464–467
Beer clarification, smectites application,
6:697t, 699
Beer fermentations, 26:466
Beer Institute, 15:534
Beer–Lambert expression/law, 7:317; 14:237; 24:90. See also Beer's Law; Lambert–Beer law
Beer's Law, 23:107. See also Beer–Lambert expression/law;
Lambert–Beer–Bouguer law
quantitative analysis based on, 23:140–141
Beer/wine bottles, polyester, 20:52–53
Beeswax, 26:207
alcohols from, 2:2
cosmetically useful lipid, 7:833t
in cosmetic molded sticks, 7:840t
in dental waxes, 8:296
in eye makeup, 7:862
Beet juice
purification of, 23:459–463
raw, 23:459
Beetles, alkaloids in, 2:75
Beet pulp, 23:458
Beets, nonsucrose components in, 23:463. See also Sugar beets
Beet sugar crystallization scheme,
23:463–465
Beet sugar factory, 23:457
Beet sugar molasses, 23:466
Behavioral toxicology studies, 25:219
Behenic acid
percent in important fats and oils, 5:47t
physical properties, 5:30t
Behenolic acid, 5:34t
Behentrimonium chloride, cosmetic
surfactant, 7:835t
Beidellite, 6:664
Beijerinck, Martinus, 11:7
Bel Baie II paper former, 18:120
Belgian retort process, 16:147
Belgium, coal grades, 6:713t
Belite, phase in Portland cement clinker,
5:472t, 473t
Bell, Alexander Graham, 11:129
Bell furnace, 12:288–289
Bellows-actuated differential-pressure
element, 20:651
Bellows elements, 20:650–651
Bellows meters, 11:655
Bell-type pressure element, 20:647
Beloc, molecular formula and structure,
5:95t
“Belt” compounds, preparation of,
13:438–439
Belt-conveyor scales, 26:244–245
Belt filter press, 25:913
Belt saponification, in vinyl alcohol
polymerization, 25:609–610
Benard instability, 11:764
Benazepril hydrochloride, molecular
formula and structure, 5:149t
Benchmark dose and margin-of-exposure
method, 25:244
Bench-scale experimentation, in large-scale
pharmaceutical synthesis,
18:726–729
Bench scale laboratory, in fine chemical
research and development, 11:426
Bench scales, 26:243
precision, 26:245
Bending, copper wrought alloys, 7:733–735
Bending stiffness, of sutures, 24:214
Bendroflumethiazide, 5:168
molecular formula and structure, 5:161t
Benedict–Webb–Rubin (BWR) equation/
relationship, 12:370; 24:657
Beneficitation
bentonites, 6:679–680
chromite, 6:478–479
ceramics processing, 5:643–646
of magnesite ores, 15:390
of mixed lead–zinc ores, 14:732
of tungsten, 25:361
Benefin, 13:319
Benefit cost analysis (BCA), 24:177
Benfield process, 4:812
Benfotiamine, 2:812
Benidipine, 5:130, molecular formula and
structure, 5:125t
Benefin, 13:323
Bentazon, 13:323
Bent-core liquid crystals, 15:98
See also Smectites
in detergent formulations, 8:417
estimated total production, 6:683
mining, 6:679–681
uses, 6:691–692, 693
Bentonite clay, 15:243
Bentonite deposits, 6:696
Bentorite, 6:471t
Benzo(a)pyrene, See Benzo(a)pyrene

Benzo(a)pyrene, 9:232–234
Benzo(b)fluoranthene, 9:245–246
Benzo(b)pyrene, 9:234–235
Benzo(c)pyrene, 9:232–234
Benzo(c)pyrenes, 9:232–234
Benzo[c]chrysene, 9:238–239
Benzo[d]fluoranthene, 9:246–247
Benzo[g,h,i]perylene, 9:253–254
Benzo[k]fluoranthene, 9:247–248
Benzo[k]pyrene, 9:235–236
Benzo[a]anthracene, 9:221–222
Benzo[a]pyrene, 9:230–231
Benzo[a]pyrene, 9:231–232
Benzo[a]pyrene, 9:232–233
Benzo[a]pyrene, 9:233–234
Benzo[a]pyrene, 9:234–235
Benzo[a]pyrene, 9:235–236
Benzo[a]pyrene, 9:236–237
Benzo[a]pyrene, 9:237–238
Benzo[a]pyrene, 9:238–239
Benzo[a]pyrene, 9:239–240
Benzo[a]pyrene, 9:240–241
Benzo[a]pyrene, 9:241–242
Benzo[a]pyrene, 9:242–243
Benzo[a]pyrene, 9:243–244
Benzo[a]pyrene, 9:244–245
Benzo[a]pyrene, 9:245–246
Benzo[a]pyrene, 9:246–247
Benzo[a]pyrene, 9:247–248
Benzo[a]pyrene, 9:248–249
Benzo[a]pyrene, 9:249–250
Benzo[a]pyrene, 9:250–251
Benzo[a]pyrene, 9:251–252
Benzo[a]pyrene, 9:252–253
Benzo[a]pyrene, 9:253–254
Benzo[a]pyrene, 9:254–255
Benzo[a]pyrene, 9:255–256
Benzo[a]pyrene, 9:256–257
Benzo[a]pyrene, 9:257–258
Benzo[a]pyrene, 9:258–259
Benzo[a]pyrene, 9:259–260
Benzo[a]pyrene, 9:260–261
Benzo[a]pyrene, 9:261–262
solubility of chloroacetic acid in, 1:137t
solubility of higher alcohols in, 2:3t
solubility of methylenedianiline in, 2:794t
solubility of trichloroacetic acid in, 1:141t
solvent for anionic copolymerization, 7:626t
specifications, standards, and test methods, 3:610–614
stereoselective alkylation of, 12:165
sulfonation of, 9:273; 23:524–525
superstructure for the manufacture of, 20:726–727
terminal activity coefficients of mixture with chloroform, 8:743t
terminal activity coefficients of mixture with methanol, 8:743t
thermodynamic properties of, 3:598t
toluene disproportionation to, 25:184–185
typical commercial gas absorption process, 1:26t
U.S. consumption pattern 1999, 3:619t
U.S. producers, 3:610t
vapor-phase nitration of, 17:257
vinyl chloride reactions with, 25:632
world production by country, 3:611–612t

Benzene-based catalyst technology, 15:500
Benzene-based fixed-bed process technology, 15:505–506
Benzene chlorination process, of phenol manufacture, 18:751
m-Benzenedisulfonic acid, 3:602
p-Benzenedisulfonic acid, 3:602
Benzene feedstock, 23:329
Benzene hexachloride, 3:602
Benzene manufacture, toluene in, 25:180–181
Benzene oxychlorination process, of phenol manufacture, 18:751
Benzeneperoxyseleninic acid, 18:466
Benzene rings, in liquid crystalline materials, 15:103–104
Benzene sulfonation process, of phenol manufacture, 18:751
Benzenesulfonic acid, 3:602
Benzene–toluene fraction, in styrene manufacture, 23:341–342
Benzene–toluene–xylene (BTX), 10:782; 18:678
extractive processes for, 10:783–784t
1,3,5-Benzenetrisulfonic acid, 3:602
Benzenoids, aroma chemicals, 3:241
Benzethonium chloride
    cosmetic surfactant, 7:835t
    disinfecting agent for aquaculture in U.S., 3:213t
Benzidine, 9:270, 448
    nonmutagenic analogues of, 9:451
    congeners of, 9:450
dye, 9:401
Benzil, 3:594; 14:594
Benzilonium bromide, 4:359t
Benzimidazoles, microwave-assisted synthesis of, 16:574–575
Benzimidazolethiols, 25:197
Benzimidazolone dioxazine, 19:446
Benzimidazolone pigments, 19:432–433
Benzimidazolone Violet, pigment for plastics, 7:367t
Benzine, 3:597
Benzisoxazolone couplers, 19:254
Benzisoxazolone dye releasers, 19:290
Benzoate esters, 10:513–513
    aroma chemicals, 3:257
Benzoate plasticizers, 25:184
Benzoates
    as antiseptic agents, 10:519
    for PVC polymers, 25:673–674
    uses for, 10:522
Benzoic acid
    promising new uses for aquaculture, 3:224
    registered for use in aquaculture in Australia, 3:222t
Benzocyclobutenone, 21:141
Benzodifuranone (BDF) dyes, 9:254–255
Benzodioxane, 18:761
Benzofuranones, radical scavengers, 3:111
Benzofurans, 21:152
Benzoic acid
    antimicrobial used in cosmetics, 7:831t
    aroma chemical derived from toluene, 3:234; 25:183–184
derivatives, 3:634
economic aspects, 3:628–629
health and safety factors, 3:629–630
manufacture, 3:627–628
physical properties of, 3:626t, 627t
solid-state reaction with ammonia, 8:27–88
specifications and analysis, 3:629, 630t
uses of, 3:630–634
vapor pressure vs. temperature, 3:627t
Benzoic acid esters, 3:635
Benzoic acid salts, 3:634–635
Benzoic anhydride, 1:147; 3:634
Benzoin, 3:594
templation of, 26:847
Benzoisothiazoles, 9:290
Benzoate, 3:597
Benzonitrile, 17:242–244
health and safety factors related to, 17:243
herbicides, 13:315–318
shipping and storage of, 17:243
uses for, 17:244
Benzenophenone, 3:634; 14:593
Benzenophenone-3, cosmetic uv absorber, 7:846t
Benzenophenone-4, cosmetic uv absorber, 7:846t
Benzenophenone-8, cosmetic uv absorber, 7:846t
Benzenophenone process, 13:583
Benzenophenonetetraarboxylic dianhydride (BTDA), 10:404, 407t
Benzenophenone triflouroborane, 4:144t
Benzopyran Red, colorant for plastics, 7:374t
Benzopyrans

colorants for plastics, 7:374t
photochromic materials, 6:598
thermoregulatory materials, 6:621
typical soluble dye applications, 7:376t
Benzopyran soluble dyes, 7:373t
Benzopyrroloquinone derivative, 21:151
Benzoquinolines, 21:200
in metallurgy, 21:195
Benzoquinone(s), 21:236
reaction with coal, 6:714
p-Benzquinone, Diels–Alder adduct from cyclopentadiene, 8:222t
1,2-Benzquinones, 21:251
Diels–Alder reactions of, 21:256
1,4-Benzquinones, 21:239, 242, 244
addition of cyanotrimethylsilane to, 21:260–261
addition of thioureas to, 21:258
manufacture of, 21:266
studies of, 21:247
synthesis of, 21:263, 265
Benzoquinone soluble dyes, 7:373t
Benzoisothiazole dyes, 20:513
Benzoisothiazolydrazine, 9:420
Benzo-thietes, 21:151
Benzoethionium chloride, 7:851
Benzotriazoles, water-soluble, 26:400
Benzotrichloride, 6:323–337
analysis, 6:330
chemical properties, 6:325–327
derivatives, 6:332–334
economic aspects, 6:330
end use of chlorine, 6:134t
handling and shipment, 6:329
manufacture, 6:327–329
physical constants of ring-chlorinated derivatives, 6:333t
physical properties, 6:324–325
uses, 6:331–332
Benzoxazine (BZD), 19:333–334
Benzoxazine resins
polymerization reaction of, 18:770
production of, 18:769
Benzoxazoles, synthesis of, 21:258
N-Benzoxycarbonyl-glycyl-L-proline, 6:77
Benzoylacetonilide couplers, 19:253
Benzoyl chloride, 3:595, 634
end use of chlorine, 6:134t
physical constants of ring-chlorinated derivatives, 6:333t
Benzoylcylohexane-diones, 13:294
Benzoyloxy radicals, 14:281
Benzoyl peroxide (BPO), 3:634; 20:105
hazards associated with, 18:491
uses for, 18:496
N-Benzoylquinolinium chloride, 21:185
Benzthiazide, 5:168
Benzvalene, copolymerization with norbornene, 7:515
Benzyl acetate, aroma chemical derived from toluene, 3:234
Benzyl acetone, 3:595
aroma chemical derived from toluene, 3:234
6-Benzyladene, 13:24t, 29, 38
Benzyl alcohol, 3:595; 10:429–430
antimicrobial used in cosmetics, 7:831t
aroma chemical derived from toluene, 3:234
Benzyl alcohol trifluoroborane, 4:144t
Benzylamine, 3:595
Benzyl benzoate, 3:635
3-(2-Benzylbenzoyl)-1,2-dimethyl-4(1H)quinolones, photochromic materials, 6:594
Benzyl bromoacetate, 4:358t
physical properties of, 4:350t
Benzyl chloride, 6:323–337; 25:184 analysis, 6:330
aroma chemical derived from toluene, 3:234
binary azo trope with benzaldehyde, 3:591t
chemical properties, 6:325–327
derivatives, 6:332–334
economic aspects, 6:330
handling and shipment, 6:329
manufacture, 6:327–329
physical properties, 6:324–325, 325t
uses, 6:331–332
Benzyl chloroformate
DOT regulations for shipment, 6:301t
toxicity, 6:302t
Benzyldimethyldodecylammonium hydroxide (BDDOH), in emulsion polymerization of siloxanes, 22:561
Benzylformate, physical properties, 6:292t
Benzylideneacetone
molecular formula, 6:291t
toxicity, 6:302t
Benzyldimethyldodecylammonium hydroxide (BDDOH), in emulsion polymerization of siloxanes, 22:561
Benzyl formate, physical properties, 6:292t
Benzylideneacetone, aroma chemicals, 3:256
Benzylic carboxylic esters, cleavage of, 16:560
Benzylideneacetone, aroma chemicals, 3:256
4,6-O-Benzylidene-β-D-glucopyranose, 4:712
Benzyl salicylate, 22:16; 25:184
physical properties of, 22:13t
Benzyl sulfone pyrolysis, 21:141
Benzyltrimethylammonium tribromide, bromination reagent, 4:344
Bepadin, molecular formula and structure, 5:97t, 118t
Bepridil, 5:104
molecular formula and structure, 5:97t
Bepridil hydrochloride, 5:117
molecular formula and structure, 5:118t
Berberine, 2:90
Bergamot oil, in perfumes, 18:366
Berg, Otto, 21:681
Berger and Maurer experimental design text, versus other texts, 8:395t
Beriberi, 26:291
Berkeley–Novartis collaborative agreement, 24:383
Berkelium (Bk), 1:463–491, 464t
electronic configuration, 1:474t
ion type and color, 1:477t
metal properties of, 1:482t
Berlin Green, 6:580; 14:537
Berlin Institute Method, for reducing sugars, 23:475
Berlinite, 14:94–95
Berl saddles, 1:28; 8:770
characteristics of ceramic, 1:82t; 8:774t
packing parameters, 1:69, 868
Bernard–Soulier syndrome, 4:85
Berne Convention for the Protection of Literacy and Artistic Works, 7:794
Berne Convention Implementation Act of 1968, 7:790
Bernoulli equation, 11:661, 742–743; 26:960
Bernoulli principle, 11:656–657
Berry pseudo-rotation, 16:470–471
Bertrandite, 3:638, 640–641
Bertrand lens, 16:470–471
Beryl, 3:638, 640
color, 7:329
Beryllia, as a refractory raw material, 21:491
Beryllides, 3:663–664
high temperature oxidation resistant, 3:664t
Beryllium (Be), 3:637–661. See also Beryllium compounds
analysis, 3:645–647
chemical reactions, 3:639–640
in coal, 6:718–719
commercial grades, 3:644t
economic aspects, 3:644–645
effect on copper resistivity, 7:676t
fabrication, 3:642–644
in galvanic series, 7:805t
handling, 3:647
occupational exposure limits, 3:647–648
occurrence, 3:637–638
ore processing, 3:640–641
physical properties of, 3:638–640
solubility limits and electrical conductivity effects on copper, 7:750t
uses of, 3:648
Beryllium alloys, 3:651–659
cast and wrought copper–beryllium alloys, 3:653t, 655t
cast and wrought nickel–beryllium alloys, 3:657t, 658t

Beryllium–aluminum composites,
3:648–649, 649t, 650t, 651

Beryllium–beryllium oxide composite,
3:649, 651t

Beryllium bromide, 3:663
physical properties of, 4:328

Beryllium carbide, 3:663–664
Beryllium carbonates, 3:662
Beryllium carbonate tetrahydrate, 3:662
Beryllium carboxylates, 3:662
Beryllium chloride, 3:663
Beryllium composites, 3:648–649
fabrication, 3:649–651
Beryllium compounds, 3:661–668
economic aspects, 3:666–667
health and safety factors, 3:667
in SiC-ceramic fabrication, 22:535–536

Beryllium copper, 7:170
β-adrenergic agonists
as animal growth regulators, 13:14–17
genotype, gender, and nutritional interactions related to, 13:16
mechanism of action of, 13:17

β-adrenoceptor blockers, antihypertensive agents, 5:155–157t, 160, 167

β-alkoxypropionates
alcohol elimination, 1:359
dehydrogenation, 1:359–360

β-alumina, 2:408
β-aluminum–iron–silicon alloys, 2:317
intermetallic phases, 2:316t

β-aluminum oxide-hydroxide.
See Diaspore

β-aluminum trihydroxide. See Bayerite

β-amino alcohols, 2:113
β-amylases, 10:288
attack on amylose in beer making, 3:568, 576, 577

β-apo-8-carotenal, 24:560–561
β-aroylacrylic acids, 15:486

β-brasses, effect of alloying on mechanical properties, 7:677

β-cryptoxanthin, 17:657

β-damascenone, 24:567, 570

β-damascene, 24:569
β-decay, 21:296–298
classification of, 21:297t
double, 21:305–306, 307t

β⁺-decay, 21:298–299
β⁺-dicalcium silicate
phase in Portland cement clinker, 5:472t

Best efficiency point (BEP), 21:63

Best (Management) Practices
for fertilizers, 11:127
in operation and maintenance, 10:159–162
in technology transfer, 24:380–391

β-aluminum trihydroxide. See Bayerite

β-amino alcohols, 2:113
β-amylases, 10:288
attack on amylose in beer making, 3:568, 576, 577

β-apo-8-carotenal, 24:560–561
β-aroylacrylic acids, 15:486

β-brasses, effect of alloying on mechanical properties, 7:677

β-cryptoxanthin, 17:657

β-damascenone, 24:567, 570

β-damascene, 24:569
β-decay, 21:296–298
classification of, 21:297t
double, 21:305–306, 307t

β⁺-decay, 21:298–299
β⁺-dicalcium silicate
phase in Portland cement clinker, 5:472t
\(\beta\)-diketone chelates, 25:89–91

Beta distribution, 26:1020

\(\beta\)-eleostearic acid, physical properties, 5:33t

\(\beta\)-ethylacrylic acid, physical properties, 5:31t

\(\beta\)-eutectoid system, titanium, 24:855, 856t

\(\beta\)-form silicon carbide, 22:527

manufacture and processing of, 22:534

platelets, 22:535

\(\beta\)-form succinic acid, 23:417

\(\beta\)-Gal-(1-3)-\(\alpha\)-GalNAc, 26:798

Beta-galactosidase, 12:501

\(\beta\)-glucanases, 10:300

\(\beta\)-glucans, 10:292

Beta-H elimination reactions, 20:157

\(\beta\)-HCG (beta subunit human chorionic gonadotropin), 9:64

\(\beta\)-hydroxy acids, 14:130, 131

\(\beta\)-hydroxyethyl esters, 10:487

Betaine, 2:65

piezochromic material, 6:611

thermochromic material, 6:625–626

surfactants, 24:148

Betaine monomers, 20:479

direct polymerization of, 20:481

\(\beta\)-ionone, 24:562, 564

\(\beta\)-iso-methyloionone, 24:566

\(\beta\)-isophorone, 14:585

\(\beta\)-ketoester chelates, 25:91

\(\beta\)-lactam antibiotics, 24:603

\(\beta\)-lactamases, 3:33

\(\beta\)-lactams, 3:32–34

bacterial resistance mechanisms, 3:32t

Betalamic acid, 2:92

\(\beta\)-linalolene, 24:487

Betaloc

molecular formula and structure, 5:95t

\(\beta\)-naphthol

aroma chemical derived from

napthalene, 3:235

derivatives of, 21:145

dye intermediates derived from, 9:287

stereoselective glycosylation of, 12:166

Betanidine, 2:92

\(\beta\)-nitrostyrenes, preparation by nitration of

styrenes, 16:581

\(\beta\)-n-methyloionone, 24:565

\(\beta\)-octaalkylporphyrins, 14:552

Betapace

molecular formula and structure, 5:94t

\(\beta\)-parinaric acid, physical properties, 5:33t

\(\beta\)-pentenoic acid, physical properties, 5:31t

\(\beta\)-peroxy lactones, 18:484

Beta phase titanium, 24:838

in alloys, 24:854–856

properties of, 24:840, 941

\(\beta\)-phellandrene, 24:493

\(\beta\)-picoline, 21:110

from acrolein, 1:276

uses for, 21:120

\(\beta\)-pinene, 3:230; 24:496–497

major products from, 24:478

l-menthol from, 24:522

as natural precursor for aroma chemicals, 3:232

terpenoids from, 24:478–479

\(\beta\)-propiolactone, polymerization of, 14:259

\(\beta\)-quartz solid solution, 12:637–638

Beta ratio, in filtration, 11:329–330

Beta (\(\beta\)) rays, 21:285

\(\beta\)-scission reactions, 14:280–281

\(\beta\)-skytanthine, 2:101

\(\beta\)-spodumene solid solution, 12:638–639

\(\beta\)-sulfur trioxide, 23:756

\(\beta\)-sultones, 23:527

\(\beta\)-tocopherol, 25:793

\(\beta\)-tocotrienol, 25:793

\(\beta\)-vinylacrylic acid, physical properties, 5:33t

\(\beta\)-vinyl silicones, 22:553, 554

Betaxanthins, 2:92

Betel nut, alkaloids in, 2:83

BET model, 1:628

Betteron–Kroll process, 4:5; 14:755. See also Kroll-Betterton debismuthizing process

Betts electrolytic process, 4:5

Betulin, 24:556–557

Betulinic acid, 24:556–557

Beulah–Zap coal, empirical composition, 6:730t

Beverage carbonation, 15:847

Beverage Container Market Survey, 20:54t

Beverage industry, noncertified food colors in, 12:51

Beverage packaging, barrier polymer applications, 3:405

Beverage processing, reverse osmosis in, 21:650–651

Beverages

activated carbon application, 4:753

carbonation, 4:818
chemical analysis of archaeological materials, 5:750
citric acid in, 6:645
defoamer applications, 8:247
flavor delivery systems in, 11:553
packaging, 18:35
U.S. citric acid/citrate distribution, 6:643t
vanillin in, 25:553
yeast-fermented, 26:455–457
Bexarotene, 25:790
Bezafrirate, 5:146
molecular formula and structure, 5:141t
Bezalip, 5:146
molecular formula and structure, 5:141t
Bezatol, molecular formula and structure, 5:141t
Bezold–Brücke effect, 7:308
B-form oligonucleotides, 17:606
BHK cell based products, 5:351t
Bhopal disaster, 21:829, 830
BHS-Fest pressure filter, 11:378–379
Bi2223 magnets, refrigerator-cooled, 23:856
Bi2Sr2CaCu2O8+x compound, 23:848.
See also Bismuth (Bi)
Bi2Sr2CaCu2O8–x compound, 23:848.
Bicyclic cryptands, 14:161
Bicyclic ketones, trans-fused, 13:655
Bicyclic monoterpenes, aroma chemicals, 3:238–241
Bicyclic monoterpenoid alcohols, 24:527–528
Bicyclic monoterpenoid hydrocarbons, 24:494–499
Bicyclic sesquiterpenes, aroma chemicals, 3:239–240
Bicycloguanidinium receptor, 16:787
Bidentate chelants, 5:709
Bidentate ligands, 9:396, 397; 13:443
Bidentate phosphates ligands, 25:433
Bifunctional catalysis, 5:246–248;
19:813–814
Bifunctional chelating agents, 5:7236
Bifunctional dyes, 9:472–473
Bifunctional molecules, 24:53
Bifunctional thiomethacrylates, novel, 23:731
Bighead carp, common and scientific names, 3:187t
Biginelli reactions, using microwave irradiation, 16:579–580
Biginelli three-component condensation products, 16:550
Bingham buffer, common and scientific names, 3:187t
Bilayer structure, of anhydrous soap, 22:728–729
Bile acid sequestrants, 5:144–145
Bile salts, 24:161
Bilges, corrosion protection coatings, 7:205
Bilinear chemometrics methods, 6:39–57
Biloxit polyester, titanium, 24:858
Bill of Material, 15:460, 470
Bills of lading, 25:330
Bimetal complexes, 16:88
Bimetallic deactivation processes, 16:93–94
Bimetallic fluorides, 15:396
Bimetallic metal nitrides, 17:199
Bimetallic organometallic uranium complexes, 25:442
Bimetallic organometallic thorium complexes, 24:773–774
### Bimetallic strips, as smart materials, 22:706
- Bimodal aluminum composites, shear viscosity of, 10:26, 27
- Bimodal aluminum-filled composites, 10:25–28
dielectric constant and dissipation factor of, 10:28
- “Bimodal” polymer, 20:165
- Bimodal polymerization, 20:531
- Bimodal reactor technology, for high density polyethylene, 20:170
- Bimodal weight ratio, 10:17

### Bimodal polymer, 20:165
- Bimodal polymerization, 20:531
- Bimodal reactor technology, for high density polyethylene, 20:170
- Bimodal weight ratio, 10:17

### Bimodal polymerization, 20:531
- Bimodal reactor technology, for high density polyethylene, 20:170
- Bimodal weight ratio, 10:17

### Bimodal reactor technology, for high density polyethylene, 20:170
- Bimodal weight ratio, 10:17

### Bimodal weight ratio, 10:17
- Bimodal polymerization, 20:531
- Bimodal reactor technology, for high density polyethylene, 20:170
- Bimodal weight ratio, 10:17

### Bimodal reactor technology, for high density polyethylene, 20:170
- Bimodal weight ratio, 10:17

### Bimodal weight ratio, 10:17
- Bimodal polymerization, 20:531
- Bimodal reactor technology, for high density polyethylene, 20:170
- Bimodal weight ratio, 10:17

### Bimodal reactor technology, for high density polyethylene, 20:170
- Bimodal weight ratio, 10:17

### Bimodal weight ratio, 10:17
- Bimodal polymerization, 20:531
- Bimodal reactor technology, for high density polyethylene, 20:170
- Bimodal weight ratio, 10:17

---

### Bioadhesive drug delivery systems, 99

- Bimodal plutonium halides, 19:689
- Bimodal plutonium oxide, 19:688
  - See also Binary heterogeneous polymer blends
disperssed droplet size in, 20:330–334
permeability of, 20:358
phase structure evolution during annealing in, 20:334
- Binary refrigeration, 10:617
- Binary selenides, 22:87
- Binary soap–water system, phase behavior of, 22:725–727
- Binary systems, evolving separation strategies for, 22:322–325
- Binary ultraphosphate glasses, diffraction studies of, 12:574–575

### Binders
- anthropogenic silicas and silicates in, 22:472
calcium aluminate cement applications, 2:416
ceramics processing, 5:646
ethylene oxide polymers in, 10:688–689
for ferrites, 11:73
heterogeneous catalysts, 5:228–229
in paper coating formulations, 18:124
pellet, 10:838s
polychloroprene latexes in, 19:859
use in graphite production, 12:724–726
use of latex in, 14:712
vinyl acetate polymers in, 25:585
- Binder systems, 15:248
- Binding, of fibers, 11:178–179
- Binding interaction, drug delivery, 9:63–65
- Bingel reaction, 12:243
- Bingham fluids, 11:768, 769, 771
- Bingham plastic rheological model, 12:15–16
- Binodal curves, 20:320–321
  - “Bins” concept, 10:32
- Bioaccumulation, of herbicides, 13:310
- Bioactive barrier, defined, 3:758t
- Bioactive fixation, 12:611
- Bioactive food ingredients, 17:646
- Bioactive nutritions, 17:645t
- Bioactive substancesidentifying, 17:646
  - safety of, 17:647
- Bioactive zone, defined, 3:758t
- Bioadhesive agents, 9:48, 49
- Bioadhesive drug delivery systems, 9:45
Bioaffinity chromatography, 6:399–400
Bioantimutagen, vanillin as, 25:556
Bioassay dyes, 9:518
Bioassays, microfluidics in, 26:968–969
Bioaugmentation, defined, 3:758t
Bioaugmentation/bioremediation effluent treatment, 9:436, 438
Bioavailability, of antisense oligonucleotides, 17:628
Biocatalysis, 3:668–683; 16:395. See also
Biocatalyst entries
aminotransferase case study, 3:676–681
combinatorial, 16:414
enzyme classes, 3:672–676
enzyme sales, 3:669t
ionic liquids in, 26:897–898
performance, 3:671–672
whole cells vs. pure enzymes, 3:669–671
Biocatalysts, 12:473, 480–481
from fermentation, 11:4–5
lipophilic substrate delivery to, 16:411
in microbial transformations, 16:409–414
Biocatalyst selection, in microbial transformations, 16:404–409
Bioceramics
advanced, 14:102–104
hydroxyapatite, 14:104
Biochemical compounds, information sources for, 15:763
Biochemical cycle, 26:12
Biochemical effects
of hydroxy-PCBs, 13:143–144
of PCBs, 13:137–138
Biochemical engineering, 11:9–10
Biochemical functions, of ascorbic acid, 25:767–768
Biochemically sensitive materials, smart, 22:708t, 716–717, 721t
Biochemical mass spectrometry, 15:666–668
Biochemical nomenclature, 17:401–402
Biochemical oxygen demand (BOD), 19:217, 25:828, 829. See also Biological oxygen demand (BOD)
with fermentation, 11:49
in wastewater treatment, 25:883, 885, 887t, 898, 903
Biochemical oxygen demand analysis. See also BOD5
of water, 26:42–43
Biochemical oxygen demand tests, 12:653
Biochemical processes, phenolic resins from, 18:769–770
Biochemical processing, 11:2
Biochemical reactions, of quinones, 21:239–242
Biochemical sensors, conducting polymer applications, 7:539
Biochemical uncoupling, as a toxic effect, 25:206
Biochemistry
of ascorbic acid, 25:766–773
wine studies and, 26:299
Biochips, 17:622
Biocidal antifoulings, 7:155–162
Biocidal surfaces, self-cleaning of, 22:122–123
Biocides
bromine applications, 4:315t
chromium application, 6:523
cycloaliphatic amines, 2:511
metal bromide applications, 4:326–327
in polychloroprene latex compounding, 19:859
for PVC polymers, 25:675
sodium bromide as, 22:824
triorganotins as, 24:817
and water quality requirements for aquaculture, 3:200
Biocompatibility, of suture materials, 24:216–218
Biocompatibility studies, of dendrimers, 26:800–801
Bioconjugated oligonucleotides, 17:634
Biocontrol agents, 13:346
hypervirulent, 13:351–352
improving, 13:350–352
microbial, 13:347–348
Biocontrol organisms
maintaining populations of, 13:347
as a source of phytotoxins, 13:356
Bioconversions, 16:395; 11:4, 10
Biodegradability
in biological waste treatment, 25:825–826
of polyhydroxyalkanoates, 20:255–256
Biodegradable base stocks, 15:218–219
Biodegradable drilling fluid, 9:35
Biodegradable hydrogels, 13:739–742, 748
typical, 13:741–742
Biodegradable materials, 24:171–172
Biodegradable plastics, 20:231
Biodegradable polylactide polymers, 25:125
Biodegradable polymer networks, with shape memory, 22:364
Biodegradable products, 12:812
Biodegradation
of emulsion additives, 10:124
of polyhydroxyalkanoates, 20:253
of polystyrene, 23:376
principles of, 25:835–836
of PVA, 25:604–605
of solvents, 23:110–111
of surfactants, 24:154–155
VDC polymer resistance to, 25:711
in wastewater treatment, 25:895–898
Biodegradation properties, of sutures, 24:218–223
Biodegradation rate, 24:154–155
Biodeterioration
of wood, 26:352–354
in fine art examination/conservation, 11:409
Biodiesel, 3:701; 26:720–721
fuels, 10:832
Bioeffluents, 1:816, 820
Bioengineered materials, 1:701–703
U.S. market trends, 1:703t
Bioengineering
of glyphosate tolerance, 12:487–490
in salicylic acid manufacture, 22:8
Bioderible polymers, 9:58
pH-sensitive, 9:63
Bio-ethanol, 24:175
Biofilm (cellulose-based temporary skin substitute), 5:364
Biofilm reactor, defined, 3:758t
Biofilms, 26:128
in industrial water treatment, 26:147
Biofilters
in bioremediation, 25:842
design and operation of, 26:686–687
successful uses of, 26:685–686
Biofiltration
air bioremediation of hydrocarbons, 3:764
defined, 3:758t
in recirculating aquaculture systems, 3:196–197
in VOC control, 26:685–687
Biofiltration systems, 10:75–77
variables that affect, 10:76–77
Biofine chemical plants, 11:439–440
Biofluffing
defined, 3:758t
Biofouling, 7:152–153
in industrial water treatment, 26:146–149
lotus effect in prevention of, 22:122–123
Biofuels, 26:694
Biofuels production, organosolv pulping in, 21:30–31
Biogas reactors, 3:701
Biogel resins, for affinity chromatography, 3:846
Biogen, 11:12
Biogenic materials
in ocean basins, 17:690
unconsolidated deposits of, 17:687
Biogenic silica, 22:402
as filler, 11:311
Bioglas microcarrier, 5:353t
Bioglass, 3:709
Biohazardous waste, 26:864–866
Bioherbicides, 13:348
broad-spectrum, 13:348
Bioinformatics, 10:263; 12:473–474
Bioinorganic reactions, 13:445–448
Biodegradation
of ascorbic acid, 25:759–760
Biological chemical detection, chemical sensors versus, 22:269
Biological Control of Weeds Handbook, 13:346
Biological dual-nutrient removal, as advanced wastewater treatment, 25:908
Biological effluent treatment, 9:436–437
Biological Environmental Exposure Limits (BEEL), 21:838
Biological ethylene oxidation, 10:656
Biological Exposure Indices (BEI), 21:838
Biological factors, as wastewater parameter, 25:886t
Biological fixation
of atmospheric nitrogen, 11:111–112
of phosphate fertilizers, 11:122
Biological fluidized bed, defined, 3:758t
Biological hazardous waste treatment, 25:825–830
Biological hydrogen production, 13:849–850
Biological leaching process, for zinc, 26:577
Biologically active compounds, fluorinated, 11:867
Biologically active carbon, 17:803
Biological media, drug stability in, 9:53
Biological nanomachines, 17:45
Biological nitrogen fixation, 17:295–311, 316
Biological oxygen demand (BOD), 14:401.
See also Biochemical oxygen demand (BOD)
Biological phosphorus removal, as advanced wastewater treatment, 25:907
Biological products, FDA regulation of, 21:576
Biological properties
of ethylene, 10:598–599
of macrolide antibiotics, 15:302–305
of sutures, 24:216–218
Biological recycling technologies, in wastewater treatment, 25:889t, 895–902
Biological research, rubidium in, 21:823
Biological self-assembly, of 4-sulfonatocalixarenes, 24:50
Biologicals, from fermentation, 11:5–6, 21–22
Biological sludge, 25:912, 914
Biological specimen freezing, nitrogen in, 17:287
Biological structures, 24:60
Biological systems
DNA topology in, 17:613
infrared spectroscopy and, 14:239–240
liquid crystals in, 15:111–113
metabolic detoxification/activation of chemicals by, 25:213t
smart materials in, 22:721
Biological waste treatment
activated sludge in, 25:827–830
biodegradability in, 25:825–826
Biological weed control, 13:331–332
Biologies, manufacture of, 3:826
Biology, microfluidic applications in, 26:968–973
Bioluminescence, immunoassay and, 14:151
Biomagnification, of herbicides, 13:310
Biomarker isomers, in petroleum, 18:575
Biomarkers, 17:648–649; 18:571, 574, 593
Biomass
as adsorbent for bioremediation, 3:782
defined, 3:683–684
ethanol from, 3:689–690, 702–703
from fermentation, 11:3–4, 21
gasification, 3:691–699
harvesting in bioremediation, 3:757
power generation from, 3:686–688
phenolic resins from, 18:769–770
product of bioremediation, 3:756–757
pyrolysis, 3:699–701
Biomass ash, 3:685–686
Biomass-based hydrogen production, 13:846–847
Biomass combustion devices, 3:686–688
Biomass conversion, for hydrogen production, 13:784
Biomass conversion, protein in, 20:840
Biomass energy, 3:683–707
environmental benefits, 3:703–704
power generation, 3:686–688
waste-to-energy facilities, 3:688–689
Biomass processing enzymes, 10:286–296
Biomass Research and Development Act of 2000, 24:168
Biomass Research and Development Initiative (BioInitiative), 24:192
Biomaterial coatings, ethylene oxide polymers in, 10:688
Biomaterials, 3:707–709. See also
Biomaterials, prosthetics, and biomedical devices
bioresorbable polymers, 3:735–740
for cardiovascular devices, 3:715–720
for hip implants, 3:733–734
hybrid, 13:552–553
proteins as, 20:840
shape-memory alloys, 3:741–750
synthesis techniques for, 13:552
Biomaterials, prosthetics, and biomedical devices, 3:707–753
Biomechanical machines, 20:840
Biomedical applications, of hydroxyacetic acid, 14:129
Biomedical applications
cellulose esters, 5:407–408
for ethylene oxide polymers, 10:686–688
for high performance fibers, 13:396–397
scavenging by alkanolamines from nitro alcohols, 2:120
Biomedical devices, 3:707, 709
cardiovascular devices, 3:709–721
orthopedic devices, 3:721–735
tantalum, 24:327
Biomedical research, 9:43
radiotracers in, 21:279–280
transgenic and gene-targeted mice for, 12:466–467
Biomedical science and technology, effect on research and development, 21:614–615
BioMEMS, lotus effect in, 22:123
Biomimetic affinity chromatography, 6:402
“Biomimetic membrane transport” system, 20:120
Biomimetics, coordination compound applications, 7:600–601
Biomimetic sensors, 3:809–810
Biomimetic synthesis, 13:552
Biomimicry, 24:33
Biomolecular electronics (BME), 13:553
Biomolecules, metal-containing, 24:47
Bio-oils, 3:699–701
uses of, 3:701
Biopesticides, encapsulation of, 16:458
Biopharmaceuticals, 9:54
Biophotolysis, 13:849
Biopile, 3:769
defined, 3:758t
Bioplas microcarrier, 5:355t
Biopolishing, 8:30; 10:304; 24:622
Biopolymer extraction, 10:787–788
Biopolymers, 20:444. See also Proteins
mass spectrometry of, 15:667–668
production and consumption of, 11:276–278
Bioprocessing, 11:2
Bioprospecting, 26:497
“Biorational approaches,” 14:343
Bioreactors
aeration, 1:737–743
membrane, 16:26
Biorefineries, 1:701
“Bio-refinery” concept, 13:847
Bioregulators, 11:578
Bioremediation, 3:753–794
biological definitions relating to, 3:757t
halogenated organic compounds, 3:772–776
halogenated organic solvents, 3:770–772
hydrocarbons, 3:760–770
inorganic contaminants, 3:781–786
metals and metalloids, 3:782–785
military chemicals, 3:779–780
new developments in, 3:786–789
nitrogen compounds, 3:781
nonchlorinated pesticides and herbicides, 3:776–779
organic contaminants, 3:760–780
in soil and ground water treatment, 25:835–836
technological definitions relating to, 3:758–759t
Biorepellent coatings, lotus effect in, 22:121–122
Biore sorbable polymers, 3:735–740
Bioselective adsorption, 6:387
affinity: DNA biosensors, 3:805–808
affinity: immunosensors, 3:800–805
applications, 3:812–813
biomimetic sensors, 3:809–810
catalytic, 3:796–799
cellulose ester applications, 5:408
comparison with microarrays, 16:381t
evolution of, 16:380–381
production by thick-film technology, 3:810–812
synthetic receptors, 3:808–810
Bio separations, 3:816–849
biologics manufacture, 3:826
biosynthetic human insulin from E. coli, 3:817–821
Biosilon microcarrier, 5:353t

Biotechnology, 3:816
    advances in, 13:330
    application to agriculture, 13:283
    in chemical transformations, 12:481–482
    development of, 24:174–175
    fermentation as, 11:1–2
    for higher alcohol manufacture, 2:19
    to improve allelopathy, 13:353–355
    to improve biocontrol agents, 13:350–352
    silk and, 22:633–634
    vanillin production by, 25:547–548
    in weed management, 13:333

Biotechnology companies, fermentation products of, 11:17–20t

Biotechnology herbicides, 13:346–369
    biocontrol of weeds with plant pathogens, 13:346–352
    control of weeds with allelopathy, 13:352–357
    crop resistance to, 13:358–363

Biotechnology law, European Union, 18:543

Biotechnology regulation
    EPA, 18:541–542
    outside the United States, 18:542–543

Biotechnology research, on allelopathy, 13:355

Biotechnology technology transfer partnership model, 24:390

Bioterrorism, protection against, 18:26

Biotin, 25:800
    in beer, 3:582t

Biotin-labeled probes, 16:388

Biotite, in coal, 6:718

Biotower units, 15:714

Biotransformation analysis/interpretation, 16:406–409

Biotransformation enzymes, location in the cell broth, 16:403–404

Biotransformations, 11:4; 16:395. See also
    Microbial transformations
    for bulk chemical applications, 16:396–397
    defined, 3:758t
    organic solvents in, 16:412–414

Biotrickling filter, defined, 3:759t

Bioventing in bioremediation, 25:842
    defined, 3:759t

Biowall, 3:767
    defined, 3:758t

(Bi, Pb)2Sr2Ca2Cu3O10 tapes, status and performance of, 23:849t. See also
    Bismuth (Bi); Lead (Pb)

(Bi, Pb)2Sr2Ca2Cu3O10 conductors, 23:845–848

Biphasic Acid Scavenging Utilising Ionic Liquids (BASIL™) process, 26:899, 900

Biphenyls
    from benzene, 3:620
    from benzene pyrolysis, 3:604

Bipolar battery construction, 3:428

Bipolar cell connection, 9:662–663

Bipolar electrodes, 9:623
Bipolar junction transistors (BJTs), 22:166, 246–249
Bipolar plates, MCFC, 12:223
Bipolar transistors, silicon based semiconductors in, 22:246–249
Bipolymers, 20:533, 534
Bipropellants, 10:727
Bipyridines, uses for, 21:127
Bipyridinium herbicides, 13:315
Bipyridium, 24:51
Bipyridyl trimers, 24:50
Biquinolines, 21:200
Birefringence, 14:675, 680; 19:745
in ferroelectric crystals, 11:94
polycarbonate, 19:822
of regenerated cellulose fibers, 11:275
Birefringent (BR) LCDs, 15:115
Birefringent modulator, 17:446
Birkeland-Eyde process, 17:291–292
2,4-Bis(1,1-dimethylpropyl)phenol. See 2,4-Di-tert-amylphenol
2,4-Bis(1,1-dimethylethyl)phenol. See 2,4-Di-tert-butylphenol
Bis-1,2-(bromoacetoxy)ethane, 4:358t
2,2'-Bis-1,3-benzdithiolene, 6:269
Bis-1,4-(bromoacetoxy)-2-butene, 4:358t
2,4-Bis(1-methyl-1-phenylethyl)phenol. See 2,4-Dicumylphenol
2,4-Bis(1-methylpropyl)phenol. See 2,4-Di-sec-butylphenol
2,6-Bis(1-methylpropyl)phenol. See 2,6-Di-sec-butylphenol
1,3-Bis(1-phenylethyl)benzene, 14:254
Bis[2-(3,6,9-trioxadecyloxycarbonyl)-4-phenyl]oxalate (TDPO), chemiluminescence reagent, 5:847–850
Bis[2,4,4-trimethylpentyl] phosphinic acid, 19:64
Bis[2,4,5-triphenylimidazole], photochromic material, 6:596
1,2-Bis[2,4,6-tribromophenoxy]ethane, 11:468
Bis[2,4,6-trichlorophenyl]oxalate (TCPO), chemiluminescence reagent, 5:847
Bis[2,4-dinitrophenyl]oxalate (DNPO), chemiluminescence reagent, 5:847
Bis(2-chloroethanol)trifluoroborane, 4:144t
Bis(2-chloroethyl) 2-chloroethylphosphonate, 11:490–491
1,2-Bis(2-chloroethyloxy)ethane, 5:816
Bis(2-chloroethylthioethyl) ether, 5:816
Bis(2-ethylhexyl)phthalate, 2:27
Bis(2-ethylhexyl)tetrabromophthalate, 11:468
physical properties of, 4:355t
Bis(2-hydroxy-1-propyl) terephthalate (HDT), polycondensation with bis(2-hydroxy-ethyl) terephthalate (HDT), 7:634
Bis(2-hydroxy ethyl) terephthalate (HET), polycondensation with bis(2-hydroxy-1-propyl) terephthalate (HDT), 7:634
Bis(3,5-dibromosalicyl)fumarate, hemoglobin modifier, 4:120
2,2-Bis(3,5-dichloro-4-hydroxyphenyl) propane, polycondensation, 7:635
N,N'-Bis(3,5-di-tert-butyl-4-hydroxyhydrocinnamoyl) hydrazine, 3:115
N,N'-Bis-(3-aminopropyl)-ethylenediamine, physical properties, 8:486t
Bis(3-hydroxyphenyl) phenyl phosphate, 11:500
Bis(4-aminocyclohexyl)methane, 2:493
Bis(4-fluorophenyl)tri-4-tolyblismuth, 4:35
2,2-Bis(4-hydroxyphenyl) propane, polycondensation, 7:635
Bis(4-isocyanatophenyl)methane (MDI), with alkyl resins, 2:164
α-Bisabolol, 24:548
Bis(acetic acid)trifluoroborane, 4:144t
Bisacetoacetarylide, pigment for plastics, 7:366t
Bis(acetylacetone) titanate, 25:90, 91
Bis(antimony pentafluoride)iodide, 3:63
Bis(antimony trichloride)tricarbonyliron, 3:62t
Bis(antimony trichloride) benzene, 3:62t
Bis(antimony trichloride) trimethylamine, 3:62t
Bis(azide)–rubber resists, 15:157
Bis-(β-hydroxyethyl) terephthalate, 10:487
Bis(biphenyl) chromium(I) iodide, physical properties, 6:528t
Bis(carbamoyl) peroxides, 18:477
Bischler indole synthesis, 2:787
Bismoth-Napieralski reaction, 21:201–202
Bis(chloromethyl) ether, 14:388, 389
Bischloroformate, 23:736
Bischofone, 5:785t
Bis(cyclam)s, 24:54
Bis(cyclopentadienyl)dicarbonyliron, 14:551
Bis(cyclopentadienyl)iron, 14:551
Bis(cyclopentadienyl)titanium dichloride, 25:105, 116
Bis(ethanol)trifluoroborane, 4:144t
Bis(ethyl acetoacetate) titanate, 20:54
Bisglycinatocopper(II), 25:14
Bis(hexachlorocyclopentadieno)
Bis(hexachloroantimonic(III) acid)
Bis(hydroxymethyl)hydracrylic acid, 2,2-Bis(hydroxymethyl)-1,3-propanediol,
2,2-Bis(hydroxymethyl)hydracrylic acid,
Bis(hexachlorocyclopentadieno)
cyclooctane, 11:468
2,2-Bis(hydroxymethyl)hydracrylic acid, 2:49
2,2-Bis(hydroxymethyl)-1,3-propanediol,
See Pentaerythritol
Bishydroxyethyl terephthalate (BHET), 12:646
Bismabenzene, 4:31
Bis(methyl)tetrabromophthalate, physical properties of, 4:355t
Bismin, 4:31
Bis(mono-4-fluoro)-triazine dyes, 9:473
Bismuth (Bi); 4:1–16. See also Bismuth
alloys; Bismuth compounds
analysis, 4:10
barium alloys with, 3:344
catalyst poison, 5:257t
economic aspects, 4:6–9
environmental concerns, 4:10–11
fabrication, 4:4–5
health and safety factors, 4:10–11
manufacture and processing, 4:3–6
mine and refinery production by country, 4:6t
physical properties of, 4:2, 3t
production, 4:2–3
recovery from tin concentrates, 4:5–6
recycling, 4:10
refining, 4:6
reserves, 4:7t
specifications, 4:9–10
thermochemical and thermodynamic
properties of, 4:4t
U.S. consumption by category, 4:11t
uses of, 4:11–12
Bismuth alkoxydes, 4:25
Bismuth alloys, 4:12–15
composition and uses of selected, 4:12t
properties of low melting, 4:14t, 15t
Bismuth bromide, physical properties of, 4:328
Bismuth(III) bromide, 4:21
Bismuth bromide sulfide (19:3:27), 4:24
Bismuth bromosulfide, 4:24
Bismuth carboxylates, 4:25
Bismuth chloride, 4:6
Bismuth(III) chloride, 4:19–20
Bismuth chlorosulfide, 4:24
Bismuth compounds, 4:16–43
alloy-like superconducting, 4:18t
analysis, 4:17
inorganic compounds, 4:17–26
medical uses, 4:36–37
organobismuth compounds, 4:26–36
physical properties of, 4:20t
Bismuth disulfide, 4:24
Bismuth(III) fluoride, 4:19
Bismuth(V) fluoride, 4:22
Bismuth halides, 4:18–19
Bismuth hydroxide, 4:23
Bismuthides, 4:18
Bismuthine, 4:18
Bismuth(III) iodide, 4:21
Bismuth iodosulfide, 4:24
Bismuth–lead alloys, 4:13
Bismuth monochloride, physical properties of, 4:20t
Bismuthonium ylides, 4:34
Bismuth(III) oxide, 4:23–24
Bismuth oxide(1:1), 4:23
Bismuth oxide(1:2), 4:23
Bismuth oxide(2:4), 4:23
Bismuth oxide(3:5), 4:23
Bismuth oxide(4:9), 4:23
Bismuth oxide halides, 4:23
Bismuth oxides, 4:23–24
Bismuth oxybromide, 4:23
Bismuth oxychloride, 4:23
physical properties of, 4:20t
pigment used in makeups, 7:836t
Bismuth oxyfluoride, 4:23
Bismuth oxyiodide, 4:23
Bismuth pentafluoride, 4:22
physical properties of, 4:20t
Bismuth phosphate, 4:25
Bismuth removal, from lead, 14:755. See also Kroll-Betterton debismuthizing process
Bismuth salts, 4:25
Bismuth sesquisulfide, 4:24
Bismuth subcarbonate, 4:36
Bismuth subgallate, 4:36
Bismuth subhalides, 4:19
Bismuth subnitrate, 4:36
Bismuth subsalicylate, 4:1, 36
medical applications of, 22:11–12
Bismuth(III) sulfate, 4:25
Bismuth(III) sulfide, 4:24
Bismuth sulfides, 4:24–25
Bismuth thiolates, 4:25
Bismuth–tin alloy waterfowl shot, 4:15
Bismuth triacetate, 4:25
Bismuth tribromide, 4:21
physical properties of, 4:20t
Bismuth trichloride, 4:19–20
physical properties of, 4:20t
Bismuth trifluoride, 4:19
physical properties of, 4:20t
Bismuth trihalides, 4:19
Bismuth triiodide, 4:21–22
physical properties of, 4:20t
Bismuth trinitrate pentahydrate, 4:25
Bismuth trioxide, 4:23–24
physical properties of, 4:20t
Bismuth triperchlorate pentahydrate, 4:25
Bismuth triselenide, 4:24
Bismuth trisulfate, 4:25
Bismuth trisulfide, physical properties of, 4:20t
Bismuth tritelluride, 4:24
physical properties of, 4:20t
Bismuth trithiocyanate, 4:25
Bismuth trihalides
Bismuth Vanadate Yellow, 19:405–406
pigment for plastics, 7:370t
Bismuthyl carbonate hemihydrate, 4:25
Bismuthyl nitrate hemihydrate, 4:25
Bismuthyl nitrite hemihydrate, 4:25
Bis(N-maleimidomethyl) ether (BME),
hemoglobin modifier, 4:113
Bisoprolol fumarate, molecular formula and structure, 5:156t
Bis(pentafluorophenyl)borane, 13:638
Bis[pentafluorophenyl]triacetate, 4:35
Bis(pentafluorophenyl)triphenylbismuth, 4:35
Bis-peroxides, as silicone rubber curing agents, 22:580
Bisphenol A (BPA), 2:209. See also BPA entries
with alkyd resins, 2:165–166
copolycarbonates of, 19:800–801
cumene as feedstock, 8:156
phenol use in, 18:754
phosgenation of, 19:811
copolycarbonates of, 19:799
production from acetone, 1:174
Bisphenol A–based epoxy resins, 10:348
Bisphenol A–based novolacs, 10:406
Bisphenol A bischloroformate, molecular formula, 6:291t
Bisphenol A–derived epoxy resins, 10:356
Bisphenol A epoxy novolacs, 10:370
Bisphenol A manufacture, microporous catalysts and, 14:420
Bisphenol A moiety, 10:355–356
Bisphenol A polycarbonate (BPA-PC), 10:195
Bisphenol A resins, 10:5–6
Bisphenol A terminated hardeners, 10:406
Bisphenol F epoxy resin, 10:368–369
Bis(phenolic) developers, 19:346–347
Bisphenol resins, formulation of,
20:104–105
Bisphenols. See also Bisphenol A (BPA)
Aromatic polycarbonates derived from,
19:806–808t
as developers in PTG systems, 19:358
Bis(phenol)trifluoroborane, 4:144t
Bis(phthalocyaninato)lutecium(III) electrochromic material, 6:577
1,2-Bis(p-hydroxyphenyl)ethane,
production from acetaldehyde, 1:105
Bis-pyrazolinones, 19:256
Bis(pyridoxal)tetraphosphate, hemoglobin modifier, 4:119–120
Bis(squarylium) dye, 20:519
Bis(tetramethyl tetraselenafulvalenium) hexafluorophosphate ([TMTSF]2-PF6], in organic semiconductor, 22:206
Bis(tribromophenoxy)ethane, physical properties of, 4:355t
Bis(tributyltin) oxide, as wood preservative, 24:817–818
Bis(trifluoromethyl)fluorobismuthine, 4:28
7,8-Bis(trifluoromethyl)tricyclodeca-3,7,9-tetraene, 7:514
N,O-Bis(trimethylsilyl)acetamide (BSA), as silylating agent, 22:693t, 694, 695
N,O-Bis(trimethylsilyl)trifluoroacetamide (BSTFA), as silylating agent, 22:693t, 694
Bis(trimethylsilyl)urea (BSU), as silylating agent, 22:695
Bis(triethylyphenyl) oxide, 24:816–817
Bisulfitation, of unsaturated hydrocarbons, 23:526
Bisulfitation sulfonation processes, 23:540–541
Bisulfite(s)
as bleaching agents, 4:63
pulping, 21:22
reaction with acrylamide, 1:289, 291–292
Bisulfite chain transfer, in aqueous dispersion polymerization, 11:198, 199
Bisulfite ions, in photographic fixation, 19:213–214. See also Stabilization
Bite registration wax, 8:299
specification, 8:300t
Bitolylene diisocyanate (TODI), 25:462
Bitterfeld cell, 15:605
Bitterns, in solar salt harvesting, 22:807
Bitter substances, analysis of, 11:523
Bittersweet chocolate, 6:362
Bitumen, 18:591, 641; 19:107
high sulfur-content, 23:597
mining of, 18:620
Bitumen-coated spunbonded polypropylene fabrics, 17:487
Bituminous coal, 6:703
classification by rank, 6:711t
composition, 6:720t
defined, 6:826
heating in coal gasifiers, 6:775
model of structure, 6:717
operating conditions and product distributions for coal gasification processes, 6:788t
origin, 6:704
peat conversion to, 6:705
tar production in coal gasification, 6:781
world reserves, 6:704
Bivalirudin, 4:100, 100t, 101
Bixin, 24:561
Black amorphous selenium, 22:74
Black-and-white instant films, 19:282
Black-and-white instant imaging processes, 19:279–282
Black-and-white photography, fixation in, 19:213
Blackbody
color of, 7:327
emittance from, 19:131–132
spectral radiance of, 24:453
Blackbody radiation law, 24:452
Blackbody responsivity, 19:132
Blackbody temperature sensor, 11:149–150
“Black-box” approach, to reliability modeling, 26:987–988, 990
Black copper, 16:144
Black crappie, common and scientific names, 3:187t
Black liquor, combustion, 3:689
Black liquor recovery furnace, 12:328, 329
Black magnetite, 19:397
Black ores, 25:349
Black pepper, 23:158, 170
decorticated, 23:162–163
“spent,” 23:162
Vietnamese, 23:154–155
Black phosphorus, 19:3–4
Black pigments, for inks, 14:317
Black shale uranium deposits, 17:521
Blackstrap molasses, 23:449, 483
Blade coatings, 7:7, 8–10; 18:123
method summarized, 7:5t
shear rates, 7:32t
Bladex/Cyanazine, 2:549t
Blake–Kozeny relationship, 11:787
Blanc fixe, filler for powder coatings, 7:45
Blanco Directo sugar cane process, 23:451
Blanc–Quelet reaction, 3:603
Blanking, ceramics processing, 5:655
Blassius correlation, 11:750
Blassius solution, 11:752
BLAST algorithm, 12:474
Blast furnace(s), 14:500; 21:393–394
early, 14:492
energy balance in, 14:505t
first use of, 6:784
iron, 16:141–143
operation of, 14:508–509
plant layout of, 14:505–508
thermochemistry of, 14:499–505
Blast furnace bullion, decopperized, 14:755
Blast furnace ferromanganese production, 15:552
Bleach products, fragrances in, 18:363
Bleaching clays
kaolin application, 6:688t
smectites application, 6:697t, 698
Bleaching herbicides, 13:294–295
Bleaching powder, 4:45, 52
Bleaching systems, 10:279, 284
Bleach liquor, 4:52
Bleach products, fragrances in, 18:363
Bleed-and-feed process, 9:797
Blended cements, 5:492–493, 501
Blending, cotton, 8:17. See also Mixing and blending
Blending octane number (BON), 12:413; 25:180t
Blend iodine value, in toilet soap making, 22:733t, 734
Blend modulus, 20:346, 347
Blends, polycarbonate, 19:824–825
Blind Canyon (HVB) coal
carbon structural distribution based on NMR, 6:715t
empirical composition, 6:730t
Blind dyeing, 9:168
Blinding effects, in screening, 22:280, 282–283
Block coal, 6:705
Block copolyamide, 19:739
Block copolymerization, 19:762
Block copolymers, 7:645–650; 10:436;
23:367
classification in terms of monomer sequence distribution, 7:608t
compatibilization efficiency of, 20:338
differing behavior of, 20:338
doubly “smart,” 20:487–489
effect of elastomer segment on, 24:703
high throughput experimentation
application to segregation and surface morphology, 7:410–411
hydrophilic-hydrophobic, 20:485
hydrophilic/tunably hydrophilic/
hydrophobic, 20:485–487
interface between dissimilar glassy polymers, 1:521
IUPAC source-based classification, 7:609t
polycarbonate, 19:823
polychloroprene, 19:834–835
in polymer blends, 20:324–325

for recycled pulps, 21:51–52
reducing bleaches, 4:63–64
uses of, 4:70–73

Bleaches. See also Bleaching
anthropogenic silicas and silicates in, 22:473
azo dye oxidation by, 9:370–373
color film, 19:260–261
low temperature, 9:364
oxidants used as, 9:369–370
Bleaching, 9:170, 188, 192, 195, 204.
See also Bleaching agents
electron-transfer-mediated,
9:378–379
of fibers, 11:180
N-halamine, 13:99
hydrated lime in, 15:65
hydrogen peroxide in, 14:63–64
in paper recycling, 21:440–441
of pulp, 21:31–38
slaked lime in, 15:65
in soap making, 22:735–736
sodium bifluoride in, 22:826
of wool, 26:401–402
Bleaching agents, 4:43–81
chlorine-containing, 4:47–55
for decontamination of chemical warfare equipment, 5:835
in detergent formulations, 8:419
economic aspects, 4:69
enzymes, 4:64–69, 73–74
as food additives, 12:56–57
health and safety factors, 4:69–70
letter designations for, 21:43
mechanism of, 4:46–47
peroxyogen compounds, 4:55–63
for pulp, 21:44–48

Blast furnace hearth design, 12:762–765
Blast furnace ironmaking, 14:498–509
Blast-furnace lead smelting, 14:734–736
Blast furnace material balance, 14:504
Blast furnace plant, 14:506
Blast furnace refractory, carbon as,
12:761–765
Blasting charges, 10:734
Blastomeres, nuclear transfer from, 12:451
Blattellaquinone, 21:259
Bleach activator, ethyleneamines application, 8:500t, 504–505
Bleach boosting, 10:304–305
Bleached board products, 18:130
Bleached chemo-thermo mechanical pulp (BCTMP), 14:57
Bleached montan wax, 9:677
Bleaches. See also Bleaching
anthropogenic silicas and silicates in, 22:473
azo dye oxidation by, 9:370–373
color film, 19:260–261
low temperature, 9:364
oxidants used as, 9:369–370
Bleaching, 9:170, 188, 192, 195, 204.
See also Bleaching agents
electron-transfer-mediated,
9:378–379
of fibers, 11:180
N-halamine, 13:99
hydrated lime in, 15:65
hydrogen peroxide in, 14:63–64
in paper recycling, 21:440–441
of pulp, 21:31–38
slaked lime in, 15:65
in soap making, 22:735–736
sodium bifluoride in, 22:826
of wool, 26:401–402
Bleaching agents, 4:43–81
chlorine-containing, 4:47–55
for decontamination of chemical warfare equipment, 5:835
in detergent formulations, 8:419
economic aspects, 4:69
enzymes, 4:64–69, 73–74
as food additives, 12:56–57
health and safety factors, 4:69–70
letter designations for, 21:43
mechanism of, 4:46–47
peroxygen compounds, 4:55–63
for pulp, 21:44–48

for recycled pulps, 21:51–52
reducing bleaches, 4:63–64
uses of, 4:70–73

in reactive compatibilization, 20:325–326
structure determination of, 20:340–342
styrene–butadiene, 23:377
synthesis of, 24:704–705
synthesis using different techniques, 7:647t
thermoplastic elastomers based on, 24:697t
vinyl acetate, 25:575
blk designation, 7:609t
Block diagrams, in process control, 20:689
Blocked aliphatic isocyanates, 25:474
Blocked diisocyanates, 25:463
Blocked isocyanates, 25:463
Block foam production, 25:469–470
Blocking, 8:386–388
amount of coverage in experimental
design texts compared, 8:395t
commercial experimental design
software compared, 8:398t
design for, 8:394
Blocking groups, dyeing characteristics
affected by, 9:391
Blocking resistance, of paint, 18:71–72
Block ionomers, 14:475
Block polyampholytes, 20:477–478
Blodite, 5:785t
Blood
citric acid in, 6:632t
preservation using cryogenics, 8:42
salt in, 22:812
Blood access devices, 3:719–720
Blood alcohol tests, 12:96
Blood clots, 4:82–83
Blood clotting, vitamin K in, 25:795
Blood coagulation, 4:84–90
and anticoagulant drugs, 4:81–109
hemostatic system, 4:82t, 84–90
therapeutic intervention, 4:90–106
Blood collection procedures, 12:142
Blood derivatives, freeze-drying for, 12:139
Blood dyscrasias, sulfonamide-related,
23:510
Blood endotoxin detection, 14:151
Blood flow monitoring, radioisotopes in,
21:318–319
Blood fractionation, 4:111
Blood oxygenators, 3:720; 15:846
Blood plasma, 4:111
Blood plasma fractionation. See Plasma
fractionation
Blood pressure, salt and, 22:813
Blood salvage, 3:719
Blood serum levels, radiotracers
for determining, 21:281
Blood stains, as evidence, 12:102
Blood substitutes, 4:109–132
hemoglobin modifications, 4:113–124
hemoglobin sources, 4:125–126
Blood typing tests, 12:103
Blood urea nitrogen (BUN) values, 26:822
Blotch printing, 9:218
Blotting techniques, 9:755–756
Blouses (woven), number produced from
one bale of cotton, 8:133t
Blowing agents, 19:549, 552. See also
Monolayer blown-film extrusion;
Multilayer blown-film extrusion
chloorofomate applications, 6:304
for extruded polystyrene foams,
23:376
for silicone foam rubber, 22:585
hydrofluorocarbons as, 13:715–719
for PVC polymers, 25:675–676
Blow-molded articles, LLDPE, 20:208
Blow-molded bottles, 20:45–47
PEN, 20:50–51
Blow-molded containers, hot fill
applications for, 20:50–52
Blow molded food packaging, 18:49–51
Blow-mold-fill-seal food packaging, 18:51
Blow molding, 10:179, 193–194;
19:553–554; 23:399
ABS, 1:427
HDPE, 20:171–172
LDPE, 20:237
LLDPE, 20:200
of polyamide plastics, 19:790–791
Blown film, LLDPE, 20:199
Blown film applications, for high density
polyethylene, 20:173–174
Blown film process, 19:544–545
Blown film properties, of LDPE, 20:213t
Blown oils, 9:149
Blown PB film, 20:428, 431
Blue(s)
CIE chromaticity diagram, 7:313, 315
typical applications of inorganic in
plastics, 7:372t
typical applications of organic in plastics,
7:368t
typical soluble dye applications, 7:376t
Blue alumina, 5:334–335
Blue asbestos, world production in 2000, 3:289t
Blue catfish, common and scientific names, 3:187t
Blue crab, aquaculture, 3:189
Bluegill, common and scientific names, 3:187t
Blue–green laser diodes, 22:179
Blue lasers, 22:142
 silicon carbide in, 22:531
Blue LEDs, silicon carbide in, 22:530–531
Blue light absorption, in color photography, 19:238–239
Blue mussel, common and scientific names, 3:188t
Blue phases, in liquid crystalline materials, 15:96
Blue pigments, 7:353
 for inks, 14:318
 transparent, 19:412
Blue-sensitive cones, in eye, 7:304, 308
Blue shrimp, common and scientific names, 3:188t
Blue tilapia, common and scientific names, 3:187t
Blue water gas, 6:784–790, 827
Blue-white, and blackbody color, 7:327
Blue zircon pigment, 19:404
Blumlein configuration, 14:690
B-matrix, 8:587–588
 optimization of complete B-matrices, 8:597–599
 systematic calculation, 8:590–597
BMS-186716, molecular formula and structure, 5:154t
BMS-284756, 21:226–227
B-number, 8:587
Board of Patent Appeals and Interferences, 18:182
Boca Raton reverse osmosis desalination system, 26:82
BOD5, 26:157–158. See also Biochemical oxygen demand entries
Bodied oils, 9:148–149
Body-centered cube lattice, 8:114t
Body-centered rectangular prism lattice, 8:114t
Body-centered rhombic prism lattice, 8:114t
Body-centered square prism lattice, 8:114t
Body mass index (BMI), 3:88t, 88–89
Body odors, 1:816
Body preparations, 7:842t
Body tissue, caustic soda versus, 22:840
Body washes, 22:748
Body waves, 17:422
Body weight, role in toxicology studies, 25:216
Boehmeria nivea, 11:294
Boehmite (aluminum oxide monohydrate), 1:6; 2:345t, 347, 421, 425–426
 classification, 2:422
 composition in bauxite used for alumina production, 2:346t
 decomposition, 2:392–394
 mineralogical and structural properties of, 2:423t
 surface area after activation, 2:393
 thermodynamic data, 2:423t
Boeing, titanium contract with Timet, 24:846
Boeing Rocketdyne, corporate decision making by, 24:386
Boggsite (BOG), 16:813
Boghead coal, 6:705
Bohr, Niels, 21:289
Bohr frequency, 23:128
Bohrium (Bh), 1:492t
Boiler deposits, in industrial water treatment, 26:131
Boiler economizers, 10:146
Boiler feed pumps, 21:56
Boilers, 10:152; 23:215–216
 atmospheric pressure fluidized-bed, 7:465–467
 dispersant applications, 8:688
 energy consumption by, 10:156–157
 recirculating, 23:216–217
 shop-assembled, 12:327
Boiler system corrosion, in industrial water treatment, 26:129–131
Boiler tubes, corrosion in, 23:225
Boiler water additive, 12:31
Boiler-water limits, in steam-generating systems, 23:220
Boiler water treatment, 26:131–135
 alkanolamines from nitro alcohols, 2:120
 selection of, 23:226
Boiling, in beer making, 3:575, 579
Boiling limit, heat pipe, 13:230
Boiling liquid expanding vapor explosion (BLEVE), 21:842–843
Boiling point, 24:284
in simple distillation system synthesis methods, 22:298–299
Boiling water reactors (BWRs),
17:544–545, 554–555, 562, 566,
578–582; 19:673
Bois de rose, in perfumes, 18:366
Bolden’s Kaldo lead smelting process,
14:742–743
Bolivia, tin mines in, 24:783, 784
Bollgard, 8:2
Boll weevil, 8:9
Bollworm/budworm complex, 8:9
Bolometers,
19:143–144
Bolton-Hunter reagent, 21:274
Boltzmann distribution, 14:657; 26:1035
Boltzmann’s constant, 26:1035
numerical value of, 24:434
Boltzmann’s law, 14:662
Bolzano magnesium manufacturing process,
15:342
Bomb reduction, of zirconium oxide, 26:632
Bombykol, 22:269
Bombyx mori, silk from, 11:174; 22:627,
628t, 632t, 633
Bond dissociation energy (BDE),
14:276–277
Bond dissociation energies (BDEs)
ethylene, 10:593
for oxygen–oxygen and oxygen–hydrogen
bonds, 18:430
Bonded abrasives, 1:2, 17–21
grit sizes, 1:9t
Bonded alumina, carbon monoxide
compatibility with, 5:4t
Bonded solid-film lubricants, 15:248–251
Bonded strain gauge, 20:654
Bond energies, 11:828, 829t
Bonderizing process, 16:214
Bond functionalities, in lignin, 15:6
Bonding
ABS, 1:428
conduction in organic semiconductors
and, 22:201
corrugator, 18:17–18
dye–fiber, 9:160–162
of ethylene–tetrafluoroethylene
copolymers, 18:327
of fibers, 11:178–179
flip-chip, 17:836–837
indium in, 14:194–195
mechanical and chemical, 16:176
of metal carbonyls, 16:59–61
modes, 16:60
for ODRs, 14:858
of spunbonded nonwoven fabrics,
17:474–478
Bondline readout, 7:122
Bond number (Bo), 15:687t
Bond orientational order, of liquid
crystalline materials, 15:85
Bonds, fullerene, 12:233–234
Bond strength, in thermal bonding, 17:510
Bone, 7:273t. See also Bones
citrnic acid in, 6:632t
Bone fractures, 3:725
Treatment, 3:725
Bone health, vitamin K and, 17:655
Bone injuries, superelastic and
pseudoelastic SMA devices for, 22:351
Bone marrow, preservation using
cryogenics, 8:42
Bone plate, 3:744–745
Bone remodeling, 3:733
Bones, 3:721–722, 724. See also Bone
chemical analysis of archaeological
materials, 5:752, 753
Bone staple, 3:744–745
BON reds/maroons, 19:436
Bontril, 3:91, 92t
BONUS (better optimization of nonlinear
uncertain systems) algorithm, in
control systems, 26:1046
Book of SEMI Standards (BOSS), in fine
chemical production, 11:435
Books
green chemistry, 12:814–815
preservation of, 11:414
Boolean logic, in patent searching, 18:249
Boolean logic expressions, in database
searching, 18:239
Boolean operators, data searching using,
6:6
Bootop, 7:203–204
9-Borabicyclo[3.3.1]nonane (9-BBN),
13:637–638
Boracite (stassfurite), 4:133t
Borafullerenes, 12:231
Boraheterocyclic reagents, 13:636
Borane, 4:170
activators, 16:95–97
Borane adducts, 13:634
economic aspects, 4:228–229
Borane–amine complexes, 13:633
Borane complexes, 13:634
monomeric, 13:632
Borane–dimethyl sulfide (BMS), 13:632
complex, 13:633, 634
Boranés. See also Boron hydrides, heteroboranes, and their metalla
derivatives; Tetrahydroborates
closó, 4:188–193
disubstituted, 13:636–640
electrophilic attack, 4:188
molecular orbital calculations, 4:183–184
monosubstituted, 13:635–636
_nido_ and _arachno_, 4:184–186
as pharmacophores, 4:227–228
physical properties of, 4:184t
polyhedral expansion, 4:187–188
proton abstraction, 4:187
reactions with Lewis bases, 4:186–187
structural systematics, 4:172–179
Borane–triethylamine complex, 13:634
Borate(s), 4:241–244; 17:390. See also
Boron oxides, boric acid, and borates;
Sodium borates
colorants for ceramics, 7:346t
dispersants, 8:710t
calcium-containing, 4:278–282
commercial minerals, 4:243t
glass-ceramics based on, 12:642
occurrence, 4:245–246
potassium-, ammonium-, and lithium-containing, 4:275–278
solutions, 4:256–258
sources and supplies, 4:259–261
Borate analysis, of water, 26:39
“Borate Anomaly,” 12:573
Borate glasses, 12:572–573. See also
Borosilicate glasses
durability of, 12:585
Borate melts and glasses, 4:279–282
Borax, 4:133, 133t, 241, 243t, 245; 5:785t
esterification with PVA, 25:601
in detergent formulations, 8:418
solubility-temperature curve, 4:262
Borax decahydrate, 4:261
Borax pentahydrate, 4:261
BORAX program, 17:579
Borax stability, 25:577
Borazon, 1:8
Bordeaux mixture, 7:779
Borehole bioreactor, defined, 3:759t
Bore-side feed hollow-fiber module, 15:820, 821
Bore skin fibers, 16:22
Boric acid, 4:249–255. See also Boron
oxides, boric acid, and borates
analysis, 4:255
esterification with PVA, 25:601
flame retardant for cotton, 8:27
manufacture, 4:254–255
physical properties of, 4:251–254
solubility–temperature curve, 4:262
solutions, 4:256–258
uses of, 4:255
Boric anhydride, 4:246
Boric oxide, 4:246–249
physical properties of vitreous, 4:247t
Boride phases, in nickel-base superalloys, 13:515
Borides
formed by metals, 23:832
refractory properties of, 21:493
titanium, 25:5–6
tungsten, 25:386
zirconium, 26:641
Boriding (boronizing), case hardening by, 16:211
Bornafix, 24:528
Borneols, 24:510, 527–528
Born–Haber cycle, 3:413
Born–Oppenheimer approximation, 16:736
Bornyl, 24:479
Borocarbides, 23:851
Borofluorides, 4:150
Borogypsum, 4:593
Borohydride derivatives, 13:614
Borohydride reduction effluent treatment, 9:432–434
Borohydrides, 13:613–621
lithium, 13:620–621
potassium, 13:620
sodium, 13:614–620
in uranium systems, 25:440
Boron (B), 4:132–138. See also Boranes;
Hydroboration; MgB<sub>2</sub> entries
addition to aluminum wrought alloys,
2:327
in coal, 6:718
coupling of organic groups attached to,
13:650
effect on copper resistivity, 7:676t
replacement by hydrogen or heteroatom,
13:647–650
replacement by metal, 13:650
replacement by nitrogen, 13:649
replacement by sulfur and selenium,
13:650
health and safety factors, 4:135–136
in hydrogen fluoride manufacture, 14:11
minerals of commercial importance,
4:133t
physical properties of, 4:133–134
preparation, 4:135
production, 4:135
as silicon impurity, 22:507
uses of, 4:136–137
Boron–aluminum–magnesium alloys, 4:137
Boron analysis, of water, 26:39
Boronate affinity chromatography,
6:403–404
Boronatocalcite, 4:133t
Boron carbide, 1:4–5, 8; 4:244, 647
CVD, 4:141
as diamondlike carbide, 4:654
hardness in various scales, 1:3t
physical properties of, 4:653t
whisker reinforcement
for ceramic–matrix composites,
5:557t
Boron carbide (4:1), 4:649t
Boron compounds, 18:398
recovery from brine, 5:790–792
Boron dioxide, 4:242t, 249
Boron-doped silicon carbide, 22:535
Boron enolates, 13:671–672
Boron fibers, 26:760–761
Boron filaments, 4:136–137
Boron halides, 4:138–159; 14:267–268
chemical reactions, 4:141–145
derivatives, 4:149–159
health and safety factors, 4:147
manufacture, 4:145–146
physical properties of, 4:139–140t
shipping and handling, 4:146
specifications and analysis, 4:147,
147t
uses of, 4:147–149
Boron hydrides, heteroboranes, and their
See also Boranes; Heteroboranes;
Metallaboranes
arachno clusters (2n + 6 systems), 4:176
boron hydrides, 4:169–170
bonding, 4:180–184
economic aspects, 4:228–229
hypho clusters (2n + 8 systems), 4:176
localized bonding, 4:180–183
metalla derivatives, 4:176–178
M–H–B bridges, 4:179
molecular orbital descriptions,
4:183–184
nido clusters (2n + 4 systems),
4:175–176
nomenclature, 4:170–172
placement of extra hydrogens, 4:178–179
placement of heteroatoms, 4:178
structural systematic exceptions,
4:179–180
structural systematics, 4:172–179
Boronic esters, homologation of, 13:671
Boron monoxide, 4:242t, 249
Boron neutron-capture therapy, 4:190,
226–227
Boron neutron-capture treatment (BNCT),
26:797
Boron nitride, 4:244. See also Cubic boron
nitride
ceramic insulator, 5:593
in ceramic–matrix composites, 5:553t,
554t
composites, 17:219
CVD, 4:141
mechanical properties of cubic, 8:526t
Boron nitride-shaped bodies, pyrolytic,
17:209–210
Boron oxides, boric acid, and borates,
4:241–294. See also Borates; Boric
acid; Sodium borates
boron oxides, 4:246–249
boron oxides, 4:242t
environmental concerns, 4:284–285
health and safety factors, 4:285–288
occurrence, 4:245–246
Boron perchlorates, 18:278
Boron phosphate, 4:242t, 283
Boron removal, from water, 14:418
Boron-stabilized carbanions, 13:660–661
Boron subhalides, 4:141
Boron suboxide, 4:242t
Boron tribromide, 4:138
manufacture, 4:145–146
physical properties of, 4:139–140t, 325
reactions, 4:141
specifications, 4:147t
uses of, 4:149
Boron trichloride, 4:138
manufacture, 4:145–146
physical properties of, 4:139–140t
reactions, 4:141
specifications, 4:147t
uses of, 4:148–149
Boron trifluoride, 4:138; 10:413
adducts with oxygen, chlorine, and
fluorine compounds, 4:144t
manufacture, 4:145
physical properties of, 4:139–140t
reactions, 4:142t, 142–143
supported, 5:327, 328
uses of, 4:147–148
Boron trifluoride hydrate, 12:190
Boron trihalides, 4:138–159; 10:413
Boron triiodide, 4:138
manufacture, 4:146
physical properties of, 4:139–140t
reactions, 4:141
uses of, 4:149
Boron Wittig reaction, 13:660
Borosilicate glasses, 12:585, 593–594, 616. See also Borate glasses
Borromean topology, 24:51–52
Borstar, 7:636
Bose-Einstein condensation, 17:352
Bosons, 17:352
Boswellic acids, 24:557
Botox (Clostridium botulinum toxin
type A), 2:816
Bottle centrifuge
operation, 5:528–529
theory of performance, 5:507–508
Bottle polymerization, 20:376
Bottles
blow-molded, 20:45–47
coated, 20:53
as industrial materials packaging, 18:13
Bottle washing, detergent systems
for commercial, 8:413t
Bottling, of wine, 26:319
Bottom-blown basic-oxygen process,
23:259–260
for steelmaking, 23:249–250
Bottom blown oxygen cupel (BBOC),
14:752, 753
Bottom-blown processes, chemistry of,
23:260
Bottom feed, with rotary drum vacuum
filters, 11:357
Bottom-fermenting yeasts, 26:465
Bottom-pressure casting method, 23:269
Bottom-spray fluidized-bed units,
16:448–449
Bottom spraying (Wurster coating), 11:542
Bottom-up nanoscale fabrication, 24:61
Bottom-up technology, 17:45
Bouguer-Lambert-Beer law, 18:153;
23:126. See also Beer’s Law
Boundary film lubrication regimes, 15:212
Boundary layer capacitors, carbon black
application, 4:800
Boundary layer concept, 11:751–753
Boundary lubricity additives, 15:213,
224–225
Boundary managing, in R&D, 21:619–620
Boundary spanning, in R&D, 21:619
Bound chloride formation, 10:358
Bound moisture, 9:96
Bourdon tube, 20:647–649
Boussinesq approximation, 11:779
Bouteque fuels, 12:419
Bovatec, 20:136
Bovine hemoglobin, 4:125
Bovine insulin, 3:817
Bovine serum albumin (BSA), 20:573
properties of standard, 3:836t
Bovine somatotropin (BST), 10:871
Bovine spongiform encephalitis/
encephalopathy (BSE) (mad-cow
disease), 4:125; 11:46–47
Box–Behnken design, 8:399
commercial experimental design
software compared, 8:398t
Box dies, in bar soap manufacture,
22:752
Boxer shorts, number produced from one
bale of cotton, 8:133t
Boxes
glue lap joints in, 18:20
as industrial materials packaging, 18:14
Box furnace, 12:289
Box, Hunter, and Hunter experimental
design text, versus other texts,
8:395t
Boxing dental wax, 8:299
specification, 8:300t
Box-type mixer–settler, 10:774
Boyer, Herbert, 11:11
BPA diacetate, transesterification of,
19:816. See also Bisphenol A
(BPA)
BPA–polycarbonate oligomers, solid-state
polymerization of, 19:818
BPA polycarbonates, 19:808
interfacial polymerization process for,
19:811–812
properties of, 19:803–804
studies on, 19:804
BPI protein, 18:256–258
BPO-DMA redox system, 14:283–284
Bracellinite, 6:471t
Brackish reverse osmosis systems, 26:80–83
Brackish water desalination, 15:834–835, 837
energy consumption in, 26:87
Bradyarrhythmias, 3:711
Bradycardia, 5:88, 108
Bragg-Brentano powder diffractometer, 26:426–427
Bragg diffraction, 14:676–677
Bragg's law, 26:418–419
Bragg wavelength, 14:702
Brahmanol, 24:536
Braided sutures, 24:214
Brain function studies, 21:281
Brain natriuretic peptide (BNP), 5:187
Brainstorming, 5:766
Brain wave changes, fragrance exposure and, 18:386–387
Brake linings and pads
asbestos alternatives, 3:315
asbestos applications, 3:312, 313
Brake linings, graphite use in, 12:794
Bramycin, bacterial resistance mechanisms, 3:32t
Branch and bound techniques, discrete optimization via, 26:1023
Branched aliphatic solvents, 23:104
Branched alkylbenzene (BAB), 17:725
Branched copolymers, 7:610t
Branched epoxies, 10:364
Branched olefins, 17:724, 726
Branched polycarbonates, 19:805
Branched polymers, 20:391
Branched primary alcohols, synthetic processes for, 2:27t
Branching
polychloroprene, 19:838–840
in PVC polymerization, 25:666
Branching enzyme, in starch biosynthesis, 12:493–494
Branching index, 19:839
branch-poly-(n-butyl acrylate), 7:610t
Brass, 7:753
arsenic addition to, 3:271
chemical analysis of archaeological materials, 5:747
color, 7:334
effect of alloying on mechanical properties, 7:677
electroplated using coordination compounds, 7:596
selenium and metallurgy of, 22:98
UNS designation, 7:721t
β-Brasses, effect of alloying on mechanical properties, 7:677
Brassidic acid, physical properties, 5:32t, 37t
Brassinosteroids, as natural plant growth regulators, 13:22–28
Brass mills, 7:671, 690
Brass plating, 9:766, 809–810
Braunite, 15:540
Bravais lattices, 8:114t
Brazeability, copper wrought alloys, 7:745–746
Brazed components, gold, 12:693
Brazed-fin aluminum cores, 10:157
Brazil
natural graphite in, 12:781
quartz powder from, 22:413
Brazing
gold alloys in, 12:703
piping system, 19:484
Brazing alloys, silver in, 22:658
Brazing dental investments, 8:295
Bread, 26:264
salt in, 22:815
yeasts in, 26:461–463
Bread doughs, 26:462
Bread making, modified yeast in, 26:492
Breakage, in crystallization, 8:95
Breakdowns
equipment failure from, 15:478
reducing, 15:464
Break-even charts, 9:546–547
Breaking strength, 19:743
Breakpoint chlorination, 13:101; 26:181
Breakthrough, in carbon adsorption units, 25:812
Breakthrough curves, adsorption columns, 1:603–609
Breakup regime, in liquid atomization, 23:182–183, 185
Breast cancer, antiaging agents for, 2:811
Breath alcohol testing, 12:96
Breathing gases, noble gases as, 17:376–378
Breathing zone measurements, 14:214, 217
Breccia complex uranium deposits, 17:520
Breeding gain (BG), 17:586
Breeding programs, to enhance allelopathy, 13:353
Breeding ratio (BR), 17:586
Bremsstrahlung X-radiation, 24:101–102
   external, 21:312
   internal, 21:309, 310t
   in fine art examination/conservation, 11:403
BREND A Web site, 10:260
Breokinase, molecular formula
   and structure, 5:172t
Brestan, 24:817
Bretton Woods Agreement, 12:694
Bretton Woods Conference, 12:684
Bretylan, molecular formula and structure, 5:96t
Bretylate, molecular formula
   and structure, 5:96t
Bretylium, molecular formula
   and structure, 5:96t
Bretylium tosylate, 4:359t; 5:103
Bretylol, molecular formula and structure, 5:96t
Brevibloc, molecular formula
   and structure, 5:94t
Brewers’ malt, 15:523
Brewers’ wort, 26:464–465
Brewers’ yeasts, 3:580–581; 26:464–467, 472
   strains of, 26:465–466
Brewery fermentations, 26:465
Brewhouse, 3:574–575
Brewing. See also Beer entries
   alcohol content control in, 10:293
   diacetyl control in, 10:293
   filtration problems in, 10:292
   steps in, 10:292t
   recombinant yeast in, 26:493
Brewing enzymes, 10:286
Brewing production
   U.S., 15:533
   world, 15:532
Brewing water, ozonation of, 17:807–808
Brewster angle, 14:670
Brewster’s law, 14:857
Brewster windows, 14:682, 687
Brezinate, 6:471t
Brick. See also Refractory brick entries;
   Silica brick
   ASTM classifications and specifications
      for, 21:508
   physical properties of, 21:497t
Bridged bis(cyclopentadiene)s, 25:116
Bridged metallocenes
   chiral, C1-symmetric (asymmetric), 16:108–109
   chiral, C2-symmetric, 16:104–108
   Ct-symmetric, 16:109–110
Bridged polysilsesquioxanes, 1:753; 13:538
Bridgehead nitrogen heterocyclic
   compounds, microwave-assisted
   synthesis of, 16:576
Bridge resins, 8:325
Bridge thickeners, 22:65
Bridging, of sodium chloride (salt), 22:808
Bridging flocculation, 22:55
Bridging mechanism, 11:633–635
Bridgman-type anvils, 8:528
Bright beer tank, 3:584
Brightness, of organic pigments, 19:427
Bright nickel, 9:820
Brillouin scattering, 7:339
Brimstone. See Sulfur (S)
Brine(s)
   chemicals from, 5:784–803
   for chlorine plants, 6:162–168
   as drilling fluid material, 9:10
   lithium in, 15:123–124
   lithium recovery from, 15:127–128
   minerals from, 5:790–793
   salt production from, 22:797
   sodium bromide in, 22:824
   sodium carbonate, 22:787, 790
   after sodium chloride solution mining, 22:802–805
   in sodium hydroxide manufacture, 22:832–835
   in sodium nitrate processing, 22:845–846
   sodium sulfates in, 22:863, 865
   in solar salt harvesting, 22:806–808
   solids-free, 9:29
   sources of, 5:784–786; 9:27–28
   as sources of iodine, 14:354, 362–365
   in water softening, 22:818–819
Brine chemical industry, 5:791
Brine–dolime magnesium hydroxide
   production, 15:399–402
Brinell Hardness Number (BHN), 15:204; 23:273
Brine treatment, use of aqueous
   hydrochloric acid in, 13:834
Brining, 5:788
Brinkman's theory, 22:54
Briquetting process, 14:497
Britannia metal, composition, 3:52t
British Lubrication Engineering Working Group, 15:201, 202. See also Great Britain; United Kingdom (UK)
British Occupational Hygiene Society (BOHS), 14:203
Brittle fracture, as failure mechanism, 26:983
Brittle materials, strengthening, 26:775
Brittle particles, ceramic–matrix composite reinforcement, 5:569–570
Brix hydrometer, 23:474
BRL-32872, novel antiarrhythmic agent, 5:106
Broadband, 14:658
Broadband analysis, 15:469
Broad band gap semiconductors, 25:17
Broad spectrum antimicrobial agents, 24:604
Brochantite, 7:773
Brocrinate, 4:360t
Brodie Purifier, 8:139
Brodie reaction, 12:778
Brodifacum, 4:359t
Brofoxine, 4:360t
Brokaw equation, 15:674
Broken parts, displaying, 15:479–480
Bromacil, 4:358t; 13:324
Bromadiolone, 4:359t
Bromadoline, 4:359t
Bromal, production from acetaldehyde, 1:105
Bromamide, 4:299, 318–319
Bromamine acid (1-amino-4-bromoanthraquinone-2-sulfonic acid), 9:309
derivatives of, 9:327–328
physical properties of, 4:353t
Bromamine-B, 13:109
Bromamines, 4:318–319; 13:100
inorganic, 13:101–104
organic, 13:104–112
N-Bromamines, 13:305
Bromamine-T, 13:109
Bromazepam, 4:360t
Bromethalin, 4:359t
Bromfenac, 4:359t
Bromic acid, 4:334
Bromidea, 4:360t
Bromide analysis, of water, 26:41
Bromides ions, in development solution, 19:205–206
Bromides, 4:319–330
thorium, 24:763
titanium, 25:54
tungsten, 25:379
uranium, 25:439
Bromimide, 4:299, 319
Brominated additive flame retardants, 11:461–468, 471–473t
Brominated Anthanthrone Orange, pigment for plastics, 7:367t
Brominated aromatic compounds, 11:459
Brominated bisphenol A–based epoxy resins, 10:366
Brominated butyl rubber, 4:436
development of, 4:434
manufacture, 4:400, 442–444
Brominated carbonate oligomers, 11:470
Brominated diphenyl oxides, 11:461
Brominated epoxies, 10:383
Brominated epoxy oligomers, 11:470
Brominated epoxy resin, 10:456
Brominated poly(isobutylene-co-p-methylstyrene), 4:438
blends with halobutyl, 4:453
copolymers, 4:446
vulcanization, 4:450
Brominated polystyrene(s), 11:470–474; 20:65
physical properties of, 4:356t
Brominated reactive flame retardants, 11:475–477t
Brominated styrene, 11:479
Brominated trimethylphenylindane, physical properties of, 4:355t
Bromination, 12:18
additive, 4:345
in higher olefins, 17:713
of isoquinoline hydrochloride, 21:200
of salicylic acid, 22:6
substitutive, 4:343–3443
α-Bromination transfer, in organoboranes, 13:658–659
Bromindione, 4:359t
Bromine (Br), 4:295–318; 9:280. See also CBr3 compounds; Inorganic bromine compounds; KBr disks; Organic bromine compounds
addition to fullerene, 12:240
analouges, 13:112

catalyst poison, 5:257t
carriers, 4:308
chemical reactions, 4:298–304
for disinfection, 8:621–626
economic aspects, 4:308–309
health and safety factors, 4:311–314
manufacture, 4:305–308
occurrence, 4:304–305
physical properties of, 4:295–298, 296t
production by country, 4:309t
reaction of furan with, 12:276
as a reactive flame retardant, 11:479
recovery from brine, 5:792–793
sodium reactions with, 22:765

specifications and analysis, 4:310t, 310–311
standard electrode potential, 7:799t
storage and transportation, 4:313–314
use in selenium analysis, 22:94
Bromine chloride, 4:330
for disinfection, 8:626–628
properties and characteristics compared to other disinfectants, 8:608t
Bromine dioxide, 4:332
Bromine electrodes, standard potential, 3:413t
Bromine halides, 4:330–332
Bromine monofluoride, 4:330; 13:123
Bromine monoxide, 4:332
Bromine oxides, 4:332
Bromine pentfluoride, 4:299, 331–332; 13:123, 126
Bromine pool sanitizers, 26:176–177
Bromine reservoirs, formation of, 17:788
Bromine trifluoride, 4:331; 13:123, 127, 128, 129
manufacture of, 13:128–129
uses for, 13:131
(2-Bromo-1,2-di dio acryl)ethylcarbonate, 4:358t
Bromo-2,4-difluorobenzene, physical properties of, 4:352t
N-(4-Bromo-2-methylphenyl)-2-chloracetamide (BMPCA), 4:358t
2-Bromo-2-nitropropane-1,3-diol, antimicrobial used in cosmetics, 7:831t
2-Bromo-2-nitropropanol (BNP), 4:358t
2-Bromo-2-nitrostyrene (BNS), 4:358t
2-Bromo-3-alkyl-5-(bromozinio)thiophene, 7:518
2-Bromo-3-alkylthiophene, 7:517
3-Bromo-3-butene-1-ol, physical properties of, 4:350t
1-Bromo-3-chloro-5,5-dimethylhydantoin, 4:54
1-Bromo-3-chloro-5,5-dimethylhydantoin (BCDMH), 13:110
1-Bromo-3-chloropropane, physical properties of, 4:350t
2-Bromo-3-methoxy-1,4-naphthoquinone, 21:245–246
2-Bromo-4,6-dinitroaniline, physical properties of, 4:352t
1-Bromo-4-methylaminoantraquinone, physical properties of, 4:353t
5-Bromo-5-nitro-1,3-dioxane, antimicrobial used in cosmetics, 7:831t
N-Bromoacetamide, 13:106
Bromoacetic acid, 1:142–143
physical properties of, 4:350t
Bromoacetyl bromide, physical properties of, 4:350t
N-(Bromoacetyl)-N'-(5-(dimethylamino)naphthalene-1-sulfonyl)piperadine (Dns-BAP), chemiluminescence reagent, 5:851
4-Bromoaniline, physical properties of, 4:352t
Bromobenzene
diffusion coefficient in air at 0° C, 1:70t
physical properties of, 4:352t
4-Bromobenzyl cyanide, physical properties of, 4:352t
Bromobutide, 4:358t
2-Bromobutyric acid, physical properties of, 4:350t
N-Bromocaprolactam, 13:116
Bromochloramine-T, 13:109
Bromochlorodifluoro methane, 4:348, 348t
Bromochlorodimethylhydantoin (BCDMH), 13:115
Bromochloroethanes, 10:586
Bromochloromethane, 4:347; 16:373
Bromochlorophen, 4:358t
Bromochlorophenol blue, 4:362t
Bromocresol green, 4:362t
Bromocresol purple, 4:362t
Bromocriptine, 4:360t
Bromocriptine mesylate, 4:360t
Bromodichlorodiphenylmethylenimony, 3:75
Bromodiphenhydramine, 4:359t
Bromofenoxim, 4:358t
4-Bromofluorobenzene, physical properties of, 4:352t
Bromoform, 4:348
vinyl chloride reactions with, 25:632
Bromofos, 4:358t
Bromogallates, 12:357
Bromohexine, 4:360t
Bromohydrins, from polyhydric alcohols, 2:49
Bromohydroxotricyclohexylantimony, 3:77
Bromomethane, 4:345
4-(Bromomethyl)-7-methoxycoumarin (Br-Mmc), chemiluminescence reagent, 5:851
Bromophenol blue, 4:362t
Bromophenol red, 4:362t
Bromo pink, 9:310
2-Bromopropionic acid, physical properties of, 4:350t
3-Bromopropionic acid, physical properties of, 4:350t
Bromopropylate, 4:358t
Bromoquinolines, 21:185
trans-Bromostyrene, physical properties of, 4:350t
N-Bromosuccinimide (NBS), 13:116
brominated butyl rubber from, 4:434
bromination reagent, 4:344
Bromothymol blue, 4:362t
Bromotrichloroethane, 6:269
Bromotrifuoromethane, 4:348, 348t
Bromous acid, 4:333
5-Bromovaleric acid, physical properties of, 4:350t
Bromoxynil, 4:358t; 13:315
crop resistance to, 13:360–361
Bromoxynil octanoate, 4:358t
2-(Bromozincio)-3-alkyl-5-bromothiophene, 7:518
Bromperidol, 4:360t
Brompheniramine, 4:359t
Bromyrite, 4:304
Bronchitis, effect on heart, 5:107
Bronidox, 4:358t
Bronopol, 4:358t
Brønsted acids, 12:190
Brønsted-Lewis superacids, 12:191–192
Brønsted superacids, 12:191
Bronze(s), 24:796
chemical analysis of archaeological materials, 5:747
tungsten, 25:381
Bronze bearings, bismuth replacing lead in, 4:12
Bronze plating, 9:767, 810–811
Bronze route process, 16:170–171
Brookfield viscometer, 21:737
Brook trout, common and scientific names, 3:187t
Broom corn fiber, 11:298
Broom root fiber, 11:298
Broperamide, 4:359t
Bropirimine, 4:360t
Brotozolam, 4:360t
Brovincamine, 4:360t
Brown asbestos, world production in 2000, 3:289t
Brown coal, 6:703
classification, 6:712
composition, 6:720t
origin, 6:704
Brown Coal Liquefaction process, 6:849
Brown cyclization product, 21:147
Brownian diffusion, 18:151, 152
Brownian diffusion, in depth filtration theory, 11:339
Brownian motion, 8:712; 10:117, 119; 17:45;
26:1023
effect on viscosity, 21:717
flocculation and, 22:55
Browning reaction, 11:35
Brown pigments, 7:350–351
Brown reaction, 21:146
Brown rice, 26:270
milling of, 26:285
Brown-ring test, 17:190
Brown sugars, 23:442, 453, 482
Brown trout, common and scientific names, 3:187t
Brucine, 2:74
Brucite, 15:321, 323, 399
reserves of, 15:322
Brugnatelli, Luigi, 9:760
Brunauer classification of adsorption isotherms, 1:591
Brunauer-Emmet-Teller (BET) adsorption method, 10:41
specific surface of silica and, 22:370–371, 386
Brundtland report, 24:162
Brush aerators, 26:162
Brushing, of staple-fiber nonwoven fabrics, 17:515–516
Brush plating, 9:769
Bruzem, molecular formula and structure, 5:97t, 118t
B-scan recording, 17:425
BSH, reagent for boron neutron capture therapy, 4:190, 227
B-staged adhesives, 1:528
Bt cottons, 8:2
BTEX bioremediation of groundwater, 3:766
BTX catalysis degradation by, 23:612–614
extraction of, 12:660
production from light hydrocarbons, 25:170–171
recovery of, 25:168
Bubble caps, 26:165
Bubble-cap tray column, mass transfer in, 15:696
Bubble coalescence, 12:12, 14
rates of, 11:775
Bubble column bioreactors, 1:740–742
Bubble column reactors, static mixers in, 15:708–709
Bubble columns, 15:698–703, 726
estimating shear rates for, 15:689
gas–liquid mass transfer correlations for, 15:701–702t
Bubble diameter, in foams, 12:2
Bubble-free oxygenation, 15:716
Bubble growth, 11:806
Bubbleless turbulent fluid-bed reactor design, 11:821
Bubble point calculation, 24:680, 685
Bubble process, 23:408
Bubble shapes, 11:776–777
in foams, 12:7–11
Bubbles, in fluidized beds, 11:805–806
Bubble size control, 11:805
in fluidized beds, 11:819, 821
Bubble size distribution, 12:14
in foams, 12:11
“Bubble tear-offs,” 20:229
Bubble tray absorbers, 1:27, 29
design, 1:83–86
Bubble-tube reactor, 25:194
Bubble tube viscometer, 21:739
Bubble two-phase theory of fluidization, 11:805–806
Bubble velocity, 11:806
Bubbling bed regime, 11:723–724
Bubbling column reactor, 21:334
Bubbling fluidized-bed regime, 11:801, 802
Bubly liquid, structure of, 12:7
Buccal drug delivery, 9:48
Bucherer reaction, 9:279
Bucherer synthesis, 2:571
Buchner, Edward, 11:8
Buckingham’s theorem, 8:589
Buckingham Pi theorem, 11:744
Buckminsterfullerene (C60), 22:719
photovoltaic effects in, 22:220
Buckminsterfullerenes, 4:735; 12:228.
See also Fullerenes
conversion to diamonds, 8:542
Buckytubes, as fillers, 11:317
Buctril, 8:2
Buffered aluminum sulfate, antiperspirant ingredient, 7:848t
Buffering
in affinity chromatography, 6:391, 392
chelant applications, 5:732–733
chelants, 5:726–727
Buffers
in emulsion recipes, 25:568
in ruminant feeds, 10:870–871
Buffer solutions, reference, 14:25–26
Bufotalin, 24:474
Bufotenine, 2:75, 92
BUGS (Bayesian inference Using Gibbs Sampling) software, 26:1018
Bug spray, 1:770
Builders, in detergent formulations, 8:415–418
Building climate, solar energy materials for, 23:24–25
Building codes, flame retardants and, 11:449
Building limes, 15:26
requirements for, 15:67–68
Building materials
desirable characteristics for indoor materials, 1:827t
emissions testing, 1:829–830
low emitting, 1:829t
product testing and labeling, 1:830
selection criteria for indoor, 1:827t
Building products, PVA in, 25:619
Buildings
design, operation, and maintenance to minimize indoor air pollution, 1:830–831
indoor air pollution contaminants, 1:820–822
sick, 1:819
Building Services Piping, 19:480
Built-up edge, cutting tool failure mode, 4:659–660
Bukeite, 5:785t
Bulk casting, PMMA, 10:200
Bulk chemical analysis, of solid waste, 25:866
Bulk chemical applications, biotransformations for, 16:396–397
Bulk chemicals, 20:711
Bulk containers, flexible intermediate, 18:13
Bulk continuous polymerization, 10:205
Bulk-crystallized polymers, 20:398
Bulk density
  of limestone, 15:31
  of quicklime, 15:42
  of slaked lime, 15:44
Bulk drug products, polymorphic forms of, 18:729
Bulked-continuous-filament (BCF) yarns, 11:225, 243; 19:754
Bulk elastic modulus, of binary compound semiconductors, 22:145, 146–147t
Bulk enzymes, from genetically engineered microbes, 12:480
Bulk erosion, 9:78
Bulk fluid velocity method, 16:688
Bulk gallium nitride, supercritical ammonia solution growth of, 14:96–97
Bulk gases
delivery and control of, 13:463
purification of, 13:457–461, 461–462
Bulk gas phase
  in a chemical reactor, 25:272–273
  one minus dimensionless molar density in, 25:314
  temperature in, 25:273–276
Bulk gas-phase molar densities, 25:273
Bulk gas phase velocity, 25:274
Bulk glass, 26:750
Bulk glass-ceramic processing, 12:627–628
Bulk graphites, 12:744
Bulk handling, of industrial materials, 18:5–6
Bulkhead pan roof, 24:292
Bulk hydrated lime, 15:56
Bulking agents, 12:43–44
  in sweeteners, 24:244–245
Bulk materials
electromagnetic applications for, 23:865–870
  weighing, 26:246
Bulk micromachining
  of MEMS devices, 26:964
Bulk micromachining, in MEMS, 22:259–260
Bulk molding compounds (BMC), 19:557; 20:117
  injection molding of, 20:118
Bulk phase handling properties of adipic acid, 1:555t
Bulk plastics
gross energy requirements for, 24:169, 179–180
  life-cycle assessments for, 24:182–183
Bulk polymerization(s), 20:407–408
  acrylic ester monomers, 1:381
  acrylonitrile, 11:201–202
  of methacrylic ester polymers, 16:281–282
  of polychloroprene, 19:829
  of PVC, 25:669
    in the Spheripol process, 20:537–538
types of, 16:282
  of VDC, 25:695–696
  of vinyl acetate, 25:570
Bulk processes, in polypropylene manufacture, 20:536
Bulk refractory products, 21:506
Bulk resistivity, of aluminum powder, 10:19t
Bulk separation, molecular sieves in, 16:841–842
Bulk-set process, of silica gel preparation, 22:395
Bulk solids, dispersion in a liquid, 24:157
Bulk superconducting joints, 23:844
Bulk superconductors, 23:870
Bulk viscosity, 21:717–718
Bulk weigher, 26:247
Bulk rayon, 11:261–262
Bumetanide, 5:169
  molecular formula and structure, 5:163t
Bumex, 5:169
  molecular formula and structure, 5:163t
Buna N, carbon monoxide compatibility with, 5:4t
Buna process, 22:777
Bundle branches, 5:80
Bundle of His, 5:80
Bundles scrap, 21:409
Bundpacker, 7:691
Bungalow formula, 23:473
Bunsen burners, 7:455–457, 458
Bunsenite, color, 7:331
Bunsen-Roscoe law, 19:108
Bunyaviruses, 3:138
Buoyancy
  effect on weighing, 26:242
  sedimentation and, 22:50
  in single-particle settling, 22:52
Bureau International des Poids et Mesures (BIPM), 24:436
Bureau of Alcohol, Tobacco, and Firearms (BATF), 10:553; 12:34
Bureau of Narcotics and Dangerous Drugs (BNDD), 18:685
Burger’s disease, antianginal agents for, 5:111
Buried heterostructure laser, 14:701
Burke-Plummer relationship, 11:767
Burkholderia pseudomallei, antibiotic resistant, 3:37
Burlap bags, 18:10
Burlington Industries, nanofiber research, 1:722
Burnfree blankets, 13:752
Burn-in, for reliability, 26:992
Burns, 11:845
  hydrogen fluoride, 14:18
Burnt lime, aquaculture application, 3:207
Burn wound dressing, hydrogels for, 13:751–752
Burserelin, registered for use in aquaculture in Europe, 3:220
Bursitis, 3:724, 725
Bursting strength, of paper, 18:100–101
Burton process, 18:648
Busheling scrap, 21:408–409
Bushveld Igneous Complex, 19:604
Business form inks, 14:321
  See also Research and development entries
Business-related patent information searches, 18:238–239
Butadiene, 4:365–392; 24:271
  in adiponitrile production, 17:235
  Alfrey–Price parameters, 7:617
  chemical reactions, 4:367–378
  commercial block copolymers, 7:648
  copolymers of, 23:367
  economic aspects, 4:382
  glass transition and melting temperature for soft/hard segments, 7:649
  handling, storage, and shipping, 4:380–382
  health and safety factors, 4:382–383
  manufacture and processing, 4:378–380
  physical properties of, 4:366–367
  production from acetaldehyde, 1:105
  production from acetylene, 1:219, 228
  production from butylenes, 4:424
  production of, 10:558
  production of ethylbenzene from, 23:334
  reactivity ratio from Alfrey–Price scheme compared with experimental data, 7:618
  reactivity ratios in anionic copolymerization, 7:626
  separation of, 10:785
  specifications and analysis, 4:380
  temperature effect on dimerization rate, 4:381
  uses of, 4:383–384
  U.S. producers, 4:382
1,2-Butadiene, 4:365
  physical properties of, 4:367
  vapor pressure equation constants, 4:403
  vapor pressure ratio relative to n-butane, 4:404
1,3-Butadiene, 4:365
  Diels–Alder adduct from cyclopentadiene, 8:222
  physical properties of, 4:366–367
  poly(butadiene) from, 4:433
  vapor pressure equation constants, 4:403
  vapor pressure ratio relative to n-butane, 4:404
Butadiene–acrylonitrile–styrene (ABS) polymer, 10:205–207. See also ABS entries
Butadiene-based rubbers, in polystyrene manufacture, 23:358
Butanal, physical properties of, 2:60; 4:459
2-Butenal. See Crotonaldehyde
Butane(s), 13:674, 695–700
  dehydrogenation for butylenes manufacture, 4:417–418
debondulation of, 18:678
economic aspects of, 13:699
health and safety factors related to, 13:699–700
maleic anhydride production from, 15:496–497
manufacture and processing of, 13:698–699
properties of, 13:696–697
shipment of, 13:699
solvent for supercritical hydrogenolysis for higher alcohol manufacture, 2:18–19
specifications, standards, quality control, and storage of, 13:699
spontaneous ignition temperature, 7:438
uses for, 13:700

n-Butane
acetylene manufacture from, 1:195t, 200t
azeotrope with ethylenediamine, 8:487t
catalytic aerogels for isomerization, 1:763t
dehydrogenation to butadiene, 4:378–379
diffusion coefficient in air at 0 °C, 1:70t
liquid-phase oxidation to acetic acid, 1:125–126, 129
physical properties as propellant, 1:776t
reactions of, 13:695–697
reactivity as VOC, 1:792t
typical commercial gas absorption process, 1:26t
vapor pressure equation constants, 4:403t
Butane-1,4-diol, 20:36
Butane-based catalyst technology, 15:498–500
Butane-based fixed-bed process technology, 15:501–502
Butane-based fluidized-bed process technology, 15:502–504
Butane-based transport-bed process technology, 15:504–505
Butane-containing streams, 13:699
1,4-Butanedicarboxylic acid. See Adipic acid
Butanediol from butadiene, 4:371
economic aspects, 1:243–244
health and safety factors, 1:244
manufacture, 1:243
physical properties of, 1:235t
production from acetylene, 1:217, 219, 220, 231, 241–244
reactions, 1:241–243
shipment and storage, 1:244
specifications and analysis, 1:244
uses of, 1:244
U.S. producers, 1:244t
1,4-Butanediol, 13:798; 20:36. See also Butanediol formaldehyde in, 12:121–122
production of, 23:424
in shape-memory polymers, 22:362, 363
1,4-Butanediol-γ-butyrolactone–THF family, maleic anhydride in the production of, 15:513–514
1,2,3,4-Butanetetracarboxylic acid for cotton esterification, 8:30
1-Butanol
azeotrope with water, 8:747–748
azeotropic mixtures, 4:395t
butyraldehyde derivative, 4:467
manufacture, 4:396–397
physical properties of, 4:394t
uses of, 4:398
2-Butanol
azeotrope with benzene, 3:598t
azeotropic mixtures, 4:395t
manufacture, 4:397
physical properties of, 4:394t
uses of, 4:398
(±)-2-Butanol, 4:393
(R)(–)-2-Butanol, 4:393
(S)(+)-2-Butanol, 4:393
n-Butanol
adipic acid solubility, 1:555t
butyraldehyde derivative, 4:460, 467
dehydration of, 18:515
solubility of boric acid in, 4:253t
manufacture by oxo process, 2:37
Butanone, solubility of dispersant tails in, 8:685
2-Butanone, 13:582, 583
permeation in selected barrier polymers, 3:389t
Butanoic acid, physical properties, 5:29t
1-Butene, 4:402
catalytic aerogels for isomerization, 1:763t
chemical reactions, 4:406–410
commercial production of, 20:413
from ethylene, 17:720–722
percentage in equilibrium distribution of butylenes at selected temperatures, 4:409t
physical properties of, 4:405t; 20:414t
vapor pressure equation constants, 4:403t
vapor pressure ratio relative to n-butane, 4:404
cis-2-Butene, 4:402
catalytic aerogels for preparation by isomerization, 1:763t
chemical reactions, 4:406–410
percentage in equilibrium distribution of butylenes at selected temperatures, 4:409t
physical properties of, 4:405t
vapor pressure equation constants, 4:403t
vapor pressure ratio relative to n-butane, 4:404
trans-2-Butene, 4:402
catalytic aerogels for preparation by isomerization, 1:763t
chemical reactions, 4:406–410
percentage in equilibrium distribution of butylenes at selected temperatures, 4:409t
physical properties of, 4:405t
vapor pressure equation constants, 4:403t
vapor pressure ratio relative to n-butane, 4:404
n-Butene
feedstock for higher aliphatic alcohols, 2:40
oxydehydrogenation to butadiene, 4:379
2-Butene-1,4-diol. See Butenediol
Butenediol
health and safety factors, 1:241
manufacture, 1:241
physical properties of, 1:235t
production from acetylene, 1:220, 231, 238–241
reactions, 1:238–241
shipment, storage, and price, 1:241
specifications and analysis, 1:241
uses of, 1:241
Butenes, 24:254
feedstocks for higher aliphatic alcohols, 2:29t, 30t
oxidation to acetic acid, 1:126
production of, 24:259
cis-2-Butenoic acid, physical properties, 5:31t
trans-2-Butenoic acid, physical properties, 5:31t
3-Butenoic acid, physical properties, 5:31t
N-3-Butenylaza[18]crown-6, 24:41
Buthidazole, 13:323
Butler-Volmer equation, 9:611–612; 19:207
N-tert-Butoxycarbonyl (Nboc) group cleavage, microwaves in, 16:559
Butoxyethanol (ethyleneglycol monobutylether), solvent for cosmetics, 7:832
Butralin, 13:40t, 46–47
Butter, as colloid, 7:273t
Butterflies, alkaloids in, 2:75
Butterfly valve, 19:474–475
Butterworth P-43 machines, 16:709, 711
2 N-tert-Butyl-2-benzothiazolesulfenamide, 2:550t
Butyl acetate, 4:398
adipic acid solubility, 1:555t
production from acetaldehyde, 1:105
2-Butyl acetate, azeotropic mixtures with butyl alcohols, 4:395t
n-Butyl acetate
azeotropic mixtures with butyl alcohols, 4:395t
production of, 10:479–480
separation from acetic acid-n-butyl acetate mixtures, 8:828, 841–845
solubility of dispersant tails in, 8:685
sec-Butyl acetate, oxidation to acetic acid, 1:126
tert-Butyl acetate, 10:486
hydrolysis of, 15:169
Butyl acetate dehydration, 18:515
N-tert-Butylacrylamide, 1:295
Butyl acrylate
Alfrey–Price parameters, 7:617t
reactivity ratio from Alfrey–Price scheme compared with experimental data, 7:618t
comonomer with acrylonitrile, 1:451t
physical properties of, 1:344t, 376t
in shape-memory polymer networks, 22:364
in shape-memory polymers, 22:357
toxicity, 1:363t, 377t
vapor pressure, 1:346t
n-Butyl acrylate, block copolymer synthesis, 7:647t
N-tert-Butyloxycarbonyl (Nboc) group cleavage, microwaves in, 16:559
Butoxyethanol (ethyleneglycol monobutylether), solvent for cosmetics, 7:832
Butralin, 13:40t, 46–47
Butter, as colloid, 7:273t
Butterflies, alkaloids in, 2:75
Butterfly valve, 19:474–475
Butterworth P-43 machines, 16:709, 711
2 N-tert-Butyl-2-benzothiazolesulfenamide, 2:550t
n-Butyl alcohol
from n-butyraldehyde, 4:560
diffusion coefficient in air at 0° C, 1:70t
physical properties of, 4:394t
sec-Butyl alcohol
physical properties of, 4:394t
production from butylenes, 4:424
tert-Butyl alcohol (TBA), 16:256; 20:801–802
azeotrope with benzene, 3:598t
manufacture of, 4:397–398
physical properties of, 4:394t
production from butylenes, 4:425–426
production of butylenes from, 4:416
uses of, 4:399
Butyl alcohols, 4:393–402
azeotropes, 4:395t
health and safety factors, 4:400–401
manufacture, 4:396–398
physical and chemical properties of, 4:393–396
specifications and analysis, 4:399–400, 400t
storage and handling, 4:401
uses of, 4:398–399
n-Butylamine, 2:538t
physical and chemical properties of, 2:540t
specifications and economic data, 2:551t
sec-Butylamine, 2:538t
physical and chemical properties of, 2:540t
tert-Butylamine, 2:538t
physical and chemical properties of, 2:540t
production from butylenes, 4:425
2-(tert-Butylamino)-4-chloro-6-ethylamino-1,3,5-triazine, 2:549t
2-(tert-Butylamino)-4-chloro-6-ethylamino-1,3,5-triazine, 2:550t
t-Butylaminoethyl methacrylate,
copolymerization with acrylic monomers, 1:380t
tert-Butyl areneperoxysulfonates, 18:484t, 486
Butylated hydroxyanisole (BHA), 10:576; 12:85
antioxidant useful in cosmetics, 7:830t
production from butylenes, 4:427
uses for, 10:582
Butylated hydroxytoluene (BHT), 12:60
antioxidant useful in cosmetics, 7:830t
as soap bar additive, 22:744–745
4-t-Butylbenzaldehyde, 9:680–681
n-Butylbenzene, 12:163
N-Butylbenzenesulfonamide, 2:550t
Butyl benzoate, 3:635
4-tert-Butylbismin, 4:31
n-Butyl bromide, physical properties of, 4:350t
Butyl butyrate, 4:460
p-t-Butylcalix[4]arene, 14:165
4-t-Butylcalix[8]arene-p-sulfonic acid, 23:722
n-tert-Butyl carbonate, physical properties, 6:306t
4-tert-Butylcatechol (TBC)
as a polymerization inhibitor, 23:382
in styrene manufacture, 23:338
sec-Butyl chloroformate
DOT regulations for shipment, 6:301t
molecular formula, 6:291t
toxicity, 6:302t
4-tert-Butyl chloroformate, DOT
regulations for shipment, 6:301t
n-Butyl chloroformate, molecular formula, 6:291t
4-tert-Butylcyclohexylamine, physical properties of, 2:499t
4-tert-Butyl cyclohexyl chloroformate
molecular formula, 6:291t
toxicity, 6:302t
1,4-Butylene dimethacrylate,
copolymerization with acrylic monomers, 1:380t
tertiary-Butyldimethylsilyl (TBDMS),
cleavage of, 16:559, 560
tert-Butylidimethylsilyl group, in silylation, 22:694
Butyl diphenyl phosphate, 11:494
Butyl elastomers, 4:409
Butylene(s), 4:402–433, 10:486
alkylation, 2:175–176
analysis, 4:421–422
chemical reactions, 4:404–410
economic aspects, 4:421
equilibrium distribution of ideal gas at selected temperatures, 4:409t
feedstock for higher aliphatic alcohols, 2:27t
health and safety factors, 4:422
in integrated manufacturing process, 6:237t
manufacture, 4:410–421
as a source of petrochemicals, 18:677
physical properties of, 4:403–404, 405t
production of, 24:271–272
shipment and handling, 4:421
uses of, 4:422–429
1,4-Butylene glycol. See Butanediol
Butylene oxide, 10:555
  production from butylenes, 4:426
  reaction with ammonia, 2:122
Butylethanolamine, physical properties of,
  2:124
n-Butyl ether, 10:576
  uses for, 10:582
n-Butyl formate
  azeotropic mixtures with butyl alcohols,
  4:395t
  physical properties, 6:292t
sec-Butyl formate
  physical properties, 6:292t
Butyl glycidyl ether (BGE), 10:376
tert-Butyl hydroperoxide (TBHP),
  20:801–802
tert-Butyl hydroperoxide process,
  for propylene oxide manufacture,
  20:801–803
tert-Butylhydroquinone (TBHQ), 12:60
  antioxidant useful in cosmetics, 7:830t
Butyl isocyanate,
  production from butylenes, 4:425
t-Butyl phenyl diphenyl phosphate, 11:494
Butylpoly[isobutylene-co-isoprene] (butyl rubber), 4:433
Butyl rubber(s), 4:433–458; 9:561; 14:265.
  See also Halogenated butyl rubber
  annual capacity, 4:451t
  carbon monoxide compatibility with, 5:4t
  chemical reactions, 4:448
  copolymers, 4:444–446
  cure systems for, 21:802–803
  economic aspects, 4:451, 452t
  elastomeric vulcanizates, 4:448–450
  formulation for reclaiming, 21:475t
  health and safety factors, 4:452–453
  isobutylene polymerization mechanism,
  4:434–436
  manufacture of, 4:439–444
  modification of, 4:436–437
  molecular structure, 4:444–446
  new materials, 4:437–438
  nitrogen diffusion coefficients in,
  4:447
  physical properties of, 4:446–447
  in rubber compounding, 21:766
  uses of, 4:453–454
  vulcanization, 4:450
5-t-Butylsalicylic acid, 22:5
Butyl sealants, 22:43–44, 48t
  reactive hot melt, 22:44
Butyl stearate
  cosmetically useful lipid, 7:833t
  in cosmetic molded sticks, 7:840t
Butyltin, 3:68
4-tert-Butylstyrene (TBS), 23:348
tert-Butyl tetrahydropryran-2-yl peroxide,
  18:454
Butyltin trichloride, 24:816
p-tert-Butyltoluene
  aroma chemical derived from toluene,
  3:234
  production from butylenes, 4:426
4-tertio-Butyl-toluene, oxidation of,
  19:86–87
Butyltricyclohexyltin, 24:816
iso-Butyltriethoxysilane, as silylating
  agent, 22:697
Butyl vinyl ether, 1:254
  physical properties of, 1:255t
2-Butyne-1,4-diol, 20:36. See also Butynediol
Butynediol
  health and safety factors, 1:238
  manufacture, 1:236–238
  physical properties of, 1:235t
  production from acetylene, 1:181, 220, 231, 234, 235–238
  reactions, 1:236
  shipment, storage, and price, 1:238
  specifications and analysis, 1:238
  uses of, 1:238
2-Butynoic acid (tetrolic), 5:34t
Butyraldehyde(s), 4:459–470
  annual consumption by region, 2:67t
  azeotropes, 4:460t
  chemical reactions, 4:460–463
  economic aspects, 4:464
  health and safety factors, 4:466–467
  manufacture, 4:463
  physical properties of, 4:459t
  production from propylene, 20:786
  specifications and analysis, 4:464, 465t
  storage and handling, 4:464, 466
  uses of, 4:467–468
n-Butyraldehyde, 4:459
  animal toxicity, 4:466t
  azeotropes, 4:460t
  1-butanol manufacture from, 4:396
  physical properties of, 4:459t
  quality specifications, 4:465t
  effect of unsaturation on toxicity, 2:69t
  feedstock for higher aliphatic alcohols, 2:27t, 30t
  spectroscopic properties of, 2:62t
Butyric acid, 5:27
  butyraldehyde derivative, 4:460, 467
  dissociation constant, 5:40t
  in fermentation, 11:7
  physical properties, 5:29t
Butyroin, butyraldehyde derivative, 4:462
  γ-Butyro lactone, 1:244–249; 14:131
  acetylene-derived, 1:217, 231, 244–249
  health and safety factors, 1:249
  in lithium cells, 3:459
  manufacture, 1:248
  physical properties of, 1:245t
  production of, 23:424
  for purification of hydrocarbon-derived acetylene, 1:203
  reactions, 1:245–248
  shipment and storage, 1:248–249
  solubility of acetylene in, 1:178t
  specifications and analysis, 1:249
  uses of, 1:249
  γ-butyloxyacrylamyl-l-leucine anhydride, chiral derivatizing reagent, 6:76t
  3-O-Butyryl-2,6-di-O-pentyl-derivatized cyclodextrin, 6:98
  B-vector, 8:587–588
  B-vinyl-9-BBN, 13:662
  BWR/6 nuclear reactor, 17:580–582
  BXN cotton, 8:2
  Bylotensin, molecular formula and structure, 5:129t
  Bypass currents, 9:663
  Bypass flow effects, in heat transfer, 13:258
  Bypassing in size separation, 22:277–278
  in wet classifiers, 22:284–285
  By-product energy, 10:135
  By-product formation, in large-scale pharmaceutical synthesis, 18:728–729
  By-product polyethylene waxes, 26:219
  By-product power, 10:140–141
  By-products disposal in vinyl chloride manufacture, 25:644–645
  in furfural production, 12:265–266
  malt, 15:535–536
  By-product synergies, 10:165–166
  Byssinosis, 8:33
  C₂, chlorinated, 13:833
  C₂-Diversity, 6:17
  C₄ fraction, 4:402. See also Butylene(s)
  separation and purification, 4:418–421
  C₆–C₁₁ alcohols, 2:2
  uses of, 2:22
  C₆ nonaromatics, 23:329
  C₈ aromatics ethylbenzene recovery from, 23:333–334
    extraction of, 10:785–786
  C₁₂ alcohol, 2:2, 11t
    cosmetic application, 2:20
    uses of, 2:22
  C₁₃ alcohol, 2:2, 11t
    uses of, 2:22
  C₁₄ alcohol, 2:2, 21
    cosmetic application, 2:20
  C₁₄–C₂₂ fatty alcohols, 2:21
C16 alcohol, 2:2
  - cosmetic application, 2:20, 21
C18 alcohol, 2:2
  - cosmetic application, 2:20–21
C20, C24, C26, C28, C32 alcohols, 2:2
C22 alcohol, 2:2
  - cosmetic application, 2:21
C30 alcohol, 2:2
  - agricultural applications, 2:21
C-30 skeleton group polyethers, 20:129
C60 structure, 23:851
C1216 alcohol
  - cosmetic application, 2:21
Cable(s)
  - HDTS, 23:852–854
  - LDPE, 20:234–236
  - PPTA fibers in, 19:734
  - PVC in, 25:685
Cable coating extrusion, 19:548–549, 790
Cable insulating materials, mechanical and electrical properties of, 17:849t
Cable insulation
  - HDPE, 20:174–175
  - LLDPE, 20:208–209
Cable materials, in electronic materials packaging, 17:848
Cable sheathing, lead–antimony alloys in, 14:771
Cabrueva oil, 24:546
Cacodylic acid, 13:298, 324–325
C-acylation, 9:282
Cadaverine, 2:81
Cadmium (Cd), 4:471–507. See also
  - Cadmium alloys; Cadmium compounds; Helium–cadmium (HeCd) laser; HgCdTe photodiodes; Mercury cadmium telluride (MCT);
  - Nickel–cadmium batteries in barium alloys, 4:12t
  - catalyst poison, 5:257t
  - in coal, 6:718
  - in coatings, 24:795
  - consumption by country, 4:482t
  - in cotton fiber, 8:20t
  - economic aspects, 4:482–485
  - effect on copper resistivity, 7:676t
  - environmental concerns, 4:488–493
  - in galvanic series, 7:805t
  - health and safety factors, 4:494–498
  - manufacture of, 4:476–482
  - occurrence of, 4:472–473
  - physical properties of, 4:476, 477t
  - production by country, 4:474t
  - recycling, 4:487–488, 519
  - solubility limits and electrical conductivity effects on copper, 7:750t
  - sources and supplies of, 4:473–475
  - specifications and analysis, 4:484t, 485–487
  - standard electrode potential, 7:799t
  - uses of, 4:498–503
  - with selenium in pigments, 22:102
  - world consumption of refined, 4:482t
  - world production of refined, 4:473t
  - in zinc die-casting alloys, 26:589
Cadmium(II), concentration formation constant of chelates, 5:717t
Cadmium acetate, 4:517–518
Cadmium alloys, 4:501–502
Cadmium antimonide, 3:53–54
  - physical properties of, 4:508t
Cadmium arsenide, 4:510
Cadmium-based pigments, 19:386
Cadmium benzoate, 4:518
Cadmium borates, 4:510–511
Cadmium borotungstate, 4:511
Cadmium bromide, 4:512
  - physical properties of, 4:322t, 508t
Cadmium bromide tetrahydrate, 4:512
Cadmium/cadmium compound plating baths, 9:799–800
Cadmium–cadmium hydroxide electrodes, constant discharge curve, 3:414
Cadmium carbonate, 4:511
  - physical properties of, 4:508t
Cadmium chloride, 4:512
  - physical properties of, 4:508t
Cadmium chromate, molecular formula, properties, and uses, 6:561t
Cadmium complexes, 4:511–512
Cadmium compounds, 4:507, 507–523, 508t
  - analysis, 4:519
  - economic aspects, 4:518–519
  - environmental concerns, 4:521
  - health and safety factors, 4:519–521
  - inorganic compounds, 4:510–516
  - organic compounds, 4:516–518
  - OSHA permissible levels for, 19:413
  - physical properties of, 4:507, 508–509t
  - uses of, 4:521–522
Cadmium copper, 7:752–753
Cadmium decanoate, 4:518
Cadmium diarsenide, 4:510
Cadmium dichromate, molecular formula, properties, and uses, 6:561t
Cadmium dihydrogen phosphate, 4:514
Cadmium diphosphide, 4:510
Cadmium electrodes, 3:408
standard potential, 3:413t
Cadmium electroplating, 24:749
Cadmium ethylenediamine hydroxide,
solvent for cotton, 8:21
Cadmium fluoride, 4:512
physical properties of, 4:508t
Cadmium fluoroborate, 4:511
Cadmium fluoroborate hexahydrate,
4:157t, 158, 159
Cadmium halides, 4:512–513
Cadmium hydroxide, 4:513
physical properties of, 4:508t
Cadmium iodide, 4:512–513
physical properties of α-form, 4:508t
Cadmium-ion laser, 14:685
Cadmium laurate, 4:518
Cadmium lithopones, 4:516
Cadmium mercury telluride, 4:503
Cadmium metaphosphate, 4:514
Cadmium metasilicate (m-silicate), 4:515
physical properties of, 4:509t
Cadmium myristate, 4:518
Cadmium naphthenate, 4:518
Cadmium nitrate, 4:513
physical properties of, 4:508t
Cadmium nitrate tetrahydrate, 4:513
physical properties of, 4:508t
Cadmium octoate, 4:518
Cadmium orange, color and bad gap, 7:335t
Cadmium orthosilicate, 4:515
Cadmium oxide, 4:507, 513–514
physical properties of, 4:508t
Cadmium palmitate, 4:518
Cadmium perchlorate, 18:278
Cadmium peroxide, 4:514
Cadmium phenolate, 4:518
Cadmium phosphate, 4:514
Cadmium pigments, 19:407
Cadmium plating, 9:763–764
Cadmium selenide, 4:514–515, 521
physical properties of α-form, 4:509t
piezochromic material, 6:607
Cadmium selenite, 22:73t
Cadmium silicates, 4:515
Cadmium stearate, 4:518
Cadmium sulfate, physical properties of, 4:509t
Cadmium sulfate hydrate, 4:515
physical properties of, 4:509t
Cadmium sulfate monohydrate, 4:515
physical properties of, 4:509t
Cadmium sulfide, 4:503, 515–516, 518, 521
colloidal precipitation color, 7:343t
color and bad gap, 7:335t
physical properties of, 4:509t
piezochromic material, 6:607
Cadmium sulfide photodetectors, 19:137
Cadmium sulfide photodetector,
fabrication and performance of,
19:155–156
Cadmium sulfide precipitates, 23:636
Cadmium sulfide selenide
colloidal precipitation color, 7:343t
color and bad gap, 7:335t
Cadmium Sulfide Yellow, pigment for
plastics, 7:370t
Cadmium Sulfoselenide Orange, pigment
for plastics, 7:370t
Cadmium Sulfoxylene Red, pigment for
plastics, 7:370t
Cadmium telluride, 4:503, 514–515, 521;
24:412–413
physical properties of, 4:509t
thin film PV technology, 23:42–43
Cadmium tetrathiophne, 4:510
Cadmium tungstate, 4:516
Cadmium Yellow, color and bad gap,
7:335t
Cadmoselite, 4:472t
analysis in green coffee, 7:253t
analysis in roasted, brewed, and instant
coffee, 7:255t
in chocolate and cocoa, 6:366–367
in cocoa shell from roasted beans,
6:357t
content of finished chocolate products,
6:367t
content of various chocolate liquors,
6:366t
economic aspects, 2:108
Caisson thickeners, 22:65
Cake deposition, prevention by vibration,
11:382–383
Cake filtration theory, 11:330–337
advanced modeling for, 11:336–337
compactable cake modeling in,
11:335–336
two-resistance model for, 11:333–335
Cake flours, 26:283
Cake removal, in filtration, 11:382
Cake system, of yarn washing and drying, 11:258–259
Cake-wash machines, 11:258
Caking of sodium chloride (salt), 22:808
of sodium nitrite, 22:856–857
sodium sulfates and, 22:863
Caking coal, defined, 6:827
Caking properties, coal, 6:780–781
Calabash curare, 2:74
Calamine process, 5:747
Calamitic mesogens, 20:79
Calan, molecular formula and structure, 5:97t, 119t
Calandria evaporator, in sodium chloride solution mining, 22:804
Calcicard, molecular formula and structure, 5:747
Calciherols, 25:791–793
dietary sources of, 25:793
Calcination, 2:353, 403, 407–410;
12:726–727
characteristics, of ceramics processing, 5:645
in ferroelectric preparation, 11:99
in pyrometallurgy, 16:138
Calcined aluminas, 2:403–406
capacities of domestic plants, 2:412t
economic aspects, 2:410–411
in making aluminate cement and tabular alumina, 2:411, 415
preparation, 2:407–410
reactions, 2:349
specialty, 2:407–410
uses of, 2:412–414
U.S. imports and exports, 2:411t
world production by country, 2:355t, 410t
Calcined anhydrite, 4:599
Calcined dolomite, 15:42, 53
Calcined iron oxide, 19:399
Calciners, 9:130
Calcining
kaolins, 6:679
of uranium ores, 25:401
Calcining kiln, 12:727
Calcipotriene, 25:792
Calcite, 4:551–552; 5:785t; 15:29, 31, 32
in clays, 6:685
in coal, 6:718
as drilling fluid material, 9:10
as filler, 11:311
hardness in various scales, 1:3t
isoelectric point, 8:674t
physical properties of, 4:552t
Calcitic limestone, 15:26
Calcitrol, 25:791, 792
Calcium (Ca), 4:524–532. See also
Lead–calcium alloys;
Lead–calcium–tin alloys
beer as dietary source of, 3:588
chemical reactions, 4:525–526
in coal, 6:718
content in cocoa and chocolate products, 6:371t
in cotton fiber, 8:20t
economic aspects, 4:528–529
effect on beer making when present in water, 3:573
effect on copper resistivity, 7:676t
in fertilizers, 11:113
in flax fiber, 11:598t
health and safety factors, 4:529–530
in M-type ferrites, 11:69
in pet foods, 10:851
in ruminant feeds, 10:867
in sodium analysis, 22:775
in sodium chloride electrolysis, 22:771
manufacture, 4:526–528
physical properties of, 4:524–525, 525t
reserve batteries based on, 3:468
role in hemostatic system, 4:87
shipment, 4:528
silicone chemistry and, 22:550
specifications, 4:529
uses of, 4:530
U.S. imports for consumption, 4:528t
Calcium(II), concentration formation constant of chelates, 5:717t
12-Calcium-7-aluminate, phase in Portland cement clinker, 5:472t
Calcium absorption, 26:292
Calcium addition, in silicon production, 22:505–506
Calcium alginate gels, 4:728
Calcium alloys, 4:530
Calcium aluminates, 2:345t
Calcium aluminates cement, 2:415–416;
5:500t, 502
manufacture, 5:493–494
mineral constituent characteristics, 2:415t
as refractory raw materials, 21:489
uses of, 2:416
Calcium aluminate chloride, phase in
Portland cement clinker, 5:472t
Calcium aluminate fluoride, phase in
Portland cement clinker, 5:472t
Calcium aluminoferrite, phase in Portland
cement clinker, 5:472t
Calcium aluminoferrite hydrate, 5:477t
Calcium–aluminum alloys, 4:530
Calcium amalgam, 22:773
Calcium ammonium nitrate, 2:724
Calcium analysis, of water, 26:37
Calcium A zeolite, separation
of hydrocarbons by, 16:823
Calcium–barium–silicon alloy, 22:519
Calcium-bearing manganese silicon,
22:519
Calcium bentonites, 6:664–666, 696
Calcium borosilicate, allowed pigment in
anticorrosive coatings, 7:195t
Calcium bromide, dessicant, 8:360
Calcium bromide
physical properties of, 4:322t, 328
solubility in water, 4:322t
Calcium bromide hydrates, 9:34
Calcium bromide solution, 9:28t
Calcium bromide/zinc bromide solution,
9:28t
Calcium–bromine (C–B, UT-3) cycle,
13:848
Calcium carbide, 4:532–551, 647
acetylene manufacture from, 1:204–208,
216, 218, 228
in ammonia synthesis, 11:115
chemical reactions, 4:534–535
economic aspects, 4:541–548, 546–547t
health and safety factors, 4:541
manufacture, 4:535–539
physical properties of, 4:533t
production of, 15:62
quicklime in, 15:62
shipment and transportation, 4:540–541
specifications and analysis, 4:539–540
uses of, 4:548–550
in vinyl chloride manufacture, 25:633
Calcium carbide (2:1), 4:649t
Calcium carbonate(s), 4:551–556
in beet juice purification, 23:461–462
calcination of, 14:503
cathodic precipitate inhibitor, 7:815
economic aspects, 4:554
effect as fillers for LDPE barrier
polymers, 3:398t
as filler, 11:311; 22:41
health and safety factors related to,
4:554; 15:74
in hydrogen fluoride manufacture,
14:10
inorganic precipitation of, 15:30
manufacture of, 4:552–553
in paper manufacture, 18:107–108
physical properties of, 4:551–552
as a rubber filler, 21:776, 777
as sealants, 22:33
scale formation, 18:851
in solar salt harvesting, 22:806–807
specifications, standards, and quality
control, 4:554
in synthetic fillers, 11:314
uses of, 4:554–555
water treatment compound for
aquaculture in U.S., 3:213t
Calcium carbonate protective scale, in
industrial water treatment,
26:142–143
Calcium carbonate saturation index (SI),
26:186–188
Calcium carbonate (limestone) slurry, in
flue gas scrubbing, 11:717
Calcium channel blockers, 5:116–135
aryalkylamines and benzothiazepins,
5:116–117, 118–120t
1,4-dihydropyridines, 5:124–129t
Calcium channels, 5:85–86
role in excitation and contraction
coupling, 5:81–82
Calcium chelate dental cements,
8:286–287
classification and composition, 8:284t
Calcium chloride, 4:557–570; 12:67
dessicant, 8:359
economic aspects, 4:561–563
environmental concerns, 4:563–565
as a firming agent, 12:57
grades and specifications, 4:563, 564t
health and safety factors, 4:565
manufacture of, 4:559–561
physical properties of, 4:557–559
recovery from brine, 5:793–795
therapeutant for aquaculture in U.S.,
3:211t
uses of, 4:566–568, 567t
U.S. exports, 4:562t
U.S. imports for consumption, 4:563t
water treatment compound
for aquaculture in U.S., 3:213t
Calcium chloride dihydrate, physical
properties of, 4:557t
Calcium chloride hexahydrate, physical
properties of, 4:557t
Calcium chloride monohydrate, physical
properties of, 4:557t
Calcium chloride production, use
of aqueous hydrochloric acid in,
13:834
Calcium chloride tetrahydrate, physical
properties of, 4:557t
Calcium chromate, molecular formula,
properties, and uses, 6:561t
Calcium chromate(V), 6:536
molecular formula, properties, and uses,
6:564t
Calcium citrate, molecular formula, 6:638t
Calcium citrate tetrahydrate
molecular formula, 6:638t
solubility in water, 6:649t
Calcium cyanamide, 4:535, 548–549; 8:157;
17:270–271
manufacture, 8:161
Calcium cyanamid process, for ammonia
synthesis, 11:114, 115
Calcium cyanide, 8:194–197
Calcium cyanide diammoniate, 8:195
Calcium dichromate, molecular formula,
properties, and uses, 6:561t
5-Calcium disilicate monosulfate, phase in
Portland cement clinker, 5:472t
5-Calcium disilicate monocarbonate, phase
in Portland cement clinker, 5:472t
Calcium disilicide, 4:530
8-Calcium disodium trialuminate, phase in
Portland cement clinker, 5:472t
Calcium doping, 23:842–844
Calcium β-alumina, 2:406t
Calcium ethylenediaminetetraacetate,
7:596t
Calcium-exchanged A zeolite, 16:822
Calcium fluoride 4:570–582
color of, 7:337
economic aspects, 4:575–576
environmental concerns, 4:578–579
grades and specifications, 4:576–578
health and safety factors, 4:578
manufacture, 4:575
mining, 4:574–575
occurrence, 4:570–572
physical properties of, 4:572–573
shipment, 4:575
uses of, 4:579–580
Calcium fluoroborate dihydrate, 4:153
Calcium hydride, 13:609, 610
Calcium hydroxide, 5:479t
as a flocculating agent, 11:626–627
in Portland cement hydration,
5:477t
water treatment compound
for aquaculture in U.S., 3:213t
Calcium hypochlorite
bleaching agent, 4:51e
disinfecting agent for aquaculture in
U.S., 3:205t, 212t
end use of chlorine, 6:135t
pool sanitizer, 26:175
properties and characteristics compared
to other disinfectants, 8:608t
pulp bleaching agent, 21:47–48
Calcium iodate monohydrate, 14:375
Calcium ions, soap and, 22:724
Calcium langbeinite, phase in Portland
cement clinker, 5:472t
Calcium limes, 15:25
sales of, 15:60
Calcium magnesium acetate, 1:127
Calcium magnesium carbonate, health
and safety factors related to, 15:74
Calcium monosulfoaluminate, 5:477t
Calcium montmorillonite, 6:686, 696
structure and composition, 6:668–669
Calcium nitrate, in nitrogen fertilizers,
11:116–117
Calcium oil-soluble sulfonates, 23:533
Calcium oxide
calcium carbide impurity, 4:532
in coal for gasification, 6:774, 782
dessicant, 8:360
in Portland cement, 5:467
in Portland cement clinker, 5:472t
reactions in cement manufacture,
5:490
therapeutant for aquaculture in U.S.,
3:211t
water treatment compound
for aquaculture in U.S., 3:213t
Calcium oxide–aluminum oxide–silicon
dioxide (C–A–S) system, 5:468–471
Calcium pantothenate, 25:799
Calcium pectate gels, 4:728
Calcium peroxide, 18:395–396
applications of, 18:395, 396
from hydrogen peroxide, 14:67
Calcium phosphate(s), 11:120; 18:836–839
accelerator for dental cements, 8:285, 341–342
manufacture of, 18:854–855
uses for, 18:838–839
Calcium phosphide, 19:59
Calcium phosphinite, 19:54
Calcium phosphosilicate, allowed pigment in anticorrosive coatings, 7:195t
Calcium propionate
antimicrobial used in cosmetics, 7:831t
encapsulated, 16:456
Calcium pyrophosphate(s), 18:843–844
manufacture of, 18:859
Calcium reduction, of pure vanadium, 25:519
Calcium removal, in beet juice purification, 23:463
Calcium-responsive drug delivery, 9:64–65
Calcium salt(s)
as flocculating agent, 11:626
in hard water, 22:817, 818
Calcium salt of methylarsonic acid (CMA), 13:325
Calcium selenite, 22:73t
Calcium silicate(s), 12:63
hydration, 5:475–477
Calcium silicate hydrate, 5:477t
hydration, 5:475
Calcium silicate hydrate gel (CSH gel), 5:479t
Calcium–silicon alloy, 22:519
Calcium–silver technology, for batteries, 22:684
Calcium stearate, with butyl rubber, 4:449
Calcium sulfate, 4:582–602; 11:119, 120; 12:67
dessicant, 8:360
economic aspects, 4:595–597
filler for dental cements, 8:287
manufacture of, 4:588–593
phase in Portland cement clinker, 5:472t
physical properties of, 4:583–585
in Portland cement, 5:467
recovery of, 14:12
scale formation, 4:593–595
shipment of, 4:595
sources of, 4:585–586
specifications, 4:597–598, 598t
thermodynamics and kinetics of gypsum formation–decomposition, 4:586–588
uses of, 4:598–601
Calcium sulfate α-hemihydrate, 4:582
manufacture, 4:590–591
Calcium sulfate anhydrous (anhydrite), 4:582, 583t
manufacture of, 4:591
physical properties of, 4:585t
uses of, 4:599
Calcium sulfate β-hemihydrate, 4:583
manufacture of, 4:588–590
Calcium sulfate dihydrate (gypsum), 4:582; 5:479t
in dental plasters, 8:288–292
physical properties of, 4:585t
Calcium sulfate hemihydrate, 4:582
physical properties of, 4:585t
uses of, 4:599–601
Calcium sulfide, 23:577
from coal gasification with limestone, 6:775
phase in Portland cement, 5:471
Calcium sulfoaluminate, phase in Portland cement clinker, 5:472t
Calcium superoxide, 18:417
Calcium tribismuthide, alloy-like superconducting compound, 4:18t
Calcium tungstate, uses for, 25:388
Calcium vanadates, 25:536, 538
Calcium–zinc stabilizers, for PVC polymers, 25:671–672
Calderbank–Moo-Young equation, 15:688
Calidine, molecular formula and structure, 5:127t
Calendering, 19:555–556
ABS, 1:427
of ethylene–acrylic elastomers, 10:701
of polychloroprene, 19:851
of staple-fiber nonwoven fabrics, 17:514–515
Calgene antifoam, commercial defoamer, 8:241t
Calibration
in high purity gas analysis, 13:465
in quality control, 21:161
of sensors, 22:268–269
Calibration program, in commercial-scale pharmaceutical operations, 18:735
Caliche, 5:785t
  iodine recovery from, 5:795; 14:360
California
  diesel fuel composition standards in, 12:430
  emissions reduction in, 12:418–419
  environmental regulations in, 19:527
  mercury legislation in, 16:46
  water overpumping in, 26:52–53
  wine industry in, 26:323
California Air Resources Board (CARB), 11:686
  regulations, 13:774
California emission standards, 10:32, 57
California giant kelp, common names, 3:188t
California hazardous materials management statute, 21:830–831
California Standard Offer-4, regulations in, 12:534
California Technical Bulletin 133 test, 11:459
California Technical Bulletin 133 test, 11:459
Californium ( Cf ), 1:463–491, 464t
  electronic configuration, 1:474t
  ion type and color, 1:477t
  metal properties of, 1:482t
Caliper Life Sciences, 26:976
Calixarene(s), 2:209; 24:35–36, 47
  crystals of, 24:53
  derivatives of, 24:37
  inclusion compounds in, 14:165–166
  lipophilic, 24:57
  organometallic derivatives of, 24:44–45
  receptors, 16:785
Calix–cavitates, 14:160
Calixpyrroles, 24:45
  displacement assays using, 24:46
C-alkylations, 9:280
Callose, 5:365
Calmagite, 9:382, 383
Calmodulin, purification, 3:845
Calomel, 16:38
Calomel electrode, 14:29
Caloric restriction, 2:812–813
Calorimeters, heat release, 11:458
Calorimetry studies, in pilot plant safety, 18:732–733
Calotype process, 19:172
CALPUFF odor impact model, 26:725
Calslot, molecular formula and structure, 5:127t
Calutron separator, 25:415–416
Calycanthine, 2:99
Cambium, in flax fiber, 11:597
Cambridge Crystallographic Database, 6:9–10
Cambridge Structural Database (CSD), 6:9–10; 26:426
Camouflaged boranes, 4:190–191
Campanulales, alkaloids in, 2:75
Camphene, 3:231; 24:477, 478, 497–498
Campholenic aldehyde, 24:496, 534–536
  sandalwood materials made from, 24:535–536
Camphor, 3:231; 24:540
Camphoraceous odor, 3:227t
Canada. See also Atomic Energy of Canada, Ltd. (AECL); Environment Canada aquaculture chemicals registered in, 3:218t, 218–219
  bioengineering research program, 1:702
  biotechnology regulation in, 18:543
  flax fiber industry in, 11:593
  indium in, 14:193–194
  iron ore deposits in, 14:495
  magnesium production in, 15:344–345
  methanol producers in, 16:311t
  natural graphite in, 12:780
  platinum-group metals in, 19:605
  PVC capacity of, 25:677t
  salt industry in, 22:810–811
  silicon carbide statistics for, 22:536, 537t
  titanium reserves in, 24:845
  vinyl chloride production in, 25:647t
Canadian Deuterium Uranium (CANDU) reactors, 17:583–585
  design of, 17:567
Canadian Electrolytic Zinc, Ltd., 26:564
Canadian Environmental Protection Act (CEPA), 18:542; 23:120–121
Canadian nuclear power program, 17:585
Cancer. See also Breast cancer;
  Carcinogenic risk; Carcinogens;
  Prostate cancers
  antiaging agents for, 2:811, 825–827
  arsenic and, 3:278
  boron neutron capture therapy, 4:226–227
  DEHP and, 25:674–675
food additives and, 12:35–36
indoor air pollution can cause, 1:817
obesity and, 3:87r
photodynamic treatment of, 19:121–122
radiation exposure and, 17:551–552
role of ascorbic acid in preventing, 25:769
uranium and, 17:528
from vinyl chloride contact, 25:651
Cancer biomarkers, 17:528
Cancer-causing substances, regulated areas related to, 21:838–839
Cancer prevention, selenium in, 22:91, 101–102
Cancer slope factors, 25:243
Cancer treatment
platinum complexes in, 19:628
polymeric drug delivery systems for, 9:82
radioactive iodine, 14:373
Can coatings
growth of, 10:446–447
coatings, protective, 18:38–39
Candelilla
in cosmetic molded sticks, 7:840t
Candelilla wax, 26:210
Candelum, 24:498
Canderal, 24:226
Candesartan, molecular formula and structure, 5:152t
*Candida, 26:446
*Candida albicans, 26:475
*Candida antarctica lipase B, 10:307
*Candida glabrata, genome of, 26:450t
*Candida utilis, 26:473
Candle filters, 11:362–363
Cando-luminescence, cerium application in, 5:129
Can (cylinder) dryers, 9:134
Candy
citric acid in, 6:645
packaging, 18:35
Cane-Celmer-Westley unified stereochemical model, 20:137
Cane factory, energy requirements for, 23:449–450
Cane sugar
chemical properties of, 23:442–444
color of, 23:444
physical properties of, 23:438–441
refining, 23:451–454
use in foods, 23:439–441
Cane sugar products, uses for, 23:481–482
Canine Nutrition Expert (CNE) subcommittee, 10:857
Can manufacturing. See also Cans
coatings exhaust streams from, 10:106–108
operating techniques in, 10:107
*Cannabis sativa, 11:293
Canned foods, 18:33
Canned fruits and vegetables, citric acid in, 6:646
Canned motor pumps, 21:76–78
Canned pet foods, 10:849
Cannel coal, 6:705
Cannizzaro reaction, 12:110
solid-state crossed, 16:574
Cannon–Fenske viscometer, 21:728
Canoe fragrances, 18:360
Canonical ensemble, 1:33
See also Can manufacturing
Cantala, 11:296
uses of, 11:299t
Cantilever beams, in MEMS, 22:260
CAP-18/LL-37 peptide, 18:259–260
Capacitance
double-layer, 9:569, 570
exponents of dimensions, 8:585t
Capacitance discharge, food preservation by, 12:87
Capacitance manometers, 20:658–659
Capacitance probes, 20:681
Capacitive pressure transducers, 20:656–657
Capacitor fabrication, 10:17
Capacitor-grade tantalum powder, 24:326
Capacitors
carbon aerogels in supercapacitors, 1:767
embedded, 10:15
multilayer, 11:101–103
tantalum, 24:331–333
Capacity, of ion-exchange resins, 14:393–395
Capacity dies, in bar soap manufacture, 22:752
CAPIC (2-chloro-3-amino-4-methylpyridine), 18:737, 738, 740–741, 743
Capillarity, 9:112–115
in porous and fine granular materials, 9:110
Capillary Breakup Extensional Rheometer (CaBER), 21:740
Capillary columns, 6:377, 408
  band broadening, 6:412
  instrumentation, 6:424
  speciality applications, 6:427t
Capillary condensation, 1:585, 591; 9:113
Capillary drilling, 9:600
Capillary electrophromatography, 4:603, 639–641; 6:385
Capillary electrophromatography-mass spectrometry (CE-MS), 4:641
Capillary electrodes, 14:27
  antibody based columns with, 6:402
  chiral additives, 6:77–79
  applications, 4:641
  basic principles, 4:606–609
  detectors, 4:634–635
  for DNA analysis, 4:636–637
  flow profiles generated, 4:608
  instrumentation, 4:633
  as microfluidic assay technique, 26:969, 970
  sample injection, 4:633–634
  sample preparation, 4:609–610
  separation selectivity factors, 4:635–636
Capillary flow, 9:97
Capillary forces, 11:800
atomic force microscopy, 3:322
Capillary gas chromatographs, 10:551.
  See also Gas chromatography
Capillary gel electrophoresis (CGE), in microfluidic assays, 26:971
Capillary hydrodynamic flow (CHDF) techniques, 16:291; 20:381
Capillary microfiltration/ultrafiltration (MF/UF) technology, 26:83–84
Capillary number, 11:746
Capillary optics, 26:438
Capillary pumped loops (CPLs), 13:236–237
Capillary rheology tests, 19:578
Capillary separations, 4:602–647
  sample preparation, 4:609–610
Capillary viscometers, 21:726–731
  commercial, 21:729
  uses of, 21:727
Capillary zone electrophoresis, 4:636
Capital cost, heat exchanger, 13:192–196
Capital investment cost, 9:527–531
  estimates of, 9:529–530
Capitalization, in fine chemical production, 11:428
CAPlus database, 18:235
Capo designation, for boron hydrides, 4:174
Capoten, molecular formula and structure, 5:149t
Capozide, molecular formula and structure, 5:149t
Capped argon stirring (CAS), 23:264
Capped octahedron, geometry for metal coordination numbers, 7:574, 575t
Capped square antiprismatic, geometry for metal coordination numbers, 7:574, 575t
Capped trigonal prismatic, geometry for metal coordination numbers, 7:574, 575t
Capraldehyde. See Decanal
Capric acid
  boiling point, 5:53t
  percent in important fats and oils, 5:47t
  physical properties, 5:29t
  in toilet soap making, 22:733t
CAPRI system, 18:229
Caproaldehyde. See Hexanal
Poly(γ-caprolactone)/dimethylacrylate, in shape-memory polymers, 22:357
Poly(γ-caprolactone)/OMLS nanocomposite, 20:311
Poly(γ-caprolactone) switching segment, in shape-memory polymers, 22:362–363
Caproic acid
  boiling point, 5:53t
  percentage in selected fats and oils, 2:519t; 5:47t
  physical properties, 5:29t
  from benzoic acid hydrogenation, 3:631
  extraction of, 10:785
ε-Caprolactam, 19:747, 748
ε-Caprolactone, block copolymer synthesis, 7:647t
Caproleyic acid, physical properties, 5:31t
Caprylaldehyde. See Octanal
Caprylic acid
  boiling point, 5:53t
  percentage in selected fats and oils, 2:519t; 5:47t
  physical properties, 5:29t
Caprylic/capric glycerides, cosmetically useful lipid, 7:833t
Caprylic/capric triglyceride, cosmetically useful lipid, 7:833t
Capsanthin, 24:560
Capsicum group, 23:164–165
Capsorubin, 24:560
Capsular polysaccharides, 20:455
Capsules. See also Microencapsulation extruding, 16:446 pharmaceutical, 18:708 produced by spray drying, 16:447–448
Capsule standard platinum resistance thermometers, 24:445
Captafol, 23:629, 647
Captan, 23:628
Captiva camera, 19:307
“Captive” hydrogen, 13:841
Captopril, 5:148
molecular formula and structure, 5:149t
Caraway seed, 23:165
Carbalddehyde, 2:58
Carbamate esters, in oxazolidinone preparation, 17:738–739
Carbamate groups, in polyurethanes, 25:454
Carbamate herbicides, 13:320
Carbamates, 13:108
amine, 16:359
Carbamic acid nitrile, 8:158
Carbamide derivatives, as cellulose solvents, 11:272
Carbamodiimide, 8:158
Carbamoylated gelatin, 12:444
Carbamoyl-methylphosphoryl family, extractants of, 10:789
Carbaryl chlorides, 12:180
Carbanion coordination, 13:656–657
Carbanions, 21:101
boron-stabilized, 13:660–661
Carbanion stability, initiators and, 14:245t
Carbapenems, bacterial resistance mechanisms, 3:32t
Carbazole (CZ) dendrimers, 26:803
Carbazole Dioxazine Violet, pigment for plastics, 7:367t
Carbazole Violet, 19:445–446
Carbendazim, 6:303
Carbene insertion-extrusion cycle, 21:138
Carbene precursors, 26:930
Carbenes, 26:843, 847
Carbide acetylene, impurities in, 1:207t
Carbide lime, 15:27
carbonyl group reactions, 4:697–710
classification, 4:696–697
in cocoa shell from roasted beans, 6:357t
content in cocoa beans and their
products, 6:369t
crystalline state of, 11:534
hydroxyl group reactions, 4:710–713
modifications of carbon chain, 4:713
nomenclature, 4:696
in pet foods, 10:853–854
reaction during acid pulping, 21:29
reaction during alkaline pulping,
21:27–29
reaction during chemical pulping,
21:26–29
representation, 4:697
ring forms, 4:697–700
saccharide chemistry, 4:697–713
sulfated, 23:538
synthesis, 4:704–705
uses of, 4:713–731
in wood, 26:335
Carbomer, 7:856
for cosmetics emulsification, 7:837
Carbometalation, 25:108–109
of olefins and acetylenes, 25:117
Carbomycin A, 15:287
Carbon (C), 4:733–741. See also Activated
carbon; Artificial graphite; C2;
Carbides; Carbon black; CBr3
compounds; C–C bond forming
reactions; Charcoal entries;
14C isotope; Diamond entries; Graphite
entries; [H]- and [13C]-nmr spectroscopy;
Low carbon silicomanganese;
Natural diamond; Natural graphite;
Synthetic diamond
alloyed with iron, 23:248
in amorphous silica, 22:385
antimony impregnated, 3:53
atomic structure of, 22:232
biologically active, 17:803
as a blast furnace refractory,
12:761–765
carbides produced from, 4:647–648
catalyst fouling by, 5:230, 263–270
catalyst regeneration after fouling
by, 5:304, 309
in chromium ferroalloys, 6:501t
colloidal suspensions, 7:275
color and bad gap, 7:335t
crystal structure, 4:734–735
diamond-like, 14:453
effect on stainless steel corrosion
resistance, 7:809
fiber reinforcement for ceramic–matrix
composite, 5:559–560
fluorine reactivity with, 11:832
formation on supported catalysts,
5:264–267
free-radical attack at, 21:100–101
glassy, 4:738
liquid chromatography stationary phase,
4:623
in microphones, 11:130
nomenclature, 4:735–736
pickling, 16:222–223
prevention of deactivation by fouling,
5:299–300
principal binary compounds of, 4:647
in pyridines, 21:98–100
refractory properties of, 21:491
resistance to hydrochloric acid, 13:827
in silicon carbide, 22:525–527
in silicon production, 22:502–503
silver impregnated with, 22:660
in sodium carbonate recovery, 22:790
sodium reactions with, 22:765
substituents in pyridines, 21:101–103
in tin smelting, 24:787–788
in titanium alloys, 24:855
vitreous silica reaction with, 22:419–420
in VOC adsorption, 26:680–683
widely used support materials, 5:324t
xenon bonded to, 17:331–332
Carbon-14, 4:807. See also 14C isotope
Carbon-14 dating, in fine art examination/
conservation, 11:418
Carbon-14 labeled materials, basic building
blocks of, 21:273
Carbonaceous fiber, 13:383–385
Carbonaceous limestone, 15:27
Carbonaceous materials, characteristics
of, 12:762
Carbonaceous resins, in hazardous waste
management, 25:813
Carbon adsorbents, preparation, 1:586
Carbon adsorption, in hazardous waste
management, 25:811–813
Carbon adsorption system, 26:681
Carbon adsorption units, 25:812
Carbon aerogels
applications, 1:767
preparation, 1:752
Carbon alpha olefins, 17:709–710. See also \( \alpha \)-olefins

Carbon–alumina refractories, 12:794
Carbon arcs, cerium application, 5:688
Carbonatation, in cane sugar refining, 23:452. See also Carbonation
Carbonatation plant, in sugarcane processing, 23:450
Carbonated soft drinks (CSDs), estimated maximum oxygen tolerance, 3:381t
Carbonated soft drink bottles, 20:45–46
Carbonates, 6:304–305; 9:806
Chemical properties, 6:306–310
Economic aspects, 6:312
Health and safety factors, 6:312
Iron, 14:533
Manufacture, 6:310–312
Physical properties of, 6:305–306
predicted deviations from Raoult's law based on hydrogen-bonding interactions, 8:814t
Shipping and storage, 6:312
Specifications and analysis, 6:312
Thallium, 24:630
Uranium, 25:430–432
Uses, 6:312–314
Zirconium, 26:648–649
Carbonate sediments, 15:30
Carbonate transesterifications, 12:646
Carbonation. See also Carbonatation
Entries
In beet juice purification, 23:461
Beverage, 15:847
Gallium extraction by, 12:345
In salicylic acid synthesis, 22:8
In sodium carbonate recovery, 22:791
Carbon-based ethyl radicals, 16:284
Carbon black, 4:735; 6:761–803; 18:678. See also Carbon blacks
Adsorption energy to pigments or fillers, 8:683t
Analytical test methods, 4:776–777t
Carburization with solid solutions of industrial carbides, 4:688
Chemical composition, 4:764–766, 765t
Classification of, 4:775–777
Commercial grades of, 21:775t
Economic aspects, 4:789–790
Environmental concerns, 4:792–793
As a filler for rubber, 21:773–776
Formation, 4:777–780
Health and safety factors, 4:790–792
Manufacture by acetylene black process, 4:786
Manufacture by impingement (channel, roller) black process, 4:787
Manufacture by lampblack process, 4:786–787
Manufacture by oil-furnace process, 4:780–785
Manufacture by thermal black process, 4:785–786
Microstructure, 4:767–769
Morphology effects on filled compound properties, 4:795t
Morphology of, 4:770–774, 773t
Particle structure of, 21:774
Physical properties and characterization, 4:763–775
Pigment for plastics, 7:369t
Properties of rubber-grade, 4:778t
Recycle blacks, 4:787–788
Separation from hydrocarbon-derived acetylene, 1:203–204
Surface activity, 4:774–775
Surface modification, 4:788–789
As a tire reinforcing filler, 21:808–809
Uses of, 4:793–800
U.S. manufacturers, 4:790t
U.S. production 1971–2000, 4:789t
U.S. production by grade, 4:794t
World capacities, 4:790t
Carbon black dispersant, lignosulfonates in, 15:17–18
Carbon black pigments, 19:409–410
Carbon blacks, 10:713; 11:316–317
As graphite filler materials, 12:724
Production of, 19:385
Carbon–carbon bond cleavage, in lignin, 15:6
Carbon–carbon bond formation, in organoboranes, 13:650–661. See also C–C bond forming reactions
Carbon–carbon bonds, in lignin, 15:2–5
Carbon–carbon composites, 26:772–773
Fabrication of, 26:767
Mechanical properties of, 26:774
Phenolic resins in, 18:793–794
Carbon–carbon double bond stretching, 14:235
Carbon–carbon initiators, 14:296–297; 23:379
Carbon circulation, in the hydrologic cycle, 26:27–30
Carbon compounds, of gallium, 12:361–361
Carbon content of direct reduced iron, 14:510
Carbon content of regenerated catalyst (CRC), 11:708
Carbon deposition, effect on catalyst activity, 23:335–336
Carbon diffusion, in gas carburizing, 16:203–204

Carbon disulfide manufacture, 4:836t

Carbon fiber, 11:214–215

Carbon fiber ceramic–matrix composites, 26:773

Carbon fiber composites, 10:451; 13:390; 26:771

auto clave d, 26:769

resins in, 18:793

Carbon fiber filaments, in heat pipes, 13:233

Carbon fiber metal–matrix composite, 26:774

Carbon fiber–PEEK, 26:764

Carbon fiber polymer–matrix composites, properties of, 26:774

Carbon-fiber-reinforced plastic composites, 26:760

Carbon fibers, 4:735; 24:624; 26:729–749

applications of, 26:745

cellulose-based, 26:735–736

crystallite dimensions in, 26:737–739

gas-phase grown, 26:736–737

PAN-based, 26:730–733

pitch-based, 26:733–735

plasma-treated, 26:744

processing of, 26:730–737

properties of, 26:739–743

prospects for, 26:746–747

quality control and specifications for, 26:745–746

as reinforcement materials, 26:756, 758–760

safety and health factors related to, 26:746

structural parameters of, 26:739t

structure and morphology of, 26:737–739s

surface treatment of, 26:743–745

Carbon fillers, 11:316–317

Carbon foam, 4:737

Carbon-free iron-nickel martensites, 23:308

Carbon–graphite fibers, 24:614

Carbon–graphite materials, 12:747–748

Carbon–half moly, 17:16

Carbonic acid, 4:805; 6:290

Carbonic anhydrase (CA) inhibitors, antihypertensives, 5:169

Carbonic anhydrase volume profile, 13:448

Carbonic ester manufacture, phosgene in, 18:811

Carboni da gas coal grade (Italy), 6:713t

Carbonigrassi corta fiamma coal grade (Italy), 6:713t

Carboni grassi da vapore coal grade (Italy), 6:713t

Carboni grassi media fiamma coal grade (Italy), 6:713t

Carboni magri coal grade (Italy), 6:713t

Carboni secchi coal grade (Italy), 6:713t

Carboni semigrassi coal grade (Italy), 6:713t

Carbon-nitride alloys, quaternary, 17:218.

See also Carbonitrides; Carbon nitride entries

Carbonitrides, in superalloys, 4:691

Carbonitriding, case hardening by, 16:210

Carbonization, in VDC polymer degradation, 25:713

Carbonizing, in wool processing, 26:385

Carbonless copy paper

phenolic resins in, 18:784–785

salicylic acid and derivatives in, 22:10

Carbon linings, 12:745

Carbon–magnesite brick, 12:793, 794

Carbon materials, hydrogen storage and, 13:852

Carbon–matrix composites, 26:751

Carbon microbeads, phenolic resins in, 18:797

Carbon mixes, designing, 12:729–730

Carbon molecular sieves

adsorption chromatography application, 1:610

adsorption isotherm for water, 1:622, 623

for gas separation, 1:618t

mesoporous, 1:655

narrow micropore distribution size, 1:586–587
nitrogen uptake curves for two samples, 1:601
poor size distribution of typical, 1:586–587, 631
properties and applications, 1:587t
resistance to mass transfer, 1:600
Carbon molecular sieve MSC-5A, variation of activation energy with kinetic molecular diameter for diffusion, 1:600t
Carbon monosulfide, 23:621
Carbon monoxide (CO), 5:1–27. See also CO entries
as air pollutant, 1:789, 798; 26:668–669
as air pollutant in mega-cities, 1:788t
from burning PVC, 25:682–683
as a catalyst deactivator, 13:708
chemical reactions, 5:3–12
from coal gasification, 6:771, 772, 773–774, 775
compatibility with elastomers and plastics, 5:4t
compatibility with refractory materials, 5:4t
control of, 10:102
conversion, 10:102
criteria pollutant, 1:813t
cryogenic methods used for purification, 8:42
electrostatic properties of, 1:621t
feedstock for higher aliphatic alcohols, 2:36
gas bulk separation, 1:618t
indoor air pollutant, 1:804
N-substituted acrylamide preparation, 1:295
oxidation by palladium, 5:235
physical properties, 5:2–3
in phosgene manufacture, 18:806
in a phosphoric acid fuel cell, 12:219
sodium reactions with, 22:766
thermophysical properties, 8:41t
three-way catalytic oxidation of, 10:49
in transition-metal complexes, 16:58
trends in emissions, 1:798
typical commercial gas absorption process, 1:26t
Carbon monoxide complexes
osmium, 19:643
platinum, 19:656
Carbon monoxide/hydrogen stoichiometric feed, production of methanol from, 25:303–305
Carbon monoxide off-gas, from phosphorus manufacture, 19:12
Carbon nanostructures, 17:46–58
Carbon Nanotechnologies, Inc., 1:718, 719
Carbon-nanotube fibers, 13:385–386
deprotonation of, 17:57
direct sidewall functionalization of, 17:58
as fillers, 11:317
fluorination of, 17:54
functionalization of, 17:52
properties and applications of, 17:48–50
in scaling to deep submicron dimensions, 22:256
U.S. market trends in, 1:722t
Carbon-nanotube spinning method, 13:385–386
Carbon nitride, 17:214–215
conductivity of, 17:204–206
field emission properties of, 17:221
theoretical band structure calculations for, 17:203–204
Carbon nitride films, 17:205
Carbon nitride solids, 17:203
Carbonochloridic esters, 6:290
Carbon paper, 4:738–739
Carbon profile, in gas carburizing, 16:204
Carbon Raschig-ring tower packing, 12:745
Carbon reduction, of ferrovanadium, 25:518
Carbon residue, in diesel fuel, 12:424
Carbon selenides, 22:87
Carbon sources, for fermentation, 11:25
Carbon steels, 23:291–297
cold working, 23:295–296
heat treatment of, 23:296
hot working, 23:294–295
microstructure and grain size of, 23:293–294
properties of, 23:292–293
residual elements in, 23:296–297
wrought, 23:296
Carbon storage, of hydrogen, 13:786
Carbon sulfides, 23:621, incompletely characterized, 23:62
Carbon sulfotelluride, 24:419
Carbon–sulfur surface compounds, 23:621
Carbon tetrabromide, 4:348
Carbon tetrachloride, 6:249
acrylamide solubility in, 1:290t
adipic acid solubility, 1:555
azeotrope with acrylonitrile, 1:399
bioremediation substrate, 3:770–772
catalytic decomposition of, 26:806
chlorocarbon/chlorohydrocarbon of industrial importance, 6:227
consumption, 6:244
diffusion coefficient in air at 0°C, 1:70
end use of chlorine, 6:134
hydrogenation to chloroform, 6:284
in integrated manufacturing process, 6:237
salicylic acid and, 22:5
solubility of benzoic acid in, 3:626
solubility of chlorine in, 6:133
solubility of chloroacetic acid in, 1:137
solubility of methylenedianiline in, 2:794

Carbon yields, 12:274
Carbonylation, 13:654–656
ionic liquids in, 26:882–885
methanol, 16:315
of methyl acetylene, 16:245
reaction, 10:506–507
Carbonyl bromide, 4:300
Carbonyl clusters, high nuclearity, 16:64–66
Carbonyl complexes, zirconium, 26:654–655
Carbonyl compounds
addition to, 13:659
α-alkylation of, 13:658s
reduction with alumina–sodium borohydride, 16:572–573
reduction with aluminum alkoxides, 16:572
reductive amination of, 16:573
Carbonyl groups
biodegradability of compounds with, 25:826
in lignin, 15:11
Carbonyl halides, 12:180
Carbonyl ligands, 16:61
Carbonyl process, for nickel refining, 17:92
Carbonyl reductions, 13:569–570
Carbonyls, 16:58. See also Metal carbonyls as catalyst poison, 5:257
chemiluminescence reagents for determination, 5:849–851
dinuclear, 16:62
iron, 14:550–551
mononuclear, 16:61–62
reactions with acetylene, 1:181, 220
rhenium, 21:697–699
synthesis of metal carbonyls from, 16:68–69
tri-, tetra-, and pentanuclear, 16:62–64
Carbonyl stretching, 14:235
Carbonyl sulfide, 4:824–825, 827, 833; 23:621–625
analytical methods for, 23:624
chemical properties of, 23:621–623
health and safety factors related to, 23:624–625
occurrence and preparation of, 23:623–624
physical properties of, 23:621, 622
production, shipment, and specifications for, 23:624
reactions of, 23:623
thermodynamic properties of, 23:622
uses for, 23:625
Carbonyl telluride, 24:419
Carbon–zinc cells, 3:431, 434–435
cell chemistry, 3:435–439
characteristics, 3:446
companies manufacturing, 3:469
performance, 3:439–441
world market estimated, 3:410
Carboplatin, 19:628, 636, 657
meta-Carborane, 4:198
ortho-Carborane, 4:197
para-Carborane, 4:198
Carborane anticrowns, 4:216–217
Carboranes, 4:169, 170, 197–202
economic aspects, 4:229
main group element derivatives, 4:219–225
molecular orbital calculations, 4:183–184
weakest anions and strongest acids, 4:202–204
Carborods, 4:201, 202
Carbosulfan, 2:550
Carbothermal reduction, 17:210–211
as magnesium manufacturing process, 15:342
Car-bottom furnace, 12:288, 734
Carbowaxes, 26:221
N-Carboxy-α-amino acid anhydride (NCA), 2:569
Carboxybetaine monomers, 20:479–480
Carboxyethyl germanium sesquioxide, 12:554
Carboxy group, ion-exchange group used in protein purification, 3:830t
Carboxylate(s)
dispersant moieties, 8:706t
soaps, 22:732
surfactants, 24:144–145
thallium, 24:630–632
thorium, 24:768–769
zirconium, 26:651
Carboxylate-based brine solution, 9:33
Carboxylated acrylic polymers, in water-based inks, 14:326
Carboxylation, 9:282
Carboxyl cure sites, in ethylene–acrylic elastomers, 10:698
Carboxylesterase, for medical defense against chemical warfare agents, 5:837
Carboxyl group esterification, 14:117
Carboxyl groups
biodegradability of compounds with, 25:826
in lignin, 15:11–12
Carboxylic acid(s), 5:27–78; 14:642.
See also Fatty acids
achiral derivatizing agents, 6:96t
adsorbent affinity, 1:674
aroma chemicals, 3:253–254
aroma compounds in roasted coffee, 7:252–253, 256t
branched chain, 5:54
chemical reactions, 5:40–45
chemiluminescence reagents
for determination, 5:851
chiral derivatizing reagents, 6:76t
dissolution behavior of, 15:177
economic aspects, 5:54–57
environmental concerns, 5:57
esterification of, 10:380
health and safety factors, 5:57
manufacture of, 5:45–54
nomenclature of, 5:34–36
nonoleo-based, 5:54, 55t
oleo-based, 5:56–57, 58t
physical properties, 5:36–40
reaction of photo-holes with, 19:84
reaction with phosgene, 18:805
reactions with acrylic acid derivatives, 1:344–346
reactions with bromine, 4:302
reactions with chloroformates, 6:295
salts of, 25:459
selected substituted, 5:35t
straight-chain alkanoic, 5:29–30t
straight-chain alkenoic, 5:31–32t
Carboxylic acid anchoring groups, 8:683t
Carboxylic acid group, in salicylic acid reactions, 22:2–4
Carboxylic acid hydrazides, 13:574
Carboxylic acid layer, on polymer surfaces, 20:379–380
Carboxylic ester debenzylation, microwaves in, 16:559
Carboxylic esters, organic, 10:497
Carboxylic functional polyesters, 10:402–403
Carboxylic functional polyester curing agents, 10:401–406
Carboxylic functional polyester curing
agents, 10:401–406
Carboxyl ion system, 19:193
Carboxyl-terminated butadiene nitrile, rubbers and, 10:376–375
in paper manufacture, 18:115
physical properties, 5:450t
production from chloroacetic acid, 1:138, 139)
sodium salt, 20:560
Carboxymethyl celluloses, 4:724t, 729–730
properties of, 13:74t
Carboxymethyl group, ion-exchange group used in protein purification, 3:830t
Carboxymethyl guar gum, 4:724t
Carboxymethylhydroxyethylcellulose (CMHEC), 5:455; 20:560, 561
Carboxymethyl method (for cellulose), for covalent ligand immobilization, 6:396t
N,N'-Carboxydiimide (CDI) method, for covalent ligand immobilization, 6:396t
Carboxymethylstarches, 4:724t
Carboxydimethylamines
chloride, 1:138
2-Carboxyquinoline, 21:185
Carboys, 18:13
Carbureted gasifier process, 6:787, 789
Carburization by exothermic thermochemical reaction, 4:676
by fusion, 4:674–675
by Menstruum process, 4:675
solid solutions of industrial carbides, 4:688
by thermal diffusion, 4:675
Carburizing, 25:359
of steel, 23:290–291
Carcexplexes, 14:163; 16:785
Carcerands, 14:163; 16:785
Carcinogen exposure, calculating safety for, 25:242–244
Carcinogenic compounds, 9:448
aromatic amine, 9:450
in dye production, 9:296
Carcinogenic elements, in ferrites, 11:59
Carcinogenicity. See also Cancer
of acetaldehyde, 25:561
classification scheme for, 13:311
of herbicides, 13:311
hydrazine, 13:590–591
methanol, 16:314
of propylene oxide, 20:811
testing, 25:221–223
of 2,4-D, 13:315
Carcinogenic potential, 25:222
Carcinogenic risk, of nickel compounds, 17:120
Carcinogenic solvents, 23:113
Carcinogenic substances, dose–response relationship for, 25:236. See also Carcinogens
Carcinogens, 21:837. See also Cancer
category I, 10:580
DEHP as, 25:674–675
formaldehyde, 12:121
nonlinear and threshold models for, 25:244
Cardamom seed, 23:165
Carded yarn, 11:178
Cardene, molecular formula and structure, 5:128t
Cardiac arrhythmias, 3:711; 5:80, 86–88. See also Antiarrhythmic agents
current and future trends in treatment, 5:105–106
and myocardial oxygen demand, 5:108
types of, 5:88–89
Cardiac-assist devices, 3:718
Cardiac contractility, 5:108
Cardiac drug delivery, 9:60
Cardiac glycosides, 5:105, 184
Cardiac physiology, 5:79–88
Cardilate, molecular formula and structure, 5:111t
Cardiloid, molecular formula and structure, 5:111t
Carding
of cotton, 8:16–17
textile, 17:498–499
of wool, 26:385
Cardiomyopathy, 3:711
cardiac device solutions, 3:714
Cardioquin, molecular formula and structure, 5:90t
Cardidonics
inotropic agents, 5:180–181t
molecular formula and structure, 5:181t
Cardiotoxicity, of fluoroquinolones, 21:231
Cardiovascular agents, 5:78–200.
See also Heart antianginal agents,
5:107–135, 110–111t, 118–120t, 124t
antiarrhythmic agents, 5:86–106, 90–98t
antihypertensive agents, 5:146–170, 149–157t, 161–166t
antilipemic agents, 5:135–146, 138–141t, 144t
antithrombolytic agents, 5:170–175, 171–172t
congestive heart failure, 5:179–187
future developments in, 5:187–189
thrombolytic agents, 5:175–179
Cardiovascular biomarkers, 17:649
Cardiovascular devices, 3:709–721
biomaterials for, 3:715–720
Cardiovascular disease
and blood coagulation, 4:81
congestive heart failure, 5:179–187
estimated world impact, 5:78
statistics and pharmaceutical industry, 5:187
Cardiovascular problems, 3:710–711
Cardiovascular system, antiaging agents, 2:821–823
Carditoxin, molecular formula and structure, 5:180t
Cardizen, molecular formula and structure, 5:97t, 118t
Cardoxin, molecular formula and structure, 5:181t
Cards
double-doffer, 17:500
nonwoven, 17:499–500
random, 17:502
roller-top, 17:500
single-cylinder, 17:500
Cardura, molecular formula and structure, 5:155t
Carene, 24:498–499
3-Carene, 3:231; 24:499
daeta-3-Carene (Δ3-carene), 499
3-Carene routes, to l-menthol from, 24:516–517, 518
Carey Lea silver, 19:244
CaRFG specifications, 11:686
Cargill Dow, bioengineering research program, 1:702
Caribbean fruitfly, 13:34
Car industry, electrochemical machining in, 9:602. See also Automobile entries; Automotive entries
Carlsbursite, 6:471t
Carmack Amendment, 25:335–336
Carman-Kozeny equation, 22:53, 54
Carminic acid (CI Natural Red 4), 4:705
Carnallite, 5:785t; 15:392
technology, 15:336, 337, 338
Carnauba
cosmetically useful lipid, 7:833t
in cosmetic molded sticks, 7:840t
in mascara, 7:862
Carnauba wax, 26:209–210
alcohols from, 2:2
in dental waxes, 8:296
Carnitine, 17:671
ascorbic acid and, 25:768
Carnot cycle heat pump, 24:655
Carnot cycles, 10:138, 140; 23:231
Carnot efficiency of heat engines, 24:654
limit, 13:858
Carnot equation, 12:209–210
Caroa, 11:296
Carob gum, 13:67
properties of, 13:74t
Carom process, 25:169–170
Caro’s acid, 4:57; 18:405–406; 21:46, 47
β-apo-8’-Carotenal, 24:560–561
α-Carotene, 24:558
β-Carotene, 17:649–650; 24:560
color of, 7:331
γ-Carotene, 24:560
ζ-Carotene, 13:294
colorants in cosmetics, 7:835
dietary sources of 791
Carotenoid biosynthesis inhibitors, 13:294
Carotenoid degradation products, 24:561–572
Carotenoids, 10:806; 17:655–663; 24:468, 557–561
color, 7:331
dietary, 17:660
macular, 17:659
in plants, 17:656t
oxygenated, 24:560–561
Carrubers, Wallace H., 19:739
β-Carotin, 17:657
β-Carotin, 17:657
Carp
nutrition and feeding, 3:201
reproduction and genetics, 3:205, 206
small eggs, 3:190
Carpet backing, spunbonded polypropylene in, 17:483–484
“Carpet” principle, 18:255
Carpet
properties of, 13:74t
κ-Carrageenan, 20:570–571
Carreau model fluids, settling in, 22:53
Carrier catalyst, 10:81–82
Carrier doping, 23:838
Carrier facilitated transport, 15:845–846
Carrier gas, gas chromatography, 4:611
Carrier momentum, 14:834
Carrier overflow, 14:845
“Carrier solvents,” 16:410
supercritical, 24:23
Carriomycin, 20:133
Carrollite, 7:209t
Cars, gasoline engine oils for, 15:227–232
See also Automobile entries; Automotive entries
Carsiolumochromic materials, 22:708t
Cartier, Jacques, 25:746
Cartonic, molecular formula and structure, 5:181t
Cartons, folding, 18:21–22
Cartridge brass, 7:695, 753
mechanical properties of 70%, 7:678t
Cartridge filters, 11:367–369; 15:827
Carus cell, 15:605
Carus liquid-phase oxidation process, 15:603
Carvone, 13:23t, 28; 24:536–539
d-Carvone, 13:28; 24:537, 538, 539
l-Carvone, 13:28; 24:537, 538, 539
Carvone enantiomers, interconversion of, 24:537–538
Carvoxime, 24:538
C-aryl glycosides, 12:166
Caryophyllene, 3:231; 24:542–543
Cascade aerators, 26:162
Cascade burners, 23:659, 660
Cascade complexes, 14:170
Cascade control, 20:696–697
Cascade falling films photoreactors (CFFP), 19:99
Cascade reactor systems, 20:170
Cascade refrigeration systems, 21:547–550
three-stage, 21:549–550
two-stage, 21:548
CASE, 6:19. See also Coatings, adhesives, sealants, elastomers (CASE) applications
Case hardening, 9:107; 16:196–211
additional methods of, 16:209–211
by austenitic nitrocarburizing, 16:211
by boronizing, 16:211
by carbonitriding, 16:210
by chemical change, 16:201–207
by drip carburizing, 16:210
by electron beam heating, 16:200–201
by ferritic nitrocarburizing, 16:210–211
by flame heating, 16:199
by gas carburizing, 16:201–205
by gas nitriding, 16:205–207
by heat treatment, 16:199–208
by induction heating, 16:199–200
by ion implantation, 16:208–209
by laser heating, 16:200
by liquid carburizing, 16:210
by liquid nitriding, 16:210
material life improvement and, 16:197t
by pack carburizing, 16:209–210
by plasma carburizing, 16:210
by plasma nitrocarburizing, 16:211
by surface deformation, 16:207–208
by vacuum carburizing, 16:210
Casein, 1:546; 12:53
cationic, 14:129
Casein micelles, high pressure treatment of, 13:437–438
Case materials, in electronic materials packaging, 17:837–840
Case nitrided steels, properties of, 16:207
Case polymers, uses for, 25:481–482
Cash flows, 9:540–542
CASLINK software, 18:250
Caspian Sea, 5:784
CAS Registry, 18:242, 246
Cassegrain condenser, reflective, 14:233
Cassia, 23:165–166
Cassie–Baxter equation, 22:112, 113
Cassiterite, 24:783, 791
Casson–Asbeck plots, 21:709
Casson fluid flow model, 21:705
CASS test, 9:790
Castable refractories, ASTM classifications and specifications for, 21:510
Castables, 21:482
Cast alloys, 13:524
Cast copper–beryllium alloys, 3:653t, 655t
Cast elastomers, 25:456
Cast film, 19:790
extrusion, 19:545–546
ILDPE, 20:200
Casting, 10:12. See also Castings
aluminum alloys, 2:333–334
in bar soap manufacture, 22:748, 749–750
copper, 7:696–697
copper–beryllium alloys, 3:654–655
diallyl carbonate cast plastics, 2:254–255
epoxy resins in, 10:457
magnesium, 15:344
of metal–matrix composites, 16:166–167
in the sol–gel process, 23:60
Casting alloys, magnesium, 15:358–359t
Casting in frame, in bar soap manufacture, 22:749
Casting machines, development of, 23:268
Casting process, 19:556
Casting rings (dental investments), 8:295
Castings. See also Casting
information sources for, 15:763
magnesium alloy, 15:354–357
preparing for electroless deposition, 9:718
tellurium in, 24:424
titanium, 24:857
Cast iron. See also Cast irons
  asbestos substitute, 3:315
  cerium addition, 5:682
  hardness compared to ceramics, 5:627t
  ductile, 22:518–519
  silicon in production of, 22:516
Cast-iron boring scrap, 21:410
Cast-iron production, 14:521–522
Cast irons, 21:413. See also Cast iron
  molybdenum in, 17:17
Cast lead alloys, mechanical properties of,
  14:775t
Cast lead–calcium–tin alloys, 14:775
Cast-link belt furnaces, 12:289
Cast-mature process, in bar soap
  manufacture, 22:749
Cast multicrystalline silicon material,
  23:40
Castner cell, 22:767, 768–769, 772
Cast nickel–beryllium alloys, 3:657t, 658t
Castor oil, 2:82; 9:143; 10:817, 820–822
  cosmetically useful lipid, 7:833t
  in cosmetic molded sticks, 7:840t
  in defoamer formulations, 8:237–238
  dehydrated, 9:150
  feedstock for higher aliphatic alcohols,
    2:27–28t
  in nail-care products, 7:853
  in soap making, 22:735
Castor wax, 26:212
Cast polyurethane elastomers, 25:475
Cast refractories, 21:482
Cast steels, 23:266–270
  microstructure of, 23:294
Cast tin, 24:792
Ca_{\text{surface}}, evaluating via effectiveness
  factor, 25:276–279
Caswell silveryrite, 6:471t
Catabolism, herbicide, 13:309
Catacarb process, 4:812
Catalases
  for textile bleaching effluent treatment,
    4:67–69
Catalog of Teratogenic Agents, 25:209
Catalysis 5:200–254. See also Acid–base
  catalysis; Catalyst entries; Catalytic
  entries; Heterogeneous catalysis;
  Homogeneous catalysis; Photocatalysis
  of aromatic reactions, 16:844
  cerium applications, 5:685–688
  chelant applications, 5:733–734
  dendrimers in, 26:805–806
  green chemistry and, 12:805
  history, 5:203–204
  ion implantation and, 14:452–453
  ion-exchange resin, 14:420
  iridium compounds and, 19:650
  metal carbonyls in, 16:72–75
  molecular sieves in, 16:842
  nitrides in, 17:221
  nitrogenase, 17:304–305
  palladium, 19:653–654
  platinum, 19:657
  rhodium compounds in, 19:646–648
  ruthenium, 19:640
  thorium in, 24:757–758
  use of rare earths in, 14:649–650
Catalysis industry, 24:261
Catalysis technologies, using metallocenes,
  10:711–712
Catalyst “architecture,” 26:532
Catalyst(s)
  activation of, 5:229
  aging of, 23:780
  diorganotins as, 24:823
  effective, 24:174
  pharmacophore generation technique,
    6:11, 15
  research on, 24:261
  role in synthetic organic chemicals
    manufacture, 24:260–261
  stannic chloride as, 24:804
  stannous 2-ethylhexanoate as,
    24:826–827
  stannous oxalate as, 24:827
  tellurium in, 24:427
  tin in, 24:794
Catalyst activities, specific, 10:47t
Catalyst additives, nitrogen oxide
  emissions and, 11:719
Catalyst-based diesel particulate filter
  (CB-DFP) technology, 10:61–62
Catalyst bed(s)
  geometries of, 10:82t
  regeneration of, 10:107; 23:615
  sizes of, 10:89
    in subdew point systems, 23:614–615
Catalyst bed formaldehyde plant,
  12:114
Catalyst deactivation, 5:202, 229–230,
  255–322; 10:95
    avoiding, 10:94
enzyme mechanisms, 5:289–293, 292–293
heterogeneous catalyst mechanisms, 5:255–287, 256t, 279t
homogeneous catalyst mechanisms, 5:287–289, 288–289t
prevention, 5:293–303
prevention of chemical degradation, 5:296–299
prevention of fouling by coke and carbon, 5:299–300
prevention of mechanical degradation, 5:302–303
prevention of poisoning, 5:300–301
prevention of sintering, 5:301–302
summary of mechanisms, 5:256t
typical lifetimes and factors determining life of important industrial catalysts, 5:294–295
Catalyst degradation, by BTX, 23:612–614
Catalyst development, 5:249–250
Catalyst emissions, FCC unit regenerator, 11:714–715
Catalyst feeding, in the Spheripol process, 20:537
Catalyst generations, performance of, 20:528t
Catalyst handling, industrial hygiene and, 14:212–213
Catalyst inhibition, 10:90–95
substances causing, 10:92t
Catalyst inhibitors, in silicone network preparation, 22:565
Catalyst longevity, phosphoric acid and, 10:540
Catalyst metals, 10:46–47
Catalyst method, 10:333–334
Catalyst modifications, in photocatalysis, 19:94–95
Catalyst performance
at can plants, 10:107
effect of temperature on, 10:46
Catalyst poisoning, 5:256t, 256–263
catalyst regeneration after deactivation, 5:309–310
common according to structure, 5:257t
important parameters, 5:259t
prevention of, 5:300–301
for selected catalysts, 5:258t
Catalyst poisons/inhibitors, 10:53–54
Catalyst preparation, heterogeneous catalysis, 5:231–232
Catalyst-process combinations, selecting, 26:534
Catalyst redispersion, 5:230–231
Catalyst regeneration, 5:202, 230, 255–322
catalyst deactivated by coke or carbon, 5:304, 309
catalyst deactivated by poisoning, 5:309–310
catalyst deactivated by sintering, 5:310–311
Catalyst residues, from EPDM polymerization, 10:709–710, 711
Catalysts. See also Catalysis; Catalytic entries; Cocatalyzed baths; Metallocene catalysts; Spent catalysts; Ziegler-Natta catalysts; Zinc catalyst activated alumina applications, 2:399–400
activated carbon applications, 4:757
advanced materials, 1:693
alkanolamines from nitro alcohols, 2:120
in catalytic oxidization, 10:80–83
choice of, 10:88–89, 420
chromium application, 6:560
cobalt applications, 7:218, 238–244
coking of, 10:651
contamination of, 10:102
coordination compounds, 7:593–595
dehydrogenation, 23:336–337
for direct hydration of ethylene, 10:539–541
for electrolytic plating, 9:689–690
ester-alcohol interchange, 10:491
esterification, 10:477–478
for ethane chlorination, 10:588
ethylene oxide, 10:648–649
in foam rubber preparation, 22:585
as food manufacturing aids, 12:66
Friedel–Crafts, 12:188–192
gallium use in, 12:353
gold, 12:705
for HDPE production, 20:152–155
for heterophasic copolymers, 20:533–534
high throughput experimentation, 7:382t, 393–398
in hydrogen peroxide manufacture, 14:54
in indirect hydration, 10:53
inhibitors of, 10:649
iodine, 14:370
kaolin application, 6:695
layer loss from, 10:55
for LLDPE production, 20:189–193
manganese-based, 15:586
mercury, 16:52
metal-complex, 22:700–701
metallocarboranes, 4:217–218
MgCl₂ support structure of, 20:525
microencapsulated, 16:460
nickel compound, 17:121–123
in novolac resin production, 18:767
olefin metathesis, 26:924–926
organic titanium compounds as, 25:122
PAFC, 12:217–218
phase-transfer, 19:813
in phenolic dispersion production, 18:768
in phenolic resin polymerization, 18:760–765
in photocatalysis, 19:75–76
platinum-group metal, 19:602–603
in polymerizing ethylene oxide, 10:683
polyurethane polymerization, 10:6
in pressure-sensitive adhesive preparation, 22:591
quinolines as, 21:196
reactivation of, 10:95–96
in RTV silicone preparation, 22:595–596
SCR, 10:99–100
selecting, 26:543–544
in silanol condensation, 22:566
in silicone chemistry, 22:554, 555
with silicone fluids, 22:573
in silicone network preparation, 22:563–564, 568
in silicone polymerization, 22:556
silver as, 22:684–685
silver compounds as, 22:685
silver in, 22:659
smart, 22:720
smectites application, 6:697t
sodium and compounds as, 22:777–778
sol–gel-derived, 23:55
spent silver, 22:657
sulfuric acid, 23:780
in sulfur production, 23:603
supported, 5:322–344
synthetic diamond manufacture, 8:531–535
temperatures for, 10:52–53
thermal degradation and sintering of, 10:94
transition metal, 20:151–152
use for minimizing toxic reagents, 12:808
in vinyl alcohol polymerization, 25:608–609
in vinyl chloride manufacture by oxychlorination, 25:639–640, 645–646
zeolite, 25:171
zirconium organometallic compounds as, 26:656–657
Catalyst selection, in unsaturated polyester cross-linking, 20:107–109
Catalyst Stabilization Technology (CST), 23:337
Catalyst supports, 5:227–228, 322–344
acid catalysis by zeolites, 5:333–334
base catalysis by zeolites, 5:335–336
blue alumina, 5:334–335
carbon black applications, 4:800
coating pre-formed supports, 5:323–325
effect of variables on sintering rates of supported metals, 5:271t
high surface area supports/catalyst formation, 5:325–326
hydrotalcites, 5:336
ion-exchange resins, 5:337
KF alumina, 5:337
metal oxides, 5:336–337
organic–inorganic hybrid, 5:337
palygorskite/sepiolite application, 6:700t
preparation of inorganic, 5:323–326
supported basic catalysts, 5:334–337
supported heteropoly compounds, 5:329–330
supported Lewis acids, 5:327–329
supported metal complexes, 5:337–341
supported solid acids, 5:326–334
supported sulfur(VI) acids, 5:330–333
Catalyst support structure, 10:82–83
Catalyst support unit, 10:42–44
Catalyst symmetries, for stereoselective propene polymerization, 16:104
Catalyst systems
ethylenepropylene polymer, 10:708
in hydrocracking, 18:656
polypropylene, 20:525–528
Catalyst technology
benzene-based, 15:500
butane-based, 15:498–500
Catalyst treatments, heterogeneous catalysis, 5:229–231
Catalytic aerogels, 1:762–764, 763t
Catalytic afterburners, 10:108
Catalytical methanol process, 16:311
Catalytic alumina, 2:391
Catalytic antibodies, 3:671–672
Catalytic antibodies, 11:4
Catalytic applications
  of platinum-group metals, 19:619–628
  for vanadium, 25:542
Catalytic asymmetric hydroboration, 13:667
Catalytic biosensors, 3:796–799
Catalytic chain transfer polymerization (CCTP), 20:442, 444
Catalytic Coal Liquid (CCL) process, 6:848
Catalytic coke yield, 11:705
Catalytic constant, 10:254
Catalytic converter(s), 10:31, 39–40; 26:719. See also Three-way catalytic converter
ceramic substrate for, 10:42–44
in Claus furnaces, 23:607
deactivation, 5:255–256
durability of, 10:50–52
metallic substrate for, 10:44
pelleted, 10:40
production of sulfur in, 23:602
in sulfuric acid manufacture, 23:781
Catalytic converter substrates, physical properties of, 10:43t
Catalytic copolymerization, 7:627–632
Catalytic cracker, popularity of, 11:700
butylenes manufacture, 4:414–416, 417
molecular sieves in, 16:842
zeolites for, 5:238–239
Catalytic cracking technology, 24:257, 260, 274
Catalytic cracking unit, 24:258–259
Catalytic curing agents, 10:388, 411–415
Lewis acids, 10:413
Lewis bases, 10:411–413
photoinitiated, 10:414–415
Catalytic cycle(s), 5:201
involving halogen radicals, 17:787–788
in silicone network preparation, 22:564–565
Catalytic dehydrogenation, of normal paraffins, 17:723–724
Catalytic dewaxing, 15:217; 18:662, 671, 672, 673
Catalytic direct oxidations, 24:172–174
Catalytic distillation, 10:616–617
Catalytic engineering, progress in, 26:949
Catalytic gas–liquid–solid reactions, 21:331
Catalytic gas–solid reactions, 21:331
steps in, 21:342
Catalytic hydroboration, 13:644–646
Catalytic hydrochlorination, ethyl chloride production from, 10:587
Catalytic hydrogenations, 10:504; 13:570; 18:731
for amines, 2:477–488
microwaves in, 16:544
Catalytic incineration, 19:625
Catalytic incinerators, operating temperature, 10:88
Catalytic nucleic acids, 17:627
Catalytic oxidation/oxidization, 10:78–96
catalysts in, 10:80–83
empirical models, 10:85–86
experimental evaluation of, 10:94–95
for halogenated hydrocarbons, 10:103
mechanistic models, 10:83–87
process conditions related to, 10:89–90
system design and operation, 10:87–90
in thermal waste treatment, 25:833
Catalytic oxidizers, 26:684
Catalytic pellets, 25:270, 271–272
Catalytic polymerization, block copolymers, 7:645–646
Catalytic processes, in advanced cracking techniques, 20:778–779
Catalytic pyrolysis, 10:619
Catalytic random copolymers, 7:635–638
Catalytic reaction process, 10:83–84
rate of, 10:84–85
Catalytic reactor, design of, 10:88. See also Catalytic unit
Catalytic reformates, 13:703; 25:168
Catalytic reformers, 18:557
aromatics from, 18:565
effluent separation from, 20:750
Catalytic reforming, 12:403; 18:657–658
benzene manufacture, 3:604–606
as a source of toluene, 25:166
Catalytic silver sulfate, 23:536
Catalytic steam reforming reaction, 13:841–842
Catalytic system designs, 10:88, 89
Catalytic Two-Stage Liquefaction (ITSL), 6:841, 843
Catalytic unit, 10:40–44. See also Catalytic reactor
activated catalyst layer, 10:40–42
Catalyst support unit, 10:42–44
precious metal catalyst, 10:42
Catalyzed hydrazine formulations, 13:595
Catastrophic failure, 26:982
Catechin, chemiluminescence reagent, 5:857–858
Catecholamines, 5:184–185
ascorbid acid and, 25:768
Catechoborane, 13:639, 644
catalytic hydroboration with, 13:645
Category factor investment cost estimates, 9:530
Category scaling techniques, 11:513
Catenanes, 17:52
Catfish, aquaculture, 3:183. See also
Channel catfish
Catgut, 3:735
Catharanthine, 3:180
Cathelicidins, 18:709
Cathode(s), 9:607
coatings for, 9:709
defined, 3:409
deformation test for, 9:793–794
efficiency of, 9:772, 806
heated, 14:686
materials for, 9:626, 654
MCFC, 12:223
practical battery system, 3:427
reaction rate at, 9:611
Cathode overvoltage, 12:215
Cathode ray tube phosphors, cerium application, 5:689
Cathode ray tubes (CRTs), barium–aluminum getters, 3:349
Cathodic (precipitating) corrosion inhibitors, 26:144, 145
Cathodically colored electrochromic inorganic films, 6:578–579
Cathodic arc plasma deposition (CAPD), 17:208
Cathodic electrodeposition (CED), 10:437, 439, 448–449
Cathodic electrodeposition coatings, 10:410
Cathodic inhibitors, 7:815
Cathodic protection, 7:804–806
Cathodic stripping voltammetry, 9:569
Cathodoluminescence microscopy, 16:484
Catholyte systems, 9:675–676
Cation binding, in supramolecular chemistry, 24:40–43
Cation bridging, 11:634–635
Cation complexation, routes to, 24:41
Cation exchange, in zeolites, 16:826
Cation-exchange catalysts, 10:477–478; 12:191
Cation-exchange membranes, 15:799–800, 836–837
materials for preparation of, 23:719
Cation-exchange resins, sales of, 14:414
Cation exchangers
macroporous, 14:387
regeneration of, 14:411
Cation formation, in fullerenes, 12:231–236
Cationically conducting ceramics, electrolysis based on, 22:773–774
Cationic-anionic polymer combinations, in mineral processing, 11:635
Cationic antimicrobial peptides (CAPs), 18:259–260, 266
Cationic carbamoyl polymers, 1:313–314
Cationic catalysts, 16:95–97
Cationic copolymerization, 7:626–627
Cationic coupling, 10:708
Cationic dyes, 9:217
azo, 9:421–424
Cationic electrophilic bleaching reagents, 21:33
Cationic guar gum, 4:724t
Cationic hydroxyethylcellulose, 5:455–456
Cationic initiators, 14:265–273
directed initiation and, 14:268–269
direct initiation and, 14:270
initiating systems for, 14:266–268
photoinitiation and, 14:270
ring-opening polymerization and, 14:271
Cationic latexes, 19:855
Cationic metalloocene complexes, 16:90
Cationic monomers, of water-soluble polymers, 20:475–482
Cationic nickel ligand complexes, 17:116–117
Cationic polyelectrolytes, 20:469–472
Cationic polymerization, 19:835, 20:409
living, 14:271–272
of cyclic siloxanes, 22:560
of higher olefin polymers, 20:425
Cationic polymers, 11:632
Cationic products, 9:193–194
Cationic PVA, 25:602
Cationic resins, in hazardous waste management, 25:817
Cationic starches, 4:721–722, 724t; 18:123; 20:563
in paper manufacture, 18:114–115
Cationic styrene polymerization, 23:384, 386–388
Cationic surfactants, 10:283; 14:717; 22:724; 24:147–148
Cationomycin, 20:135
Cations, catalytic effect of, 18:849–850
Cativa process, 16:74
Cativa technology, 19:621
Catla, common and scientific names, 3:187t
Cat litter
palygorskite/sepiolite application, 6:700t
smectites application, 6:697t, 698
CATOFIN process, 4:417, 418; 20:778–779
Cat-specific pet food additives, 10:855–856
Cattierite, 7:209t
Cat-to-oil coke, 11:707
Caulks
acrylic ester polymers, 1:390
dispersant applications, 8:692
Cauprene chloride, 25:628
Cause and effect diagram, 21:175–176
Caustic baryta, 3:363–364
Caustic-calcined magnesia, 15:413–414
Caustic corrosion, in industrial water treatment, 26:130
Caustic coupling process, 10:356–357
Caustic flooding, 18:629–630
Caustic fusion, of zircon, 26:628
Caustication, 15:63
in Bayer process, 2:352
slaked lime in, 15:45, 63
Caustic scrubbing, phosgene decomposition by, 18:807
Caustic soda, 6:130. See also Sodium hydroxide
electrolytic preparation of, 16:40
enthalpy versus concentration of solutions of, 22:831
freezing points of solutions of, 22:830
in silica/silicate manufacture, 22:462
uses, 6:206
Caustic solution disposal, 10:613
Caustic washing, 18:660–661
Cavitates, 14:160–170
Cavitation, 8:638; 9:59, 81; 20:352
in pumps, 21:84–86
rubber particle, 20:353
Cavitation number, 11:746
Cavity-filling process, 10:11–13
Cavity optics, 14:669–672
Cavity sinking, 9:601
CAZy database, 10:261
C-Bourdon tube, 20:648
CBr3 compounds, 19:358
C–C bond forming reactions, microwave-assisted, 16:581–582.
See also Carbon–carbon entries
CCD scanners, 16:389
CD6 impeller, 16:673, 701, 703
cDNA, 12:507
hybridized, 12:515
molecular sequencing of, 12:473
CDRFs (controlled-drug-release formulations), classification of, 9:75–81
CD-ROMs, patent documents on, 18:249
CDTech two-phase zeolite-based alkylation, 23:331–332
CdTe electrodeposition, 9:800
Cecropin-melittin hybrid (CEMA), 18:256
Cedarwood, in perfumes, 18:366–367
Cedarwood oils, 24:543–544
fragrance ingredients from, 24:544–545
Cedrander, 24:544
Cedrene, 24:543–544
Cedrene oxide, 24:544
Cedrol, 24:543–544
Cedryl acetate, 24:544
Cedryl methyl ether, 24:544
Cedur, molecular formula and structure, 5:141t
Cefepime, 3:25
Ceiba pentandra, 11:297
Celanese Research bioengineering research programs, 1:703
PBI fiber development at, 13:380
CELANEX, 20:63
Celastr, 2:819
Celastrol, 23:165
Celastrol, 23:316
Celestite, 23:316
conversion of, 23:319
mining of, 23:317
Celestite ore, 23:321
Celgard membranes, 15:803
Celiac disease, 26:290
Cell-adhesion proteins, 26:972, 973
Cell-bound enzymes, 10:267
Cell cultivation processes, 11:11
typical characteristics of, 11:30t
Cell cultures, silk in, 22:634
Cell culture technology, 5:345–360
  economic aspects, 5:356–357
  mammalian cell characteristics, 5:346–349
  processes, 5:349–356
  pros and cons of commonly used, 5:351t
  regulations and standards, 5:357
  safety considerations, 5:357–358
  selected example products, 5:346t
Cell division inhibitors, 13:302–304
Cell elongation, allelochemicals and, 13:355–356
Cell-enclosing pressure vessel, 13:426
Cell-free hemoglobin, 4:113
Cell fusion, 3:816
Cellhouse operating parameters, 26:572t
Cell interconnects, SOFC, 12:226
Cell macromolecules, enzyme
  immunoassay for, 14:143
Cell-mediated immune response (CMI), 25:500, 501
Cell membrane, liquid crystal properties in, 15:111
Cellophane sheet, 4:716
Cell patterning, microfluidics in, 26:972–973
Cell potential, 9:607–609
  standard, 15:750
Cell Saver, 3:719
Cells, encapsulation of, 16:454
Cell sorting, microfluidics in, 26:971–972
Cell-specific dendritic carriers, 26:797
Cell targeting, dendrimers in, 26:797–798
Cell thermostating, 13:426
Cellular components inducers, herbicide
damage to, 13:297–298
Cellular damage, in aging, 2:810
Cellular diseases, yeast as a model for, 26:496–497
Cellular phone base stations, 23:872
Cellular polymers, modification of, 25:473–474
Cellular response, suture material
  biocompatibility and, 24:216
  benefits of, 10:283
  as bleaching agents, 4:64
  cotton modification, 8:30
  textile industry, 10:302
Cellulon, 5:363–364
Cellulose, 4:724t; 5:360–394, 412–413;
  10: 282; 11:246, 285; 20:549, 556;
  26:335. See also Regenerated cellulose fibers
  adhesives derived from, 1:547
  amorphous, 5:372–373
  analysis in green coffee, 7:253t, 255
  analysis in roasted, brewed, and instant coffee, 7:255t
  annual production of, 11:251
  biosynthesis, 5:364–367
  biosynthesis in cotton fiber, 8:5–6
  chemical modifications of, 20:558
  chemical reactivity, 5:382–383
  classification by structure, 4:723t
  in cocoa shell from roasted beans, 6:357t
  in cotton fibers, 8:18, 19t; 11:172–173
  crystalline, 5:373–379
  in crystal structures, 21:7
  in dental investments, 8:295
  dissolution of, 11:265–269
  elemental composition of, 21:5–7
  in flax fiber, 11:597
  inorganic pigment applications, 7:372t
  liquid crystals, 5:384–386
  microcrystalline, 5:381–382
  moisture properties, 5:416t
  molecular genetics, 5:366–367
  molecular weight of, 20:557–558
  nitration of, 20:558t, 559
  organic pigment applications, 7:368t
  organic titanium compounds and, 25:132
  polymorphs, 5:362, 374–379
  preparation, 5:367–368
  role in plants, 4:697
  solvents, 5:383–384
  sources, 5:363–364
  structure–property relationship, 5:368–381
  as a substrate for microbial biomass, 26:473–474
  typical soluble dye applications, 7:376t
  uses of, 4:715–717
  water interactions with, 11:168
  in the wood cell wall, 21:5–8
  α-Cellulose, 4:716; 5:362
  β-Cellulose, 4:716; 5:362
  γ-Cellulose, 4:716; 5:362
  first synthetic production, 5:364–365
  transformation to cellulose II, 5:377–379
  unit cell, 5:373
Cellulose Iα, 5:362, 375–376
Cellulose IIβ, 5:362, 375–376
Cellulose II, 5:362; 8:21–22
X-ray diffraction pattern, 5:372
Cellulose II, X-ray diffraction pattern, 5:372
Cellulose II hydrate, 5:379
Cellulose III, 5:378–379; 8:21–22
unit cell, 5:373
Cellulose IIII, 5:378
Cellulose IIIII, 5:378
Cellulose IV, 5:378–379; 8:21–22
first synthetic production, 5:365
unit cell, 5:373
Cellulose IVI, 5:378
Cellulose IVII, 5:378
Cellulose acetate, 4:716; 5:368, 422–427;
15:839–840. See also Cellulose acetates
acetic anhydride used in production of,
1:157
analysis, 5:430–434
domestic and foreign producers,
5:415t
economic aspects, 5:427–430
health and safety factors, 5:434–435
moisture properties, 5:413–414, 416t
production from acetic acid, 1:133
U.S. consumption of flake, 5:428t
uses of, 5:435–439
Cellulose acetate butyrate, 4:716; 5:415,
419–421
uses of, 5:435–439
U.S. production, 5:429t
Cellulose acetate dope composition, 16:11
Cellulose acetate fibers, 16:19, 20
spinning, 16:20
Cellulose acetate flake, U.S. production,
5:429t
Cellulose acetate isobutyrate, 5:421
Cellulose acetate propionate, 5:419, 420
acetic anhydride used in production of,
1:157
uses of, 5:435–439
U.S. production, 5:429t
Cellulose acetate reverse-osmosis
membranes, 15:811
Cellulose acetates, 4:724t; 20:559, 560.
See also Cellulose acetate
solubility in selected solvents, 5:417t
Cellulose acetate valerate, 5:421
Cellulose aminoacetates, 5:419
Cellulose-based carbon fibers, 26:735–736
Cellulose-binding module (CBM), 10:282
Cellulose butyrate
acetic anhydride used in production of,
1:157
manufacture, 5:418
moisture properties, 5:416t
Cellulose butyrate valerate, 5:421
Cellulose caprate, moisture properties,
5:416t
Cellulose caproate, moisture properties,
5:416t
Cellulose chloroacetates, 5:419
Cellulose deoxysulfonates, 5:400
Cellulose derivatives, 12:54; 20:457–459,
557–563
Cellulose derivative gums, 13:63t, 71–73
Cellulose diacetate, 9:197
acetic anhydride used in production of,
1:157
Cellulose dinitrate, 5:396
Cellulose ester hollow fibers, 16:19
Cellulose esters, 4:716; 20:558–559.
See also Inorganic cellulose esters;
Organic cellulose esters
dyeing, 9:197–198
U.S. production, 5:429t
Cellulose ethers, 4:712, 716; 5:445–466;
20:560–561
health and safety factors, 5:448–449
Cellulose fibers, 11:165
dyes for, 9:301
economic aspects of, 11:175–176
in paper, 11:164
Cellulose formate, manufacture, 5:418
Cellulose heptanoate, moisture properties,
5:416t
Cellulose hydrates, 5:379
Cellulose laurate, moisture properties,
5:416t
Cellulose molecule, “twofold screw axis”
of, 21:6
Cellulose mononitrate, 5:396
Cellulose myristate, moisture properties,
5:416t
Cellulose nitrate (pyroxylin), 4:716; 8:29.
See also Cellulose nitrates
Cellulose nitrate lacquers, 5:403–404
Cellulose nitrate photography supports,
Cellulose nitrate, 4:724t; 5:396–397
solubility, 5:402–403
U.S. production, 5:429t
Cellulose palmitate, moisture properties, 5:416t
Cellulose phosphate(s), 5:401; 8:29; 20:459
flame resistant, 8:27
paper, 5:408
solubility of, 5:402
Cellulose propionate
manufacture of, 5:418
moisture properties, 5:416t
Cellulose propionate valerate, 5:421
Cellulose propionate isobutyrate, 5:421
Cellulose substrates, dyeability of,
9:482–483
Cellulose sulfate(s), 5:397–400; 8:29; 20:459
solubility, 5:402
Cellulose sulfonates, 5:400–401
solubility, 5:402–403
synthetic intermediates from, 5:405–407
Cellulose synthase, 5:366
Cellulose triacetate (CTA), 5:417;
9:197–198
acetic anhydride used in production of,
1:157
fibers, 16:19
uses of, 5:435
Cellulose triesters, moisture properties of
selected, 5:416t
Cellulose trinitrate, 5:396
Cellulose valerate(s), 5:419
moisture properties, 5:416t
Cellulose x, 5:373, 378–379; 8:21
Cellulose xanthate, 4:716; 5:383; 20:559
Cellulosic–acrylic fibers, dyeing, 9:201–202
Cellulosic fiber blends, dyeing, 9:199–202
Cellulosic fiber–nylon blends, dyeing, 9:202
Cellulosic fibers, 18:96
acid fixing reactive dyes for, 9:478–481
dyeing, 9:169–183, 263
early reactive dyes for, 9:465–468
neutral fixing reactive dyes for,
9:477–478
in paper manufacture, 18:116
polyfunctional reactive dyes for,
9:471–477
Cellulosic hollow fibers, 16:18–20
Cellulosic materials, in ethanol
fermentation, 10:535–536
Cellulosic membranes, in hemodialysis,
26:825, 826–828t
Cellulosic papermaking fibers, 18:91
Cellulosic phases, for chiral separations,
6:88–89
Cellulosic–polyester fibers, dyeing,
9:199–201
Cellulosic polymer RO membrane
materials, 21:633
Cellulosic receiving layers, in instant
photography, 19:281–282
Cellulosics
bleaching, 4:72
drilling fluid, 9:13
phosphoric acid-based systems for,
11:488
Cell wall
cellulose in, 5:362
as target of antibiotics, 3:24–29
Cell-wall-degrading enzymes, 10:300
Celmer’s model, 15:305
Celsius scale, 1:xviii; 2–26:xvi; 24:283.
See also Degree Celsius
Cement(s); 5:467–505. See also Portland
cement
acrylic fibers in, 11:214
alkanolamines from olefin oxides and
ammonia, 2:135–136
calcium silicates hydration, 5:475–477
cement paste structure and concrete
properties, 5:482–484
cement admixtures, 5:484–485
cement composition, compounds,
and fineness, 5:476t
clinker chemistry, 5:467–475
clinker formation, 5:470–471
coloring of, 19:376
dispersant applications, 8:690
economic aspects, 5:495
environmental concerns, 5:495–498
ferrite hydration, 5:477–478
furan resins in, 12:274
geothermal, 12:527
in hazardous waste management, 25:823
hydration, 5:475–482
information sources for, 15:764
kaolin application, 6:688t, 695
magnesium phosphate, 15:416
manufacture, 5:485–495
paste structure and concrete properties,
5:482–484
phase equilibria, 5:468–470
phases hydrated at normal
temperatures, 5:479t
production of, 15:38
raw material proportions, 5:474, 475t
special purpose and blended, 5:492–493
specifications and types, 5:498–500
tricalcium aluminate hydration, 5:477–478
uses of, 5:500–502
Cementation
in hydrometallurgical recycling, 21:397, 398
metal recovery via, 16:154
Cementation steelmaking process, 23:249
Cement-based structural materials, 26:755
Cement copper, 7:688
Cemented carbides, 4:655–674, 693; 25:359
economic aspects, 4:672
metal-cutting applications, 4:662–670
nonmetal-cutting applications, 4:670–672
occupational exposure to dust of, 25:372
physical properties of, 4:660–662
scrap recycling, 4:657
tool failure modes, 4:657–660
Cemented Carbides Producers Association (CCPA), 25:369
Cementite, 4:647; 23:272, 274, 275
Cement kiln dust, 5:492, 495
Cement kilns, 13:178
scrap tire fuel in, 21:464
Cement–matrix composites, 26:751
Cement plants, sulfuric acid and, 23:787
Cement rock, raw material for cement, 5:475t
Cementstone, 15:27
Center for Biologics Evaluation and Research (CBER), 11:47; 18:687;
21:572, 25:487, 495
Center for Chemical Process Safety (CCPS), 21:862
Center for Devices and Radiological Health (CDRH), 21:572, 576
Center for Drug Evaluation and Research (CDER), 11:47; 18:687; 21:572
Freedom of Information Electronic Reading Room, 18:701–702
Center for Food Safety and Applied Nutrition (CFSAN), 21:572, 578
Center for Veterinary Medicine (CVM), 21:572, 579
Centerline-mounted refinery pump, 21:65
Centipoise (cP), 15:206
Centistoke (cSt), 15:206
Centocor, 5:173
Central American coffees, 7:250
Central American Free Trade Agreement (CAFTA), 23:467
Central composite design, commercial experimental design software compared, 8:398t
Centralized control networks, pilot-plant, 19:463
Central nervous system, antiaging agents, 2:815–817
Central nervous system disorders, drug release for, 9:82–83
Centrifugal compressors, 10:155; 19:512
noise reduction for, 19:522
Centrifugal discharge filters, 11:366
Centrifugal extractors, 10:780–781
Centrifugal extrusion encapsulation processes, 16:449–450
Centrifugal filters, 11:324, 388–393
Centrifugal force, in thin-film evaporators, 815
Centrifugal potting, 16:18
Centrifugal pumps, 19:513
affinity laws related to, 21:63
costs associated with, 21:87
efficiency of, 21:60
nonmetallic, 21:76
suction specific speed of, 21:63
Centrifugal sedimentation, 18:142, 143–144
Centrifugal separation(s), 5:505–551;
16:659–660
factors influencing, 5:518–519
liquid–liquid phase behavior, 5:519–520
separation by compaction, 5:515–516
separation by density difference, 5:506–511
separation by drainage, 5:512–515
theory, 5:506–519
in wastewater treatment, 25:888, 889
Centrifugal separators, 17:163
Centrifugal turbine compressors, 17:294
Centrifugation, 8:719–722
in aqueous dispersion polymerization, 11:199–200
in continuous saponification, 22:738
in Guggenheim process, 22:848
of phosphoric acid cellulose solutions, 11:273
in sodium carbonate recovery, 22:789
Centrifuge dewatering, 18:671
Centrifuges, 22:288. See also
Hydrocyclones
basket, 11:389–390, 391
filtration equipment, 5:542–548
fixed-bed, 11:389–391
materials of construction
and operational stress, 5:522–524
moving-bed, 11:391–392
noise, 5:524–525
power, energy, and drives, 5:520–522
pusher, 11:392
sedimentation equipment, 5:526–542
Centrifuge sludge thickening, 25:913
Centrifuge systems, advantages of, 18:731
Centromeres, in yeast plasmids, 26:483
Centrospermae, alkaloids in, 2:75
Cephalosporin(s), 3:25
bacterial resistance mechanisms, 3:32t
hydrolyzed, 16:400
Cepheid, 26:976
Cephrene, 24:508
CE Plant Cost Index, 9:526, 527
Ceramalloy, composition of alloy for crowns and bridges, 8:311t
Ceramco, gold-based dental alloy, 8:307t
Ceramco “O,” gold-based dental alloy, 8:307t
Ceramic binders, ethylene oxide polymers in, 10:688–689
Ceramic cartridges, silver-containing, 26:178
Ceramic catalytic unit, 10:40
Ceramic composites systems, 5:552–554
Ceramic decoration, use of gold in, 12:693
Ceramic ferrites, 11:59
Ceramic fibers, 24:614, 618
refractory, 13:388
silicon carbide, 13:386
Ceramic-grade fluorspar, 4:579, 580
analysis, 4:577t
Ceramic, high temperature
superconducting, 23:836–851
Ceramic insulators, 5:593–595
Ceramic laminates, 17:843
Ceramic matrices, 5:557–558
Ceramic–matrix composites, 5:551–581; 26:751
composite reinforcements, 5:554–557
crack deflection, 5:563–566
crack tip shielding, 5:566–568
crack-wake bridging, 5:567–568
creep resistance, 5:578–579
fiber reinforcement performance, 5:575–577
mechanical performance, 5:568–575
nonoxide-based, 5:554t
oxide-based, 5:553t
particle reinforcement performance, 5:568–572
platelet reinforcement performance, 5:575
process-zone shielding, 5:566–567
reinforcement integrity, 5:577–578
toughening processes, 5:561–568
whisker reinforcement performance, 5:572–575
Ceramic–matrix fiber composites, 26:775
Ceramics mechanical properties, 5:613–638
cyclic fatigue, 5:633–634
dynamic behavior, 5:613–615
fracture analysis, 5:634–635
fracture toughness, 5:619–623
hardness, 5:626–628
impact and erosion, 5:630
plasticity, 5:623–626
strength, 5:615–619
subcritical crack growth, 5:628–630
thermal stress and thermal shock, 5:632–633
tribological behavior, 5:630–632
Ceramic membranes, 15:800, 814; 18:511
Ceramic–metal interfaces, in metal–matrix composites, 16:176, 178
Ceramic oxide compositions, synthesis of, 23:55
Ceramic pigments, 7:345–354; 19:404
Ceramic–polymer composites
ferroelectric, 11:100–101
sol–gel technology in, 23:80–81
Ceramic powders, 1:704
Ceramic processes, chemical-based, 23:53–54
Ceramic refractories, 12:763
Ceramic reinforcements, in metal–matrix composites, 16:181
Ceramics. See also Advanced ceramics;
Ceramics mechanical properties;
Ceramics as electrical materials;
Ceramics processing; Digital library
of ceramic microstructures (DLCM); Glass-ceramics
advanced materials, 1:703–710
for biomedical devices, 3:708–709
calcined alumina applications, 2:412–413
cerium applications, 5:684–685
chemical analysis of archaeological materials, 5:745–746
CMC applications, 5:452t
colloidal suspensions, 7:273t
colorants for, 7:342–358
dental, 8:274–278
detergent systems for, 8:413t
in electronic materials packaging, 17:838
electrolysis based on cationically conducting, 22:773–774
of ferrites, 11:71
HEC applications, 5:454t
high throughput experimentation, 7:382t
HPC applications, 5:463t
kaolin application, 6:688t, 688–689
lead oxides in, 14:786
methylcellulose applications, 5:459t
nickel compounds in, 17:123–124
palygorskite/sepiolite application, 6:700t
pigments used in, 7:345–354; 19:404
preparation of, 11:98–101
PZT family of, 14:100–102
resistance to hydrochloric acid, 13:827
selenium uses in, 22:96–97
in sensors, 22:271–272
shaping and densification of, 11:99
silicon carbide, 22:525
as smart materials, 22:710
smectites application, 6:697t
thorium in, 24:758
titanium dioxide in, 25:30–31
use in heat pipes, 13:233
zinc oxide in, 26:615–616
Ceramics as electrical materials, 5:581–612
ceramic insulators, 5:593–595
conduction in glasses, 5:592–593
electrical conduction, 5:585–587
electronic conduction, 5:598–601
electronic conduction, 5:595–598
fast-ion conductors, 5:589–592, 590t
ferroelectrics, 5:605–608
ionic conduction, 5:587–589
processing effects, 5:609–610
spinel and ferrites, 5:602–603
superconductivity, 5:603–605
transference number of cations, anions, and electrons or holes in selected
compounds, 5:586t
varistors, 5:608–609
Ceramics industry
silicon in, 22:509
stannic oxide in, 24:805
use of rare earths in, 14:650
Ceramics processing, 5:638–669
batching and mixing, 5:648
beneficiation, 5:643–646
dry forming, 5:648–649
drying, 5:655–656
forming additives/processing aids, 5:646–648
forming/fabrication processes, 5:648–654
green finishing/machining, 5:654–655
microwave technology in, 16:531
paste forming, 5:651
plastic forming, 5:649–651
postsintering processes, 5:664–665
presinter thermal processing, 5:656–657
raw materials, 5:638–643
sintering/thermal consolidation, 5:657–664
slurry forming, 5:651–654
structure–property relationship, 5:666–667
surface modification techniques, 5:665
Ceramic substrate catalytic converter, 10:42–44
Ceramic superconductors, 23:847
Ceramic tile
information sources for, 15:764
sulfur impregnation of, 23:593
Ceramidie, 4:706
Cereal grains, 26:262–294
ceeliac disease and, 26:290
composition and morphology of, 26:270–276
corn, 26:286–289
deficiency diseases and, 26:290–292
early cultivation of, 26:266
health and safety factors related to, 26:289–292
in history, 26:266–267
nutritional value of, 26:289–290
origins of, 26:265–266
production of and trade in, 26:268–270
rice, 26:284–286
species of, 26:267–268
wheat, 26:276–284
Cereal mash, 5:292
Cereal products, packaging, 18:34–35
Cereals
as nutritious foods, 26:267
defined, 26:263
Ceresin, in dental waxes, 8:296
Ceresin wax, 26:214
Ceria, 5:592, 675; 14:630
Ceria-stabilized alloy, 10:44. See also
 Cerium oxide
Ceric ammonium nitrate, 5:674
Ceric ammonium sulfate, 5:674
Ceric fluoride, 5:674
Ceric hydroxide, 5:676
Ceric oxide, 5:670, 675
Ceric rare earths (RE), 14:631
Ceric sulfate, 5:674
Ceric sulfate method, for tellurium
determination, 24:415
Cerium (Ce), 5:670–692; 14:630, 631t, 634t.
See also Cerium compounds
analysis, 5:679–680
color, 7:335
economic aspects, 5:678–679
electronic configuration, 1:474t
health and safety factors, 5:680–681
production, 5:671–674
resources, 5:670–671
separation of, 14:639
in SO₂ oxidation, 11:718
uses of, 5:681–690
Cerium(III) acetate, 5:677
Cerium-based catalysts, 14:645
Cerium-based compounds, 14:646
Cerium compounds. See also Ceric entries;
 Ceric entries
 production, 5:673–674
 uses of, 5:681–690
 U.S. exports by country, 5:679t
 U.S. imports by country, 5:680t
 Cerium(III) compounds, 5:675–677
 Cerium(IV) compounds, 5:674–675
 Cerium dioxide, 5:675
 Cerium hydrate, 5:676
 Cerium monohydrate, 13:627
 Cerium monosulfide, 5:676–677
 Cerium(III) nitrate hexahydrate, 5:676
Cerium oxide, 14:649, 650
 air/fuel conditions and, 10:50
 for oxidizing iron in glass, 7:343
 energy gap at room temperature, 5:596t
 Cerium(III) oxysulfide, 5:677
 Cerium(III) phosphate, 5:677
 Cerium sesquioxide, 5:675
 Cerium(III) sulfide, 5:676
 Cerium tetrachloride, 5:674
 Cerium–zirconium oxides, 14:649
 Cerius2 software, 1:629; 7:385, 399, 422;
 16:754
 Cerivastatin sodium, 5:142
 molecular formula and structure, 5:138t
 Cermet, 23:11
 CERN Intersecting Storage Rings, aerogel
 application, 1:766
 Ceroplastic acid, physical properties, 5:30t
 Cerotic acid, physical properties, 5:30t
 Cerous bromide, physical properties of,
 4:328
 Cerous carbonate octahydrate, 5:676
 Cerous carbonate trihydrate, 5:676
 Cerous chloride hydrate, 5:676
 Cerous fluoride, 5:676
 Cerous hydroxide, 5:676
 Cerous oxalate, 5:676
 Cerous oxychloride, 5:676
 Cerous oxyfluoride, 5:676
 CerOx Corporation electrolysis cells,
 9:669–670
 Cerpass sol–gel abrasives, 1:7
 Certificate of Correction, for patents,
 18:184
 Certificate of registration,
 trademark-related, 25:262
 Certificates of analysis (COA), 21:163
 Certification, of high purity gases,
 13:464–468
 Certification marks, 25:253, 261
 Certified food colors, 12:49–50
 Certified industrial hygienists (CIH),
 14:203
 Certified pigments, performance criteria in
 cosmetic use, 7:860t
 Ceruloplasmin, copper containing, 7:776
 Cervantite, 3:41, 59
 Cesium (Cs), 5:692–708. See also Cesium
 compounds; Cs isotopes
 chemical properties, 5:693–694
 economic aspects, 5:701
 handling, storage, and shipment, 5:701
health and safety factors, 5:702
occurrence, 5:694–695
physical properties, 5:692–693
pollucite processing, 5:695–697
production, 5:697–698
standards and analysis, 5:701–702
uses of, 5:702–705
Cesium\textsuperscript{134}, biomedical applications, 5:703
Cesium\textsuperscript{137}, generation in fuel rods, 5:705
Cesium acetate, 5:701
Cesium alloys, 5:698
Cesium aluninate, 5:697
Cesium aluminum sulfate, 5:700
Cesium azide, 5:697
Cesium bromide, 5:698
physical properties of, 4:328
Cesium carbonate, 5:697, 698
Cesium chloride, 5:698–699
Cesium chromate, 5:698
molecular formula, properties, and uses, 6:561t
Cesium compounds, 5:692–708
Cesium-containing catalyst systems, 16:253
Cesium cyanide, 8:194
Cesium dibismuthide, alloy-like superconducting compound, 4:18t
Cesium dicarbonyltetrachlororuthenium, 5:701
Cesium fluoride, 5:699
Cesium fluoroborate
physical properties of, 4:152t
thermodynamic properties of, 4:154t
Cesium formate, 5:699
Cesium heptaoxide, 5:700
Cesium hydrogen carbonate, 5:698
Cesium hydroxide, 5:693, 697, 699
Cesium hydroxide monohydrate, 5:699
Cesium iodide, 5:699
Cesium isotopes, 5:705
Cesium–lithium alloys, 5:698
Cesium monoxide, 5:700
Cesium nitrate, 5:699–700
Cesium oxalate, 5:699
Cesium ozonide, 18:417
Cesium perchlorate, 5:699
Cesium permanganate, 5:700
Cesium peroxide, 5:700
Cesium silicates, 22:452
Cesium–sodium alloys, 5:698
Cesium sulfate, 5:700
Cesium superoxide, 5:700
Cesium tetrachlorogold, 5:701
Cesium tetrahydrogallium, 5:701
Cesium tetrahydrogallium, physical properties of, 4:194t
Cesium trifluoroborate, 5:701
Cesium vapor thermionic convertor, 5:704–705
Cesspools, 25:915
Cetalkonium chloride, cosmetic surfactant, 7:834t
Cetane engine, 12:422
Cetane number, 18:668
of diesel fuel, 12:422–423
Ceteareth-10, cosmetic surfactant, 7:834t
Ceteareth-40, cosmetic surfactant, 7:834t
Cetoleic acid, physical properties, 5:31t
Cetone alpha, 24:565
CETP inhibitors, 5:144t
Cetrimonium bromide (CTAB), 4:358t.
See also Cetyltrimethylammonium bromide (CTAB) surface area antimplicrobial used in cosmetics, 7:847
cosmetic surfactant, 7:834t
Cetus, 11:12
Cetyl alcohol, 22:756
properties of commercial, 2:11t
Cetyl bromide, physical properties of, 4:350t
Cetyl chloroformate, molecular formula, 6:291t
Cetyl lactate, cosmetically useful lipid, 7:833t
Cetyl palmitate, in nail-care products, 7:853
Cetylpyridinium bromide, physical properties of, 4:350t
Cetylpyridinium chloride, function as ingredient in cosmetics, 7:829t
Cetytrimethylammonium bromide (CTAB) surface area, of silica, 22:371, 386.
See also Cetrimonium bromide (CTAB)
Cevian, 7:639
CFCl\textsubscript{3}SCI, 23:629
cGMP, nitric oxide stimulates, 5:112.
See also Current good manufacturing practices (cGMPs)
cGMP products, 11:427, 431, 433, 434, 435
Chabazite
differential heats of sorption, 1:625
pore dimensions, 5:239
structure of, 16:814, 816
Chadwick, Edwin, 22:755
Chagas' disease, 14:338
Chain branching, biodegradability and, 25:826
Chain–chain interactions, 20:440
Chain directionality, of fiber polymers, 11:175
Chain-end initiation, 23:372
Chain-end initiator control, 20:303
Chain fluoro silicates, 12:636–637
Chain growth in bulk polymerization, 11:202
with metallocene catalysts, 16:97–102
Chain-growth copolymerization, 7:609–610
Chain-growth polymerization, 20:391, 406–410; 24:16
Chain length control, polymer, 20:529–530
Chain-like organic semiconductors, 22:202–203
Chain-propagating radical reaction, nonpolymeric, 14:276
Chain propagation, in low density polyethylene, 20:218–220
Chain-reaction polymerizations, 14:244
Chain rule of partial differentiation, 24:651
Chain-scrambling, in anionic polymerization of cyclic siloxanes, 22:560
Chain stationary insertion, 16:110
Chain stiffness, of fiber polymers, 11:175
Chain-stopped alkyds, 2:152
Chain structure of PVDC, 25:699
of linear low density polyethylene, 20:182
Chain/substrate interaction, 24:139
Chain transfer (CT)
in emulsion polymerization, 11:202; 19:831–832
with metallocene catalysts, 16:102
in polychloroprene, 19:838
in poly(vinyl acetate), 25:605–606
in PVC polymerization, 25:667–668
in solution polymerization, 11:200–201
in vinyl acetate polymerizations, 25:573
in Ziegler-Natta polymerization, 26:522
Chain-transfer agents (CTAs), 19:831, 832, 840; 20:221, 443; 25:568
common, 20:222
in styrene polymerization, 23:383–384
in synthetic latex manufacture, 14:719–720
Chain-transfer constants, 25:571
Chain-transfer rate constants, 19:832
Chain-transfer rates, 19:839
Chain transfer to solvent (CTS), 23:385
Chalc an thite, 7:772
Chalcogenide glasses, 12:575, 584
semiconductivity in, 12:587
Chalcogenides
acidic, 12:190–191
gallium, 12:359
in photocatalysis, 19:75
plutonium, 19:691
zirconium, 26:641
Chalcogens, amorphous semiconductors based on, 22:127
Chalcomycin, 15:296, 297
Chalk, 15:27
compression effects in centrifuges, 5:513, 514
as filler, 11:311
performance criteria in cosmetic use, 7:860
powder used in cosmetics, 7:841
raw material for cement, 5:467
Chalk-Harrod mechanism, in silicone network preparation, 22:564
Chalking, 19:383
Chalopyrite, 4:472
Chamaerops humilis, 11:298
Chamber process, for sulfuric acid production, 23:754
Chamomile oil, 24:548
Chamot, Emile, 16:468
Change-can mixers, 16:721
Change control program, in commercial-scale pharmaceutical operations, 18:736
Change management, in piping systems, 19:491–492
Change of state, involving mixtures, 24:690–692
Channel blacks, 4:762
manufacture, 4:787
Channel catfish
aquacultural chemical needs, 3:209
aquaculture, 3:183, 188
aquaculture ponds, 3:192
common and scientific names, 3:187
geosmin and taste, 3:207–208
large eggs, 3:189
nutrition and feeding, 3:201, 202
reproduction and genetics, 3:205, 206
world aquaculture production in 1996, 3:186
Channel conductance, in field-effect transistors, 22:250
Channel electron multipliers, 24:105–106
Channel-forming systems, crown ethers in, 24:59
Channel induction furnaces, 12:311–313, 316
Channeling effect, in ion implantation, 14:435
Channeling, in settling of suspensions, 22:55
Channel region, in FETs, 22:163
Character impact items, for flavors, 11:571, 572–574
Characterization models, in life cycle assessment, 14:818–820
Charcoal
from biomass, 3:687–688
reaction with sulfur to produce carbon disulfide, 4:828–830
in silicon production, 22:503
Charcoal briquettes, sodium nitrate in, 22:852
Charcoal delay systems, for nuclear waste, 1:651
Charcoal production, from wood, 26:360
Chardonnet, Hilaire de, 11:248
Chardonnet process, history of, 11:248–249
Charge assistance, 8:77
Charge attraction dominated recognition, 16:779–781
Charge carriers, in silicon-based semiconductors, 22:237–239
Charge control additives, in paper manufacture, 18:116–117
Charge-coupled devices (CCDs), 19:132, 142–143; 23:143, 144; 26:421
arrays of, 22:267
in chemical analysis, 19:150
color applications of, 19:147
consumer applications of, 19:148
design type and application for,
19:151–152
fabrication and performance of, 19:146–152
n-type dopant in, 19:151
p–i–n junctions for, 22:138
utilization of, 19:146–150
Charged interfaces, colloids, 7:285–286
Charge dissipation, conducting polymer applications, 7:537–538
Charged membranes, 21:651
development of, 21:653–654
Charged polysaccharides, 20:553
Charge-grade ferrochromium, 6:480, 500
Charge-handling capacity, 19:141
Charge-injection devices (CIDs), 19:142
Charge mode detectors, 19:140–143
Charge neutralization, 11:631, 632
Charge polarization, nonlinearity of, 14:679
Charge separation, 9:584
Charge transfer
cause of color, 7:326t, 332–333
target of crystal engineering, 8:86t
Charge-transfer complexes
organic, 22:223
organic semiconductors and, 22:203–204
Charge-transfer devices (CTDs), 19:142–143
Charge-transfer dominated substrate recognition, 16:782–783
Charge transfer inhibition, 11:836
Charge-transfer resistance, 9:570
Charge-transfer salts
electrical properties of, 22:204–207
optical properties of, 22:208
organic semiconductors and, 22:204
synthesis and manufacture of, 22:212–213
Charge transport, electrochemical cell, 9:659
Charging, batteries, 3:410
CHARM analysis, 11:519–520
Char Oil Energy Development (COED) process, 6:853
Charpy Izod impact test, 19:580–581
Charts, heat-exchanger effectiveness, 13:255–256
Chaulmoogra acids, 5:28
Chaulmoogric acid, 5:36t
CHDMT pure isomers, crystal structure of, 20:61–62. See also Cyclohexyldimethanol terephthalate (CHDMT)
Checker burner, 23:660
Checklists, safety, 13:155
Check sheet, 21:177
Check valves, 19:475–476
in refrigeration systems, 21:540
Cheese, as colloid, 7:273t
Cheese manufacture/production, 10:296
recombinant yeast in, 26:492
salt in, 22:815
Cheese products, packaging, 18:33
Cheese whey solids, 26:473
Chelant(s), 5:708
in bleaching of recycled pulps, 21:52
as soap bar additives, 22:744
Chelant control, in industrial water treatment, 26:133
Chelate compounds, 14:545–550
Chelated organic titanates, 25:127
Chelated titanates, 25:129
“Chelate effect,” 24:38, 39
Chelate formation, citric acid, 6:637–638
alkanolamine, 25:92–95
nickel, 17:117
nomenclature and structural representation, 5:713–715
titanium, 25:86–97
titanium phosphorus-containing, 25:91–92
Chelating agents, 5:708–739; 12:61, 122
applications, 5:731–732
bifunctional, 5:7236
classes of, 5:712–713t
concentration formation constants of metal chelates, 5:717t
cyanide applications, 8:183
dispersants contrasted, 8:686
economic aspects, 5:729–730
environmental, health, and safety factors, 5:731
ethylenamines application, 8:500t, 503–504
nomenclature and structural representation, 5:713–715
ring effects on complex stability, 5:720t
U.S. production, 5:730t
Chelating extractants, 10:750
Chelating ligands, 7:575–576
Chelating properties, of 1,3-diketones, 14:598t
Chelating salts, PVA and, 25:603
Chelation, 5:708
displacement equilibria, 5:716–718
electrochemical potentials, 5:728–729
factors affecting stability, 5:718–719
formation equilibria, 5:715–716
metal buffering, 5:726–727
pH effects, 5:719–724
solubilization, 5:727–728
titration behavior, 5:724–726
Chelation complex, 5:708
Chelation drug delivery, 9:64–65
Chelators, 15:221–222
dendrimers as, 26:806–807
use in retting, 11:609
Chelidonine, 2:90
Chematur process, 17:164
Chem-bioinformatic tools, 24:175
CHEMDOC service, 18:245
Chemicals process, 15:575
Chemetics process, 17:163
Chemical absorption of carbon dioxide
$k_{1\text{L}}$, measurement method, 15:679
Chemical Abstract (CAS) Registry Number, 19:423
Chemical Abstracts (CA), 18:246
database, 18:237
Chemical Abstracts Indexes, 17:403
Chemical Abstracts Service (CAS), 6:19; 18:227–228
index nomenclature generation program, 17:401
“Chemical accounting,” 14:335
Chemical additives, in paper, 18:98
Chemical admixtures, cement, 5:484–485
Chemical analyses, 15:468
devices in, 19:150
in fine art examination/conservation, 11:397
in flavor characterization, 11:511
of polypeptides, 22:700
for silicones, 22:598
silylating agents in organic, 22:692–695
of sodium nitrite, 22:856–858
of sodium tetrasulfide, 22:875
of styrene plastics, 23:402
of trigeminal stimuli, 11:524
of wine, 26:324
Chemical applications
of artificial graphite, 12:744–747
of microwave technology, 16:530
of polytetrafluoroethylene, 18:306
Chemical beam epitaxy (CBE), 5:807
Chemical behavior, heuristic model of, 16:735
Chemical-binder bonding, 17:475, 477
Chemical–biological masks, 5:833–834
Chemical biotechnology, 24:175, 196
Chemical blowing agents (CBAs), 13:584, 585; 19:549
hydrazine solutions in, 13:591–593
Chemical bonding, 16:176; 17:496, 508–510; 26:772
Chemical bronchitis, 25:479
Chemical bulk analysis, of silicon surface chemistry, 22:373
“Chemical burns,” quicklime and hydrated lime, 15:74
Chemical Buyers Directory, 12:71
Chemical change(s) case hardening by, 16:201–207 in liquid–liquid extraction, 10:746
Chemical characterization, of aroma, 11:516–521
Chemical chemistry, in toxicology studies, 25:216
Chemical cleaning, industrial hygiene and, 14:211
Chemical companies, voluntary incentives of, 19:414
Chemical composition distribution (CCD), 26:542
Chemical compounds. See also Compounds in the marine environment, 24:164 means of identifying, 17:386
Chemical congresses, international, 17:385–386
Chemical conversion coatings, 15:251
Chemical conversion purifiers, 13:458, 459, 460
Chemical conversion processes, for high purity gases, 13:457
Chemical corrosion, of magnesium and magnesium alloys, 15:369–370
Chemical corrosion resistance, 9:710
Chemical databases, 6:19–20 data analysis and preparation, 6:20–21 data searching, 6:6–19 docking and target structure-based searches, 6:13–14 flexible searches, 6:10–11
Chemical deaeration, in industrial water treatment, 26:143–144
Chemical defect densities, in industrial water treatment, 26:143–144
Chemical defects, 3:386–387
Chemical degradation methods, for lignin characterization, 15:10
Chemical development, of pharmaceuticals, 18:723–724
Chemical DNA sequencing, 12:509
Chemical effluent treatment, 9:432–435
Chemical emissions, environmental stress caused by, 24:188
Chemical equations, kinetic measurements and, 14:607–608
Chemical equilibria in fiber optic fabrication, 11:138–139 liquid–liquid, 10:749–751
Chemical equilibrium calculations, 24:687–690
Chemical equilibrium criteria, in multicomponent mixtures, 24:675–678
Chemical etching, in sensor fabrication, 22:267
Chemical exposure, electrochemical process industries, 9:646–647
Chemical exposure hazards, extrapolating, 25:228
Chemical exposure tests, on plastics, 19:583
Chemical extractants, 10:750
Chemical fiber modification, 16:14
Chemical finishing, of fibers, 11:180–181
Chemical fluid deposition (CFD), of metals, 24:22
Chemical food preservation, 12:85–86
Chemical formula, defined, 21:336
Chemical fossils, 18:571
Chemical gas scavengers, 12:77
Chemical gel stabilization, 23:71
Chemical-grade limestone, 15:27
Chemical-grade propylene, product specification for, 20:777t
contaminants, 21:836–837
control of exposure to, 21:838–839
flammability, 21:839–842
protection against, 19:702
reaction control, 21:843–846
threshold limit values and, 21:837–838
toxic materials, 21:833–836
vapor cloud explosions, 21:842
Chemical hydrides, hydrogen storage and, 13:852
Chemical ignition sources, 23:116–117
Chemical imidization, 20:271
Chemical indicator pH determination, 14:24, 25
Chemical industry, 10:133. See also Chemical processing industries (CPI)
application of surfactants in, 24:119
electroless deposition in, 9:699–700
energy and, 10:134–137, 24:165–167
environmental impact assessment and, 10:228–229
German, 24:253–254
globalization of, 24:263
heat pipes in, 13:237–240
hydrogen in, 13:797–798
materials and processes in, 24:167–176
metrics for assessment in, 24:179
natural gas in, 12:383–385
quality control in, 21:159–164
regional economic patterns in, 24:263–265
reliability in, 26:980–998
Responsible Care initiative of, 24:163, 192
silicon consumption by, 22:509
standards affecting, 21:168
technical service in, 24:338–351
Total Quality Management in, 21:173
wood-based, 26:357
Chemical industry applications, platinum-group metal catalysts in, 19:620–623
Chemical industry equipment, tantalum in, 24:325–326
Chemical industry quicklimes, requirements for, 15:68
Chemical information retrieval, 6:6–19
Chemical information storage, 6:2–6
Chemical insecticides, problems associated with, 14:349–350
Chemical interaction
influence on toxicity, 25:213–214
in smart materials, 22:707
Chemical intermediates
alkanolamines from olefin oxides and ammonia, 2:139–140
bromine-containing organic compounds, 4:350–353t
butylenes, 4:423–429
butyraldehydes, 4:460–461
carbon disulfide, 4:837
from carbon monoxide, 5:25
cellulose ester applications, 5:405–406
fatty acid amides, 2:458
Chemical Inventory and Test Submission
Data Base, hydrocarbons on, 13:694
Chemical ionization, 15:653–654
See also Kinetic measurements
first-order irreversible, 25:286–287
Chemical leaching methods, for graphite, 12:782–783
Chemical leavening, 12:65–66
Chemical libraries, 6:17–18
combinational chemistry, 7:382–420
Chemically amplified (CA) negative-tone photoresists, 15:172
Chemically amplified resists
image blur in, 15:183
polymers for, 15:175–176
postexposure bake (PEB) temperature control and, 15:172–173
processing characteristics of, 15:172–175
processing delay time effects and, 15:173–175
Chemically assisted ion-beam etching (CAIBE), 22:184
Chemically modified waxes, 26:220
Chemically resistant fibers, 13:389
Chemically sensitive field-effect transistors (ChemFETs), 22:269. See also Field effect transistors (FETs)
Chemically sensitive materials, smart, 22:708t, 716–717, 721t
Chemical manganese dioxide (CMD), 15:586–588
Chemical manufacture, hydrogen fluoride in, 14:20
Chemical Manufacturers Association (CMA), 19:414 Responsible Care program, 9:647
Chemical manufacturing
sodium sulfide in, 23:639
key characteristics of, 11:440t
safety in, 21:826–827
safety legislation related to, 21:827–828
Chemical mapping, AES, 24:106
Chemical Marketing Research Association
(CMRA), 15:645–646
Chemical metallurgy, 16:126
Chemical methods
in archaeology, 5:739–758
for flavor characterization, 11:516–524
Chemical microsensors, 22:271
Chemical migration, in tire compounding, 21:806–807
Chemical mineral size reduction, 16:613
Chemical netpoints, in shape-memory polymers, 22:356, 358
Chemical nomenclature, 17:384. See also Nomenclature
Chemical nonwoven finishing, 17:512–514
Chemical oil bleaching, 10:809
Chemical oxygen demand (COD), 26:153
in wastewater treatment, 25:883, 885, 887t
Chemical oxygen demand analysis, of water, 26:42
Chemical parcel tankers, 25:328
Chemical plants
biofine, 11:439–440
fugitive emissions from, 10:68–70
process design for, 26:999–1001
process operations in, 14:205–207
railroad tracks within, 25:324–325
reliability of, 26:980–998
safe construction of, 21:852
Chemical plant units, overhauls of, 14:210
Chemical–political innovations, evaluating, 24:189
Chemical precipitation, 21:397. See also Precipitation
in phosphoric acid purification, 18:824
recovery of silver via, 22:654
of uranium ores, 25:404
Chemical pretreatment of fibers, 11:180
in solid–liquid separation, 11:343
Chemical problems, Monte Carlo methods applied to, 16:749
Chemical process design, 20:710–711
approaches to, 20:725–728
hierarchy of, 20:717–722
Chemical processes, See also Chemical conversion processes; Chemical processing entries; Chemical reactions; Chemical vapor deposition (CVD) process
health and safety criteria for, 20:710
hydrogen chloride as by-product from, 13:824
as part of a sustainable industrial activity, 20:710
synthesis of, 20:710
Chemical processing
defoamer applications, 8:245–246
exhaust control in, 10:105–106
methylene chloride in, 16:378
oxygen in, 17:763
of tungsten, 25:361–363
Chemical processing industries (CPI)
alkali silicates in, 22:473
exposure sources in, 14:206t
induction furnaces in, 12:315
market research in, 15:632
nitrogen use in, 17:284
pressure measurement in, 20:644
regulation of, 21:580–590
risk analysis in, 24:184
Chemical process synthesis, complexity of, 20:720
Chemical product design, 5:758–784
idea, 5:758, 766–771
manufacture, 5:759, 776–782
manufacturing considerations for different types, 5:777t
needs, 5:759, 760–766
selection, 5:759, 772–776
Chemical production, of pharmaceuticals, 18:724
Chemical products, 5:758
added value of, 20:714
classes of, 20:732
design stage of, 20:715
environment-oriented design of, 24:163–164
function driven, 5:782
life cycles of, 20:713–714
patent protection for, 20:712
risk assessment of, 24:191
sulfur in, 23:594
Chemical Propulsion Information Agency (CPIA), 13:597
Chemical pulp bleaching, 21:43–48
Chemical pulp bleach plant, 21:43
Chemical pulping, 21:21–31
reaction of carbohydrates during, 21:26–29
Chemical pulps
bleaching, 21:31–32
standard, 21:64–65
in papermaking, 18:94
Chemical purification, ion exchange in, 14:420–421
Chemical quality lime, 15:27
Chemical quality quicklimes, sales of, 15:60
Chemical rates, variation with temperature and pressure, 14:622–623
Chemical reaction coefficient, 25:281, 283, 290
combinations of, 25:293t
effect on critical value of mass transfer
Peclet number, 25:284t
Chemical reaction engineering (CRE), 21:330
Chemical reaction rates, 14:607. See also Kinetic measurements
Chemical reactions. See also Chemical processes; Reaction entries
with absorption, 1:47–48, 71–76
activated carbon for control of, 4:755
on adsorbents, 1:629–630, 650–651
atomic level of, 16:736
contexts of, 21:336
diesel and, 12:390–391
heterogeneous, 21:331–332, 339
homogeneous, 21:339
independent and dependent, 21:336–337
mass-transfer coefficients with, 10:753–755
microemulsions and, 16:431
microfluidic control of, 26:967–968
monitoring at high pressures, 13:417
notation for, 24:668–669
rate of, 21:339–340
supercritical carbon dioxide as a medium for, 12:808–809
thermochemical modeling of, 14:85–86
TWC catalyst, 10:48–49
Chemical reactivity
abrasives, 1:4–5
of fullerenes, 12:236–254
solvent influence on, 23:107–109
Chemical reactors. See also Reactor entries
classification of, 21:332–335
configurations of, 21:333
design equations for, 21:348–350
modes of operation of, 21:332
requirements for, 21:331
systematic design of, 20:742–744
Chemical reactor technology. See Reactor technology
Chemical reactor transport phenomena,
25:269–322. See also Packed catalytic tubular reactors
C_A, surface evaluation, 25:276–279
methodology for, 25:270–309
nomenclature related to, 25:316–321
species concentrations in the bulk gas phase, 25:272–273
strategy for ideal nonisothermal packed catalytic tubular reactors, 25:310–316
temperature on catalytic surface and in bulk gas phase, 25:273–276
Chemical receptors, structural parameters for storage of information in, 16:769t
Chemical recycling, 21:371
Chemical recycling technologies, in wastewater treatment, 25:889t, 892–894
Chemical reduction, gallium extraction by, 12:345
Chemical releases, assessing, 14:818
Chemical resistance
of acrylic fibers, 11:193–194
of engineering thermoplastics, 10:224, 225t
of ethylene–tetrafluoroethylene copolymers, 18:322–325
of fibers, 11:170
of high density polyethylene, 20:166
of inorganic pigments, 19:383
of liquid-crystal polymers, 20:84–85
of polyester elastomers, 20:75t
of thermoplastics, 10:178
Chemical resists, 9:219–220
Chemical retting, 11:291, 608
Chemicals, See also Chemicals from brine; Fine chemicals
applications research related to, 15:642
assessing the stability of, 21:844
capital investment and returns related to, 15:640–641
carcinogenic potential of, 25:222
cauterization, 18:629–630
commodity versus specialty, 15:640
container systems for, 18:1
dessicant applications, 8:356t
distribution channels for, 15:642
effect on polyamide plastics, 19:783
electrolytic production of, 12:759
as food additives, 12:29–30
from genetically engineered microbes, 12:480–482
genotoxic, 25:221
groundwater, 12:846
health effects of, 14:205
information sources for, 15:764
management interests in, 15:641
market trends for, 24:264t
metabolic detoxification/activation of, 25:213t
packaging and shipping regulations for, 18:2–4
as perfume ingredients, 18:354
persistent, bioaccumulative, toxic (PBT), 16:46
pest-control, 13:282
prices of, 15:640, 641–642
production requirements for, 15:640
properties of, 21:834–835t
recovery and reuse of, 9:453–454
registration of, 9:296–297
research and development related to, 15:640
role in insect control, 14:338–340
safe transportation of, 21:856–857
safer, 12:804, 811–812
safety of, 24:163
scale of production of, 20:712
slope factors for, 25:243
taste-active, 11:565
technical service related to, 15:642–643
undifferentiated and differentiated, 20:712
wood resistance to, 26:352
Chemical safety, in commercial-scale pharmaceutical operations, 18:736. See also Safety entries
Chemical sensitization curves, 19:191
Chemical sensitization
of photographic crystals, 19:189–192
in photography, 19:235
in photothermographic/thermographic imaging materials, 19:361–362
Chemical sensors, 3:794; 22:264
on microchips, 20:682–683
versus biological chemical detection, 22:269
Chemicals from brine, 5:784–803
calcium chloride, 5:793–795
iodine, 5:795–796
lithium, 5:796–797
magnesium compounds, 5:797–798
minerals from brine, 5:790–793
potassium compounds, 5:798–799
recovery process, 5:786–790
sodium carbonate, 5:799–800
sodium chloride, 5:800–801
sodium sulfate, 5:801–802
Chemicals Guideline, integrated, 24:192–193
Chemical shifts, 24:97–98
in surface and interface analysis, 24:90–92
Chemical shim control, in nuclear power facilities, 17:544
Chemical shippers, 25:324
Chemical sludge, 25:912
Chemical solution(s)
deposition from, 23:13
thin films from, 24:747–750
Chemical solution deposition, 23:13
as fabrication method for inorganic materials, 7:415t
Chemical space, 6:16
Chemical species, separation of, 14:184–185
Chemical structures, testing, 24:186
Chemical syntheses. See also Syntheses
computer-aided molecular design and, 26:1036–1038
enzymes as catalysts for, 10:307
less hazardous, 12:804
of lactic acid, 14:119
metrics applied to, 24:180t
uses of succinic acid and succinic anhydride in, 23:429t
Chemical systems, sampling techniques for, 26:1035–1047
Chemical technology, basic standards for, 15:748–751
Chemical textile finishing, 24:622
Chemical thermodynamics, of gas carburizing, 16:201–203
Chemical Transportation Emergency Center (CHEMTREC), 25:343
Chemical treatment of magnesium, 15:374
of spent nuclear fuel, 25:854
Chemical uses, for hydrogen peroxide, 14:66–67
See also CVD entries; Plasma-enhanced chemical vapor deposition (PECVD); Vapor deposition catalyzed, 26:806
ceramics and, 5:663
common precursors and corresponding thin films grown, 5:805t
in compound semiconductor processing, 22:188, 189
MOCVD as, 22:153–154
in silicon carbide fiber manufacture, 22:534
thermally activated, 24:744–745
Chemical vapor infiltration (CVI), 26:767
ceramics and, 5:664
Chemical warfare, 5:813–840
defense against, 5:830–837
Chemical warfare agents, detection of, 22:716–717
Chemical wastes, clean-up of, 12:476
Chemical weathering, in the hydrogeochemical cycle, 26:4–7
Chemiluminescence, 8:255; 16:389
analytical applications, 5:840–863; 14:59 measurement of, 19:577
using acridine derivatives, 5:845–846
using aryloxoalate derivatives, 5:847–855
using dioxetane derivatives, 5:855
using lophine and indole derivatives, 5:856
using luminol derivatives, 5:840–845
using ozone, 17:812
using ruthenium(II) complex, 5:856–857
Chemiluminescence detectors
gas chromatography, 4:615
liquid chromatography, 6:450
Chemiluminescent immunoassay, 14:150–151
Chemiluminescent immunoassay systems, commercial, 14:151
Chemineer CD6 agitator, 1:739
Chemineer CD6 impeller, 16:673, 701, 703
Chemisorbed water, 23:71
Chemisorption, 1:583–584
for indoor air cleaning, 1:834
parameters of physical adsorption and chemisorption contrasted, 1:583t
Chemisorption chromatography, 6:405
Chemistry, See also Combinatorial chemistry; High pressure chemistry;
Forensic chemistry; Green chemistry for accident prevention, 12:805
acid-catalyzed, 15:168–169
of anthropogenic silicas and silicates, 22:459–461
direct reduction process, 14:509–510
microfluidic applications in, 26:967–968
of RTV silicones, 22:595–596
in sensor technology, 22:264–265
silicone, 22:549–555
silver, 22:636
sodium chloride (salt) in, 22:819
sustainable development and, 24:162–205
vitreous silica applications in, 22:439
Chemistry of Heterocyclic Compounds, The (Weissberger), 21:182–183
Chemithermomechanical pulp (TMP), 21:20
Chemithermomechanical pulp (CTMP), 18:93–94
Chemithon film sulfonating–sulfating systems, 23:544–547
Chemithon reactor, 23:544
Chemoinformatics, 6:1–25
chemical databases, 6:19–20
chemical information retrieval, 6:6–19
chemical information storage, 6:2–6
chemical library design, 6:17–18
clustering techniques, 6:16–17
conformational flexibility, 6:10–11
conformational searches, 6:10–11
data analysis and preparation, 6:20–21
data searching, 6:6–19
diversity searches, 6:14–18
docking and target structure-based
database searches, 6:13–14
and economics, 6:21–22
flexible searches, 6:10–11
line notations, 6:3
pharmacophore generation
and validation, 6:11–12
similarity searches, 6:7–8
structural and substructural searches,
6:6–7
table representation, 6:3–6
three-dimensional chemical databases,
6:9–14
three-dimensional data searches, 6:8–9
toxicity prediction, 6:19
two-dimensional data searches, 6:6–8
virtual screening, 6:8–9, 14
Chemoluminescence.
    See Chemiluminescence
Chemometrics, 6:25–72
    artificial neural networks combined with
variable selection, 6:68–69
background spectrum correction, 6:62–66
bilinear methods, 6:39–57
classical least squares and inverse least
squares, 6:39–41
instrument standardization, 6:66–67
linear regression analysis, 6:27
locally weighted regression, 6:53
mean centering and variance scaling,
6:35–38
model selection, 6:50–52
multivariate curve resolution, 6:54–56
multivariate linear regression, 6:32–35
multiway analysis, 6:57–63
multiway curve resolution, 6:59–62
nonlinear methods, 6:53–54
optical computation, 6:67–68
outlier detection, 6:56–57
partial least squares, 6:47–49
principal component analysis
    and principal component regression,
6:41–47
solution constraints, 6:62–63
statistical background of regression
analysis, 6:38–39
target factor analysis, 6:52–53
Tucker3 models, 6:59–62
univariate regression, 6:28–31
Chemorheology, 10:425
Chemosensorst
conducting polymer applications, 7:539
coordination compound applications,
7:598–599
Chemotherapy
    HIV, 3:149–153
    platinum compounds in, 19:657
    waste from, 25:865
CHEMTREC information network, 21:856
Chernobyl-4 graphite-moderated reactor,
17:571–572
Chernobyl accident/disaster, 6:813; 17:533,
551, 597
Chert, 22:402
Chestnut Run Technical Service
Laboratory, 24:339
Chevrel phase (Pb,Sn)Mo6S8, 23:835–836
Chevron, bioengineering research
programs, 1:703
Chevron-Gulf ν-olefin manufacture, 17:713,
715–718
Chevron Phillips slurry manufacture, 20:198–199
Chibata, Ichiro, 11:11–12
Chichibabin reaction, 21:99
Chicken pox vaccine, 25:491–492
Chickens
    limiting amino acids of common
    feedstuffs for, 2:604t
    nutrient requirements of, 10:839–841t,
    845t
Chicken test, 5:763–764
Chicory, as coffee substitute, 7:268
Child-resistant packaging, 18:28
Chile
    aquaculture chemicals registered in,
3:219, 222t
    aquaculture production, 3:189t
    sodium nitrate mined in, 22:843–845,
    846–848
Chilean nitrate, 22:843. See also Sodium
    nitrate
Chilean saltpeter, 22:843. See also Sodium
    nitrate
Chili peppers, 23:163, 164
Chili powder, 23:164
    adulterated, 23:163
Chilled castings, tellurium in, 24:424
Chilled surface drying, in bar soap
    manufacture, 22:750–751
Chill proofing enzymes, 10:294
Chilton–Colburn analogy, 1:47
Chimeric embryos, 12:458
China. See also People’s Republic of China
acyrlic fiber production in, 11:189, 220
adhesive joint ventures, 1:526
advanced materials research, 1:696
aquaculture history, 3:183
aquaculture production, 3:189t
ascorbic acid synthesis in, 25:754
demand for oil in, 23:530
nanocomposite development, 1:717
natural graphite in, 12:780
oil recovery program in, 23:534
olefin fiber production in, 11:243
production and consumption of
regenerated cellulose fibers in,
11:275, 276t
silicon consumption and production by,
22:510
titanium production in, 24:839
titanium reserves in, 24:845
titanium uses in, 24:868
tungsten market in, 25:354–355
China clay, 6:659
as filler, 11:312
in paper manufacture, 18:108–109
China jute, 11:295
Chinese gum turpentine, 24:476
Chinese hamster ovary (CHO) cells
applications, 5:351t
use in cell culture, 5:348–349
Chinese insect wax, alcohols from, 2:2
Chinese patent,
Chinese wax, 26:207–208
Chinook salmon, common and scientific
names, 3:187t
Chin-Shih-Hu, 2:102
Chiolite, 2:364t
Chip-on-board (COB) encapsulated devices,
10:9
Chiral active pharmaceutical ingredients,
18:725–726. See also Enantio- entries
Chiral additives, 6:75–79
Chiral alcohols, synthesis of, 13:667–668
β-Chiral alcohols, synthesis of, 13:669
Chiral alkanes, synthesis of, 13:668–669
Chiral alkenes, synthesis of, 13:668–669
Chiral alkoxides, 26:929
Chiral alkynes, synthesis of, 13:668–669
Chiral ammonium ions, enantiomer
recognition properties for, 16:790
Chiral ansa-metallocenes, 16:90
Chiral auxiliaries, in oxazolidinone
formation, 17:738–739
Chiral, C₁-symmetric (asymmetric) bridged
metallocenes, 16:108–109
Chiral, C₂-symmetric bridged
metallocenes, 16:104–108
Chiral, C₂-symmetric catalysts, racemic
mixture of, 16:106
Chiral, C₂-symmetric unbridged
metallocenes, 16:108
Chiral catalysts, 16:395
Chiral centers, in biochemical compounds,
17:402
Chiral chromatography, 6:387
Chiral crystalline materials, target of
crystal engineering, 8:86t
Chiral dialkylboranes, 13:640
Chiral discrimination, 24:47
Chiral frameworks, target of crystal
engineering, 8:86t
Chiral hosts, 14:180
α-Chiral ketones, synthesis of, 13:669
β-Chiral ketones, synthesis of, 13:669
Chiral liquid crystals, high spontaneous
polarizations in, 15:106–107
Chiral metallocene catalysts, methyl
substituents in, 16:106
Chiral molecules, 6:73. See also α-chiral
ketones; β-chiral entries
synthesis of, 13:667–671
Chiral monoalkylboranes, 13:666
Chiral nematic liquid crystals, 15:117
structure of, 15:91–92
Chiral organoboranes, 13:662
asymmetric synthesis via, 13:664–671
Chiral pool, in oxazolidinone synthesis,
17:740
Chiral raw materials, 18:726
Chiral recognition, 16:789–791
Chiral separations, 6:72–103
achiral derivatizing agents, 6:96t
cellulosic and amylosic phases, 6:88–89
chiral additives, 6:75–79
chiral crown ether phases, 6:91–92
chiral derivatizing reagents, 6:76t
chiral stationary phases, 6:79–82
chiral synthetic polymer phases,
6:92–93
chirobiotic phases, 6:90–91
cyclodextrin phases, 6:84–87
ligand-exchange phases, 6:82–83
liquid chromatography, 6:45t
Pirkle phases, 6:83–84
protein-based phases, 6:89–90
Chiral smectic C liquid crystals, 15:106–107
Chiral stationary phases, 6:79–82
Chiral supramolecular clusters, 24:61
Chiral synthons, 11:5
Chiral titanium complexes, 25:98–99
Chirobiotic phases, for chiral separations, 6:90–91
Chiroselective inclusion, 14:162, 163
Chitin(s), 4:724t; 17:672; 20:565–568
derivatives of, 20:459
dissolving, 20:567
main applications of, 20:566t
classification by structure, 4:723t
Chitosan(s), 4:724t; 20:459, 565–568
degree of acetylation of, 20:567
dissolving, 20:566–567
main applications of, 20:566t
Chitosan hollow fibers, 16:23
Chitosan/PAA hydrogels, 13:734
Chlamydia trachomatis, DNA-based
biomonitor, 3:806
Chloral, production from acetaldehyde, 1:105
Chlor-alkali cell gas effluent,
gas purification, 1:618t
Chlor-alkali electrolytic process, 13:809
Chlor-alkali processes, 13:775
of sodium hydroxide production, 22:832, 833, 834
Chlor-alkali production, 9:620, 645–646;
16:40, 48
Chlor-alkali technologies, 13:842–843
Chloramination, 13:102
Chloramine-B, 13:109
Chloramines
inorganic, 13:101–104
organic, 13:104–112
N-Chloramines, 13:105
Chloramine-T, 13:109
registered for use in aquaculture in
Europe, 3:220t
Chloramphenicol, 3:30; 18:684
bacterial resistance mechanisms, 3:32t
Chlorargyrite, natural occurrence of,
22:668
Chlorate(s), 6:103–120
electrolytic production of, 12:759
Chlorate cells, 9:630–632
Chlorate liquors, 9:632
Chlorbromuron, 4:358t
Chlorendic acid, 11:479
Chlorendic anhydride, 8:232
CHLOREP program, 25:343
Chlorfenapyr, 14:349
Chlorfuren methyl ester, 13:44t
Chlorfureno methyl ester, 13:44t
Chlorhexidine gluconate, 8:340
Chloric acid, 6:103–120; 8:544
chemical properties, 6:104
manufacture, 6:104–105
physical properties, 6:103–104
uses, 6:105–106
oxidation state and stability, 8:545t
Chloride(s)
in cocoa shell from roasted beans, 6:357t
in hydrogen fluoride manufacture, 14:11
replacement of aliphatic hydroxyl with,
13:821
thorium, 24:762–763
tungsten, 25:378–379
uranium, 25:438–439
Chloride analysis, of water, 26:37–38
Chloride baths, 9:828
Chloride by-products, removal in vinyl
chloride manufacture, 25:643
Chloride content, of epoxy resins, 10:386
Chloride-free mixed alcohol phosphate
esters, 25:92
Chloride ion, in plating baths, 9:808–809
Chloride process
pigment plants, 25:36–37
for titanium dioxide pigments, 25:36–37
in titanium manufacture, 24:849–851
wastes from, 25:63–64
Chloride solutions, electrolysis of, 9:626–633
Chloride titanium dioxide production
process, 19:388
Chlorinated additive flame retardants,
11:468–470, 471–473t
Chlorinated aromatics, 6:242
decomposition using microwaves, 16:555
Chlorinated butyl rubber, 4:436
development of, 4:434
manufacture, 4:400, 442–444
Chlorinated ethanes
economic aspects, 6:245–246
manufacture, 6:236–241
uses, 6:249–250
Chlorinated ethylenes
economic aspects, 6:245–246
manufacture, 6:236–241
uses, 6:249–250
Chlorinated fluorocarbons (CFCs), 21:591
Chlorinated glycolurils, 13:109–110
Chlorinated hydantoins, 13:110
Chlorinated hydrocarbons (CHC) contamination by, 23:111–112
for PVC polymers, 25:674
Chlorinated isocyanurates end use of chlorine, 6:135t
as pool sanitizers, 26:175–176
Chlorinated methanes economic aspects, 6:244–245
manufacture, 6:236–238
uses, 6:249
Chlorinated molecules, total mineralization of, 19:90
Chlorinated organics, 21:47
Chlorinated paraffin formulations, 11:459t
Chlorinated paraffins, 6:121–129, 11:468–470
chemical and physical properties, 6:121–123
economic aspects, 6:125–126
end use of chlorine, 6:135t
environmental concerns, 6:127
fractions, 6:121
health and safety factors, 6:126–127
manufacture, 6:123–124
shipment and storage, 6:125
uses, 6:127–128
Chlorinated polyethylene, 21:768
Chlorinated propanes, 6:246
uses, 6:250
Chlorinated PVC (CPVC), uses of, 25:684
Chlorinated rubber, for corrosion protection, 7:201
Chlorinated solvents, acetylene-derived, 1:229
Chlorinated TSP (Cl-TSP), manufacture of, 18:853
Chlorination, 8:610–615; 26:391, 398
as advanced wastewater treatment, 25:909
from burning PVC, 25:682–683
environmental considerations related to, 25:679
of ethane, 10:587–588
in hazardous waste management, 25:819
lithium recovery techniques, 15:126
of methane, 16:321–322
of naphthalene, 17:74, 77
PVC and, 25:679
in pyrometallurgy, 16:140
of saligenin, 22:24
selenium recovery via, 22:83–85
separation of tantalum and niobium via, 24:321
of tin, 24:804
in VDC polymerization, 25:695
of vinyl chloride, 25:631–632
in vinyl chloride manufacture, 25:634–638
of zircon, 26:629
Chlorination–dehydrochlorination, of paraffins, 17:723
Chlorine (Cl), 6:130–211; 9:280. See also Inorganic chlorine; XeCl laser
addition to fullerene, 12:240–241
analytical methods, 6:202
bleaching agent, 4:50
capacities of facilities, 6:193–198t
catalyst poison, 5:257t
chemical properties, 6:133–138
diffusion coefficient for dilute gas in water at 20° C, 1:67t
diffusion coefficient in air at 0° C, 1:70t
for disinfection, 8:605
economic aspects, 6:188–202
electrolytic preparation/production of, 12:759; 16:40
end uses, 6:134–135
in fused quartz manufacture, 22:413
generating from hydrogen chloride, 13:833
health and safety factors, 6:203–204
hydrogen chloride synthesis from, 13:822
hydroxybenzoic acids and, 22:3
manufacture of, 6:138–186
materials of construction for, 6:186–187
in membrane pretreatment, 21:663
physical properties of, 6:131t, 131–133
properties and characteristics compared to other disinfectants, 8:608t
as a pulp bleaching agent, 21:47
reactions with acrylamide polymers, 1:316
from salt production, 22:810
in selenium recovery, 22:84
shipment and storage, 6:187–188
in sodium hydroxide manufacture, 22:832, 833, 834, 835, 837, 841
sodium reactions with, 22:765
solubility in hydrochloric acid, 13:818
solubility in selected solvents, 6:133t
standard electrode potential, 7:799t
in stream water, 26:24
uses, 6:204–206
Chlorine-based pool sanitizers,
26:173–176
Chlorine-based shrink-resist treatments,
26:392
Chlorine bleach, 10:279
Chlorine-caustic extraction-hypochlorite
(CEH) bleaching process, 4:45
Chlorine circulation, in the hydrologic
cycle, 26:31
Chlorine compounds, reaction with
molecular surface hydroxyl groups,
23:71
Chlorine-containing bleaching agents,
4:47–55
bleaching mechanism, 4:46–47
Chlorine derivatives, in industrial water
treatment, 26:148
Chlorine dioxide, 4:54–55
for disinfection, 8:617–619
oxidation state and stability, 8:545t
properties and characteristics compared
to other disinfectants, 8:608t
as a pulp bleaching agent, 21:32, 44, 45
Chlorine emission limits, 13:183
Chlorine-fastness, 9:332
Chlorine-free bleaching processes,
21:43–44
Chlorine-free bleaching technologies,
10:304–305
Chlorine-free shrink-resist treatments,
26:392–393
Chlorine heptoxide, 18:275
Chlorine–Hercosett process/treatment,
9:469; 26:392
Chlorine–hydrogen hazards, 9:646
Chlorine Institute, 21:831; 25:343
Chlorine market, in vinyl chloride
manufacture, 25:646
Chlorine monofluoride, 13:123–124
Chlorine monoxide, 8:545t
Chlorine oxygen acids/salts, 17:389t
Chlorine perfluoride, 13:125
Chlorine peroxide, oxidation state
and stability, 8:545t
Chlorine replacement, via electrochemical
synthesis, 12:809–810
Chlorine reservoirs, formation of, 17:788
Chlorine resistance, of reverse osmosis
membranes, 15:835–836
Chlorine-resistant membranes, 16:28
Chlorine sanitizers
for swimming pools, 26:180–181
toxicity of, 26:198
Chlorine stabilizers, for swimming pools,
26:190–192
Chlorine trifluoride, 13:124–125, 126
manufacture of, 13:129
uses for, 13:130–131
Chlorinolysis, 6:231–232
Chlorisondamine, 5:159
Chlorite
structure and composition, 6:670, 673
in unit layer mixtures, 6:671
Chlormequat chloride (CCC), 13:40t, 47, 306
1-Chloro-1,1-difluoroethane, physical
properties of, 1:778t
2-Chloro-1,3-butadiene, production from
acetylene, 1:221, 230
3-Chloro-1-propene, chlorocarbon/
chlorohydrocarbon of industrial
importance, 6:227t
1-Chloro-2-(chloromethyl), physical
constants, 6:333t
4-Chloro-2-chloromethyltoluene, 6:339
1-Chloro-2-(dichloromethyl), physical
constants, 6:333t
4-Chloro-2-nitrotoluene, 6:339
1-Chloro-2-propanol phosphate, 11:490
1-Chloro-2-(trichloromethyl), physical
constants, 6:333t
1-Chloro-3-(chloromethyl), physical
constants, 6:333t
4-Chloro-3-chloromethyltoluene, 6:339
1-Chloro-3-(dichloromethyl), physical
constants, 6:333t
4-Chloro-3-methylbenzenesulfonyl
chloride, 6:339
4-Chloro-3-nitrotoluene, 6:339
1-Chloro-3-(trichloromethyl), physical
constants, 6:333t
3-Chloro-4,4-dimethyl-2-oxazolidinone,
13:111–112
1-Chloro-4-(chloromethyl), physical
constants, 6:333t
2-Chloro-4-chloromethyltoluene, 6:339
2-Chloro-4-(1-cyano-1-methylethylamino)-
6-ethylamino-1,3,5-triazine, 2:549t
1-Chloro-4-(dichloromethyl), physical
constants, 6:333t
2-Chloro-4-ethylamino-6-isopropylamino-
1,3,5-triazine, 2:549t
1-Chloro-4-((trichloromethyl), physical
constants, 6:333t
2-Chloro-5-chlorosulfonyltoluene, 6:339
8-Chloro-6-demethyl-6-deoxytetracycline,
24:598
Chloroacetaldehyde, production
from acetaldehyde, 1:105
Chloroacetamide, 1:142
herbicides, 13:303
Chloroacetate esters, 1:142
physical properties of, 1:142t
Chloroacetic acid, 1:136–139
end use of chlorine, 6:135t
physical properties of, 1:137t
producers, 1:139t
production from acetic acid, 1:133, 138
Chloroacetic anhydride, chloroacetyl
chloride in production of, 1:142
Chloroacetophenone, chloroacetyl chloride
in production of, 1:142
Chloroacetyl chloride, 1:141–142; 16:374
Chloroalkanes, hydrogen peroxide and,
14:65
2-Chloroalkanesulfonfyl chloride, 23:653
β-Chloroalkoxy titanates, 25:73
N-Chloroalkylamines, 13:106
Chloroamidines, 13:107
N-Chloroamino acids, 13:107
o-Chloroaniline (OCA), derivative
of nitrochlorobenzenes, 6:223t
p-Chloroaniline (PCA), derivative
of nitrochlorobenzenes, 6:223t
Chloroanilines, 21:199
1-Chloroanthraquinone, 9:314
2-Chloroanthraquinone, 9:317–318
m-Chlorobenzyl chloride, physical
constants, 6:333t
p-Chlorobenzyl chloride, physical
constants, 6:333t
Chlorobenzene(s), 21:199
chlorocarbon/chlorohydrocarbon of
industrial importance, 6:227t
2-Chloroethanol, 13:31
bioremediation substrate, 3:772
2-Chloroethanol phosphate, 11:489–490
reaction with ozone, 17:783
specifications, analysis, and quality
control, 6:222
storage, shipment, and handling, 6:217
toxicity of selected, 6:218t
U.S. consumption, 6:246t
uses, 6:222–224
vapor-phase nitration of, 17:261t
o-Chlorobenzene, U.S. consumption, 6:246t
p-Chlorobenzene, U.S. consumption, 6:246t
Chlorobenzoic acids, photocatalytic
degradation and mineralization of,
19:78
m-Chlorobenzotrichloride, physical
constants, 6:333t
p-Chlorobenzotrichloride, physical
constants, 6:333t
o-Chlorobenzotrichloride, physical
constants, 6:333t
m-Chlorobenzyl chloride, physical
constants, 6:333t
p-Chlorobenzyl chloride, physical
constants, 6:333t
Chloroborane,
2-Chlorobutadiene, chlorocarbon/
chlorohydrocarbon of industrial
importance, 6:227t
Chlorobutanol
antimicrobial used in cosmetics, 7:831t
registered for use in aquaculture in
Europe, 3:220t
Chlorocarbonates, 6:290
Chlorocarbon processes, 10:587
Chlorocarbons, 6:226–253
of industrial importance, 6:227t
physical properties of selected, 6:227t
Chlorocyclophosphazenes, 19:31
Chloro dehydroxilation, 6:233–234
Chlorodifluoromethane (HCFC-22), 6:279,
288
physical properties of, 1:778t
pyrolysis of, 18:289
N-Chlorodimethyloxazolidinone,
13:115–116
Chloroethane(s), 6:253–278
chlorocarbon/chlorohydrocarbons of
industrial importance, 6:227t
2-Chloroethanol, 13:31
bioremediation substrate, 3:772
Chloroethene, 25:628. See also Vinyl chloride
clicarbon/chlorohydrocarbon of industrial importance, 6:227t
2-Chloroethyl benzoate, 6:327
1-Chloroethyl chlorofomate, molecular formula, 6:291t
2-Chloroethyl chlorofomate, molecular formula, 6:291t
1-Chloroethyl cyclohexyl carbonate, molecular formula, 6:305t
2-Chloroethyl diphosphates, 13:491
Chloroethylenes, 6:253–278; 25:628.
See also Vinyl chloride
1-Chloroethyl ethyl carbonate, molecular formula, 6:305t
2-Chloroethylphosphonic acid, 13:26t, 31–32
Chloroferric phthalocyanine, 14:547
Chlorofluorocarbons (CFCs), 1:775; 11:859; 13:718, 727
alternatives to, 12:25
as blowing agents, 23:376; 25:472
decline in use of, 1:770–771
effect on ozone depletion, 17:786
as greenhouse gases, 1:806, 807t, 808
as harmful greenhouse gases, 21:530
ozone depletion and, 17:813–814
physical properties of, 1:776t
recycling of, 25:871
as refrigerants, 21:524, 528–529
regulatory control of, 24:262–263
role in stratospheric ozone depletion, 1:809–811
Chlorofluorocarbon solvents, replacing, 24:15
Chlorofluorochemicals (CFCs), 13:714.
See also Chlorofluorocarbons (CFCs) substitutes for, 13:715
Chloroform, 6:279–290; 16:373, 374
acrylamide solubility in, 1:290t
adipic acid solubility, 1:555t
analytical methods, 6:285–286
azeotrope with acetone, 8:747
chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
consumption, 6:244t
economic aspects, 6:284–285
end use of chlorine, 6:134t
health and safety factors, 6:286–287
in integrated manufacturing process, 6:237t
LD₅₀ of, 25:228
manufacture, 6:283–284
physical and chemical properties, 6:279–283, 280t
production from acetaldehyde, 1:105
solubility of aminophenols in, 2:653t
solubility of benzoic acid in, 3:626t
solubility of chlorine in, 6:133t
solubility of dispersant tails in, 8:685
specifications and standards, 6:285
terminal activity coefficients of mixture with benzene, 8:743t
terminal activity coefficients of mixture with ethyl acetate, 8:743t
toxicity of, 25:227t
uses, 6:287
vinyl chloride reactions with, 25:632
water–acetone–chloroform azeotrope, 8:821
Chloroformamidine hydrochloride, 8:160–161
Chloroformate production, phosgene in, 18:811
Chloroformates and carbonates, 6:290–323
chemical properties, 6:293–298
commercial, 6:291t
DOT regulations for shipment, 6:301t
economic aspects, 6:302
health and safety factors, 6:302
manufacture, 6:298–300
physical properties, 6:291, 292t
shipping and storage, 6:300–301
specifications and analysis, 6:302
uses, 6:303–304
Chloroformic acid, 6:290
Chlorogallates, 12:357
Chlorogenic acids
analysis in green coffee, 7:253t
analysis in roasted, brewed, and instant coffee, 7:255t
N-Chlorohydantoin moiety, 13:113
Chlorohydrin, 12:649–650
Chlorohydrination, in the chlorohydrin process, 20:799–800
Chlorohydrin processes, 10:655; 24:172
for propylene oxide manufacture, 20:796, 798–801
Chlorohydrocarbons, 6:226–253
chemical properties, 6:226–236
economic aspects, 6:244–246
health and safety factors, 6:247–248
of industrial importance, 6:227t
manufacture, 6:236–243
physical properties, 6:256
physical properties of selected, 6:227t
shipment and storage, 6:243–244
specifications, standards, and quality control, 6:246–247
uses, 6:248–250
Chlorohydroxotricyclohexylantimony, 3:77
N-Chloroamines, 13:102
Chloroisocyanurates, 13:114, 115
Chloromaleic anhydride, Diels–Alder adduct from cyclopentadiene, 8:227t
Chloromethane(s)
chlorination to chloroform, 6:283–284
chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
consumption, 6:244t
Chloromethylation, 12:167; 13:821
of naphthalene, 17:75
of salicylic acid, 22:5
Chloromethylation (Blanc–Quelet reaction), benzene, 3:603
Chloromethylbenzene, 3:603
Chloromethyl chloroformate, molecular formula, 6:291t
1-Chloromethyl isopropyl carbonate, molecular formula, 6:305t
Chloromethyl methyl ether, 14:388, 389
5-Chloromethylsalicylic acid, 22:5
p-Chloro-m-xylene, antimicrobial used in cosmetics, 7:847
2-Chloronicotinoyl chloride, 18:738
ortho-Chloronitrobenzene, vanillin preparation from, 25:546–547
N-Chloro-N-sodiobenzenesulfonamidates, 13:109, 113
N-Chloro-N-substituted-p-nitroanilides, 13:109
Chloropentakis(ethanol) cobalt(II), thermochromic material, 6:615
Chloroperoxidases, as bleaching agents, 4:66–67
Chlorophenols, manufacture of, 23:654
Chlorophenoxy acid herbicides, 13:304
(E)-(RS)-1-(4-Chlorophenyl)-4,4-dimethyl-2-(1H-1,2,4-triazol-1-yl)-pent-1-en-3-ol, 13:47–48. See also 4-Chlorophenyl-4,4-dimethyltriazol pentenol
4-Chlorophenyl-4,4-dimethyltriazol pentenol, 13:40t, 47–48
Chlorophosphazenes, 19:55, 56
in silicone polymerization, 22:556
Chlorophyll, 10:806; 24:551–552
color of, 7:331
biosynthesis inhibitors of, 13:295
colorant in cosmetics, 7:835
Chloropicrin, diffusion coefficient in air at 0° C, 1:70t
Chloro pink, 9:310–311
Chloroplast transit peptide, 12:489
N-Chloropolyacrylamides, 1:316
Chloroprene, 6:242, 246. See also 2-Chloro-1,3-butadiene from butadiene, 4:369
chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
copolymerization of, 19:829–830
end use of chlorine, 6:134t
removal in vinyl chloride manufacture, 25:642
Chloroprene–dichlorobutadiene copolymers, 19:843
Chloroprene elastomers, 21:767
Chloroprene peroxides, 19:829
Chloroprene (M1) reactivity ratios, 19:832t
Chloroprene rubber, 9:561–562; 19:828
Chloroprene–sulfur copolymerization, 19:833–834
Chloroprene–sulfur copolymers curing, 19:848
manufacture of, 19:840–843
3-Chloropropyl chloroformate molecular formula, 6:291t
Chloropyridines, uses for, 21:123
7-Chloroquinoline, 21:195
Chlorosilane intermediate mixtures, in silicone preparation, 22:600–601
Chlorosilanes, as silylating agents, 22:692, 697
Chlorostannate rubidium processing method, 21:818
Chlorostyrene, monomeric, 23:368
Chlorostyrene beads, foaming-in-place, 23:406t
N-Chlorosuccinimide, 4:54; 13:112, 116; 23:422
N-Chlorosulfamates, 13:104
Chlorosulfonated polyethylene, 21:768–769
Chlorosulfonation processes, 23:527, 539, 658
Chlorosulfonic acid, 23:517, 537. See also ClSO₃H
m-Chlorosulfonyl benzoyl chloride, 6:327
Chlorosulfuric acid, 23:652
N-Chloro-tert-alklycyanamides, 13:107
Chlorothiazide Na, 5:168
molecular formula and structure, 5:161t
Chlorotitanates, partially alkoxyalted, 25:72
o-Chlorotoluene
chemical properties, 6:338–341
health and safety factors, 6:343
manufacture, 6:341–342
physical properties, 6:338
p-Chlorotoluene
chemical properties, 6:338–341
health and safety factors, 6:343
manufacture, 6:341–342
physical properties, 6:338
Chlorotoluenes 6:323–337. See also Ring chlorotoluene analysis, 6:330
and benzyl chloride, benal chloride, and benzotrichloride, 6:323–337
chemical properties, 6:325–327
derivatives, 6:332–334
economic aspects, 6:330
end use of chlorine, 6:134t
handling and shipment, 6:329
health and safety factors, 6:330–331
manufacture, 6:327–329
physical properties, 6:324–325, 325t
uses, 6:331–332
Chlorotrimethylsilane, azeotrope with acrylonitrile, 1:399t
Chlorotris(dialkylamino) titanates, 25:100
Chlorotris(triphenylphosphine)rhodium(I), 7:591, 593
Chlorous acid, 8:544
oxidation state and stability, 8:545t
Chlorpropham, 13:40t, 48
Chlorthalidone, 5:168
molecular formula and structure, 5:161t
Chocolate. See also Chocolate and cocoa flavor development in, 11:580
vanillin in, 25:552
Chocolate and cocoa, 6:350–373
amino acid content, 6:368t
economic aspects, 6:367–371
minerals content, 6:371t
nutritional properties, 6:367, 370t, 371t
standards, 6:351–352
vitamin content, 6:370t
Chocolate flavored syrup, theobromine and caffeine content, 6:367t
Chocolate liquor, 6:355–358
amino acid content, 6:368t
composition, 6:369t
in formulation for milk chocolates, 6:362t
in formulation for sweet (dark) chocolates, 6:362t
minerals content, 6:371t
theobromine/caffeine content of various, 6:366t
tocopherols, 6:370t
vitamin content various samples, 6:370t
Chocolate mass, 6:355
Cholate dissolution inhibitors, 15:181
Cholecalciferol, 25:781, 791
commercial forms of, 25:791–792
deficiency disease related to, 25:792
metabolic function of, 25:792
Cholecystokinin (CCK), target of antiobesity drugs, 3:98
Choleic acid inclusion chemistry, 22:755
Cholesteric liquid-crystal phase, 13:370
Cholesteric mesophase liquid crystals, 20:79
Cholesterol, 2:104; 10:804–805
ascorbic acid and, 25:767–768, 769
chemical analysis of archaeological materials, 5:749
“good” and “bad”: HDL and LDL, 5:135–137
niacin and, 25:798
phytosterols and, 17:670
risk factor for CHD, 5:109
skin conditioner/moisturizer, 7:843t
Cholesterol chloroformate, molecular formula, 6:291t
Cholesterol–phospholipid–lipoprotein liquid crystal phase, 15:112
Cholesterylamine, 14:420
molecular formula and structure, 5:141t
Cholesteryamine resin, molecular formula and structure, 5:141t
Cholic acid derivatives, 24:47
Choline, 2:737–738; 25:807
Choline salicylate, 22:12
Cholinesterase inhibitors, 2:817–818
Chondroitin(s), 4:706; 20:456
classification by structure, 4:723t
Chondroitin 4-sulfate, 4:706
Chondroitin 6-sulfate, 4:706
Chondroitin sulfates, 20:456
Chopped strand mat (CSM), 26:751
Chopper pumps, 21:78
Chop-stx number, for boron hydrides, 4:183
Chorinated trisodium phosphate, 4:52
Christmas tree module design, 15:835
Chromacity diagrams, 7:313–315
Chromaphores, 19:379
Chromate coatings, 9:827
Chromate conversion coatings, 16:218
Chromated copper arsenate, 3:276;
  6:523, 559
  composition and specifications for, 6:558t
Chromated zinc chloride
  composition and specifications for, 6:558t
Chromates
  air standards and classification, 6:549t
  in posttreatments, 9:831–832
Chromatic color, 7:305
Chromatic dispersion, 11:134
Chromatin, 17:611–613
Chromating, metal surface, 16:218–220
Chromatite, 6:471t
Chromatograms, 4:604–606; 6:409
  developing, 6:374–377
  capillary electrophoresis examples, 4:640
  gas chromatography examples, 4:619
  ion chromatography examples, 4:629
  liquid chromatography examples, 4:626
  micellar electrokinetic chromatography
    examples, 4:639
  supercritical fluid chromatography
    examples, 4:632
Chromatographic immunoassay, 6:400
Chromatographic isotope separations,
  14:185
Chromatographic methods, 10:508
  in niobium separation, 17:143
  in fine art examination/conservation,
    11:405–406
Chromatographic techniques, 21:278
Chromatographs, 10:622
  See also Affinity chromatography;
  Gas chromatography (GC);
  Liquid chromatography (LC)
  activated alumina applications, 2:400
  adsorption, 1:610–611
  of ascorbic acid, 25:760
  basic principles, 4:603–606
  classification of solvents for, 23:87
  classification of systems, 6:375
  flow profiles generated, 4:608
  helium in, 17:370
  high pressure liquid, 9:234
  ionic liquids in, 26:876–877
  in organic peroxide analysis, 18:489
  overview of major techniques, 6:374–389
  paper and thin-layer, 9:233–234
  pharmaceutical separation, 1:678–686
  in phenolic resin analysis, 18:775–776
  principles, 6:374–376
  in quinoline and isoquinoline homologue
    separation, 21:187
  sample preparation, 4:609–610
  in sugar analysis, 23:476–477
  supercritical fluid, 24:12–13
Chromatography–infrared spectroscopy,
  14:233
Chrome, 6:470
Chrome acetate, specifications, 6:547t
Chrome alum
  color, 7:331
  specifications, 6:547t
Chrome alumina pink spinel, formula and
  DCMA number, 7:348t
Chrome Antimony Titanate Buff, pigment
  for plastics, 7:369t
Chrome brick, 6:495
Chrome dyes, 9:468; 26:396
Chrome green, 6:554
  color, 7:331
Chrome hydroxide green, pigment used in
  makeups, 7:836t
Chrome Iron Nickel Black, pigment for
  plastics, 7:369t
Chrome–magnesite brick, 6:495
Chrome Manganese Zinc Brown, pigment
  for plastics, 7:369t
Chrome-mordant dyeing, 9:399
Chromenes
  photochromic materials, 6:598
  thermochromic materials, 6:621
Chrome–nickel stainless steels, pickling,
  16:223
Chrome Niobium Titanate Yellow, pigment
  for plastics, 7:370t
Chrome Orange, 6:523, 554, 555t
  pigment for plastics, 7:370t
Chrome ore, as a refractory raw material,
  21:490
Chrome oxide greens, pigment used in
  makeups, 7:836t
Chrome refractories, 21:518
Chrome-tanned leather, 9:225
Chrome yellow, 6:523, 554, 555t
color, 7:332
for green, 6:555t
U.S. imports for consumption, 6:545t
Chromia–alumina, catalytic aerogels, 1:763t
Chromian clinohlore, 6:471t
Chromian diopside, 6:471t
Chromian garnet, 6:471t
Chromian geikielite, 6:471t
Chromic acetate, molecular formula, properties, and uses, 6:563t
Chromic acetylacetonate, molecular formula, properties, and uses, 6:563t
Chromic acid, 6:522, 536; 16:221
air standards and classification, 6:549t
manufacture, 6:538–543
Chromic acid-based plating solutions, 9:801, 802
Chromic ammonium sulfate, molecular formula, properties, and uses, 6:563t
Chromic bromide, physical properties of, 4:328
Chromic chloride, molecular formula, properties, and uses, 6:563t
Chromic chromate, molecular formula, properties, and uses, 6:561t
Chromic fluoride, molecular formula, properties, and uses, 6:563t
Chromic hydroxy dichloride, molecular formula, properties, and uses, 6:563t
Chromic nitrate, molecular formula, properties, and uses, 6:563t
Chromic oxide refractory producers, products, and end uses, 6:492t
use in alloys, 6:565
Chromic phosphate, molecular formula, properties, and uses, 6:563t
Chromic potassium oxalate, molecular formula, properties, and uses, 6:563t
Chromic potassium sulfate, molecular formula, properties, and uses, 6:563t
Chromic sulfate, molecular formula, properties, and uses, 6:563t
Chromite, 6:468–469, 471t
consumption, 6:490–491
mining and processing, 6:477–481
refractory producers, products, and end uses, 6:492t
sources and supply, 6:481–487
Chromite foundry sand, 6:493–494
economic aspects, 6:497
Chromite ore, 6:469–470, 526
chemical specifications, 6:503–507t
chromium manufacture, 6:487–494
classification by composition, type of deposit, and principal uses, 6:473t
economic aspects, 6:496
occurrence, 6:470–475
reserves, reserve base, and identified resources by country, 6:472t
U.S. trade, 6:486
world production by country, 6:489
Chromite products, 6:479
Chromite refractories, 6:491, 493, 495–496, 523
Chromium (Cr), 6:468–526. See also Chromium compounds; Cr2O3 surface scale; Nickel–chromium–iron alloys; Nickel–chromium–molybdenum (tungsten) alloys; Ni-Cr alloys analytical methods, 6:502–514
composition of metal compared to chromium ferroalloys, 6:501t
dispersoid former, 2:325, 327
disposal, 6:519–521
economic aspects, 6:496–500
effect on cobalt alloys, 7:220
effect on stainless steel corrosion resistance, 7:809
environmental concerns, 6:514–518
grades, specifications, and quality control, 6:500–502
health and safety factors, 6:521–522
manufacture and production, 6:487–494
in MCFC anodes, 12:222
mining and processing, 6:477–481
in M-type ferrites, 11:66, 69, 70
occurrence, 6:470–475
physical properties, 6:475–477, 476t
recycling, 6:518–519
shipment, 6:494–496
solubility limits and electrical conductivity effects on copper, 7:750t
solution color of ions in glass, 7:343t
sources and supply, 6:481–487
supported catalyst complexes, 5:338
uses, 6:522–523
water exchange rates and activation parameters of hexaaqua complexes, 7:589t)
Chromium(III) acetate, 6:533
Chromium(II) acetate dihydrate, physical properties, 6:528t
Chromium(III) acetylacetone, physical properties, 6:528t
Chromium alloys, 6:468–523
Chromium alumina pink corundum, formula and DCMA number, 7:347t
Chromium antimony titanium buff rutile, formula and DCMA number, 7:347t
Chromium-based catalysts, 20:173
Chromium baths, 9:800–804
metallic impurities in, 9:802–803
specialty, 9:803
Chromium(II) bromide, 6:531
Chromium(III) bromide, 6:532
Chromium(IV) bromide, 6:535
Chromium carbide, 4:649t, 668, 683, 685, 691
lattice, 4:652
physical properties of, 4:684t
thermodynamic properties of, 4:651t
U.S. imports for consumption, 6:545t
Chromium carbide (3:2), 4:649t
cemented carbides, 4:656
as industrial hard carbide, 4:674
Chromium carbide (4:1), 4:649t
Chromium carbide (7:3), 4:649t
Chromium carbide (23:6), 4:649t, 692
Chromium carbonitride, chemical vapor deposition precursor, 5:805t
Chromium catalyst, for HDPE production, 20:152–154
Chromium(II) chloride, 6:528t, 531, 564t
Chromium(III) chloride, 6:532
physical properties, 6:528t
Chromium(IV) chloride, 6:535
Chromium(III) chloride hexahydrate, physical properties, 6:528t
Chromium chromate coatings, 16:219–220
Chromium complexes, 9:399
Chromium compounds, 6:526–571
analytical methods, 6:547–548
economic aspects, 6:543–546
environmental concerns, 6:550–551
health and safety factors, 6:548–550
hydrolysis, equilibrium, and complex formation constants, 6:530t
manufacture, 6:538–543
molecular formula, properties, and uses, 6:563t
properties, 6:527–538, 528–529t
specifications and shipment, 6:546–547
standard reduction potentials, 6:530t
uses, 6:551–565
U.S. exports, 6:544t
U.S. imports for consumption, 6:545t
Chromium(0) compounds, 6:527–531
Chromium(II) compounds, 6:531–532
air standards and classification, 6:549t
Chromium(III) compounds, 6:533–535
and glucose tolerance/diabetes, 6:549–550
manufacture of water-soluble, 6:542–543
in volumetric sweep efficiency, 18:620
Chromium(IV) compounds, 6:533–535
Chromium(V) compounds, 6:535–536
Chromium(VI) compounds, 6:536–538
air standards and classification, 6:549t
U.S. Government specifications, 6:546t
Chromium(VI) dioxide difluoride, 6:535
Chromium(VI) dioxide dichloride, physical properties, 6:528t
Chromium copper, 7:760–761
effect of alloying on mechanical properties, 7:677
mechanical properties, 7:678t
Chromium finishes, 9:766
Chromium(II) fluoride, 6:531
Chromium(III) fluoride, 6:532
Chromium(IV) fluoride, 6:535
physical properties, 6:528t
Chromium(V) fluoride, 6:535
Chromium(VI) fluoride, 6:536
Chromium greenblack hematite, formula and DCMA number, 7:347t
Chromium hexacarbonyl, effective atomic number of noble gas, 7:590t
Chromium(0) hexacarbonyl molecular formula, properties, and uses, 6:563t
physical properties, 6:528t
Chromium hydroxide, water exchange rates and activation parameters of hexaaqua complexes, 7:589t
Chromium(III) hydroxide trihydrate, 6:534
Chromium(II) iodide, 6:531
Chromium(III) iodide, 6:532
Chromium(IV) iodide, 6:535
Chromium–iron alloys, 23:300
Chromium iron manganese brown spinel, formula and DCMA number, 7:348t
Chromium iron nickel black spinel, formula and DCMA number, 7:348t
Chromium isotopes, 6:476
Chromium magnesium oxide, 5:583
Chromium manganese zinc brown spinel, formula and DCMA number, 7:348t
Chromium–nickel alloys, 17:100–101
Chromium–nickel–iron alloys, 17:102–103
Chromium–nickel stainless steels, 15:563
Chromium niobium titanium buff rutile, formula and DCMA number, 7:347t
Chromium(III) nitrate, 6:533
Chromium nitride, 4:668
chemical vapor deposition precursor, 5:805t
Chromium(III) oxide, 6:534
byproduct from chlorates manufacture, 6:113
physical properties, 6:528t
Chromium(IV) oxide
conducting oxide, 5:585
Chromium(IV) oxide, 6:535
molecular formula, properties, and uses, 6:564t
physical properties, 6:528t
Chromium(V) oxide, 6:535
Chromium(VI) oxide, 6:536–537
physical properties, 6:528t
Chromium oxide catalysts, 20:151
for LLDPE production, 20:191
Chromium(VI) oxide diperoxide, 6:538
Chromium Oxide Green, pigment for plastics, 7:370t
Chromium oxide greens, 6:554–555
Chromium oxides
U.S. exports, 6:544t
U.S. imports for consumption, 6:545t
Chromium(VI) oxide tetrafluoride, 6:536
Chromium(III) perchlorate, 6:533
Chromium phosphate coatings, 16:218–219
Chromium(III) pigments, 19:406
Chromium plating, 6:523, 551–552; 9:764
cerium application, 5:683
decorative, 9:803
selement in, 22:98
tensile stress of, 9:793
Chromium silicide, 6:500
Chromium steels, 23:308
carbides in, 4:691

Chromium sulfates
U.S. exports, 6:544t
U.S. imports for consumption, 6:545t
Chromium(II) sulfide, 6:532
Chromium surface conversion, 6:552–554
Chromium tin orchid cassiterite, formula and DCMA number, 7:347t
Chromium tin pink sphene, formula and DCMA number, 7:348t
Chromium trioxide
supported on wet alumina, 16:568
U.S. exports, 6:544t
U.S. imports for consumption, 6:545t
Chromium tungsten titanium buff rutile, formula and DCMA number, 7:347t
Chromium Tungsten Titanate Yellow, pigment for plastics, 7:370t

Chromocene, 16:79

Chromogenic chemistry, 19:245–261
colored masking couplers in, 19:256–257
coupler types in, 19:248–249
coupling mechanisms in, 19:249–252
cyan couplers in, 19:252–253
developers in, 19:245–248
DIR couplers in, 19:257–260
magenta couplers in, 19:254–256
post-development, 19:260–261
yellow couplers in, 19:253–254

Chromogenic materials, 23:2
electrochromic, 6:571–587
photochromic, 6:587–606
piezochromic, 6:606–614
thermochromic, 6:614–631

Chromogenic technologies, alternative, 23:22–23
Chromoionophores, 20:517–518
Chromonema fibers, 17:612
Chromonic liquid crystals, 15:101

Chromophore interaction, in dye molecules, 20:511–512

Chromophore–polymer composites, 17:447–448
Chromophores, 4:46–47; 19:403, 424–425
artificial, 12:507–508
blocking groups between, 9:363
nonlinear optical, 17:449–450
organic, 17:447

Chromosome segregation, topoisomerase IV in, 21:220

Chromotropic acid, molecular formula, 5:712t
Chromous bromide, physical properties of, 4:328
Chromous chloride hexahydrate, 6:531
Chromous sulfate heptahydrate, 6:531
Chromyl chloride, molecular formula, properties, and uses, 6:561t
Chromyl compounds, 6:526, 536
Chromyl fluoride, 6:535
Chromyl perchlorate, anhydrous, 18:279
Chronic asthmatic bronchitis, effect on heart, 5:107
Chronic exposures, 25:203, 204t
Chronic kidney disease (CKD), 26:813
Chronic toxicity, 19:452
studies, 25:218
Chronic toxicology, pyridine, 21:118
Chronoamperometry, 9:568, 575–577
Chronocoulometry, 9:568
Chronological materials standards, 15:745–747
Chronopotentiometry, 9:568
Chrysoberyl, color, 7:329
Chrysoberyl, 3:288, 292
crystal structure, 3:295–297
electron micrograph, 3:295
elemental analysis, 3:293t
exposure limits, 3:316
fiber morphology, 3:291–293
geological occurrence, 3:291t
physical and chemical properties of, 3:300t
silicate backbone, 3:296
thermal analysis curve, 3:302
world production in 2000, 3:289t
Chino-Chrysotile, 3:297
ortho-Chrysotile, 3:297
para-Chrysotile, 3:297
Chrysotile asbestos, 1:803
Chuca, 22:844
Chudy coal grade (Poland), 6:713t
Chum salmon, common and scientific names, 3:187t
“Chundles,” 24:58
Chymosin, 10:251, 296, 309; 12:65
recovery of recombinant, 3:845–846
Chypre fragrances/perfumes, 18:358, 361
Cialis, molecular formula and structure, 5:182t
Ciba Bordeaux B, 5,5'-dibromothioindigo, 4:361t
Ciba cell, 22:772
Cibachrome dye destruction process, 19:241
Cibacron Blue 3GA, for dye–ligand affinity chromatography, 6:402
Cibacron C dyes, 9:475
Ciba Specialty Chemicals, 19:448
Cichlids, world aquaculture production in 1996, 3:186t
CIE color system, 7:304. See also Commission Internationale de l’clairage (CIE)
chronicity diagrams, 7:313–315
standard illuminants, 7:315–316
CIEDE200 color difference equation, 7:322
CIELAB, 7:304
CIELAB Color Space, 7:320
CIELAB color values, of flax fiber, 11:614t
Cielab dye nomenclature system, 9:244
CIELAB Metric Color Spaces, 7:320
CIELAB system, 19:428, 451
CIELUV Color Space, 7:319–320
CIE Standard Observer, 7:311–312
Cigarette filters
adsorbents for, 1:612
U.S. consumption of cellulose acetate flake for, 5:428t
Cilnidipine, 5:130
molecular formula and structure, 5:125t
Cilostazol, 4:104t, 105
Cimaterol, 13:14–15, 16
Cimetidine, achiral, 6:73
Cimetidine sulfoxide, chiral, 6:73
Cinchomeronic acid, 21:182
Cinchonidine, 2:74, 94, 97
“Cinderella anions,” 22:456
Cineole, binary azoetropes with benzaldehyde, 3:591t
1,8-Cineole, 24:528–529
Cimethylin, 13:326
Cinnabar, 16:31–32, 33, 37
Cinnabarite, color and bad gap, 7:335t
Cinnamaldehyde, 6:529
Cinnamate esters, aroma chemicals, 3:257
Cinnamic acid, aroma chemical derived from toluene, 3:234
Cinnamic alcohol, aroma chemical derived from toluene, 3:234
Cinnamic aldehyde, aroma chemical derived from toluene, 3:234
Cinnamalcohol, 23:155, 165–166
Cinoxate, cosmetic uv absorber, 7:846t
Cinormide, 4:359t
Ciprofloxacin, 3:29; 21:221, 223, 224
bacterial resistance mechanisms, 3:32t
resistance to, 21:220
structural modification as applied to, 21:222
year of disclosure or market introduction, 3:6t
Circling disease, 10:867
CIRCOFER process, 14:520
Circuit boards, hole metallization in, 9:696
Circuit breakers, virtual two-way SMA devices as, 22:347–348
Circuit integration, silicon-based semiconductors and, 22:229–230
Circuitry designs, 9:695
Circular accelerators, 23:862
Circular basin clarifier, 22:59, 60–61
Circular basin thickeners, 22:63–64
Circular Couette flow, 11:763
Circular jig, 16:629
Circulating fluidized beds (CFBs), 11:793, 803, 817–819
Circulating power, 14:669, 670
Circulation control, 9:23–24
Circulation effects, in liquid–liquid extraction, 10:763
Circulation ratio, in size separation, 22:279
Circulatory system, and cardiac physiology, 5:79–86
Circumferential patternators, 23:194
Cirramycin A1, 15:295t
Cirramycins, 15:294
See also Carbon-14 entries
Cisplatin, 19:628, 636, 657
Citation patent information searches, 18:237–238
Citation searching tools, availability of, 18:238
Citilat, molecular formula and structure, 5:128t
Citizen, molecular formula and structure, 5:97t, 118t
Citral, 3:232, 233; 24:480, 506, 529–532 analogues of, 24:531
manufacture of, 24:481
odor of, 24:530–531
selective hydrogenation of, 24:507
Citrate esters, for PVC polymers, 25:673
Citrates
iron, 14:533
in VDC polymer stabilization, 25:720
Citric acid, 6:631–657; 12:44–45, 60–61, 62
analytical and test methods, 6:643–644
buffer for ion-exchange chromatography, 3:830t
chemical properties, 6:635–639
in citric acid cycle, 6:633
in cocoa shell from roasted beans, 6:357t
concentration formation constants for metal chelates, 5:717t
corrosion rates in various metals, 6:642t
for cotton esterification, 8:30
derivatives, 6:648–650, 649t
economic aspects, 6:642–643
environmental concerns, 6:644–645
fermentation of, 11:9
health and safety factors, 6:644
manufacture, 6:639–641
molecular formula, 5:712t
occurrence, 6:632–633
physical properties, 6:634t, 634–635
physiological role, 6:632–633
shipment and storage, 6:641–642
as soap bar additive, 22:744
solubility of anhydrous, 6:634t
specifications, standards, and quality control, 6:643
uses, 6:645–648
Citric acid activity (CAA) test, 15:405
Citric acid cycle, 6:632–633
Citrine, color, 7:337
Citrogyypsum, 4:593
Citronella, 24:504
Citronellal, 3:232; 24:532–533
hydration to hydroxcitronellal, 24:533, 534
d-Citronellal, 24:516
acid-catalyzed cyclization of, 24:519
Citronella oil, in perfumes, 18:367
Citronellene, 24:487–490, 495, 507
Citronellol, 3:232, 233; 24:489, 490, 505, 506–509
dehydrogenation of, 24:508
Naarden/Shell routes to, 24:507
Citronellyl acetate, 24:508
Citronellyl ester, 3:233
Citronellyl methyl acetal, 24:509
Citronellyl nitrile, 24:531–532
Citronellyl oxycetaldehyde, 24:509
Citronitrile, 24:532
Citrus-derived chemicals, 24:240–241
Citrus industry, GA3 use by, 13:34
Citrus odor, 3:228t
Citrus perfumes, 18:359
Civil engineering
- epoxy resins in, 10:452–453
- high performance fibers in, 13:394
Civil engineering projects
- by-product reuse in, 25:875t
Civil structures, with fiber-optic smart structures, 11:158–159
CJD (Creutzfeldt-Jakob disease), transmission of, 12:140
CL20, 10:742
CLAB underground spent fuel disposal facility, 17:549
Cladinosi, 4:713
Clafin refiner, 18:105
CLAIMS-Citation database, 18:238
CLAIMS-Citation files, 18:247, 248
CLAIMS Compound Registry, 18:247
CLAIMS databases, 18:237, 247
Claisen condensation, 10:505
Claisen–Cope rearrangement, 24:479, 482
Claisen reactions, 2:64
- microwaves in, 16:542–544
Claisen rearrangement, 20:138–139
Claissen–Schmidt condensation, 14:57
Clams
- aquaculture, 3:183, 189
- world aquaculture production in 1996, 3:186
Clam shells, raw material for cement, 5:467
Clathromycin, 3:30
Clarithromycin, 3:286, 303, 304
Clarke–Othmer process, for acetic acid–water for ethanol separation, 8:834
Claros Diagnostics, 26:976
Class 4A inert ingredients, 14:126
Classes A–C radioactive waste, 25:853
- disposal of, 25:857
Classical least squares, 6:39–41
Classical thermodynamics, 24:641–642
Classification
- bauxite, 2:353
- ceramics processing, 5:644–645
- coal, 6:709–712
- classification efficiency, in size separation, 22:278–279
- Classified-product removal, 8:124
Classifiers
- mineral, 16:619–622
- in size separation, 22:275, 283–288, 288–293
Classifying particles, in filtration, 11:326
Class I hybrids, 13:536, 543
Class II hybrids, 13:536, 543
Clastogenesis, 25:206
Clathrate hydrates, 14:170–171
Clathrate receptor chemistry, 16:797
Clathrates, 12:374; 14:159, 170–182
- formation of, 10:633–635; 26:869
- Hofmann- and Werner-type, 14:171–172
- phenol-type, 14:180
- tri-o-thymotide, 14:179
Claus catalysts
- deactivation by aromatics, 23:613
- principles of, 23:607–610
- sulfate formation on, 23:610–614
Claus conversion chemistry, sulfate ratio control in, 23:611–612
Claus converter, operation of, 23:609
Claus furnace
- chemistry of, 23:604
- principles of, 23:603–607
Clausius–Clapeyron equation/relationship, 1:623; 24:663
Claus plants
- “classic,” 23:606–607
- configuration of, 23:606
Claus process, 12:377; 23:603, 632, 656–657
- conversion of hydrogen sulfide to elemental sulfur by, 23:601–610
Claus reaction, 23:607
- equilibrium limitation of, 23:608
- at subdew point conditions, 23:614–616
Claus sulfur recovery plant, 23:601
Clay, 5:640. See also Clays
in FCC catalysis, 11:681
as filler, 11:312
raw material for cement, 5:467, 475t
Clay conversion process, 16:834
Claycop-hydrogen peroxide, oxidation reactions with, 16:569
Clayden effect, 19:204
Clayen, selective solvent-free oxidation with, 16:568–569
Clay fillers, for PVC polymers, 25:675
Clay liners, in landfill design, 25:879
Clay minerals, 6:685–686
in coal, 6:718
properties relating to applications, 6:686t
structure and composition, 6:667–671
Clays, 6:658–685. See also Clay
aluminum compounds in, 2:344
common clay deposits, 6:667
common clays, 6:701
in detergent formulations, 8:417
for drilling fluid viscosity, 9:11–12
environmental concerns, 6:681–682
kaolin deposits, 6:659–664
kaolin dry mining process, 6:673–675
kaolins, 6:686–696, 688t
kaolin wet mining process, 6:675–679
lithium in, 15:124
lithium recovery from, 15:126–127
mining and processing, 6:671–681
mixed-layer, 6:671
occurrence and geology of major deposits, 6:659–666
palygorskite and sepiolite, 6:699–701, 700t
palygorskite and sepiolite deposits, 6:665–667
palygorskite–sepiolite mining, 6:681
production and consumption, 6:682–683
properties relating to applications, 6:686t
as rubber fillers, 21:776, 778
silane-modified, 21:781
smectite deposits, 6:664–666
smectite mining, 6:679–681
smectites, 6:696–699, 697t
uses of, 6:685–702
water-swelling, 18:615
Clay-supported manganese dioxide, 16:568
Clayton Valley lithium source, 15:127–128
Clay treatment, in petroleum refining, 18:661
Clean Air Act (CAA), 6:827; 10:67, 513, 568; 12:388, 405; 14:581
air quality management and, 1:812–814
amendments of 1970, 10:31
chromium and, 6:516–517
coal gasification and, 6:807–808
chlorinated fluorocarbon (CFC) propellants, 1:775, 786
emissions regulation under, 13:
182–184
hazardous air pollutants and, 1:802, 812
limits on sulfur dioxide in, 23:588
silicon and, 22:521
standards, 12:415
ink regulation under, 14:334
Clean Coal Technology program, 6:758, 821
Cleaner formulations, for electroplating, 9:783
Cleaners
alkanolamines from olefin oxides and ammonia, 2:136, 138
defoamer applications, 8:246
dispersant applications, 8:692
fatty acid amides, 2:456–457
phosphoric acids as, 18:829
pine oil in, 24:510
for swimming pools, 26:193
Clean fuels production, in fluid catalytic cracking, 11:686–689
Cleaning
in fine art examination/conservation, 11:412–414
of magnesium parts, 15:374
membrane, 15:831–832
of metal surfaces, 16:211–213
in paper recycling, 21:439
of paper stock, 18:106
supercritical fluids in, 24:20
Cleaning agents, uses of succinic acid and succinic anhydride in, 23:427t
Cleaning application, of hydroxyacetic acid, 14:129
Cleaning cycles
for electroplating, 9:785
heat exchanger, 10:161
Cleaning formulations, lignosulfonates in, 15:18
Cleaning in place (CIP), 11:40
   in membrane systems, 16:24
   pump capabilities for, 21:64
Cleaning methods, for electroplating, 9:780–785
Cleaning products
   citric acid in, 6:647
   perfuming of, 18:361
   U.S. citric acid/citrate distribution, 6:643t
Cleaning validation, in commercial-scale pharmaceutical operations, 18:735
Cleanliness, in fine art examination/conservation, 11:409
Clean room garments, high performance fibers for, 13:393
Cleansers/cleansing agents
   bleaching agent applications, 4:70–71
   cosmetic surfactants, 7:834t
Cleansing preparations, 7:849–851
   ink regulation under, 14:334
   environmental limits on silver in, 22:651–652
Clear/impact copolymers, 26:538–540
Clearing layer, in Polaroid SX-70 film, 19:305
Clear-liquor advance, 8:124
CLEAR process, 23:576
“Clear Skies Legislation,” 16:45
Cleavage fracture, as failure mechanism, 26:983
Cleavage products, 10:569
Cleavage reaction, in phenol manufacture, 18:749–750
Cleavage tests, 1:514
(+)-Cleavamine, 2:98
Clenbuterol, 13:14–15
Clentiazem, 5:121
   molecular formula and structure, 5:118t
Clerget double polarization method, 23:474
Clerici’s solution, 24:632
Click chemistry, 1:222; 26:788
Client-server (personal computer) distributed control system configuration, 20:670
Clinafloxacan, 21:220, 223, 224
Clinch River fast-breeder plant (CRFBP), 17:587
Clindomycin, 3:30
   bacterial resistance mechanisms, 3:32t
Clinical applications, immunoassays for, 14:140
Clinical diagnosis, radioactive tracers in, 21:271
Clinical drug investigations, phases of, 21:573–574
Clinical drug trials, safety of, 18:697–698
Clinical endpoints, 17:648
Clinical products, licenses for, 12:150
Clinical protocols, for investigational new drug applications, 18:690
Clinical signs, in toxicology studies, 25:216
Clinker, 5:467
   fuel requirement, 5:488
Clinkering, 5:467
Clinojorubicin, 8:114t
C liquid crystals, 15:106–107
Clofibrate, 5:145–146
   molecular formula and structure, 5:141t
Clofibrate bezafibrate, molecular formula and structure, 5:141t
Clogging, of filters, 11:325–326, 330–332
Clomazine, 13:326
Cloned DNA, mutagenesis of, 12:518
Cloned enzyme libraries, 16:405
Clone-identification probes, 12:504
Clones, genome maps formed from, 12:508–509. See also Embryo cloning
Cloning vectors, for DNA fragments, 12:504–506
Clopidogrel, 4:104, 104t
Clopypyrail, 13:322
Cloriodotriphenylantimony, 3:76
Close-clearance impellers, 16:672, 675, 690, 719
Close-Coupled Integrated Two-Stage Liquefaction (CC-ITSL), 6:843
Close-coupled single-stage horizontal end suction pump, 21:63–64
Close-coupled vertical centrifugal pump designs, 21:64
Closed circuit voltage, 3:410
Closed-circular DNA, 17:611. See also Deoxyribonucleic acid (DNA)
   “Closed-closed” tubular reactors, 25:288
Closed-loop bioremediation defined, 3:759t
Closed-loop control, analyzers for, 20:683
Closed-loop control systems, 9:56–57
Closed-loop dynamics, 20:693–694
Closed-loop fuel metering system, 10:55–56
on-board diagnostics, 10:57–58
Closed manometers, 20:647
Closed manufacturing system, 14:110
Closed-mold processes, for unsaturated polyesters, 20:117–118
Closed system maintenance, 14:209
Closed systems
energy balance in, 24:647–648
rate of change of entropy in, 24:649
closo designation
boranes, 4:188–193
boron hydrides, 4:170, 172–174
Clostridia, 18:33
Clostridium acetobutylicum, 11:8
Clostridium, as a host system for gene expression, 12:477–478
Clostridium botulinum, 12:76, 79
thermal resistance characteristics, 8:634t
Clostridium botulinum (Type A-Str.62), exposure to ethylene–dichlorodifuoro-methane mixture, 8:635t
Clostridium botulinum toxin (Botox) type A, 2:816
Clostridium stricklandii, selenocysteine produced by, 22:89
Clostridium thermosaccharolyticum, 8:631–632
Cloth belt discharge, with rotary drum vacuum filters, 11:356
Clot inhibiting proteins, 25:795
Clotrimazole, 12:168
Clotting, in hemodialysis, 26:823
Cloud gels, 23:23
Clouding agents, as food manufacturing aids, 12:67
Cloud point (CP), 15:207; 24:126
Cloud seeding, silver iodide in, 22:685
Clove bud oil, 24:542
Clove buds, 23:166
Clove leaf oil, in perfumes, 18:367
Cloverite, 16:820
Coves, 23:155
Cloxacillin, 3:33
Cloxyfonac, 13:41t, 48
ClSO₃H, fatty alcohol sulfation with, 23:541. See also Chlorosulfonic acid
Clospanodonic acid, physical properties, 5:33t
Cluster compounds, gold-containing, 12:708
Cluster emission, 21:305
Cluster glass transitions, 14:469
Clustering techniques, 6:16–17
Cluster sampling, 26:1018
C-Methylcalix[4]resorcinarene, 14:165
CMOS image sensors, fabrication and performance of, 19:154–155. See also Complementary Metal Oxide Semiconductors (CMOS)
CMR ring, 8:770
N-Methyl-pyrrolidone (NMP), 15:174, 175
N-methyli trifluoroacetamide, silylation and, 22:694
C-nitration, 17:157
CNS-related disorders, sustained drug release for, 9:82–83
CO₂. See also Carbon dioxide absorption of, 23:598–599
as an alternative refrigerant, 21:533
removal by alkanolamines, 23:597–600
CO₂ emissions, from FCC unit regenerators, 11:720–721
CO₂ flooding, in oil recovery, 18:615–617
CO₂ removal unit, 10:646, 648
CO₂ stimulation, in oil recovery, 18:617
CO-896, chain length and linearity, 2:12t
CO-1270, chain length and linearity, 2:12t
Coacervates, size of, 11:548
Coacervation, 12:439; 16:440–441
simple, 16:441
types of, 11:546
Coacervation encapsulation, 11:545–548, 555
difficulties with, 11:549
Coaching, in R&D, 21:619
Co-aggregation, 9:509
Coagulants
inorganic, 26:108t
organic, 11:642
in water treatment, 26:107–111
in wet fiber spinning, 11:206
Coagulation, 22:55–56. See also Coagulation/filtration
as advanced wastewater treatment, 25:908
in hazardous waste management, 25:821
in precipitated silica preparation, 22:398
of silica sols, 22:393
in wastewater treatment, 25:889t, 892t, 893
in water treatment, 26:106–111
Coagulation factor products, 12:139
Coagulation factors, 12:144–145
Coagulation/filtration, for arsenic removal, 3:280t, 281–282
Coal, 3:683; 6:703–771. See also Coal gasification; Coals
acetylene manufacture from, 1:189, 210–213
activated carbon manufacture from, 4:744–747
analysis, 6:749–754
biochemical stage, 6:704–705
bioprocessing and biotreatment, 6:766–767
bonding between macromolecules, 6:717–718
bonding in macromolecules, 6:714–717
chemistry, 6:730–738
classification by rank, 6:711t
classification systems, 6:709–712
combustion technology for, 7:463–467
composition, 6:712–714
constitution, 6:718
economic aspects, 6:749
fluidity, 6:718
geochemical stage, 6:705
health and safety factors, 6:755–756
heterogeneous combustion, 7:449–454
history of use, 6:783t
international systems of coal classes, 6:713t
mechanical properties, 6:724–726
mineral matter in, 6:718–719
mining, 6:744–745
origin, 6:704
partial oxidation to ammonia, 2:701
petroleum replaces as feedstock for advanced materials, 1:692
physical properties, 6:722–723
Portland cement industry consumption, 5:497t
preparation, 6:745–748
production in U.S., 6:741, 742–743t, 744
properties involving utilization, 6:726–730
recovery of ammonia from, 11:115
reserves in U.S., 6:739t, 740–741
resources, 6:738–744
sample sources, 6:744
storage, 6:747–748
structure, 6:714–718
swelling and coking tests, 6:755
transportation, 6:748
U.S. exports by destination, 6:750–751t
ultrafine structure, 6:723–724
usage for energy in U.S., 6:744t, 813–814
uses, 6:703, 756–767
world reserves, 6:738–740, 739t
world supply and disposition, 6:752–754t
Coal ash, 6:727
reactions, 6:732–733
CO alcohols, 2:8t
Coal combustion, 6:772
properties related to, 6:726–728
Coal devolatilization, 6:772, 775
Coal dust explosions, 6:755–756
Coalescence, during sedimentation, 22:50–51
Coalescence process, 10:117, 765
Coalescence rates, 11:775
Coal gas, 6:784–790
Coal gasification, 6:760–765, 771–832; 12:332. See also Coal gasification processes
by-product utilization, 6:807, 824–825
chemical and physical changes of coal during, 6:772
chemistry, 6:772–775
cleanup, 6:806–807
coal characteristics affecting, 6:778–782
economic aspects, 6:812–826
efficiency, 6:807
environmental concerns, 6:807–812
fuel flexibility, 6:806
future technology developments, 6:821–826
gasification systems, 6:804–807
gasifier types, 6:792–804
gas separation, 6:824
history, 6:782–792, 783t
largest plants worldwide, 6:818–819t
for liquid and chemical feedstocks, 6:790–792
planned plants worldwide, 6:825–826t
product flexibility, 6:806
status of technology, 6:817–821
surface gasification, 6:761–763
syngas chemistry, 6:775–778
system flexibility, 6:807
timeline for development, 6:785
underground, 6:763–764
Coal gasification processes, use of steam in, 23:239
advanced, 13:845–846
hydrogen from, 13:842
Coal gasifiers, 6:772. See also
  Entrained-flow gasifier
blue water gas, 6:786–787, 789–790
design, 6:760–761
future technology developments, 6:824
performance, 6:800–804
types, 6:792–804
Coal industry, alkanolamines from olefin
  oxides and ammonia, 2:138
Coalition of Northeast Governors
  (CONEG), ink regulation under,
  14:333
Coal liquefaction, 6:765–766, 832–869
coprocessing, 6:856–858
direct, 6:833–858
indirect, 6:858–867
use of steam in, 23:239–240
Coal mining, 6:744–745
Coal–oil coprocessing, 6:833, 856–857
Coal petrography, 6:706–709
Coal petrology, 6:706
Coal, ash properties of, 12:324t
Coal slurry pipelines, 6:748
Coal tar
  anti-dandruff agent, 7:851
  benzene recovery from, 3:597, 608
  for corrosion protection, 7:201
  quinoline manufacture from, 21:187–193
  as a source of naphthalene, 17:77–80
Coal-tar binder pitches, 12:725–726, 729
Coal-tar distillates, organic chemicals
derived from, 24:253
Coal-tar epoxies, 10:443
Coal-tar pitch, 12:724
Coal-tar pitch coke, as a graphite filler
  material, 12:723–724
Coal–waste coprocessing, 6:833, 857–858
Coanda effect, 11:667
Coarse bubble diffusers, 26:165
Coarsening (ripening) process, 12:14–15, 17
  as an aging mechanism, 23:65
Coarse ore drums, 15:452
Coarse pearlite, annealing to, 23:288–290
Coastal Thermal Cracking process, 4:417, 418
Coated Abrasive Manufacturing Institute
  (CAMI), silicon carbide standards by,
  22:537
Coated abrasives, 1:2, 10–15
  phenolic resins in, 18:787
Coated bottles, 20:53
Coated carbide tools, 4:664–670
  with functionally gradient substrate
  microstructures, 4:666–667
Coated conductors
  architectures of, 23:843
  techniques used to manufacture, 23:842
Coated mica, pigment used in makeup,
  7:836t
Coated paper, supercalendered, 18:124
Coated salt, 22:820
Coated suture materials, 24:212–213
Coaterless films, 19:281
Coating components, of paper, 18:99
Coating hoppers, 19:198
Coating machines, 7:2–3
Coating materials
  conformal, 17:843–845
  in fluidized-bed encapsulation, 11:541
  See also Powder coating processes;
  Spray coating processes
  discrete surface-coating methods,
  7:23–24
drying and solidification, 7:26–34
limits of coatability, 7:6–7
mechanisms, 7:25–26
multilayer methods, 7:22–23
shear rates, 7:32t
summary of methods, 7:5t
surface forces, 7:33–34
phenolic resins in, 18:788–789
Coating process sprays, recovery of silver
  from, 22:653
Coating products, properties and
  applications of organosilicone,
  22:590–591
Coating removers, manufacturers of,
  18:87t
Coatings, 7:1, 77–150. See also Antifouling
  coatings; Electroless coatings;
  Marine coatings; Organic coatings
  for corrosion control; Paint
  acrylic ester polymers, 1:388–389
  adhesion, 7:90–92
  advanced ceramic, 1:704–705
  alkanolamines from olefin oxides and
  ammonia, 2:136
  alkyd resins, 2:167–168
  amino acid resin applications, 2:635–637
  anticorrosion, 25:134
  anticorrosion metallic, 1:713–714
antifouling triorganotin, 24:818
application methods, 7:118–119
application technologies for, 10:438–442
architectural, 7:137–142; 12:609–611
asbestos applications, 3:311
automotive, 12:608–609
based on neopentyl glycol, 12:670–671
cadmium applications, 4:500–501
calcium carbonate applications, 4:555
cellulose acetates, 5:437
cellulose ester applications, 5:403–404
ceramics processing, 5:665
chemical conversion, 15:251
chromium chromate, 16:219–220
color and appearance, 7:109–112
composite, 9:697, 708–709
conductive, 1:712–713
container, 12:608
for corrosion control, 7:92–95, 816–818
corrugated paperboard, 18:19
defoamer applications, 8:248
density of, 18:69
diallyl carbonate cast plastics, 2:255–256
dispersant applications, 8:692
doped oxide semiconductor, 23:17–19
EC and HEEC applications, 5:461t
economic aspects, 7:145–146
environmental-resistance, 13:507–508
epoxy resin, 10:348, 436–450
ethylene oxide polymers in, 10:688–689
exterior durability, 7:87–89
exterior wood, 18:67–68
extrusion, 19:547–548
film defects, 7:119–124
film formation, 7:77–83
flow, 7:83–85
folding carton, 18:21
gelatin, 12:444
glass, 12:592; 18:39
for glazings, 23:16–23
gold, 12:702
for graphite protection, 12:741
health, safety, and environmental
factors related to, 18:74–75
HEC applications, 5:454t
HPC applications, 5:463t
hydrocarbon use in, 13:689
indium oxide, 14:195
interior, 18:67
kaolin application, 6:688t, 689–691
lead–tin alloy, 14:778
masonry, 18:68
mechanical properties, 7:85–86
for metal, 7:124–137
mercury in, 16:52
methylcellulose applications, 5:459t
for molybdenum, 17:6
molybdenum compounds in, 17:39
multifunctional advanced material,
1:714–716
natural graphite in, 12:796
nitride, 17:209–210, 220–221
palladium, 19:654
paper, 18:98
phenolic resins in, 18:781–783
phosphate, 16:215, 217, 218
pigments, 7:112–118; 18:123–125
platinum, 19:657–658
polychloroprene latexes in, 19:859–860
polyester resins in, 20:117
poly(vinyl fluoride), 20:593
powder, 10:350
properties and applications of paper
release, 22:591–592
quaternary ammonium compounds,
2:775
reflective, 14:857
refractory metal alloy, 13:529
resins for, 7:95–107
rheology, 18:60–62
silica in, 22:375
silicon carbide in, 22:541
silver in, 22:656
by sodium, 22:762–763
special purpose, 7:142–145
stannic oxide in, 24:805
styrenic block copolymers in, 24:714
sulfur in, 23:593
terlary alloy, 9:698
thermal barrier, 1:711–712
thermochromic material applications,
6:627
tin, 24:793–794, 794–796
titanium dioxide in, 25:23–25
use of latex in, 14:712
using the IBAD process, 14:442
from VDC copolymer latices, 25:736
from VDC lacquer resins, 25:734–735
vitreous silica in, 22:442, 444–445
volatile components, 7:107–109
Coatings, adhesives, sealants, elastomers
(CASE) applications
organic titanium compounds in, 25:135
for polyurethanes, 25:474–477
Coatings industries processes, air pollution from, 10:106–109
Coatings industry, 9:153
solid epoxy resins in, 10:359
Coating structures, in photography, 19:198–199
Coating techniques, in lithographic resists, 15:155
Cobalamin, 25:803
folic acid and, 25:802
Cobalt (Co), 7:207–228. See also Co-base superalloys; 60Co isotope; 60Co nucleus; Fe-Ni-Co alloys; Dicobalt octacarbonyl; Tetracobalt dodecacarbonyl
analysis, 7:215–216
in ceramic–matrix composites, 5:554t
coke formation on, 5:266
colloidal suspensions, 7:275
economic aspects, 7:214–215
effect on copper resistivity, 7:676t
environmental concerns, 7:216
health and safety factors, 7:216–218
in M-type ferrites, 11:66, 69
occurrence, 7:208
poisons in representative reactions, 5:258t
polymer autoxidation catalysis, 3:104
processing, 7:212–214
properties, 7:208–211
solubility limits and electrical conductivity effects on copper, 7:750t
solution color of ions in glass, 7:343t
standard electrode potential, 7:799t
in superalloys, 17:103
uses, 7:218–219
water exchange rates and activation parameters of hexaaqua complexes, 7:589t
Cobalt(II), concentration formation constant of chelates, 5:717t
60Cobalt, 7:219. See also 60Co isotope; 60Co nucleus
disinfection application, 8:663–664
Cobalt(II) 2-ethylhexanoate, uses, 7:240t
Cobalt(III) acetate, uses, 7:239t
Cobalt acetate tetrahydrate, analysis, 7:237t
Cobalt(II) acetate tetrahydrate, 7:230
uses, 7:239t
Cobalt(II) acetylacetonate, 7:230
uses, 7:239t
Cobalt alloys, 7:219–226. See also Cobalt high temperature alloys for orthopedic devices, 3:728
selenium and metallurgy of, 22:98
Cobalt alloy T-800, 7:223
properties, 7:223t
Cobalt(II) aluminate, uses, 7:241t
Cobalt aluminate blue spinel, formula and DCMA number, 7:348t
Cobalt Aluminate Blue, pigment for plastics, 7:370t
Cobalt aluminum blue, transparent, 19:412
Cobalt(II) aminobenzoate, uses, 7:239t
Cobalt(II) ammonium sulfate, uses, 7:239t
Cobalt(II) arsenate, uses, 7:241t
Cobalt-base corrosion-resistant alloys, 7:221t
Cobalt-base high temperature alloys, 7:221t
Cobalt-base wear-resistant alloys, 7:221t
Cobalt borates, 4:282
Cobalt(II) bromide, uses, 7:239t
Cobalt by-product, 16:129
Cobalt carbide, 4:690–692
lattice, 4:652
Cobalt carbide (3:1), 4:649t, 691
Cobalt carbonate, analysis, 7:237t
Cobalt(II) carbonate, 7:230
uses, 7:239t
Cobalt(II) carbonate (basic), uses, 7:239t
Cobalt chloride analysis, 7:237t
as thermochromic material, 6:615
Cobalt(II) chloride, uses, 7:239t
Cobalt(II) chloride hexahydrate, 7:230
Cobalt chromate, molecular formula, properties, and uses, 6:561t
Cobalt(II) chromate, uses, 7:241t
Cobalt chromite, molecular formula, properties, and uses, 6:563t
Cobalt Chromite Blue, pigment for plastics, 7:370t
Cobalt chromite blue-green spinel, formula and DCMA number, 7:348t
Cobalt chromite green spinel, formula and DCMA number, 7:348t
Cobalt Chromite Green, pigment for plastics, 7:370t
Cobalt–chromium alloys, dental applications, 8:309–310
Cobalt citrate, molecular formula, 6:638t
Cobalt(II) citrate, uses, 7:239t
Cobalt compounds, 7:229–249
analytical methods, 7:233–234
economic aspects, 7:230–233
health and safety factors, 7:238
reactions and preparation, 7:230–233
uses, 7:238–247
Cobalt corrosion-resistant alloys, 7:225–226
Cobalt(II) dicobalt(III) tetroxide, 7:233
Cobalt difluoride, 7:231–232
Cobalt dilanthanum tetroxide, uses, 7:241t
Cobalt driers, 9:147–148
Cobalt(II) ethylhexanoate, 7:230
Cobalt extraction, 10:791
Cobalt(II) fluoroborate hexahydrate, 4:157t, 158, 159
Cobalt(II) ferrate, uses, 7:241t
Cobalt(II) fluoroide, uses, 7:239t
Cobalt(III) fluoride, 7:232–233
uses, 7:239t
Cobalt(II) fluoride dihydrate, 7:232
Cobalt(II) fluoride trihydrate, 7:232
Cobalt(II) fluoride tetrahydrate, 7:232
uses, 7:239t
Cobalt(II) fluorsilicate hexahydrate, uses, 7:240t
Cobalt(II) formate, 7:230
uses, 7:240t
Cobalt glass, color, 7:331
Cobalt(II) hexaquo ion, 7:229
Cobalt hexahydrate, analysis, 7:237t
Cobalt high temperature alloys, 7:223–224
Cobalt hydroxide, analysis, 7:237t
Cobalt(II) hydroxide, 7:230
uses, 7:240t
Cobalt(II) iodide, uses, 7:240t
Cobalt(II) ion, 7:229
Cobalt(III) ion, 7:229
Cobalt isotopes, residual radiation from, 17:553–554
Cobaltite, 3:263t, 7:209t
Cobalt(II) linoleate, 7:230
uses, 7:240t
Cobalt lithium violet phosphate, formula and DCMA number, 7:347t
Cobalt Lithium Phosphate Violet, pigment for plastics, 7:370t
Cobalt magnesium red-blue borate, formula and DCMA number, 7:346t
Cobalt(II) manganate, uses, 7:241t
Cobalt mixed oxide, analysis, 7:237t
Cobalt(II) naphthenate, uses, 7:240t
Cobalt nickel gray periclase, formula and DCMA number, 7:347t
Cobalt nitrate, analysis, 7:237t
Cobalt(II) nitrate hexahydrate, 7:230
uses, 7:240t
Cobalt(II) oleate, 7:230
uses, 7:240t
Cobaltous bromide, physical properties of, 4:328
Cobalt(II) oxalate, 7:231
uses, 7:240t
Cobalt oxide, 7:229
carrier mobility at room temperature, 5:597t
color, 7:331
energy gap at room temperature, 5:596t
for oxidizing iron in glass, 7:343
uses, 7:241t
Cobalt(II) oxide, 7:229, 233
uses, 7:241t
Cobalt(II) phosphate, uses, 7:242t
Cobalt(II) phosphate octahydrate, 7:231
Cobalt Phosphate Violet, pigment for plastics, 7:370t
Cobalt phthalocyanine, uses, 7:240t
Cobalt plating, 9:804
Cobalt(II) potassium nitrite, uses, 7:240t
Cobalt recycling, economic aspects of, 21:402–404
Cobalt(II) resinate, 7:230
uses, 7:240t
Cobalt silicate blue olivine, formula and DCMA number, 7:347t
Cobalt(II) stearate, uses, 7:240t
Cobalt(II) succinate trihydrate, uses, 7:240t
Cobalt(II) sulfamate, 7:231
uses, 7:241t
Cobalt(II) sulfate, uses, 7:241t
Cobalt(II) sulfate heptahydrate, 7:231
Cobalt sulfate hexahydrate, analysis, 7:237t
Cobalt(II) sulfate monohydrate, 7:231
Cobalt sulfide, poisons in representative reactions, 5:258t
Cobalt(II) sulfide, uses, 7:241t
Cobalt(II) thiocyanate, uses, 7:241t
Cobalt tin alumina blue spinel, formula and DCMA number, 7:348t
Cobalt tin blue-gray spinel, formula and DCMA number, 7:348t

Cobalt titanate green spinel, formula and DCMA number, 7:348t

Cobalt Titanate Green, pigment for plastics, 7:370t

Cobalt trifluoride, 7:232–233

Cobalt(II) tungstate, uses, 7:242t

Cobalt tungsten carbide (6:6:1), 4:649t

Cobalt violet phosphate, formula and DCMA number, 7:347t

Cobalt wear-resistant alloys, 7:221–223

Cobalt zinc aluminate blue spinel, formula and DCMA number, 7:348t

Cobalt Zinc Aluminate Blue, pigment for plastics, 7:370t

Cobalt zinc silicate blue phenacite, formula and DCMA number, 7:347t

Co-base superalloys, 13:503, 525–527

Cobbling services, magnetic drums used in, 15:445–446

Cobb test, 18:101

Cocaine, 2:74, 79, 80, 108

economic aspects, 2:108

Cocamide DEA, function as ingredient in cosmetics, 7:829t

Cocamine oxide, cosmetic surfactant, 7:834t

Cocatalyst heterogenization, 16:87

Cocatalysts, metal alkyls, 12:190; 20:153

Cocatalyzed baths, 9:801

Coccidiosis, controlling, 20:139

Coccolith exoskeletons, 24:60

Cochnel, colorant in cosmetics, 7:835

Cochromite, 6:471t

Cockles, world aquaculture production in 1996, 3:186t

Cocoa, 6:358

amino acid content, 6:368t

composition, 6:369t

theobromine and caffeine content, 6:367t

vitamin content various samples, 6:370t

Cocoa beans, 6:352–355

composition, 6:369t

fatty acid composition, 6:371t

minerals content, 6:371t

production of raw, 6:354t

tocopherols, 6:370t

varieties, 6:354t

vitamin content various samples, 6:370t

Cocoa-brown, in cocoa shell from roasted beans, 6:357t

Cocoa butter, 6:358–360

in cosmetic molded sticks, 7:840t

fatty acid composition, 6:371t

in formulation for milk chocolates, 6:362t

in formulation for sweet (dark) chocolates, 6:362t

tocopherols, 6:370t

Cocoaalkylamines, 2:519

melting point, 2:521t

Cocoaalkylidimethylamines, melting point, 2:521t

Cocoa mass, 6:355

Cocoa alkylamines, melting point, 2:521t

Cocoaalkylamines, melting point, 2:521t

Cocoaalkylidimethylamines, melting point, 2:521t

Cocoa powder, 6:358

Cocoa-purple, in cocoa shell from roasted beans, 6:357t

Cocoa shell, analysis of roasted beans, 6:357t

CO combustion, in FCC units, 11:710.

See also Promoted CO combustion promoters, 11:710–713.

See also Carbon monoxide (CO)

Cocondensation resins, 15:778–780

Cocontinuous morphology, in polymer blends, 20:329–330

Cocontinuous structures, in binary polymer blends, 20:334

Coconut, fatty acid composition, 5:56t

Coconut diethanolamide blends with alkylaryl sulfonate, 2:454t

effect on foaming of anionic surfactants, 2:453t, 453–455

Coconut oil

cosmetically useful lipid, 7:833t

fatty acid composition, 2:519t

feedstock for higher aliphatic alcohols, 2:28t

list price versus ethylene (as high alcohol feedstock), 2:8t

in soap making, 22:732, 735, 742

Coconut palm, 11:297

Cocos nucifera, 11:297

Co-current flow capillary electrophoresis, 4:635

Co-current spray dryers, 9:128
Codeine, 2:89, 90
package testing under, 18:28
sections in, 18:3
-co- designation, 7:609t
Codex Alimentarius Commission, 23:470
Codex Committee on Pesticide Residues (CCPR), 18:541
Coe and Clevenger method, 22:57, 59
Coefficient of diffusion, 23:105
Coefficient of friction, 9:715; 15:204–205
of sutures, 24:216
Coefficient of linear thermal expansion (CLTE), 19:573
Coefficient of proportionality, 21:72
Coefficient of thermal expansion (CTE), 9:706–707; 12:722
of artificial graphite, 12:717
exponents of dimensions, 8:585t
mismatched, 10:424
Coenzyme A (CoA), 20:249–250. See also Acetoacetyl-CoA
in citric acid cycle, 6:633
Coenzyme Q10, 17:673
Coercivity, of M-type ferrites, 11:70
Coextruded food packaging, 18:44, 45
Coextrusion techniques, for gelatin capsule preparation, 11:549
Cofactors, 10:253; 11:4
folic acid, 25:801–802
for enzymes, 3:672–673
protein, 20:828–829
vitamin B12, 25:804
vitamins as, 25:781
*Coffee arabica*, 7:250
*Coffee Canephora*, 7:250
*Coffee liberica*, 7:250
biotechnology, 7:265–267
decaffeinated, 7:263
economic aspects, 7:263–264
estimated maximum oxygen tolerance, 3:381t
instant coffee, 7:257, 260–262
regulations and standards, 7:267–268
Coffee button, 7:250
Coffee substitutes, 7:268
Cogeneration, 10:149
defined, 6:827
of steam, 23:236–237
Cogeneration and site utility systems, 20:751–755
operability of, 20:762–763
Cogeneration gas turbine, 10:142
Cogeneration steam system, 10:139–141
Coherence, 14:655–656
Coherence length, superconducting, 23:805–806
Coherency strains, 13:501
Coherent anti-Stokes Raman scattering (CARS), 21:328
Cohesive energy, 23:90
Coho salmon, common and scientific names, 3:187t
Coil coatings, 7:129–130; 10:444–447
hydrocarbon emissions in, 10:108
Coils, heat-transfer, 16:717–718
Coinage Act of 1965, silver and, 22:648
Coins
gold, 12:705
recovery of silver from, 22:653
silver, 22:643, 648, 662
Coir, 11:297
mechanical properties of, 11:290
uses of, 11:299t
60Co isotope, uses for, 21:319. See also 60Cobalt
Coke(s)
catalyst fouling by, 5:230, 263–270
catalyst regeneration after fouling by, 5:304, 309
dusting problems, 2:304
formation on metal oxide and sulfide catalysts, 5:267–270
formation on supported catalysts, 5:264–267
in gas adsorption, 1:635
hydrogen content of, 11:707
manufacturing processes, 6:784
as a petroleum product, 18:673–674
prevention of deactivation by fouling, 5:299–300
sulfur level of, 12:722
use in producing graphite, 12:721
Coke burning/combustion
in FCC units, 11:706–713
rate of, 11:707–709
specific heat of, 11:707t
Coke deposition, 11:704
in cracking furnaces, 10:607–609
Coke formation, in FCC units, 11:703–706
Coke gasification, 14:501
Coke oven gas, commercial gas absorption processes for, 1:26t
Coke suppression technologies, 10:609–616
energy efficiency improvement in, 10:615–616
recovery and purification in, 10:610–615
Coking, 6:703, 787, 789
and coal petrography, 6:709
Coking coals, 6:728
Coking processes, in petroleum processing, 18:649–651
Coking steam coal grade (U.K.), 6:713t
Coking tests, coal, 6:727, 755
Cola beverages, 6:366
Colchicine, 2:72, 74, 91; 13:302
Cold-cathode ionization gauges, 20:662–663
Cold composite curve, 13:191
Cold-ethanol precipitation, 12:135–136
Cold exhaust dyeing, 9:176–177
Cold flow improvers, for diesel fuel, 12:427–428
Cold-fluid flow maldistribution, 13:271
Cold forming
ABS, 1:428g
copper, 7:695–696
Cold fusion, 9:635
Cold gas dynamic spraying, 17:369
Cold Gas Efficiency, 6:827
Cold isostatic molding, 12:733
“Cold junction compensation,” 24:461
Cold lime water softening method, 26:120
Cold-molded foams, 25:470
Cold on-column injection
gas chromatography, 4:613
Cold pad-batch dyeing, 9:177–178
Cold plasma spray, 1:714
Cold-plate heat exchangers, 13:265
Cold polymerization, 20:376–378, 386
Cold process streams, 13:187, 188
Cold-rolled lead alloys, 14:777
“Cold rubber,” 9:557–558
Cold setting, of printing inks, 14:313
Cold start Tailpipe HC emissions, 10:35
Cold storage, of food products,
21:563–564
Cold storage injuries, 21:559
Cold stream, heat capacity flow-rate of,
13:191
Cold-water swelling starches, 4:722
Cold work, 13:473, 496
Cold worked copper alloys, 7:723t
Cold working
of carbon steels, 23:295–296
of steel, 23:271
Colebrook correlation, 11:750
Colemanite, 4:133t, 241, 243t, 245; 5:785t
Colesevelam hydrochloride, 5:145
Colestid, molecular formula and structure, 5:141t
Colestipol hydrochloride, 5:144
molecular formula and structure, 5:141t
Coliform analysis, of water, 26:45–46
CO ligand, 16:60. See also Carbon monoxide (CO)
Collaboration(s). See also Collaborative research partnerships; Research partnerships
accountability mechanisms for,
24:389–390
guiding principles for, 24:371–372
impact on university mission, reputation, and financial resources,
24:369–371
practical difficulties related to, 24:368
proactive facilitation of, 24:383–384
programs that foster, 24:395
role of technology transfer professionals in, 24:391–392
Collaboration barriers, in technology transfer, 24:366–372
Collaborative arrangements, overview of,
24:373t
Collaborative partnership model, 24:354–355
Collaborative research partnerships, managing, 24:387–389
Collagen
glycoprotein receptors for, 4:85
in skin aging products, 7:843
Collagen-based nanofibers, 1:722–723
Collagen biosynthesis, ascorbic acid and, 25:767, 768
Collapse breccia pipe uranium deposits, 17:521
Collapsing–drying step, in wet fiber spinning, 11:208
Collecting plate designs, 26:703, 704
Collective marks, 25:253
Collective works, 7:786
Collector regions, in HBTs, 22:167–168
Collectors
  for flotation separation of sulfides and precious metals, 16:647
  in froth flotation, 14:733; 16:644, 646–650
Collector transit time (t_{CT}), in HBTs, 22:169
Colleenchyma cells, 21:18
Colletotrichum coccodes, 13:351
Colletotrichum gleosporioides, 13:347
2,4,6-Collidine, 21:114
Colligative property techniques, 20:395
Collimation, 14:656
Collisional broadening, 23:131, 132
Collision diameter, 25:312
Collision integral, 25:301–302, 303
Collocation techniques, in sampling, 26:1010–1011
Collodetrinite, 6:707t
Colloidal approach, in optical fiber manufacturing, 11:145
Colloidal dispersion, 8:697
Colloidal gases, 7:295–296
Colloidal gels, syneresis in, 23:64–65.
  See also Colloidal silica gels
Colloidal graphite, 12:795
Colloidal liquids, 7:294–295
Colloidal materials, as membrane foulants, 21:664
Colloidal particle interaction, in water treatment, 26:106
Colloidal particles, foams used to collect and separate, 12:22
Colloidal powders, 23:55–56
Colloidal silica, 22:380, 382, 384
  applications of, 22:394
  modification of, 22:393–394
  preparation of, 22:392–393
  properties of, 22:391–392
  purification of, 22:393
Colloidal silica gels, 23:60
Colloidal solids, 7:293–294
Colloidal stabilizers, in polychloroprene latex compounding, 19:857
Colloid mills, 8:702; 10:127
Colloids, 7:271–303; 23:54. See also
  Polymer colloids
  analysis, 7:296
  applications, 7:292–296
  conducting, 7:524
  dispersed species characterization and sedimentation, 7:276–279
  electrokinetics, 7:284–286
  health and safety factors, 7:296–297
  interfacial energy, 7:281–284
  kinetic properties, 7:291–292
  model, 20:388
  preparation and stability of dispersions, 7:272–276
  rheology, 7:279–281
  in silicone network preparation, 22:564
  silver, 22:657
Collofelinite, 6:707t
Colognes, 18:356
Colomionic acid, classification by structure, 4:723t
Colon
  drug absorption from, 9:45–46
  targeting drugs to, 9:46
Colonic flora, 9:46
Colony stimulating factor (CSF)
  selling price, 3:817t
Color, 7:303–341. See also Colors
  in analysis of water, 26:35
  causes of, 7:326t, 326–340
  coatings, 7:109–112
  of fibers, 11:167, 180
  of flax fiber, 11:614
  and light, 7:304–307
  information sources for, 15:764
  in inorganic pigments, 19:379–380
  measurement of differences, 7:319–323
  of oils, 10:827
  perceptual attributes of, 19:262
  of sugar, 23:472
  of waxes, 26:222
Color additives
  liquid chromatography applications, 6:464
  in pet foods, 10:855
Colorants, 9:155–156. See also Colorants
  for ceramics; Colorants for plastics;
  Dyeing
  for coatings, 7:112–118
  cobalt applications, 7:218, 245–246
  in continuous-filament yarns, 19:757–758
  for fibers, 11:180
  hair colorants, 7:856–858
  iodine in, 14:371
  leather, 9:225–226
  mixing, 7:317–318
  textile printing, 9:214–218
Colorants for ceramics, 7:342–358
  economic aspects, 7:354
  health and safety factors, 7:354
  opacification, 7:344–345
  pigments, 7:345–354
  precipitation colors, 7:343–344
  uses, 7:355–356
Colorants for plastics, 7:358–380
  dispersions, 7:360–361
  effect colorants, 7:371, 375, 377–378
  inorganic pigments, 7:359, 367, 369–370t, 372t, 378
  organic pigments, 7:359, 365, 366–368t, 378
  properties, 7:361–362
  soluble dyes, 7:359, 371, 373–375t, 379
Color bases, 9:266
Color blacks, 4:775
Color bodies, ozone decolorization of, 17:809
Color care effect, of cellulases, 10:283
Color centers, 7:326, 337–338
  in vitreous silica, 22:437–438
Color/coloring materials, for inks, 14:316–318
Color concentrates, for inks, 14:316–317
Colorcurve, 7:310
Color determination maleic anhydride
  purity test, 15:510
Color developers, 19:247–248
  for photothermographic materials, 19:347–349
Colorectal cancer, antiaging agents for, 2:811
Colored bodies, 7:342–343
Colored glass, selenium uses in, 22:96–97
Colored images, steps in the formation of, 19:234–235
Colored masking couplers, in chromogenic
  chemistry, 19:256–257
Colored organic compounds, 19:425
Colored organic pigments, 19:417
Colored pigments, 19:397–408
  brightness of, 19:427
  cadmium, 19:407
  chromium(III), 19:406
  complex inorganic, 19:402–406
  cyanide iron blues, 19:407
  derived from titanium dioxide, 25:39
  fastness of, 19:427–428
  iron oxide, 19:397–402
  lead chromate, 19:407–408
  production of, 19:384
  specifications for, 19:384
  ultramarine, 19:406
Colored resists, 9:220
Colorfastness
  to acids and alkalis, 9:230
  to atmospheric contaminants, 9:230
  to cleaning and refurbishing, 9:229
  to light, 9:228–229
  to rubbing and abrasion, 9:230
  testing, 9:227–230
  to wet agencies, 9:229–230
Color film bleaches, 19:260–261
Color films, instant, 19:298–314
Color filter arrays, 9:512–513
Color filter dyes, 9:340
Color-forming coupler chemistry, 19:348
Color imaging processes, instant, 19:283–298
Colorimeters, 7:325
Colorimetric iron compound analysis, 14:560
Colorimetric methods, 10:551
  determining trace mercury using, 16:45
  in sugar analysis, 23:475
  in organic peroxide analysis, 18:489
Colorimetric spectrometry ozone analysis, 17:812
Colorimetric techniques, in platinum-group
  metal analysis, 19:618
Colorimetry, 7:311–319
  of ascorbic acid, 25:760
  color difference measurement, 7:319–323
  in fine art examination/conservation, 11:400
Coloring adjunct, 12:31
Coloring, electrolytic, 16:221–222
Color intensity, of spices, 16:234
Coloring, additive, 19:284
Coloring, additive mixing in, 19:240–241
dye stability in, 19:263
Color, see also Color salts, fast, 9:266–267
film quality in, 19:261–265
film speeds in, 19:261–262
image structure in, 19:264–265
light-recording element in, 19:234–240
processes in, 19:240–245
professional segment of, 19:267
subtractive, 19:283
subtractive mixing in, 19:241–245
Color photography system, instant, 19:241–242
Color-Pigments Manufacturers’ Association (CPMA), 19:402
Color printing, 7:304; 19:234
Color removal
using nanofiltration, 21:652–653
in water treatment, 26:111
Color rendering, 14:861
Color rendering index (CRI), 14:861
Color reproduction
in color photography, 19:262–263
methods of, 19:283–284
Color reproduction, spectral response for, 9:508–509
Color reproduction system, characteristics of, 19:232–233
Colors. See also Color
absorbed light wavelength and, 19:425–426
as food additives, 12:35, 49–51
Color salts, fast, 9:409–411
Color-shifted dye developers, 19:287–288
Color standards, 9:166–167
Color television, additive process in, 19:241
Color vision, 7:307–308; 19:231–233
Columbates, 24:315
Columbian coffees, 7:250
Columbites, 17:140; 24:316, 319
processing of, 17:137
Columbite-tantalite minerals, 17:134–135
Columbium, 17:132. See also Niobium (Nb)
Columnar phase, of liquid crystalline materials, 15:96
Columnar systems, for ion exchange, 14:403–404
Columns
in distillation hazardous waste management, 25:815
gas chromatography, 4:615; 6:377, 379
liquid chromatography, 4:623; 6:385
mechanically agitated, 10:777–781
supercritical fluid chromatography, 4:631
Column side-draws, methanol removal from, 18:520
Column switching, liquid chromatography, 6:446–447
COMA copolymers, for 193-nm resists, 15:180–181
Comb copolymers, 7:610t
Combed yarn, 11:178
Combes synthesis, of quinolines, 21:189
Combicat, 7:387, 392
Combination vaccines, 25:504–505
Combinatorial biology, 16:414
Combinatorial biosynthesis, 15:301–302, 305
Combinatorial chemistry, 7:380–434; 8:400–401; 13:283–284. See also
High-throughput experimentation applications, 7:381–383
commercial environment, 7:387–389
methodology, 7:383–387
microwaves in, 16:548–552
nomenclature, 7:380
polymers, 7:405–413
Combinatorial libraries, 12:515–517
Combinatorial methods, 7:380
Combinatorial optimization approach, in computer-aided molecular design, 26:1037
Combinatorics, in process scheduling, 26:1042–1043
Combined aerobic–anaerobic systems, in bioremediation, 25:837
Combined cycle, 10:142–143
Combined cycle fossil fuel plants, 23:236
Combined heat and power (CHP), from biomass, 3:687
Combined mixer–settler (CMS), 10:774, 775
Combined reforming, in methanol synthesis, 16:304
Combining flow manifolds, 13:272
Combipress, molecular formula and structure, 5:161t
Combustible masking materials, 10:91
Combustion, See also Fire entries in diesel engines, 12:420–421
energy loss from, 10:138
of ethers, 10:579–580
explosives and propellants during, 10:719
fluidized-bed, 12:332
natural gas, 12:383
oxygen in, 17:748, 750
oxygen-enriched, 17:762–763
phosgene decomposition by, 18:807
preventing sodium, 22:775–776
of sodium, 22:764–765
of vinyl chloride, 25:631
Combustion air preheat, 10:144
heat pipes and, 13:238
Combustion chamber deposits, 12:410
Combustion control technologies, 10:96–97
Combustion devices, 10:72
Combustion engine lubricants, 23:533
Combustion processes
Claus furnace, 23:604
hydrogen use in, 13:854–857
Combustion reactions, 21:844
Combustion science, 7:435–479
definitions and terminology, 7:435–449
flame types, 7:443–449
heterogeneous combustion, 7:449–454
spontaneous ignition temperature of selected compounds, 7:438t
Combustion technology, 7:435
emissions control, 7:474
environmental considerations, 7:470–474
fossil fuel system design considerations, 7:467–469
gaseous fuels, 7:455–460
liquid fuels, 7:460–463
solid fuels, 7:463–467
of phosphorus flame retardants, 11:502
Combustors, primary and secondary, 13:174
Co-metabolic degradation, defined, 3:757t
Cometabolism
in biodegradation, 25:836
herbicide, 13:309
COMEX, 12:696, 697
CoMFA analysis, 10:329–330
Cominco, Ltd., 26:562
Comité International des Poids et Mesures (CIPM), 24:434, 435, 436
Comité International Spécial de Perturbations Radioélectriques (CISPR), 16:512
Comité Europ en de Normalisation (CEN), 15:755, 756
Commerce, interstate and intrastate, 25:330–331
Commercial alloys, 13:525–530
Commercial asphalt materials, recycling, 23:592
Commercial catalysts, 24:260
Commercial Development and Marketing Association (CDMA), 15:646
Basic Market Research Short Course, 15:635
Commercial diisocyanates, properties of, 25:465–467t
Commercial extractors, 10:768, 769–777
classification of, 10:772
summary of, 10:773t
Commercial fibers, physical properties of, 11:226t
Commercial fluorine cells, 11:832–837
Commercial glass, recycling, 21:378
Commercial grade charge-coupled devices, 19:146
Commercial hybrid materials, silicon-based, 13:538–540
Commercial hydrazines, physical properties of, 13:565t
Commercial hydrolysis, in vinyl alcohol polymerization, 25:609, 612t
Commercial immunoassays, for clinical applications, 14:140
Commercial inks, 14:320
Commercial laundering, detergents systems for, 8:413t
Commercial mercury, testing of, 16:44
Commercial oil reclaimers, 21:425
Commercial PCBs, 13:137–138
Commercial phosphorus flame retardants, 11:487–499
Commercial polychloroprene polymers, 19:851–852
Commercial polyester block copolymers, 24:707–708
Commercial polyesters, historical survey of, 20:32–34
Commercial polyether polyols, 25:468t
Commercial polymerization, of VDC, 25:721–725
Commercial production, of nevirapine, 18:743–744
Commercial products, high pressure applications in, 13:436–438
Commercial-scale pharmaceutical operations, 18:733–736
in-process controls in, 18:734
processing equipment requirements in, 18:733–734
validation programs in, 18:734–736
Commercial silane coupling agents, 22:698, 699t, 701–703
Commercial silylating agents, 22:692, 693t
Commercial sutures, 24:207–214
trade names and manufacturers of, 24:208–212t
Commercial tellurium, 24:408, 414
Commercial vaccines, 25:487
Commercial waste, 25:864
Commingled plastic wastes recycling, 21:453–456
thermal cracking of, 21:454
thermal degradation of, 21:454
Commingled recyclables, 21:368
in waste collection, 25:869–870
Comminution, 16:135
ceramics processing, 5:643–644
coil, 6:725–726
in minerals recovery/processing, 16:610–615
Commissioner of Food and Drugs, 21:571
Commission for Environmental Cooperation, 16:47
Commission for the Reform of the Nomenclature of Inorganic Chemistry report, 17:392
Commission Internationale de l'Eclairage (CIE) standards, 19:585. See also CIE color system
Commission on Biochemical Nomenclature (CBN), 17:401
Commission on Macromolecular Nomenclature, 17:403–404
Commission on Nomenclature of Inorganic Chemistry (CNIC), 17:392
Committee on Medical and Biologic Effects of Environmental Pollutants, 26:585
Committee on Nomenclature, Terminology, and Symbols (American Chemical Society), 17:386
Commo designation, for boron hydrides, 4:172
Commodities, fine chemicals as, 11:423–424
Commodity chemicals, 5:758; 15:640; 20:711, 714, 732
distribution of, 15:642
manufacturing considerations, 5:777t
price driven, 5:782
pricing of, 15:641
process optimization for, 20:760–761
technical service support for, 24:341
Commodity resins, 19:537
Commodity-scale processes, organic electrochemical processing, 9:674–677
Common bundle, 5:80
Common carp, common and scientific names, 3:187t
Common carriers, 25:325–326
liability of, 25:335–336
Common clay, 6:686
occurrence and geology of major deposits, 6:667
uses, 6:701
Common law trademark right, 25:258
Common mode failures, 13:169
Communication. See also Communications organizational, 21:622, 628–629
in pilot-plant planning, 19:467–468
among process control levels, 20:676
Communication applications, glass fibers in, 12:612–616
Communications, laser diodes in, 22:180
Community Emergency Exposure Levels (CEEL), 21:838
Comonomer BPA, 23:741
Comonomers of acrylonitrile, 11:197
polyester dyeability and, 20:4
Compactable cake modeling, 11:335–336
Compact heat exchangers, 13:218
Compaction centrifugal separation by, 5:515–516
in radioactive waste treatment, 25:853
of vitreous silica, 22:423
Compact limestone, 15:27
Compagnie Européenne du Zirconium (CEZUS) hafnium separation method, 13:84
Companies making fermentation products, 11:14–22
Company project managers, turnover of, 24:388
Comparative analysis
characteristics of tools for, 24:178t
risks considered in, 24:178t
tools for, 24:177
Comparative modeling, in protein structure prediction, 20:837
Comparative Molecular Field Analysis (CoMFA), 6:16; 16:755–757
pharmacophore generation and validation, 6:12
Comparative Molecular Shape Indexes Analysis (CoMSIA), 10:327t, 330–331
Comparative risk analysis of alternatives (CRAoA), 24:177
Comparative risk reduction, in nuclear power facilities, 17:539–542
Comparative tracking index (CTI) technique, 19:587
Comparison, of ideas in chemical product design, 5:772–773
Compatibilization
of polymer blends, 20:323–326
polymer mechanical properties and, 20:324–325
Compatibilizer architecture, effect of, 20:335–338
Compatibilizer concentration, effect of, 20:338
Compatibilizers
effect on phase structure, 20:335
effect on polymer blend microrheology, 20:334–335
in polymer blends, 20:334–338
Compatible polymer blend, 20:319
“Compensating cables,” 24:463
Compensation, in technology transfer, 24:374–375
Competitive advantage
from research initiatives, 24:393
sustaining, 24:191
Competitive binding insulin delivery, 9:66–67
Competitive binding immunoassay, 14:139
Competitive enzyme inhibition, 10:256
Competitive intelligence work, 15:645
Competitiveness, organizational, 21:623–625
Competitive technology intelligence (CTI), 15:645
Competitive uniqueness, 21:627
Competitors, marketing research on, 15:638–639
Compilations, copyright, 7:786–787
Complement activation, in hemodialysis, 26:823
Complementarity, in receptor design, 16:769–770
Complementarity determining regions (CDRs), 20:831
Complementary assets, 24:365
Complementary Metal Oxide Semiconductors (CMOS). See also CMOS image sensors bipolar transistors with, 22:249
improving performance of, 22:257
logic circuits with, 22:251–253
Moore’s law and device scaling and, 22:253–254
processing of, 14:428
in scaling to deep submicron dimensions, 22:256
Complementary metal oxide semiconductor devices, 10:2
Complete enzyme inhibition, 10:318, 320
Completely denatured alcohol (CDA), 10:553
Complete mix activated sludge (CMAS) process, 25:900, 903–904
Complete neglect of differential overlap (CNDO) technique, 16:737
Completion developer, 19:301
Completion fluids, 9:26–30
Complex III inhibitors, 14:348–349
Complexation
inclusion, 11:552–553
iodine, 14:357
in wastewater treatment, 25:911
Complex carbides, 4:692
Complex coacervation, 11:546
Complex coacervation process, 16:440–441
Complex detection, in microarray fabrication, 16:388–389
Complex distillation systems, design of, 20:748–750
Complexes, with sodium, 22:764
Complex fluids, encapsulation in, 11:551–552
Complex-forming solutions, in leaching chemistry, 16:152–153
Complex hydrides, 13:607, 613–621
Complexing agents
biologically degradable, 24:172
lignosulfonates as, 15:18
Complex inorganic colored pigments
(CICPs), 19:386, 402–406
Complexity
implications of, 21:617–618
in the R&D context, 21:616–617
Complex Lorentz force, in layered HTS,
23:827
Complex metal hydrides, hydrogen storage
and, 13:851
Complex salts
krypton, 17:333
radon, 17:335
xenon, 17:326–330
Composers, 8:334–335
Component concentrations, rate law and,
14:609
Component-level modeling, for reliability,
26:987–990
Components industry, 24:332–333
Composite barrier layer, in landfill design,
25:879
Composite coatings, 9:697, 708–709
Composite construction membranes, 18:510
Composite curves, 13:191
Composite electrode technology,
22:505–508
Composite ferroelectric devices, 11:104–105
Composite fibers, 13:390
advanced, 13:395
carbon-nanotube, 13:386
Composite hollow-fiber membranes,
16:14–15
Composite interface engineering,
26:771–773
Composite interfaces, ceramic–matrix
composites, 5:558–561
Composite liner, in landfills, 25:877
Composite material coatings, 14:105
See also Composites
advanced materials in, 1:693
classification by geometry, 26:752–755
classification by matrix material,
26:751–752
economic aspects of, 26:783
electronic applications for, 26:755–756
fabrication of, 26:765–773
history of, 26:750–751
matrix materials, 26:761–765
nanocomposites, 1:716–718
performance of, 26:773–775
reinforcements using, 26:756–761
silver-epoxy, 10:16
structural applications for, 26:755
theories of reinforcement, 26:775–783
Composite membranes
for highly acidic environments, 21:634
interfacial, 15:811–812
solution-cast, 15:813
thin-film, 21:633
Composite oxyalkoxides, 25:99–100
Composite packagings, U.N. packaging
codes for, 18:12t
Composite paperboard food canisters,
18:36–37
Composite propellants, 10:737. See also
Composite rocket propellants
Composite refractories, 21:483
Composite reinforcements, 5:554–557
integrity, 5:577–578
Composite rocket propellants, 10:726
Composites
Composites. See also Composite materials
Composites. See also Laminates
aluminum-filled, 10:15–28
carbon fiber, 26:745
ceramic-filled polymer, 10:15–16
ceramic–matrix, 5:551–581
conducting, 7:524
from cotton, 8:31
ferroelectric ceramic–polymer,
11:100–101
fiber-reinforced, 21:456
fibrous, 26:752
flax fiber in, 11:594
glass-ceramic, 12:643
high performance fibers in, 13:369
hydrothermal processing of,
14:104–106
manmade, 11:302
mechanical properties of, 18:793t
nickel-matrix, 17:104
particulate, 26:754–755
phenolic resin, 18:792–794
photocatalytic support-based, 14:105
polyimide matrix, 20:284
PPTA reinforced, 19:734
reinforced, 22:701–703
strength predictions of, 26:778–779
structural, 10:450–452
Composite strengthening, 13:502–503
Compound semiconductor systems, epoxy adhesion in, 10:427–428
Compositional uniformity, of linear low density polyethylene, 20:204
Composition analysis, for plastics, 19:563–569
Composition measurement, 11:785
Composition of matter category, in patents, 18:165–166
Compositions of interest
  in separating nonideal liquid mixtures, 22:305–306
  in separation synthesis algorithm, 22:312
Composition space, 22:330–331
Composting, 21:11
  defined, 3:759t
  ecological impact of, 25:874
  solid waste volume reduction via, 25:870, 873–874
Composting facilities, 25:873–874
Compound III–V type semiconductors, 23:15
  Compounded perfumes, 18:354
  Compound gauge, 20:646
Compounding
  in bar soap manufacture, 22:748, 751
  complexity of, 21:758–759
  of ethylene–propylene polymers, 10:712–714
  of flavors, 11:575–581
  in polyamide plastic manufacture, 19:783–784
  of polychloroprene, 19:847–851
  of polychloroprene latexes, 19:857–859
  rubber, 21:758–815
  tire, 21:804–812
  of vinyl chloride polymers, 25:670–676
Compounding ingredients, effect on vulcanization, 21:803
Compound Parabolic Collector (CPC) photoreactor case study, 19:95–99
Compounds. See also Chemical compounds for carbon adsorption treatment, 25:811–812
  esterification of, 10:484–488
  group names for, 18:594
  reported to be sweet, 24:244t
  Compound semiconductor-based laser diodes, 22:179
  Compound semiconductors, 22:141–200
    applications of, 22:141–142
    crystalline structure of, 22:141
  defined, 22:141
  in electronic devices, 22:160–172
  electronic properties of, 22:150t, 151
  fabrication technologies for, 22:182–193
  lithography in fabricating, 22:192–193
  optical and transport properties of, 22:148, 150t
  in photonic devices, 22:172–182
  physical properties of, 22:142–152
  types of, 22:141–142
  via metal organic chemical vapor deposition, 22:152–160
  Comprehensive Data Base, 18:229
  Comprehensive Drug Abuse Prevention and Control Act, 18:685
  Comprehensive Plan on Ergonomics (OSHA), 21:593
  Comprehensive two-dimensional GC, 6:434
  Compressed air
    dessicant applications, 8:356t
    explosions, 21:848–849
  Compressed air systems, 10:151
  operation and maintenance of, 10:161
  Compressed aspirating aerators, 26:168–169
  Compressed fluid, 24:1
  Compressed Gas Association (CGA), 17:363
    Gas Specification Committee, 17:756
  Compressed gas propellants, 1:779
    physical properties of, 1:779t
  Compressed natural gas (CNG), as a motor fuel, 12:432
  Compressed tablet drug dosage form, 18:702, 706
  Compressed yeast, 26:460
  Compressibility, of silicone fluids, 22:578–579
  Compressible flows, 11:760–761
  Compression equipment, 10:155
    in settling of suspensions, 22:54–55
    stepwise, 13:404
    in vapor–compression refrigeration systems, 21:541
  Compression drug coatings, 18:707–708
  Compression filters, continuous, 11:379–381
  Compression ignition (CI) engine, 10:60
Compression layer, of thickeners, 22:64
Compression molding, 10:179; 20:243; 26:770
of Teflon AF, 18:341
of thermosetting resins, 19:556–557
Compression permeability (C-P) cell, 11:336
Compression set
of silicone LIM rubber, 22:585
of silicone rubber, 22:582–583
Compression weighing systems, 26:253
Compressive creep test, 13:472, 475
Compressors
cryogenic applications, 8:61
fugitive emissions from, 10:71
in nitric acid production, 17:178
in plant layout, 19:512
in refrigeration systems, 21:534–536
Compton electrons, 21:277
Compton-scattered photons, 21:312
Compton scattering, 7:339
Computational chemistry, 16:728–729
sampling techniques for, 26:1035–1036
Computational fluid dynamics (CFD),
11:777–781
use of, 11:822
Computational methods, for molecular modeling, 16:734–755
Computer-aided chemical engineering,
7:479–512. See also Computer-assisted entries
arranging expressions for computation, 7:500–503
current advances, 7:509–511
multiple uncertainties, 7:507–509
software development, 7:482–503
software examples, 7:481–482
using engineering software, 7:504–509
Computer-aided design (CAD)
in microfluidic fabrication, 26:964–966
for molds and extruder screws, 19:539
in plant layout, 19:493, 497, 498,
519–521
Computer-aided design and manufacturing
(CAD/CAM), dental ceramics,
8:275–276
Computer Aided Material Preselection by Uniform Standards (CAMPUS), 19:793
Computer-aided molecule design (CAMD),
7:479, 509; 26:999
in chemical synthesis, 26:1036–1038
stochastic modeling for, 26:1019–1020
Computer-aided process synthesis,
7:509–510
Computer-aided programs, for SLS
equipment selection, 11:348
Computer analysis, of DNA sequence information, 12:510–512
piping system sizing using, 19:473–474
Computer-assisted color matching,
19:382
Computer-assisted contrast, 16:487
Computer-assisted inhibitor design, 10:326–341
Computer-assisted molecular modeling
(CAMM), 16:726
uses of, 16:728–757
Computer-assisted molecular modeling package, 10:331–333
Computer-assisted tomography (CAT),
sodium iodide in, 22:827
Computer-automated image analysis, as a particle counting method, 18:146–149
Computer-controlled viscometers, 21:732
Computer controller, closed loop fuel metering system, 10:57
Computer control loop, components of,
20:677–678
Computer controls, blast furnace, 14:508
Computer control systems, ethylene plant, 10:622
Computer control technology, in silicon production, 22:505–506
Computer graphics
in molecular modeling, 16:730–734
overview of, 16:733
Computer graphics systems, in molecular modeling, 16:731
Computer industries, epoxy resins in,
10:349, 350
Computer integrated food manufacturing,
12:88
Computerization, standardization and,
15:759
Computerized fluid dynamics (CFD),
21:350
Computerized tomography (CT),
26:440–441
Computer modeling
of glass melting, 12:605–606
of glass structure, 12:576–577
Computer programs. See also Software
for monitoring fermentation, 11:41
for patent information processing, 18:226
Computers
role in technical service, 24:349
vitreous silica in, 22:442, 443
Computer simulation packages, 20:729.
See also Programmer consoles;
Software
Computer technology, sensors and, 22:263, 264
Computer validation, of fermentation
equipment, 11:48
Computing properties, defined, 16:729–730
CoMSIA, pharmacophore generation and
validation, 6:12
Concavalin A (Con A), 9:66–67
Concave receptor, 16:774
Concentrate, defined, 16:127
Concentration
of ethylene oxide polymers, 10:675–676
function of crystallization, 8:95
measurements of, 14:612
Concentration overvoltage, 12:207–209
Concentration polarization (CP), 21:641–642
batteries, 3:425–426
in membrane fouling, 15:831–832
simulations, 21:642
Concentration profiles, in liquid–liquid
extraction, 10:754–755
Concentration separations, of minerals,
16:604
Concentration standards, 15:750–751
Concentrators, sulfuric acid, 23:787
Concentric annular reactors, 23:544
Concentric cylinder viscometer, 21:733
Concentric hemispherical analyzer (CHA),
24:103–104, 105
energy resolution of, 24:106
Conching, milk chocolate, 6:363–364
Concomitant polymorphism, 8:69
CONCORD program, 6:10; 16:752
Concrete(s)
alkanolamines from olefin oxides and
ammonia, 2:135–136
calcium chloride as accelerator, 4:568
cement paste structure and concrete
properties, 5:482–484
citric acid application, 6:648
commingled plastic wastes in, 21:454
elastic properties, 5:614t
information sources for, 15:764
lightweight, 23:406
particles in, 26:754
in perfumes, 18:365
special cement applications, 5:500t
Concrete additives, vinyl acetate polymers
as, 25:585–586
Condensate drainage devices, 10:148
Condensate polishing
ion exchange in, 14:417
in steam-generating systems, 23:227
water softening method for, 26:122–123
Condensate return, in heat pipes, 13:226
Condensate return systems, 10:147–148
Condensate systems, in industrial water
treatment, 26:136–137
Condensation, 9:281–282. See also
Polycondensation
control of VOCs by, 26:679–680
ketone, 14:570
in silicate solutions, 22:458–459
in vapor–compression refrigeration
systems, 21:541–542
Condensation cure, 10:4
silicone network preparation via,
22:566–567
Condensation-cured model systems,
of silicone networks, 22:569
Condensation energy, 23:826
Condensation-hydrolysis technology,
14:586
Condensation polymers
commercial, 20:392–393t
phenol–formaldehyde, 10:409
Condensation polymerization, of silicone
fluids, 22:573
Condensation principle, 16:65
Condensation processes, natural gas liquid
recovery by, 12:375
Condensation reactions
of aluminum alkoxides, 23:76
aminophenols, 2:658
amyl alcohols, 2:769–770
aniline, 2:786
heterogeneous catalysts in, 18:518–519
lactic acid, 14:116–118
in lignin, 15:5–6
microwaves in, 16:563–566
phenol, 18:747–748
water removal from, 18:516–520
Condensation silicones, 8:331–332
Condensed Distiller’s Syrup, 10:534
Condensed materials, nitriding or
carbonitriding of, 17:208
Condensed molasses solubles (CMS),
23:483
Condensed-phase flame retardant mechanisms, 11:484–485
Condensed phosphates, 18:841–852
  colloidal properties of, 18:851
  complex ion formation in, 18:850–851
  crystalline, 18:847
  hydrolysis of, 18:848–850
  manufacture of, 18:856–859
  properties of, 18:848–851
Condensed phosphoric acids, 18:826–830
  as catalysts, 18:830
  physical forms of, 18:826–828
  uses for, 18:829–830
Condensed potassium phosphates, 20:637
Condenser flooding, in variable-conductance heat pipes, 13:234
Condensers
  air-cooled, 23:218
  in distillation, 22:300–301
  in plant layout, 19:510
  in refrigeration systems, 21:536–537
  in solar salt harvesting, 22:806
  water-cooled, 23:218
Condensing turbines, 10:147
Conditional Expectations (ACE) nonlinear method, 6:53
Conditional targeted deletions, production of, 12:460–462
Conditioning, in cane sugar refining, 23:453
Conditioning orifice plates, 11:658
Conducting ceramics, 5:598–599
Conducting organic polymers (COPs), 13:541, 543, 544
  doped with electroactive molecular clusters, 13:544–546
  p-doped, 13:546
  polyoxometalate-doped, 13:544
Conducting polymer blends, 7:524–525
  applications, 7:537–541
  doping, 7:528–529
  electrical conduction properties, 7:531–532
  electrochromic materials, 6:572t, 574–576
  metallic, 7:532–534
  optical properties, 7:529–531
  semiconducting, 7:534–535
  smart, 22:717, 718–719
  stability, 7:535–537
  synthesis, 7:513–526
  in wastewater treatment, 25:911
Conduction, in organic semiconductors, 22:201–204. See also Conductivity
  Conduction band, 5:595; 22:201, 202, 233–234
  Conduction band minima, in compound semiconductors, 22:148–151
  Conduction (heart) block, 5:86
  Conduction dryers, coatings, 7:29
  Conduction freezing, 12:83–84
  Conduction furnaces, 12:295–296
  Conductive blacks, 4:775, 799–800
  Conductive coatings, 1:712–713
  Conductive energy flux, 25:275–276
  Conductive fibers, acrylic, 11:219
  Conductivity, 16:512. See also Electrical conductivity
    of artificial graphite, 12:715
    of carbon nitride, 17:204–206
    of charge-transfer salts, 22:204–207
    of ionic liquids, 26:852
    measurements of, 14:612
    of polymers, 22:208
    of silicon, 22:484–485
    of silver sulfide, 22:684
    of sodium, 22:778
    of vitreous silica, 22:430
  Conductivity detection system, 13:419
  Conductivity detectors, liquid chromatography, 6:387
  Conductometric detectors
    capillary electrophoresis, 4:635
    ion chromatography, 4:627
    liquid chromatography, 4:622–623
  Conductometric sensors, 22:271–272
  Conductor joints, 23:846–847
Conductors
  Chevrel phase, 23:835–836
  Group 14 (IV) elements as, 22:232, 233
  high throughput experimentation, 7:382t
  Nb–Ti, 23:829–831
  organic semiconductors and, 22:201, 202
Cone angle, 23:187. See also Conical entries

Cone calorimeter, 19:588

Cone crushers, 16:612

Cone-down tank bottoms, 24:293–296

Cone–plate viscometer, 21:734–735

Cone-roof tanks, 24:289

Cones, in eye, 7:307–308

Cone-up tank bottoms, 24:293

Coney Island, salt production on, 22:800

Confections
  citric acid in, 6:646
  vanillin in, 25:552–553

Conferences, steam-related, 23:202.
  See also Chemical congresses

Confidence level method (CLM), optimization via, 26:1028–1029

Confidentiality, in technology transfer, 24:375–376

Confidentiality agreements, 24:376

Confidential Statement of Formula (CSF), 18:544

Configurable programmable logic controllers, 20:671

Configurational-bias Gibbs ensemble techniques, 26:1035–1036

Configuration heuristics, 22:334t

Confined aquifer, 12:839

Confined jets, 11:759–760

Conflicts of interest, in technology transfer, 24:367–368, 370–371

Confocal microscopy, 16:472, 483–484

Confocal micro XRF spectrometry, 26:439

Conformal coating materials, in electronic materials packaging, 17:843–845

Conformal coatings, 10:12–13

Conformal moldings, 10:11

Conformation, of fiber polymers, 11:175

Conformational analysis, 10:326–327; 15:306
  of macrolide antibiotics, 15:305–306

Conformational flexibility, 6:10–11

Conformational polymorphism, 8:69

Conformational searches, 6:10–11

Congestive heart failure
  antianginal agents for, 5:110t
  therapy, 5:179, 184–187

Congo red, reactions with PVA, 25:603

Congruent sublimation temperature, for compound semiconductors, 22:148

Conical basket centrifuge, 11:391. See also Conical entries

Cone refiners, 18:104–105

Conical screen centrifuge, operation, 5:546–548

Coniel, molecular formula and structure, 5:125t

Conine, 2:74, 107

Conjugated cyclohexenones, enolization of, 13:672

Conjugated-diene butyl, 4:436–437

Conjugated drying oils, 9:148

Conjugated hemoglobin, 4:122–124

Conjugated linoleic acid (CLA), 10:829; 17:664–665

Conjugated oils, synthetic, 9:150

Conjugated polymers, 23:709

Conjugate vaccines, 25:506

Conjugating, protein isolation by, 13:748

Conjugation, 12:471. See also Conjugation reactions
  plasmid, 12:501

Conjugation effect, influence on absorption spectrum, 20:510

Conjugation reactions, 14:139–140
  noncovalent methods for, 14:140

Conjuncto-boranes, 4:172

Connectivity, in multiphasic solids, 11:100–101

Connector materials, in electronic materials packaging, 17:845–848

Connectors, fugitive emissions from, 10:71

Connolly solvent-accessible dot surface, 16:732, 733

Conrad-Limpach-Knorr synthesis, of quinolines, 21:189

Conrad recycling process, 21:455

Conradson carbon test method, 11:705, 721

Consensus materials standards, 15:743

Consent decree protocols, in the United States, 11:692–694

Consent decrees, 11:689–690

Consequence analysis, 21:860–861

Consequence modeling, 13:165–166

Conservation applications, high performance fibers in, 13:398

Conservation of energy, 21:290

Conservation of mass, 11:737, 738–739

Conservation, of resources, 24:164–167

Conservation scientists, 11:398–399
  “Consistent force field,” 16:744

Consolidants, in fine art examination/conservation, 11:410

Consolidated Mining and Smelting Company of Canada (Cominco, Ltd.), 26:562
Consolidated ocean deposits, 17:691–694
Consolidation Synthetic Fuels (CSF) process, 6:848
CONSOL pyrolysis process, 6:854
Constant analyzer energy (CAE) mode, 24:103
Constant conduction heat pipes, 13:227
Constant failure rate, 13:167
Constant-field scaling, of FETs, 22:253, 254
Constant-modulus alloys, 17:101
Constant of proportionality, 14:237
Constant pressure heat capacity, 24:656
Constant rate drying, 9:103–105
Constant rate period, 9:97; 23:66–67
Constant retard ratio (CRR) mode, 24:103
Constant slope condition, 24:136–137
Constant stress test, 13:472; 19:583
Constant voltage scaling, of FETs, 22:253
Constant volume heat capacity, 24:656
Constant volume sampling system (CVS), 10:33

Constituent properties
of bainite, 23:280
of martensite, 23:280–281
of pearlite, 23:280
of tempered martensite, 23:281–282
“Constrained geometry” catalysts, 16:81; 20:193
Constraint control strategies, 20:675–676
Constraint method, in multiobjective optimization, 26:1033

Constructed wetland, defined, 3:759t

Construction
aluminum applications, 2:340
copper applications, 7:711–712
epoxy resins in, 10:452–453
ethylene oxide polymers in, 10:689
HEC applications, 5:45t
high performance fibers in, 13:394
methylcellulose applications, 5:459t
use of limestone in, 15:37–38
uses of succinic acid and succinic anhydride in, 23:427t

Constructional alloy steels, 23:299–300
molybdenum in, 17:16

Construction and demolition (C&D) debris, 21:411

Construction business, economic future of glass in, 12:617
Construction codes, piping system, 19:487

Construction industry, PVC use in, 25:676
Construction materials
embrittlement of, 13:839–840
resistance to hydrogen chloride, 13:825–827
for storing and using hydrazine, 13:587–588

Construction type, plant site selection and, 19:525

Construction vehicles, heavy duty diesel engine oils for, 15:233–235

Consultants, for market or marketing research studies, 15:631, 633

Consultative Committee on Thermometry (CIPM), 24:436

Consumable-electrode melting, 12:302
Consumable-electrode electric-arc melting technique, 25:522
Consumable-electrode melting, 23:254

Consumer applications, for polyamide plastics, 19:795

Consumer preferences, for tamper-evident packaging, 18:29

ink regulation under, 14:333

Consumer products
hydrogen peroxide in, 14:68
microencapsulated, 16:459–460
nondestructive evaluation of, 17:414

Consumption, of regenerated cellulose fibers, 11:275, 276–278

Contac, 3:90
Contact activation, 4:86–87

Contact adhesives, phenolic resins in, 18:783–784

Contact angle hysterisis, 22:109, 110, 113–114

Contact atomic force microscope system, 24:83

Contact dermatitis, from nickel, 17:119

Contact dryers, coatings, 7:29
Contact drying, 9:105–107

Contact  icing, of food, 21:561

Contacting, differential, 10:760–762

Contact mechanics, 1:515–517

Contact mode atomic force microscopy, 3:320–325; 17:63

Contact nucleation, 8:105

Contactors
ozone, 17:801–802
selection of, 10:767–768
Contact plants, 23:768–769
Contact printing, in microarray fabrication, 16:386
Contact process
stoichiometric relation between reactants and products for, 23:773
for sulfuric acid manufacture/production, 23:755, 767–768, 769
Contact stabilization, in biological waste treatment, 25:828
Contact X-ray microradiography, 16:504
Containers
aluminum applications, 2:339–340
pharmaceutical, 18:719
for radioactive waste disposal, 25:857
for radioactive waste transport, 25:855
semibulk, 18:5–6
tinplate, 24:793
Container systems, for industrial materials, 18:1–14
Containment building, for nuclear power facilities, 17:538
Containment landfills, 25:877
Contaminant coke, 11:705
Contaminant concentration, measurements of, 14:214
Contaminant deposition, from steam in turbines, 23:228–228
Contaminant effects, on magnesium and magnesium alloys, 15:370–373
Contaminant metals
on equilibrium catalyst, 11:721
FCC catalysts and, 11:681–685
Contaminant removal, 9:20
Contaminants. See also Contamination; Impurities
in bioremediation design considerations, 25:838
in industrial used oil, 21:424t
in paper recycling, 21:431–432, 433t
physiological classifications of, 21:836–837
in phosphorus manufacture, 19:13
in vehicle used oil, 21:423t
in vitreous silica, 22:410
Contaminant transport studies, 12:843–846
Contaminated soil/ground water, treatment of, 25:834–843, 843–845, 846
Contamination
in fermentation, 11:46–47
silicon-based semiconductors and, 22:231
by silicones, 22:603
in silicon refining, 22:505, 506
soap versus, 22:756
by sodium, 22:775
in sodium nitrite analysis, 22:857
by sodium oxides, 22:776
Contamination cleanup, solvent-related, 23:111–112
Contigs, identifying, 12:510–511
Continental shelf
consolidated deposits in, 17:691–692
unconsolidated deposits in, 17:686–689
Continuing Commodity Guarantees, 23:161
Continuity equation, 11:739
Continuous addition, in VDC emulsion polymerization, 25:723–724
Continuous anionic polymerization, 23:385–386
for polystyrene, 23:385
Continuous aqueous dispersion process, 11:199
Continuous arteriovenous hemofiltration (CAVH), 26:832
Continuous bulk polymerization plants, 23:358
Continuous bulk SAN polymerization, 1:447–448
Continuous carbon dioxide foaming, 24:21
Continuous-cast aluminum-killed steel, 23:270
Continuous casting
in bar soap manufacture, 22:749–750
copper, 7:692
Continuous-casting machines, designs of, 23:267
Continuous cellulosic fibers, 20:557
Continuous compression filters, 11:379–381
Continuous conveyors, 9:119
Continuous cooling, in austenite transformation, 23:282–283
Continuous-cooling transformation (CCT) diagrams, 17:16; 23:280
Continuous copper-drossing process, 14:745–747
Continuous countercurrent extraction, 10:757
of sucrose, 23:456–459
Continuous countercurrent adsorption processes, 1:613
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous culture, 11:28–29</td>
<td>101</td>
</tr>
<tr>
<td>Continuous cylindrical screen centrifuge, operation, 5:545–546</td>
<td>645</td>
</tr>
<tr>
<td>Continuous drawing process, for textile glass filaments, 13:387</td>
<td>520</td>
</tr>
<tr>
<td>Continuous dryers, 9:116</td>
<td>281</td>
</tr>
<tr>
<td>Continuous drying, of reaction feed streams, 18:522</td>
<td>354</td>
</tr>
<tr>
<td>Continuous Emissions Monitoring System (CEMS), 13:792</td>
<td>384</td>
</tr>
<tr>
<td>Continuous emulsion copolymerization processes, for vinyl acetate,</td>
<td>201</td>
</tr>
<tr>
<td>Continuous esterification, 10:480–482 with heterogeneous catalysts,</td>
<td>202</td>
</tr>
<tr>
<td>Continuous ethyl acetate process, 10:483</td>
<td>203</td>
</tr>
<tr>
<td>Continuous Exposure Guidance Levels (CEGL), 21:837</td>
<td>204</td>
</tr>
<tr>
<td>Continuous extractors, 10:751</td>
<td>205</td>
</tr>
<tr>
<td>Continuous falling film SO$_3$ sulfonation process, 23:544, 550–552</td>
<td>206</td>
</tr>
<tr>
<td>Continuous fiber composites, fabrication of, 26:766, 767</td>
<td>207</td>
</tr>
<tr>
<td>Continuous fiber reinforcement, 5:555, 654 performance in ceramic–matrix composites, 5:576–577</td>
<td>208</td>
</tr>
<tr>
<td>Continuous fibers, 11:177 textyle yarns from, 11:177–178</td>
<td>209</td>
</tr>
<tr>
<td>Continuous filament glass, asbestos substitute, 3:314t</td>
<td>210</td>
</tr>
<tr>
<td>Continuous filament process, for cuprammonium rayon, 11:265</td>
<td>211</td>
</tr>
<tr>
<td>Continuous filament yarns, 20:12 additives to, 19:757–758</td>
<td>212</td>
</tr>
<tr>
<td>Continuous flow fast atom bombardment (CF-FAB) liquid chromatography,</td>
<td>213</td>
</tr>
<tr>
<td>Continuous flow mixing, 14:612–613</td>
<td>214</td>
</tr>
<tr>
<td>Continuous fractional distillation, in hazardous waste management,</td>
<td>215</td>
</tr>
<tr>
<td>Continuous hydrogenation, 10:811</td>
<td>216</td>
</tr>
<tr>
<td>Continuous improvement philosophy,</td>
<td>217</td>
</tr>
<tr>
<td>Continuous inkjet (CIJ) printing, 9:222</td>
<td>218</td>
</tr>
<tr>
<td>Continuous ion-exchange systems,</td>
<td>219</td>
</tr>
<tr>
<td>Continuous ion-exchange water softening, 26:120</td>
<td>220</td>
</tr>
<tr>
<td>Continuous labscale RO unit, 21:644</td>
<td>221</td>
</tr>
<tr>
<td>Continuous latex manufacturing,</td>
<td>222</td>
</tr>
<tr>
<td>Continuous linear-flow reactors (LFR), 23:386</td>
<td>223</td>
</tr>
<tr>
<td>Continuously operated thickeners, 22:59</td>
<td>224</td>
</tr>
<tr>
<td>Continuously variable transmissions (CVTs), 15:236</td>
<td>225</td>
</tr>
<tr>
<td>Continuous membrane system, 21:638</td>
<td>226</td>
</tr>
<tr>
<td>Continuous microwave reactors (CMR), reactions in, 16:554</td>
<td>227</td>
</tr>
<tr>
<td>Continuous mixers, 16:722</td>
<td>228</td>
</tr>
<tr>
<td>Continuous nitrobenzene process,</td>
<td>229</td>
</tr>
<tr>
<td>Continuous oleum sulfonation processes, 23:543</td>
<td>230</td>
</tr>
<tr>
<td>Continuous panel processes, 20:107</td>
<td>231</td>
</tr>
<tr>
<td>Continuous perfusion cell culture systems, 5:350, 354–355 pros and cons of, 5:351t</td>
<td>232</td>
</tr>
<tr>
<td>Continuous polymerization (CP) process, 19:749, 842</td>
<td>233</td>
</tr>
<tr>
<td>Continuous processing, of organic peroxides, 18:487–488</td>
<td>234</td>
</tr>
<tr>
<td>Continuous process pilot plants,</td>
<td>235</td>
</tr>
<tr>
<td>Continuous reactors, 21:332–333 designs of, 23:544</td>
<td>236</td>
</tr>
<tr>
<td>Continuous reforming operations, 25:166</td>
<td>237</td>
</tr>
<tr>
<td>Continuous salt mining, 22:806</td>
<td>238</td>
</tr>
<tr>
<td>Continuous slab casters, 23:266</td>
<td>240</td>
</tr>
<tr>
<td>Continuous smelting processes, 23:773</td>
<td>241</td>
</tr>
<tr>
<td>Continuous SO$_3$ jet-impact sulfonation process, 23:553</td>
<td>242</td>
</tr>
<tr>
<td>Continuous SO$_3$ processes, alternative, 23:552–553</td>
<td>243</td>
</tr>
</tbody>
</table>
Continuous SO$_3$ single-pass sulfonation processes, 23:543–552, 550
Continuous solution polymerization, reactors used for, 23:394–395
Continuous steel casting, 23:266–270
difficulties of, 23:266–267
universality of, 23:269–270
Continuous sterilization, in fermentation, 11:35–36
Continuous-stirred tank reactor anionic polymerization, 23:385, 394–395, 396
Continuous-stirred-tank-reactor processes, 23:366, 367
defined, 3:759t
operation of, 10:478
Continuous-stirred-tank–reactor system, 11:198–199, 204. See also CSTR reactor system
Continuous vacuum filters, 16:657
Continuous vacuum pans, for raw sugar crystallization, 23:449
Continuous veno-venous hemodiafiltration (CVVHD), 26:832
Continuous veno-venous hemofiltration (CVVH), 26:832
Continuous washing and drying process, 11:259
Continuous web dryers, 9:119–120
Continuous weighing, 26:248
Continuum hypothesis, of flow phenomena, 11:735–736
Continuum modeling, of cake filtration, 11:336
Contour shaping, 9:601, 602
Contract carriers, 25:326
liability of, 25:336
Contraction coupling, human heart, 5:81–83
Contract manufacturers, 19:462
Contractor pumps, 21:78
Contractors, use for routine maintenance, 15:478
Contract research, 24:374–375
Contracts, in technology transfer, 24:373–377
Contrast. See also Differential interference contrast (DIC)
computer-assisted, 16:487
in microscopy, 16:474
techniques for improving, 16:474–487
Contribution analysis, in life cycle assessment, 14:823
Contributory trademark infringement, 25:262
Control chart, 20:700; 21:176
Control clusters, in nuclear reactors, 17:574–577
Control elements, final, 20:684–687
Controlled atmosphere storage (CAS), of food products, 12:77; 21:564–565
Controlled delivery devices, biocompatibility of, 9:56
Controlled depletion polymer antifouling coatings, 7:158
Controlled drug delivery, membrane technology in, 15:847–848
Controlled drug release formulations (CDRFs), 9:51, 55
polymers in, 9:71–73
Controlled drug release systems, 9:50–51
design, 9:51–52
development, 9:55–57
“intelligent,” 9:56–57
in market, 9:83–85
Controlled expansion alloys, 13:520–522
Controlled flavor release systems, 11:528, 543–553, 554–555
characteristics of, 11:544t
demand for, 11:555
developments in, 11:558
elements of, 11:555–557
extrusion encapsulation for, 11:550
key aspects of, 11:556t
morphologies of, 11:545
Controlled free-radical polymerization, block copolymers, 7:646
Controlled humidity drying, ceramics processing, 5:655–656
Controlled indexing, 18:241
Controlled initiation, 14:268–269
Controlled laboratory studies, in environmental chemistry, 18:546
Controlled/living free radical polymerizations (CLRP), 20:442, 461, 483
Controlled radical copolymerization, 7:620–622
“Controlled release,” of dendrimers, 24:53
Controlled release agricultural technology, 7:551–573
formulations, 7:556–570
pesticide formulations, 7:551–553
principles of, 7:553–556
Controlled release drug dosage forms, 18:708–712
Controlled release formulations, 7:551–555
pesticide formulations, 7:551–553
Controlled rheology, 14:275
Controlled stress viscometers, 21:736–737
Controlled structure polymeric betaines, 20:481
Controlled structure poly(methacrylic acid), 20:466–467
Controlled Substances Act of 1970, 3:90
Controlled temperature oven,
gas chromatography, 4:613
Controllers, programmable logic, 20:670–671
Control needs/options, in industrial hygiene, 14:221–222
Control of Substances Hazardous to Health Regulations (COSHH; UK), 14:220
Control rods, nuclear reactor, 17:569
Control room, in plant layout, 19:514–515
Controls, food processing, 12:87–88
Control stations, 20:668
Control strategies, for fermentation, 11:36–40
Control systems
distributed, 20:668–670
gas adsorption, 1:659
sampling techniques for, 26:1045–1047
Control techniques, advanced, 20:695–702
Control tests, in phenolic resin manufacture, 18:779
Control valves
accessories for, 20:686
performance of, 20:684–686
specifying, 20:686
Control variate sampling, 26:1005
Contusion, 3:724
$^{60}$Co nucleus, decay of, 21:301–302
Convection
battery electrolytes, 3:423–424
and mass transfer coefficients, 1:46–47
Convection bank, cleaning, 10:162
Convection–diffusion equations, in size separation, 22:278
Convection dryer, 9:101
Convection drying, 23:106
Convection furnaces, low-temperature, 12:291–292
Convection heat transfer, 13:245–248
correlations for, 13:247–248
Convection heat-transfer analysis,
dimensionless numbers used in,
in fermentation, 11:34
general separation heuristics for, 22:320
grinding fluids for metal working, 1:22–23
during ozone generation, 17:796–797
pilot plant, 18:730
polymer precipitation by, 15:805–806
radiative, 23:25–26
Cooling Agent, 10, 24:525
Cooling agents, physiological, 24:525–526
Cooling crystallizers, 8:134
Cooling heat exchanger, 13:269
Cooling system corrosion, in industrial water treatment, 26:137
Cooling system deposits, in industrial water treatment, 26:138
Cooling systems
in industrial water treatment, 26:137–146
in nuclear power facilities, 17:537–538
Cooling towers, 13:268
in plant layout, 19:514
Cooling water, for fermentation, 11:45
Cooling water chemistry, 23:218
Cooling-water pump pit, 19:514
Cooling water systems, design of, 20:755
Cool on-column injection, 6:383
Cool storage, of food products, 21:563–564
Cooperative arrangement technology
transfer partnership model, 24:390
Cooperative fuels research (CFR) engine, 12:392–393
Cooper pairs, 5:603; 23:803–805
depairing of, 23:822
tunneling of, 23:820–821
Coordinate indexing, in the chemical literature, 18:239
Coordinating Research Council (CRC), 12:393–394
Coordination chemistry, 24:38
self-assembly and, 24:61
Coordination complexes
thorium, 24:763–770
plutonium, 19:694–698
uranium, 25:434–437
Coordination compounds, 7:573–606; 8:84–85
applications, 7:593–602
classification of donors, acceptors, and solvents based on polarizability, 7:587
groups 1 (IA) and 2 (IIA), 7:579–580
hydrides, 7:579
iridium, 19:648–649
ligand classification, 7:575–579
main group metal, 7:580–582
nomenclature, 7:577–579
osmium, 19:641–642
palladium, 19:651
platinum, 19:655–657
properties of, 7:586–593
rare earth metal, 7:584
rhodium, 19:644–645
ruthenium, 19:638–639
theories of coordination, 7:584–586
transition-metal, 7:582–584
Coordination-insertion mechanism, for lactide polymerization, 20:300–301
Coordination networks, crystal engineering, 8:84–85
Coordination nomenclature, 17:392
Coordination numbers
for chelating agents, 5:709–710
for phosphorus compounds, 19:25
Coordination polymers, 7:595
Coordination clathrate hosts, 14:180
CO oxidation reaction, steps in, 10:50.
See also Carbon monoxide (CO)
Copolyamides, random, 19:762–763
Copoly(disulfide)s, as electroactive materials, 23:713–714
Copolyestercarbonates, 19:822
Copolyester elastomers, thermoplastic, 20:70–71
Copolyesterether elastomers, 20:71
mechanical properties of, 20:73–75
Copolymer beads, 14:391
Copolymer blocks
miscibility of, 20:336–337
molecular weight of, 20:336
Copolymer formation, reactive compatibilization through, 20:325–326
Copolymerization. See also Copolymers of acrylonitrile, 11:202–204
anionic, 7:624–626
catalytic, 7:627–632
cationic, 7:626–627
chloroprene–sulfur, 19:833–834
of cyclic olefins, 16:112–113
with depropagation, 7:617–619
free-radical, 7:611–624
heterogeneous, 11:203–204
homogenous, 11:202–203
with metallocene catalysts, 16:111
Copoly(polychloroprene, 19:832–835
with PVC, 25:670, 671t
ring-opening, 7:627
step-growth, 7:632–635
time-temperature profiles in, 14:387
types of reactions, 7:609–611
of VDC, 25:697–699
Copolymerization catalysts, 17:706–707
Copolymerization initiators, 14:252
Copolymerization microstructure, polychloroprene, 19:838
Copolymers, 7:607–669. See also
Copolymerization
alternating, 7:644–645
of amine-containing styrenic monomers, 20:473–474
AMPS-containing, 23:722
block, 7:645–650
classification in terms of monomer sequence distribution, 7:608t
compatibilization efficiency of, 20:335–336
graft, 7:650–654
in high bulk yarns, 11:213
hyperbranched, 7:654–655
IUPAC source-based classification, 7:698t
microstructure control, 7:642–644
nomenclature, 7:609, 610t
nylon, 19:762–763
polycarbonate, 19:821–824
in polymer blends, 20:324–325
of PVA, 25:611
random, 7:635–650
rubber-modified, 23:368–371
star and hyperbranched, 7:654–655
structures, 7:607–609, 608t
vinyl acetate, 25:574–575
vinyl chloride in, 25:651
with vinylidene chloride, 25:691–745
Copoly(p-phenylene/3,4′-diphenyl ether terephthalamide) (ODA/PPTA), 19:713, 714. See also 3,4′-
Diaminodiphenyl ether (3,4′ODA; ODA/PPTA fibers; Poly(p-phenylene terephthalamide) (PPTA)
commercial process for, 19:721–723
wet spinning of, 19:725
Copoly(p-phenylene sulfide sulfone/ ketone)s, 23:710
Copper (Cu), 7:670–720, 767. See also
Copper compounds; Cu- entries;
Cupr- entries; Dinuclear copper complex; Nickel–copper alloys;
Lead–copper alloys; Wrought copper alloys
analytical methods, 7:701–702
L-ascorbic acid and, 25:751
in blast-furnace charges, 14:736
in cast dental gold alloys, 8:307t
catalyst poison, 5:257t
chemical analysis of archaeological materials, 5:747
chemical properties, 7:674t, 677–679
chemical vapor deposition precursor, 5:805t
in coatings, 24:795
in cocoa shell from roasted beans, 6:357t
colloidal precipitation color, 7:343t
color of, 7:334
gluten content in cocoa and chocolate products, 6:371t
corrosion, 7:679
in cotton fiber, 8:20t
daily recommended requirement, 7:776
economic aspects, 7:698–700
effect on stainless steel corrosion resistance, 7:809
elastic properties, 5:614t
electrodeposition of, 9:761
electroless, 9:686
electroplating for dental applications, 8:315–316
electrorefining of, 16:163–164
electrowinning of, 16:161
environmental concerns, 7:702–705
fabrication, 7:690–698
in galvanic series, 7:805t
with gold in dental applications, 8:304–305
hardness compared to ceramics, 5:627t
health and safety factors, 7:708–711
mechanical properties of, 7:678t
occurrence, 7:671–672
in pet foods, 10:851
in pewter, 24:798
physical properties, 7:673–677, 674t, 750t
pickling, 16:223
polymer autoxidation catalysis, 3:104
production growth compared to aluminum and other metals, 2:301t
reactions with PVA, 25:603
reaction with VDC, 25:694
recovery and processing, 7:681–690
recycling and waste disposal, 7:705–708
reduction, 16:144–145
refining, 16:149, 150
removal from slimes, 24:409
resistivity effects of addition of wide variety of solutes, 7:676t
role in superconductors, 22:712
selenium and metallurgy of, 22:98
with selenium in pigments, 22:102
silicone chemistry and, 22:549
solution color of ions in glass, 7:343t
sources and supplies, 7:679–680
specifications, standards, and quality control, 7:700–701
standard electrode potential, 7:799t
therapeutic for aquaculture in U.S., 3:205t
thermal degradation of catalysts, 5:272
uses, 7:711–716
in wastewater, 9:446
water exchange rates and activation parameters of hexaaqua complexes, 7:589t
in zinc die-casting alloys, 26:587
Copper(II)
concentration formation constant of chelates, 5:717t
piezochromic organometallic complexes, 6:611–612
Copper(I) acetate, molecular formula and uses, 7:777t
Copper(II) acetate
molecular formula and uses, 7:777t
molecular formula and uses of basic, 7:777t
Copper(II) acetate monohydrate, molecular formula and uses, 7:777t
Copper acetylides, 1:179–180
Copper alloys. See also Wrought copper alloys
1/2 hard, 7:723t
1/2 hard/relief annealed, 7:723t
1/4 hard, 7:723t
3/4 hard, 7:723t
corrosion of, 7:810–811
environmentally induced cracking, 7:812
preparing for electroless deposition, 9:718
selenium and metallurgy of, 22:98
tellurium in, 24:425–426
Copper alloy UNS C10100, 7:675
Copper alloy UNS C10200, 7:675
Copper alloy UNS C11000, 7:675
Copper alloy UNS C26000, 7:675
Copper alloy UNS C36000, 7:675
Copper alloy UNS C37700, 7:675
Copper–aluminum–nickel shape-memory alloy, 22:712
Copper anodes, 9:777
Copper(II) arsenate, molecular formula and uses, 7:777t
Copper–arsenic alloys, 3:271–272
Copperas, 25:63
Copper–barium–yttrium superconductors, silver in, 22:659
Copper-based composites, applications for, 16:192
Copper-based metal alloys, 17:847t
Copper-based shape-memory alloys, 22:341–342
Copper–beryllium alloys, 3:652–656
Copper borates, 4:282
Copper(I) bromide, molecular formula and uses, 7:777t
Copper(II) bromide, molecular formula and uses, 7:777t
Copper(II) bromide, molecular formula and uses, 7:777t
Copper(I) chloride, 7:768–769
molecular formula and uses, 7:777t
Copper(II) chloride, 7:769
addition in ruby glass manufacture, 7:344
molecular formula and uses, 7:777t
Copper(II) chloride dihydrate, molecular formula and uses, 7:777t
Copper(II) chloride hydroxide, molecular formula and uses, 7:777t
Copper(II) chromate(III), molecular formula and uses, 7:777t
Copper(II) chromate(VI), molecular formula and uses, 7:777t
Copper Chromate Black, pigment for plastics, 7:369t
Copper chromite, molecular formula, properties, and uses, 6:563t
Copper chromite black spinel, formula and DCMA number, 7:348t
Copper citrate, molecular formula, 6:638t
Copper compounds, 7:767–783
analytical methods, 7:773–776
economic aspects, 7:773–776
health and safety factors, 7:776
properties and manufacture, 7:768–773
uses, 7:776–780
Copper-containing alloys, pickling, 16:223
Copper-containing lead alloys, 14:776
Copper(I) cyanide, molecular formula and uses, 7:777t
Copper deposits, electroless, 9:708
Copper Development Association, 15:765
Copper dichromate, molecular formula, properties, and uses, 6:561t
Copper(II) diphosphate hydrate, molecular formula and uses, 7:778t
Copper drossing, 14:745–747
Copper electrodes, 3:430
Copper(II) fluoborate, molecular formula and uses, 7:777t
Copper fluoroborate hexahydrate, 4:157t, 158, 159
Copper(II) fluoride, molecular formula and uses, 7:777t
Copper(II) fluoride dihydrate, 7:769
Copper(II) formate, molecular formula and uses, 7:777t
Copper(II) gluconate, molecular formula and uses, 7:777t
Copper hydroxide, 13:41t, 48
Copper(II) hydroxide, 7:769–770
molecular formula and uses, 7:777t
Copper hydroxyfluoride, 7:769
Copper hydroxypropyridmethione, biocide for antifouling coatings, 7:156
Copper indium diselenide (CIS) thin film PV technology, 23:43
Copper indium gallium diselenide (CIGS) thin film PV technology, 23:43–44
Copper industry, silicon consumption by, 22:508
Copper(II) ion, 7:767
Copper ions, in swimming pools, 22:681
Copper(II) iodide, molecular formula and uses, 7:777t
Copper–lead–tellurium alloys, 24:426
Copper metallization, electroless, 9:696–697
Copper–molybdenum antagonism, 17:31–32
Copper naphthenate, 20:108, 109
Copper(II) naphthenate, molecular formula and uses, 7:778t
Copper–nickel, 7:758–759
Copper–nickel, 10%, mechanical properties, 7:678t
Copper–nickel, 30%, mechanical properties, 7:678t
Copper–nickel, 70–30, in galvanic series, 7:805t
Copper–nickel, 80–20, in galvanic series, 7:805t
Copper–nickel, 90–10, in galvanic series, 7:805t
Copper–nickel alloys, 17:100
Copper–nickel–tin alloys, effect of alloying on mechanical properties, 7:677
Copper(II) nitrate, molecular formula and uses, 7:778t
Copper(II) nitrate hexahydrate, 7:770
Copper nitrates, 7:770
Copper nitrate trihydrate, 7:770
Copper(II) nitrate trihydrate, molecular formula and uses, 7:778t
Copper(II) oleate, molecular formula and uses, 7:778t
Copper Omadine, biocide for antifouling coatings, 7:156
Copper(II) oxalate, molecular formula and uses, 7:778t
Copper(I) oxide, 7:771–772
molecular formula and uses, 7:778t
semiconducting ceramic, 5:599–600
Copper(II) oxide, 7:771–772
molecular formula and uses, 7:778t
Copper oxides, 7:771–772
Copper(II) oxychloride, 7:769
Copper perchlorates, 18:277
Copper(II) phosphate trihydrate, molecular formula and uses, 7:778t
Copper phosphides, 19:59
Copper Phthalocyanine (CPC) Blue, 19:439–441
Copper phthalocyanine dyes, 9:261
Copper Phthalocyanine (CPC) Green, 19:441
Copper phthalocyanines, 19:424, 427, 438–441
Copper plating, 9:764, 766, 804–807
Copper pollutants, 9:443–444
Copper pyrophosphate deposition, 9:809
Copper recovery with cuprammonium rayon manufacture, 11:265 via liquid–liquid extraction, 10:791
Copper recycling economic aspects of, 21:404 pyrometallurgical, 21:392–394
Copper refinery slimes, selenium recovery from, 22:78–79, 80, 81, 82, 83–85
Coppers, 7:751 nominal composition and UNS designation, 7:722t UNS designation, 7:721t
Copper smelting, early, 16:133
Copper sodium chromate, molecular formula, properties, and uses, 6:561t
Copper(II) stearate, molecular formula and uses, 7:778t
Copper strike solutions, 9:806
Copper sulfate, 26:569 applications, 7:779 herbicide/algicide for aquaculture in U.S., 3:215t oxidations with, 16:569–570 promising new uses for aquaculture, 3:223
Copper(II) sulfate, molecular formula and uses, 7:778t
Copper(II) sulfate monohydrate, 7:772–773
Copper(II) sulfate pentahydrate, 7:772–773 molecular formula and uses, 7:778t
Copper(II) sulfate, molecular formula and uses of tribasic, 7:778t
Copper(II) sulfates, 7:772–773
Copper(I) sulfide, molecular formula and uses, 7:778t
Copper(II) sulfide, molecular formula and uses, 7:778t
Copper table, in silicon casting, 22:507
Copper telluride, 24:409
Copper(I) thiocyanate, molecular formula and uses, 7:778t
Copper–tin alloys, 24:796
Copper plating, 9:810–811
Copper wrought alloy C101, 7:749, 750 elemental composition, 7:722t
Copper wrought alloy C102, 7:750, 751, 761
Copper wrought alloy C107, elemental composition, 7:722t
Copper wrought alloy C110, 7:723, 750, 751 annealed tensile properties, 7:726t annealing response of cold rolled, 7:728 cold rolling behavior, 7:726 deoxidized, 7:730 electrical conductivity and strength, 7:732t elemental composition, 7:722t machinability rating, 7:748t properties, 7:731t stress corrosion susceptibility and dealloying, 7:743t
Copper wrought alloy C115, 7:750
Copper wrought alloy C120, 7:750
Copper wrought alloy C122, 7:730, 751, 761 elemental composition, 7:722t
Copper wrought alloy C129, 7:750
Copper wrought alloy C142, 7:751
Copper wrought alloy C143, 7:752
Copper wrought alloy C145, 7:730, 751 machinability rating, 7:748t
Copper wrought alloy C147, 7:730, 751 machinability rating, 7:748t
Copper wrought alloy C150, 7:752 elemental composition, 7:722t
Copper wrought alloy C151, 7:752 applications, 7:763 elemental composition, 7:722t hydrogen embrittlement resistant, 7:744 properties, 7:731t
Copper wrought alloy C155, 7:752 elemental composition, 7:722t
Copper wrought alloy C157, 7:750
Copper wrought alloy C162, 7:752–753, 753
Copper wrought alloy C171, dispersed phase alloy, 7:729
Copper wrought alloy C172 conductivity and yield strength, 7:760t elemental composition, 7:722t fatigue strength, 7:742t hydrogen embrittlement resistant, 7:744 machinability rating, 7:748t properties, 7:731t stress relaxation resistance, 7:740
Copper wrought alloy C180, properties of precipitation-hardened, 7:762t
Copper wrought alloy C181, conductivity and age-hardened tensile properties, 7:761t
Copper wrought alloy C182 applications, 7:763 conductivity and age-hardened tensile properties, 7:761t conductivity and hard temper tensile properties, 7:752t electrical conductivity and strength, 7:732t elemental composition, 7:722t properties, 7:731t strength, 7:730
Copper wrought alloy C187, 7:752 machinability rating, 7:748t
Copper wrought alloy C190, 7:752 elemental composition, 7:722t
Copper wrought alloy C194, 7:752, 753 applications, 7:763 dispersed phase alloy, 7:729 elemental composition, 7:722t fatigue strength, 7:742t hydrogen embrittlement resistant, 7:744 properties, 7:731t stress corrosion susceptibility and dealloying, 7:743t
Copper wrought alloy C197 elemental composition, 7:722t hydrogen embrittlement resistant, 7:744
Copper wrought alloy C199, 7:752
Copper wrought alloy C205, 7:753
Copper wrought alloy C210 conductivity and hard temper tensile properties, 7:752t electrical conductivity and strength, 7:732t
Copper wrought alloy C220 annealed tensile properties, 7:726t conductivity and hard temper tensile properties, 7:752t conductivity and wrought tensile strength, 7:754t
Copper wrought alloy C230 conductivity and hard temper tensile properties, 7:752t electrical conductivity and strength, 7:732t
Copper wrought alloy C240, conductivity and hard temper tensile properties, 7:752t
Copper wrought alloy C240, conductivity and hard temper tensile properties, 7:752t
Copper wrought alloy C280, 7:753
Copper wrought alloy C312, 7:753
Copper wrought alloy C353 conductivity and hard temper tensile properties, 7:752t machinability rating, 7:748t
Copper wrought alloy C360, 7:730, 748 brazeability, 7:746 conductivity and hard temper tensile properties, 7:752t elemental composition, 7:722t machinability rating, 7:748t properties, 7:731t
Copper wrought alloy C385, 7:753
Copper wrought alloy C411, 7:754 conductivity and wrought tensile strength, 7:754t
Copper wrought alloy C422, 7:754 stress corrosion susceptibility and dealloying, 7:743t
Copper wrought alloy C425, 7:754 annealed tensile properties, 7:726t conductivity and wrought tensile strength, 7:754t elemental composition, 7:722t
Copper wrought alloy C425, 7:754 annealed tensile properties, 7:752t stress corrosion susceptibility and dealloying, 7:743t
Copper wrought alloy C425, 7:754 annealed tensile properties, 7:726t conductivity and wrought tensile strength, 7:754t elemental composition, 7:722t

COPPER WROUGHT ALLOY C425 221

softening resistance, effect of prior cold work on, 7:739 stress corrosion susceptibility and dealloying, 7:743t
Copper wrought alloy C240, conductivity and hard temper tensile properties, 7:752t
Copper wrought alloy C280, 7:753
Copper wrought alloy C312, 7:753
Copper wrought alloy C353 conductivity and hard temper tensile properties, 7:752t machinability rating, 7:748t
Copper wrought alloy C360, 7:730, 748 brazeability, 7:746 conductivity and hard temper tensile properties, 7:752t elemental composition, 7:722t machinability rating, 7:748t properties, 7:731t
Copper wrought alloy C385, 7:753
Copper wrought alloy C411, 7:754 conductivity and wrought tensile strength, 7:754t
Copper wrought alloy C422, 7:754 stress corrosion susceptibility and dealloying, 7:743t
Copper wrought alloy C425, 7:754 annealed tensile properties, 7:726t conductivity and wrought tensile strength, 7:754t elemental composition, 7:722t
Copper wrought alloy C425, 7:754 annealed tensile properties, 7:726t stress corrosion susceptibility and dealloying, 7:743t
Copper wrought alloy C425, 7:754 annealed tensile properties, 7:726t conductivity and wrought tensile strength, 7:754t elemental composition, 7:722t

COPPER WROUGHT ALLOY C425 221

softening resistance, effect of prior cold work on, 7:739 stress corrosion susceptibility and dealloying, 7:743t
Copper wrought alloy C240, conductivity and hard temper tensile properties, 7:752t
Copper wrought alloy C280, 7:753
Copper wrought alloy C312, 7:753
Copper wrought alloy C353 conductivity and hard temper tensile properties, 7:752t machinability rating, 7:748t
Copper wrought alloy C360, 7:730, 748 brazeability, 7:746 conductivity and hard temper tensile properties, 7:752t elemental composition, 7:722t machinability rating, 7:748t properties, 7:731t
Copper wrought alloy C385, 7:753
Copper wrought alloy C411, 7:754 conductivity and wrought tensile strength, 7:754t
Copper wrought alloy C422, 7:754 stress corrosion susceptibility and dealloying, 7:743t
Copper wrought alloy C425, 7:754 annealed tensile properties, 7:726t conductivity and wrought tensile strength, 7:754t elemental composition, 7:722t

machinability rating, 7:748t
properties, 7:731t
stress corrosion susceptibility
and dealloying, 7:743t
Copper wrought alloy C443, 7:754
cconductivity and wrought tensile
strength, 7:754t
machinability rating, 7:748t
Copper wrought alloy C444, 7:754
Copper wrought alloy C445, 7:754
Copper wrought alloy C485, 7:754
Copper wrought alloy C505
conductivity and wrought tensile
strength, 7:755t
electrical conductivity and strength,
7:732t
Copper wrought alloy C510, 7:761
annealed tensile properties, 7:726t
annealing response of cold rolled, 7:728
applications, 7:763
bending, 7:734
conductivity and wrought tensile
strength, 7:755t
electrical conductivity and strength,
7:732t
elemental composition, 7:722t
fatigue resistance, 7:741
fatigue strength, 7:742t
hydrogen embrittlement resistant, 7:744
machinability rating, 7:748t
properties, 7:731t
stress corrosion susceptibility
and dealloying, 7:743t
Copper wrought alloy C511, conductivity
and wrought tensile strength, 7:755t
Copper wrought alloy C521
annealed tensile properties, 7:726t
cold rolling behavior, 7:726
cconductivity and wrought tensile
strength, 7:755t
electrical conductivity and strength,
7:732t
stress corrosion susceptibility
and dealloying, 7:743t
Copper wrought alloy C524, conductivity
and wrought tensile strength, 7:755t
Copper wrought alloy C544, 7:755
conductivity and wrought tensile
strength, 7:755t
machinability rating, 7:748t
Copper wrought alloy C606, 7:755, 7:56
Copper wrought alloy C614, conductivity
and hard temper tensile properties,
7:756t
Copper wrought alloy C615, conductivity
and hard temper tensile properties,
7:756t
Copper wrought alloy C625, conductivity
and hard temper tensile properties,
7:756t
Copper wrought alloy C630, conductivity
and hard temper tensile properties,
7:756t
Copper wrought alloy C636, 7:756
Copper wrought alloy C638
elemental composition, 7:722t
properties, 7:731t
Copper wrought alloy C644, 7:755
Copper wrought alloy C651
conductivity and hard temper tensile
properties, 7:757t
elemental composition, 7:722t
Copper wrought alloy C654
conductivity and hard temper tensile
properties, 7:757t
elemental composition, 7:722t
Copper wrought alloy C655
conductivity and hard temper tensile
strength, 7:757t
Copper wrought alloy C664, 7:757
conductivity and wrought tensile
strength, 7:757t
Copper wrought alloy C674, 7:758
conductivity and wrought tensile
strength, 7:757t
Copper wrought alloy C687, conductivity
and wrought tensile strength, 7:757t
Copper wrought alloy C688, 7:757
conductivity and wrought tensile
strength, 7:757t
elemental composition, 7:722t
hydrogen embrittlement resistant, 7:744
properties, 7:731t
stress corrosion susceptibility
and dealloying, 7:743t
Copper wrought alloy C690, 7:757
conductivity and wrought tensile
strength, 7:757t
Copper wrought alloy C694, 7:758
conductivity and wrought tensile
strength, 7:757t
Copper wrought alloy C704, conductivity and hard temper tensile properties, 7:758t
Copper wrought alloy C706, conductivity and hard temper tensile properties, 7:726t
annealing response of cold rolled, 7:728t
applications, 7:763
conductivity and hard temper tensile properties, 7:758t
electrical conductivity and strength, 7:732t
elemental composition, 7:722t
machinability rating, 7:748t
properties, 7:731t
stress corrosion susceptibility and dealloying, 7:743t
Copper wrought alloy C710, conductivity and hard temper tensile properties, 7:758t
Copper wrought alloy C715, applications, 7:763
conductivity and hard temper tensile properties, 7:758t
electrical conductivity and strength, 7:732t
elemental composition, 7:722t
machinability rating, 7:748t
properties, 7:731t
stress corrosion susceptibility and dealloying, 7:743t
Copper wrought alloy C722, conductivity and hard temper tensile properties, 7:758t
Copper wrought alloy C725 bending, 7:734
conductivity and hard temper tensile properties, 7:758t
elemental composition, 7:722t
properties, 7:731t
Copper wrought alloy C727, 7:761
Copper wrought alloy C729, conductivity and hard temper tensile properties, 7:722t
properties, 7:731t
properties of precipitation-hardened, 7:762t
Copper wrought alloy C745, conductivity and hard temper tensile properties, 7:759t
Copper wrought alloy C752, annealed tensile properties, 7:726t
conductivity and hard temper tensile properties, 7:759t
elemental composition, 7:722t
machinability rating, 7:748t
properties, 7:731t
Copper wrought alloy C754, conductivity and hard temper tensile properties, 7:759t
Copper wrought alloy C757, conductivity and hard temper tensile properties, 7:759t
Copper wrought alloy C762, fatigue strength, 7:742t
Copper wrought alloy C770 conductivity and hard temper tensile properties, 7:759t
stress corrosion susceptibility and dealloying, 7:743t
Copper wrought alloy C782, conductivity and yield strength, 7:760t
electrical conductivity and strength, 7:732t
elemental composition, 7:722t
properties, 7:731t
Copper wrought alloy C7265, properties of precipitation-hardened, 7:762t
strength, 7:730
stress relaxation resistance, 7:740, 741
Copper wrought alloy C7410, dispersed phase alloy, 7:722t
properties of precipitation-hardened, 7:762t
Copper wrought alloy C7540, arc welding, 7:747
brazeability, 7:746
mechanical properties, 7:678t
Copper wrought alloy C11000, mechanical properties, 7:678t
Copper wrought alloy C12200, mechanical properties, 7:678t
Copper wrought alloy C14300, tensile properties of dilute, 7:751t
Copper wrought alloy C14500, mechanical properties, 7:678t
tensile properties of dilute, 7:751t
Copper wrought alloy C14700, tensile properties of dilute, 7:751t
Copper wrought alloy C15000, tensile properties of dilute, 7:751t
Copper wrought alloy C15100, tensile properties of dilute, 7:751t
Copper wrought alloy C15500, tensile properties of dilute, 7:751t
Copper wrought alloy C15720 dispersed phase alloy, 7:729
mechanical properties, 7:678t
tensile properties of dilute, 7:751t
Copper wrought alloy C16200, conductivity and hard temper tensile properties, 7:752t
Copper wrought alloy C17200, mechanical properties, 7:678t
Copper wrought alloy C17410, 7:761 conductivity and yield strength, 7:760t elemental composition, 7:722t
Copper wrought alloy C17460 applications, 7:763 conductivity and yield strength, 7:760t elemental composition, 7:722t
Copper wrought alloy C18080 applications, 7:763 conductivity and age-hardened tensile properties, 7:761t
Copper wrought alloy C18135, conductivity and age-hardened tensile properties, 7:761t
Copper wrought alloy C18200, mechanical properties, 7:678t
Copper wrought alloy C19000, conductivity and hard temper tensile properties, 7:752t
Copper wrought alloy C19010, 7:761 properties of precipitation-hardened, 7:762t
Copper wrought alloy C19200, conductivity and hard temper tensile properties, 7:752t
Copper wrought alloy C19400, conductivity and hard temper tensile properties, 7:752t
Copper wrought alloy C19500 conductivity and hard temper tensile properties, 7:752t mechanical properties, 7:678t
Copper wrought alloy C19700, conductivity and hard temper tensile properties, 7:752t
Copper wrought alloy C26000, mechanical properties, 7:678t
Copper wrought alloy C28000, mechanical properties, 7:678t
Copper wrought alloy C36000, mechanical properties, 7:768t
Copper wrought alloy C37700, mechanical properties, 7:678t
Copper wrought alloy C50500, mechanical properties, 7:768t
Copper wrought alloy C51000, mechanical properties, 7:768t
Copper wrought alloy C54400, mechanical properties, 7:678t
Copper wrought alloy C61300, mechanical properties, 7:768t
Copper wrought alloy C61800, mechanical properties, 7:678t
Copper wrought alloy C63000, mechanical properties, 7:678t
Copper wrought alloy C65500, mechanical properties, 7:768t
Copper wrought alloy C70600, mechanical properties, 7:678t
Copper wrought alloy C71500, mechanical properties, 7:678t
Copper wrought alloys, 7:720-764
Copper wrought alloys C10100–C13000, tensile properties, 7:750t
Copper wrought alloys C10100–C15999, principal alloy elements, 7:721t
Copper wrought alloys C16000–C19999, principal alloy elements, 7:721t
Copper wrought alloys C20500–C28580, principal alloy elements, 7:721t
Copper wrought alloys C31200–C38590, principal alloy elements, 7:721t
Copper wrought alloys C40400–C486, principal alloy elements, 7:721t
Copper wrought alloys C50100–C52400, principal alloy elements, 7:721t
Copper wrought alloys C53200–C54800, principal alloy elements, 7:721t
Copper wrought alloys C55180–C55284, principal alloy elements, 7:721t
Copper wrought alloys C60600–C64400, principal alloy elements, 7:721t
Copper wrought alloys C64700–C66100, principal alloy elements, 7:721t
Copper wrought alloys C662–C69950, principal alloy elements, 7:721t
Copper wrought alloys C70100–C72950, principal alloy elements, 7:721t
Copper wrought alloys C73150–C77600, principal alloy elements, 7:721t
Copper wrought alloys C78200–C79900, principal alloy elements, 7:721t
Copper–zinc alloy plating, 9:809–810
Copper–zinc–aluminum shape-memory alloy, 22:712
Copper–zinc brasses, 7:753
modified, 7:757–758
Coprecipitation, 14:196
Coproduction
coal gasification applications, 6:823–824
defined, 6:827
Copycolor materials, 19:322
Copy paper, carbonless, 18:784–785
Copyrightability, 7:785–787
Copyright Act of 1976, 7:784
Copyright deposit, 7:790
Copyright infringement, 7:793–794
Copyright notice, 7:790
Copyright Office, 7:790
Copyright registration, 7:790
Copyrights, 7:783–795
duration, 7:791
formalities, 7:790–791
international, 7:794–795
limitations, 7:793
moral rights, 7:792
ownership, 7:787–788
rights inherent in, 7:792
in technology transfer, 24:377–378
transfers and licenses, 7:788–791
versus trademarks and patents, 25:254
Coral reefs, bioremediation
of hydrocarbons, 3:765
Corals, deposits of, 17:687–688
Corannulene, 21:146
Corchorus capsularis, 11:293
Corchorus olitorius, 11:293
Cordage fibers, 11:295
Cordan, molecular formula and structure, 5:119t
Cordarex, molecular formula and structure, 5:95t
Cordarone, molecular formula and structure, 5:95t
Cordierite, automotive exhaust catalyst support, 2:399
Cordierite glass, matrix for ceramic–matrix composites, 5:553t
Cordierite glass-ceramics, 12:639–640
Cordilox, molecular formula and structure, 5:97t, 119t
Cordis-Dow hemodialyzer, 16:14
Cordium, molecular formula and structure, 5:97t, 118t
Cord making, 11:287
Coreactants, in microencapsulation, 16:444
Coreactive curing agents, 10:388–389,
392–411, 418. See also Curing agents amine functional, 10:392–401
carboxylic functional polyester and anhydride, 10:401–406
cyanate ester, 10:411
cyclic amidine, 10:410
isocyanate, 10:410
melamine–, urea–, and phenol–formaldehyde resins,
10:408–409
mercaptans, 10:409–410
phenolic-terminated, 10:406
Core competence, 21:625
Core cross-linked nanoassemblies, 20:490
Core damage frequency (CDF), for nuclear power facilities, 17:540
Coreless induction furnaces, 12:309–311
Core level electron energy loss spectroscopy (CEELS), 24:74
Coremans, Paul, 11:398
Core-shell model, 14:464
Core-shell particles, in polymer blends, 20:354–355
Coretal, molecular formula and structure, 5:156t
Core technologies, 21:625–626, 629
Core tissues, in flax fiber, 11:597–598
Corex process, 14:520–521
Corey–Pauling–Kolton (CPK) surfaces, 16:732
Corgard, molecular formula and structure, 5:93t
Coriander seed, 23:166
Coriandro1, 24:500
Coridil, molecular formula and structure, 5:181t
CORINA, 6:10
Coriolis, 20:681
Coriolis-type flowmeters, 11:671–673
Cork processing, enzymatic steps in, 10:307
Cork taint, in wine, 26:320
Corn, 26:286–289
as animal feed, 26:287
fermentation of, 10:534
wet milling of, 26:287–288
Corning Glass, silicone industry and, 22:547
Corn kernels, citric acid in, 6:632
Corn oil, 26:289
in defoamer formulations, 8:237–238
surface tension, 8:244
Corn Refiners Association (CRA), 23:471
Corn starch, 4:718, 724; 26:288–289
powder used in cosmetics, 7:849–850
Corn-starch-based sweeteners, 26:288–289
Corn stover, as biomass, 3:684
Corn sweetener, industry ion-exchange resin in, 14:418
Coronands, 16:773
Coronary arterial thrombosis, 5:170
Coronary artery bypass graft, 3:712, 714
Coronary artery disease, 5:79, 107–109
and LDL/HDL, 5:136
Coronary heart disease (CHD), 5:107;
17:662–663
and obesity, 3:87
causes, 5:109
and LDL/HDL, 5:136–137
Coronary vasodilators, nitrates, 5:109,
111t, 119t, 120t
Coronates, 14:160–161
Coronaviruses, 3:138
Corotrope, molecular formula and structure, 5:181
Corpogelinite, 6:707
Corporate average fuel economy (CAFÉ) standards, 10:30
Corporate culture, quality improvement and, 21:179
Corporate decision making, examples of, 24:386–387
Corporate decision-making models, role in facilitating research partnerships, 24:385–386
Corporate management, role in facilitating research partnerships, 24:384–385
Corporate pollution prevention programs, 9:456–457
Corporate technology transfer organization, 24:359
Corporations
access to scientists and engineers, 24:355
barriers to collaboration with, 24:368, 372
role in facilitating research partnerships, 24:384–391
Corrective maintenance (CM), 15:465
for reliability, 26:992
Correlation diagram, 21:178
Correlation flowmeters, 11:178
Correlations
in bubble columns, 15:701–702t
in gas–liquid–solid fluidized bed reactors, 15:710–711
for liquid-phase mass transfer coefficients, 15:693
solid–liquid mass transfer, 15:716
Corrosion, 7:796–819; 9:25; 10:2. See also Anticorrosion pigments; Corrosion control; Metal corrosion alloy composition and metallurgical factors, 7:808–811
aluminum alloys, 2:336–338
as a cause of tank spills and leaks, 24:306
citric acid, 6:638–639
cooling system, 26:137
degradation of art via, 11:416–418
in distillation, 8:779–780
electrochemical nature equilibrium diagrams, 7:800–801
electrochemical nature of, 7:796
 electroplating and, 9:789–790
environmental effects, 7:806–808
environmentally induced cracking, 7:811–814
as failure mechanism, 26:983–984
galvanic corrosion and cathodic protection, 7:804–806
in industrial water treatment, 26:125–129
iron, 14:522
kinetics of electrochemical reactions, 7:801–804
of magnesium and magnesium alloys, 15:369–375
manifestations, 7:796–798
origin, 7:798–800
piping system, 19:479, 489–490
prevention of, 10:545
from resin degradation, 18:336
in steam, 23:242–244
of tantalum, 24:330
of vitreous silica, 22:418t
Corrosion behavior
mechanisms in, 14:451
of plutonium metal, 19:685
Corrosion control
anthropogenic silicas and silicates in, 22:471
coatings for, 7:92–95, 816–818
dessicant applications, 8:356t
in industrial water treatment, 26:141–142
organic coatings for, 7:167–192
use of gold in, 12:703
Corrosion fatigue, 13:494
Corrosion fatigue cracking, 7:812
Corrosion inhibition, sodium nitrite in, 22:859
Corrosion inhibitors, 7:814–816
alkanolamines from olefin oxides and ammonia, 2:136
amine oxides, 2:473
chromium application, 6:523
cycloaliphatic amines, 2:511
in diesel fuel, 12:427
fatty amines, 2:533, 534
in finish removers, 18:79, 80
in gasoline, 12:407–408
in industrial water treatment, 26:144–146
for lubricating oil and grease, 15:222
quinolines as, 21:194
sodium benzoate applications, 3:633–634
thiosalicylic acid as, 22:25
Corrosion protection, 9:691, 693, 709–710
lead–tin alloy, 14:778–779
of steel, 9:831
Corrosion rates, of metals in steam, 23:243t
Corrosion reactions, 21:845
Corrosion resistance, 9:710; 10:441
of copper wrought alloys, 7:742–744
of lead–calcium alloys, 14:774
of materials used with fluorine, 11:839
of platinum-group metals, 19:600, 601t
of silver, 22:639
of titanium alloys, 24:840, 841–845
of zirconium, 26:626–627
Corrosion-resistant coatings, 10:443
Corrosion resistant fiber-reinforced plastic (FRP), 12:273–274
Corrosion-resistant Ni-base alloys, 13:513–515
Corrosion resistant paints
chromium pigments, 6:556–557
conducting polymer applications, 7:538
product design consideration, 5:778–779
Corrosion tests, accelerated, 16:218
Corrosive applications, pumps for, 21:76–78
Corrosive components, coal, 6:782
Corrosive impurity concentration, from steam, 23:244
Corrosive liquids, plastic pumps for, 21:76
Corrosive material, as a hazard class, 25:340
Corrosive specialty gases, 13:462–463
Corrosive wear, 15:206
Corrosivity
of hydrogen sulfide, 23:635–636
of seawater, 26:71–72
of sulfur dioxide, 23:662–663
Corrugated boxes, 18:14. See also Corrugated paperboard boxes
Corrugated paperboard boxes, converting, 18:16–20. See also Corrugated boxes
Corrugated paperboard
chemical treatments applied to, 18:18–19
surface coatings and pulp slurry additives for, 18:19
Corrugated plate interceptor (CPI), in hazardous waste management, 25:818
Corrugated surface reactor, 23:553
Corrugating medium paperboard, 18:130
Corrugator adhesive, water-resistant, 18:18
Corrugator bonding, 18:17–18
Corterra, 20:68
Cortexes, in wool fibers, 11:173
Cortisone, production of, 11:10
Corundum, 1:1; 2:345t
color, 7:328
conversion of aluminum hydroxides to, 2:428
as diamondlike carbide, 4:654
hardness in various scales, 1:3t
Corundum–hematite, colorants for ceramics, 7:347t
Corvert, molecular formula and structure, 5:96t
Cosme
dtic products

Corynebacterium glutamicum,
fermentation products from,
11:2–3, 10
Corzide, molecular formula and structure,
5:93t, 161t
Cosmetic applications, lactic acid in, 14:125
Cosmetic emulsions, 10:129
Cosmetic formulations, interaction with
skin, 24:158
Cosmetic manufacturing, magnesium
carbonate in, 15:391
Cosmetic packaging, 18:24–30
design of, 18:24–25
FDA role in, 18:26–27
product tampering and, 18:25–26
tamper-evident features of, 18:27–28
Cosmetic products
ethyl alcohol in, 10:548–549
organic esters in, 10:518–519
Cosmetics, 7:820–865
alkanolamines from olefin oxides and
ammonia, 2:136–137
astringents, 7:847–848
chromium application, 6:523
citric acid application, 6:648
cleansing preparations, 7:849–851
CMC applications, 5:452t
decorative, 7:860–862
detergent alcohols for, 2:20–21
economic aspects, 7:821–822
emulsification, 7:837–841
FDA regulation of, 21:579–580
foams in, 12:24
hair products, 7:854–860
HEC applications, 5:454t
ingredients, 7:824–837, 829–836t
kaolin application, 6:688t, 696
methylcellulose applications, 5:459t
microcapsules in, 16:459
nail care products, 7:852–854
powder blending, 7:840–841
product requirements, 7:824–827
regulation, 7:822–824
shaving products, 7:851–852
silk in, 22:634
skin preparation products, 7:841–847
smectites application, 6:697t
surfactants in, 24:158–159
U.S. citric acid/citrate distribution,
6:643t
vanillin in, 25:553–554
Cosmid vectors, 12:507
COSMO-RS, model, 8:815
Cosolutes, effect on critical micelle
concentration, 24:122
Cosolvents, in finish removers, 18:78, 79
COSORB process, 5:18–19
Cossee-Arlmar mechanism, 16:97
Cossee monometallic mechanism, of
Ziegler-Natta polymerization,
26:510–511
Cost(s). See also Economics; Prices/pricing;
Investment costs; Manufacturing
costs; Total cost assessment (TCA)
of barley and malt, 15:534
electric furnace, 12:313–314
electricity, 12:533
of engineering thermoplastics,
10:222–223
enzyme production, 10:270
of ethylene, 18:563
of fluorine production, 11:843
gold production, 12:695–696
of Grignard reagents, 12:829t
heat exchanger, 13:192–196, 218–219,
259
herbicide development, 13:285
hidden, 12:814
of hydrogen fluoride production, 14:14
incineration, 13:172–173
of magnesium hydroxide, 15:406
of market research, 15:636
organic electrochemical processing,
9:671–674
in selecting membrane modules, 15:821,
823t
of size separation, 22:295–296
weed control agent, 13:328
COST 847 project, 11:617
Costabilizers, for PVC polymers,
25:672
Cost–benefit analyses, 24:189
for immunizations, 25:506–507
Cost correlations, 9:526
See also Economic aspects
Cost indexes, 9:526–527
Cost of acquisition (COA), 15:471
Cost of haulage, of limestone, 15:37
Cost of ownership (COO), 15:471
Cost ratio construction cost estimation,
19:464–465
Counterion exchange, in sulfonic acids, 23:534
Counterions
micelle-associated, 24:123–124
in soap–water system, 22:727
Counting scales, 26:244, 252
Coupled transport, 15:826
Coupler-developers, 19:295
Coupler types, in chromogenic chemistry, 19:248–249
Coupling
of fillers, 11:304–305
polymer chain termination by, 20:221
commercial silane, 22:698, 699t, 701–703
for polymer composites, 25:129–130
Coupling mechanisms, in chromogenic chemistry, 19:249–252
Coupling reactions, 9:354, 357
acid, 9:358–359
alkaline, 9:358
azo, 9:352–359
ionic liquids in, 26:889–892
palladium-catalyzed, 19:653
as release mechanisms, 19:293
Couplings, for pumps, 21:79–80
Coupling step, in affinity chromatography, 6:396
Coupling sugar, 23:480
Courtaulds lyocell process, 11:266–267, 267–269. See also Samuel Courtauld & Co., Ltd.
Covalent bonding, adhesion, 1:510–511
Covalent carbon nanotube functionalization, 17:53–54
Covalent chromatography, 6:405
Covalent compounds, of graphite, 12:778
Covalent hydrides, 13:611–613
properties of, 13:611t
Covalent ligand immobilization, 6:395–396, 396t
Covalent noncyclopentadienyl compounds, 25:105–109
Covalent sidewall nanotube functionalization, 17:55
Cover crops, allelopathic, 13:352–353
Covering power, 9:773
Coverstock, use of nonwoven goods in, 17:517
Cowpox, 3:136
Cox experimental design text; versus other texts, 8:395t
Cox–Merz empirical relationship, 21:723
Cozaar, molecular formula and structure, 5:153t
Cp₂MX₂ compounds, 25:440. See also Dicyclopentadiene
Cp₂Ti derivatives, reactions of, 25:120. See also Cyclopentadienyltitanium compounds
CP44,161 antibiotic, 20:137
CP-346086, novel potential antihyperlipemic agent, 5:144t
CP-529414, novel potential antihyperlipemic agent, 5:144t
3-CPA, 13:41t, 48
4-CPA, 13:41t, 48–49
CP Matrix Pinch system, 13:199, 206
CpTi–R bond, 25:119–120. See also Cyclopentadiene
Cr₂O₃ surface scale, 13:511
“Crabbing,” 9:183
Crabs
aquaculture, 3:189
world aquaculture production in 1996, 3:186t
Crack closure, 13:495
Crack deflection, 5:622
ceramic–matrix composites, 5:563–566
Cracked gas, gas purification, 1:618t
Crackel salt, 5:785t
Cracking, 18:648; 24:257. See also Steam cracking
cutting tool failure mode, 4:660
Cracking catalysts
cerium applications, 5:685–686
coking characteristics of, 11:705–706
kaolin application, 6:695
Cracking furnaces, 10:601–609. See also Cracking reactor
efficiency of, 10:604
kinetic models used for design of, 10:606–607
run length of, 10:607–609
Cracking models, based on molecular reactions, 10:607
Cracking reactions, 10:601–604
in vinyl chloride manufacture by pyrolysis, 25:643, 646
Cracking reactor. See also Cracking furnaces
adiabatic, 10:617–618
advanced, 10:617
Crack propagation, ceramics, 5:628–630
Crack-resistance behavior
  ceramic–matrix composites, 5:561–563
Crack tip shielding
  ceramic–matrix composites, 5:566–568
Crack wake bridging, 5:622
  ceramic–matrix composites, 5:567–568
Crane scales, 26:244
Crankcase emissions, 10:59
Crappie, aquaculture, 3:183
Cratering, coating film defect, 7:121–122
Crater wear, cutting tool failure mode, 4:658
Crawfish, aquaculture, 3:183
Crawling, coating, 7:121–122
Crayons
  kaolin application, 6:688t
  smectites application, 6:697t
Craze formation, in styrene plastics, 23:363
Crazing, in polymer blends, 20:350–351
Crescoite, 6:468
Creaming, 10:117–118, 122
Cream liquors, as colloid, 7:273t
Creams
  classification by body part and use, 7:842t
  for drug delivery, 18:713
Cream yeast, 26:459–460
Creatine, 17:671
Creatine monohydrate, 17:671
Creatine-sensitive detector, 3:809
Creativity, in R&D, 21:620–621
Crede, C. S. F., 22:678–679
Creep, 19:743; 23:307
  in z-form silicon carbide, 22:529t
  of fibers, 11:184, 185
  in metal–matrix composites, 16:189–191
  in olefin fibers, 11:227–228
  piping system, 19:491
  in polymer blends, 20:347, 348
  and recovery, 19:744
Creep behavior, determining, 13:474–477
Creep curve, 21:742
  analysis of, 13:472
Creep data analysis, 13:477–480
Creep deformation, 13:470, 471–480
  effects of temperature and stress on, 13:474
Creep-fatigue environment interactions, 13:494
  test temperatures and, 13:488
Creep feed grinding wheels, 1:20–21
Creep feeding, for young animals, 10:873
Creep measurements, 21:741–742
Creep rate, 13:472
Creep resistance, 13:473
  ceramic–matrix composites, 5:578–579
  lead–calcium-alloy, 14:773
Creep-rupture properties, 13:477–478
Creep rupture strength, of stainless steels, 13:509
Creep strain, 13:475
Creep strength, highest, 13:473
Creep testing
  basic, 13:475–476
  environment for, 13:477
Creep tests, 19:581
  for styrene-based plastics, 23:359–362
Cre/loxP recombination system, 12:461–462, 467
Crepasin, molecular formula and structure, 5:120t
Cresex process, 1:676t
Cresol epoxy novolacs, 10:369
Cresol novolacs, 10:406
Cresols, from propylene, 20:786–787
m-Cresol, 20:268. See also 3-Methylphenol
  antimicrobial used in cosmetics, 7:831t
o-Cresol. See also 2-Methylphenol
  antimicrobial used in cosmetics, 7:831t
  binary azeotrope with benzaldehyde, 3:591t
p-Cresol, antimicrobial used in cosmetics, 7:831t. See also 4-Methylphenol.
  See also para-Cresol
para-Cresol, 25:185
Crestor, 5:143
  molecular formula and structure, 5:140t
Creutzfeldt-Jakob disease (CJD), transmission of, 12:140
Crevic corrosion, in industrial water treatment, 26:127
Crick, Francis, 11:10
Cricketer, 11:363
Criegee mechanism, 17:781
Crime laboratories, 12:95
Crime lab, scanning electron microscope in, 16:494
Crime scene searches, 12:99
Crimp
  in bulky rayons, 11:261–262
  of fibers, 11:167
  in olefin fibers, 11:239, 240
Crimping
  of synthetic fibers, 20:16
  in texturing processes, 19:754
  in wet fiber spinning, 11:209
Crin vegetal fiber, 11:298
Criollo cocoa beans, 6:353
Cristobalite, 22:380, 382, 402
  in fused quartz manufacture, 22:413
  phase equilibria in the C–A–S system, 5:468
  phase transitions of, 22:420
  viscosity of, 22:426
  vitreous silica devitrification and, 22:421
Criteria Air Pollutants, 6:827
  and coal gasification, 6:810
Criteria pollutants, 1:812, 813t
Critical aggregation concentration (CAC), 24:142
Critical care analytes, measuring, 24:55
Critical cooling rate of steel, 23:283
Critical current density, 23:821–823, 825
  optimization of, 23:829
  in PIT conductors, 23:833–834
  temperature and field dependence of, 23:847–848
Critical currents, 23:821–823
  in superconducting, 23:819–825
Critical event (CE), 15:462
Critical failure, 26:982
Critical features, in separating nonideal
  liquid mixtures, 22:307
Critical fields, thermodynamic, 23:809–811
Critical flocculation concentration, 11:631
Critical item evaluation, for reliability, 26:991
Critical micelle concentration (CMC),
  7:284; 12:3–4; 14:714; 20:375–376;
  22:725; 24:53, 120–123
Critical micelle condensation (CMC), 20:336
Critical moisture content, 9:97, 103, 107,
  113
Critical nozzles, 11:660–661
Critical oxygen concentration, selected
  organisms, 1:731t
Critical packing parameter (CPP), 24:124,
  158
Critical pigment volume concentration
  (CPVC), 7:117; 18:58, 66; 19:381;
  25:584
  and flow of dispersions, 8:728
Critical point drying (CPD), 24:20
Critical point of a fluid, 24:664
Critical process parameters (CPPs), 11:49
Critical quality attributes (CQAs), 11:49
Critical regime, 11:755–756
Critical solids flux \( (G_s) \), in thickener design
  and scale-up, 22:58, 59
Critical strain energy release rate, 1:51
Critical stress intensity factor, 19:582
Critical temperatures, 23:274, 821
Crixivan, 3:675
Crocin, 24:561
Crocidolite, 1:803; 3:288, 292
  electron micrograph, 3:295
  elemental analysis, 3:293t
  fiber morphology, 3:294t
  geological occurrence, 3:291t
  physical and chemical properties of,
  3:300t
  thermal analysis curve, 3:302
  world production in 2000, 3:289t
Crocin, color, 7:331
Crocoite, 6:471t, 526
Cromic naphthenate, molecular formula,
  properties, and uses, 6:563t
Crop growth regulators, economic aspects
  of, 18:535–536
Crop lands, irrigation of, 26:57
Crop resistance
  to biotechnology herbicides,
  13:358–363
  to bromoxynil, 13:360–361
  to glufosinate, 13:359–360
  to glyphosate, 13:358–359
  to protox, 13:361–362
  to selective herbicides, 13:361–362
  to sulfonylurea and imidazolinone,
  13:361
Crops
  as biomass, 3:684
  genetically modified, 18:533–534
  herbicide tolerance in, 13:284
  quantity of herbicides used on, 18:534
  quantity of insecticides used on,
  18:533
  sulfur dioxide effect on, 23:666
Cross-belt magnetic separators, high
  intensity, 15:454–455
Cross-belt separator, 16:641
Cross-breeding, of hybrid materials,
  13:533–534
Cross correlation techniques,
  11:675–676
Cross-linking reactions, alkyl, 12:835
Cross-dyeing, 9:198
Crossed cylinder test, 9:714
Crossed-immunoelectrophoresis, 9:755
“Crossed-polarized light” (XPL), 16:470, 476
Cross-file patent searches, 18:243–244
CrossFire Beilstein, 6:19
Cross-flow filtration, 11:383; 15:827, 829
in porous pipes, 11:387–388
with rotating elements, 11:383–387
Cross flow model, 21:706
Cross-flow packed scrubber, 26:687–688
Crossflow plates, 8:762–763
Cross-flow screens, 22:282
Cross-flow velocity, 15:725
Crosshead mandrel, in VDC film extrusion, 25:732–733
Cross-lapping, 17:501
Cross-linkable epoxy thermoplastic system (CET), 10:436
Cross-link density, 10:415–416, 417–418
direct measurement of, 10:426–427
Cross-linked copolymers, 7:610t
Cross-linked high amylose starch, 13:742
Cross-linked hydrogels, 13:729–730
Cross-linked polymers, internal stresses and, 10:423–424
Cross-linked starches, 4:721
Cross-linked thermoset polymer structure, 10:418
Cross-linkers
silicone, 22:33
in silicone latex sealants, 22:34–35
in urethane formulations, 22:37
Cross-linking, 9:145–147, 496; 10:387–388; 14:275. See also Cross links
catalysis of, 9:147–148
cellulose, 5:381, 383
cotton, 8:25–26
effect on permeability in barrier polymer, 3:393
enzyme-crystal, 10:271
oxidative attack and, 14:401
in poly(ethylene oxide), 10:684
polymer solubility and, 20:403
in PVA, 25:603, 604
Cross-linking agents, 13:733
use in polymers, 14:711
Cross-linking amino acids, 9:494
Cross-linking PEG, 13:736, 737
Cross-linking PVA, 13:735–736
Cross-linking reactions, acid-catalyzed polymer, 15:168–169
Cross-linking resists, 15:172
Cross-linking systems, covalent dye fixation using, 9:489–491
Cross-linking treatments, in volumetric sweep efficiency, 18:620
Cross-links
in fiber finishing, 22:593–594
in foam rubber preparation, 22:585
in paper release coatings, 22:591
in polymerization, 20:394–395
in RTV silicone preparation, 22:595
in shape-memory polymers, 22:356, 358
in silanol condensation, 22:566–567
silicone network characterization and, 22:569
in silicone network preparation, 22:562–563
in silicone network radiation cure, 22:567, 568
in silicones, 22:598
in T resins, 22:589
Cross-metathesis (CM), 26:920, 921
Cross-oxidation, 21:248
Cross-polarization magic-angle spinning (CP/MAS) technique, 23:740–741
Cross-polarization magic angle spinning NMR (CP/MAS-NMR), for archaeological materials, 5:743
Cross-references, to standards and specifications, 15:769
Cross-sectional area, of fibers, 11:166, 181–182
Cross-sectional shape. See also Shape of acrylic fibers, 11:189, 190
of fibers, 11:166–167
of inflated rayons, 11:262, 263
of solvent-spun fibers, 11:207–208
Cross-section analysis, in fine art examination/conservation, 11:404–405
Cross-section nylon fiber shapes, 19:756–757
Cross talk, in CMOS image sensors, 19:155
Crotalaria juncea, 11:294
Crotonaldehyde
Diels–Alder adduct from
cyclopentadiene, 8:222t
production from acetaldehyde, 1:103
spectroscopic properties of, 2:62t
Crotonic acid
Diels–Alder adduct
from cyclopentadiene, 8:222t
physical properties, 5:31t, 37t
18-Crown-6, 7:588
Crown analogue inclusions, 14:162
Crown compounds, 14:160, 185.
See also Crowns
Crown compounds/cryptands, 14:162
Crown ether motif, diagnostic sensors based on, 24:54–55
Crown ethers, 7:588; 24:41
barbiturate receptors derived from, 24:47
in channel-forming systems, 24:59
chelating agents, 5:710
chiral phases, 6:91–92
derivatives of, 24:40
discovery of, 24:37
ethylene oxide, 10:637
larger, 24:43
in membrane-spanning molecules, 24:58–59
sodium and, 22:764
Crown–guest hydrogen bonds, 14:161
Crown macroring inclusion compounds, 14:160–161
Crown polysulfonic acid, 23:721
Crown resins, 8:325
Crowns, 16:773. See also Crown compounds
Crown thioether complexes, 23:707
Crucibles, in fused quartz manufacture, 22:413
Crucible steelmaking process, 23:249
Crude beeswax, 26:207
Crude oil(s), 3:760; 10:825; 18:591. See also
Crude petroleum; Oils; Petroleum
acetylene manufacture from, 1:194–195, 200
biodegradation, 3:760–763
bioremediation, 3:763–772
composition of, 18:575
compounds in, 18:571–572, 576t
cyclohexane in, 13:711
distillation of, 12:401–402
elemental composition of, 18:577–579
molecular classes of, 18:579–586
nitrogen levels in, 18:589
parallel streams of, 13:222
prices of, 18:567
process limitations of, 13:223
production of, 13:685
refining, 24:256
representative hydrocarbons found in, 3:761
selenium content of, 22:77
sour and sweet, 18:641
spills, 3:764–765
United States discoveries of, 18:597
Crude petroleum, 24:255
Crude preheat trains, 13:221–223
design methodology for, 13:223–224
Crudes
krypton–xenon, 17:360, 361–362
rare gas, 17:358–360
Crude sulfur, 23:587
Crude sulphate turpentine (CST), 24:476
Crude tank sludge control, 16:708–711
Crude toluenediamine, purification of, 25:195–196
Crumbled yeast, 26:460
Crushers, mineral, 16:610
Crush-form grinding, 1:20
Crushing
catalyst deactivation mechanism, 5:256t
ceramics processing, 5:643–644
of minerals, 16:611–613
Crushing/sizing equipment, artificial
graphite, 12:727–729
Crustaceans
aquaculture, 3:182
common and scientific names, 3:188t
Crutanium, base-metal dental alloy, 8:309t
Crutcher
in bar soap manufacture, 22:748, 749, 750
in continuous saponification, 22:738
Cryocoolers, 8:43
Cryogen-free electromagnets, 23:856
Cryogenic adsorption processes, 13:461
Cryogenic air separation, 17:275–278, 752–753
Cryogenic bearing lubrication, 15:254
Cryogenic distillation, nitrogen separation via, 17:274
Cryogenic ethylene storage, 10:623
Cryogenic-freezers, 17:285
Cryogenic freezing equipment, 12:84
Cryogenic gas processor, 14:693
Cryogenic insulation, 8:62–63
Cryogenic liquids, 24:283
Cryogenic mechanical alloying, of polymer blends, 20:326
Cryogenic nitrogen plants, 17:275–278
Cryogenic properties, of Teflon PFA resins, 18:933t
Cryogenic recovery, of hydrogen, 13:794
Cryogenic refrigerators, 8:42
Cryogenics, noble gases in, 17:373–375
Cryogenic seals, indium in, 14:194
Cryogenic tanks, 24:299–301
Cryogenic technology, 8:40–65
  air separation, 8:43–48
  applications, 8:43–48
  equipment, 8:60–63
  helium purification and liquefaction, 8:57–60
  hydrogen liquefaction, 8:52–54
  hydrogen purification, 8:51–52
  hydrogen purification with light olefins and LPG recovery, 8:52
  light olefins and LPG recovery, 8:54–56
  liquefied natural gas (LNG), 8:49–51
  liquid nitrogen, oxygen, and argon, 8:48–49
  nitrogen rejection and helium recovery, 8:56–57
  refrigeration methods, 8:42–43
  safety aspects, 8:63
Cryogenic temperatures, applications of, 17:374
Cryogenic tire pulverizing, 21:469–470
Cryolite, 2:285–287, 362, 364t, 365–370
  minimum melting compositions, 2:367t
  physical properties of, 2:365t
  synthetic, 2:368–370
Cryolithionate, 2:364t
Cryomicroscopy, 12:11
Cryoprecipitate, proteins in, 12:144
Cryopumping, 8:42
2.2.2-Cryptate, 7:576
  chelating agent, 5:711
  molecular formula, 5:713t
Cryptands, 24:41
Cryptaspherands, ionophores derived from, 24:55
Cryptate effect, 7:576
Cryptates, 7:576–577; 14:161
Cryptococcus, 26:446, 475–476
Cryptococcus noformans, genome of, 26:450t
Cryptomelane, 15:540
Cryptophanes, 16:785, 791
Cryptostyline I, 2:86
β-Cryptoxanthin, 17:657
Cryptate technique, 20:204
Crystal chemistry, of ferrites, 11:59–71
Crystal engineering, 8:65–94; 24:31, 52–53
  applications, 8:85
  based on hydrogen bonds, 8:72–74
  based on van der Waals interactions, 8:71–72
  with coordination networks, 8:82–84
  with coordination networks and hydrogen bonds, 8:84–85
  with hydrogen bonds between ions, 8:76–81
  with metal species, 8:81–82
  neutral molecules, 8:74–76
  and polymorphism, 8:68–70
  solid-state reactivity, 8:86–89
Crystal growth, 8:95, 107–112
  hydrothermal, 14:92–97
  kinetics of, 12:567
  mercury cadmium telluride photodetectors and, 19:159–161
  in photography, 19:179–184
  silicon purification via, 22:495–497
Crystal interfaces, molecular recognition of, 16:796–798
Crystal isomers, 8:70
Crystal lattice, X-ray diffraction from, 26:416–418
Crystal lattice packing, 12:249–250
Crystal lattice vibrations, 14:236
Crystalline adsorbents, 1:586, 589. See also Molecular sieves; Zeolites
  for gas separation, 1:631
  properties and applications, 1:588t
Crystalline alkali silicates, atomic structure of, 22:454–455
Crystalline cellulose, 5:373–379
Crystalline epoxy resins, 10:373–374
Crystalline flake graphite, 12:793
  manufacture and processing of, 12:781–784
Crystalline fructose, 23:485–486
Crystalline glycolic acid, 14:127
Crystalline hybrid compounds, 13:546–548
Crystalline inclusion compounds, 14:184
  molecular recognition behavior of, 16:796
  preparation of, 14:182
Crystalline melting point, of polymers, 20:399
Crystalline oxides, 12:569
Crystalline peroxohydrates, 14:40
Crystalline phases
in soap bar processing, 22:728
of soaps with low water content, 22:729
Crystalline phosphates, 18:839
condensed, 18:847
Crystalline photovoltaic materials,
alternative, 23:41–42
Crystalline poly(4-methyl-1-pentene)
(PMP)
manufacture of, 20:429–430
properties of, 20:421t
Crystalline polymers, 9:554; 10:169; 20:411
master curves for, 21:747
cooling, 20:402
Crystalline polyphosphates, manufacture
of, 18:857–859
Crystalline products, 10:458
Crystalline pyrophosphate salts, 18:841
Crystalline red selenium, 22:74
Crystalline regions, in fibers, 11:171–172, 175
Crystalline silica, 18:75
amorphous silica versus, 22:403
atomic structure of, 22:409, 452–455
as filler, 11:311
Crystalline silicates, insoluble, 22:474–475
Crystalline silicon, amorphous silicon
versus, 22:134
Crystalline silicon photovoltaic module,
23:47
Crystalline silicon photovoltaic materials,
22:39–41
Crystalline sodium metasilicates,
manufacture of, 22:464
Crystalline solids, solid–fluid equilibria for,
24:10–11
Crystalline structure. See also Crystal
structure
of binary compound semiconductors,
22:145, 146–147t
of compound semiconductors, 22:141
of ferrites, 11:55–58
of shape-memory alloys, 22:341–345
of silica, 22:380–383
of siliceous minerals, 22:366
of silicon, 22:481–482
of silicon carbide, 22:525–527
of silk, 22:629
of spun yarn, 11:237–238
Crystalline sucrose, thermolysis of, 23:442
Crystalline surfactants, 22:724
Crystalline thermoplastics, 10:8
Crystalline trisodium phosphate,
manufacture of, 18:853
Crystallinity
effects of fabrication on, 18:303
of ethylene oxide polymers, 10:674
of ethylene–propylene polymers, 10:705
of FEP polymer, 18:309–310
of LLDPE, 20:184
of LLDPE resins, 20:181
of lyocell fibers, 11:269
of polyamide plastics, 19:775–776
of polycarbonates, 19:802–805
polymer, 20:397–399
of VDC copolymers, 25:707–708
Crystallites, 11:171–172, 175
PVC, 25:663, 664–665
Crystallite size determination,
diffractometers in, 26:428
Crystallization, 8:95–147
agglomeration, 8:116
of ascorbic acid, 25:748–749
batch, 8:130–134
Bravais lattices, 8:114t
in cane sugar refining, 23:452–453
crystal growth, 8:107–112
crystal morphology, 8:113–116
crystal morphology, 8:113–116
enzyme purification via, 10:268
of fats and oils, 10:819
glass, 12:627–628
growth rate dispersion, 8:112–113
in Guggenheim process, 22:848
HDPE, 20:162
hydrothermal, 14:85
kinetics, 8:103–113
mass and energy balances, 8:101–103
of olefin fibers, 11:235–236
of polychloroprene polymers, 19:843–844
in polymer blends, 20:323
population balances and crystal size
distributions, 8:120–134
purity, 8:116
of PVA, 25:592–594
selenium recovery via, 22:79
size-dependent growth, 8:112
of sodium carbonate peroxyhydrate,
18:412
in sodium nitrite production, 22:855–856
of sodium sulfate, 22:865
in solar salt harvesting, 22:807
solid–liquid equilibria, 8:97–103
in solid–liquid separation, 11:343
solubility, 8:97–100
from solution, 8:134–135
do of sucrose, 23:463–465
of supersaturation, 8:100–101
of VDC, 25:696
of VDC copolymers, 25:702
in wastewater treatment, 25:899t, 891
Crystallization-based separations, general
heuristics for, 22:317t, 319–320
Crystallization point data, 9:33t
Crystallization point maleic anhydride
purity test, 15:510
Crystallization-resistant polychloroprene
grades, 19:852
Crystallization theory, 12:566
Crystallized resins, 10:359
Crystallizers, 8:134–142
potassium permanganate, 15:605
sodium carbonate recovery via, 22:789
Crystallizing rubbers, 9:552
Crystallographic analyses,
of oligonucleotides, 17:606–607
Crystallographic data, for polyester
homopolymers, 20:6t
Crystallographic properties, of natural
graphite, 12:772–774
Crystallographic shear structures,
of lower oxides of titanium, 25:14–15
Crystallographic studies, computer
graphics in, 16:733–734
Crystalluria, sulfonamide-related, 23:510
Crystals
growth rate of, 14:95–96
index of refraction in, 14:680
molecular self-recognition in, 16:801
optical nonlinearity in, 11:94
quality of, 14:94
sucrose, 23:437
technologically important, 14:97
trends in hydrothermal growth of,
14:97t
uranium dioxide, 25:423
Crystal shapes, in color photography,
19:239–240
Crystal size distibutions, 8:95, 117–120
and population balances, 8:120–121
Crystal structure. See also Crystalline
structure
of CHDMT pure isomers, 20:61–62
of inorganic pigments, 19:377–378
of limestone, 15:31
of PET, 20:57t
of PVDC, 25:699–703
in VDC polymer degradation,
25:713–714
Crystal structure modification, in smart
materials, 22:707
CS (riot control agent), 5:823–824
CS₂, formation in the Claus furnace,
23:605. See also Carbon disulfide
C-scan images, 17:424, 429
Cs isotopes, decay of, 21:303–304.
See also Cesium (Cs)
C₆-symmetric bridged metallocenes,
16:109–110
CSTR reactor system, 23:396. See also
Continuous- stirred tank reactor
(CSTR) anionic polymerization
C-toxiferine, 2:74, 99
C-type inks, 14:324, 326
C-type natriuretic peptide (CNP),
5:186–187
Cu(II)-binding dendrimers, 26:807.
See also Copper entries
Cu(II) complex concentrations,
13:446–447
Cubature techniques, in sampling,
26:1010–1011
Cubebol, 24:549
Cubed compound, in PVC siding
manufacture, 25:685
Cube lattice, 8:114t
Cubic boron nitride, 1:8; 4:654
grinding wheels, 1:21
hardness in various scales, 1:3t
physical properties of, 4:653t
Cubic close-packed (CCP) structure,
of spinel ferrites, 11:60
Cubic ferrites, 11:55–57
Cubic geometry, for metal coordination
numbers, 7:574, 575t. See also Cubic
structure; Cubic symmetry
Cubic silsesquioxanes (CSS), 13:539
Cubic structure, of ferroelectric crystals,
11:94–95, 96
Cubic symmetry, 8:114t
Cubitron sol–gel abrasives, 1:7
Cucurbituril inclusion compounds,
14:168–169
Cuen, cellulose solvent, 5:384
Cullet, non-glass contaminants in,
21:381.
See also Glass container cullet
Cullet processing, 21:380
Cultch, 3:190
Cultispher microcarrier, 5:353t
Culture, continuous, 11:28–29
Culture screening, microbial, 16:405–406
from benzene, 3:603, 619t, 620
economic aspects, 8:153–154
manufacture of, 8:148–153; 23:355
production by alkylation, 2:182–188
properties, 8:148, 149t
specifications and analysis, 8:154
uses, 8:155–156
Cumene hydroperoxide (CHP), 18:748, 749, 757; 20:108
cleavage to acetone and phenol, 1:165–166, 169
Cumene processes, for phenol manufacture, 18:748–750
Cumene production, propylene in, 20:785
Cumene synthesis, molecular sieves in, 16:845–846
Cumin seed, 23:166
Cummingtonite–grunerite, 3:288, 292
geological occurrence, 3:291t
world production in 2000, 3:289t
Cumulative frequency, in particle size measurement, 18:137–138
Cumulative liquid volume, 23:186
Cumulenes, 21:144
4-Cumylphenol (PCP), 2:222
health and safety data, 2:220t
physical properties of, 2:205t
4-Cumylphenyl chloroformate
molecular formula, 6:291t
p-Cumylphenol. See 4-Cumylphenol (PCP)
Cumyl potassium, 14:256
Cup anemometers, 11:666
Cupellation, lead refining by, 14:753–754
Cupola cast scrap, 21:410
Cupolas, refractories for, 12:765
Cupped blade impeller, 16:673
Cupra, cellulose solvent, 5:384
Cuprammonium hollow fiber production process, 16:18
Cuprammonium rayon, 11:263–265
Cuprate oxides, 23:838–839
Cuprate superconductors, 23:837
Cupric chloride, 7:769
in vinyl chloride manufacture, 25:638–639, 640
Cupric fluoride, 7:769
Cupric oxide, energy gap at room temperature, 5:596t
Cupriethylenediamine hydroxide, solvent for cotton, 8:21
Cuprite, 7:771
Cupronickel(s)
nominal composition and UNS designation, 7:722t
UNS designation, 7:721t
Cuprophan fibers, 16:18, 19
Cuprous bromide, physical properties of, 4:328
Cuprous chloride, 7:767
transference number of cations, anions, and electrons or holes, 5:586t
Cuprous oxide, 7:767
energy gap at room temperature for, 5:596t
Cuprous sulfide, 7:767
Curative levels, optimizing, 21:803–804
Curatives, in polychloroprene latex compounding, 19:858
Curculin, 24:246
Curdlan, 4:724t; 20:577–578
classification by structure, 4:723t
properties of, 13:74t
Cured silicone LIM rubber, 22:585
Cure exotherm, in unsaturated polyesters, 20:109
Cure rate, of silicone sealants, 22:33
Cure system design, in vulcanization, 21:800–802
Cure systems, for butyl rubber and EPDM, 21:802–803
Cure temperatures
epoxy system, 10:17–18
management of, 10:423
in vulcanization, 21:802
silicone heat-cured rubber and, 22:579–580
Curie, Marie, 21:286
Curie temperature(s), 11:93, 95, 96, 97; 23:275; 25:44, 46
electrostrictive materials and, 22:713
magnetostrictive materials and, 22:714
ferrites and, 11:62, 63, 68
of rare-earth metals, 14:651
Curie-Weiss law, 11:93
Curing
of phenolic resins, 18:770–773
of pressure-sensitive adhesives, 1:528
of printing inks, 14:314
in RTV silicone preparation, 22:594, 595, 596
Curing agents, 10:368. See also Coreactive curing agents
catalytic, 10:411–415
reactivity of, 10:424–425
selection of, 10:418
toxicity of, 10:461
meat, 18:32
Curing process
developing, 10:424–425
of EPM/EPDM compounds, 10:715
in ethylene–acrylic elastomers, 10:698
Curium (Cu), 1:463–491, 464t
electronic configuration, 1:474t
ion type and color, 1:477t
metal properties of, 1:482t
Currants, citric acid in, 6:632t
Current charging, 9:569–570
efficiency of, 9:594, 595
Faradic, 9:570–571
in field-effect transistors, 22:251, 252
Current crowding, 14:842
in light emitting diodes, 14:840
Current densities, 9:671, 773, 774
anode, 9:777
in electrolytic plating, 9:689
optimization of, 9:672t
ranges of, 22:853
Current distribution, 9:614
electrochemical cell, 9:659
Current Drugs Ltd., 18:235
Current gain (β), in HBTs, 22:169
Current good manufacturing practices (cGMPs), 18:736, 25:487, 505.
See also cGMP entries
guidelines for, 12:150
in salicylic acid manufacture, 22:8
Current Good Manufacturing Practice (cGMP) regulations, 21:574–575
for medical devices, 21:577–578
Current-injection scheme, in light emitting diodes, 14:842
Current leads, in superconducting electromagnets, 23:855–856
Current meters, 11:666
Current Patents Fast Alert service, 18:235
Current percolation, through grain boundaries, 23:842–845
Current-spreading layers, in light emitting diodes, 14:840
Current transport, in LED Structures, 14:840
Currie, J. N., 11:8
Curry powder, 23:166–167
Curtain coating, 7:20–21
method summarized, 7:5t
shear rates, 7:32t
Curtain spin process, 17:473–474
Curtius degradation, 2:573
Curved surgical needles, 24:206–207
Curve-fitting procedures, 14:237
Cusping, in fine art X-radiography, 11:401
Cusp-shaped magnetic field-type (CMC), 23:857
Customblen, 3:765
Customer complaints, quality assurance and, 21:168
Customer processes, simulation of, 24:342
Customers
concessions to, 15:643
technical service to, 24:339
Custom preparation, of silicone rubber, 22:580–581
Cutback asphalts, 18:673
Cutinite, 6:707t
Cut size
in centrifuges, 22:288
in hydrocyclones, 22:287, 288
in size separation, 22:277, 278
Cut structural and plate scrap, 21:409
Cutting oils, fatty acid amides, 2:458
Cutting tools
calcined alumina applications, 2:412
failure modes of, 4:657–660
Cutworms, 8:9
Cu–Zn system, shape-memory effect in, 22:343. See also Copper entries
CVD-deposited films, properties of, 24:746. See also Chemical vapor deposition (CVD)
CVD-deposited materials, factors affecting, 24:745
CVD processes, 24:746
CVS system flow, 10:33, 35
CW laser beam, 14:673, 674
Cygard RF1204, 11:496
Cyan, CIE chromaticity diagram, 7:313, 315. See also Cyan dyes
Cyanamides, 8:157–171; 13:107

economic aspects, 8:162–163
health and safety factors, 8:163–164
manufacture, 8:161
shipping and handling, 8:162
specifications and analysis, 8:163
Cyanate ester curing agents, 10:411
Cyanate ester resins, production of, 18:769
Cyanation, 9:313
Cyanazine, 13:321–322
Cyan couplers, in chromogenic chemistry, 19:252–253
Cyan dyes in chromogenic chemistry, 19:249
stability of, 19:263
Cyanic acid, 8:172
Cyanidation, 13:656
alternatives to, 12:690
gold recovery by, 12:689
of silver, 22:638, 646–647
Cyanide analysis, of water, 26:41
Cyanide-based plating baths, 9:813t
Cyanide baths, 9:829
copper, 9:804, 805–807
Cyanide ion, 21:98
Cyanide iron blues, 19:407
Cyanide poisoning, 17:231
Cyanides, 8:171–199
gold, 12:707
iron, 14:533–537
silver(I) complexes with, 22:674–675
Cyanide solutions, operating conditions for, 9:805t
Cyanide wastes, ozone oxidation of, 17:808
Cyan indophenol dye developer, 19:287
Cyanine dyes, 7:373t; 19:236–237; 20:520
Cyanine dyes, 9:503, 504, 505–506
Cyan masking coupler, 19:256–257
1-Cyano-2-methoxy-1,2-dihydroquinoline, 21:184
Cyanocacetic acid, 1:138, 139
and esters, 17:244–245
Cyanocarbamate adhesives, 1:539–540
Cyanocarbamate vapors, 12:102
Cyanobacteria, in nitrogen fixation, 17:302
Cyanobacterial associations, in nitrogen fixation, 17:299–300
Cyanocobalamin, 7:238; 25:803–804
Cyanogen. See Acrylonitrile (AN)
1-Cyanoethyl-2-ethyl-4-methylimidazole (2EMZ-CN) curing catalyst, 10:17
N-Cyanoethylated toluenediamines, 25:197
Cyanoethylyation
cotton, 8:28
fatty amines, 2:523
β-Cyanoethylmethylsiloxane, 22:583
Cyanogen, 8:172
Cyanogen bromide (CNBr) method, for covalent ligand immobilization, 6:396t
Cyanogen chloride, 8:172
Cyanoguanidine, 8:164
Cyanohydrins, 17:229
production from acetaldehyde, 1:105
5-Cyanopentanoic acid, 1:557
4-Cyanopyridine, 21:101
Cyanopyridines, 21:102–103
Cyanouracilines, 21:186
Cyanurates, 18:769
Cyanuric acid, 8:199–219; 26:190–192
chlorination of, 13:111
economic aspects, 8:210–211
health and safety factors, 8:211–212
manufacture, 8:208–210
preparation, 8:206–208
reactions, 8:201–206
specifications and analysis, 8:211–212
swimming pool pH and, 26:183
uses, 8:211–214
Cyanuric chloride, 8:206; 9:290–291, 491
Cyanuric chloride 2,4,6-trichloro-s-triazine, 8:201–202
Cyanuric chloride method, for covalent ligand immobilization, 6:396t
Cycads, in nitrogen fixation, 17:300
Cyclam, 12:42; 24:234, 236
sweeteners, 2:513–514
Cyclamen aldehyde, aroma chemical derived from toluene, 3:234
Cyclam, 13:41t, 49
Cyclar process, 3:609; 25:170, 171
Cycle diluents, in ethylene oxidation, 10:651
Cyclen, 24:41–42
Cycle stock (recycle stock), 18:594
Cyclic “belt” compounds, preparation of, 13:438–439
Cyclic 1,2-diketones, 14:594
Cyclic acrolein acetics, 1:271
Cyclic amidine curing agents, 10:410
Cyclic amidines, 10:412
Cyclic (aromatic disulfide) oligomers, 23:712
Cyclic aromatic disulfides, polymerization reactions of, 23:706
Cyclic (arylene) disulfides, 23:712
Cyclic batch adsorption processes, 1:613
Cyclic bis(arylene tetrasulfide)s, 23:712
"Cyclic carbon," polymer materials with, 15:177
Cyclic carbonates, 12:664
in oxazolidinone preparation, 17:738–739
Cyclic compounds, unnatural, 24:59
Cyclic cooligomerization, 16:238
Cyclic corrosion tests, 16:218
Cyclic diacyl peroxides, 18:473, 477
Cyclic dimethylsiloxanes, 22:575
Cyclic diperoxides, 18:461
Cyclic diperoxyniketals, 18:457
Cyclic disulfides, antimicrobial properties of, 23:713
Cyclic dithiocarbonates, five-membered, 23:727–728
Cyclic enone, 12:185
Cyclic ethers, 10:567, 569; 12:663
polymerization, 14:271
Cyclic fatigue, in ceramics, 5:633–634
Cyclic gas generators, 6:786–787, 789, 827
Cyclic halides, 19:56
Cyclic hexakis(thio-1,4-phenylene), melt polymerization of, 23:705
Cyclic hydrocarbons, 13:687
Cyclic hydroxyalkyl alkyl peroxide, 18:454
Cyclic ion exchange operation, 14:408–413
Cyclic ketones, 12:176, 177; 14:590–592.
See also Cyclic 1,2-diketones
physical properties of, 14:591
hydroxyalkyl hydroperoxides from, 18:450
Cyclic liquid adsorption processes, 1:683–684
Cyclic method, selenium and tellurium purification via, 22:86
Cyclic molecules, synthetic, 24:35
Cyclic monomers, ring-opening polymerization of, 14:271
Cyclic monoterpenes, aroma chemicals, 3:237–238
Cyclic monoterpenoids, biosynthetic routes to, 24:472
Cyclic neopentyl hydrogen phosphonate, 11:501
Cyclic neopentyl thiophosphoric anhydride, 11:493
Cyclic olefin-based resists, 15:180
Cyclic olefin copolymers (COCs), 10:180
properties of, 10:181
Cyclic olefin-maleic anhydride (COMA) copolymers, 15:177
Cyclic olefin polymers (COP), 10:180;
for 193-nm resists, 15:179–180
Cyclic olefins, polymerization and copolymerization of, 16:112–113
Cyclic oligomer mixtures, preparation process for, 19:817
Cyclic oligomers
ethylene oxide, 10:637
formation of, 14:271
ring-opening polymerization of, 19:816–817
Cyclic oligomers mixture, ROP reaction of, 23:712
Cyclic peptides, self-assembly of, 24:59–60
Cyclic peroxides, 18:436, 447–448, 459
Cyclic poly(aliphatic disulfide)s, 23:712
Cyclic poly(disulfide)s, available information related to, 23:713
Cyclic polyethers, 12:658
chelating agents, 5:710
Cyclic reforming operations, 25:166
Cyclic sesquiterpenoids, biosynthetic routes to, 24:472
Cyclic siloxanes
anionic polymerization of, 22:559–560
cationic polymerization of, 22:560
Cyclic stability, of shape-memory alloys, 22:345
Cyclic strain limit, of shape-memory alloys, 22:345
Cyclic stresses/strains, 13:481–483
Cyclic stress-strain curves, 13:491
Cyclic structures, nonaromatic, 15:5
Cyclic thermomechanical characterization,
of shape-memory polymers, 22:358–362
Cyclic trimer ketone peroxides, 14:292
Cyclic trioxides, 18:448
Cyclic voltammetry, 9:580
Cycloheximides, 4:710
Cyclization(s)
acetaldehyde, 1:103
acetylene, 1:181
aminophenols, 2:657–658
aniline, 2:787
bromine-containing organic compounds, 4:341
Cyclization reactions, microwaves in, 16:540–542
Cycloalkenes, ring-opening metathesis polymerization of, 26:923
Cycloalkylation, 12:168–170
Cycloamyloses, 4:715
Cycloate, 13:320
Cyclobenzaprine, biotransformation of, 16:399
Cyclobutadiene, 14:183
Cyclobutane-1,2-dione, bromine used in formation of, 4:303
Cyclobutane derivatives, 15:489
Cyclobutene adducts, 15:489
ring-opening metathesis polymerization of, 26:921
Cyclobutylamine, physical properties of, 2:498t
Cyclobuxine-D, 2:104
β-Cyclocitrinal, 24:570
Cyclocitrinellene acetate, 24:488
α-Cyclocitrilenedebutanone, 24:565
Cyclodehydrating agents, 20:276
Cyclodemol, 24:488
β-Cyclodextrin, 4:715
Cyclodextrin glucanotransferase, 24:48
Cyclodextrin glycosyltransferase, 4:715
Cyclodextrin inclusions, 14:183
Cyclodextrin inclusion compounds, 14:166–167
Cyclodextrin molecule packing, 14:167
Cyclodextrin phases, 6:84–87
Cyclodextrin receptor molecules, 16:784–785
Cyclodextrins, 4:715; 6:77, 78; 16:790; 24:47–48
as drug delivery agents, 24:56–57
in flavor encapsulation, 11:552–553
Cyclodimerization process, 23:344
cis,trans,trans-1,5,9-Cyclododecatriene (CTT), 4:373
trans,trans,trans-1,5,9-Cyclododecatriene (TTT), 4:373
Cyclododecylamine, physical properties of, 2:498t
Cyclogeranic acid, 24:570
Cycloheptaamylose, 4:714
Cycloheptylamine, physical properties of, 2:498t
Cyclohexane, 13:706–711, 797; 24:27
air oxidation, 1:558–562, 559t
analytical methods for, 13:710
azeotrope with benzene, 3:598t
azeotropic mixtures with butyl alcohols, 4:395t
from benzene, 3:601, 619t, 620; 8:804
catalytic aerogels for preparation by hydrogenation, 1:763t
economic aspects of, 13:709–710
health and safety factors related to, 13:711
manufacture and shipment of, 13:708–709
occurrence of, 13:707–708
oxidation to adipic acid, 1:557, 558–562
properties of, 1:566–567
solubilities of alkanoic acids in, 5:39t
solvent for anionic copolymerization, 7:626t
specifications for, 13:710
uses for, 13:711
world demand for, 13:709–7105
Cyclohexanecarboxamide, 13:41t
Cyclohexane dimers, 13:49
Cyclohexanediamine, 13:49
cis, trans-1,2-Cyclohexanediamine, physical properties of, 2:500t
cis, trans-1,2-Cyclohexanediamine, physical properties of, 2:500t
(+)-trans-1,2-Cyclohexanediamine, physical properties of, 2:500t
(±)-trans-1,2-Cyclohexanediamine, physical properties of, 2:500t
(−)-trans-1,2-Cyclohexanediamine, physical properties of, 2:500t
cis, trans-1,3-Cyclohexanediamine, physical properties of, 2:500t
cis, trans-1,3-Cyclohexanediamine, physical properties of, 2:500t
trans-1,3-Cyclohexanediamine, physical properties of, 2:500t
cis, trans-1,4-Cyclohexanediamine, physical properties of, 2:500t
cis, trans-1,4-Cyclohexanediamine, physical properties of, 2:500t
trans-1,4-Cyclohexanediamine, physical properties of, 2:500t
cis, trans-1,3-Cyclohexanediamine, 2-methyl, physical properties of, 2:500t
cis, trans-1,3-Cyclohexanediamine, 4-methyl, physical properties of, 2:500t
Cyclohexane diisocyanate (CHDI), 25:463
Cyclohexanedimethanol (CHDM), 20:36, 97
1,4-Cyclohexanediol, 12:674–675, 20:33
1,3-Cyclohexanediol, crystal engineering, 8:76
Cyclohexanediols, herbicidal activity of, 13:296
Cyclohexanol, 1:558
nitric acid oxidation to adipic acid, 1:564–568
Cyclohexanone, 1:558; 14:562, 592
adipic acid solubility, 1:557
nitric acid oxidation to adipic acid, 1:564–568
Cyclohexene
azeotrope with benzene, 3:598t
catalytic aerogels for epoxidation, 1:763t
phenol manufacture via, 18:751
Cycloheximide, 13:302–303
4-Cyclohexylacetophenone, 12:176
Cyclohexylamine
manufacture, 2:502–503
physical properties of, 2:498t
Cyclohexylidimethanol terephthalate (CHDMT), 20:37–38. See also Poly-
(cyclohexanidimethylenterephthalate) (PCT)
polymerization of, 20:44
properties of, 20:61
(Cyclohexylenedinitrilo)tetraacetic acid (CDTA), 26:38
Cyclohexylhydroperoxide (P; or CHHP), 1:560–562
Cyclohexylsuccinic anhydride, 15:491
cyclo[(L-arg-D-leu)₄], 24:59
cyclo[(L-glu-D-leu)₄], 24:59
Cyclolignans, 20:450
Cyclomaltoheptaose, 7:15
Cyclone boilers, 21:465
Cyclone classifier, 16:620–622
Cyclone dimensions, standard, 26:698t
Cyclone efficiency curves, 26:697
design of, 26:699
in FCC unit regenerators, 11:726–728
Cyclonite, 10:735
1,5-Cyclooctadiene (COD), 4:373
Cyclooctatetraene (COT), 14:703; 22:213
acetylene-derived, 1:229
production from acetylene, 1:181
Cyclooctatetraenyl compounds
thorium in, 24:772–774
complexes of uranium with, 25:441
Cyclooctene, 20:414
polymerization of, 26:945–946
Cyclooctylamine, physical properties of, 2:498t
Cycloolefin copolymers, 17:708; 20:180
Cycloolefin polymers, 17:700, 707–708
uses of, 20:432–433
Cycloolefins, 20:413, 414
epoxidation of, 10:378
polymerization of, 20:425
ring-opening polymerization of, 20:425–426
stereoregular polymers of, 20:420
Cyclooxygenase-2 (COX-2), 2:827
Cycloparaffins, 18:592–593
Cyclopentadiene, 8:219–235. See also Dicyclopentadiene
catalytic aerogels for hydrogenation to cyclopentene, 1:763t
chemical reactions, 8:220–226
health and safety factors, 8:229
physical properties, 8:219–220, 220t
sources and production, 8:226–228
storage and handling, 8:228–229
uses, 8:229–233
Cyclopentadienyl (Cp) complexes, thorium in, 24:770–772
Cyclopentadienyl (Cp) ligands, 16:79
Cyclopentadienylmetal complexes, 16:79
π-Cyclopentadienyl nickel complexes, 17:114–115
Cyclopentadienyl ring, 16:79
modifications of, 16:80
Cyclopentadienylsilylamido ligand, 16:81
Cyclopentadienylthallium, 24:635;
25:110
Cyclopentadienyltitanium trichloride, 25:116
Cyclopentadienyltitanium halides
displacement reactions of, 25:118–119
reaction of, 25:119
Cyclopentadienyltitanium compounds, 25:109–116
with other carbon titanium links, 25:116–118
synthesis of, 25:110–116
Cyclopentadienyluranium complexes, 25:440–441
Cyclopentadienyl zirconium compounds, 26:652–653
Cyclopentene, 8:231
catalytic aerogels for preparation by hydrogenation, 1:763t
Cyclopentylamine, physical properties of, 2:498t
Cyclopentyl chloroformate, molecular formula, 6:291t
Cyclophane host inclusion compounds, 14:163–165
Cyclophanes, 24:37–38
Cyclopropanes, 13:654; 26:654
Cyclopropenyl acids, 5:28
Cyclopropylamine (CPA)
in nevirapine synthesis, 18:741–742
physical properties of, 2:498t
Cyclopropyl bromide, physical properties of, 4:350t
Cyclopropylmethyl bromide, physical properties of, 4:350t
Cyclosilicates, 22:453t
Cyclosiloxanes, polymerization of, 14:259
Cycloalkylamines, physical properties of, 2:498t
Cyclotetramethylenetetranitramine, 10:735–736
Cyclohexane, 2:498t
Cyclohexene, 2:229–230
Cyclohexylamine, physical properties of, 2:498t
Cyclohexylamine, physical properties of, 2:498t
Cyclohexylchloroformate, molecular formula, 6:291t
Cyclohexylmethylchloroformate, molecular formula, 6:291t
Cyclohexylmethylbenzenes, molecular formula, 6:291t
Cyclodextrins, 8:40
Cypermethrin, registered for use in aquaculture in Europe, 3:220t
Cyprinids, world aquaculture production in 1996, 3:186t
Cyclophane, 14:163–165
Cysteine
antioxidant useful in cosmetics, 7:830t
in coffee, 7:255
systematic name, formula, and molecular weight, 2:556t
D-Cysteine, systematic name, formula, and molecular weight, 2:556t
L-Cysteine, systematic name, formula, and molecular weight, 2:556t
Cysteine thiol residues, 9:494
Cystic fibrosis, yeast as a model for, 26:496–497
Cystic fibrosis transmembrane conductance regulator (CFTR) gene, 12:467
Cystine
content in cocoa and chocolate products, 6:368t
systematic name, formula, and molecular weight, 2:556t
D-Cystine, systematic name, formula, and molecular weight, 2:556t
D-Damascone, 24:569
Damascones, 24:561, 567–570
odor thresholds of, 24:567t
synthesis of, 24:567–568
molecular formula and structure, 5:172t
Damage assessment, fiber-optic smart structures for, 11:155–156
Danaparoid, 5:174
molecular formula and structure, 5:172t
Dampkôhler number, 21:345
intrapellet, 25:276, 277, 279, 280
Danmar, for protecting art, 11:410, 411
Danze, 11:410, 411
Danmark, 10:162
Damp, in shape-memory alloys, 22:341
Damping characteristics, of ethylene–acrylic elastomers, 10:700–701
Danzaparoid, 5:174–175
molecular formula and structure, 5:172t
Danckwerts boundary conditions, 25:281–283, 288
D&C Red No. 6 Barium Lake, in nail-care products, 7:853
D&C Red No. 34 Calcium Lake, in nail-care products, 7:853
D&C Red No. 34 Calcium Lake, in nail-care products, 245
Dandruff shampoos, 7:850–851
Dangerous drugs, testing for, 12:98–99
Dangerously toxic substances, 23:113
Dangerous substances, substitute chemicals for, 24:194
Dangling bond (DB) density, 22:132
Daniel experimental design text; versus other texts, 8:395t
Danneel-Lonza cell, 22:772
Dapex process, 10:790
Dapsone, 23:494, 508
Daran, 3:383
Darapskite, 5:785t; 22:846
Darcy friction coefficient, 13:247, 248t, 260
Darcy’s formula/law, 11:332, 333; 12:841, 842; 19:473
Darenthin, molecular formula and structure, 5:96t
Dark chocolate, 6:361
minerals content, 6:371t
theobromine and caffeine content, 6:367t
tocopherols, 6:370t
typical formulation, 6:362t
Dark conductivity ($\Phi_D$), of $\alpha$-Si:H, 22:
131, 132, 133, 134
“Dark cure,” 10:414, 459
Dark current, 19:134, 136
Darkfield condenser, 16:479
Darkfield illumination technique, 16:478–480
Darob, molecular formula and structure, 5:94t
Dartanol, 24:536
Dart impact strength, 20:429
Darzens–Claisen condensation, 14:570
Darzens condensation, 10:505
DAS antibody, 14:145, 147
DAS-hemisuccinate (DAS-HMS), 14:144
DASH-Sodium Study, 22:813
Data, growth of, 21:612–613. See also Decay data
Data acquisition/collection/gathering employee cooperation in, 14:218
in hazard evaluation, 14:219
in life cycle assessment, 14:813
primary and secondary sources in, 15:633, 634
reliability and, 26:994
for sensors, 22:263–264
Data analysis and preparation, 6:20–21
for ammonia plant, 26:996–997
in groundwater monitoring, 12:846
in hazard evaluation, 14:219
in market research, 15:636–637
reliability and, 26:994
See also Patent databases
Databases
in sensor technology, 22:264–265
specialized, 15:634
Data highways, 20:668
Data Reporting Guidelines (DRGs), 18:
544, 547
Data representation, in particle size measurement, 18:133–138
Data searching, 6:6–19
Data sheets, engineering thermoplastic, 10:221t
Data structures, 6:26
Dating
in fine art examination/conservation, 11:418–419
radioisotopes used in, 21:314–318
Datolite, 4:133t, 243t
Daubreelite, 6:471t
Daughter isotopes, 21:316, 318
Daugirdas II calculation, 26:822
Davies experimental design text; versus other texts, 8:395t
Davy, Humphry, 11:398; 22:760
Davy-Powergas unit, 10:774, 775
Daylight fluorescent pigments, for inks, 14:318
Daytime oxidation chemistry, 17:791–792
2,4-D ([2,4-Dichlorophenoxy)acetate]
bioremediation substrate, 3:773, 774
herbicide/algicide for aquaculture in U.S., 3:215t
sensitive detector, 3:810
d-c arc furnace, 12:303
DCCA (N,N’-dichloroisocyanuric acid), 26:392. See also Dichloroisocyanuric acid (DCCA)
DCPA, 13:303–304, 315
DCPEAT, 9:487–489
dc sensing current, 24:450. See also Direct current (dc) diode sputtering
DDS-vacuum pressure filter, 11:372
DDT bioremediation substrate, 3:773, 774
d–d transitions, 19:379–380
Deacidification, of paper, 11:414
Deacon process, 13:820
Deacylation reactions, microwaves in, 16:558
Dead-block coilers, 7:691
Dead-burned dolomite, 15:27, 53
Dead-end filtration, 11:388; 15:827, 829
“Dead end” hydrogenation reactor, 10:811, 812
Dead Sea, 5:784
magnesium chloride recovery from, 5:798
Dead Sea periclase (DSP) magnesia manufacture, 15:402, 412
Dead Sea Works magnesium manufacturing process, 15:338
Dead zones, 13:463
Deaeration, 10:148
in industrial water treatment,
26:143–144
of paper stock, 18:106
of viscose, 11:255–256
Dealkylation/dealkalization, 12:162
chloroformates, 6:297–298
water, 14:416–417
Dealuminization, vanadium prepared by, 25:521t
DEA myristate, cosmetic surfactant, 7:834t
Deanesmithite, 6:471t
DEA p-methoxycinnamate cosmetic uv absorber, 7:846t
Dearomatization, in photocatalytic water decontamination, 19:90
7-Deazaguanosine, 2:823
Debaryomyces hansenii, genome of, 26:450t
Debismuthizing. See Kroll-Bettermann debismuthizing process
Deborah number, 21:721; 23:101
Debottlenecking, 20:724–725, 755
oil refinery, 20:761–762
Debrining, in potassium chloride refining, 20:619
De Broukere mean diameter, 18:135
Debt capital cost, 9:542
Debt ratio (DR), 9:541
Debt structure, 9:542–543
Deburring, surface, 9:597–598
Debutanizer, 10:614–615
Debye–Hückel theory, of electrolytes, 3:415–418
Decaborane(14), 4:185–186, 189
physical properties of, 4:184t
Decabromodiphenylethane, physical properties of, 4:355t
Decabromodiphenyl ether, physical properties of, 4:355t
Decabromodiphenyl oxide (Deca), 11:455, 466
formulations, 11:460t
1,9-Decadiene, 4:374
Decadic absorbance, 23:126
trans-2,4-Decadienoic acid, physical properties, 5:33t
Decaffeinated coffee, 7:263
1,1,1,2,3,4,4,5,5,5-Decafluoropentane, 13:724–725
Decahydronaphthalenes, 17:75t, 76–77
Decahydroquinoline, 21:187
Decal inks, 14:329
Decalol, aroma chemical derived from naphthalene, 3:235
Decalyl esters, aroma chemical derived from naphthalene, 3:235
Decamethylene disocyanate, melt polymerization of, 23:736
Decanal, physical properties of, 2:61t
Decane, spontaneous ignition temperature, 7:438t
Decanoic acid, physical properties of, 5:29t
Decanol, properties of commercial, 2:12t
1-Decanol, physical properties of, 2:3t
n-Decanol, 13:24t
list pricing, 2:9t
as a plant growth regulator, 13:30
thermal, flammable, and critical properties of, 2:4t
Decanter centrifuge materials of construction, 5:524
operation, 5:538–542
theory of performance, 5:508, 515–516
Decarboxylation, 14:280, 281
of diacyl peroxides, 14:283
of hydroxybenzoic acids, 22:4
of maleic anhydride, 15:490
Decarboxylation reactions, microwaves in, 16:546
2,4,6,8-Decatetraene, color, 7:331
Decay constants, 21:291–294
Decay data, 21:313–314
Decay equations, 21:293
Decay schemes, 21:301–303
γ-Decay, 21:299–301
9-Decenoic acid, physical properties, 5:31t
### cis-4-Decenoic Acid, Physical Properties

- cis-4-Decenoic acid, physical properties, 5:31t
- trans-4-Decenoic acid, physical properties, 5:31t
- Decene, 17:726
- Decolorization in cane sugar refining, 23:452
- Decolorized dyebaths, recovery and reuse of, 9:452–453
- Decomposition of hydrogen peroxide, 14:37–38
- of maleic anhydride, 15:490
- of hydrogen peroxide, 14:61–63
- Decomposition reactions
  - acetaldehyde, 1:102
  - acetic acid, 1:118
  - acetylene, 1:181
  - amine oxides, 2:466–467
- Decomposition tests, of hydrogen peroxide, 14:60
- Decontamination
  - chemical warfare agents, 5:835–836
  - in radioactive waste management, 25:853
- Deconvolution technique, 14:237
- Decoration, gold, 12:693–694, 703
- Decorative cosmetics, 7:860–862
- Decorative laminates, phenolic resins in, 18:789–790
- Decorative plating, 9:765–767, 769
- Décor paper, 18:129
- Decorticated black pepper, 23:162–163
- 4-Decylaniline (4DA), 14:479–480
- n-Decyl chloroformate, molecular formula, 6:291t
- n-Decyl formate, physical properties, 6:292t
- Decyl oleate, in shaving products, 7:852
- Decyl polyglucose, cosmetic surfactant, 7:834t
- Decyl tetradecanol, in cosmetic molded sticks, 7:840t
- 9-Decynoic acid, 5:34t
- Dedicated facility design, 11:47
- DEDM hydantoin, antimicrobial used in cosmetics, 7:831t
- Dee Fo, foam ban, commercial defoamer, 8:241t
- Deep-sea manganese nodules, 15:542, 566–567
- Deep-sea nodules, metal content of, 15:544t
- Deep Shaft process, in biological waste treatment, 25:905
- “Deep shaft” reactor, 15:713, 714
- Deep tank aeration, in biological waste treatment, 25:905
- Deep-ultraviolet chemically amplified resists, 15:163–181
- Deepwater barges, 25:327
- Deep-well turbine pumps, 21:68
- Deesterification, of aspartame, 24:227
- DEET, 2:549t
- Defaunation, 10:871
- D,E,F color scale, 7:310
- Defect Action Levels (DALs), 23:160
- Defects, in silicon-based semiconductors, 22:232
- Defect states, in amorphous semiconductors, 22:128–129
- Defense applications, for high performance fibers, 13:397–398
- Defense-in-depth concept, for nuclear power plant design, 17:534–536
- Defense Logistics Agency (DLA), 14:201
- Defensins, 18:258–259
- amino acid sequence of, 18:259t
- Deferred maintenance, 15:465, 472
- Deferriferrioxamine B, 14:557
- Deficiency diseases
  - biotin, 25:800
  - cereal grains and, 26:290–292
  - folic acid, 25:802
  - niacin, 25:797
  - pantothenic acid, 25:799
  - vitamin A, 25:789
vitamin B₁, 25:796
vitamin B₂, 25:797
vitamin B₆, 25:799
vitamin B₁₂, 25:804
vitamin C, 25:805
vitamin E, 25:794
vitamin K, 25:795
vitamins and, 25:781–782, 784


Deflagrating explosives, 10:719–720
Deflagrating explosive materials, effects for, 10:722t
Deflagration, 10:719
acetylene, 1:183–184
rate of, 10:720
transition to detonation, 10:721
Deflection temperature testing, 19:577
Deflection temperature under load (DTUL), 10:177
Deflector plate nozzle, 23:179
Deflocculants, ceramics processing, 5:647
Deflocculation, 22:56
anthropogenic silicas and silicates in, 22:473

Defoamers, 8:236–254; 9:23
applications, 8:245–249
commercial sources, 8:240, 241t
components, 8:237–240
defoaming theory, 8:241–245
economic aspects, 8:249–250
health and safety factors, 8:251–252
in paper manufacture, 18:118
in polymer colloids, 20:386
silica in, 22:376
surface tension, 8:244t
test methods, 8:250–251
Defoaming, 8:240–242
Defoaming (antifoaming) agents, 25
in diesel fuel, 12:428
in food, 12:63–64
Deformable bodies, flow past, 11:775–777
Deformation, defined, 21:702
Deformation maps, 13:479–480
Deformation processing, of metal–matrix composites, 16:169–171
Deformation strain, 13:473
Defrost controllers, in refrigeration systems, 21:540
Degassing, in solid–liquid separation, 11:343
Degenerate four-wave mixing (DFWM), 17:456
Degeneration, 25:205
Degradable-cross-linking-agent hydrogels, 13:740–741
Degradable implants, shape-memory polymers in, 22:355
Degradable-pendant-chain hydrogels, 13:741
Degradable-polymer-backbone hydrogels, 13:739–740
Degradable polymers, production of, 23:426
Degradable surgical sutures, 3:735
Degradation
acrylamide polymers, 1:312
of L-ascorbic acid, 25:751
characterizing products produced from, 9:442
design for, 12:805
herbicide, 13:309
of high density polyethylene, 20:166–167
of polychloroprene polymers, 19:845–846
during pulp bleaching, 21:34–35
of styrene plastics, 23:372–373
of triazine herbicides, 13:321–322
Degradation chemistry, of VDC polymers, 25:711–719
Degradation products, biocompatibility of, 24:222
Degradative shrink-resist treatments, 26:391
Degree Celsius, 24:435. See also Celsius scale
Degree of acetylation (DA), of chitosan, 20:567
Degree of condensation, in melamine resins, 15:777
Degree of cure, estimating, 10:426
Degree of dissociation, for ionic surfactants, 24:130
Degree of polymerization (DP), 10:305
of cellulose, 21:5–6
Degrees Baumé (°Bé), 24:282
Degrees of esterification (DE), of pectins, 20:564
Degrees of freedom, 24:682
Degrees of polymerization (DP), 23:384
Degrees pol, 23:473
Degudent, gold-based dental alloy, 8:307t
Degumming, of oils, 10:807
DEHA, 2:549t
Dehumidification, dessicant applications, 8:356t
Dehydrated onions, 23:169
Dehydrating agents, phosphorus (V) oxide, 19:50–51
Dehydration
of amyl alcohols, 2:763, 766–768
of ethyl alcohol, 10:531
food preservation by, 12:84–85
higher aliphatic alcohols, 2:5
of maleic anhydride, 15:492
molecular sieves in, 16:840
of natural gas, 12:374–375
in the sol–gel process, 23:60
Dehydro-3-epiandrosterone (DHEA), 2:815
Dehydro-10-undecylenic acid, 5:34t
Dehydroacetic acid, antimicrobial used in cosmetics, 7:831t
Dehydroascorbic acid, 25:760, 771
Dehydrochlorination, incomplete, 10:358
in VDC polymer degradation, 25:712–719
7-Dehydrocholesterol, 25:791, 792
Dehydrocoupling reaction, 25:181
Dehydrogenases, 3:672
Dehydrogenating condensations, 12:171
Dehydrogenation, 10:620
catalytic, 17:723–724
in catalytic reforming, 18:658
of cyclohexane, 13:706
of ethane, 10:619
of ethyl alcohol (ethanol), 10:531, 554
of ethylbenzene, 23:334–342
of higher aliphatic alcohols, 2:6
of quinone, 21:242–243
silver in, 22:659
Dehydrogenation catalysts, 23:336–337
cerium application, 5:687–688
Dehydrogenation reactors, 23:334–335
Dehydrogenation technology, fluidized bed, 20:779
Dehydrogenation units, 23:339–340
Dehydrohydroxycitronellol, 24:508
Dehydro-L-ascorbic acid 1, 25:749, 751
Dehydrolinalool, 3:233, 24:479, 480, 563
allylation of, 24:567
Dehydronerolidol, 24:547
1-Dehydropiperidine, 2:81
De-icing
calcium chloride application, 4:566
salt in, 22:814, 817
De-inking
bentonite application, 6:691–692
in paper recycling, 21:435
De-inking paper
detersive systems used in scouring of raw, 8:413t
De-ionization, 14:396
of recycled water, 14:423
water, 14:416
Delaney Clause (Food Additives Amendment), 12:35–36;
18:538–539
Delayed (latent) toxicity, 25:203, 204t
Delayed action drug delivery systems, 18:712
Delayed coking, 18:649–650
Delayed coking technology, 12:721–722
Delignification, 21:21
chemistry of, 21:23–26
in the kraft process, 21:22
in organosolv pulping, 21:30
Deliquoring, in solid–liquid separation, 11:344
Delivery methods, for high purity gases, 13:463
Delivery receipt, 25:330
Delocalized cationic azo dyes, 9:423
Delta-3-carene (D-3-carene), 24:499
δ-alumina, 2:404, 406t
Delta coke, 11:704
δ-damascone, 24:570
Delta furnace, in phosphorus manufacture, 19:8–9
δ-manganese dioxides, 15:584–585
Deltametrin, 4:358t
Deltamycins, 15:287–290
Deltanoids, 25:792–793
Delta phase soaps, 22:729
δ-tocopherol, 25:793, 794
Delta-type pump–mixing impeller, 10:775
Deltazene, molecular formula and structure, 5:97t, 118t
Delusterants, in continuous-filament yarns, 19:757
Del Vecchio experimental design text; versus other texts, 8:395t
Demadex, 5:169
molecular formula and structure, 5:164t
Demagnetizing effect, in superconductors, 23:811–812
Demanding contents, thermoplastic polyester bottles for, 20:52–53
Demecarium bromide, 4:360t
Demethanizer overhead expander, 10:616
Demethoxylation, during alkaline pulping, 21:23–24
6-Demethyl-6-deoxytetracycline, 24:592
Demineralization water softening method, 26:23
Deming, W. Edwards, 15:479; 21:171
Demisexual derivatives
in gasoline, 12:410–411
for lubricants, 15:226
Demurrage charges, 25:325
Demycarosylangolamycin, 15:292
Denaturant, ethyl ether as, 10:581
Denatured alcohols, 10:548
solvent for cosmetics, 7:832
Denatured ethanol
production of, 11:8
uses for, 10:553–554
Dendrimer-stabilized quantum dots, 26:804–805
Dendrimer synthesis, 26:797–788
breakthrough approaches in, 26:788
“Dendritic box,” 26:790
Dendritic silver, 19:367–368
Dendritic nanoparticles, water-soluble, 26:796
Dendritic polysomes, fullerene, 12:252
Dendritic salt, 22:805
Dendritic siloxanes, synthesis of, 22:554
Dendrobine, 2:102
Dendrochronology, in fine art examination/conservation, 11:418
Dendrogram, 6:16
Dendrophanes, 26:790
Denier, 11:182, 247
Denim finishing, 10:302–303
Denitrification, 3:757t
Denitrifying conditions, defined, 3:757t
Denitration pots, 25:405
Denitrator, fluidized bed, 25:406
Denitrification
as advanced wastewater treatment, 25:907–908
defined, 3:757t
Denoxification, 17:788
DENOX units, 10:605
Dense medium separation (DMS), 16:633–636
Dense medium separators, desliming of the feed to, 16:635
Dense medium separators, desliming of the feed to, 16:635
Dense metal membranes, 15:800
Dense nonaqueous phase liquids (DNAPLs), in soil and ground water treatment, 25:834
Dense symmetrical membranes, 15:800–801
Densification, 10:424; 23:58
in ferroelectric preparation, 11:99
in the sol–gel process, 23:60–61, 73–75
Densified refuse-derived fuel (d-RDF), 21:369
Densifiers, 9:36–37
Density
  centrifugal separation by difference, 5:506–511
  exponents of dimensions in absolute, gravitational, and engineering systems, 8:584t
  of aqueous sodium hydrosulfide solutions, 22:870
  of aqueous sodium sulfide solutions, 22:873
  of calcium oxide, 15:42
  of diesel fuel, 12:424
  of ethylene oxide polymers, 10:674
  of fats and oils, 10:822
  of fillers, 11:305–306
  of ion-exchange resins, 14:393
  of ionic liquids, 26:858
  of LDPE, 20:228
  of limestone, 15:31
  of LLDPE, 20:203–204
  of LLDPE resins, 20:181
  as a property of steam, 23:203
  of a pure fluid, 24:3
  of silicones, 22:600
  of slaked lime, 15:44
  thermoplastic, 10:174–175
  of vitreous silica, 22:422–42
Density function, 26:987
Density functional techniques, 16:751
Density functional theory (DFT), 21:138
Density-functional theoretical studies, 16:104
Density measurements, 13:409
  equilibrium volume parameters from, 13:435–436
  in sugar analysis, 23:474
Density of defect states (DOS), 22:128
  in amorphous semiconductors, 22:128–129, 131–133
  controlling, 22:129
Density of states (DOS), 22:234
Density of states calculations, 17:203
Dental abrasives, 8:338–339
Dental amalgams, 8:301–319
  mercury in, 16:41
  tin in, 24:798
Dental applications
  of platinum-group metals, 19:628–629
  U.S. patents in, 12:612t
Dental ceramics, 8:274–278
Dental devices, shape memory alloys, 3:745
Dental glass–ceramics, 8:276–277
Dental implants, 8:342–345
Dental industry, electroless deposition in, 9:700
Dental inlay casting wax, 8:297
  specification, 8:300t
Dental investments, 8:292–295
Dental materials, 8:274–354
  calcium phosphate materials, 8:341–342
  fluorides, 8:339–341
  therapeutic, 8:339–341
Dental plasters, 8:288–292
Dental stones, 8:291–292
  compressive strength, 8:289t
Dental waxes, 8:296–300
n-Dentate ligands, 14:547
Dentifrices, 7:851. See also Toothpastes
  sodium fluoride in, 22:825
Dentin adhesives, 8:336–338
Dentistry
  gold casting alloys in, 12:697
  gold in, 12:693
  silver in, 22:657, 660
Denture adhesives, ethylene oxide polymers in, 10:686
Denture bases, 8:319–323
Denture reliners, 8:323–324
Deodorant fragrances, 18:364
Deodorants, 7:847–848
Deodorization
  in soap making, 22:735
  of oils, 10:814
Deodorized oils, viscosity of, 10:821t
Deoxidized copper, 7:751
Deoxidizers
  alkaline, 16:223
  ferrosilicon as, 22:516
  silicon as, 22:515
Deoximation reactions, microwaves in, 16:561–562
Deoxycholic acid, inclusion compounds, 14:175
2-Deoxy-D-glucose, 2:813
2-Deoxy-D-ribose
(2-deoxy-D-erythro-pentose), 4:710

6-Deoxy-L-ascorbic acid, 25:761
Deoxynupharidine, 2:102
Deoxyoligonucleotides, 17:621
Deoxyribonucleic acid (DNA), 12:448–449; 17:602–603; 20:445–447. See also
A-DNA; B-DNA; cDNA; Cloned DNA; DNA entries; Genomic DNA libraries;
Passenger DNA; Plasmid DNAs; Recombinant DNA entries; Transferred deoxyribonucleic acid
(T-DNA); Vector DNA; Z-DNA
analysis of, 12:454
liquid crystalline structures in, 15:112
molecular dynamics simulations of, 17:607
molecular weights of, 20:446–447
noncovalent labeling of, 20:519
relaxed closed-circular, 17:611
sequence-dependent cleavage
of, 12:497–498
silver ion versus bacterial, 22:678
techniques for labeling, 21:281–282
transfer between Streptomyces species, 12:478
Deoxyribonucleic acid (DNA) manipulation
technologies, 10:262. See also DNA
shuffling

6-Deoxytetracyclines, 24:595, 596
Deoxothymidylic acid (dTMP), folic acid
and, 25:801
Deoxyuridylic acid (dUMP), folic acid and, 25:801
Department of Agriculture (DOA), bioengineering research, 1:702. See also U.S. Department of Agriculture (USDA)
Department of Commerce (DOC), help for
commercialization of advanced materials, 1:697
Department of Defense (DOD), help for commercialization of advanced materials, 1:697
reserve battery research, 3:467
thin film research, 1:724
Department of Energy (DOE). See also U.S. Department of Energy (DOE)
bioengineering research, 1:702
biomass energy research, 3:690–691
help for commercialization of advanced materials, 1:697
thin film research, 1:702
Department of Transportation (DOT).
See also DOT entries; U.S. Department of Transportation (DOT)
anthropogenic silicas and silicates and,
22:467
Hazardous Materials Table, 20:809
Dependent chemical reactions, 21:336–337
Dephlegmators, 8:54–56; 10:616
Depleted uranium, 25:421
Depletion allowance, 9:539
Depletion flocculation, 10:122, 123
Depletion provisions, magnesium, 15:347
Depletion region, 14:838; 23:35
width, 22:244
Depolarization, in cardiac
electrophysiology, 5:81–86
Depolymerization
in silicate solutions, 22:458–459
of silicones, 22:598
Depolymerized scrap rubber, 21:467
Deposit control agents, 26:139
Deposition, in the hydrogeochemical cycle,
26:10–12
Deposition-in-vacuum thin-film
techniques, 23:12–13
Deposition reactions, 9:688
Deposition techniques, 23:842
for metal–matrix composites,
16:172–173
Deposition technology, thin film, 23:6–7
Deposits, cooling system, 26:138
Depreciation, 9:539
book-basis, 9:540
Depressants, in froth flotation, 14:733;
16:645
Depressurization of an expanded liquid
organic solution (DELOS), 24:17, 18
Depropanizer, 10:614, 615
Deprotection reactions, 15:168–169, 170,
172, 173, 183
Deprotonation, 15:654
alkylborane, 13:660
Depth filters, 15:827, 828
Depth filtration, in protein separation,
12:136
Depth filtration theory, 11:322, 323,
337–341
advanced modeling for, 11:341
Depth-of-cut notching, cutting tool failure
mode, 4:660
Depth of field (DOF), in microscopy, 16:474
Depth profiling, 24:98–100
considerations related to, 24:100
Depth sensitivity, in surface analysis, 24:74–75
Depth-type cartridges, for cartridge filters, 11:368–369
DEREK, 6:19
De Re Metallica (Agricola), 16:126, 595
Derivative fibers, 11:247; 24:616
Derivative formation, from hydrogen peroxide, 14:67
Derivatives, reducing, 12:805
Derivative spectroscopy, 23:139, 144
Derivatization
for analysis, 22:692–695
silylating agents and, 22:692
Derivatizing agents, 6:75
achiral, 6:96t
chiral, 6:76t
Derived air concentration (DAC), 19:702
Derived units, in SI system, I:xi–xiv;
2–26:ix–xii
Derjaguin–Landau–Verwey–Overbeek (DLVO) theory, 14:709
Dermal exposure, to ethylene oxide, 10:660–661
Dermal irritation/sensitization, 9:47.
See also Skin entries
Dermaseptin(s), 18:254, 263–265
amino acid sequence of, 18:264t
properties of, 18:264
Dermaseptin derivatives, 18:266
Dermatan sulfates, 4:706; 20:457
classification by structure, 4:723t
Dermatin sulfate, 4:98
Dermatitis
arsenic and, 3:278
selenium and, 22:101
Dermatological problems, surfactant-related, 24:153–154. See also Skin irritants
Derwent Direct, 18:226
Derwent Information Ltd., 18:211, 216–227
Derwent patent database, 18:222–223
Derwent’s FARMDOC–AGDOC–CHEMDOC code, 18:242. See also FARMDOC service
Derwent World Patents Index (WPI), 18:244–246
Desalination, 21:649. See also
Desalt-entries; Water desalination
brackish water, 15:834–835, 837
composite membranes in, 16:14–15
hollow fiber membranes in, 16:22
reverse osmosis in, 21:643, 648–650
seawater, 15:834
solar, 26:89–94
use of steam in, 23:240
wind energy in, 26:93–94
Desalination organizations, 26:102
Desalination processes, 26:59, 61
Desalination systems, hybrid, 26:94–96
Desalination technologies, progress in, 26:97
Desalinator(s), 26:55
Desalted water, cost of, 26:59. See also Desalination
Desalting, in petroleum processing, 18:644–645
Desalting electrodialysis, 14:120, 121
Descaling, sodium in, 22:777
Descriptive analysis
in flavor characterization, 11:514
of wine, 26:325
Descriptive marks, 25:256–257
Descriptive sampling, 26:1005
Desertification, United Nations program to combat, 24:169
Des-F(6)-quinolone derivatives, 21:225
Des-F(6)-quinolones, 21:222, 223–224,
226–227
Desiccants, 8:355–382; 10:477, 22:45
economic aspects of, 18:535–536
Desi cottons, 8:3
Design. See also Computer-aided molecular design (CAMD); Design margins;
Header design; Experimental design;
Process design; Product design;
Thermal design parameters
of ammonia plant, 26:995–996
of control systems, 26:1045–1047
inherently safe, 13:170
for reliability, 26:991
Design and operating controls, 21:832–833
Design calculations, precision in, 20:716–717
Design category, in patents, 18:166
Design codes, for tanks, 24:303
Design deficiencies, as a cause of tank spills
and leaks, 24:309
Designease 6.0.6, features compared to
other software, 8:398t
Designer drugs, 24:174
Design expert 6.0.5
features compared to other software, 8:398t
Design failure, 26:982
Design flowsheets, 20:718–720
Design for the Environment (DfE), 12:806
Design Institute for Emergency Relief Systems (DIERS), 21:850
Design limit testing, for reliability, 26:991
Design loading, of screens, 22:281
Design margins, heat transfer, 13:256–263
background variables and blocking, 8:386–388
combinatorial chemistry, 8:400–401
commercial software, 8:403–404
commercial software features compared, 8:398t
experimental environment and constraints, 8:389–392
experimental variables, 8:384–389
formal experimental plans, 8:394–400
multiple response variables, 8:403
preliminary estimate of repeatability, 8:391–392
primary variables, 8:386–387
prior knowledge, 8:390–391
purpose and scope of experiments, 8:384
response variables, 8:391
stagewise experimentation, 8:392–393
statistical tools for analysis of designed experiments, 8:401–403
summary of important texts, 8:396t
uncontrolled variables and randomization, 8:388–389
variables held constant, 8:389
Design options, formulation of, 20:716
Design patents, 18:182
Design phase, in fine chemical production, 11:432–433
Design problem, formulating as a mathematical model, 20:727
Design qualification (DQ), in fine chemical production, 11:432–433
Design safety features, of nuclear power facilities, 17:536–538
Design software, 3D, 19:519–521
Design specifications, increasing, 20:717
Desilylation reactions, microwaves in, 16:559
Desizing, 10:302
Desliming, 22:279, 282
Desmycosin, 15:292
Desolvation encapsulation technology, 16:450–451
Desorbate, 1:613
Desorbing, 1:675
Desorption, 1:27
processes for, 1:613
DESOX technology, 11:690–692
Desoxyn Gradumet, 3:91, 92t
Despeissis, L. H., 11:248
Desserts, citric acid in, 6:646
Dessert wines, 26:315–316
Dessicant cooling, 8:379
adsorbents for, 1:612, 613
Dessicants, 1:589–590, 611–612
adsorption capacity versus years of service, 1:630
adsorption plots, 8:375–377
applications, 8:356t
chlorate application, 6:116
closed-system drying, 8:362–365
compatibility, 8:358
dynamic adsorption drying system design, 8:371–377
dynamic drying, 8:365–371
economic aspects, 8:377–379
kaolin application, 6:688t, 696
liquid, 8:365–366
mechanism, 8:355–357
properties and applications of, 1:587t
smectites application, 6:697t, 699
solid, 8:367–371
static drying, 8:358–365
water analysis, 8:357–358
Destec gasifier, defined, 6:827
Destinations, for separation synthesis, 22:315
Destruction and removal efficiency (DRE) limits, 13:183, 184
Destructive hydroprocesses, 18:654–655
Desugaring, of molasses, 23:453–454, 465–466
Desulfogypsum, 4:591–593, 595
Desulfuration, 1:650; 10:785
Desulfurizing reagents, calcium carbide application, 4:549–550
Deswelling process, for solvent removal, 23:104
Detailed labor/material construction cost estimation, 19:465
Detection techniques, electrophoretic, 9:752–756

Detectors
capillary electrophoresis, 4:634–635
chromatography, 6:374
gas chromatography, 4:613–615; 6:380–381, 425–432
liquid chromatography, 4:622–623; 6:386–387, 448–452
photon, 22:180–182
supercritical fluid chromatography, 4:631

Detergency and detergents, 8:411–456.
See also Detergents
factors influencing, 8:420–426
measurement of, 8:437–442
oily-soil, 8:433–437
solid-soil, 8:428–433

Detergent additives
to diesel fuels, 12:427
to gasoline, 12:408–410
Detergent alkylation, 2:189–194
Detergent alkylation sulfonation processes,
batch and continuous, 23:542t
Detergent alklylation, 14:19
Detergent analysis, of water, 26:42–43
Detergent builders, molecular sieves as, 16:847
Detergent enzyme granulates, 10:272–273
Detergent enzymes, 10:273–286
cleaning effects of, 10:275
functions of, 10:274–275
performance evaluation of, 10:276–278
Detergent fragrances, 18:362
Detergent industry
economic aspects of, 10:311
enzyme use in, 10:252
sodium sulfate standards for, 22:867
Detergent inhibitors, 15:222
Detergent proteases, 10:278–279
Detergent range alcohols
chain length and linearity, 2:10t
deﬁned, 2:1–2
economic aspects, 2:7–8
list pricing, 2:8t
physical properties of, 2:4
properties of commercial linear, 2:11t
specifications and standards, 2:10–12
uses of, 2:19–21, 20t
U.S. producers, 2:8t
Detergents, 8:411–456; 22:756
acute oral LD50 ranges, 8:446t
alkanolamines from olefin oxides
and ammonia, 2:137
amine oxides, 2:472–473
analytical methods, 8:445
anthropogenic silicas and silicates in, 22:470
citric acid in, 6:646–647
classification of, 15:423
CMC applications, 5:452t
components, 8:412–414, 413t
dispersant applications, 8:692
environmental considerations, 8:447–449
eutrophication and, 8:448–449
fats in, 10:829–831
fatty acid amides, 2:453–457
foams in, 12:23
formulation, 8:414–420
health and safety factors, 8:445–447
higher olefins in, 17:725–726
ionic stabilization, 8:430–433
kaolin application, 6:688t
for lubricating oil and grease, 15:222
manufacture of, 8:442–444
mechanism, 8:426–437
quaternary ammonium compounds, 2:749–751
smectites application, 6:697t
steric stabilization, 8:433
U.S. citric acid/citrate distribution, 6:643t
Deterioration, failures due to, 26:982
Deterioration technologies, 15:468–470
Dethioacetalization reaction, microwaves in, 16:559–561
Dethiocarbonylation, microwaves in, 16:562
Detinning facilities, 21:405
DETOL process, 3:607
Detonating explosive materials,
10:720–721
effects for, 10:722t
Detonation, 10:71
acetylene, 1:183–1849
burning to, 10:721
of commercial hydrogen peroxide, 14:63
shock to, 10:721–722
Detoxiﬁcation, ascorbic acid in, 25:769
Detro-inertinite, 6:707t
Detro-vitrinite, 6:707t
Deuterated hydrocarbons, synthesis of, 13:667–668
Deuterium, 8:456–485; 13:759. See also Canadian Deuterium Uranium (CANDU) reactors
analytical methods, 8:467–468
economic aspects, 8:467
health and safety factors, 8:461–462
physical properties, 8:457–462, 459t
production of heavy water, 8:459t, 462–467
uses of, 8:468–469
Deuterium fusion, 8:468–469
Deuterium nmr spectroscopy, filled networks and, 19:565; 22:571
Deuterium selenide, 22:86
Deuterium tryglycine sulfate (DTGS), 14:226
Deutsches Electronen-Synchrotron (DESY), aerogel application, 1:766
Deutsche Texaco one-step MIBK process, 16:339
Devarda’s method, 17:191
Developers
in chromogenic chemistry, 19:245–248
for photothermographic/thermographic imaging materials, 19:346–350
in Polacolor film, 19:298
Developer solutions. See also Development solution
activity of, 19:205–206
composition of, 19:204–206
Developing agents
in color photography, 19:247
incorporation of, 19:211
Development. See also Development process
adjacency effects during, 19:209–210
chemistry and mechanism of, 19:206–208
initiation of, 19:208
oxidation by-products of, 19:208
photographic, 19:177, 204–212
role of binders in, 19:359–360
source of silver ions during, 19:208
special methods of, 19:211–212
temperature dependence of, 19:207–208
thermal, 19:358–359
Development inhibitors, 19:258
Development-inhibitor-releasing (DIR) couplers, 19:243, 262
in chromogenic chemistry, 19:257–260
Development process
for reliability, 26:991
technical service and, 24:348
Development scale (kilo-lab) pilot plants, 19:459
Development solution, agitation of,
19:208. See also Developer solutions
Deviations, for polymethine dyes, 20:509
Devices, manufacturing considerations, 5:777
Device scaling, of FETs, 22:253–255
Devil process, 22:760, 766
Devitrification, 12:578
of vitreous silica, 22:420–421
Devolatilization, defined, 6:827
See also Dewatering method
coal, 6:747
polyacrylamide polymers for, 1:324
of resins, 14:398
thermal, 16:660
Dewatering method
in petroleum processing, 18:644–645
for phosphate salt manufacture, 18:852–853
Dewaxing, 15:216–217
molecular sieves in, 16:844
of oils, 10:807
in petroleum refining, 18:662, 670, 671
Dew point, 9:97
calculation of, 24:680
Dew retting, 11:291, 292, 604–606
disadvantages of, 11:606–608
Dexanthation, of viscose, 11:255
Dextrantrim, 3:90
Dextrompheniramine, 4:359t
Dexfenfluramine, 3:93
Dexon sutures, 24:222
Dexsilk, 4:204
Dextran, 4:724t; 20:454; 23:481
hemoglobin modifiers, 4:114, 122
in beets, 23:463
Dextrins, 1:547; 4:720, 724t
in beer, 3:582t
Dextrose, 4:703
formation of, 10:289
uses of, 4:714
Dezincing, lead refining by, 14:754–755
DGEBA-aromatic polyamine adduct system, 10:416, 417. See also
Diglycidyl ether of bisphenol A (DGEBA)
N,N'-Di-(1-cyclohexylmethyl)piperazine, 8:492
Di-2-ethylhexyl (2-EHP) percarbonate, 6:303
Di-2-ethylhexyl carbonate
molecular formula, 6:305t
physical properties, 6:306t
Di-2-ethylhexylphthalate (DEHP), 25:
Di-4-tert-butylcyclohexyl percarbonate, 6:
Diabetes, 2:810
and chromium deficient diets, 6:550
biosensors for glucose control, 3:811
and obesity, 3:87
Diabetic neuropathy, 2:812
2,3:4,6-Diacetone-2-keto-l-gulonic acid
(DAG), in ascorbic acid manufacture,
25:756, 757–758
Diacetoneacrylamide, 1:295
Diacetone alcohol (DAA), 1:164, 174;
14:581–583
in methyl isobutyl ketone production,
16:333
production of, 16:335–336
Diacetone amine, production from acetone,
1:163
2,3:4,6-Diacetone-L-sorbose (DAS), in
ascorbic acid production, 25:753, 754,
756, 757
Diacetoxyacrylonitrile (DAN) immunoassay,
14:144–147
Diacetyl, 23:483
Diacetyl control, 10:293
Diacetyl peroxide, 1:148
Diacetyl rest, in beer making, 3:584
Diacrylamide, 1:293
Diacylglycerols, 10:802
Diacyl hydrazines, 13:599
Diacyl peroxides, 14:281; 18:467
decomposition of, 18:473
as free-radical initiators, 14:282–284
hydrolysis and perhydrolysis of, 18:466, 473
preparation of, 18:476
properties of, 18:468–469t
reaction with amines, 18:474
reduction of, 18:474
symmetrical or unsymmetrical, 18:477
uses of, 18:472
Diafiltration, 12:137–138
Diagenesis, 5:753; 15:30
Diagnostic products, 3:816
cellulose ester applications, 5:408
Diagnostics
for MOCVD, 22:155–156
microarrays in, 16:390, 392–393
supramolecular chemistry in, 24:54–55
Diagnostic sensors, 24:54–55
Diagnostics while drilling (DWD)
techniques, 12:527
Diaion HPK-25, properties
and applications, 1:587t
Dialdoses, 4:711
Dialkanolamine titanates, 25:95
Dialkoxyboranes, 13:639
Dialkoxydichlorotitanium alcoholate, 25:83
Dialkoxytitanium diacylates, 25:96
Dialkoxytitanium dichloride, 25:83
Dialkyl alkylphosphonates, 19:37, 54
Dialkylamines, 13:105
Dialkylamidines, 9:411
Dialkylation phenols, 2:228–231
Dialkylbenzenes, isomerization of, 12:163
Dialkylboranes, 13:632, 633, 635
primary, 13:636
Dialkyl derivatives, in silicone network
preparation, 22:562
Dialkyl (C12–C18) dimethylammonium
chloride, 24:147
hair cleaner ingredient, 7:850t
Dialkyltrimethylammonium quaternary
higher alcohols, 2:21
Dialkylgold(III) halides, 12:708
Dialkylhydrazines, unsymmetrical, 13:571
Dialkyl peroxides, 14:281; 18:434, 436–448
α-oxygen-substituted, 18:448–460
chemical properties of, 18:439–444
decompositions of, 18:441
physical properties of, 18:436–439
primary and secondary, 18:439,
441–442
synthesis of, 18:444–448
unsymmetrical and symmetrical,
18:445–446
Dialkyl peroxydicarbonates, 18:477
decomposition of, 18:474–475
as free-radical initiators, 14:289–290
properties of, 18:470–471t
Dialkylphenacyl sulfonium salts, 10:414–
415
Dialkylphosphates, 19:51
Dialkyl phosphonates, manufacture of, 19:37
Dialkyl succinates, 23:419
Dialkylsulfosuccinates, 23:526
emulsifiers, detergents, and dispersants, 8:710t
Dialkylthallium(III) derivatives, 24:634
Dialkyl thiodipropionates, 3:111–112
Dialkyltin compounds, as PVC stabilizers, 24:821
Diallyl, 2:252
Diallylamine, 2:538t
physical and chemical properties of, 2:540t
Diallyl ammonium monomers, 20:472
Diallyl ammonium polymers, 2:267
Diallyl carbonate molecular formula, 6:305t
physical properties, 6:306t
Diallyl carbonate cast plastics, 2:252–257
physical properties of, 2:253t
Diallylcyanamide, 8:160
Diallyl esters, 2:263–264
Diallyl ether, 2:252
Diallyl isophthalate (DAIP), 2:258, 261
physical properties of, 2:258t
thermoset molding properties of, 2:262t
Diallyl phthalates (DAP), 2:258–263; 20:110
copolymerization, 2:259–260
Diallyl terephthalate (DATP), 2:259
DIALOG file, 18:246
DIALOG OneSearch, 18:244
-dial suffix, 2:58
Dialysate, 26:814, 815
composition of, 26:817
Dialysis. See also Hemodialysis
alternative modes of, 26:832–833
requirements for adequate, 26:821–822
treatment time and frequency of, 26:833–834
Dialysis, kidney, 15:844–845
Dialysis membrane, hydraulic permeability/ultrafiltration coefficient of, 26:818–819
Dialyzer model, 26:817
Dialyzers
design and performance of, 26:831
design changes in, 26:833
mass transport requirements for, 26:818–823
sterilizability and reuse of, 26:824
sterilization techniques for, 16:19
Diamagnetic defects, in vitreous silica, 22:410
Diamagnetic materials, 15:434
Diamagnetic supercurrents, 23:802–803, 815
Diamagnetism, of silver(III) compounds, 22:676
Diamines. See also Diamines and higher aliphatic amines
electron affinity and basicity values of, 20:267t
in polyamic acid formation, 20:266
Diamines and higher aliphatic amines, 8:485–519
applications, 8:499–507
chemical properties, 8:487–493
economic aspects, 8:495–496
health and safety factors, 8:499
manufacture, 8:493–495
physical properties, 8:485–487, 486t
physical properties of commercial, 8:486t
specifications and test methods, 8:496–497
storage and handling, 8:497–499
1,4-Diamino-2,3-disubstituted anthraquinones, 9:329
1,4-Diaminoanthraquinone-2,3-dicarboxyimide derivatives, 9:322–325
Diaminoanthraquinones, 9:308
1,4-Diaminoanthraquinones, 9:306t, 312–313, 326–327
Diaminobutane (DAB) dendrimers, 26:795–796
Diaminodihydroxyanthraquinone derivatives, 9:325
3,4’-Diaminodiphenyl ether (3,4’ODA), 19:715. See also Copoly(p-phenylene/3,4’-diphenyl ether terephthalamide) (ODA/PPTA)
Diaminodiphenyl sulfone (DDS), 10:454
cis-1,3-Di(aminomethyl)cyclohexane, physical properties of, 2:500t
cis-1,4-Di(aminomethyl)cyclohexane, physical properties of, 2:500t
cis,trans-1,3-Di(aminomethyl)cyclohexane, physical properties of, 2:500t
cis,trans-1,4-Di(aminomethyl)cyclohexane, physical properties of, 2:500t
trans-1,3-Di(aminomethyl)cyclohexane, physical properties of, 2:500t
trans-1,4-Di(aminomethyl)cyclohexane, physical properties of, 2:500t
2,4-Diaminophenol, 2:667
physical properties of, 2:666t
2,4-Diaminophenoxyethanol HCl, intermediate used in oxidation hair
dyes, 7:858t
4,5-Diaminophthalhydrazide (DPH), chemiluminescence reagent, 5:843–844
1,3-Diaminopropane, 8:485
manufacture, 8:495
physical properties, 8:486t
pK values, 8:487t
prices of commercial, 8:496t
typical specifications, 8:496t
Diaminopropanes, 8:485
2,6-Diaminopyridine, 21:123
intermediate used in oxidation hair dyes, 7:858t
2,4-Diaminopyrimidines antibacterials, 3:9
preparation and manufacture, 3:16
therapeutic utility, 3:20
2,4-Diaminooquinolines, 21:192
Diaminotoluene (m-TDA), 25:189
Diaminotriphenyl, soluble dyes, 7:373t
Diammonium citrate, solubility in water, 6:649t
Diammonium dimolybdate, 17:21
Diammonium phosphate (DAP), 11:120–121
manufacture of, 18:854
Diammonium phosphates, 18:835
Diammonium tetraborate tetrahydrate, 4:242t, 276
Diamond, 1:1, 8:519, 530. See also Natural diamond; Synthetic diamond in
ceramics, 5:582
carrier mobility at room temperature, 5:597t
color, 7:335
color and bad gap, 7:335t
crystal structure, 4:734
elastic properties, 5:614t
grinding wheels, 1:21
hardness compared to metals, 5:627t
hardness in various scales, 1:3t
mechanical properties compared to other hard materials, 8:526t
physical properties compared to carbides and nitrides, 4:653t
silicon carbide versus, 22:541
Diamond anvil cell (DAC), 14:232
Diamond electrodes, 9:573
Diamond grit, 8:541
Diamond-like carbides, 4:647, 653t, 654
Diamond-like carbon (DLC), 14:453; 24:744–745
Diamond-like nitrides, 17:201–206
Diamond structure, 22:232
of silicon, 22:481–482
Diamylamine, 2:538t
physical and chemical properties of, 2:540t
Diamyldithiocarbamic acid, zinc salt, 2:550t
Dianemycin, 20:130
Dianhydrides electron affinity and basicity values of, 20:267t
in polyamic acid formation, 20:266
Dianin’s compound, 14:172, 174
Dianions, 14:246, 248
Diantimony tetrachloride oxide, 3:62t
Diaper/incontinence coverstock,
spunbonded nonwoven fabrics for, 17:489–490
Diaper-rash products, 7:842t
Diapers number produced from one bale of cotton, 8:133t
superabsorbent polymer in, 13:753
Diaphragm cells operating characteristics of, 9:629
in sodium hydroxide manufacture, 22:832, 833, 835, 836t, 837, 838, 839
technology of, 9:628
Diaphragm gauges, 20:649–650
Diaphragm meters, 11:655
Diaphragm pumps, 18:65–66; 21:74, 75
Diaphragms (membranes), 9:624–625
in electroorganic systems, 9:656–657
Diaphragm valve, 19:475
Diapirs, 22:798
mining of, 22:806
Diaralkyl peroxides, preparation by autoxidation, 18:447
Di(arenesulfonyl) peroxides, 18:475–476
Diaroyl peroxides, 18:472
in silicone network preparation, 22:562
Diarylbismuthinic acids, 4:31
Diaryl carbonium dyes, 9:259–260
Diaryl disulfides, photooxidative polymerization of, 23:706
Diaryl dithiophosphoric acids, 19:47
Diaryl ethers, 10:575
Diaryl disulfides, photooxidative polymerization of, 23:706
Diaryl dithiophosphoric acids, 19:47
Diaryl ethers, 10:575
Diarylide pigments, 19:427, 434t
carcinogenicity of, 19:452
Diarylide Yellow 83, pigment for plastics, 7:366t
Diarylide Yellow AAMX, pigment for plastics, 7:366t
Diarylide Yellow AAOA, pigment for plastics, 7:366t
Diarylide Yellow AAOT, pigment for plastics, 7:366t
Diarylide yellow pigments, 14:317; 19:433
Diaryliodonium salt photoinitiators, 14:270
Diaryliodonium salts, 19:108
photolysis of, 10:414
Diaryl pyrrolopyrroles (DPPs), 19:441–443
commercial, 19:443t
Diarylthallium(III) derivatives, 24:634
Diaspore, 2:345t, 347, 426
classification, 2:422
decomposition sequence, 2:392, 421
mineralogical and structural properties of, 2:423t
thermodynamic data, 2:423t
Diastase, 10:250
Diastereomere separation, adsorbents for pharmaceuticals, 1:678
Diastolic blood pressure, 5:107, 108
Diastolic ventricular wall tension, 5:108
Diathermy heating techniques, 16:529
Diatomaceous earth, 22:402
as filler, 11:311
Diatomaceous earth filters, for swimming pools, 26:193
Diatomic halides, uses for, 17:337
Diatomite, asbestos substitute, 3:314t
Diazahemicyanine dyes, 9:257
Diazene reductions, 13:570
Diazepam, chloroacetyl chloride in production of, 1:142
Diazinon
bioremediation substrate, 3:777
in microcapsule formulations, 7:564t
toxicity, 7:564t
Diaziridines, 13:580
Diazocarboxyl compounds, 13:658
Diazo coupling reactions, alkylphenols, 2:211–212
Diazolidinyl urea, antimicrobial used in cosmetics, 7:831t
Diazomethane
chiral derivatizing agent, 6:96t
solylization of, 22:696
Diazonaphthoquinone (DNQ), 20:281
Diazonaphthoquinones, in positive-tone photoresists, 15:161–163
Diazonium (Azo) method, for covalent ligand immobilization, 6:396t
Diazonium halides, arylation with, 12:171
Diazonium salt formation, aminophenols, 2:657
Diazonium salts, 9:409–411
salicylic acid and, 22:6
Diazophenols, 9:357
Diazotization reaction, 9:245–247, 350–352
Diazotrophy, 17:295
Diazoxide, 5:169
molecular formula and structure, 5:166t
Dibarium hexakisycanoferate, 14:535
Dibarium oxide triborate, 3:365
Dibasic acid anhydrides, 10:484
Dibasic acids
alkyls from, 2:147, 154
monoesters of, 10:498
Dibasic lead phosphate, 14:791
Dibasic lead phthalate, 14:795–796
Dibasic lead sulfate, 14:790
Dibasic magnesium hypochlorite, 4:52
1,2,5,6-Dibenzacridine, photochromic material, 6:596
Dibenzenes, chromium(0), physical properties, 6:528t
Dibenzo–crown-6, 5:710
molecular formula, 5:713t
Dibenzo[18]crown-6, 7:576; 24:40, 41
Dibenzo[30]crown-10, 24:43
Dibenzo[crown] ethers, 24:50
Dibenzo[uran], 21:152
Dibenzyopyrenquinone dyes, 9:336
Dibenzo[bis]phenenes, 21:152
Dibenzoyl peroxide (BPO), 14:283–284; 18:427
Dibenzoyl peroxides, in silicone network preparation, 22:562
O,O-Dibenzoyltartaric anhydride, chiral derivatizing reagent, 6:76t
Dibenzyamine, 3:595
Dibenzyl carbonate, molecular formula, 6:305t
Dibenzytin dichloride, 24:816
Dibismuth ditellurium selenide, 4:25
Dibismuth ditellurium sulfide, 4:25
Dibismuthenes, 4:30–31
Dibismuthines, 4:29–30
Diblock copolymers, 7:646; 23:367
Diborane, 13:619, 632, 634
Diborane(6), 4:141, 142, 184–185
bonding, 4:181
economic aspects, 4:228
physical properties of, 4:184t
Diboron dioxide, 4:242t
Diboron trioxide, 4:242t, 246
Dibromamine, 13:103
N, N-Dibromamines, 13:105
Dibromamine-T, 13:109
Dibromamine, 4:319
Dibromamine oxide, 4:332
1,2-Dibromo-2,4-dicyanobutane, 4:358t
2-Dibromo-2-butene-1,4-diol, production from acetylene, 1:220
2,2-Dibromo-2-cyanoacetamide (DBNPA), 4:358t
1,2-Dibromo-3-chloropropane, 4:359t
1,3-Dibromo-5,5-dimethylhydantoin (DBDMH), 4:358t, 362; 13:110
bromination reagent, 4:344
Dibromoacetic acid, 1:143
Dibromoborane-dimethyl sulfide, 13:639
1,4-Dibromobutane acetylene-derived, 1:242
physical properties of, 4:350t
Dibromochlorodiphenylantimony, 3:75
Dibromodichloroethane, 6:269
N, N-Dibromodimethylhydantoin, 13:116
Dibromoethylidibromocylohexane, physical properties of, 4:355t
1,2-Dibromoethylene, production from acetylene, 1:180
Dibromohexamidine isethionate, 4:358t
5,5'-Dibromomindigo, 4:361t
Dibromomaleic anhydride, 15:492
Dibromomethane, 4:348
Dibromoneopentyl glycol (DBNPB), 11:478; 20:97, 104
physical properties of, 4:357t
2,3-Dibromopropan-1-ol, physical properties of, 4:351t
1,3-Dibromopropane, physical properties of, 4:350t
1,2-Dibromotetrafluoroethane, 4:348, 348t
Dibromo/tribromo styrene monomers, homopolymers of, 11:470
Dibutylamine, 2:550t
Dibutylnickel, 4:517t
Dibutylcadmium, physical properties of, 4:517t
Dibutylthiocarbamate salt, sodium salt, 2:550t
Dibutylthiocarbamate salt, zinc salt, 2:550t
Dibutylethanolamine, physical properties of, 2:124t
Dibutyl phthalate (DBP), 10:430
Dibutylphthalate number, of silica, 22:371
Dibutyl sebacate, cosmetically useful lipid, 7:833t
Dibutoyltributylamine, 3:73
Dibutyltin diacetate, 24:823
Dibutyltin dilaurate, 24:823
Dicadmium triantimonide, 4:510
Dicalcium aluminosilicate, phase in Portland cement clinker, 5:472t
Dicalcium ferrite, phase in Portland cement clinker, 5:472t
Dicalcium hexaborate pentahydrate, 4:242t, 278
Dicalcium hexakis(cyanoferrate, 14:535
Dicalcium phosphate (DCP), 11:120; 18:837, 838
in dental cements, 8:283
function as ingredient in cosmetics, 7:829t
manufacture of, 18:856
Dicalcium phosphate dihydrate (DCPD), manufacture of, 18:856
Dicalcium silicate hydration, 5:477t
phase in Portland cement clinker, 5:472t
in Portland cement, 5:467
α'-Dicalcium silicate, phase in Portland cement clinker, 5:472t
β'-Dicalcium silicate, phase in Portland cement clinker, 5:472t
Dicamba, 13:315
closo-1,2-Dicarbadodecaborane(12), 4:197
Dicarboxylic acid ligand, 24:768
Dicarboxylic acid recognition, 16:781–782
Dicarboxylic acids, reactions with alkanolamines from olefin oxides and ammonia, 2:128
Dichalcogenides, 26:641
Dichlofenil (Acme Norosac G-10, Casoron-10G), 13:315
herbicide/algicide for aquaculture in U.S., 3:215t
Dichloramine, 13:101, 102–103
Dichloramine-B, 13:109
N,N-Dichloramines, 13:106
Dichloramine-T, 13:109
Dichlorine dioxide, oxidation state and stability, 8:545t
Dichlorine heptoxide, 18:275
Dichlorine hexoxide, oxidation state and stability, 8:545t
Dichlorine monoxide, 8:545–550 oxidation state and stability, 8:545t
Dichlorine tetroxide, oxidation state and stability, 8:545t
Dichlorine trioxide, oxidation state and stability, 8:545t
1,2-Dichloro-1,1,2,2-tetrafluoroethane (Propellant 114), physical properties of, 1:776t
2,4-Dichloro-1-(chloromethyl), physical constants, 6:333t
1,3-Dichloro-2-(chloromethyl), physical constants, 6:333t
1,3-Dichloro-2-(dichloromethyl), physical constants, 6:333t
1,3-Dichloro-2-propanol phosphate, 11:490
3,6-Dichloro-2,4,8,10-tetraoxa-3,9-diphosphaspiro-[5,5]-undecane, 2:49
4,5-Dichloro-2N-octyl-4-isothiazol-3-one, biocide for antifouling coatings, 7:156
1,2-Dichloro-4-(chloromethyl), physical constants, 6:333t
1,2-Dichloro-4-(dichloromethyl), physical constants, 6:333t
1,2-Dichloro-4-(trichloromethyl), physical constants, 6:333t
1,3-Dichloro-5,5-dimethyl hydantoin (DCDMH), 4:53; 13:110
Dichloroacetaldehyde, production from acetaldehyde, 1:105
Dichloroacetic acid, 1:140
N,N-Dichloroalkylamines, 13:105, 106
1,5-Dichloroanthraquinone, 9:314–315
2,4-Dichlorobenzal chloride, physical constants, 6:333t
2,6-Dichlorobenzal chloride, physical constants, 6:333t
3,4-Dichlorobenzal chloride, physical constants, 6:333t
1,2-Dichlorobenzene
Antoine constants, 6:215t
chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
physical and thermodynamic properties, 6:214t
ratio to 1,4-dichloro with various catalysts, 6:215t
toxicity, 6:218t
1,3-Dichlorobenzene, 6:211
Antoine constants, 6:215t
physical and thermodynamic properties, 6:214t
1,4-Dichlorobenzene
Antoine constants, 6:215t
chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
physical and thermodynamic properties, 6:214t
ratio to 1,2-dichloro with various catalysts, 6:215t
toxicity, 6:218t
m-Dichlorobenzene, uses, 6:223–224
o-Dichlorobenzene
chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
economic aspects, 6:220–221
uses, 6:223, 250
p-Dichlorobenzene
chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
economic aspects, 6:220–221
uses, 6:223, 250
3,3'-Dichlorobenzidine, derivative of nitrochlorobenzenes, 6:223t
3,4-Dichlorobenzotrifluoride, physical constants, 6:333t
3,5-Dichlorobenzoyl chloride, 6:327
2,4-Dichlorobenzyl chloride, physical constants, 6:333t
3,4-Dichlorobenzyl chloride, physical constants, 6:333t
Dichloroborane, 4:141
Dichloroborane-1,4-dioxane, 13:638
Dichloroborane complexes, 13:638
Dichlorobutadiene, 19:838
1,4-Dichlorobutane
acetylene-derived, 1:242
end use of chlorine, 6:134t
cis-Dichlorodiammineplatinum(II), 7:597
1,1′-Dichlorodibutyl ether, butyraldehyde derivative, 4:461

Dichlorodifluoromethane (Propellant 12), physical properties of, 1:776t
N,N′-Dichlorodimethylhydantoin, 13:116
Dichlorodimethylsilane, in silicone polymerization, 22:555–556
Dichlorodiphenyltrichloroethane (DDT), 14:339, 340; 18:524
Dichloroethane, 6:253
1,1-Dichloroethane chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
in integrated manufacturing process, 6:237t
production from acetaldehyde, 1:105
1,2-Dichloroethane, 6:253
acrylamide solubility in, 1:290t
bioremediation substrate, 3:772
chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
in integrated manufacturing process, 6:237t
water–formic acid–1,2-dichlorethane azeotrope, 8:823
1,1-Dichloroethylene, 6:257; 25:692.
See also Vinylidene chloride (VDC)
in integrated manufacturing process, 6:237t
1,2-Dichloroethylene, 6:257–259
health and safety factors, 6:259–260
manufacture, 6:258
physical and chemical properties, 6:258
production from acetylene, 1:180
storage and handling, 6:258–259
uses, 6:260
Dichloroethyl ether, end use of chlorine, 6:134t
2,2′-Dichloroethyl sulfide (mustard gas), 5:816–818
diffusion coefficient in air at 0°C, 1:70t
Dichlorofluorenyl methyl ester, 13:44t
Dichloroisocyanuric acid (DCCA), 8:203; 13:111; 26:398. See also DCCA (N,N′-
dichloroisocyanuric acid)
Dichloromalonic anhydride, 15:492
Dichloromethane chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
colorimetric response in, 24:45
solubility of cellulose acetates in, 5:417t
Dichloromethylborates, 13:657
1,1-Dichloromethyl methyl ether (DCME) reaction, 13:656
2,4-Dichlorophenoxyacetic acid (2,4-D), 13:41t, 50, 314–315
Dichlorophenyl dimethyl urea, biocide for antifouling coatings, 7:156
Dichloroprop, 13:41t, 49
2,2-Dichloropropanoic acid, 6:269
2,6-Dichloropyridine, 21:95, 123
Dichloroquinolines, 21:95
Dichlorotitanium diacetate, 25:96
2,2-Dichlorotoluene, 6:344
3,4-Dichlorotoluene, physical properties, 6:344t
3,5-Dichlorotoluene, physical properties, 6:344t
Dichlorotoluenes, 6:343–344
Dichlorotriazine groups, 9:320
2,2′-Dichlorotriethylamine (HN1), 5:816
N,N′-Dichloroureia, 13:106
Dichlorophenamidine, 5:169
Dichlorophenyl sulfone, end use of chlorine, 6:134t
Dichloro dyes, 9:338, 340
Dichromate, 6:470
Dichromated gelatin coatings, 12:444
Dichromated resists, 15:156
Dichromate treatment, 9:397
Dickite, 6:659
structure and composition, 6:668
Dicobalt manganese tetroxide, uses, 7:241t
Dicobalt nickel tetroxide, uses, 7:242t
Dicobalt octacarbonyl, 7:233; 593; 16:62
uses, 7:239t
Dicocooalkylamines, melting point, 2:521t
Dicocooalkylmethylamines, melting point, 2:521t
DICORANTIL, molecular formula and structure, 5:90t
Dicor glass-ceramic, 12:635–636
Dicots, fibers from, 21:18
Dicotyledonous grains, 26:267
Dictamine, 2:107
Dicumene chromium(0), molecular formula, properties, and uses, 6:563t
Dicumyl peroxide, in silicone network preparation, 22:562

2,4-Dicumylphenol, 2:230

health and safety data, 2:220t

physical properties of, 2:205t

Dicyandiamide

manufacture, 8:165–166

properties, 8:164t

reactions, 8:164–165

uses, 8:166–167

Dicyandiamide (DICY), 1:535; 10:400–401, 413, 440, 454

Dicyanoargentate(I), 7:578t

Dicyanogold, 12:704

Dicyclohexamine nitrate, 7:816

Dicyclohexylamine

manufacture, 2:503–504

physical properties of, 2:499t

Dicyclohexylborane, 13:637

Dicyclohexylcarbodiimide (DCCD), 13:299

Dicyclohexylpercarbonate, 6:303

Dicyclohexylstibine, 3:68

Dicyclopentadiene (DCPD), 8:219,

219–233; 10:706, 707, 708; 20:97, 103

chemical reactions, 8:220–226

physical properties, 8:219–220, 220t

sources and production, 8:226–228

storage and handling, 8:228–229

uses, 8:228–229, 229–233

endo-Dicyclopentadiene (DCPD), 26:946–947

Dicyclopentadiene resins, 20:114

formulation of, 20:103–104

Dicyclopentadienylmagnesium, 25:120

Didecyl dimethylammonium chloride (Sanaqua), disinfecting agent for aquaculture in U.S., 3:205t, 212t

2,6-Dideoxy-3-C-methyl-3-O-methyl-L-ribohexose, 4:713

Di(diacyl peroxides), 18:476

Die attach process, 17:830

Die casting

magnesium alloy, 15:366

magnesium in, 15:350, 351

Die-casting alloys

zinc, 26:580–582, 587–591

corrosion performance of, 15:370

Die castings

aluminum alloys, 2:326t

zinc alloy, 26:590

Die casting temperatures, 26:590

Dieckman reaction, 10:505

Dielectric analysis (dea), of plastics, 19:586

Dielectric breakdown strength, of vitreous silica, 22:430

Dielectric constant, 10:16, 17

of bimodal aluminum filled composites, 10:26, 27

of FEP polymer, 18:311

of ferroelectric crystals, 11:95, 96

of polytetrafluoroethylene, 18:298–299

requirement for ceramics, 5:582

of steam, 23:205–207, 208

of sucrose, 23:438, 440–441

of thermoplastics, 10:176

use in solvent selection, 23:108

of water, 23:241

Dielectric deposition systems, in compound semiconductor processing, 22:192

Dielectric (radio frequency) dryers, 9:137–138

Dielectric enrichment, 23:109

Dielectric materials, polyimide, 20:278

in multilayer capacitors, 11:102

Dielectric measurements, 10:17, 425–426

Dielectric overlayers, in compound semiconductor processing, 22:191–192

Dielectric permittivities, 16:512–513

of multilayer capacitors, 11:101–103

of relaxor ferroelectrics, 11:106

Dielectric properties, of Teflon AF, 18:340

of EPM/EPDM vulcanizates, 10:716

of glass-ceramics, 12:630–631

high throughput characterization, 7:420

of silicone fluids, 22:578

of unsaturated polyesters, 20:114

of vitreous silica, 22:430, 431t

Dielectric relaxations, 18:294

Dielectrics

high throughput experimentation, 7:382t, 414t

linear, 11:91

nonlinear, 11:91–92

Dielectric spectroscopy, in silicone network characterization, 22:569

Dielectric stiffness, 11:93

Dielectric strength, of plastics, 19:587

of thermoplastics, 10:176
of ethylene–tetrafluoroethylene copolymers, 18:321–322
Dielectric thermal analysis, 19:577
Dielectrophoresis (DEP)-based cell separation, microfluidics in, 26:972
Dielectrophoresis electrostatic separation, 16:642
Diels–Alder condensation, in VDC polymer degradation, 25:712
Diels–Alder dimer, 23:381–382, 383
Diels–Alder maleic addition product, 20:104
See also Retro-Diels–Alder entries
Die swell, 20:172
Diets, bar soap manufacture, 22:752
Diethanolamine (DEA) buffer for ion-exchange chromatography, 3:830t
physical properties of, 2:123t
specifications, 2:132t
Diethatyl, 13:325
Diethoxyborane, 10:639
Diethyl-2-hydroxypropylaminoethyl group, ion-exchange group used in protein purification, 3:830t
3,5-Diethyl-2-propylpyridine, butyraldehyde derivative, 4:462
1,3-Diethyl-2-thiobarbituric acid (DETBA), chemiluminescence reagent, 5:850–851
Diethyl acetal production from acetaldehyde, 1:104
from wine decomposition, 1:99
Diethynylboranes, 13:663
Dies, bismuth alloy applications, 4:14
electroless deposition for, 9:701
Diesel engine emission control, 10:60–62
technology for, 10:31
Diesel engine oils, heavy duty, 15:233–235
Diesel engines advantages and disadvantages of, 12:420–421
categories of, 12:421
combustion in, 12:420–421
performance requirements of, 15:234–235t
Diesel exhaust, 10:60–61
health effects of, 12:421
Diesel fuel, 12:420–43; 18:668
from coal gasifier syngas, 6:7780
cold temperature properties of, 12:423
manufacture of, 12:426–429
requirements for, 12:421–426
specifications for, 12:426t
volatility of, 12:423–424
Diesel hauling trucks (LHDs), in continuous salt mining, 22:806
Diesel index (DI), 18:668–669
Diesel vehicles, environmental regulations for, 12:429–430
Dies, in bar soap manufacture, 22:752
Diester/ether diol of tetrabromophthalic anhydride, 11:478
Diester production, 10:489
“Die swell,” 20:172
Diet, 2:823
carbohydrates, 4:697
risk factor for CHD, 5:109
Dietary fibers, as food additives, 12:67–68
Dietary guidelines, salt in, 22:813
Dietary Reference Intakes (DRI), 17:652; 25:784
Dietary sugar, effects on health, 23:478
Dietary supplements ascorbic acid as, 25:760
yeasts as, 26:472
Diet foods industry, 24:233
Dietary supplements
ascorbic acid as, 25:760
yeasts as, 26:472
Diet foods industry, 24:233
Diethanolamine (DEA) buffer for ion-exchange chromatography, 3:830t
physical properties of, 2:123t
specifications, 2:132t
Diethyhydrol, 13:325
Diethyoxoborane, 10:639
Diethyl-2-hydroxypropylaminoethyl group, ion-exchange group used in protein purification, 3:830t
3,5-Diethyl-2-propylpyridine, butyraldehyde derivative, 4:462
1,3-Diethyl-2-thiobarbituric acid (DETBA), chemiluminescence reagent, 5:850–851
Diethyl acetal production from acetaldehyde, 1:104
from wine decomposition, 1:99
Diethynylin, 2:537t
ACGIH TLV, 2:548t
physical and chemical properties of, 2:540t
production from acetaldehyde, 1:104
specifications and economic data, 2:551t
7-(Diethylin)-3-[(4-idoacetylamino)phenyl]-4-methylcumarin (DCIA), chemiluminescence reagent, 5:851, 853
Diethylamino anchoring groups, 8:683t
7-(Diethylamino)cumarin-3-carbohydrazide (DCCH), chemiluminescence reagent, 5:851
2-Diethylaminoethanol, 2:549t
Diethylaminoethyl group, ion-exchange group used in protein purification, 3:830t
3-(N, N-Diethylamino)phenol, 2:668
Diethylaniline (DEA), 2:109
Diethylbenzene (DEB)
dehydrogenation of, 23:353
transalkylation of, 23:329
in PSMAna ionomers, 14:479
Diethylbenzenes, 23:330
meta-Diethylbenzenes, 23:353
para-Diethylbenzenes, 23:353
Diethyldiamine, 4:503, 516–517
physical properties of, 4:517t
Diethyl carbonate
DOT regulations for shipment, 6:312t
molecular formula, 6:305t
physical properties, 6:306t
specifications, 6:313t
N, N-Diethycyclohexylamine, physical properties of, 2:499t
N, N-Diethylthiocarbamate salt
diethylamine salt, 2:549t
sodium salt, 2:549t
triethylamine salt, 2:549t
zinc salt, 2:549t
Diethyl dithiophosphoric acid, molecular formula, 5:713t
Diethylene glycol (DEG), 10:665; 12:646–647, 659; 20:42
as dessicant, 8:366
esterification of, 10:478t
solubility of boric acid in, 4:253t
solvent for cosmetics, 7:832
Diethylene glycol bis(allyl carbonate)
DOT regulations for shipment, 6:312t
physical properties, 6:306t
properties of, 2:253t
specifications, 6:313t
Diethylene glycol bischloroformate
DOT regulations for shipment, 6:301t
molecular formula, 6:291t
toxicity, 6:302t
Diethylene glycol bisformate, physical properties, 6:292t
Diethylene glycol dibenzoate, 3:631, 632t
Diethylene glycol dimethacrylate (DEGDMA), 13:733, 734
Diethylenetriamine, 8:485
as chelant, 5:709
molecular formula, 5:712t
physical properties, 8:486t
pK values, 8:487t
prices of commercial, 8:496t
typical specifications, 8:496t
Diethylenetriaminopentaacetic acid (DTPA), in mechanical pulp bleaching, 21:49
Diethylethanolamine
manufacture, 2:130
physical properties of, 2:124t
Diethyl ether, 10:538, 539, 568, 575
solubility of aminophenols in, 2:653t
solubility of higher alcohols in, 2:3t
solubility of anhydrous citric acid in, 6:634t
solubility of boric acid in, 4:253t
production of, 10:556
Diethyl ether trifluoroborate, 4:144t
Diethyl ethylphosphonate, 11:489
Diethylhydroxylamine, 2:549t
Diethyl ketone (DEK), 14:584–585
N, N-Diethyl-m-toluamide, 2:549t
Diethyl percarbonate, 6:303
Diethyl phosphonate, 18:20
Diethylpropion hydrochloride (Tenuate), 3:91, 92t
Diethylstibine, 3:68
Diethylstibinic acid, 3:73
Diethylstilbestrol (DES), 10:868
Diethyl sulfate, ethyl chloride from, 10:588
Diethyl sulfite reaction, 10:530
Diethyltoluenediamine (DETDA), 25:197
Dietzeite, 6:471t
Difasol process, 26:899
Difenzoquat, 13:322
Difference spectroscopy, 14:236; 23:144
Difference tests, in flavor characterization, 11:512
Differential centrifugation, 5:531
Differential contacting, 10:760–762
Differential display, 13:354
Differential equations, 11:736
of motion, 11:738–739
Differential interference contrast (DIC), 16:480–483
Differential mass conservation equation, *11*:738–739
Differential momentum equation, *11*:741
Differential plug-flow tubular reactors, *25*:269
Differential-pressure flowmeters, *11*:656–663
advantage of, *11*:657
Differential pressure flow rate sensors, *20*:680
Differential pressure-measuring meter bodies, *20*:656
Differential scanning calorimeter measurement, *10*:17–18. See also DSC thermogram
Differential scanning calorimetry (DSC), *10*:13; *19*:570; *20*:340
in phenolic resin analysis, *18*:776–777
in silicone network characterization, *22*:569
in thermal analysis, *19*:572–573
in wax analysis, *26*:223
Differential thermal analysis (DTA), *19*:718
of polyester fibers, *20*:22
of silicon surface chemistry, *22*:373
in plastics testing, *19*:571
of VDC copolymers, *25*:703
Differentiated chemicals, *20*:712
Diffraction
cause of color, *7*:326t, 340–341
in protein structure determination, *20*:834–836
Diffraction grating, *14*:705
Diffraction techniques, *23*:193–194
Diffractometers, in fine art examination/conservation, *11*:406
Diffused-air aeration systems, *26*:163
Diffused semiconductor strain gauges, *20*:654, 655
Diffused silicon sensor, *20*:655
Diffusely reflected light, measuring, *24*:111
Diffuser aerators, jet air, *26*:165
Diffuse reflectance, *14*:231
Diffuse reflectance infrared Fourier transform spectroscopy (DRIFT), *24*:72, 110–111
Diffuse reflection, and object mode perceptions, *7*:306, *306t
Diffusers
course bubble, *26*:165
dome, *26*:163–165
fine bubble, *26*:163
plate, *26*:163
in sucrose extraction, *23*:456, 458
tubular, *26*:165
Diffuser tubes, *26*:163, 165
Diffuse transmission, and object mode perceptions, *7*:306t
Diffusing wave spectroscopy (DWS), *12*:18
Diffusion, *9*:110–112
adhesion and interdiffusion, *1*:508–509
barrier polymers, *3*:376–380
battery electrolytes, *3*:423–424
of gas through vitreous silica, *22*:421–422, 423t
and mass transfer coefficients, *1*:39–42
macropore, *1*:596–597
in microfluidics, *26*:961
micropore, *1*:596, 597–599
radiation enhanced, *14*:436–437
Diffusional mass fluxes, intrapellet, *25*:275
Diffusional molar flux, *25*:275–276, 300
Diffusion bonding (DB)
of titanium, *24*:859
of metal–matrix composites, *16*:169, 170
Diffusion coatings, *13*:507
Diffusion coefficients, *15*:671–675
dilute gases in liquids at 20 °C, *1*:67t
for polymer penetrants, *25*:711t
selected gases in air at 0 °C, *1*:70t
Diffusion collision integral, effect on maximum intrapellet temperature, *25*:301–303
Diffusion-controlled drug delivery, *9*:77
Diffusion Deborah number, *23*:101
Diffusion flames
chemistry of, *7*:473–474
laminar, *7*:446–447
in transition region, *7*:447–448
turbulent, *7*:448–449
“Diffusion-induced bulk flow,” *15*:731
Diffusion length, *14*:844
Diffusion models, in gas carburizing, *16*:204
Diffusion processes, in photography, *19*:208
Diffusion theory, *23*:101–107
Diffusion transfer reversal (DTR) processes, *19*:273
black-and-white, *19*:283
Diffusion voltage, *14*:838
Diffusivity, 15:671–675
effective, 15:679–730
in gases and vapors, 15:673–675
in solvents, polymer solutions, and gels, 15:672–673
Diffubenzuron, registered for use in aquaculture in Europe, 3:220t
Diffuorobromine tetrafluoroborate, 4:144t
1,1-Difluoroethane, 13:722
physical properties of, 1:778t
Diffuromaleic anhydride, 15:492
Difunctional initiators, 14:252–254; 23:380, 381; 24:706
Difunctional prepolymers, 24:705
Difunctional resins, 10:417–418
Digacin, molecular formula and structure, 5:98t
Digalloyl trioleate, cosmetic UV absorber, 7:846t
Digester, defined, 3:759t
Digest flavor enhancers, 10:857–860
Digestion, bauxite, 2:351–352

Digital circuits, SETs in, 22:171
Digital communications, 20:669
Digital detectors, 26:441
Digital encoding, 11:130–131
Digital film recorders, 19:322
Digital imaging, high purity selenium in, 22:103
Digitalin, molecular formula and structure, 5:180t
Digital load cells, 26:233–234
Digital Millennium Copyright Act of 1998, 7:794
Digital photography, 19:273
Digital PID controllers, 20:693
Digital pressure sensors, 22:268
Digital printing, silica in, 22:376
Digital scanning electron microscope, 16:491–492
Digital still imaging, 19:266
Digital-to-analogue converter (DAC), 20:677
Digitin, molecular formula and structure, 5:180t
Digitogenin, molecular formula and structure, 5:180t
Digitonin, molecular formula and structure, 5:180t
Digitoxin, 5:105, 184
molecular formula and structure, 5:180t
Diglycerides, 12:55
melting points of, 10:821
Diglycidyl ether(s) of bisphenol A (DGEBA, DGBPA), 1:534–535; 10:354, 376, 383; 17:839, 840. See also DGEBA-aromatic polyamine adduct system
in epoxy coatings, 10:437
hydrogenated, 10:374–375
solid epoxy resins based on, 10:359–365
toxicity of, 10:460–461
Diglycidyl ether of bisphenol A resins, 10:350
in casting systems, 10:457
difunctional, 10:417
epoxy, 10:459
Diglycidyl phenylphosphonate, 11:500
Dignover, molecular formula and structure, 5:97t, 119t
Digoxin, 5:105, 184
molecular formula and structure, 5:98t
N, N-Dihalamides, 13:106
Dihalobismuthines, 4:28–29
Dihaloethanes, 10:598
Dihalogenoboranes, 13:638
Dihalostibines, 3:69–71
Dihalosuccinic acids, 15:491
1,1'-Diheptyl-4,4'-bipyrindinid dibromide, 6:574
Diheteroglycans, 13:64
classification by structure, 4:723t
2,3-Dihydro-2,2-dimethyl-7-benzofuranyl
[(dimethylamino)thio)methylcarbamate, 2:550t
Dihydro-2(3H)-furanone.
See γ-Butyrolactone
3,4-Dihydro-2-formyl-2H-pyran, 1:279
Dihydrizides, 13:574, 599
Dihydric alcohols, dispersants, 8:710t
Dihydroabietyl alcohol, in eye makeup, 7:862
Dihydroactindiolide, 24:572
Dihydrochalcones, 24:240–241
Dihydroflorifone, 24:570
Dihydrofolate reductase (DHFR) inhibitors, 26:495–496
Dihydrogen, for synthesis gas (syngas), 17:293
Dihydrogenated tallowalkylamines, melting point, 2:521t
Dihydrogenated tallowalkylmethylamines, melting point, 2:521t
Dihydrogen phosphate, 24:43
Dihydroindolizines, photochromic materials, 6:600
Dihydroisoquinolines, 21:201–202, 205, 206
Dihydrojasmine, 14:598
Dihydrolinalool, 24:502
Dihydromyrcene, 24:487, 488
Dihydromyrcenol, 24:487, 488, 495
Dihydroperoxides geminal, 18:455–456
thermal decomposition of, 18:455
Di(hydroperoxyalkyl) peroxides, 18:459
Dihydropterate synthase (DHPS), 26:495
sulfonamide inhibition and, 23:503
1,4-Dihydroxyanthraquinones, as vasodilators, 5:123
Dihydropyrimidines, 16:550–551
Dihydroquinolines, 21:186–187
Dihydroterpineol, 24:512
Dihydroterpinyl acetate, 24:512
Dihydrotestosterone (DHT), 25:791, 792
Dihydroxyacetone, in skin coloring products, 7:847
Dihydroxyacetone phosphate, 4:711
2,6-Dihydroxy-4-methyl-3-cyanopyridine, 18:738–740
1,4-Dihydroxyanthraquinone, 9:311–312
1,5-Dihydroxyanthraquinone, 9:315
Di(hydroxyalkyl) peroxides, 18:449, 458
o,o-Dihydroxyazo dyes, 9:395
2,4-Dihydroxybenzophenone, 6:327
4,4’-Dihydroxybiphenyl, 20:38–39
1,25-Dihydroxycholecalciferol, 25:791, 792
5,6-cis-Dihydroxycyclohexa-1,3-diene, 7:515
Dihydroxydimethylethyleneurea, cotton cross-linking agent, 8:26
Dihydroxyethylene urea, 2:621
N-Dihydroxyethylglycine, molecular formula, 5:712t
Dihydroxyfluoroboric acid, 4:151
Di(hydroxymethoxymethyl) peroxide, 18:458
2,2’-(Dihydroxymethyl)butanal, butyraldehyde derivative, 4:461
9,10-Dihydroxyoctadecanoic acid, physical properties, 5:35t
Dihydroxyphenylstibine oxide, 3:72
1,3-Dihydroxytetradecanoic (ipurolic) acid, physical properties, 5:35t
Dihydroxypentatetrahydroxynaphthacenedione derivatives, 12:175
Diiminosuccinonitrile, 8:174
Diiodoacetic acid, 1:144
1,2-Diiodoethylene, production from acetylene, 1:180
Diiron nonacarbonyl, 7:591; 14:550–551; 16:62
Diisoamylcadmium, physical properties of, 4:517t
Diisobutyl adipate, cosmetically useful lipid, 7:833t
Diisobutylaluminum chloride, production from butylenes, 4:426
Diisobutylaluminum hydride, production from butylenes, 4:426
Diisobutylaluminum hydroxide, production from butylenes, 4:426
Diisobutyllamine, 2:538t
physical and chemical properties of, 2:540t
specifications and economic data, 2:551t
Diisobutyldiacidum, physical properties of, 4:517t
Diisobutyldicyaninol (DIBC), production from acetone, 1:174
Diisobutyl carbonate, molecular formula, 6:305t
Diisobutylene, production from butylenes, 4:424
Diisobutyl ketone (DIBK), 14:583–584
production with acetone, 1:168, 174, 175
Diisocyanates, 23:736
carbon monoxide in production of, 5:7–8
properties of, 25:465–467t
reaction with dianhydrides, 20:276
1,4-Diisocyanatobenzene (PPDI), 25:460
N,N-Diisopropylethylamine, 2:549t
Diisopropanolamine (DIPA)
   physical properties of, 2:123t
   specifications, 2:132t
Diisopropoxy-bis(triethanolamine)titanate,
   25:94
Diisopropyl (IPP) percarbonate, 6:303
Diisopropylamine, 2:537t
   ACGIH TLV, 2:548t
   physical and chemical properties of,
   2:540t
   specifications and economic data, 2:551t
Diisopropyl carbonate
   molecular formula, 6:305t
   physical properties, 6:306t
Diisopropylethanolamine, physical properties of,
   2:124t
Diisopropyl ketone, adipic acid solubility,
   1:555t
Diisoyadimonium chloride, hair conditioner ingredient,
   7:855t
Diispinocamphenylborane (DIP2BH),
   4:187, 229
Diked tanks, 24:296
Dikegulac, 13:24t
   as a plant growth regulator, 13:30
β-Diketone chelates, 25:89–91
Diketones, 14:545–546, 565, 593–599
   aroma chemicals, 3:252
1,2-Diketones, 14:593–594
   physical properties of, 14:595t
1,3-Diketones, 14:596–598
   chelating agents, 5:712t
   enol and chelating properties of, 14:598t
   physical properties of, 14:597t
1,4-Diketones, 14:598–599
   physical properties of, 14:599t
Diketopiperazines, formation from amino acids, 2:568
Diketo-pyrrolo-pyrrol, pigment for plastics,
   7:367t
Dilactide, 14:116–117, 122
Diladel, molecular formula and structure, 5:104
Dilantin, folic acid and, 25:803
Dilatancy, 21:717
Dilatant flow, 7:280t; 8:728
Dilatant fluids, 11:768, 769
Dilatometers, vitreous silica in, 22:441
Dilatometric techniques, 13:436
Dilauryl thiodipropionate, antioxidant useful in cosmetics, 7:830t
Dilavase, molecular formula and structure,
   5:111t
Dilead hexacyanokisferrate, 14:535
Diligence provisions, in licensing agreements, 24:379
Dilithium initiators, hydrocarbon-soluble,
   14:253
1,7-Dilithium-meta-carborane, 4:198
1,2-Dilithium-o-carborane, 4:198
Dilithium tetraborate trihydrate, 4:277
Dillseed, 23:167
Dillweed, 23:167
Diltiazem, 5:104
   molecular formula and structure, 5:97t
Diltiazem hydrochloride, 5:117, 121
   molecular formula and structure, 5:118t
Diluents, 10:428–430
   in ethylene oxidation, 10:651
   in finish removers, 18:78
   in flavor compounds, 11:576–577
   kaolin application, 6:696
   resin, 14:324
   in slurry processes, 20:168
Dilute acetic acid, recovery of, 10:478
Dilute dispersions, viscosities of, 21:715
Dilute magnetic semiconductors, 22:142
Dilutensens, molecular formula and structure, 5:162t
Dilute solution viscosity testing,
   of polymers, 19:578–579
Dilution
   by flame retardants, 11:456
   of flocculant solution, 11:639
Dilution ratio (DR), in characterizing solvent power, 23:89
Dilzem, molecular formula and structure,
   5:97t, 118t
Dimagnesium phosphate trihydrate, 18:839
Dimanganese decacarbonyl, 16:62
Dimebon, 2:819
Dimensional analysis, 8:582–605; 9:662; 23:190
   dimensional matrix and dimensionless products, 8:585–590
   of drag coefficient, 22:51–52
   in fluid mechanics, 11:743–748
   of intrapellet temperature, 25:300–301
   molar density required for, 25:289
optimization algorithm, 8:599–603
optimization of complete B-matrices, 8:597–599
systematic calculation of B-matrix, 8:590–597
units and dimensions, 8:582–584
Dimensional Danckwerts boundary condition, 25:288
Dimensional homogeneity, 8:582
Dimensionally stable anodes (DSA), 9:625–626, 628, 655; 19:622
Dimensional matrix, 8:585–590
Dimensionless axial molar density gradient, 25:285
Dimensionless blend time method, 16:688
Dimensionless groups, 15:685, 686t, 687t
Dimensionless mass transfer equation, 25:279–281
Dimensionless molar density profiles, 25:315
Dimensionless numbers in mixing, 16:685
used in convection heat-transfer analysis, 13:246–247
Dimensionless parameter, external mass transfer resistance and, 25:290–292
Dimensionless reactor design formulation, 21:350
Dimensions, 8:583–584
Dimer acids, 9:149, 153; 10:399
Dimercapto compounds, 23:740
Dimercaptopropanol, molecular formula, 5:712t
Dimeric chloride initiators, 14:267
Dimeric fullerences, 12:233, 252
Dimeric Lewis acids, 14:267
Dimeric rhodium isocyanide complexes, 19:648
Dimerization
acrylic esters, 1:349
butadiene, 4:373–374
ionic liquids in, 26:885–887
polychloroprene, 19:828–829
Dimersol dimerization process, 17:724; 20:783
Dimesitylborane, 13:638
Dimesitylstibine, 3:68
Dimetapp, 3:90
Dimethicone
cosmetically useful lipid, 7:833t, 845
function as ingredient in cosmetics, 7:829t
Dimethipin, 13:42t, 50
6,7-Dimethoxy-1-methyl-2(1H)-quinoxalinone-3-propionylcarboxylic acid hydrazide, chemiluminescence reagent, 5:851, 852
Dimethoxyethane, in lithium cells, 3:459
Dimethoxymethane, anesthetic properties of, 2:69
Dimethoxymethyluron, cotton cross-linking agent, 8:26
2,2-Dimethoxypropane, pyrolysis, 1:163
Dimethoxytetralone, 12:175
2,3-Dimethyl-1,3-butadiene, 1:229
3,5-Dimethyl-1-hexanol, physical properties of, 2:3t
2,2-Dimethyl-1-propanol butyraldehyde derivative, 4:461
physical properties of, 2:764t
2,6-Dimethyl-2,5-heptadien-4-one. See Phorone
Dimethyl-2-imidazolidinone, solvent for cotton, 8:21
2,5-Dimethyl-3-hexyne-2,5-diol, 1:249t
3,6-Dimethyl-4-octyne-3,6-diol, 1:249t
3,3-Dimethyl-5-(3-carboxypropionyl)-2-indoline, 12:175
Dimethylacetamide (DMAc), cellulose solvent (with lithium chloride), 5:384
N, N-Dimethylacetamide (DMAc), 23:703
extractive distillation solvent, 8:802
solvent for cotton, 8:21
N, N-Dimethlacrylamide (DMA), 20:487
β,β-Dimethyl acrylic acid, physical properties, 3:35t
Dimethylallylamine, 2:247
3,3-Dimethylallyl pyrophosphate, 2:78
Dimethylamine (DMA) as chelant, 5:709
in modified viscose processes, 11:259
Dimethylamine reactions, 16:358–359
N-[4-(6-Dimethylamino-2-benzofuranyl)phenyl] maleimide (DBPM), chemiluminescence reagent, 5:851–853
2-Dimethylamino-2-methyl-1-propanol commercial alkanolamine, 2:114t
physical properties of, 2:114t
Dimethylaminobenzylidenerhodamine colorimetric technique, silver analysis via, 22:651
Dimethylaminomethyl methacrylate, 16:242
copolymization with acrylic monomers, 1:380t

3-(N, N-Dimethylamino)phenol, 2:668
physical properties of, 2:666t

4-(N, N-Dimethylamino)phenol, 2:669–670
physical properties of, 2:666t

5-N, N’-Dimethylaminonaphthalene-1-sulfonohydrazide (Dns-H), chemiluminescence reagent, 5:849–850

Dimethylaniline (DMA), 14:101–102, 119, 123

Dimethylethanolamine, physical properties of, 2:124t

Dimethyl ether (DME), 1:780
in methyl chloride production, 16:323
physical properties of, 1:780t
as propellant, 1:779–780

(Di)methyl ether, 10:567

Dimethylethylamine, 2:538t
physical and chemical properties of, 2:540t

4-(1,1-Dimethyl)phenol.
See 4-tert-Butylphenol (PTBP)

Dimethylformamide (DMF), 8:174, 15:493; 22:694; 24:238
acrylamide solubility in, 1:290t
carbon monoxide in manufacture, 5:11
extractive distillation solvent, 8:802
in nevirapine synthesis, 18:742
for purification of hydrocarbon-derived acetylene, 1:203, 208, 216
solubility of acetylene in, 1:178t

N, N-Dimethylformamide (DMF), 11:188, 204–205. See also DMF recovery unit

Dimethyl fumarate, 15:492

Dimethylglyoxime, molecular formula, 5:712t

Dimethylhexynediol, physical properties of, 1:250t

N, N-Dimethylhydrazine, bioremediation substrate, 3:779–780
unsym-Dimethylhydrazine.
See Unsymmetrical dimethylhydrazine (UDMH)

Dimethylisopropanolamine, physical properties of, 2:124t

Dimethyl ketone. See Acetone

Dimethyl mercaptan, 21:23–24

3,3’-Dimethylmethylenedichloroethane, in silicon carbide manufacture and processing, 22:533

Dimethyldichlorosilane, 18:443
delignification of, 21:48

1,2-Dimethyldiphenylamine, 19:20

Dimethylditallow alkylammonium chlorides, function as ingredient in cosmetics, 7:829t

N,N-Dimethyldodecyl amine oxide, 2:815–816
production by alkylation,
2:196–197
3,5-Dimethylphenylcarbamoylated
cyclodextrin-based chiral stationary
phase, 6:87
Dimethyl methylphosphonate (DMMP),
11:489; 25:472
Dimethylnaphthalenes, 17:84, 85
Dimethyl-n-butylamine, 2:538t
physical and chemical properties of,
2:540t
Dimethyl-n-decylamine, melting point,
2:521t
Dimethyl-n-dodecylamine, melting point,
2:521t
Dimethyl-n-hexadecylamine, melting
point, 2:521t
Dimethyl-n-octadecylamine, melting point,
2:521t
Dimethyl-n-octylamine, melting point,
2:521t
Dimethyl-n-propylamine, 2:538t
physical and chemical properties of,
2:540t
Dimethyl-n-tetradecylamine, melting
point, 2:521t
Dimethylolalkyl carbamate, cotton
cross-linking agent, 8:26
Dimethylolalkyltriazone, cotton
cross-linking agent, 8:26
Dimethyloldihydroxyethyleneurea
(DMDHEU), in fiber finishing, 22:593
Dimethyloldihydroxyethyleneurea
(DMDHEU), cellulose cross-linking
agent, 5:381
Dimethyloldihydroxyethyleneurea, cotton
cross-linking agent, 8:26
Dimethylolethyleneurea, cotton
cross-linking agent, 8:26
Dimethylolpropyleneurea, cotton
cross-linking agent, 8:26
Dimethylol-substituted phenols, 18:763
Dimethylolurea, 12:112
cotton cross-linking agent, 8:26
Dimethyl oxazolidine, antimicrobial used
in cosmetics, 7:831t
Dimethylphosphine, 19:20
Dimethylpinacoloxysilane, 22:580
1,4-Dimethylpipperazine, 8:488
2,2-Dimethylpropanal, 5:61
physical properties of, 2:60t
2,2-Dimethylpropanoic (pivalic) acid,
5:60–61
physical properties, 5:35t
Dimethyl-p-toluidine (DMPT), 20:109
2,4-Dimethylquinoline, 21:189
Dimethyl sebacate, from adipic acid,
1:554
N, N-Dimethylserotonin, 2:92
Dimethylsilanediol
biodegradability of, 22:605
in silicone polymerization, 22:556
Dimethylosilicone fluids
decomposition of, 22:575–576
kinematic viscosity–temperature
relationship of, 22:577
Dimethylosilicone oils, 22:576
Dimethylosilicone polymers, 22:577–578
Dimethylosiloxane, molecular weight of,
22:576
Dimethylstibine, 3:68
Dimethylstibinic acid, 3:73
Dimethyl succinate, 23:419
Dimethylsulfide borane, 4:186
Dimethyl sulfide production, 15:17
Dimethyl sulfosuccinate, 23:535
Dimethyl sulfoxide (DMSO), 10:369, 782;
15:493
acrylamide solubility in, 1:290t
in anionic polymerization of cyclic
siloxanes, 22:560
extractive distillation solvent, 8:802
in paint removers, 18:83
solubility of acetylene in, 1:178t
solubility of aminophenols in, 2:653t
solubility of dispersant tails in, 8:685
Dimethyltellurium dihalides, 24:422
Dimethyl terephthalate (DMT), 10:472,
517; 16:315; 20:35, 76
in PET bottle resin process, 20:48
in polyester manufacture, 20:10
cis-Dimethylthiirane, 23:712–713
trans-Dimethylthiirane, 23:713
Dimethyltin dichloride, 24:823
Dimethyltitanocene, 25:118
Dimethyltrichloroantimony, 3:75
Dimethyleurea, 2:638
Dimorpholinyl disulfide (DTDM),
21:794
Dimyrcetol, 24:487
Di-n-butylamine, 2:538t
  physical and chemical properties of, 2:540t
specifications and economic data, 2:551t
Di-n-butyl carbonate, molecular formula, 6:305t
Di-n-butyl percarbonate, 6:303
Di-n-decylmethylamine, melting point, 2:521t
Di-n-dodecylamine, melting point, 2:521t
Di-n-hexadecylamine, melting point, 2:521t
Di-n-hexadecyl percarbonate, 6:303
Dinitraniline Orange, 19:434
Dinitroaniline herbicides, 13:318–319
Dinitroanlines, 13:303
1,5-Dinitroanthraquinone, 9:315–316
α,α’-Dinitroanthraquinones, 9:315–316
Dinitrochlorobenzenes, 17:262
Dinitrogen, 17:311. See also N₂ oxidation complexes, 17:273–274
fixation of, 17:290
reduction and protonation of, 17:313
Dinitrogen complexes, zirconium, 26:655
Dinitrogen-reducing systems, in nitrogen fixation, 17:311
Dinitrogen tetroxide, 12:182
Dinitroparafins, 17:166
4,4’-Dinitrodiphenyl ether (DNDPO), derivative of nitrochlorobenzenes, 6:223t
2,4-Dinitrophenol, 3:602
2,4-Dinitrotoluene, hydrogenation of, 25:192–193
Dinitrotoluuenes (DNTs), 17:160, 267–268; 25:183, 192
hydrogenation of, 25:194
Di-n-octadecylamine, melting point, 2:521t
Di-n-octyl carbonate, molecular formula, 6:305t
Dinoseb, 3:777, 778; 13:319
Di-n-propylamine, 2:537t
  physical and chemical properties of, 2:540t
specifications and economic data, 2:551t
Di-n-propyl carbonate molecular formula, 6:305t
  physical properties, 6:306t
Di-n-propyl percarbonate (NPP), 6:303
Dinuclear carbonyls, structure of, 16:62
Dinuclear copper complex, 16:788
Dinuclear porphyrin complex, 19:645
2,5-Diocyloxy-1,4-phenylene vinylidene block copolymer synthesis, 7:647t
Diocyl phthalate (DOP), 2:27; 14:478
Diocyl sodium sulfosuccinate, cosmetic surfactant, 7:834t
Diocyltin diacetate, 24:823
Diode array detectors (DADs), liquid chromatography, 6:448–449
Diode arrays, 19:158
Diode array spectrometers, 23:144
Diode equation, 22:243, 246
Diode lasers, conducting polymer applications, 7:540–541
Diodes. See also Avalanche photodiodes (APDs); Laser diodes; Light-emitting diode entries; Photodiodes; Planar cavity surface-emitting laser (PCSEL) diodes; Vertical cavity surface-emitting laser (VCSEL) diodes
compound semiconductors in, 22:160–162
in HBTs, 22:168
organic semiconductors used as, 22:214–220
silicon carbide in, 22:539
gallium use in, 12:351
Diol, 3:383
Diofenolan, 14:344–345
1,2,5,6-Di-O-isopropylidene-α-D-glucofuranose, 4:712
Diolefins, addition of dithiols to, 23:734
α,ω-Diolefins from butadiene, 4:384
synthesis of, 26:941
Diol oligomer, reactive phosphate, 11:497
Diols
  acetone to block reactivity of hydroxyl group, 1:163–164
  achiral derivatizing agents, 6:96t
  condensation polymerization with sulfonated diacids, diesters, or anhydrides, 23:535
  phosphine oxide, 11:501
  phosphorus-containing, 11:496–497
2,6-Di-O-methyl-3-O-trifluoroacetyl-derivatized cyclodextrin, 6:98
3,6-Di-O-pentyl-derivatized cyclodextrin, 6:98
Di(organosulfonyl) peroxides, symmetrical, 18:478
Diorganotin carboxylates, 24:819
  as catalysts, 24:823–824
  as PVC stabilizers, 24:822
Diorganotin dichlorides, in diorganotin preparation, 24:820
Diorganotin dihalides, 24:820
Diorganotin esters, 24:821
Diorganotin mercaptocarboxylates, as polyurethane foam catalysts, 24:823
Diorganotins, 24:819–824
  acute oral toxicities of, 24:829, 830t
  physical properties of, 24:819t
  preparation of, 24:820–821
  reactions of, 24:819–820
  toxicity of, 24:829
  uses of, 24:821–824
Diorganotin sulfides, 24:820
Diorganozinc compounds, in tetraorganotin preparation, 24:813
Diovan, molecular formula and structure, 5:154t
Diovan HCT, molecular formula and structure, 5:154t
Dioxane
  acrylamide solubility in, 1:290t
  formation of, 23:537
  solubility of boric acid in, 4:253t
Dioxane problem, in continuous SO₃ single-pass sulfonation processes, 23:549–550
Dioxapyrrolomycin, 14:349
Dioxazines, 19:445–446
1,2,4-Dioxazolidines, 18:460
Dioxetane, chemiluminescence reagents, 5:855
1,2-Dioxetanes, 18:443
Dioxin emissions, 13:181; 14:525–526
  limits on, 13:183
Dioxins
  from PVC incineration, 25:681
  PVC and, 25:679
Dioxiranes, 18:443–444
  unstable and explosive, 18:446
1,3-Dioxolane, 12:659
  in lithium cells, 3:459
Dioxolane formation, microwaves in, 16:557
2,3-Dixo-L-gulonic acid, 25:751
Dioxyn, reversible binding of, 14:554
Dioxygen binding, by iron, 24:47
Dip coating, 7:18; 10:12; 23:79
  for discrete surface coating, 7:23
  method summarized, 7:5t
  shear rates, 7:32t
2,6-Dipentyl-derivatized cyclodextrin, 6:98
Dipentaerythritol, 2:46, 47
  economic aspects, 2:52
  manufacture, 2:51–52
  physical properties of, 2:48t
Dipentene, 24:491–492
  uses for, 24:492
Diperoxides, cyclic, 18:459
Diperoxyacetals, 18:456
Diperoxycarboxylic acids, 18:464
Diperoxymethylene, 4:62
Diperoxylethers, 14:281; 18:456
  boiling points of, 18:457t
  as free-radical initiators, 14:287–288
Diphase solids, connectivity patterns for, 11:101
Diphenamid, 13:319
1,1’-Diphenyl-2-picyrhydrazyl (DPPH), 23:377
1,3-Diphenyl-2-thiobarbituric acid (DPTBA), chemiluminescence reagent, 5:850–851
Diphenylbismuthinic acid, 4:31
Diphenylcadmium, 4:517
Diphenyl carbonate
  crystal structures of, 19:804
  molecular formula, 6:305t
  physical properties, 6:306t
  preparation of, 19:815
Diphenylchlorobismuthines, 3:68
Diphenylethane, cracking to styrene, 23:344
(Di)phenyl ether, 10:567
Diphenyl ether (DPE) herbicides, 13:297
Diphenyl ethers, 13:288
1,1-Diphenylethylene (DPE), 14:254
  reactivity ratios in anionic copolymerization, 7:626t
Diphenylfluorostibine, 3:70
Diphenylhalobismuthines, 4:29
1,1-Diphenylhexyllithium, 14:258
Diphenyl isophthalate (DPIP), 13:380
Diphenylmethane, soluble dyes, 7:373t.
  See also (Hydroxy)diphenylmethanes (DPM)
4,4’-Diphenylmethane diisocyanate, 24:707
(Hydroxy)Diphenylmethanes (DPM), 18:771
1,1-Diphenylmethylcarbanions, as initiators, 14:257–258
Diphenylmethingristilium, 14:257
Diphenylphosphine ethane gold, 12:701
Diphenylphosphino-cyclopentadienyl (CpP) complexes
of uranium, 25:442
Diphenylpolyethylene dyes, 20:505
Diphenylsilanediol, 22:580
Diphenylstibine, 3:68
Diphenylstibinic acid, 3:73
Diphenyl(trimethylsilyl) stibine, 3:68
Diphosphates, 11:491–492
Diphosphine, 19:28
Diphosphine oxide, 11:496
2,3-Diphosphoglycerate (2,3-DPG), hemoglobin binding, 4:113, 115–116
Diphosphonic acid, 19:53
Diphosphoric acid, 18:818, 828
Diphtheria CRM197? protein, 25:492
Diphtheria, Tetanus, and Pertussis (DTP) vaccines, 25:488–490, 504
Dipolar amidic system, 19:193
Dipolar conjugated dyes, 9:511–512
1,3-Dipolar cycloaddition reactions, 13:440
Dipolar ion, reaction with solvents, 17:782
Dipolar polarization, 10:21
Dipole–dipole interactions, 15:103; 23:91–92
in water, 26:16
Dipole forces, of ethylene oxide polymers, 10:674
Dipole moment, 1:620–621
amino acids, 2:464
selected molecules, 1:621t
Dipolymers, peroxide-cured, 10:697–698
Dipotassium phosphate (DKP), 18:834–835
Dipotassium tetraborate tetrahydrate, 4:251
Dipped goods
polychloroprene latexes in, 19:860
goods, use of latex in, 14:712
Dipping, 10:457. See also Dip coating
Dipropylcadmium, physical properties of, 4:517t
Dipropyl disulfide
permeability in selected household films, 3:387t
permeation in selected barrier polymers, 3:389t
Dipropylene glycol, 12:661, 664
uses for, 12:669
Dipropylene glycol, 20:812
Dipropylene glycol dibenzoate, 3:631, 632t
Dipropylstibinic acid, 3:73
Dip-squeeze saturation, 17:509
Dipyridamole, 4:104, 104t
molecular formula and structure, 5:181t
Dipyridyl, molecular formula, 5:712t
Diquat, 13:315; 21:120, 127
Diquat dibromide (Aqua-Clear), 4:358t
herbicide/algicide for aquaculture in U.S., 3:215t
Diradicals
in flash vacuum pyrolysis, 21:136
generation of, 14:287
Direct-arc electric furnace, 23:251
Direct-arc furnaces, 12:298–306
Direct black dyes, 9:407
Direct blue dyes, 9:403–405
Direct bonding, adhesives, 1:548
Direct borohydride injection (DBI) bleaching process, 21:52
Direct brown dyes, 9:406–407
Direct chemical oxidation, 9:438
Direct chill process, aluminum alloys, 2:334
Direct chlorination, in vinyl chloride manufacture, 25:634–638, 642
Direct coal liquefaction, 6:833–858
Direct compression drug dosage form, 18:705
Direct consumption sugar, 23:450–451
Direct contact heat exchangers, 13:268
Direct cooler evaporators, 21:537
Direct-coupled plasma (DCF), 25:370
Direct covalent carbon nanotube functionalization, 17:54–55
Direct current (dc) diode sputtering, 24:730–731. See also dc sensing current
Direct current closed furnace technology, in silicon production, 22:506
Direct digital control (DDC), 20:668
Direct dissolution processes, for regenerated cellulose fibers, 11:265–269
Direct dyes, 9:171–172, 226, 242
azo, 9:401–411
Direct dyestuffs, 9:223
Directed evolution, 10:264
Direct Electroreduction of Oxides (DERO), 23:831
Direct esterification, 14:117, 127
Direct-fed microbials, in ruminant feeds, 10:868–870
Direct fluorination, 11:864, 882
Direct food additives, 12:29, 34
categories of, 12:30
function of, 12:30
Direct formed polyimides, 20:284
Direct fuel cells, 12:221
Direct-gap semiconductors, 14:837;
22:234–235
band structure of, 22:142–144
versus indirect gap semiconductors,
22:151–152
Direct green dyes, 9:406
Direct heat dryers, 9:117–127
batch compartment dryers, 9:118–119
continuous conveyors, 9:119
continuous web dryers, 9:119–120
dispersed-particle dryers, 9:120–121
fluid and spouted beds dryers, 9:122–123
hopper dryers, 9:123–124
pneumatic conveyors, 9:124–126
rotary dryers, 9:121–122
spray dryers, 9:126–127
through-circulation dryers, 9:120
turbotray dryers, 9:119
Direct-heat electric-resistance furnaces,
12:296–297
Direct hydration, of ethylene, 10:538
Direct hydrogenation, 6:827
Direct immunosensors, 14:154
Direct ingot (dingot) method, 25:409
Direct initiation, 14:270
Direct injection (DI) diesel engines, 12:421
Direct inlet injection, gas chromatography,
6:383, 415–416
Directional couplers, 17:446
Directional drilling techniques, in sulfur
extraction, 23:572
Directive 89/107/EEC (EU), 12:36
Direct liquefaction, 6:827
Direct marketing, technical service
personnel and, 24:343
Direct metal nitridation, 17:211–213
aerosol flow reactor, 17:211–212
Direct methanol fuel cells (DMFC),
12:203, 214; 14:482
Direct mode of operation, in separating
nonideal liquid mixtures, 22:303,
306–307
Direct numerical simulations (DNS),
11:778
Direct orange dyes, 9:402–403
Directories, standards and specifications,
15:769
Direct oxidation, of H₂S, 23:616–617
Direct oxidation catalyst, 23:616–617
Direct oxidation ethylene oxide
manufacture, 10:641–648
Direct oxidation tail gas process, 23:619
Direct oxide reduction (DOR) process,
19:676–677
Direct particle interception, in depth
filtration theory, 11:339
Direct potentiometry, 9:582–585
Direct printing, 9:218
Direct process, silicone synthesis via,
22:549–552
Direct-reading analogue, 14:30–31
Direct Red 80, semipermanent hair dye,
7:857t
Direct red dyes, 9:403, 404
Direct reduced iron (DRI), 14:492–493,
509–510; 21:412; 23:250
handling, shipping, and storing,
14:522–523
uses for, 14:527–528
Direct reduction ironmaking processes,
14:509–520
types of, 14:513–520
Direct reduction processes, 14:511–513;
16:148–149; 23:251
Direct saponification, of oils and fats,
22:736–737, 741
Direct sequence heuristic, for simple
distillation, 22:299
Direct-sheet carbon steel casting, 23:269
Direct smelting ironmaking processes,
14:520–521
Direct spark emission spectroscopy, 15:348
Direct spectrometry ozone analysis, 17:812
Direct spotting, in microarray fabrication,
16:386
Direct strong nitric (DSN) processes,
17:171, 184–185
Direct sulfation reactions, reagents for,
23:518t
Direct sulfonation reactions, reagents for,
23:518t
Direct thermal process thermographic
imaging, 19:320
Direct tissue isoelectric focusing (dtif),
9:747
Direct vacuum gauges, 20:657
Direct vasodilators, antihypertensive
agents, 5:165–166
Direct violet dyes, 9:406
Direct weighing, of fibers, 11:182
Direct (American) zinc oxide process, 26:611–612
Dirhenium decacarbonyl, 21:697–699
Dirithromycin, 15:286, 304
“Dirty bottle” synthesis, 12:518
Disaccharides, 4:697, 701; 23:435
Disalicylaldehyde-1,2-propylenediimine
molecular formula, 5:712t
N, N’-(Disalicylidene)-1,2-propanediamine, 3:115
Disanyl, 4:358t
Disaster planning, 21:861
Disaturates, 10:813
Disazo Black, colorant for plastics, 7:377t
Disazo Condensation Orange, pigment for plastics, 7:367t
Disazo Condensation Red, pigment for plastics, 7:366t, 367t
Disazo Condensation Yellow, pigment for plastics, 7:366t, 367t
Disazo dyes, 9:249, 393
primary and secondary, 9:360–362
Disazo mordant dyes, metal complexes of, 9:398
Disazo pigments, 19:430, 437, 438
Disazo Red, colorant for plastics, 7:377t
Disc electrophoresis, 9:744–745
Discharge electrode designs, 26:703, 704
Discharge piping, 21:851
Discharge printing, 9:219; 26:399
Discharging batteries, 3:410
Disclinations, 15:95–96
Disclosing dental wax, 8:299
specification, 8:300t
Disclosure, as a patentability requirement, 18:176–177
DISCO, 6:11
Discoloration, of acrylic fibers, 11:194
Discontinuous furnaces, 12:598
Discontinuous precipitation reaction, 14:773
Discotic liquid-crystal phase, 13:371
Discotic liquid crystals, 15:96
Discotic mesogens, 20:79
Discounted cash flow return rate (DCFRR), 9:544–545
Discounted cash flows, 9:541
Discounted total capital (DTC), 9:537
Discount rates, 9:545
Discovery research, on macrolide antibiotics, 15:305–306
Discrete optimization problems, 26:1023–1025
Discrete photodiodes, 19:152–153
Discrete stage centrifugal extractors, 10:781
Discrete surface-coating methods, 7:23–24
Disc-shaped micelles, 24:124
Disease(s)
development of, 17:648
enzyme inhibitors and, 10:343
implication of liquid crystals in, 15:112–113
insect vectors of, 14:338
manganese-related, 15:559–560
nutrition and, 17:644–645
role of genistein in, 17:669
soap versus, 22:755, 756
sugarcane, 23:445–446
Disease-modifying antirheumatic drug (DMARD), 2:824
Disease transmission, in swimming pools/spas, 26:196–197
Di-sec-butanolamine, physical properties of, 2:123t
Di-sec-butyl carbonate, molecular formula, 6:305t
Di-sec-butyl percarbonate (SBP), 6:303
Di-sec-butylphenol (DSBP), 2:230
physical properties of, 2:205t
2,4-Di-sec-butylphenol, 2:230
2,6-Di-sec-butylphenol, 2:230
health and safety data, 2:220t
N, N’-Di-sec-butyl-p-phenylenediamine, 3:108
Dished electrode membrane (DEM) cell, 9:669
Dishwashing, 8:440–441
automatic, 10:285
bleaching agent applications, 4:71
detergent systems for, 8:413t
Dishwashing liquids, acute oral LD50 ranges, 8:446t
Disilanes, direct-process residue, 22:552
Disilicide pest, 25:386
Disinfectant/Disinfection Byproducts Rule (D/DBPR), 17:807
Disinfectants, 8:605, 606
antibacterial agents contrasted, 3:1
for aquaculture in U.S., 3:212t
bromine applications, 4:314
iodine in, 14:372
promising chemicals for aquaculture, 3:223–224
registered for aquaculture in U.S., 3:217
registered for use in aquaculture in Canada, 3:218
registered for use in aquaculture in Japan, 3:221
tU.S. aquaculture, 3:205
Disinfectants/Disinfection By-Products
Rule, 11:626
Disinfection, 8:605–672. See also
Disinfection processes
antimicrobial nanoemulsion technology, 8:630–631
bromine, 8:621–626
bromine chloride, 8:626–628
chlorination, 8:610–615
chlorine dioxide, 8:617–619
dechlorination with sulfur dioxide, 8:615–617
electromagnetic radiation techniques, 8:655–661
electron beam technologies, 8:661–662
ethylene oxide, 8:662–663
N-halamine, 13:100
iodine, 8:628–630
methods, means, and technologies, 8:607–609
ozone in, 8:619–621; 17:803
peracetic acid, 8:630
of swimming pools, 26:179–180
thermal disinfection, 8:631–637
ultrasonic, 8:637–642
ultraviolet, 8:643–653
ultraviolet germicidal irradiation in
inactivating airborne microorganisms, 8:654
Disinfection by-products, in pools/spas, 26:198
Disinfection processes, as advanced
wastewater treatment, 25:909–910
Disjoining pressure, 12:6–7
Disk agglomeration, 19:8
Disk atomizer spray dryer, 9:127
Disk bowl centrifuge, theory of performance, 5:518
Disk centrifuges, 18:144
materials of construction, 5:524
operation, 5:534–538
power, 5:521–522
Disk coupling, for pumps, 21:79
Disk dryers, 9:132
Disk filters, 11:374–377; 16:658. See also
Rotary disk vacuum filters
Disk flat blade turbine, 16:701
Disk meters, nutating, 11:655
Disk pumps, 21:69
Dislocation density, 13:496
Disodium 5'-guanylate (GMP), 12:49
Disodium 5'-inosinate (IMP), 12:49
Disodium acetylide, 22:765
Disodium cocoamphodiacetate, cosmetic surfactant, 7:834t
Disodium decacarbonyldichromide, 6:528–529
Disodium ethylenebis(dithiocarbamate), 4:826
Disodium laurimino dipropionate, cosmetic surfactant, 7:834t
Disodium monohydrogen phosphate, 18:831
Disodium octaborate tetrahydrate, 4:242t, 266–267
uses of, 4:274–275
Disodium pentacarbonylchromide, 6:528
Disodium phosphate, 18:833
Disodium pyrophosphate, 18:841
Disodium salicylate, 22:3
Disodium tetraborate tetrahydrate, 4:242t, 265–266
uses of, 4:274
Disodium tetraborate pentahydrate, 4:242t, 265, uses of, 4:274
Disodium tetraborate decahydrate (borax), 4:242t, 261–265
uses of, 4:274
Disodium tetraborate, 4:242t, 266
uses of, 4:274
Disopyramide, 5:100
molecular formula and structure, 5:90t
Dispersants, 8:672–697
anchoring groups, 8:682–683
biodegradability, 8:693
chelants and precipitation inhibitors contrasted, 8:686
environmental considerations, 8:693
flocculants contrasted, 8:687
function, 8:672–674
in froth flotation, 16:645
in industrial water treatment, 26:141
lignosulfonates in, 15:17–18
for lubricating oil and grease, 15:222
in paper pulping, 21:436
selection, 8:709
in settling of suspensions, 22:54
soluble tails, 8:683–686
structure, 8:676–686
in sulfide flotation, 16:651
surfactants contrasted, 8:686
uses, 8:687–693
Disperse anthraquinone dyes, 9:321–327
Disperse Blue 1, semipermanent hair dye, 7:857t
Disperse Blue 20, 4:361t
Disperse Blue 56, 4:361t
Disperse Blue 79:1
hydrosulfite reduction of, 9:439–440
sediment reduction of, 9:441
Disperse blue dyes, 9:413, 414
Dispersed droplet size, in binary polymer blends, 20:330–334
Dispersed drops, freezing, 16:699
Dispersed morphology, in polymer blends, 20:530
Dispersed-particle dryers, 9:104, 120–121
Dispersed particles, 8:712–726
charge, 8:724–726
particle size, 8:717–718
particle size distribution, 8:718–719
sizing by acoustic scattering and absorption, 8:724
sizing by flow, 8:719–722
sizing by light scattering, 8:723–724
sizing by single particle detection, 8:722–723
Dispersed systems
rheology of, 21:715
viscosity of, 21:714–717
anthraquinone, 9:301
application techniques, structural variations, and fastness properties, 9:416–419
azo, 9:304, 411–420
combinations of, 9:218
dispersion quality, 9:231
foaming propensity, 9:231
liquid, 9:415–416
manufacturing, 9:415
thermal fixation properties, 9:231
Disperse red dyes, 9:413
Disperse Yellow 64, 4-bromo-3-hydroxyquinophthalone, 4:361t
Disperse Yellow 241, colorant for plastics, 7:375t
Disperse yellow dyes, 9:412
Dispersibility, of organic pigments, 19:428–429
Dispersing agents, 9:415
Dispersion(s), 8:697–739; 11:134–135.
See also Axial dispersion
aerosols, 1:774–775
aqueous, 18:292
behavior of, 15:685–690
colorants for plastics, 7:360–361
donor–acceptor interactions, 8:707–708
electrostatic repulsion, 8:732–734
in filled networks, 22:572
of filled polymers, 11:307–308
flow, 8:726–730
flushing, 8:711
hydrophile–lipophile balance of graded series of solutes, 8:707t
intermodal, 11:134
light scattering and, 8:714–717
material, 11:135
measurement of, 16:699
modeling of, 13:165–166
oil in water, 22:725
paint pigment, 18:63
phenolic resins in, 18:783
preparation and stability, 7:272–276s
production methods, 8:699–705
selective flocculation, 8:711
sodium, 22:762, 777
in solvent–solute interactions, 23:92–93
stability, 8:730–737
steric repulsion, 8:735–736
in supercritical fluids, 24:9–10
waveguide, 11:135
Dispersion devices, ozone, 17:801–802
Dispersion force, 12:4
Dispersion-free solvent extraction, 10:766
Dispersion hardening, 13:501, 502, 527
of refractory metal alloys, 13:528
Dispersion polymerization, 24:156–157
of acrylamide polymers, 1:323
of methacrylic ester polymers, 16:289
Dispersion processing
of FEP polymer, 18:314
Dissociation extraction, 10:750
Dissociation behavior, of polymer colloid
Dissociation, of viscose, 11:254–255
Dissolution-controlled drug delivery,
degradation/erosion-based drug
delivery systems, 9:77–79
Dissolution inhibition, by
diazonaphthoquinones, 15:161–163
Dissolution inhibitors, low molecular
weight aliphatic, 15:177
Dissolved air flotation (DAF), 25:913
in hazardous waste management,
25:813, 818–819
Dissolved carbon dioxide, range
for mammalian cell culture, 5:347t
Dissolved humic acid (DHA), 25:911
Dissolved humic substances (DHS), 25:911
Dissolved minerals, 17:694–695
Dissolved oxygen (DO), 26:153, 157
in fermentation, 11:38–39
range for mammalian cell culture, 5:347t
water quality requirements
for aquaculture, 3:200
Dissolved solids analysis, of water, 26:36
Dissolving pulp, 5:367
Distance geometry, 16:752–753
Distibine, 3:57; 3:71
Distillate fuel oil, 18:669
Distillate fuels, dewaxing of, 16:844
Distillate to bottoms ratio heuristic, for
simple distillation, 22:299
Distillation. See also Heuristic distillation
sequencing
Distillation(s), 8:739–785. See also
Azeotropic and extractive distillation;
Distillation processes; Extractive
distillation(s)
argon, 13:460
for aroma isolation, 11:519
atmospheric, 18:646
batch versus continuous, 8:780
of coal-tar naphthalene, 17:78–79
corrosion, 8:779–780
of crude oil, 12:401–402; 18:593
debottlenecking, 18:521
in fatty acid neutralization, 22:740
favorable vapor-liquid equilibria, 8:778
feed composition, 8:778
general separation heuristics for,
22:316–317
in hazardous waste management,
25:813–815
heat sensitivity, 8:779
hydrogen peroxide, 14:54–55
minimum number of theoretical stages, 8:756–758
minimum reflux with pinch zone, 8:758–759
molecular, 8:777
multiple equilibrium staging, 8:749–761
multiple products, 8:761
nitrogen, 13:457–459
operating pressure, 8:779
oxygen, 13:459
in petroleum processing, 18:645–647
pressure-swing, 8:817–819
processes, 8:749–761
product purity, 8:779
propylene oxide, 20:803
rules for determining difficulty of, 22:300
salt effect, 8:816–817
selenium and tellurium purification via, 22:85
as separation method, 8:777–778
simple, 8:749
in solvent recovery, 11:210
of specialty gases, 13:462
use of steam in, 8:776–777; 23:240
thermally coupled sequences for, 22:300–301
thermodynamic analysis of, 8:741–747; 20:751
unequal molal overflow, 8:756
vacuum, 18:646–647
vapor–liquid equilibria, 8:740–748
in wastewater treatment, 25:889t, 895

Distillation–amalgamation mercury assay
method, 16:44
Distillation-based separations, general
heuristics for, 22:316–319
Distillation boundaries
in separating nonideal liquid mixtures, 22:303
strategic separation schemes and, 22:309–310t
Distillation columns, 8:761–762; 10:152–154
control, 8:780–781
cryogenic applications, 8:62
dividing wall, 20:750–751
downcomer flooding, 8:765–766
entrainment flooding, 8:765
equipment costs, 8:780
packed columns, 8:768–776
plate columns, 8:762–768
in styrene manufacture, 23:337–338
Distillation design, applications of, 20:763–764
Distillation–hydrotreat process, 21:425, 426
Distillation into curved boundary, general
separation heuristics for, 22:318
Distillation lines (residue curve maps), 8:790–793
Distillation methods, 10:476
Distillation–pervaporation plant, 15:843–844
Distillation processes, 26:61–73. See also
Distillation(s)
freeze-desalination, 26:71
materials and scaling issues in, 26:71–73
multi-effect distillation, 26:65–67
multistage flash evaporation, 26:61–65
vapor compression distillation, 26:67
Distillation reactors, 21:332
Distillation region diagrams (DRD), 22:302, 303, 331
fourteen most common, 22:304
Distillation regions, in separating nonideal
liquid mixtures, 22:303
Distillation synthesis problems, 22:298
Distillation systems
design of, 20:748–750
for separating nonideal liquid mixtures, 22:301–329, 330
Distillation–titration mercury assay
method, 16:44
Distillation train, in a styrene plant, 23:340–341
Distilled beverages, yeasts in, 26:469–471
Distilled water, killing rate of E. coli, 8:641t
Distillers’ malts, 15:523, 531
Distomer, 6:74
Distributed-Bragg reflectors (DBRs), 14:701, 857–860; 22:178
Distributed control systems (DCS), 20:668–670, 673
pilot-plant, 19:463
Distributed feedback (DFB) lasers, 22:177
Distributed fiber sensors, 11:152–153
Distribution function, 26:1020
Distributor design, in fluidized beds, 11:810
Distributor grid shroud, 11:813
Distributor jets, 11:812–813
Distributors
cap-type, 11:811
pipe, 11:811–813
Distributor system, in ion-exchange systems, 14:403–404
District heating, from biomass, 3:687
4,6-Disubstituted-2-picoline synthesis of, 21:109
Disubstituted boranes, 13:636–640
N,N-Disubstituted p-phenylenediamine (PPD), 19:245
Disuccinimidyl glutarate PEG (di-SG-PEG), 13:737
Disulﬁde bonds/bridges importance of, 23:714
in wool, 26:376–378
Disulﬁdes, 23:643
Disulphopyrocatechol, molecular formula, 5:712t
Disulphur chloride, solubility of chlorine in, 6:133t
Disulphur diﬂuoride, 11:829
Disulphuric acid, 23:765
Ditallowalkylamines, melting point, 2:521t
Ditellurides, 24:422
Diterpenoid acids, 24:550–555
labdane family of, 24:573
Di-tert-alkyl peroxides, 18:439–441
as free-radical initiators, 14:288
2,4-Di-tert-amylphenol (2,4-DTAP), 2:228
health and safety data, 2:220t
physical properties of, 2:205t
3,5-Di-tert-butyl-4-hydroxyhydrocinnamic acid, 3:106
2,6-Di-tert-butyl-4-methylphenol, production from butylenes, 4:425
Di-tert-butyl carbonate, molecular formula, 6:305t
2,6-Di-tert-butyl-para-cresol (BHT), 25:185
2,6-Di-tert-butyl-p-cresol, 3:105
2,4-Di-tert-butylphenol (2,4-DTBP), 2:228–230
health and safety data, 2:220t
physical properties of, 2:205t
2,6-Di-tert-butylphenol health and safety data, 2:220t
physical properties of, 2:205t
Di-tert-butyl peroxide, 18:446
uses for, 18:496
Di-tert-butylstibine, 3:68
1,3-Dithianes, 2:65
Dithiocarboxylic acids, melt polymerization of, 23:739
Dithiodimorpholine, 23:642
1,3-Dithiole-2-thiones, thiocrowned and oxothiocrowned, 23:707
Dithiols, one-pot oxidation polymerization of, 23:713
Dithionate anion, 23:677
Dithionic acid, 23:677–678
health and safety factors related to, 23:678
Dithionite, 21:50. See also Sodium dithionite
Dithionous acid, 23:669
Dithiopolymers, 23:739
Dithiozone extraction method, silver analysis via, 22:651
Dithizone, molecular formula, 5:713t
Ditins, 24:826
Ditoly carbonate, molecular formula, 6:305t
Ditrimethylolpropane, 2:47
physical properties of, 2:48t
Ditungsten boride, 25:386
Ditungsten trisilicide, 25:386
Diucardin, molecular formula and structure, 5:162t
Diuloses, 4:711
Diuretics, 11:867
Diuril, 5:168
molecular formula and structure, 5:161t
Diuron, 13:324
biocide for antifouling coatings, 7:156
DIVA, 6:21
Divalent manganese compounds, 15:571–576
Divalent metals, ferrites of, 14:543
Divalent samarium halides, 14:649
Divalent zinc–silver oxide batteries, 3:454–455
Divergence, 14:656
Divergent dendrimer synthesis method, 26:787
Divergent exo-receptors, 16:774
DiverseSolutions software, 6:17
Diversity searches, 6:14–18
DiversitySolutions software, 6:15, 17
Dividing flow manifolds, 13:272
Dividing wall distillation columns, 20:750–751
Divinylacetylene, 1:181, 230
monomer, 23:352
Divinylbenzene mixtures
chemical analysis of, 23:353t
physical properties of, 23:352t
Divinylbenzene-styrene copolymers, 23:391
Divinyl carbonate, molecular formula, 6:305t
Divinyl sulfide, 25:630
Divinylsulfone method, for covalent ligand immobilization, 6:396t
Division of Chemical Nomenclature and Structure Representation (IUPAC), 17:399
Dizinc hexaborate heptahydrate, 4:242t
and detergency, 8:430–433
and dispersion stability, 8:731, 734–735
DMAEMA-MEMA copolymer, 20:488
DMAEMA-THPMA block copolymers, 20:490
DMAIC improvement process, 21:174
DMAM hydrogels, 13:738
Dma relaxation spectroscopy, 19:586. See also Dynamic mechanical analysis (DMA)
Dma techniques, standards for, 19:576–577t
DMDM hydantoin, antimicrobial used in cosmetics, 7:831t
DME. See Dimethyl ether
DMF. See Dimethylformamide
DMF recovery unit, 11:210
DMG-DMDOT, 24:602–603
DMG-MINO, 24:602, 603
DMNDA, 20:33, 35, 38, 44
DMNDC (2,6-dimethyl naphthalenedicarboxylate), polymerization-grade, 10:187
DNA (deoxyribonucleic acid), 2:554. See also Deoxyribonucleic acid (DNA)
base-pair sequencing of, 11:11
molecular structure of, 11:10
capillary electrophoresis, 4:636–637
chemical analysis of ancient, 5:750–751
“contact print,” 12:504
as a vaccine, 25:502–503
DNA amplification, 12:471–472
DNA analysis, microarrays in, 16:384
DNA bending/flexibility, 17:607
DNA-binding proteins, 20:831–832
DNA biosensors, 3:805–808
DNA biosynthesis, as target of antibiotics, 3:24, 29
DNA chips, 3:805
DNA compaction, 17:610
DNA delivery systems, 9:83
DNA double helix, 20:445–446
DNA exchange, safety of, 12:520
DNA fingerprinting, 21:282
DNA fragments
cloning vectors for, 12:504–506
in genetic engineering, 25:501–502
DNA gyrase, 3:29; 21:216–217
inhibition by quinolones, 21:217–221
DNA hybridization, recombinant phage screening by, 12:506–507
DNA information, analysis of, 12:497–500
DNA introduction, plasmid vectors for, 12:501
DNA isolation, for phage cloning, 12:506
DNA microarrays, 17:622–623; 12:473
DNA molecules, restriction sites on, 12:498
DNA polymerase enzymes, 12:509–510
DNA polymerases, 12:513; 20:447
DNA population, complexity of, 12:503
DNA–protein interactions, 17:608
DNA replication, 12:500
DNA restriction fragments, location of specific sequences to, 12:499
DNA sequence information
computer analysis of, 12:510–512
determining, 12:509–510
uses of, 12:512–513
DNA sequences, 12:497
analysis of, 12:509–510
DNA sequencing systems, automated, 12:510
DNA shuffling, 10:264; 12:472. See also Deoxyribonucleic acid (DNA) manipulation technologies
DNA species, mapping, 12:498
DNA splicing, 12:453
DNA structure, 17:603–613
DNA synthesis, 17:623–625
DNA targeting vector, 12:459
DNA technology, yeast in, 26:497
DNA testing, 12:103–104
DNA topology, 17:610–611
in biological systems, 17:613
DNA transcription, in plants, 13:302
DNA viruses, 3:135
DNOC (4,6-dinitro-o-cresol), 13:283; 14:349
DNQ–novolac photosesist film, optical absorption spectrum of, 15:163–164
DNQ–novolac resists, 15:162
lithographic properties of, 15:163
DNQ sensitizer backbone, structural variation of, 15:163
DNT processes, 17:163–164
Doebner–von Miller synthesis, of quinolines, 21:188–189
Dobutamine, 5:185
Docetaxel, 24:554
Docking and target structure-based database searches, 6:13–14
DOCK program, 6:13; 10:337–338
5,13-Docosadienoic acid, physical properties, 5:33t
Docosahexaenoic acid (DHA), 17:663, 665
Docosanoic acid, physical properties, 5:30t
4,8,12,15,19-Docosapentaenoic acid physical properties, 5:33t
cis-11-Docosenoic acid, physical properties, 5:31t
cis-13-Docosenoic acid, physical properties, 5:32t
trans-13-Docosenoic acid, physical properties, 5:32t
13-Docosynoic acid (behenolic), 5:34t
Documentary materials standards, 15:742
Documentation
EIA, 10:237
for maintaining trademark registrations, 25:261–262
Documentation abstracts, 18:233
in patent literature, 18:223
Document Automation and Production Service (DAPS), 15:762
Documents, shipping, 25:329–330
Document types, environmental impact assessment, 10:231–232
trans-2,4-Dodecadienoic acid, physical properties, 5:33t
Dodecahedral geometry, for metal coordination numbers, 7:574, 575t
Dodecanedioic acid, 4:374
Dodecanoic acid, physical properties, 5:29t
1-Dodecanol, physical properties of, 2:3t
n-Dodecanol thermal, flammable, and critical properties of, 2:4t
toxicological properties of, 2:7t
trans-3-Dodecanedioic acid, physical properties, 5:31t
1-Dodecylamine, melting point, 2:521t.
See also Laurylamine
Dodecylbenzenesulfonate, monoisopropylamine salt, 2:549t
Dodecylbenzenesulfonic acid (DBSA), in emulsion polymerization of siloxanes, 22:560–561
Dodecyl carbonate, molecular formula, 6:305t
Dodecyl chloroformate, molecular formula, 6:291t
Dodecyl gallate, antioxidant useful in cosmetics, 7:830t
Dodecyl hexaoxyethylene glycol, 24:129
Dodecyl mercaptan chain transfer, 19:831, 832
4-Dodecylphenol (PDDP), 2:222–223
health and safety data, 2:220t
physical properties of, 2:205t
Dodecylsuccinic anhydride (DDSA), 10:406
Doebner–von Miller synthesis, 2:787
DOE Pro XL 3.0, features compared to other software, 8:398t
Dofetilide, 5:102, 104, 106
molecular formula and structure, 5:96t
Dolanit fibers, 11:214, 215t
Dolime, 15:27, 399, 400, 401
Dolomite, 15:27, 31, 322
in clays, 6:685
raw material for cement, 5:475t
calcined, 15:53
as a refractory raw material, 21:490, 518
Dolomitic limes, 15:25
sales of, 15:60
Dolomitic limestone, 15:27
Dolphin fish, aquaculture, 3:189
Domains, in ferrites, 11:62, 68
Dome diffusers, 26:163–165
Dome-roof tanks, 24:289
Domestic freight forwarders, 25:328
Domestic fuel oils, 18:669
Domiphen bromide, 4:359t
Donaldson trout, 3:205
Donathite, 6:471t
Donnan membrane equilibrium principle, 14:421
Donnan wool dyeing theory, 26:394
Donohue correlation, 13:262–263
Donor atoms, in silicon-based semiconductors, 22:236
Donor function, in propylene polymerization, 20:529
Donor molecules
  in organic semiconductors, 22:203–204, 205–206t, 210–211
  synthesis and manufacture of, 22:212
Doors, PVC in, 25:684
L-Dopa, from vanillin, 25:554
Dopamine, nitrogen addition and, 21:251
Dopamine β-hydroxylase, copper containing, 7:776
Dopants
  in “double heterostructure” OLEDs, 22:217
  effect on silver halide crystal properties, 19:184
  in ferrites, 11:64
  for HBTs, 22:167, 168–169
  introduction into semiconductors, 14:428
  in ion implantation, 22:185, 187–188
  for MOCVD, 22:150t, 157–158
  for polymer semiconductors, 22:208, 209
  for silicon-based semiconductors, 22:236, 248–249
Dope compositions
  in melt spinning, 16:9–10
  in wet- and dry-jet wet spinning, 16:10, 11
Doped channel FETs (DCFETs), 22:164.
  See also Field effect transistors (FETs)
Doped oxide semiconductor coatings, 23:17–19
Doped oxide semiconductors, refractive index of, 23:19
Doped photoconductors, germanium and silicon, 19:164–165
Doped semiconductors, causes of color, 7:326t, 335–337
Doped silicon, conductivity in, 23:35
Doped/undoped electrochromic organic films, 6:580–582
Dop-dyeing, 9:197
Dop-making process, in acrylic fiber solution spinning, 11:204
Dope solids, in air gap spinning, 11:209
Doping, 23:838–839
  calcium, 23:842–844
  conducting polymers, 7:528–529
  in HBTs, 22:168–169
  ion implantation, 22:188
  silicon-based semiconductors and, 22:231
Doping agents, in photocatalysis, 19:76
Doppler broadening, 14:666, 671; 23:131
Doppler flowmeters, 11:673
Doré bars, 22:647
Dormex, 13:42t, 50–51
Dorr classifier, 22:285
Dorrco Flocculator-Squarex clarifier, 22:60
Dorr-Oliver slurry-fed roaster, 26:563
Dortmund-Hoerder (DH) process, 23:264
Dosage forms
  buccal or sublingual, 9:48
  conventional, 9:50–51
Dose–response curves
  characteristics of, 25:233–234
  controversy related to, 25:244
  regulatory use of, 25:235
Dose–response data
  for chloroform, 25:227t
  regulatory applications of, 25:236
  use of, 25:228–236
Dose–response relationships
  risk assessment in, 25:236–244
  test conditions impacting, 25:226–228
  in toxicology studies, 25:224–244
  types of, 25:225, 226
Dose-response studies, animal growth regulators, 13:9
Doses, in specific environmental media, 25:239–241
DOT Federal Railroad Administration, 25:337. See also U.S. Department of Transportation (DOT)
DOT hazardous materials regulations, 25:338
DOT safety regulations, 25:337
Double absorption process, for sulfuric acid manufacture, 23:769
Double absorption sulfuric acid plants, 23:774
Double absorption sulfur burning plant, flow sheet for, 23:775
Double-arm kneading mixers, 16:722
Double-barrier structure, in RTDs, 22:170–171
Double-base propellants, 10:725
Double-base rocket propellants, 10:726
See also β-decay
half-life results for, 21:307t
Double bonds
esterification rate and, 10:473
propylene, 20:773
in VDC polymer degradation, 25:712–713
Double-cell system, in soil and ground water treatment, 25:835
Double crucible technique, 11:135–136
Double-deck kiln, 15:530
Double-drum dryers, 9:134
Double-drum separator, 15:446
Double-effect distillation, 10:153
Double end point titration method, phosphorus content measurement by, 19:47–48
Double-flash generating plant, 12:531
“Double focusing mass spectrometers,” 15:664
“Double grain” model, for polypropylene growth, 26:528
Double Friedel–Crafts alkylation, 12:170
Double-helical structure, 17:603, 604.
See also Triple helices
Double-helicates, selective formation of, 16:801–803
Double helixes, self-recognition in the self-assembly of, 16:803
Double-heterojunction (DH) structures, for LEDs, 22:173, 174, 175
Double heterostructure (DH), 14:844
Double heterostructure laser diodes, 14:700
“Double heterostructure” OLEDs, 22:216
Double-immunodiffusion technique, 15:753–754
Double-jet crystal growth method, 19:179
Double-layer compression, 11:631
Double-layer forces, flocculation and, 22:55
Double-lined kraft (DLK), 18:96
Double-lined landfills, 25:877
Double mashing, 3:577
Double-neutralization phosphoric acid purification, 18:824–825
Double polarization, in sugar analysis, 23:474
Double-pulse ruby laser, 14:697–698
Double refraction, 14:675
Double salts, lanthanide, 14:633–634
Double-stranded DNA viruses, 3:135
Double-stranded RNA (dsRNA)
in yeast, 26:451–452
Double-stranded RNA viruses, 3:135
Double-suction pumps, 21:60, 63
Double tipping pan vacuum filter, 11:352
Double titration method, 15:145
Double vacuum-arc remelting (VAR), in titanium sponge consolidation, 24:854
Double wall nanotubes (DWNT), 26:737
Double-wall tanks, 24:296
Doubly “smart” block copolymers, 20:487–489
Dough, 26:462
Dough-conditioning agents, as food additives, 12:56–57
Dough strengthener, 12:31
Dovenex, 25:792
Dow aluminum nitride, 17:212
Dow catalysts, 16:81
Dow Chemical, 24:259
advanced materials research, 1:692, 696
Development and Technical Service function within, 24:339
employee contest at, 10:162–163
silicone industry and, 22:548
Dow Chemical Exposure Index, 13:156
Dow Chemical seawater process, magnesium manufacturing via, 15:330–332
Dow Corning antifoam, commercial defoamer, 8:241t
Dow electrolytic cells, 15:331–332
Dowex-50 Amberlite IR120B properties and applications, 1:587t
Dow Fire and Explosion Index, 13:155–156
usefulness of, 13:156
Dow Jones Sustainability Indexes, 24:190
Dowlex, 7:636
Dowlex resins, 20:197
Downcomer, 20:541
packed bed fluid-dynamics of, 20:542
Downdraft machines, 16:141
Downdraft sintering, 26:565
Downs cells, 16:162; 22:769–772
Dow process, 9:640–642
Dow solution polymerization process, 20:196–197
Dowson–Higginson equation, 15:211
Dow Tyril 100, physical properties and test methods, 1:440t
Doxazosin mesylate, 5:160
molecular formula and structure, 5:155t
Doxercalciferol, 25:793
Doxorubicin, 21:242
Doxycycline, 24:592, 595, 603–604
  bacterial resistance mechanisms, 3:32t
  registered for use in aquaculture in Japan, 3:221t
DPD analytical method, 13:114
DPG, 20:43
D-PriSM, 11:688
Draeger tubes, 23:636
Draft-tube-baffle crystallizer, 8:136, 137
Draft-tube sparged concentric draft-tube airlift reactor, 15:712–713
Drag coefficient ($C_D$), 11:753, 754; 22:51–52
Drag flow, 19:540, 541
Drag force ($F_D$), 22:51, 52
Dragline silk, 22:627
  composition of, 22:629
  crystallinity of, 22:630
  mechanical properties of, 22:633t
  thermal properties of, 22:633
Drag-out losses, recycling, 9:786
Drag reduction, ethylene oxide polymers in, 10:688
Drainage
  centrifugal separation by, 5:512–515
  in foams, 12:12–14
  getting rid of, 12:14
Drainage equations, 12:12–13
Drainage layer, in landfills, 25:878, 879
Drainage valves, safety of, 21:851–852
Drainage velocity, 12:13
Draught tube bioreactor, 1:741
Drawing
  copper wrought alloys, 7:735
  filament, 20:18
  new developments in, 19:751–753
  of olefin fibers, 11:237–238
  of polyester fibers, 20:15–16
  of polymer fibers, 11:175
Draw-texturing, 19:753–754
Draw–twist process, in spinning continuous filament yarns, 19:750
Dredging, of tin, 24:784
Dresses, number produced from one bale of cotton, 8:133t
Dress shirts (woven), number produced from one bale of cotton, 8:133t
Drewplus, commercial defoamer, 8:241t
Dried food, rehydration of, 12:85
Dried gels, 23:56–58
Dried yeasts, food uses for, 26:474
Drierite, 8:360
Driers (metal salts catalyzing drying), 2:149. See also Dry entries
  food, 12:85
  in refrigeration systems, 21:539–540
Drift flux correction, for pseudobinary absorption, 1:55–58
Drift/mist control, ethylene oxide polymers in, 10:689
DRIFT spectra, acquiring, 24:111. See also
  Diffuse reflectance infrared Fourier transform spectroscopy (DRIFT)
Drilling, of hydrothermal wells, 12:525–527
Drilling fluid (drilling mud) companies, 9:2
Drilling fluid materials, 9:2–9:25. See also
  Drilling fluids; Drilling muds
  alkalinity control in, 9:19
  barite, 9:9–10
  calcite, 9:10
  circulation control, 9:23–24
  clear brine fluids, 9:10
  contaminant removal, 9:20
  hematite, 9:10
  lubricants and spotting fluids, 9:24–25
  siderite, 9:10
  solid removal, 9:24
  solid salt, 9:10
  stabilization of water-sensitive formations, 9:20–22
  surfactants, 9:22–23
  viscosity buildup, 9:11–15
  viscosity reduction, 9:15–19
Drilling fluids, 9:1–42. See also Drilling fluid entries; Drilling muds
  analytical and test methods, 9:31
  benzoic acid application, 3:631
  bromine applications, 4:315t
  calcium chloride application, 4:568 classification, 9:3–6
  colloid, 7:274t
  completion and workover, 9:26–30
  costs, 9:2
  density, 9:7
  economic aspects, 9:30–31
  environmental aspects, 9:31–32
  filtration properties, 9:8
  flow properties, 9:7–8
  functions, 9:6
  metal bromide applications, 4:326
  new directions in, 9:32–37
  nontoxic, 9:35
  organic-based, 9:35
palygorskite/sepiolite application, 6:699–700, 700t
properties, 9:6–8
water chemistry, 9:8
Drilling muds, 6:699–700
chromium application, 6:523, 560
dispersant applications, 8:689–690
smectites application, 6:697, 697t
Drinking water
iron and manganese removal from, 17:805
lead in, 14:765
lime product standards for, 15:68–69
microbial control regulations for, 17:804
ozone treatment of, 17:768, 802–807
regulations, 17:528–529, 807
salt in softening, 22:817–819
selenium content of, 22:77
silver in, 22:655–656
vinyl chloride in, 25:649, 650
Drinking water contamination,
by herbicides, 13:311
Drinking water disinfection by-product regulations, 17:807
Drinking water pretreatment, hydrogen peroxide for, 14:65
Drinking Water Priority List (DWPL; EPA), 17:807; 22:680, 682
Drinking water production, nanofiltration in, 21:653
Drinking water treatment, reverse osmosis in, 21:647. See also Water treatment
Drip carburizing, case hardening by, 16:210
Drip pans, waste minimization via, 25:884
Driveability index (DI), 12:398
Driveability performance characteristics, 12:396–397
Driving force
logarithmic-mean, in packed column absorbers, 1:53
and mass transfer coefficients, 1:37–39
mass transfer of oxygen in aeration, 1:734–735
Dronedarone, 5:103, 106
Drop breakage, 16:696–697
Drop breakup, by turbulence, 16:697
Drop diameter, 10:763–764
Drop dispersions, 10:755
nonuniformity of, 10:765
Droplet deformation, in polymer blends, 20:331, 334
Droplet dispersion zone, in liquid atomization, 23:183–184
Droplet mean axial velocity, 23:189
variation of, 23:189
Droplet radius, in polymer blends, 20:333
Droplet size correlations, 23:190–191
Droplet size distribution, in polymer blends, 20:332–333
Droplet sizes, in sprays, 23:185
Drop-on-demand (DOD) inkjet printing, 9:222
Dropping mercury electrode (DME), 9:568
Dropping point, 15:243
Drops
coalescence of, 16:698
direct photography of, 16:699
Drop size, quantification of, 23:192–193
Drop size distribution (DSD), 16:696
Drop under free-fall, 5:506
Drop-weight impacts, 19:581
Dross, aluminum, 21:390
Drossing, 14:745–747
Drown-out, general separation heuristics for, 22:320
Drug Abuse Control Amendments, 18:685
Drug beads/granules, coated, 18:710
Drug carriers, leaching from, 18:710
Drug coatings, 18:706–708
Drug delivery
dendrimers in, 26:792–795
hydrogel-based, 13:748–750
membrane technology in, 15:847–848
Drug delivery systems, 9:42–93. See also
Controlled drug release systems
buccal, 9:48
nasal, 9:48–49
ocular, 9:50
oral, 9:44–46
polymer fabrication and drug encapsulation, 9:73–75
pulmonary, 9:49–50
pulsatile, 9:57–61
rectal, 9:46
representative applications, 9:81–83
self-regulated, 9:61–71
temporally controlled, 9:63
transdermal, 9:46–48
vaginal, 9:50
Drug design, combinatorial chemistry application, 7:381
Drug development, proteins in, 20:839
Drug discovery, yeasts in, 26:488
Drug dosage forms, 18:702–718
  aerosols, 18:717
  biotechnology and, 18:717–718
  capsules, 18:708
  granules, 18:702–705
  liquid, 18:712–713
  lyophilization, 18:716
  ophthalmic, 18:716
  parenteral, 18:713–716
  prolonged action/controlled release solid, 18:708–712
  radiopharmaceuticals, 18:716–717
  semisolid, 18:713
  tablets, 18:702, 705–706
Drug Efficacy Study Implementation (DESI), 18:685
Drug encapsulation, 9:75
Drug Enforcement Administration (DEA)
  forensic laboratories, 12:98
Drug formulations, micelles and surfactant monomers in, 24:160–161
Drug grade sodium nitrite, 22:856, 857t
Drug Importation Act, 18:683
Drug-like molecules, 6:18
Drug-loaded biodegradable capsules, 16:448
Drug metabolite production, microbial biotransformations for, 16:398–399
Drug Price Competition and Patent Term Restoration, 18:686
Drug products
  biologically active stereoisomers of, 18:725
  prolonged action, 18:711–712
  FDA regulation of, 21:573–576
  from fermentation, 11:13–14
Drug quality, regulating, 21:574
Drug regulation, chronology of, 18:682–687
Drug release
  controlled, 9:50–52
  ethylene oxide polymers in, 10:687
Drug research, yeast as a model for, 26:497
Drugs. See also Antibacterial oxazolidinones; Drugs of abuse; Pharmaceuticals absorption, 9:45
  accelerated development/review for, 18:697
  biological properties, 9:53–55
  biotechnology, 18:718
  concentration levels, 9:55–56
  cosmetics as, 21:579–580
  development and approval time frame for, 18:696–698
  enantiomerically selective synthetic pathways to, 21:257
  gold, 12:704
  hydrazine based, 13:598–599
  isoquinoline-derived, 21:197–198t
  maximum absorption site, 9:53
  metabolism, 9:45
  microencapsulation in, 16:453
  microfluidic assays of, 26:969–970
  nonproprietary names for, 25:265
  pharmacological action, 9:53
  physicochemical properties, 9:52–53
  quinoline-derived, 21:197–198t
  solubilization of, 24:160
  stability of, 9:53
  therapeutic efficacy, 9:51
  veterinary, 21:579
Drug screening tests, 12:98–99
Drugs of abuse
  commonly encountered, 12:92–94t
  typical, 12:98
Drug testing, 12:95–98
Drug trials, safety of, 18:697–698
Drum boilers, 23:216–217
  water treatment in, 23:225
Drum dryers, 9:106, 133–134
  in hazardous waste management, 25:816
Drum dyeing, 9:226
Drum-filling scales, 26:244
  See also Rotary drum vacuum filters
Drumming and filling operations, industrial hygiene and, 14:208
Drumming tanks, 16:286
Drums
  composite, 18:8
  fiber, 18:9–10
  in plant layout, 19:504–505
  plastic, 18:7–8
  polyethylene-coated, 18:6–7
  reusable, 18:8t
  steel, 18:6–7
U.N. packaging codes for, 18:7t
Drum separator, 16:633, 634, 639
Drum specifications, for wet drum ore concentrator, 15:447–448
Dry air, components of, 17:345t
Dry ash gasifier, defined, 6:827
Dry asphalt modification process, 21:468
Dry basis, 9:97
Dry bulk materials, handling of, 18:5
Dry chlorination, selenium recovery via, 22:83
Dry classifiers, 22:288–293
Dry cleaning, colorfastness to, 9:229
Dry-clean only garments, 9:96
Dry color pigment, 7:26
Dry coloration process, for wet drum ore concentrator, 15:215, 216
Dry core, 12:737
Dry dispersion image analysis, 18:147
Dryers, 9:116–139. See also Drying; Drying mechanisms
dielectric and microwave, 9:137–138
direct heat, 9:117–127
in hazardous waste management, 25:815–816
indirect-heat, 9:127–136
industrial, 9:94–96
radiant-heat, 9:136
superheated steam, 9:138–139
Dry etching, in compound semiconductor processing, 22:183–185
Dry fiber spinning, 11:204–206
abrasion resistance and, 11:211
Dry foams, 12:8–10
rheological properties of, 12:16
shear modulus of, 12:16
Dry foods, packaging, 18:34
Dry forming, ceramics, 5:648–649
Dry gas, 13:691
Dry goods, disinfection, 8:635
Dry granulation drug dosage form, 18:704–705
Dry grinding, 9:292
Dry-heat fixation, 9:215, 216
Dry heat, flavor development via, 11:580
Dry ice, 4:818
Dryers, 9:93–141. See also Dryers;
Drying mechanisms; Drying process in bar soap manufacture, 22:748, 750–751
in ceramics processing, 5:655–656
in coating processes, 7:26–34
of coffee, 7:262
costs, 9:96
of gels, 23:78
heat transfer mechanisms, 9:95
of inks, 14:313–315
of paper, 18:121–122
in potassium chloride refining, 20:619
of printing inks, 14:313–315
psychrometry, 9:98–102
in pyrometallurgy, 16:138
in the sol–gel process, 23:60, 66–71
in solid–liquid separation, 11:344
for solvent removal, 23:104–107
of spices, 23:153–154
of staple fibers, 11:257–259
supercritical fluids in, 24:20
terminology, 9:96–98
in vinyl alcohol polymerization, 25:610
of wood, 26:341–342
Drying agent, 12:32
Drying applications
microwave technology in, 16:530
molecular sieves in, 16:840
Drying body, inside versus outside
shrinkage rates for, 23:67
Drying–collapsing step, in wet fiber spinning, 11:208
Drying control chemical additives (DCCA), 1:754
Drying equipment, 10:154
Drying gases, commercial gas absorption
process for cellulose acetate fiber production, 1:26t
Drying index, 9:144
See also Dryers
capillarity, 9:112–115
constant rate drying, 9:103–105
contact drying, 9:105–107
critical moisture content, 9:107
diffusion, 9:110–112
drying periods, 9:102–103
drying profiles, 9:115–116
equilibrium moisture content, 9:107–109
falling rate drying, 9:109–110
Drying oils, 10:831
Drying oils, 9:142–155
autoxidation and cross-linking, 9:144–148
composition, 9:142–144
conjugated, 9:148
Dry jet-wet spinning process/technique, 13:375–376, 378
Dry-laid nonwoven processes, 17:496
Dry-laid processes, 11:179
Dry-laid pulp, 17:504
Dry low intensity separators, 16:636–639
Dry machining, of magnesium, 15:368
Dry magnetic separators, 15:442, 450–452
Dry methylene chloride, 16:732
Dry milling, 10:294
asbestos minerals, 3:308
Dry mixing, in bar soap manufacture, 22:748
Dry pet foods, 10:849–850
Dry-pit pumps, 21:65–66
Dry polyacrylamides, 1:322
Dry polychloroprene types, 19:851
applications for, 19:852–853
Dry polymer, conversion to, 19:842
Dry pressing
ceramics processing, 5:648–649
of ferrites, 11:72–73
Dry processing, of sodium carbonate
peroxohydrate, 18:412
Dry-process kilns, 5:490–491
Dry process lead refining, 14:751
Dry pulps, 11:219
Dry resins, 14:393
shipping, 14:413
Dry-screening devices, 22:275, 282
Dry section, of multipurpose plant, 11:427
Dry setting operations, in wool processing, 26:888
Dry sieve test, 19:379
Dry-sieving, in particle size measurement, 18:140–141
Dry Silver, 19:333, 334
Dry silver materials/processes, in photothermographic imaging, 19:314–317
Dry sodium dithionite, 23:676
Dry sodium metabisulphite, 23:672
Dry solids, mixing of, 16:719–720
Dry solids storage, in minerals recovery and processing, 16:660–661
Dry spinning, 19:723
of MPDI, 19:724
of polymer fiber, 24:617
Dry spinning tower, 11:204–205
Dry steam coal grade (U.K.), 6:713t
Dry-strength additives, in paper manufacture, 18:114–115
Dry sulfur trioxide, 23:756
Dry time machine, mechanical, 18:70
Dry yeasts, 26:468
DS2 decontamination agent, 5:836
DSC (differential scanning calorimeter) measurement, 10:17–18
DSC thermogram, 10:13
DSL systems, ferrites in, 11:77
DSMA, 13:325
d-sugars, 4:697
alpha and beta configurations, 4:699
D-type inks, 14:326
Dual-anode X-ray source, 24:101
Dual-medium filters, in water treatment, 26:104
Dual nickel, 9:820–821
Dual-pressure processes, in nitric acid production, 17:175, 177, 179
Dual-solvent fractional extraction, 10:760
Dual Ziegler catalysts, for LLDPE production, 20:191
Dubinin–Radushkevich adsorption isotherm, 1:626, 627
Dubnium (Db), 1:492t
Ductile (nodular) iron, 14:522
Ductile brittle transition temperature (DBTT), 13:487
Ductile cast iron, 22:518–519
Ductile fracture, as failure mechanism, 26:983
Ductile iron
antimony addition to, 3:53
magnesium ferrosilicon and, 22:518
pipe, 23:783
Ductile particles, ceramic–matrix composite reinforcement, 5:570–572
Ductile polymers, 20:351, 353
impact resistance of, 20:355
Ductility, of ordered alloys, 13:499–500
Ductility tests, 9:791
Dufour effect, 25:274
Dumas combustion method, 17:216
Dumbbell structures, fullerene, 12:252
Dumped (random) packing, characteristics, 8:774t
Dumping, open bag, 14:209
Dunova, 11:191–193
DUP-105, 17:731
DUP-721, 17:731
preparation of, 17:737
Duplex RNA regions, 17:614–615
Duplex stainless steels compositional and property linkage, 7:809
Duplicator inks, 14:321
DuPont bioengineering research programs, 1:703
collagen nanofiber research, 1:723
corporate decision making in, 24:387
eyear advanced materials research, 1:692
technical service from, 24:339
DuPont process, for HDPE manufacture, 20:167
DuPont Sclair solution polymerization technology, 20:196
DuPont–University Interface Model, 24:360
DuPont–University of North Carolina collaboration, 24:391
Durability of inorganic pigments, 19:382–384
of sealants, 22:29–32
of vitreous silica, 22:417–419
Durable products, use of nonwoven goods in, 17:517
Durain, 6:705
Duralcan process, 16:167
Durallium LG, base-metal dental alloy, 8:309t
Duranickel, 13:518
DURANICKEL alloy 301, 17:95
Duranol, molecular formula and structure, 5:93t
Duranol dyes, 9:411, 414
Duraquin, molecular formula and structure, 5:90t
Durel, 10:189
Durham-Humphrey Amendment, 18:684
Durham technique, for conducting polymers, 7:514
Duriron, corrosion resistance of, 23:785
Durran's method, 10:387
Durum wheat, 26:278
milling of, 26:282
Dust(s), 8:697
amorphous silica as, 22:403
from ferrosilicon/silicon production, 22:521
on self-cleaning surfaces, 22:115–116
silicon in, 22:499
as colloid, 7:272t, 273t
occurrences of, 7:273t
inhalation of PVA, 25:614
inhalation of PVC, 25:676–677
zinc, 26:573, 582–583, 598–600
Dust emission, lime industry, 15:75–76
Dust explosions, during pneumatic classification, 22:293–294
Dust inhalation, from carbon fibers, 26:746
Dutch chocolate liquor composition, 6:369t
tocopherols, 6:370t
Dutch cocoa butter fatty acid composition, 6:371t
minerals content, 6:371t
Dutch State Mines cyclone, 16:634
Duteplase, molecular formula and structure, 5:172t
Dutral, 7:637
Duty heat transfer coefficients, 13:203–204
Duvadilan, molecular formula and structure, 5:111t
Dwight-Lloyd continuous sintering machine, 16:141
Dyazide, molecular formula and structure, 5:165t
Dyeability of fibers, 11:169–170
of olefin fibers, 11:230
Dye affinity, effect of fiber properties on, 19:759–760
Dye aggregates, 9:509, 510
Dye-based cells, in photovoltaic devices, 22:221
Dyebath decolorization, 9:452
Dye clouds, 19:264
Dye combinations, 9:217–218
Dye compatibility values, 9:193
Dye degradation, 9:364
    by metal catalysis, 9:381–384
Dye designs, for silver halides, 9:507–508
Dye destruction technology, 19:241
Dye developer processes, 19:284–288
Dye developers
    color-shifted, 19:287–288
    insulated, 19:285–286
Dye diffusion thermal transfer (D2T2), 19:320
Dye dispersants, lignosulfonates in, 15:17
Dye fading, 9:368
Dye-fiber covalent bond, 9:463, 464
Dye-fiber fixation process, 9:466
Dye filter cakes, 9:455
Dye fixation, 9:217. See also Fixation
Dye formation processes, in subtractive dye imaging systems, 19:295–296
Dye hole, 9:508
Dye images, stabilization of, 19:296–298
Dye imaging systems, subtractive, 19:284–298
Dye-induced desensitization, 19:237
Dye industry, pollution prevention in, 9:442–456
Dyeing, 9:155–238. See also Colorants; Dyes
    acrylic fibers, 9:192–194
    aims of, 9:166–169
    batch processes, 9:162–165
    cellulose esters, 9:197–198
    cellulosic fibers, 9:169–183
    continuous processes, 9:165
    fiber blends, 9:198–204
    of fibers, 11:180–181
    general practice, 9:165–169
    history, 9:156
    leather, 9:224–227
    machinery for, 9:204–213
    paper coloring, 9:222–224
    of PBI fibers, 13:381
    polyester, 9:194–197
    preparation for, 9:170–171
    processes, 9:157–165, 171, 196, 198
    rates of, 24:621
    synthetic polyamides, 9:188–191
    textile, 24:620–621
    textile fastness tests, 9:227–230
    textile printing, 9:213–222
    water in, 9:159–160
    wool, 9:183–188; 26:394–397
Dyeing applications, tetrahydrofurfuryl alcohol in, 12:279
Dyeing theory, 26:394–395
    “Dyeing transition temperature,” 9:159
Dye intermediates, 9:265–298
    chemistry, 9:266–291
    classification, 9:265–266
    economic aspects, 9:293–295
    equipment and manufacture, 9:291–293
    health and safety factors, 9:295–298
    obtained by nitration, 9:271t
    obtained by sulfonation, 23:525
    unit processes, 9:269–283
Dye lasers, 14:702–705; 23:144
    output characteristics of, 14:705
Dye–ligand affinity chromatography, 6:402
Dye liquor, 9:163
Dye manufacturing
    pollution prevention in, 9:447–450
    process optimization in, 9:443
Dye manufacturing plants, 9:293
Dye molecules
    chromophore interaction in, 20:511–512
    “electronic asymmetry” of, 20:509
Dye oxidation. See also Oxidation process
copper-catalyzed, 9:382
    iron porphyrin-catalyzed, 9:383–384
    manganese-catalyzed, 9:382
Dye particle size, reducing, 9:415
Dye photoholes, 19:195
Dye precursors, colorless, 19:295–296
Dye radicals, formation/decay of, 9:377–378
Dye receptors, in fiber polymers, 11:195
Dye release
    by reduction, 19:293–294
    by ring opening, 19:294
    by silver-assisted cleavage, 19:294–295
    in subtractive dye imaging systems, 19:288–292
Dye-releasing quinone compounds,
19:293–294
Dye-releasing redox (DRR) compound,
19:348
p-base Dyes, 9:474
Dyers’ controls, 9:165–169
Dyes, 9:155, 238–264, 14:323. See also
    Anthraquinone dyes; Azo dyes;
    Dye intermediates; Environmental chemistry; Polymethine dyes (PDs);
    Reactive dyes; Sensitizing dyes
    aggregation, 9:162
    in anodizing, 16:222
as antibacterials, 3:3
application classes of, 24:621t
attractive forces with fibers, 9:160–162
bromine-containing organic compounds, 4:361t
chemical classification, 9:239–240, 244–264
chlorine reaction with, 9:374
chlorotoluene application, 6:345
classes, 9:172–173
color, 7:332
colored smoke fillings, 5:830, 831t
compatibility, 9:193
as complexes with heteropolyacids, 19:440t
coordination compounds, 7:595–596
cova lent fixation, 9:489–491
degradation, 9:438–439
diesel fuel, 12:428
environmental fate, 9:437–442
fastness, 9:162, 169
FD&C, 12:50
in gasoline, 12:406–407
iodine in, 14:371
ionic and cationic, 9:159
kinetic investigations of azo, 9:368–369, 370–373
laser, 14:702
liquid crystal display system, 9:338–341
microencapsulated thermochromic or photochromic, 24:623
name assignments, 9:157
nickel compounds in, 17:124–125
omenclature, 9:243–244
opacifying, 19:304–305
paper, 18:113t
photocatalytic removal of, 19:92–94
photodegradation, 9:385
photofading, 9:384–389
for polyamide fibers, 19:758–760
premetallized, 9:399–401
production of, 23:516
quinoline, 21:196
safe handling, 9:234
salicylic acid and, 22:11
as soap bar additives, 22:744
sodium nitrite in, 22:858
sodium sulfates in, 22:869
solubility testing, 9:232
spectral-sensitizing, 19:192–196, 233
sulfonates in, 23:525
synthetic organic, 9:223
testing and analysis, 9:230–234
transfer and compatibility properties, 9:231
usage classification, 9:240–243
versus pigments, 19:417
Dye selectivity, 19:761
Dye-sensitized degradation, 9:519
Dye-sensitized photoisomerization, 9:520
Dye sensitized PV cells, 23:44
Dye-sensitized solar cells, ionic liquids in, 26:878
Dye setting, control of, 9:493–498
Dyesite content, of polymer, 11:195
Dye solubility, modification of, 9:509
Dye stability, in color photography, 19:263
Dyestuff migration, 9:231–232
Dyestuff production
trends in, 9:294t
United States, 9:295
West European, 9:294t
Dyestuffs industry, growth of, 9:238–239
Dye-transfer inhibition system, 10:284
Dye transfer system, in color photography, 19:242
Dye wastewater, 9:431
Dynamic affinity chromatography, 6:398
Dynamic allotropy, 23:564
Dynamically formed membranes, 15:813t
Dynamic coefficient, 15:205
Dynamic compressors, in refrigeration systems, 21:535
Dynamic electroanalytical measurements, 9:586–588
Dynamic filters, 11:383–387
Dynamic flow calibration, 11:651–652
Dynamic gassing-in kL/LA measurement method, 15:680–682
Dynamic image analysis systems, 18:147
Dynamic Kerr effect (DKE), 17:454
Dynamic light scattering (DLS), 20:381
in molecular weight determination, 19:569–570
in particle size measurement, 18:151–152
Dynamic matrix control (DMC), 10:152
Dynamic measurements, of polysaccharides, 20:555
Dynamic measurement techniques, 21:744–747
See also Dma entries
of cured MF resins, 15:784–786
of phenolic resins, 18:777–779
in silicone network characterization, 22:569, 570
Dynamic mechanical thermal analysis (dmta), 20:346
Dynamic models, fitting to experimental data, 20:689–691
Dynamic process control models, 20:687–688
Dynamic properties, of glazing coatings, 23:20–23
Dynamic random access memory (DRAM) silicon-based semiconductors and, 22:229, 230, 231, 250, 257, 258
vitreous silica in, 22:443
Dynamic random access memory devices, 10:3
Dynamic recovery, 2:330
Dynamic reversibility of noncovalent interactions, 24:61
Dynamic scattering device, 15:115
Dynamic sealing, for pumps, 21:81–82
Dynamic SIMS method, 24:107–108
Dynamic uncertainties, 26:1019, 1021–1023
Dynamic viscometer, 21:736
Dynamic viscosity, 21:723
Dynamic vulcanizes, 24:717
“Dynamic vulcanization,” 24:700
Dynascone, 24:567
Dynatrol viscometer, 21:739
DynaWave gas cleaning technology, 23:782
Dynel, 11:202
Dyneon, 7:641
Dyno filter, 11:387
Dyrenium, 5:168
molecular formula and structure, 5:165t
Dysphasia, antianginal agents for, 5:110t
Dysprosium (Dy), 14:631t, 635t
 electronic configuration, 1:474t
Dzhezkazganite, rhenium in, 21:684
EAF dusts, 21:416
Earnings, distributed and retained, 9:540
Earth Ceramics, 14:110–111
Earth Day, 21:568
Earth movement detection system, with fiber-optic smart structures, 11:158–159
Earth’s crust
 abundance of metals in, 16:597t
 metal content of, 16:135t
 elements in, 26:23
 silica in, 22:365
 silicon in, 22:501
Earth surface geochemical system, 26:9
Earthly odor, 3:228t
Easiest next heuristic, for simple distillation, 22:300
Easily dispersible (ED) pigments, 14:316–317
East African coffees, 7:250
Easy-care wovens, 26:393
Ebalol, 24:536
E-beam (e-beam) lithography, 15:160
in compound semiconductor processing, 22:193
Eberhard effects, 19:210
EBEX ethylbenzene recovery process, 23:334
EB inks, 14:314–315
EBMax alkylation technology, 23:333
Ebola virus, 3:137
Eccentric bottom tapping (EBT), 12:300
Eccentric bottom tapping electric furnace, 23:252
Ecclesiastical wines, 26:301
Ecdysone receptor agonists, 14:345
ECHIP JMP 4.0.4, features compared to other software, 8:398t
ECLP tube press, 11:373
Eco-check Product excellence, 24:189
Eco-efficiency analysis, 24:189, 190
Eco-Efficiency program, 9:457
Ecological and Toxicological Association of Dyestuffs and Organic Pigments Manufacturers (ETAD), 9:234, 238; 19:452
Ecology, industrial, 12:806. See also Environment; Environmental entries
Ecology standards, in fine chemical production, 11:433–434
Economic aspects. See Economics
Economic-ecological efficiency, 24:196
 sustainable development and, 24:188–189
Economic evaluation, 9:525–550. See also Economics
 break-even charts, 9:546–547
 cost estimation, 9:526–534
 inflationary effects, 9:547
multiyear venture analysis, 9:537–544
problem definition, 9:525–526
profitability analysis, 9:535–537, 544–546
revenue estimation, 9:534–535
of synthetic organic chemicals, 24:253–279
uncertainty and risk, 9:547–548
Economic impacts, EIA, 10:245
Economic inflows/outflows, in life cycle assessment, 14:809–810
Economic investment opportunities, identifying, 10:162–166
Economic optimization, 9:673
Economic patterns, organic chemical industry, 24:263–265
Economic regulation, of transportation, 25:331–336
Economics, See also Capital entries; Cost entries; Earnings; Financial entries; Manufacturing costs; Oil prices; Price; Prices/pricing
of advanced materials, 1:691–730
Economies of scale, product design consideration, 5:780
Ecotoxicological studies, 9:296
Ectopic beats, 5:82
Ecto type aerators, 26:158–162
types of, 26:160
ED50 dose, 25:234–235
EDC cracking, in vinyl chloride
manufacture by pyrolysis, 25:643, 646.
See also Ethylene dichloride (EDC)
EDC pyrolysis, in vinyl chloride manufacture, 25:634, 635, 641–642, 642–645
EDDFA analysis, 10:327t, 331
Eddy-current losses, in spinel ferrites, 11:64
Eddy-current separation, 15:435
of nonferrous metallics, 15:455–457
Eddy-current separator, 21:447–448
Eddy-current technique, in nondestructive evaluation, 17:420
Eddy diffusion, 9:658
Eddy viscosity, 11:779
Eddy-viscosity-based models, 11:780
Edecrin, 5:169
molecular formula and structure, 5:163t
Edelana process, 3:606
Edema, 5:167
effect on heart, 5:107
Edge-defined film fed (EFG) technique, 23:41
Edge-defined growth, silicon purification via, 22:496
Edge effect phenomenon, in photography, 19:209
Edge-emitting LEDs, 22:174
Edge-emitting semiconductor lasers, 22:177, 178
Edge filter, 11:369
Edible oils industry, 10:817
Edman degradations, silylating agents and, 22:700
EDM/ECM processes, 9:603–604
EDOC database, 18:237, 247
Edylerite, 6:471t
EDTA. See Ethylenediaminetetraacetic acid (EDTA)
Education
for materials standards, 15:755
scientific, 21:618
Educational materials, copyrights for, 24:378
Edulans, 24:572
EDXRIF instruments, portable, 26:442.
See also X-ray fluorescence (XRF) spectrometry
Eels, world aquaculture production in 1996, 3:186t
E factors, 12:803–804
EF-AR emulsions, 15:783–786
EF-AR system, 15:786–787
Effect chemicals, 20:712
Effect colorants, for plastics, 7:371, 375, 377–378
Effective atomic number rule, 16:60–61
Effective attenuation length (EAL), 24:88–89
“Effective concentration,” 23:91
Effective diffusivity, 1:44; 15:729–730
Effectiveness factor
evaluation of CA(surface via, 25:276–279
formalism, 25:311
general expression for, 25:277
Effective terminal velocity, 11:797
Effective thermal conductivity, of a liquid-solid suspension, 13:277
Effective thickness, 24:113–114
Effervescent tablet drug dosage form, 18:706
Efficiency. See also Single collector efficiency
of filtration particle capture mechanisms, 11:339–340
in minerals recovery and processing, 16:664
of OLEDs, 22:215, 219
of size separation, 22:277, 278–279
Efficient sulfur Vulcanization (EV) cure systems, 21:801, 802
Efficient genetic algorithm (EGA), 26:1024–1025
Efficient simulated annealing (ESA), 26:1024
Efficient stochastic genetic algorithm (ESGA), optimization via, 26:1032
Efficient stochastic annealing (ESTA), optimization via, 26:1030
Effluent gases, lime industry, 15:76
Effluent guidelines/standards, 21:581–582
Effluent handling, in pilot plants, 19:467
Effluent pollutant, 9:303
Effluents
lyocell process and, 11:280
magnesia plant, 15:426
photographic processing, 19:217
viscose process and, 11:278
Effluent separation, from a catalytic reformer, 20:750
Effluent silver controlling, 22:654
environmental limits on, 22:652–653
Effluent toxicity, 25:887
Effluent treatment, 9:297–298; 20:759
dye industry, 9:432–437
Effluent wastewater treatment, in propylene oxide manufacture, 20:800–801
Efflux viscometers, 21:729–730
Efondipine, 5:131, 189
molecular formula and structure, 5:125t
E-Gas gasifier, 6:783t, 827
Egg albumen, as a foaming agent, 12:21.
See also Albumin
Eggplant, citric acid in, 6:632t
E-glass–epoxy laminates, 17:843
E-glass fibers, 26:758
Egyptian Giza cotton, 8:2
Egyptian mummies
chemical analysis of DNA, 5:751
chemical analysis of lipids, 5:749
EIA activities. See also Environmental impact assessment (EIA)
public and agency participation in, 10:237
uncertainties associated with, 10:245–246
EIA requirements, review and reform of, 10:233–234
Eicosahydrodibenzo[b,k]hexaoxacyclooctadecin, 7:588
Eicosanoic acid, physical properties, 5:29t
1-Eicosanol, physical properties of, 2:3t
Eicosapentaenoic acid (EPA), 17:663, 665
5,8,11,14-Eicosatetraenoic acid, physical properties, 5:33t
cis-5-Eicosenoic acid, physical properties, 5:31t
cis-9-Eicosenoic acid, physical properties, 5:31t
18-electron rule, 16:60–61
18-electron species, thermally stable, 16:62
Eimco High-Capacity thickener, 22:66
Einsteinium (Ea), 1:463–491, 464t
electronic configuration, 1:474t
ion type and color, 1:477t
metal properties of, 1:482t
Einstein relation, 22:238. See also Einstein’s viscosity equation
filled networks and, 22:571, 572
Einstein’s coefficient, 14:662
Einstein’s equation, 7:280; 21:716; 23:99
Einstein’s law, 19:108
Einstein’s viscosity equation, 22:54. See also Einstein relation
Eisenberg-Hird-Moore (EHM) model, 14:466, 467
Ekato Intermig agitator, 1:739, 740
Ekoflot pneumatic cell, 16:653
Elaidic acid, physical properties, 5:31t, 37t
Elastic behavior, ceramics, 5:613–615
Elastic constants, measured values of, 21:720t
Elastic deformation, 21:719
ceramics, 5:613–615
coal, 6:724–725
Elastic diffusion, 23:102
Elastic element pressure measuring devices, 20:681–682
Elastic interactions, 13:498
Elasticity, 19:743
of acrylic fibers, 11:190
defined, 21:702
of fibers, 11:181, 182, 184
of olefin fibers, 11:227–228
of sealants, 22:29
Elastomer impression materials, 8:
Elastomer production, tetrahydrofurfuryl
Elastomer-modified ed epoxies,
Elastomer-modified ed epoxy resins, 10:
Elastomer-modified epoxies, 10:375–376
Elastomer production, tetrahydrofurfuryl
alcohol in, 12:279
Elastomers, 10:596. See also Butyl rubber;
Special-purpose elastomers; Synthetic elastomers
acrylic, 9:561; 21:770–771
age-resistant, 9:559–560
antioxidant applications, 3:122–123
chloroprene, 21:767
classification of, 21:759–760
compounding and vulcanization, 9:554–555
crystallized, 19:843
cyclopentadiene and dicyclopentadiene
applications, 8:230–231s
economic aspects of, 25:477
ethylene–acrylic, 10:696–703
ethylene–propylene, 17:705–707
evaluating, 21:760
fluorocarbon, 9:563
fluorosilicone, 20:241, 243
general-purpose, 9:555–559
graft, 22:718
hydrocarbon use in, 13:689
IUPAC nomenclature for, 21:761t
nitrile, 21:770
permeability of silicone, 22:582t
physical properties of, 21:762t
precipitated silica in, 22:399
in pressure-sensitive adhesives, 1:529
resistance to hydrochloric acid, 13:827
in rubber compounding, 21:759–772
shape-memory polymers as, 22:356–358,
359t
solvent-resistant, 9:560–562
sulfonation of, 23:536
synthesis of synthetic butyl rubber after
disruption of natural rubber supply in
WW II, 4:433
temperature-resistant, 9:562–563
thermoplastic, 9:565–566
thermoplastic copolyester, 20:70–71
in tire compounding, 21:807–808
as tougheners, 10:435–436
urethane, 21:772
Elbow meters, 11:661
Elbrol, molecular formula and structure,
5:93t
Electrical applications
silicon carbide in, 22:539
silver in, 22:658
Electrical behavior
of plutonium metal, 19:681
of semiconductor materials, 22:232–235
of silicon-based semiconductors,
22:241–245
Electrical conduction
ceramics, 5:585–587
glasses, 5:592–593
Electrical conductivity. See also
Conductivity
of foams, 12:11
fillers and, 10:434
silver, 22:639
in water and steam purity monitoring,
23:227–228
Electrical double layer, 9:609, 610, 739–740
batteries, 3:418–420
Electrical effects, of solvents, 23:96–97
Electrical energy, 16:509
for fermentation, 11:45–46
Electrical equipment code, 21:841–842
Electrical flow resistivity, 23:824
Electrical generation, use of tire-derived fuel in, 21:465
Electrical hazards
carbon-fiber-related, 26:746
electrochemical process industries, 9:645
Electrical installations, safety of, 21:847–848
Electrical laminates, epoxy resins in, 10:453–457
Electrically charged membranes, 15:799–800
Electrically conductive rubber, 20:247
Electrically conductive resins, 17:840
Electrically stimulated drug delivery systems, 9:59–61, 81
Electrical mineral size reduction, 16:613
Electrical Patents Index (EPI), 18:222
Electrical properties
of amorphous semiconductors, 22:128–129
of artificial graphite, 12:715–716
of carbon nanotubes and fullerenes, 17:49
of embedding materials, 10:9–10
of engineering thermoplastics, 10:223
of EPIF resins, 18:322t
of ethylene–tetrafluoroethylene copolymers, 18:321–322
of fibers, 11:167–168
of glass, 12:585–587
of glass-ceramics, 12:630–631
of high density polyethylene, 20:164
of higher olefin polymers, 20:418–419
of linear low density polyethylene, 20:185
of methacrylic ester polymers, 16:276
of nylon-6, 19:745
of organic semiconductors, 22:204–208
of perfluorinated liquids, 11:879
of polyamide fibers, 19:745
of polyamide plastics, 19:777–778
of poly(fluorosilicones), 20:241
of polyimides, 20:277–278
of poly(methyl methacrylate), 16:276t
of polytetrafluoroethylene, 18:298–299
of rare earths, 14:652
of regenerated cellulose fibers, 11:275
of selenium, 22:99
of SiC-ceramic, 22:535–536
of silicon, 22:484–487
of silicon carbide, 22:528–530
of silicone fluids, 22:573t
of silicone rubber, 22:583t
of superconducting silver, 22:640
of Teflon PFA, 18:334
of thermoplastics, 10:176
of vitreous silica, 22:430
Electrical properties testing, on plastics, 19:586–587
Electrical recycling technologies, in wastewater treatment, 25:889t, 894
Electrical resistivity, of plutonium, 19:681
Electrical sensing devices, 20:682
Electrical steels, tellurium in, 24:425
Electrical systems, utility company, 10:149–150
Electric arc furnace (EAF), 14:509; 21:394, 408, 412; 23:251–253. See also Electric furnaces
Electric arc nitric acid processes, 17:186
Electric arc processes, of ammonia synthesis, 11:114–115
Electric-arc vaporizer zinc oxide process, 26:613
Electric charge dispersed particles, 8:724–726
exponents of dimensions, 8:585t
Electric conductive blacks, 4:775, 799–800
Electric conductivity probes, 11:785
Electric current, exponents of dimensions, 8:585t
Electric discharge, ozone generation by, 17:793–800
Electric discharge ozone generator, 17:798
Electric-field-induced second harmonic generation (EFISH), 20:515
Electric field intensity, exponents of dimensions, 8:585t
Electric field perturbations, 14:616
Electric fields in ascorbic acid manufacture, 25:758
electrostrictive materials and, 22:713
heat generation in, 9:741
in surface and interface analysis, 24:112, 115
Electric flux, exponents of dimensions, 8:585t
Electric flux density, exponents of dimensions, 8:585t
Electric force microscopy, 3:332

“Electric furnace” acid, 11:127

Electric furnace ferromanganese production, 15:552–553

Electric furnace process, for zircon, 26:627–628


See also Electric arc furnace (EAF);

Fuel-fired furnaces

applications for, 12:315–316
arc furnaces, 12:297–306
classification of, 12:286
economic aspects of, 12:313–314
health and safety factors related to, 12:314
induction furnaces, 12:307–313
in phosphorus manufacture, 19:8–11
resistance furnaces, 12:287–297
for secondary slags, 14:759–760

Electric furnace steelmaking processes, 23:251–255

Electricity, 3:413. See also Electric power entries

Electricity consumption, chemical industry, 10:136

Electricity generation, solar cells for, 23:26

Electricity production, using hydrothermal steam, 12:529–530

Electricity supply, operation and maintenance of, 10:159

Electric melting, 23:253

Electric motors, 10:149

Electric polarization, in piezoelectric materials, 22:709–710

Electric potential, 9:739

Electric potential difference, exponents of dimensions, 8:585t

Electric power. See also Electricity production

generation of, 12:528–533
steam cycles for generation of, 23:228–237

Electric power availability, plant location and, 19:530

Electric Power Research Institute (EPRI), 17:539, 554

Electric reduction furnaces, refractories for, 12:765

Electric vehicles, lithium batteries for, 15:136

Electroacoustic methods, of emulsion characterization, 10:128

Electroactive molecular clusters, conducting organic polymers doped with, 13:544–546

Electroactive polymers (EAPs), 22:708t, 717–719, 721t

electronic, 22:718
ionic, 22:718–719

Electroanalysis, resolution of, 9:573–574.

See also Electroanalytical techniques

Electroanalytical cells, 9:567

Electroanalytical techniques, 9:567–590
active, 9:568–581
economic aspects, 9:588
passive, 9:581–586
static and dynamic measurements, 9:586–588

Electrocardiogram (ECG), 5:81

Electrocatalysts, 14:452

ElectroCell AB cells, 9:667–668

Electroceramics, titanium dioxide in, 25:31

Electrochemical applications for ionic liquids, 26:877–878
lithium in, 15:135–136

Electrochemical cells, 9:652
commercially available, 9:666–670
conductivity and, 9:655
design, 9:653–666
electrolytes for, 9:657
geometries, 9:663–666
high pressure, 13:431
potential of, 14:26
as reactors, 9:660–662
in sensor technology, 22:266
transport phenomena, 9:657–660

Electrochemical deposition techniques, 23:7

Electrochemical detectors (ECD)
gas chromatography, 4:615
liquid chromatography, 4:622; 6:387, 449
supercritical fluid chromatography, 4:631

Electrochemical efficiency, batteries, 3:414

Electrochemical etching, in membrane preparation, 15:813t

Electrochemical ethylene oxidation, 10:656

Electrochemical fluorination (ECF), 11:864–865, 882

Electrochemical gas sensor, 13:589

Electrochemical grinding, 9:603

Electrochemical machining (ECM), 9:590–606
aqueous electrolyte solutions, 9:595–596
environmental effect, 9:604
hybrid processes, 9:603–604
industrial applications, 9:602–603
metal removal rates, 9:593–595
metal shaping, 9:597–602
present and future status, 9:604–605
principles, 9:591–592
surface finish, 9:596
tool design, 9:597
Electrochemical oxidation effluent
treatment, 9:435
Electrochemical ozone analysis, 17:812
Electrochemical perchloric acid production,
18:281
Electrochemical perchloric acid production,
18:280
Electrochemical potential, 9:607–608
chelating agents, 5:728–729
Electrochemical processing, 9:606–617.
See also Electrochemical processes;
Inorganic electrochemical processing
electrochemical cell thermodynamics,
9:606–609
industrial, 9:618
kinetics and interfacial phenomena,
9:609–612
nomenclature symbols, 9:616t
smaller-scale, 9:677–678
transport processes, 9:612–615
Electrochemical processes
high pressure, 13:429–431
hydrogen use in, 13:857–862
for propylene oxide production,
20:807–808
for sodium dithionite manufacture,
23:675
Electrochemical products, United States,
9:619t
Electrochemical properties, of
platinum-group metals, 19:600
Electrochemical reactors, scale-up of,
9:662–663
Electrochemical reaction engineering,
9:660–663
Electrochemical reaction kinetics,
3:421–423
Electrochemical reactions, 9:657–658
Electrochemical switches, molecules that
act as, 24:62
Electrochemical synthesis, chlorine
replacement via, 12:809–810
Electrochemical systems, 9:606
in industrial processes, 9:615
Electrochemical techniques, for spectrally
selective surfaces, 23:12–13
Electrochemical Technology Business
electrolysis cells, 9:668–669
Electrochemical transducer, 3:408
Electrochemical vapor deposition (EVD),
12:225
Electrochemical windows, in ionic liquids,
26:852–853
Electrochemistry
of organic semiconductors, 22:209
silver–silver salt electrodes in,
22:684
uses of succinic acid and succinic
anhydride in, 23:427t
Electrochromic devices, 23:20–22
basic design of, 23:21
organic semiconductors used in,
22:224–225
Electrochromic displays, 6:572t, 582–583
Electrochromic foil device, laminated
polyester- based, 23:22
Electrochromic materials, 6:571–587
anodically colored inorganic films,
6:579–580
cathodically colored inorganic films,
6:578–579
conducting polymer applications,
7:539–540
doped/undoped organic films, 6:580–582
inorganic electrodeposition, 6:577
insertion/extraction group, 6:577–582
noninsertion/extraction group,
6:573–577
organic compounds, 6:573–577
sol–gel systems, 6:582
uses, 6:572t, 572–573, 582–583
Electrochromic smart windows, 23:25
Electrochromic writing paper, 6:572t
Electrochromism, 6:571–573, 22:708t,
715–716, 23:21, 25
Electrocleaners, 9:784–785
for electroplating, 9:783–784
Electrocleaning, of metal surfaces, 16:212
Electroconductive coatings, stannic oxide
in, 24:805
Electrocyclotron resonance (ECR)
techniques, 24:746
Electrode connections, 12:756–757
Electrode consumption, 12:307t, 748–750, 757
Electrode flow cells

three-dimensional, 9:665–666

Electrode flow cells

two-dimensional, 9:664–665

Electrode flow cells

Electrode interferences, 14:26

Electrode kinetics, 9:611

Electrodeless magnetic flowmeter, 11:670–671

Electrode materials, 9:625

Electrodeposition, 9:760, 761, 769, 771
citic acid application, 6:647–648

coatings, 7:180–182

ionic liquids in, 26:878

of platinum, 19:657–658

Electrodeposition processes, for automotive coatings, 10:448

Electrodeposition primers, for metal coatings, 7:125–127

Electrodeposits, properties of, 24:749–750

Electrodeposition thickness tests, 9:789

Electrodes

AFC, 12:216
carbon, 12:752–758
defined, 3:408–409

DMFC, 12:214
electrical double layer, 3:418–420
electrochemical cell, 9:654–655
electrochemical machining, 9:592

fuel cell, 12:199, 200

furnace, 12:305

hybrid, 13:551

joints between, 12:752

metal oxide, 22:700

nickel, 17:99

niobium, 23:829

in open-arc furnaces, 12:301

PAFC, 12:217–218

PEMFC, 12:211

pH, 14:24

phosphorus furnace, 19:9–10

platinum-based, 19:629

polymers in, 22:223–224

sodium in, 22:778

SOFC, 12:225

stannic oxide in, 24:805

working, 9:568–571, 585

Electrode stability, 9:655

Electrodialysis (ED), 15:824, 826;

26:87–88

in hazardous waste management, 25:817, 818

membrane technology in, 15:836–837

in wastewater treatment, 25:889t, 894

in water treatment, 26:115

Electrodialysis reversal (EDR), 26:87

in water treatment, 26:1115

Electrodialysis unit, 26:90

Electrodialytic membrane process

technology, in salt production, 22:808

Electrodynamic electrostatic separators, 16:642–643

Electrofabrication, 9:833

Electrogalvanizing, 26:584

Electrographic inks, 14:329

Electrographic toners, 14:313

Electrographite, 4:735

Electrohydrodimerization (EHD), 9:674–676

Asahi Chemical, 9:676–677

Electrohydrodynamic-based heat exchangers, 13:269–270

Electrohydrodynamic (EHD) convection, in microfluidic mixers, 26:967

Electrokinetic flow

in microfluidic assays, 26:970

in microfluidics, 26:962–963

Electrokinetic injection, capillary electrophoresis, 4:634

Electrokinetic instability, in microfluidic mixers, 26:967

Electrokinetic measurements, for polymer colloids, 20:383–384

Electrokinetics, 9:740–741

colloids, 7:284–286

in soil and ground water treatment, 25:843–844

Electroless coatings, 9:685–687

wear resistance, 9:713–716

Electroless deposition, 9:685–727

controls and chemistry balance, 9:690

environmental concerns, 9:719–721

industries and applications, 9:699–702

key properties, 9:702–716

rates of, 9:690

for specific applications, 9:692

standards for, 9:699

surface preparation, 9:716–719

technologies, 9:690–698

theory of, 9:687–690

Electroless deposits. See also Electroless deposition
Electrolytic tough pitch copper wrought alloy, 305

- abrasion wear resistance of, 9:714
- internal stress in, 9:706–707
- solderability, 9:707–708
- Electrolysis, 9:686
- Electrolyte, 9:575
- Electrolyte solutions, aqueous, 9:626–633
- Electrolyte solvent, 13:542
- Electrolyte-based fuels, 15:558–559
- Electrolyte cells, 9:619–623
- Electrolyte coloration, 16:221–222
- Electrolyte concentrations, in soap bar
- Electrolyte corrosion (EC) test, 9:790
- Electrolyte etching, of silicon, 22:491–492
- Electrolyte in-process dressing (ELID), 9:603
- Electrolyte manganese dioxide, 15:588–592
- Electrolyte oxidation, potassium permanganate manufacture via, 15:606
- Electrolyte plating, recovery of silver via, 22:654
- Electrolyte precipitation, in hydrometallurgical recycling, 21:399
- Electrolyte preparation, of chlorine and caustic soda, 16:40
- Electrolytic processes
  - with hydrochloric acid, 13:822
  - manganese metal, 15:557–559
  - for purifying crude vanadium, 25:522
  - in titanium manufacture, 24:853–854
- Electrolytic reduction
  - amines, 2:492
  - magnesium manufacture via, 15:328–338
- Electrolytic refining, 14:755–756; 17:91–92
  - of silver, 22:647
  - of tin, 24:789
- Electrolytic strikes, 9:719
- Electrolytic tin plating, 24:793
  - stannous chloride in, 24:802–803
- Electrolytic tough pitch copper wrought alloy, 7:675
  - mechanical properties, 7:678t
Electrolytic zinc plants, 12:555
Electrolytic zinc process, 26:565–566
Electrolyzers, industrial, 18:281
Electromagnetic applications, for bulk materials, 23:865–870
Electromagnetic assisted material processing, 23:856–857
Electromagnetic brush (EMB) technology, 7:59
Electromagnetic casting, aluminum alloys, 2:334
Electromagnetic compatibility (EMC), ferrites and, 11:77
Electromagnetic field, 23:133
Electromagnetic flowmeters, 11:654, 669–676 pipe cutoffs in, 11:671
Electromagnetic force compensation (EMFC) technology, 26:234–236 advantages and disadvantages of, 26:235–236
Electromagnetic force compensation weighing cell, 26:235
Electromagnetic induction, 12:307
Electromagnetic interference (EMI), 24:463 ferrites and, 11:77, 79–80t
Electromagnetic interference testing, 19:587
Electromagnetic interference shielding, 9:696 advanced coatings for, 1:712–713
Electromagnetic pulleys, 16:639
Electromagnetic radiation, 17:417 interaction with matter, 23:125
Electromagnetic separation, of uranium isotopes, 25:415–416
Electromagnetic shielding bismuth alloy applications, 4:13 conducting polymer applications, 7:537–538
Electromagnetic spectrum, 7:305; 23:128 regions of, 23:129t
X-ray, 26:411–412
Electromagnetism, 21:289
Electromagnet systems, 23:855t
Electrometallurgy, 16:127, 133, 158–164
Electromotive pH determination, 14:24
Electromotive force (emf), 12:206; 14:23
Electromotors, M-type ferrites in, 11:87
Electron-acceptor end group, 20:504
Electron affinities, of fullerenes, 12:234–235
Electronarcosis, aquaculture applications, 3:224
Electron backscatter patterns (EBSPs), 24:77
Electron backscatter diffraction (EBSD), 16:493
Electron beam (EB) disinfection, 8:661–662
Electron beam energy, ink curing via, 14:314
Electron beam evaporation in compound semiconductor processing, 22:188–189
fabrication method for inorganic materials, 7:415t
Electron beam radiation curable coatings, 10:442
Electron beam heating, case hardening by, 16:200–201
Electron beam inks, 14:314–315
Electron beam lithography in compound semiconductor processing, 22:193
thin film applications, 1:725
Electron-beam melting, 17:140 of hafnium, 13:86
Electron capture, 21:298–299
Electron capture detector (ECD) gas chromatography, 4:614; 6:380–381, 427t, 430–431
Electron cyclotron resonance (ECR), 22:184
Electron diffraction, of hydrogen fluoride, 14:2–5
Electron-donor end group, 20:504
Electron donors, in Ziegler-Natta polymerization, 26:518–521
Electron effective mass, in direct gap semiconductors, 22:143–144
Electronegativities, Pauling scale of, 11:852
Electron energy analyzer, 24:102–103
Electron energy levels, 21:295
Electron energy loss spectroscopy (EELS), 16:489; 24:74
Electroneutrality, 9:613
Electron exchange reactions, 13:445–447
Electron field emission, 17:49–50
Electron guns, 24:102
Electron–hole pairs
in photovoltaic devices, 22:220
in solar cells, 22:137
Electron–hole recombination, 9:730;
14:833–834; 19:196
direct, 19:82–83
indirect, 19:83
Electronic absorption spectra, of plutonium ions, 19:693–694, 695
Electronically erasable nonvolatile memories (EEPROMs), silicon-based
semiconductors in, 22:258
Electronical spanning, 13:465
Electronic applications. See also
Electronics applications
aluminum nitride in, 17:202–203
for composite materials, 26:755–756
for epoxy resins, 10:457–458; 17:839
nitrates in, 17:221
for polyamide plastics, 19:795
for polycarbonates, 19:821
purity of silver in, 22:650
silicon carbide in, 22:539–540
silver in, 22:658
for tellurides, 24:428
for vitreous silica, 22:442–443
Electronic ceramics, 14:102
Electronic collisions, energy loss from,
14:431
Electronic components, gold, 12:699
Electronic conducting ceramics, 5:598–601
Electronic conduction, ceramics, 5:595–598
Electronic control unit (ECU)
closed loop fuel metering system, 10:55,
56, 57
emission control system, 10:38
Electronic devices
coatings applications, 7:246
conducting polymer applications, 7:541
copper applications, 7:712–713
high throughput experimentation, 7:414
compound semiconductors in,
22:160–172
Electronic diaphragm gauge, 20:658–659
Electronic digitizers, 14:614
Electronic document delivery, 18:249
Electronic effects
in QSAR studies, 10:328
of solvents, 23:96–97
Electronic electroactive polymers (EAPs),
22:718. See also Electroactive polymers (EAPs)
Electronic embedding, 10:1–3. See also
Embedding
Electronic equipment,
polytetrafluoroethylene in, 18:305
Electronic-grade metal
Electronic equipment
Electronic ion stopping,
Electronic ion stopping
Electrical items, recycling of,
Electronic ion stopping, 14:433
Electronic ion stopping
Electronic items, recycling of, 25:871. See also
Electronic recycling; Electronic
Electrical items, recycling of
Electronic ion stopping
Electrical items, recycling of
Electronic materials, 9:727–737
coordination compound applications of,
7:599–600
role of silicon as, 9:731–733
semiconductor energy levels, 9:728–730
semiconductor surfaces, 9:730–731
III–V semiconductors, 9:733–736
Electronic materials packaging,
17:823–851
attachment materials in, 17:830–837
cable and flex circuit materials in, 17:848
case materials in, 17:837–840
ceramics and metals in, 17:838
conformal coating materials in,
17:843–845
connector materials in, 17:845–848
lead materials in, 17:840–841
levels of, 17:824
plastic encapsulant materials in,
17:838–840
printed circuit board materials in, 17:843
semiconductor materials in, 17:825
solder materials in, 17:841
substrate materials in, 17:827–829
“Electronic noses,” 22:264
Electronic photography, polymethine dyes
in, 20:516
Electronic polarization, 10:21
Electronic pressure sensors, 20:651–657
Electronic products market, 24:331–333
Electronic properties, of compound
semiconductors, 22:150t, 151
Electronic recycling, 21:364
Electronics
high performance fibers in, 13:393
Electron microscopy, 16:464, 487–495
history of, 16:487–488
in polymer blend morphology
determination, 20:339–340
of PVC particles, 25:658–659
of silica, 22:371–372
in surface and interface imaging,
24:75–80
Electron mobility, in direct gap
semiconductors, 22:143–144
Electron paramagnetic resonance (epr),
17:418
Electron–phonon interaction, 23:804
Electron probe microanalyzer (EPMA),
16:484, 488
Electron relaxation, 24:95
Electrons
addition to fullerenes, 12:245–246
in atomic levels, 21:294
in “double heterostructure” OLEDs,
22:217
Fowler-Nordheim tunneling of, 22:258
in HBTs, 22:167–168
Moore’s law and device scaling and, 22:254
in RTDs, 22:170–171
in semiconducting silicon, 22:485–486
in semiconductors, 22:233, 237–239
in SETs, 22:171–172
in single layer OLEDs, 22:215–216
in spinel ferrites, 11:60–61
in the superconducting state, 23:804
Electron spectrometer system, components
of, 24:100–101
Electron spectroscopy for chemical analysis
(ESCA), 24:72
Electron spin density, nitrogen content
and, 17:204, 205
Electron spin resonance (esr), 22:132
for lignin characterization, 15:10
Electron-stimulated desorption-ion angular
distribution (ESDIAD), 24:74
Electron transfer (ET), 9:376–381, 388
mechanisms of, 13:444
rate constant for, 13:447
Electron-transfer dynamics, in
photochemical technology, 19:111–113
Electron-transfer-mediated dye bleaching,
9:378–379
Electron-transfer sensitization, 19:109
Electron transport, between photosystem
inhibitors, 13:288
Electron-transport layer (ETL)
in “double heterostructure” OLEDs,
22:216–217
in single layer OLEDs, 22:215–216
Electron trap, 19:187
Electron tubes, microwave range, 16:517
Electron tunneling, 3:327–328
in QEDs, 22:169
Electron velocity, in FETs, 22:165
Electrophoresis, 9:728
Electrooptic (EO) materials, 17:452–453
organic, 17:447
Electrooptic displays, liquid crystal polymers in, 15:110
Electrooptic effect, 14:675
Electrooptic modulation, second-order nonlinear optical materials for, 17:444
Electrooptic modulators, 14:675–676 market for, 17:448
performance of, 17:446
Electroorganic reaction, 9:652
Electroorganic systems, diaphragms in, 9:656
Electroosmosis, 9:740–741, 752
in microfluidic assays, 26:970, 971
in microfluidics, 26:962, 963
in soil and ground water treatment, 25:844
Electrooxidation (corrosion), 10:2
Electrophiles, halogenofullerenes as, 12:248
Electrophilic addition reactions. See also
Addition reactions
with butylenes, 4:405–408
of maleic anhydride, 15:490
with methacrylic acid/derivatives, 16:236–237
of propylene, 20:774
Electrophilic aromatic substitution,
benzene, 3:599–601
Electrophilic attack, at nitrogen and carbon, 21:98
Electrophilic fluorinating agents, 11:847
Electrophilic quench, 12:828
Electrophilic reactions
as Friedel–Crafts reactions, 12:160
toluene, 25:163–164
Electrophilic substitution, 9:267–268
in aromatics, 9:353
of isoquinoline, 21:200
in lignin, 15:5
during pulp bleaching, 21:33–34
Electrophoresis, 9:738–758
detection techniques, 9:752–756
electrostatic separation via, 16:642
equipment, 9:742–743
as microfluidic assay technique,
26:969–971
in microfluidics, 26:962, 963
materials and matrices, 9:748–752
principles of, 9:739–742
separation modes, 9:742–748
Electrophoretic mobility, flocculation and, 22:55
Electrophoretic motion, 9:739–741
Electrophotographic copy processes, 9:513–514
Electrophotographic photoconductors,
onorganic titanium compounds in, 25:134
Electrophysiology, of human heart, 5:79–80
Electropickling, 9:788
Electroplating, 9:759–838; 24:747–750
alkanolamines from olefin oxides and ammonia, 2:137
automated, 9:768, 769
cobalt applications, 7:246
in compound semiconductor processing, 22:189
coordination compound applications, 7:596–597
dental applications, 8:315–316
economic aspects, 9:763–765
electroforming and electrofabrication, 9:832–833
environmental aspects, 9:794–798
fundamentals, 9:769–779
history, 9:760–762
magnesium, 15:375
materials, 9:762–763
metal–matrix composites, 16:173
nickel compounds in, 17:123
patterned electrodeposition, 9:811–832
plating baths, 9:798–811
preparation for, 9:779–788
process, 9:759–760
properties, specifications, and test methods, 9:788–794
ruthenium, 19:641
silver cyanide in, 22:685–686
sodium cyanide application, 8:191
stannous chloride in, 24:802–803
uses, 9:765–769
Electroplating electrolytic cell, 24:748
Electroplating industry, discharging limits for, 9:795t
Electroplating process wastewaters, reverse osmosis for, 21:645–646
Electroporation, 12:470–471, 501
Electrostatics, effect on weighing, 26:243
Electrostatic self-assembly (ESA), of thin-films, 1:724–725
Electrostatic separators, 16:642
Electrostatic separation, 16:642–644
Electrostatic spray coating, 7:56–58, 74–75
Electrostatic stabilization, 10:119–121
  of latex, 14:708–709
Electrosteric stabilization, 10:122
Electrostream (capillary drilling), 9:600
Electrostrictive coefficient tensor, 11:93
Electrostrictive devices, applications of, 11:103–104
Electrostrictive materials, 22:708t, 713–714, 721t
Electro suspended magnets, 15:437
ElectroSynCell, 9:667, 668
Electrosynthesis, ionic liquids in, 26:878
Electrothermic process, for zinc, 26:577
Electrothermic zinc smelting, 26:612
Electrotreatment technique, for purifying vanadium, 25:522
Electro wet drum separators, 15:443
Electrowetting, in microfluidics, 26:962
Electrowinning, 9:637–642; 14:760; 16:154
  from aqueous solutions, 9:637–639, 16:159–161
  from fused salts, 9:639–642
  of zinc, 16:159–161
Electrowinning cell, 9:624, 639
Electrozone stream counter, 18:149
Electrum, 12:685
Elemental chlorine-free (ECF) bleaching, 10:304–305; 21:43–44
Elemental phosphorus, U.S. exports of, 19:16t. See also Phosphorus entries
Elemental phosphorus-containing materials, shipping, 19:14
Elemental phosphorus process, 19:6
Elemental sulfur, 23:569–574, 587. See also Sulfur entries
  conversion of hydrogen sulfide to, 23:601–610
  production of, 23:578–581
Elemental tellurium, 24:408, 416. See also
Tellurium (Te)
Elemental uranium, crystal structures of,
25:409. See also Uranium (U)
Elementary reaction, 21:336
Element/isotope ratios, in fine art
examination/conservation, 11:419
Element mapping, in fine art examination/
conservation, 11:406
Element names/symbols, 17:386–387
transfermium, 17:387t
Elements, in earth’s crust,
26:23
a-Eleostearic acid, physical properties,
5:33t
b-Eleostearic acid, physical properties,
5:33t
Elevated heat exchangers, 19:508
Elevated tank, 24:280–281
Elevated temperature precipitation heat
treatment, aluminum alloys, 2:333
Elevator furnace, 12:288
Elgonidipine, 5:131
molecular formula and structure, 5:126t
Elidinium bromide, 4:359t
Elimination reactions, amine oxides,
2:467–468
Elinvar, 13:522
Ellagic acid, antioxidant useful in
cosmetics, 7:329t
Ellipsometry, 24:72
for MOCVD, 22:155
Ellipticine, 2:98
Elongatable carbonaceous fiber,
13:383–385
Elongated fullerenes, 12:232
Elongation, of olefin fibers, 11:226
Elongational rheometer, 21:740
Elongation at break, 10:177; 19:743
Elongation viscosity, of olefin fibers,
11:233, 234
Elovich equation, 1:595
Elution, in ion exchange, 14:410–412
Elution buffer, in affinity chromatography,
6:392
Elution chromatography, 6:375
Eluxyl process, 1:665
Elvax, 7:640
EMAA ionomers, 14:466. See also
Na–EMAA ionomers; Zn–EMAA
ionomers
glass transition of, 14:468–469
melt-rheology of, 14:474–475
Emamectin (Slice), registered for use in
aquaculture in Europe, 3:220t
Emamectin benzoate, 14:347
Emanuel Tire process, 21:470–471
Embedded passives, 10:15
Embedding, 10:1–30. See also
Encapsulation
material curing in, 10:13–15
material processes related to, 10:11–13
reasons for, 10:1–3
Embedding materials, 10:3–8
aluminum-filled composites in,
10:15–28
electrical properties of, 10:9–10
epoxyes, 10:5–6
mechanical properties of, 10:10
polyesters, 10:7
polysulfides, 10:7–8
polyurethanes, 10:6–7
rheological properties of, 10:10
silicones, 10:3–5
thermoplastics, 10:8
Embolite, 4:304
Embreyite, 6:471t
Embrittlement relief, 9:705
Embryo cloning
by nuclear transfer from blastomeres,
12:451
by nuclear transfer from somatic cells,
12:451–452
Embryonic genome, random insertion of
transgenes into, 12:454–459
“Embryonic lethal,” 12:460
Embryonic stem cells, gene transfer with,
12:457–459
Embryos
microinjected, 12:454
retroviral infection of, 12:457
Embryo splitting, 12:450–451
Embryotoxic solvents, 23:119
Emerald, 3:638
color, 7:329
Emergency core cooling system (ECCS),
17:577, 596
in nuclear power facilities, 17:544
Emergency Exposure Guideline Levels
(EEGL), 21:837
Emergency Exposure Indices (EEI),
21:838
Emergency exposure limits (EEL), for
fluorine, 11:844
Emergency planning, 21:861
Emergency Planning and Community Right-to-Know Act (EPCRA), 21:589, 831
Emergency response, to hazardous materials incidents, 25:343
Emergency Response Planning Guidelines (ERPGs), for sulfuric acid, 23:795 values in, 13:156
Emery, dental abrasive, 8:339
Emetine, 2:74, 100
(−)-Emetine, 2:84, 85
See also Emissions
Emission catalysts, platinum-group metals as, 19:625–626
Emission control catalysts, cerium applications, 5:686
Emission control systems, 10:38–39 alternative, 10:58–59
Emission control technologies, 10:73t diesel engine, 10:61–62 selection of, 10:72
Emission depth distribution function (EDDF), 24:89
Emission intensity, 14:835
Emission rate enhancement spectrum, 14:852
Emission rate enhancement, 14:852
Emissions. See also Emission
ENAMEL ADHESIVES 313

Emulsifiable oil metal-working fluids, 1:22
Emulsification, 10:126; 16:211
  cosmetics, 7:837–841
  hydrophobic-monomer, 14:717
Emulsified wax, in paper manufacture, 18:110
Emulsifiers, 9:22; 10:113, 114, 115–117, 502; 24:155. See also Emulsifying agents
  fatty amines, 2:534
  in finish removers, 18:78–79
  in fluidized-bed encapsulation, 11:536
  in fluidized-bed encapsulation, 11:541
  food, 12:54–56
  food processing, 14:118
  for lubricants, 15:226
  regulatory status of, 12:56
Emulsifier salt, 12:32
Emulsifying agents, cosmetic surfactants, 7:834t. See also Emulsifiers
Emulsifying properties, of gelatin, 12:439–440
Emulsion additives
  biodegradation of, 10:124
  in photography, 19:196–197
Emulsion adhesives
  fillers for, 25:581–582
  solvents in, 25:582
Emulsion breaking, in petroleum processing, 18:645
Emulsion coating, in photography, 19:197–199
Emulsion droplets, eliminating coalescence of, 24:156
Emulsion hydrogel polymerization, 13:731
Emulsion morphology diagrams, 16:433
Emulsion polymerization, 9:555–556, 561; 14:707; 20:387–388, 408
  of ABS, 1:419–420
  of acrylamide polymers, 1:321–323
  of acrylic ester monomers, 1:383–385
  of acrylonitrile, 11:202
  chain transfer in, 19:831–832
  history of, 14:712–713
  intervals in, 19:830
  model system for, 20:375t
  of methacrylic ester polymers, 16:285–288
  of polychloroprene, 19:829–830
  of polymer colloids, 20:374–376
  PVA in, 25:617
  of PVC, 25:669–670
  of SAN, 1:444–445
  of siloxanes, 22:560–561
  stages of, 14:713–715
  of vinyl acetate, 25:566–570
Emulsion polymerization plant, 16:287
Emulsion polymerization reactors, 16:286
Emulsion polymerized synthetic elastomers, IISRP classification of, 21:764t
Emulsion polymers
  characterization of, 25:578t
  latexes, 10:129–130
  in latex acrylic sealants, 22:42
  specifications for, 16:291–293
Emulsion recipe, 25:566–568
Emulsions, 7:272t; 8:697; 10:113–133; 14:706–707
  adhesives, 1:533
  aerosols, 1:773, 774
  amphiphilic compounds in, 15:100–101
  asphalt, 18:673
  “breaking” of, 10:117
  characterizing, 10:127–128
  destabilizing, 10:125
  equipment and methods for, 10:126–127
  flocculation of, 24:156
  formation and stabilization of, 10:114–125
  formulation of, 10:125–128
  future trends in, 10:131
  health, safety, and environmental issues related to, 10:128
  interfacial structure of, 10:122–124
  occurrences of, 7:273t
  photographic, 19:199
  preparation of, 24:156
  sedimentation and, 22:50
  surfactants in, 24:155–156
  types of, 10:113
  uses for, 10:128–131
  viscosity–concentration relationships for, 21:717
  water-in-oil and oil-in-water, 11:551
Emulsion stabilizers, 10:114
  smectites application, 6:697t
Emulsion-type sizing agents, 18:110
Emulsion washing, in photographic crystals, 19:184–185
Enalapril maleate, 5:186
  molecular formula and structure, 5:149t
Enamel adhesives, 8:336–338
Enamel can coatings, 18:38
Enamels
cerium as opacifier in, 5:684–685
kaolin application, 6:688, 696
Enamine processes, 16:571
Enamine synthesis, microwaves in, 16:564
Enantiomer recognition, 16:789, 791
Enantiomers, 6:72–73. See also Chiral entries
Enantiomer separation
adsorbents for, 1:669–670
adsorbents for pharmaceuticals, 1:678, 684, 685t
Enantiomorphous site initiator control, 20:303
Enantioselective asymmetric synthesis, 13:665
Enantioseparation, 14:180
Enantiotropic phase transitions, 15:101
Enargite, 3:263t
Embrel, 2:824
cell culture technology product, 5:346t
market, 5:356
Encainide, 5:100–101
molecular formula and structure, 5:92t
Encapsulants, 10:3
for LEDs, 14:862–865
poly(fluorosilicones) in, 20:245–246
rheological properties of, 10:12–13
Encapsulated hemoglobin, 4:114
Encapsulated phase-change materials, small, 13:277
Encapsulated salt, 22:820
Encapsulation. See also Embedding;
Encapsulation processes;
Encapsulation technologies
cocavertion, 11:545–548
in complex fluids, 11:551–552
of electronic components, 10:458
epoxy resins in, 10:457
extrusion, 11:549–550
by freeze drying and vacuum drying, 11:539
gel, 11:548–549; 16:440
of ligand in affinity chromatography, 6:397
as natural defense against silver, 22:655, 681
in sensor technology, 22:266
by spray drying, 11:537–539; 16:457
Encapsulation matrix, $T_s$, of, 11:531–532
Encapsulation processes, 16:438–451
centrifugal extrusion, 16:449–450
in situ, 16:445
key feature of, 16:444
rotational suspension separation, 16:450
spray chilling, 16:448
spray-dry, 16:447–448
Encapsulation spinning, 16:26
Encapsulation technologies
controlled release systems, 11:543–553
flexible, 11:557
fluidized-bed, 11:539–542
desolvation, 16:450–451
fluidized-bed, 16:448–449
solvent evaporation, 16:446
Enclosed agitated vacuum filter, 11:351
ENCOAL project, 6:777, 827
EN coatings, 9:700, 701. See also Electroless nickel entries
wear testing, 9:713–715
Endamoeba histolytica, disinfection, 8:642
Endangered species, aquaculture to help preserve, 3:182–183
Endeavor eight-cell, continuous-stirred parallel pressure reactor, 7:402–403
EN deposits, 9:699, 702
Enders, John, 11:10
End group analysis, in polyesterification, 20:100
End groups, in PVC polymerization, 25:666
End-group spectral lengths, 20:507
correlation equations for, 20:508t
Endo-aerators, 26:162–170
endo-dicyclopentadiene (DCPD), 26:946–947
Endoenzymes, 10:255
End-of-life (EOL) electronics, recycling, 21:456
End-of-life money flows, 9:540
End of Life Vehicle (ELV) regulations, 9:720, 721
Endohedral fullerenes, 12:230–231
chemistry of, 12:253
Endonucleases, artificial, 17:636
Endoperoxides, 18:442–443
Endopolygalacturonase, 11:598
Endo-receptors, convergent, 16:774
Endosseous dental implants, 8:344
Endothall (Aquathol Granular, Aquathol K), 13:315
herbicide/algicide for aquaculture in U.S., 3:215t
Endothelial cells
role in hemostatic system, 4:83
Endothelium derived relaxing factor (EDRF), 5:112
Endothermic EDC cracking, in vinyl
chloride manufacture by pyrolysis,
25:643
Endotoxin adsorption, in hemodialysis,
26:823–824
Endotoxins,
11:47
Endo type aerators, types of, 26:164
End-quench test,
17:15–16
Enduron, molecular formula and structure, 
5:162t
End use chemicals, hydrocarbon use in,
13:687–690
"End-user champion," role in facilitating
research partnerships, 24:387
Eneazomethine, butyraldehyde derivative,
4:462
Ene reactions, 24:496
maleic anhydride in, 15:490
microwaves in, 16:542–544
Energetic plasticizers, 10:740t
Energetic polymers, 10:739t
Energy. See also Geothermal energy
chemical industry use of, 24:165–167
exponents of dimensions in absolute,
gravitational, and engineering
systems, 8:584t
petroleum as a source of, 18:601
smart materials as transforming, 22:706,
707
for sodium manufacture, 22:774
Energy absorption–emission, in smart
materials, 22:707
Energy analyzers, 24:103–104
Energy applications, for high performance
fibers, 13:398
Energy balance
open- and closed-system, 24:646–648
rate-of-change form of, 24:646
Energy balance equation, 21:347;
24:645–648
Energy balances, 10:143–144
Energy bands, 14:702; 22:234
silicon-based semiconductors and,
22:240
Energy consumption
chemical industry, 10:134–137
in electrodialysis, 26:87
furnace, 12:305–306
in membrane desalination processes,
26:85–87
in mineral comminution, 16:610–611
total primary, 24:179
Energy demand, heat recovery system,
13:190–192
Energy density, 13:838–839
Energy deregulation, and coal gasification,
6:815–816
Energy dispersive spectroscopy (EDS), 
24:78
Energy dispersive spectrometer (EDS),
16:488; 26:434–435
Energy dispersive X-ray (EDX) detector, 
26:434
Energy dispersive X-ray fluorescence
(EDXRF), of archaeological materials,
5:742
Energy dispersive X-ray techniques, in
thorium analysis, 24:775
Energy efficiency
in coke suppression technologies,
10:615–616
cost reduction related to, 10:158
design for, 12:804
of process integration technology,
20:748–760
Energy efficiency improvements, chemical
industry, 10:136–137
Energy efficiency programs/activities,
10:158–166
government funding for, 10:159
Energy efficient sulfuric acid plants, 
23:786–787
Energy equation,
11:738
Energy feeds, for young animals, 10:872
Energy filtered transmission electron
microscopy (EFTEM), 16:489
Energy gaps, 23:840
in HTS materials, 23:839
Energy gap structure, in high temperature
superconducting ceramic, 23:836
Energy infrastructure, 13:863
Energy intensive processes, design of, 13:187
Energy losses, in spinel ferrites, 11:64–66
Energy management, 10:133–168. See also
Energy efficiency programs/activities;
Energy technology
chemical industry and, 10:134–137
industry response to, 10:158–159
process equipment items, 10:152–158
utility system design, 10:146–152
Energy minimization process, 16:742
Energy outlooks, 12:389–390
Energy penalty, Pinch point and, 13:213
Energy requirements, for water desalination, 26:59–61
Energy savings, 9:455
Energy security, 13:863
Energy sources
hydrocarbons as, 13:686
new and renewable, 24:166–167
Energy standards, 15:751
Energy state, of soil water, 12:839–840
Energy storage
carbon nanotubes and, 17:50
O–I hybrid materials for, 13:545
Energy supplies, 3:683–684
Energy systems
renewable, 23:50
worldwide, 13:799
Energy targeting, composite curves for, 20:737
Energy technology, 10:138–146
energy balances and heat recovery, 10:143–146
steam systems and power recovery, 10:139–143
thermodynamics, 10:138–139
Energy usage, lime industry, 15:77
Energy use
in papermaking, 18:126
xanthate process and, 11:279
-ene suffix, 2:170
Ene–yne metathesis (EYM), 26:953–956
mechanisms for, 26:954–955
ruthenium alkylidene catalysts in, 26:955
Engine compression ratios, 12:395
Engine conditions, laboratory simulation tests of, 12:401
Engine design, fuel and, 12:395
Engineered microorganisms,
environmental impacts of introducing, 18:552
Engineering. See also Process systems engineering
composite interface, 26:771–773
for reliability, 26:981, 990–992
Engineering alloys, corrosion resistance of, 14:451
Engineering controls, 21:832
in leak and spill prevention, 24:310
Engineering critical current, 23:823
Engineering gold, 9:812
Engineering materials, fatigue properties database on, 13:494
Engineering plastics, 19:537–538
pigments used in, 19:407
polyamides, 19:772
polymers as, 20:401
Engineering prototypes, stereolithographic generation of, 19:117–118
Engineering Research Centers (ERC), 24:395
Engineering resins, 20:56
Engineering strain, 13:473, 482
Engineering stress, 13:473
Engineering surfaces, 15:204
Engineering system of dimensions, 8:584
Engineering thermoplastic data sheet Web sites, 10:221t
Engineering thermoplastics, 10:168–228
categories of, 10:169, 170–171t
chemical resistance of, 10:224, 225t
costs of, 10:222–222
electrical properties of, 10:223
fluorine-containing polymers, 10:218–220
future of, 10:224–225
hydrocarbon materials, 10:180–183
interpolymer competition among, 10:220–225
mechanical properties of, 10:223
nitrogen-containing polymers, 10:204–218
oxygen-containing polymers, 10:183–201
producers and trade names of, 10:173–174t
sulfur-containing polymers, 10:201–204
tensile strength of, 10:224
thermoplastic properties, 10:172–178
thermoplastics development, 10:169–172
Engineers, corporate access to, 24:355
Engine/exhaust controls, 26:717–719
Engine expansion cycle, 8:43
Engine Oil Licensing and Certification System (EOLCS; American Petroleum Institute), 15:228, 233; 21:427
Engine oils, for passenger cars and light trucks, 15:227–232
Engine-out NOx production, 13:855
Engine research, 13:856
Engines, thermodynamics of, 24:653–654
Engine test requirements, ASTM, 15:229–231t
Engine warm-up, 12:397–398
Engraving inks, 14:329
Enhanced Geothermal Systems (EGS), 12:544
Enhanced oil recovery (EOR), 9:1; 12:23; 18:611–639. See also EOR polymers
additional technologies in, 18:630–631
alkaline flooding in, 18:629–630
carbon dioxide capture and storage, 18:617
economic aspects of, 18:631
gas injection in, 18:618
heavy oil upgrading in, 18:618–620
mechanisms of, 18:613–630
nature of oil reservoirs, 18:612–613
oil displacement efficiency in, 18:628–629
organic titanium compounds in, 25:133–134
polyacrylamide polymers for, 1:325–326
polymer flooding in, 18:622–625
sulfonates for, 23:531–533
volumetric sweep efficiency in, 18:620–622
Enhanced oil recovery chemicals, propagation through rock, 18:625
Enhanced separations, nanoscale additives in, 21:670–673
Enhanced Surface Water Treatment Rule (ESWTR), 17:804
Enhanced surfactant flooding, 23:532
Enhancement factor, gas absorption with reaction, 1:47–48
Enhancement programs, aquatic organisms, 3:183, 198
Enhancement reagents, 12:102
Enhancer, 10:688
Enichem oxo-alcohols, 17:725
Enkaid, molecular formula and structure, 5:92t
Enolate anion, reaction, 10:505
Enolate initiators, 14:258
Enolate reductases, 3:674
Enolboration, 13:671–672
Enol properties, of 1,3-diketones, 14:598t
5-Enolpyruvylshikimate 3-phosphate synthase (EPSPS), 12:486, 487–490; 13:358
glyphosate-tolerant, 12:488–490
overproduction of, 12:488
Enoxacin, 21:222, 223
Enoxaparin, 4:95t; 5:175
molecular formula and structure, 5:172t
Enoximone, 5:186
molecular formula and structure, 5:181t
EN plated parts, baking, 9:705–706
ENR Construction Cost Index, 9:526, 527
Enrichment, of vitamin C, 25:765
Enrico Fermi fast-breeder reactor (Fermi-1), 17:586
Enrobing, milk chocolate, 6:366
Ensorb, 1:648–649
Enstatite glass-ceramics, 12:633
Enteric bacteria, nif genes in, 17:311
Enteric drug coatings, 18:706–707
Enterobactin, 14:557
Enterococcus faecalis, antibiotic resistant, 3:33, 36, 37
Enterococcus faecium, antibiotic resistant, 3:33–34, 36
Enterococcus hirae, antibiotic resistant, 3:33
Enterprise resource planning (ERP), 20:674
Enthalpic effects, in QSAR studies, 10:329
Enthalpy, 24:687
of caustic soda solutions, 22:831
definition of, 24:651
of micellization, 24:131–132
as a property of steam, 23:204
standard-state, 24:688
in thermodynamics, 24:643, 644
Enthalpy changes, temperature-dependent, 25:303–305
Entrained bed gasifier, for biomass gasification, 3:696
Entrained flow gasifiers, 6:729, 789, 790, 798–800, 827
operating conditions and product distributions using bituminous coal, 6:788t
Entrainer, 8:819
Entrainer distillation systems, debottlenecking, 18:521
Entrainment bubble tray absorption columns, 1:90
from a fluidized bed, 11:814–817
Environmental aspects of hydrogen energy, 13:862–864
of ketones, 14:575–581
of minerals recovery/processing, 16:609–610
Environmental assessment, of syntheses, 24:180–182
Environmental Assessment Tool for Organic Syntheses (EATOS) software, 24:180–181
Environmental catalysts, high throughput experimentation, 7:397–398
Environmental chamber, 13:477
Environmental chemistry analytical methods, 9:442
corporate programs, 9:456–457
de Dyes 9:431–463
effluent treatment, 9:432–437
fate of dyes, 9:437–442
pesticide registration requirements for, 18:545–547
pollution prevention, 9:442–456
resources, 9:457
Environmental concerns. See also Environmental considerations;
Environmental factors; Environmental impacts; Environmental issues
ascorbic acid, 25:758–759
chlorine, 25:679
dyes and dye intermediates, 9:297–298
electroless deposition, 9:719–721
electroplating, 9:794–798
gasotron fluoride-related, 14:17
hydrogen-related, 13:791–793
indium-related, 14:201
ink-related, 14:331–335
inorganic electrochemical processing, 9:643–647
iodine-related, 14:369
iron-related, 14:524–527
magnesium-related, 15:348–349
metal surface treatments, 16:224
radioactive waste-related, 25:859–860
related to inorganic titanium compounds, 25:61–65
rhenium-related, 21:695
thallium-related, 24:639
titanium-related, 24:864–865
toxic solid waste chemicals and, 25:875–876
tungsten-related, 25:370

Entrainment limit, heat pipe, 13:230
Entrainment rate, calculating, 11:814–816
Entrance span areas, in thermal design, 13:258
Entrapment, of ligand in affinity chromatography, 6:397
Entrepreneurial Technology Apprenticeship Program (ETAP), 24:392
Entrepreneuring, in R&D, 21:619
Entropy, 24:434, 676
exponents of dimensions, 8:585t
of micellization, 24:131–132
as a property of steam, 23:204
rate of change in an open system, 24:649
second law of thermodynamics and, 24:648–651
in siloxane polymer manufacture, 22:558
temperature- and volume-related changes in, 24:657–658
in thermodynamics, 24:643, 644
Entropy balances, 24:649–650, 670
Entropy generation, rate of, 24:650
Entropy generation term, 24:650
Enviro-Clear thickener, 22:66, 67
Environment
effect of color photography on, 19:265–266
effect of electrochemical machining on, 9:604
effect of phosphorus on, 19:17
effect of photographic processing on, 19:217–218
effect of pigments on, 19:413–415
effect on fatigue properties, 13:494
energy and, 10:137
FCC units and, 11:713–721
industrial enzymes and, 10:307–308
LDPE impact on, 20:230–231
manganese in, 15:559–561
natural photocatalytic processes in, 19:100–101
nuclear reactor plants and, 17:598–599
PLA-based materials and, 20:311–312
platinum emissions in, 19:618
plutonium in, 19:700
protection of, 21:827–828
Environmental Action Programmes (EAPs), 23:121
Environmental applications
of hydrogen peroxide, 14:64–67
of hydrothermal treatment–recycling–alteration technology, 14:108
Environmental conditions, industrial, 14:221

Environmental inflows/outflows, in life cycle assessment, 14:809–810
Environmental interactions, test temperature and, 13:487–488
Environmental interventions, in life cycle assessment, 14:820
Environmental issues. See also Environmental concerns concerning phosphoric acids and phosphates, 18:861
electric furnaces, 12:314
emulsion-related, 10:128
ethylene glycol, 12:653–655
with fermentation, 11:49
in fine art examination/conservation, 11:407–408
gasoline-related, 12:414–420
gold-related, 12:699–700
hot dry rock operations, 12:542–543
hydrothermal energy, 12:534–535
plasma fractionation, 12:153
propylene glycols, 12:667–668
of regenerated cellulose fibers, 11:278–280
steam-dominated geothermal resources, 12:530
Environmental laws/legislation/regulations
diesel, 12:429–430
dye industry, 9:426, 431
European, 19:531
flocculation-related, 11:625
fragrance-related, 18:388–389
green chemistry and, 12:800
growth in, 12:801–802
hydrogen-related, 13:792
methyl chloride, 16:326
methylene chloride, 16:377–378
in nitrobenzene processing, 17:256
spray technology and, 23:173
summary of, 24:305
Environmentally acceptable reactions, synthesizing, 20:741
Environmentally friendly animals, creating, 12:465–466
Environmentally friendly drilling fluids, 9:35
Environmentally friendly plastic materials, 20:255
Environmentally friendly reactive dyes, 9:455
Environmentally induced cracking, 7:811–814
Environmentally responsive drug delivery systems, 9:61–63
Environmentally sound development, economic approaches to, 24:176
Environmental management, 14:805
EIA and, 10:244–246
Environmental management systems (EMS), 10:244
Environmental permitting, 19:531
Environmental policy, 9:798; 14:805.
See also Environmental laws/legislation/regulations national, 14:342
Environmental policy formulation, long-term, 24:176
Environmental profiles, in life cycle assessment, 14:820–821
Environmental protection, product-integrated, 24:163
Environmental Protection Agency (EPA), 10:109; 21:568. See also EPA entries; U.S. Environmental Protection Agency (USEPA); U.S. EPA Tier 2 specification
air quality standards, 21:583–586
aquaculture chemical regulations, 3:209
Chemical Substances in Commerce list, 12:832
chemicals inventory, 21:591
drinking water microbial control regulations and, 17:804
drinking water regulations of, 17:528–529
gasoline detergency requirements, 12:410
on incinerator scrubbing systems, 25:681
laws and regulations, 9:794
New Chemicals Program, 9:456
New Source Performance Standards (NSPS) enforcement initiative, 11:689
P2 Recognition Project, 9:456
radioactive waste and, 25:852, 856, 857
regulation of mercury by, 16:45, 46–47
regulation of pesticides by, 18:525
Secondary Maximum Contaminant Level, 11:641
soil and ground water treatment regulation by, 25:834–835, 837
toxic metal regulations, 9:642
vinyl chloride regulations by, 25:649
on waste minimization techniques, 25:883–884
wastewater treatment regulation by, 25:917–918
water quality standards, 21:581–583
Environmental regulations. See Environmental laws/legislation/regulations; Environmental policy
Environmental remediation, using microwaves, 16:555
Environmental resistance coatings, 13:507–508
of polyimides, 20:277
of high temperature alloys, 13:504–508
Environmental risk assessment, 12:813–814
uncertainty analysis in, 26:1001
Environmental samples, silicone extraction from, 22:600, 602t
Environmental scanning electron microscope (ESEM), 16:493, 466
Environmental specifications, for gasoline, 12:387–388
Environmental standards, 10:158
Environmental stress crack resistance (ESCR), 20:166
Environmental stress screening (ESS), for reliability, 26:992
Environmental Technology Verification (ETV) Program, 10:109
Environmental testing, for reliability, 26:991
Environmental trends, in the petrochemicals industry, 24:261–262
Environment Canada, 18:542; 23:120
Enzymatic cellulose hydrolysis, 26:359
Enzymatic hydrolysis, 10:503, 535–536
Enzymatic methods, in sugar analysis, 23:475–476
Enzymatic oxidation \( k_La_L \) measurement method, 15:680
Enzymatic presoaking agent, 10:252
Enzymatic reactions, of ascorbic acid, 25:768–769
Enzymatic resolution, in oxazolidinone preparation, 17:739–740
Enzymatic stone-washing, 10:302
Enzymatic sweetener production, 10:286–287
Enzyme activity
  in flax fiber, 11:599
  in microbial transformations, 16:405
neural network-based approach to modeling, 10:341
potassium in, 20:641
Enzyme amplification, 14:147–148
Enzyme analyzers, commercial, 23:476
Enzyme applications. See Industrial enzymes
Enzyme assays, 10:257–258
Enzyme-based inhibitor design, 10:327, 328
Enzyme business, growth in, 10:311
Enzyme catalysis, 20:830
dendrimers in, 26:806
Enzyme catalysts, 16:395
Enzyme-catalyzed reactions, microwave-expedited, 16:583
Enzyme Commission (EC) enzyme classifications, 10:259–260
Enzyme drug delivery, 9:65–66
Enzyme flavor precursors, 11:578–581
Enzyme formulations, 10:268–270
solid, 10:272–273
stability of, 10:269–270
Enzyme histochemistry, suture material biocompatibility and, 24:217–218
Enzyme immobilization, 10:270–272
methods of, 10:271
Enzyme-immobilized FETs (ENFETs), 22:269. See also Enzyme ion-selective field-effect transistor (ENFET); Field effect transistors (FETs)
Enzyme immunoassay (EIA), 14:136, 143–148
in herbicide analysis, 13:312
steps in developing, 14:144
variations of, 14:147
Enzyme industry, 11:12–13
fermentation products of, 11:17–20t
Enzyme inhibition, 10:256. See also Enzyme inhibitor entries
  as a toxic effect, 25:206
types of, 10:318
Enzyme–inhibitor design, genetic software techniques for, 10:342
Enzyme inhibitor implants, 10:343
Enzyme–inhibitor interactions, visualization of, 10:340
Enzyme–inhibitor models, based on pharmacophores, 10:333
Enzyme inhibitors, 10:317–346
biological effects of, 10:328
design of, 10:324–342
future of, 10:342–344
parameters of, 10:318–324
Enzyme ion-selective field-effect transistor (ENFET), 3:799, 813. See also Enzyme-immobilized FETs (ENFETs); Field effect transistors (FETs)
Enzyme kinetics, 10:254–256
Enzyme-linked immunosorbent assay (ELISA), 3:801–802; 14:136
Enzyme manufacturers associations, 10:309
Enzyme-mediated pathways, in the RNAi process, 17:620
Enzyme modification, performance improvement, 3:671
Enzyme multiplied immunological technique (EMIT), 12:97
Enzyme Nomenclature, 17:402
Enzyme–product (EP) complex, 10:318
Enzyme production, Bacillus and, 12:477
Enzymes. See also Restriction enzymes
Enzymes, 5:201
for acrylamide manufacture, 1:294–295
for allelochemical production, 13:354
as allergens, 10:308
amino acid sequences of, 10:260–261
in automatic dishwashing detergents, 10:285
biocatalysis by, 3:668–681
bleaching agents, 4:64–69, 73–74
characteristics of, 10:253
chiral separation using, 6:75
commercial use of, 20:450
cotton modification, 8:30–31
deactivation, 5:289–293
degree of specificity of, 10:253
encapsulation of, 16:454
extracellular, 10:267
for extreme conditions, 20:840
in fatty acid manufacture, 10:831
flavor creation by, 11:579
flavor deterioration and, 11:578
from fermentation, 11:4–5, 21
in food, 12:64–65
in food processing, 12:32
herbicidal inhibition of, 13:298–300
ionic strength of, 10:269
in laundry detergent products, 10:274
microencapsulation of, 10:270
molybdenum co-factor (Moco), 17:33
for powder detergent, 10:272
as pulp bleaching agents, 21:48
in radioactive tracer synthesis, 21:274
regulation of, 10:308–310
sales of biocatalysts, 3:669t
silylating agents and immobilized, 22:700–701
in starch biosynthesis, 12:490–494
storage of, 10:268–269
as substrates in biotransformations, 16:395–396
types of, 10:278–284
use in retting, 11:608–610
whole cells contrasted, 3:669–671
yeast-derived, 26:474–475
Enzyme screening, 10:262–263
Enzyme specificity, 24:38
Enzyme structure analysis, 10:335–337
Enzyme–substrate (ES) complex, 10:254, 317
Enzyme–substrate–inhibitor (ESI) complex, 10:318
EOR polymers, properties of, 18:624t.
See also Enhanced oil recovery (EOR)
Eosine B, acid Red 91, 4
Eosine Y, Acid Red 87, 2
EPA ambient air ozone limits, 17:815.
See also Environmental Protection Agency (EPA)
EP additives, 15:213. See also EP elastomer; EP lubricant additives;
Extreme pressure (EP) lubrication regime
EPA/du Pont program, 12:816
EPA evaporative emission regulation, 10:59
EPA hazard quotient, 25:238
Epal 810
chain length and linearity, 2:12t
Epal alcohols, 2:8t
Epanutin, molecular formula and structure, 5:91t
EPAT file, 18:230, 235
EPDM crumb, 10:710
EPDM elastomers, catalysts and technologies for, 17:706
EPDM polymerization. See also Ethylene and propylene terpolymers (EPDM) gas-phase process of, 10:711
slurry process of, 10:710–711
solution process of, 10:708–710
EPDM recipes, 10:714t
EP elastomer, catalysts and technologies for, 17:706. See also EP additives
Eperezolid, 17:732
L-Ephedrine, chemoenzymatic synthesis, 3:668
24-Epibrassinolide, 13:23t, 27
Epichlorohydrin, 10:356–357, 381; 21:769
abnormal addition of, 10:358
Epichlorohydrin-bisphenol A (ECH-BPA) ratio, 10:360
Epidemic diseases, vaccines against, 25:486
Epidemiological studies
of age-related macular degeneration, 17:659
of vitamin E, 17:652
EPI DOS, 18:236
Register, 18:247
Epidote, in coal, 6:718
(−)-Epigallocatechin, 2:827
(−)-Epigallocatechin 3-gallate, chemiluminescence reagent, 5:857–858
Epigallocatechin gallate (EGCG), 17:644, 666–667
Epiminofullerenes, 12:242
Epinephrine, 3:87
Epitaxial growth, compound semiconductors and, 22:144–145
Epitaxial interface, latent image formation and, 19:354
Epitaxial reordering process, 14:447
Epitaxial tantalum films, 23:829
Epitaxial technologies, gallium use in, 12:351–352
Epitaxial thin films, 24:742
Epitaxy, 22:152, 185. See also Epitaxial growth; Heteropitaxy
in FET fabrication, 22:163–164
in HBT fabrication, 22:166, 167
in RTD fabrication, 22:170
silicon purification via, 22:496–497
vitreous silica in, 22:442
Epitaxy crystallization, ion-beam-induced, 14:447–448
Epithermal silver mineralization, 22:637, 638
Epitope vaccines, 11:5–6
Eplerenon, 5:159
EP lubricant additives, 15:223–224. See also EP additives
EPM/EPDM consumption, worldwide, 10:717t. See also Ethylene and propylene copolymers (EPM)
EPM/EPDM rubber production capacities, 10:712t
Epogen, 3:817, 817t
cell culture technology product, 5:346t
Eponite, 4:741
Epothilones, synthesis of, 26:943
Epoxidation, 10:368, 369
of ω-olefins, 10:380
of p-aminophenol, 10:372
butadiene, 4:372
catalytic aerogels for, 1:763t
in the chlorohydrin process, 20:799, 800
of cycloolefins, 10:378
ionic liquids in, 26:896
of MDA, 10:372
Epoxidation catalysts, organic titanium compounds as, 25:135
Epoxide determinations, 10:385
Epoxide equivalent mass (EEM), 10:355
Epoxide equivalent weight (EEW), 10:355, 361–363, 385
Epoxide groups, acid-catalyzed hydrolysis of, 10:378
Epoxide hydroxylase, purification, 3:845
Epoxide resins, fabrication of, 26:766
Epoxides, 10:569
reactions with chloroformates, 6:295
Epoxidized novolacs, 18:782
Epoxidized oils, 9:152
Epoxidized phenol novolac, 17:840
Epoxidized vegetable oils, 10:376, 377–380
Epoxies, 17:830. See also Epoxies anhydride-cured, 10:404
elastomer-modified, 10:375–376
as embedding materials, 10:5–6
in silicone network preparation, 22:568
Epoxi-1,4-naphthoquinones, optically active, 21:252
Epoxycrylates, 10:382–383
in varnish formulations, 10:442
Epoxycytaguration, in microarray fabrication, 16:385
Epoxycy–amino resin weight ratios, 10:445
Epoxycy–anhydride systems, properties of, 10:403–404
Epoxycy-based adhesives, 10:458–459
Epoxycy-based composites, 26:763
Epoxycy-based powder coatings, 10:439–442
Epoxycy-based thermoplastics, 10:365
Epoxy (bisoxirane) method, for covalent ligand immobilization, 6:396t
Epoxybutene, as catalyst, with silver, 22:685
Epoxy can coatings, safety of, 10:447. See also Epoxy coatings
Epoxy chalcone, 10:450
12,13-Epoxy-cis-9-octadecenoic (vernolic) acid, physical properties, 5:35t
Epoxy coatings, 10:436–450; 17:845. See also Epoxy can coatings for corrosion protection, 7:199
markets for, 10:442–449
performance of, 10:423
waterborne, 10:439
Epoxy composites, 10:450, 451
Epoxy compounds, photoinitiated polymerization of, 23:716
Epoxy content analysis, 10:385
Epoxy cresol novolac (ECN) resins, 10:367, 369
properties of, 10:370t
Epoxy cure monitoring techniques, 10:425
Epoxy curing
characterization of, 10:425–428
process for, 10:422–425
toluenediamine in, 25:196
Epoxy curing agents, 10:6
ethyleneamines application, 8:500t, 501–502
Epoxy/curing agent stoichiometric ratios, 10:418–420
Epoxy–DICY systems, 10:454
Epoxy equivalent weight (EEW), 10:399
Epoxy ester alkyd resins, 2:165–166
Epoxy esters, 10:380–384, 443
Epoxy formulations, performance of, 10:428
Epoxy groups, 10:567
hydrolysis of, 10:358
acid-catalyzed cross-linking of, 15:171
Epoxy molding compounds (EMC), 10:373, 430–434, 458
Epoxy nanocomposites, 10:350, 434
Epoxy novolac resins, 10:367–370, 383, 450 multifunctional, 10:452
Epoxy novolacs, 17:839
1,2-Epoxypentane, butyraldehyde derivative, 4:462
Epoxy phenolic can coatings, 18:38
Epoxy phenol novolac (EPN) resins, 10:367–368
toxicity of, 10:461
Epoxy phosphate esters, 10:383–384
Epoxy plasticizers, for PVC polymers, 25:674
1,8-Epoxy-p-menthane, 24:528
Epoxy–polyester automotive coatings, 10:447, 449
Epoxy–polyester hybrid powder coatings, 7:48
gloss retention in outdoor exposure, 7:49
physical and coating properties, 7:42t
1998 production, 7:49
Epoxy–polyester hybrids, 10:440–441
Epoxy–polyester thermosets, curing mechanism of, 10:403
Epoxy powder bed coating, fluidized, 10:13
Epoxy powder coatings, 7:46–48
gloss retention in outdoor exposure, 7:49
physical and coating properties, 7:42t
1998 production, 7:49
Epoxy resin adduct, 10:435
Epoxy resin adhesives, 1:534–537
Epoxy resin coatings, novolac resins in, 18:782
Epoxy resin encapsulant, 14:864
Epoxy resin functional groups, 10:388, 389
Epoxy resin industry, 10:350–353
Epoxy resins, 10:347–470. See also Epoxies; Resins; Uncured epoxies brominated bisphenol A–based, 10:366
catalytic curing agents, 10:411–415
coating resins, 7:102–103
commercial, 10:347
conducting, 7:525
consumer expectations for, 10:428
coreactive curing agents, 10:392–411
crystalline, 10:373–374
curing agents for, 10:390–392t
curing of, 10:387–392
cycloaliphatic, 10:377–380
DGEBA based, 10:359–365
elastomer-modified, 10:436
electronic applications for, 10:457–458
fluorinated, 10:366–367
formulation development with, 10:415–421
formulation modifiers for, 10:428–436
global market for, 10:350–353
halogenated, 10:366–367
health and safety factors related to, 10:460–461
history of, 10:348–350
liquid, 10:354–359
Equal probability sampling (EPS), 10:351
in parameter estimation, 26:1039
Equation of state approach, 24:134. See also Equations of state
Equation-oriented approach, 20:729
advantages and disadvantages of, 20:730
Equations. See also Bernoulli equation;
Continuity equation; Differential equations; Energy equation; Ergun equation; Euler equations; Gusev and Lusti equation; Integral equations; k-equation; Kerner equation; Laplace’s equation; Momentum equation; Navier-Stokes (N-S) equations; Reynolds-averaged equations; Scalar equation; Zero-equation models
identification of, 11:777
in thermodynamics, 24:643
Equations of state, 24:11. See also Equation of state approach
for vapor and liquid phases, 24:685
Equiaxed ferrite, 23:298
Equilibria, liquid–liquid, 10:745, 746–749
Equilibrium. See also Equilibrium state
adsorption, 1:591–594
adsorption columns, 1:602–604
chelation displacement, 5:716–718
chelation formation, 5:715–716
in dyeing, 9:164–165
formal treatments of, 14:608
gas adsorption, 1:652–653
liquid phase adsorption, 1:680–682
thermodynamic, 24:660–661
gas–liquid, 1:29–30
Equilibrium catalyst (Ecat), 11:689
Equilibrium constant(s), 10:499
for antibody-antigen reactions, 14:137
in esterification, 10:474–475
in ethylene hydration, 10:541–542
as a function of pressure, 13:409–410
temperature dependence of, 24:689
in vapor-phase esterification, 10:482
Equilibrium diagram, triangular, 10:747–748
Equilibrium film thickness, 12:6–7
Equilibrium moisture content, 9:97, 107–109
profiles of, 9:108–109
Equilibrium phase behavior, of polymer blends, 20:318–323
Equilibrium potential, 9:581–582

major producers of, 10:351
manufacturing processes, 10:353–354
mixing ratios with, 10:394
molecular structure of, 10:387
monofunctional glycidyl and aliphatic glycidyl ethers, 10:376–377
multifunctional, 10:348–349, 367–373
organic titanium compounds in, 25:126
phosphorus flame retardants in, 11:499–501
photoinitiated cationic curing of, 10:414–415
in plastic encapsulant materials, 17:838–839
as potting agents, 16:17
prices of, 10:352, 353t
producers and trade names of, 10:354t
properties in powder coating, 7:43t
properties of, 10:347
selection of, 10:416–418
specialty, 10:373–376
structural applications for, 10:450–460
structure–properties relationship in, 10:415–416
trifunctional, 10:371–372
typical soluble dye applications, 7:376t
versus phenolic resins, 18:792
weatherable, 10:374–375
Epoxy ring reactivity, 10:388
Epoxy structural composites, performance enhancements of, 10:350
Epoxy structure, cure response and, 10:390
Epoxy system curing profile, 10:17–18
Epoxy systems, post-cure for, 10:423
Epoxy vinyl ester composites, 10:452
Epoxy vinyl ester resins, 10:349
Epoxy vinyl esters, 10:383
Eprosartan, 5:187
   molecular formula and structure, 5:152t
ε-caprolactone, 19:747, 748
   block copolymer synthesis, 7:647t
Epsonite, 5:785t
Epsom salts, 5:785t; 15:419, 420
EPSPS enzymes, 12:489
EPSP synthase, 13:300
Epstein–Barr virus (EBV), 3:136
Eptastigmine, 2:818
EPTC, 13:320, 321
Eptifibatide, 4:104t, 105; 5:173
   molecular formula and structure, 5:171t
Equal, 24:226
Equilibrium segregation coefficients, for silicon impurities, 22:493t
Equilibrium stages, calculation of, 10:756–759
Equilibrium state, 24:642. See also Equilibrium
   progress toward, 24:649
Equilibrium value, 14:611
Equilibrium volume parameters, from density measurements, 13:435–436
Equimolar counterdiffusion, 1:39–40
   drift flux correction, 1:55–58
Equipment. See also Failure mode and effects analysis (FMEA)
Equipment. See also Instruments
Equipment. See also Reactor technology
Equipment
desalination, 26:55
   emulsion-formulation, 10:126–127
   for fertilization, 11:31–41
   in fine chemical production, 11:428,
      431–432
   flash vacuum pyrolysis, 21:135–136
   flotiation, 16:652–655
   flow-measuring, 11:651–652
   fluorine-production, 11:839–841
   heat exchanger network, 13:219
   high pressure processing, 13:410–412
   for high purity gas analysis, 13:464
   hydrothermal processing, 14:88–92
   injection molding, 19:550–551
   ion-exchange, 14:403–405
   liquid–liquid extraction, 10:767–781
   magnesium-manufacturing, 15:343
   magnetic, 15:434–435
   methanol-related, 16:313
   particle size measurement, 18:155
   in plant layout, 19:501–515
   in plot plans, 19:500–501
   polyesterification reaction, 20:97–98
   pyrometallurgical, 16:140–141
   rare-earth-element-extraction, 14:642
   sack-filling, 18:12
   scrap-preparation, 21:410
   steam-generation, 23:215–218
   suppliers of, 11:33t
   for thermal food preservation, 12:79–81
   utility system, 10:152–158
   validation of fermentation, 11:48
Equipment costs, 9:526–527
Equipment failure(s), 15:478
   probability of, 13:166
Equipment layout, 19:494–495
Equipment leaks, emissions from, 10:68–75
Equipment modification(s)
   for pressure relief devices, 10:71
   for pumps, 10:70
   waste minimization via, 25:884t
Equipment operation/maintenance, best practices in, 10:159–162
Equipment qualification, in commercial-scale pharmaceutical operations, 18:735
Equipment spacing
   inside battery limit for, 19:518
   outside battery limit for, 19:519
Equipment standards, 15:766–767
Equipment, in size separation, 22:277
Equity capital cost, 9:542
Equivalent box model (EBM)
   for polymer blends, 20:344
   volume fraction calculation
   in, 20:345–346
Equivalent Circular Area diameter (ECAD), 18:147
Equivalent Circular Perimeter diameter (ECPD), 18:147–148
Equivalent conductance, 3:416
Equivalent opening size (EOS), 17:488
Equivalent patent information searches, 18:236–237
Equivalent settling diameter, 18:142
Equivalent Zero Emission Vehicles (EZEV), 19:627
Eröbin (Er), 14:631t, 635t
   electronic configuration, 1:474t
Erbium-doped fiber amplifiers (EDFAs), 11:145–146; 22:179
Erbium lasers, 20:514
Erbumine, molecular formula and structure, 5:151t
Erectile dysfunction, therapeutics for, 5:182–183t
Ergocalciferol, 25:791
Ergonovine, 2:93–94
Ergosterol, 25:791
Ergotamine, 2:93–94
Ergotism, alkaloid role in, 2:75
Ergun equation, 11:332–333, 767
Erionite, 3:289
   pore dimensions, 5:239t
Erlenmeyer synthesis, 2:571
Eroding antifouling coatings, 7:158
Erosion
  ceramics, 5:630
  as failure mechanism, 26:984
  fertilizers and, 11:126–127
  landfill design and, 25:880
  release of controlled release pesticide formulation via, 7:558
Erosion corrosion, in industrial water treatment, 26:129
Error-prone polymerase chain reaction (PCR), 3:671
aminotransferase performance improvement, 3:678–681
Ersentilide, 5:106
Erucic acid
  percent in important fats and oils, 5:47t
  physical properties, 5:32t, 37t
Erwinia, as a host system for gene expression, 12:475–476
Erwinia citreus, in ascorbic acid fermentation synthesis, 25:754
Erythorbic acid, 12:60, 25:749
  antioxidant useful in cosmetics, 7:830t
Erythrite, 4:83
Erythrogenic acid, 5:34t
erythro-isomers, 21:15
Erythromycin(s), 3:30, 35; 15:279, 305
  bacterial resistance mechanisms, 3:32t
  derivatives of, 15:282–285t, 286
  11,12-carbonate of, 15:286
  ester derivatives of, 15:281
  promising new uses for aquaculture, 3:223
  registered for use in aquaculture in Japan, 3:221t
Erythromycin acistrate, 15:281
Erythronolide B, 15:279
Erythropoietin (EPO), 3:81
  market, 5:3567
  regulatory treatment, 3:826
  selling price, 3:817t
D-Erythrose, 4:698
Erythrosine, iodine consumption in, 14:371
Escherichia coli, 12:470
  antibiotic resistant, 3:33–34
  EPSPS from, 12:488, 489–490
  genome, 12:497
  as host cell, 11:23–24, 28
  as a host system for gene expression, 12:475–476
  human insulin derived from, 3:817–821
  silver ion versus, 22:677–678, 679
  uv disinfection, 8:652t
Escher-Wyss pressure filter, 11:385–386
Escor, molecular formula and structure, 5:128t
Esidrix, 5:168
  molecular formula and structure, 5:161t
Esskohle coal grade (Germany), 6:713t
Esskool coal grade (Netherlands), 6:713t
EST (expressed sequence tags) database, expression profiling and, 13:354
Estagrip, commercial block copolymer, 7:648t
Estaloc, commercial block copolymer, 7:648t
Estane, commercial block copolymer, 7:648t
Ester–acid interchange, 10:492–493
Ester–alcohol interchange, 10:491–492
Esterases, 3:675–676
Ester bonds, in the wood cell wall, 21:15
Ester carboxylates, 24:144, 145
Ester–ester interchange, 10:493
Ester hydrolysis, 10:497, 502–503
Esterifiable acids, 10:490
Esterification, 9:283, 320; 10:471–496.
  See also Ester interchange; Esters
    acid- and base-catalyzed, 10:473–474
    alkylphenols, 2:207
amino acids, 2:568
amy l alcohols, 2:768
in ascorbic acid manufacture, 25:758
batch, 10:478–480
carbohydrate hydroxyl groups, 4:711
carboxyl group, 14:117
carboxylic acids, 5:41–42
catalysts for, 10:477–478
cellulose, 5:383
citric acid, 6:635–636
completion of, 10:476–477
of compounds, 10:484–488
computer simulation model of, 10:474
continuous, 10:480–482
cotton, 8:29–30
equilibrium constants in, 10:474–475
ethanol in, 10:530–531
higher aliphatic alcohols, 2:5
of hydroxybenzoic acids, 22:4
of maleic anhydride, 15:491
of methacrylic acid, 16:241
organic acid–alcohol reactions, 10:472–478
organic titanium compounds in,
25:122–126
in polyester fiber manufacture, 20:11
of PVA, 25:601
rate of, 10:472–473
technical preparation of esters, 10:488–490
temperature of, 20:100
vapor-phase, 10:482–484
with heterogeneous catalysts, 18:518–519
Esterification catalysts, diorganotins as, 24:823
Esterification equivalent, 10:387
Esterification–hydrolysis process, 10:536–538
Esterification rate, acid catalysts and, 20:99
Ester interchange, 10:490–493
organic titanium compounds in,
25:123–124
Ester-interchange (EI) catalysts, 20:39–40
Ester plasticizers, 21:790
Esters. See also Esterification; Organic esters
Esters. See also Esterification; Parabens
Esters
adsor bent affinity, 1:674
α- and β-chiral, 13:669
aroma chemicals, 3:254–259
aroma compounds in roasted coffee, 7:256t
of ascorbic acid, 25:761
in beer, 3:582t
biodegradability of, 25:826
boronic, 13:671
in cosmetic molded sticks, 7:840t
enolate reactions of, 10:505
epoxy, 10:380–384
epoxy phosphate, 10:383–384
epoxy vinyl, 10:383
glycidyl, 10:381–382
high boiling, 10:489
hydrogenation of, 10:504–505
large-volume, 10:471–472
medium boiling, 10:489
pentaerythritol of rosin, 22:43
phosphorus, 19:27
of phosphorus oxyacids, 19:22t
physical properties of, 10:508
polarity relative selected molecules,
8:813t
polyol, 9:150
predicted deviations from Raoult’s law
based on hydrogen-bonding
interactions, 8:814t
preparation of, 10:471
preparing from ethers, 10:487
pyrolysis of, 10:506
reactions with alkanolamines from olefin
oxides and ammonia, 2:126
reactions with boron trifluoride, 4:144t
reactions with bromine, 4:302
reactions with carbon monoxide, 5:9–10
reaction with alkyl magnesium halides,
10:505
reduction of, 10:504–505
of salicylic acid, 22:12–17
of trimethylpentanediol, 12:673–674
volatility classes of, 10:476
Ester yields, reactant proportion and, 10:475
Estimated additional resources (EAR), 17:519; 25:398
Estimated Average Requirement (EAR), 25:784
Estradiol, 13:3
Estradiol, synthetic, 13:3
Estuarine environment, 26:20–21
η-carbides, 4:691, 692
Etacelasil, 13:42t, 51
Etalons, 11:151, 152; 14:704, 705
Etanercept (Enbrel), 2:824
Eta phase soaps, 22:729
hydration of, 22:730–731
Etch chemistries, for compound semiconductor wet etching, 22:183
Etch etchings. See also Dry etching; Wet etching of lotus effect surfaces, 22:117, 119, 120
in MEMS, 22:259–260
in sensor fabrication, 22:267
of silicon, 22:491–492
of silicon carbide, 22:527
Etch mechanisms, in compound semiconductor wet etching, 22:183
Etch profiles, in compound semiconductor wet etching, 22:183
ETFE, 10:220
ETFE films, 18:325
ETFE resins. See also Ethylene–tetrafluoroethylene (ETFE) copolymers
electrical properties of, 18:322t
forms of, 18:325t
Ethacrynic acid, 5:169
molecular formula and structure, 5:163t
Ethanal. See Acetaldehyde
Ethane, 13:690–695
from acetylene hydrogenation, 1:180
adsorption of mixtures with carbon dioxide on zeolite 5A, 1:603
alkylation of, 12:172
chlorination of, 10:587–588
diffusion coefficient in air at 0°C, 1:70t
economic aspects of, 13:693–694
electrostatic properties of, 1:621t
health and safety factors related to, 13:694
in liquefied petroleum gas, 18:664
manufacturing and processing of, 13:691–692
production and shipment of, 13:692–693
reaction with sulfur to produce carbon disulfide, 4:830
reactivity as VOC, 1:792t
steam cracking product distribution, 4:379t
uses of, 13:695
Ethane-1,2-bis(pentabromophenyl), 11:466–467

Ethane dehydrogenation, membranes in, 10:619
Ethane feed, 10:625
Ethane feedstock, 18:558, 559
Ethane–heptane mixtures
Gibbs ensemble simulation, 1:34
Ethane-propane cocracking, 10:600
Ethanoic acid, physical properties, 5:29t
Ethanol, 10:527–567, 568. See also Ethyl alcohol
acrylamide solubility in, 1:290t
analytical methods related to, 10:550–551
in ascorbic acid manufacture, 25:757
azeotropes with n-butyraldehyde, 4:460t
azeotrope with benzene, 3:598t
azeotrope with methanol, 8:812
azeotrope with water, 8:747, 803, 818
in beer, 3:582t
from biomass, 3:689–690, 702–703
1-butanol manufacture from, 4:396
chemical properties of, 10:528–532
chemicals derived from, 10:554–558
from corn, 26:274
dehydration of, 10:554–555
dehydration using heterogeneous azeotropic extraction, 8:819
from fermentation, 10:532–536
as fuel, 10:295, 545; 26:720
function as ingredient in cosmetics, 7:829t
gas bulk separation, 1:618t
gas chromatographic determination of, 10:551
health and safety factors related to, 10:551–552
manufacture of, 10:532–543
physical properties of, 10:527–528
preparation by indirect hydration, 10:536–538
in protein precipitation, 12:133, 135
recovery and purification of, 10:543–545
Rodebush sequence for separation from water, 8:834–835
safety factors related to, 12:153
shipment of, 10:545–546
solubility of aminophenols in, 2:653t
solubility of benzoic acid in, 3:626t
solubility of boric acid in, 4:253t
solubility of butanediol in, 1:235t
solubility of butylenediol in, 1:235t
solubility of dispersant tails in, 8:685
solubility of higher alcohols in, 2:3t
solubility of metal fluoroborates in,
4:152t
terminal activity coefficients of mixture
with ethyl acetate, 8:743t
terminal activity coefficients of mixture
with isoctane, 8:743t
terminal activity coefficients of mixture
with toluene, 8:743t
ternary heterogeneous azotropes, 8:823
units and specifications for, 10:548–549
uses for, 10:552–558
Wentworth process for separation from
water, 8:834–835
Ethanolamines, 10:665
U.S. annual production, 2:131t
U.S. consumption by use, 2:131t
use in industry, 23:599
Ethanol dehydration, 18:515
Ethanol–gasoline blends/mixtures, 3:690;
12:405
Ethanol production, 10:295–296; 11:8;
18:568–569
economic aspects of, 10:546–548
enzymes for, 10:294–295
Ethanolpyridines, 21:101, 126
Ethanol removal, using pervaporation,
18:520
Ethanol to ethylene process, 10:621
Ethanol transportation fuel, 10:60
Ethanol trifluoroborane, 4:144t
Ethanol vapor concentration, effects in
humans, 10:552t
Ethene, copolymerization of, 16:111
Ethene homopolymerization, 16:102–103
1-Ethyl-2-pyrrolidinone. See N-Vinyl-2-
pyrrolidinone
9-Ethenylcarbazole. See N-Vinylcarbazole
1-Ethenoxybutane. See Butyl vinyl ether
Ethephon, 13:26t, 305
Ether. See also Etherification; Others
dispersant moieties, 8:706t
predicted deviations from Raoult’s law
based on hydrogen-bonding
interactions, 8:814t
solubility of higher alcohols in, 2:3t
Ether amines, 2:21
Ether bond cleavage, in lignin, 15:6
Ether hydroperoxides, 18:452–453
Etherification
alkyl phenols, 2:207
amyl alcohols, 2:769
higher aliphatic alcohols, 2:5
carbohydrate hydroxyl groups,
4:711–712
cellulose, 5:383
cotton, 8:25–28
of PVA, 25:602
Ether linkage, cleaving of, 10:569
Ether oxygens, in association reactions,
10:682
Ethers, 10:487, 567–583; 12:663. See also
Ether
adsorbent affinity, 1:674
analytical methods for, 10:579
aroma chemicals, 3:247
chemical properties of, 10:569–574
commercially important, 10:575–576
economic aspects of, 10:577–578
fuel properties of, 10:574
as gasoline blending agents, 12:404–405
gasoline-related properties of, 10:574t
health and safety factors related to,
10:579–580
manufacture of, 10:574–576
monoterpenoid, 24:528–529
physical properties of, 10:569, 570–573t
polarity relative selected molecules,
8:813t
reactions with boron trifluoride, 4:144t
reactions with bromine, 4:302
reactions with carbon monoxide, 5:9–10
reaction with ozone, 17:781
shipment of, 10:576–577
solubility of butylenediol in, 1:235t
specifications for, 10:578–579
uses for, 10:580–582
Ether sulfates, 2:19, 20
Ethynyl estradiol (EE) reversible antibody
drug delivery, 9:64
Ethmozine, molecular formula and
structure, 5:93t
Ethynyl acetate. See Vinyl acetate
Ethofumesate, 13:326
Ethoxides, 10:528–529
4-Ethoxyacetanilide, 2:670–671
physical properties of, 2:666t
Ethoxy carboxylates, 24:144, 145
Ethoxydiglycol acetate, in cosmetic molded
sticks, 7:840t
Ethoxyethene. See Ethyl vinyl ether
Ethoxylated alkylphenols, emulsifiers,
detergents, and dispersants,
8:710t
Ethoxylated fats/oils, 24:150
Ethoxylated fatty acids, in modified viscose processes, 11:259
Ethoxylated fatty esters, emulsifiers, detergents, and dispersants, 8:710t
Ethoxylated nonionic surfactants, microemulsions based on, 16:428
Ethoxylated surfactants, 24:142, 148
Ethoxylates, 24:149–151
Ethoxylation, fatty amines, 2:523
2-Ethoxypyridine, 21:104
Ethoxyquin, 10:854; 13:51
2-Ethyl-1-butanol physical properties of, 2:3tl
production from acetaldehyde, 1:104
2-Ethyl-1-hexanol, butyraldehyde derivative, 4:461, 467
4-Ethyl-1-octyn-3-ol, 1:249t
2-Ethyl-2-hexenal, 2:64
2-Ethyl-2-(hydroxymethyl)-1,3-propanediol (TMP). See also Trimethylolpropane butyraldehyde derivative, 4:461, 467
Ethyl 2-methylbutyrate, permeation in selected barrier polymers, 3:389t
5-Ethyl-2-methylpyridine, 21:113
uses for, 21:120
3-Ethyl-2-propylquinoline, 21:191
Ethyl-3-methyl-3-phenylglycidate, aroma chemical derived from toluene, 3:234
2-Ethyl-3-methylquinoline, 21:191
Ethyl-4-nitrophenyl phenylphosphonothionate (EPN), toxicity of S enantiomer, 6:74
Ethyl-5-chloro-1H-3-indazolyl-3-acetate, 13:51–52
Ethyl acetate, 10:531
acrylamide solubility in, 1:290t
adipic acid solubility, 1:555t
in beer, 3:582t
dehydration of, 18:515
derivation from ethanol, 10:557
diffusion coefficient in air at 0°C, 1:70t
production from acetaldehyde, 1:104
production of, 10:478-479, 482
solubility of aminophenols in, 2:653t
solubility of boric acid in, 4:253t
solvent for cosmetics, 7:832
terminal activity coefficients of mixture with chloroform, 8:743t
terminal activity coefficients of mixture with ethyl acetate, 8:743t
terminal activity coefficients of mixture with water, 8:743t
from wine decomposition, 1:99
2-Ethylacrolein, butyraldehyde derivative, 4:462
N-Ethylacrylamide microgels, 13:746
Ethyl acrylate, 20:211, 212, 213
comonomer with acrylonitrile, 1:451t
copolymerization with VDC, 25:701
derivation from ethanol, 10:556
physical properties of, 1:344t
reactivity ratio from Alfrey-Price scheme compared with experimental data, 7:618t
toxicity, 1:363t, 377t
vapor pressure, 1:346t
β-Ethylacrylic acid, physical properties, 5:31t
Ethyl alcohol, 10:527. See also Ethanol entries
batch condensation reactions of, 18:516–518
concentrations of, 10:532
diffusion coefficient in air at 0°C, 1:70t
oxidation to acetaldehyde, 1:107
reaction with hydrochloric acid, 10:588
repeated exposure to, 10:552
solubility of anhydrous citric acid in, 6:634t
synthesis of, 10:532
Ethyl α-D-glucopyranoside, 4:701
Ethylaluminum–titanium combinations, 25:117
Ethylamine(s), 2:537t
ACGIH TLV, 2:548t
derivation from ethanol, 10:556
physical and chemical properties of, 2:540t
specifications and economic data, 2:551t
Ethyl aminobenzoate. See Benzocaine
N-Ethylaniline, steam distillation, 8:777
Ethylate, 10:528
Ethylation, of higher aliphatic alcohols, 2:5
Ethylbenzene, 10:590, 597; 24:268, 274
alkylation of, 23:328
from benzene, 3:603, 619t, 619–620
biodegradation, 3:763t
bioremediation of groundwater, 3:766–768
commercial, 23:330
ortho-ETHYLBENZENE

 manufacture of, 10:586–588
 physical and chemical properties of, 10:584–586
 shipment and handling of, 10:588–589
 standards related to, 10:589
 uses for, 10:590
 Ethyl chloride reaction, 10:530
 Ethyl chloroacetate, 1:142
 Ethyl chloroformate
   DOT regulations for shipment, 6:301t
   molecular formula, 6:291t
   toxicity, 6:302t
 Ethylchlorindazolylacetate, 13:42t
 Ethyl citronellyl oxalate, 24:509
 N-Ethylcyclohexylamine, physical properties of, 2:499t
 Ethylidethanolamine, physical properties of, 2:124t
 Ethyl dihydroxypropyl PABA, cosmetic uv absorber, 7:846t
 Ethyl dimethylaminopropyl carbodiimide (EDC) method, for covalent ligand immobilization, 6:396t
 Ethylene, 10:486, 593–632, 708; 13:24; 20:211; 24:254. See also Coke suppression technologies; Polyethylene entries
   acetoxylation of, 12:651
   acetylene as coproduct from steam cracking, 1:187, 208–210, 216
   acetylene-derived, 1:180, 229
   addition reactions of, 10:597–598
   Alfrey–Price parameters, 7:617t
   alkylation with benzene, 2:179
   1-butene from, 17:720–722
   as a by-product, 10:622
   binary refrigeration and, 10:617
   biological properties of, 10:598–599
   block copolymer synthesis, 7:647t
   catalytic aerogels for polymerization, 1:763t
   catalytic distillation and, 10:616–617
   chemical properties of, 10:593–598
   from coal process, 10:621
   consumption patterns for, 24:267–269
   copolymerization with α-olefins, 7:631
   costs of, 18:563
   derivation from ethanol, 10:554–555
   derivatives of, 10:628t; 24:268
   Diels–Alder adduct from cyclopentadiene, 8:222t

 dehydrogenation of, 23:342–343
 liquid separation adsorption, 1:673
 manufacture of, 23:328–334
 manufacture of styrene via, 23:326
 production by alkylation, 2:179–182
 zeolite selectivity, 1:675t
 Ethylbenzene, 23:353
 Ethylbenzene dehydrogenation, styrene manufacture by, 23:334–342
 Ethylbenzene hydroperoxide (EBHP), epoxidation of, 23:342
 Ethylbenzene hydroperoxide process, for propylene oxide manufacture, 20:803–806
 Ethylbenzene plants, 23:330–331
 Ethylbenzene–styrene complex, 23:328
 Ethylbenzene synthesis
   molecular sieves in, 16:845
   zeolite-based alklylation in, 23:331–333
 Ethyl benzoate, 3:635
 Ethyl β-D-glucopyranoside, 4:701
 7-Ethylbicyclooxazolidine, antimicrobial used in cosmetics, 7:831t
 Ethyl bromide, physical properties of, 4:351t
 Ethyl bromoacetate, physical properties of, 4:351t
 Ethyl butyrate, permeation in selected barrier polymers, 3:389t
 Ethylcellulose, 4:716, 724t; 5:459–461 applications, 5:461t
   liquid crystals, 5:385
   physical properties, 5:460t
   production of, 10:590
 Ethylcellulose hollow fiber, gas separation using, 16:19
 Ethyl chloride, 6:238; 10:584–592, 597; 13:833
   alternative processes for, 10:588
   chlorination of, 10:586
   chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
   dehydrochlorination to ethylene, 10:586
   from diethyl sulfate, 10:588
   economic aspects of, 10:589
   end use of chlorine, 6:134t
   as an ethylating agent, 10:590
   health and safety factors related to, 10:589–590
   in integrated manufacturing process, 6:237t
feedstock for higher aliphatic alcohols, 2:27t, 29t, 30–31t, 32, 41
fruit ripening using, 10:599
gas bulk separation of vent streams, 1:619t
health and safety factors related to, 10:627
homopolymerization of, 26:526
hydrochlorination of, 10:587
hydrogenated to ethane, 10:598
list price versus coconut oil (as high alcohol feedstock), 2:8t
manufacture by thermal cracking, 10:599–609
methyl methacrylate from, 16:252–254
oligimerization for butylenes manufacture, 4:417
oxidation by ethylene oxide by supported metals, 5:246
oxidation to acetaldehyde, 1:106–107
oxidation to acetic acid, 1:126
oxidative carbonylation, 1:359
physical properties of, 10:593, 594t
pipeline transport of, 10:623
as a plant growth regulator, 13:30–32
plastic responses to, 13:305
polymer termination by chain transfer with, 20:221
polymerization of, 20:149, 169, 197
production from acetylene, 1:219
production from propylene, 20:786
production of, 24:267
in random copolymer polymerization, 20:532–533
reaction with sulfur to produce carbon disulfide, 4:832
reactivity as VOC, 1:792t
reactivity of, 10:709
reactivity ratios for comonomers with, 20:219–220
regional trends in production of, 24:270
shipment and storage of, 10:622–623
as a source of petrochemicals, 18:674–677
specification and analysis of polyethylene, 10:623
uses for, 10:627–628t
U.S. production of, 24:270–271
in vinyl chloride manufacture, 25:633, 634–638
Wacker oxidation to acetaldehyde, 5:217–218
Ethylene-1-butene copolymers, 20:180
Ethylene-1-olefin copolymerization, 26:525
Ethylene–acrylic elastomers, 10:696–703
commercial forms of, 10:697–698
dynamic mechanical properties of, 10:700–701
economic aspects of, 10:702
mechanical properties of, 10:699
polymer properties of, 10:697–701
processing of, 10:701–702
uses for, 10:702
Ethylene–alkyne metathesis, 26:955–956
Ethylene–α-olefin copolymers, 20:179–180
commercial classification of, 20:180t
compositional uniformity of, 20:181
Ethyleneamine, ethylenediamine manufacture, 8:494–495
Ethylene and propylene copolymers (EPM), 10:704–705. See also EPM entries
Ethylene and propylene terpolymers (EPDM), 10:704–707, 708. See also EPDM entries
Ethylene-based ionomers, 14:482
Ethylene-based (C-2) process, for methyl methacrylate production, 16:244, 252–254
Ethylenebis(hydroxyphenylglycine), molecular formula, 5:712t
Ethylenebis(tetrabromophthalimide), 11:468
physical properties of, 4:355t
Ethylene bischloroformate molecular formula, 6:291t
toxicity, 6:302t
Ethylenebisdibromonorbor-nanedicarboximide, physical properties of, 4:355t
Ethylene bisformate, physical properties, 6:292t
2'-O,4'-C-Ethylene-bridged nucleic acids (LNAs), 17:632
Ethylene bromide, 1,2-dibromoethane, 4:348
Ethylene–butylene, glass transition and melting temperature for soft/hard segments, 7:649t
Ethylene–butylene–isobutylene, commercial block copolymers, 7:648t
Ethylene carbonate, 10:640, 665
   in lithium cells, 3:459
   molecular formula, 6:305t
   physical properties, 6:306t
   transesterification of, 12:651–652
Ethylene–carbon monoxide (ethylene–CO) copolymers, 5:9; 10:197
Ethylene chlorohydrin process, 10:640
Ethylene–chlorotrifluoroethylene (E–CTFE) alternating copolymer (ECTFE), 15:248
Ethylene–chlorotrifluoroethylene, powder coatings, 7:41
Ethylene cyanohydrin, 1:358, 404; 10:639
Ethylenediamine, 2:129; 8:485
   as chelant, 5:709
   molecular formula, 5:712t
   physical properties, 8:486t
   pK values, 8:487t
   prices of commercial, 8:496t
   sodium solubility in, 22:764
   typical specifications, 8:496t
Ethylenediaminetetraacetate (EDTA), 7:576
Ethylenediamine tetraacetic acid (EDTA),
   acrylamide stabilizer, 1:289
   for calcium sulfate scale removal,
   4:594–595
   concentration formation constants for metal chelates, 5:717t
   disodium salt of, 23:664
   dissociation stages, 5:712–724
   in epoxy adhesives, 1:536
   for lead poisoning chelation, 5:736
   in mechanical pulp bleaching, 21:49
   metal deactivator, 3:115
   molecular formula, 5:712t
   titration of, 22:811
   U.S. production, 5:730t
   in VDC polymer stabilization, 25:720
Ethylenediaminetetraacetic acid
   presterilization, in fermentation, 11:35
Ethylenediaminetetraacetacabalt(III), 7:589
Ethylenediaminetetra(methyl-enephosphonic acid) (EDTMP)
   concentration formation constants for metal chelates, 5:717t
   molecular formula, 5:713t
Ethylenediaminodicarboxylic acid, 19:265
Ethylene dibromide (EDB), 4:295, 348–349;
   10:53, 597
   diffusion coefficient in air at 0°C, 1:70t
Ethylene dichloride (EDC), 6:238–239, 245,
   24:268; 25:628
   chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
   economic aspects, 6:256–257
   environmental concerns, 6:257
   health and safety factors, 6:257
   in integrated manufacturing process,
   6:237t
   manufacture, 6:255–256
   physical and chemical properties,
   6:253–255, 254t
   purification for pyrolysis, 25:641–642
   uses, 6:257
   in vinyl chloride manufacture,
   25:633–645, 645–646
   world consumption, 6:245t
Ethylenedinitramine, 8:487–488
Ethylene feedslate, U.S., 18:564t
Ethylene feedstocks, 23:330
   yields from, 18:560t
Ethylene fractionator, 10:614
Ethylene glycol, 20:36, 96–97; 24:268
   as desiccant, 8:357, 366
   solubility of boric acid in, 4:253t
   solubility of dispersant tails in, 8:685
   Ethylene glycol bis(allyl carbonate),
   properties of, 2:253t
   Ethylene glycol bis(methallyl carbonate),
   properties of, 2:253t
   Ethylene glycol dimethacrylate (EGDMA),
   13:733, 734
   Ethylene glycol industry, 24:270
   Ethylene glycol monobutyl ether,
   acrylamide solubility in, 1:290t
   Ethylene glycol production, economic aspects of, 12:652–653
   Ethylene glycols (EGs), 10:664–665; 12:113,
   644–660. See also Glycols
   derivatives of, 12:656–660
   diethers of, 12:658
   from ethylene oxide, 10:596
   health, safety, and environmental factors related to, 12:653–655
   manufacture of, 12:648–652
   monoethers of, 12:656–658
   properties of, 12:645–648, 649t
   uses for, 12:645, 655–656
Ethylene hydration
direct, 10:538–543
process of, 10:542–543, 544
reaction mechanism and kinetics of, 10:541
reaction parameters in, 10:542
Ethyleneimine, 8:494
Ethylene oxidation. See also Ethylene oxidation processes; Ethylene oxide entries
air-based, 10:643–646
environmental considerations related to, 10:653–654
oxygen-based, 10:646–648
Ethylene oxidation processes, 10:640–648
alternative, 10:655–656
differences in, 10:654–655
safety considerations for, 10:652–653
technology considerations for, 10:648–655
Ethylene oxide (ETO), 10:555, 596, 632–673; 12:62; 24:268. See also Ethylene oxide polymers
anionic or cationic reactions of, 10:683
autodecomposition of, 10:663
chemical properties of, 10:636–640
clathrate formation and, 10:633–635
derivatives of, 10:664–666
for disinfection, 8:662–663
formation of, 10:641–642
health and safety factors related to, 10:659–663
hydrolysis of, 12:648–649, 652
impurities in, 10:652
isomerization to acetaldehyde, 10:639
manufacture of, 10:640–656
physical constants of, 10:633t
physical properties of, 10:632–636
polymerization of, 10:637, 657
purification of, 10:645–646, 652
reactions with PVA, 25:602
reaction with ammonia, 2:122
reaction with fatty amines, 2:523
recovery of, 10:644–645, 652
shipment and storage of, 10:656–657
solubility in water, 10:636t
specifications and analytical methods for, 10:658–659
structure of, 10:633
treatment of spices with, 23:157
uses for, 10:664
Ethylene oxide–air mixtures, hazards of, 10:663
Ethylene oxide aqueous solutions, physical properties of, 10:635t
Ethylene oxide catalysts, 10:648–649
Ethylene oxide hydrolysis, rate constants for, 10:638t
Ethylene oxide liquid, physical properties of, 10:634t
Ethylene oxide polymers, 10:673–696
analytical and test methods for, 10:684–686
chemical properties of, 10:682–683
health and safety factors related to, 10:686
industrial applications for, 10:688–690
manufacture and processing, 10:683–684
pharmaceutical and biomedical applications for, 10:686–688
physical properties of, 10:674–681
specifications, standards, and quality control for, 10:684
uses for, 10:686–690
Ethylene oxide production
economic aspects of, 10:658, 684
growth in, 10:641
Ethylene–propylene oxide (EO/PO) copolymers, 24:151
Ethylene oxide reactions, 10:636, 637–640
Ethylene oxide vapor
hazards associated with, 10:661–663
physical properties of, 10:635t
Ethylene plant
capacity of, 10:626
characteristics of towers in, 10:615t
computer control systems and training simulators in, 10:622
flow diagram of, 10:610, 611–612
Ethylene polymerization, 26:524. See also Polyethylene entries
Ethylene polymers/copolymers, 17:700–703
Ethylene production, 24:259
alternative routes to, 10:617–622
economic aspects of, 10:624–627
U.S., 18:564t
Ethylene–propylene (EP) copolymers (EPR), 23:371; 24:716–717. See also Ethylene–propylene polymers
blends of, 24:700
Ethylene–propylene diene monomer (EPDM), 23:785; 24:716–717
blends of polypropylene with, 24:699
Ethylene–propylene–diene monomer rubber, 21:765, 766. See also Ethylene–propylene (diene) rubber
cure systems for, 21:802–803
peroxide- versus sulfur-cured, 21:804t
Ethylene–propylene–diene co- and terpolymers, properties of, 10:707t
Ethylene–propylene elastomers (EPM),
7:637; 10:596; 17:700, 705–707
history of, 17:706
properties and uses of, 17:706–707
Ethylene–propylene polymers,
10.704–719
compounding, 10:712–714
health and safety factors related to, 10:716
manufacture of, 10:707–712
polymer properties of, 10:704–707
processing, 10:714–715
structure of, 10:705
uses for, 10:716–717
Ethylene–propylene polymer vulcanizates, properties of, 10:715–716
Ethylene–propylene (diene) rubber, 9:559–560
for copper wire, 7:691
in rubber compounding, 21:765–766
Ethylenesulfonic acid, 23:534, 535
Ethylene–tetrafluoroethylene (ETFE) copolymers, 18:316–329. See also ETFE entries
applications for, 18:327–328
assembly of, 18:326–327
chemical resistance and hydrolytic stability of, 18:322–325
electrical properties of, 18:321–322
fabrication of, 18:325–327
glass-reinforced, 18:321
health and safety factors related to, 18:328–329
manufacture of, 18:317–318
physical and mechanical properties of, 18:319
properties of, 18:316, 318–325
testing and standards for, 18:327
thermal properties of, 18:319–321
transitions in, 18:319
vacuum outgassing and permeability of, 18:325
2,5-endo-Ethylene-THBA, 1:278t
Ethylendithiourea, 4:826; 8:492
Ethylene trithiocarbonate, 10:640
Ethyleneurea, 8:493
Ethyleneurea-glyoxal, cotton cross-linking agent, 8:26
Ethyleneurea resins, 2:639
Ethylene–vinyl acetate (EVA) copolymers (EVAc), 7:639; 9:57–58; 25:582
Ethylene–vinyl acetate copolymer food packaging, 18:44
Ethylene–vinyl acetate copolymer processes, 25:569
Ethylene–vinyl alcohol (EVOH), 18:49, 50
Ethylene–vinyl alcohol copolymers
composition of commercial barrier, 3:385t
diffusion of oxygen and carbon dioxide in, 3:382t
good barrier-to-permanent gases, 3:383, 384
layered structure in barriers, 3:395–396
permeability of, 25:710
permeability to selected permanent gases, 3:381t
Ethyleneic hydrocarbons, naming, 18:594
Ethyleneic poly(disulfide)s, water-insoluble, 23:714
Ethyl esters, preparation of, 10:473
Ethyl ether, 10:575
adipic acid solubility, 1:555t
derivation from ethanol, 10:556–557
diffusion coefficient in air at 0°C, 1:70t
grade specifications for, 10:578t
grades of, 10:578
handling, 10:576–577
sodium reactions with, 22:767
solubility of benzoic acid in, 3:626t
solubility of methylenedianiline in, 2:794t
solubility of trichloroacetic acid in, 1:141t
toxicity of, 10:580
uses for, 10:581
Ethyl formate formate, physical properties, 6:292t
Ethyl formate trifluoroborane, 4:144t
2-Ethylhexanal, 4:467
physical properties of, 2:61t
Ethyl hexanoate, permeation in selected barrier polymers, 3:389t
2-Ethylhexanoic acid, 4:467
physical properties, 5:35t
2-Ethylhexanol, 2:2, 27
chain length and linearity, 2:12t
list pricing, 2:9t
manufacture by aldol process, 2:41–43
manufacture by oxo process, 2:37
physical properties of, 2:3t
properties of commercial, 2:12t
synthetic processes for, 2:27t, 30–31t
toxicological properties of, 2:7t
uses of, 2:22–24
2-Ethylhexenaldehyde, 2:41
2-Ethylhexyl acrylate
comonomer with acrylonitrile, 1:451t
physical properties of, 1:344t
vapor pressure, 1:346t
2-Ethylhexyl chloroformate
DOT regulations for shipment, 6:301t
molecular formula, 6:291t
toxicity, 6:302t
2-Ethylhexyl formate, physical properties,
6:292t
2-Ethylhexyl nitrate, 2:23
2-Ethylhexylpotassium, 14:255
2-Ethylhexylsalicylate, 22:16
2-Ethylhexylsodium, 14:255
Ethyl hydroperoxides, decomposition hazards of, 18:490
Ethylhydroxyethylcellulose (EHEC), 5:455t, 456
5-Ethylidene-2-norbornene (ENB), 10:706, 709, 711
Ethylidenediacetate, production from acetaldehyde, 1:105
Ethylidene norbornene, from butadiene, 4:383, 384
Ethyl iodide, 14:376
Ethylisobutyrate, azeotropic mixtures with butyl alcohols, 4:395t
Ethyl lactate preparation, 10:489
Ethyl linolen, 24:503
Ethyl linoleate, cosmetically useful lipid, 7:833t
Ethyl maltol, 12:49
Ethylmercuric chloride, 22:25
Ethyl-n-butyllamine, 2:538t
physical and chemical properties of, 2:540t
Ethyloctynol
LD50 for mice, 1:253t
physical properties of, 1:250t
Ethylparaben, antimicrobial used in cosmetics, 7:831t
Ethyl phenyl carbonate, molecular formula, 6:305t
Ethyl propionate, permeability in PVA, 3:404–405
Ethylpropylacrolein. See 2-Ethyl-2-hexenal
N-Ethyl-p-toluenesulfonamide, carrier for dental cements, 8:287
3-Ethlypyridine, butyraldehyde derivative, 4:462
O-Ethyl-S-[2-(diisopropylamino)ethyl]-methylphosphonate (VX), 5:819
Ethyl safranate, 24:571
Ethyl silicate-bonded investments, 8:294
compressive strength, 8:289t
Ethyl silicones, 22:551
Ethylstibine, 3:68
Ethyl tert-butyl ether (ETBE), 10:548, 574, 576; 12:404–405
derivation from ethanol, 10:557
Ethyltoluene, 23:329, 349
o-Ethyltoluene, 23:349
p-Ethyltoluene, 10:597
p-Ethyltoluene precursor, synthesis of, 23:351
p-Ethyltoluene synthesis, molecular sieves in, 16:846
Ethyl vinyl ether, 1:254, 258
derivation from ethanol, 10:557
physical properties of, 1:255t
Ethynylation, acetylene, 1:181, 231–249
Etretinate, 25:790
Etridiazole, 23:629
Ettringite (6-calcium aluminate trisulfate, 8-hydrate), 5:479t
Ettringite (6-calcium aluminate trisulfate, 32-hydrate), 5:479t
Ettringite cement
applications, 5:500t
hydration, 5:477, 477t
E-type inks, 14:326
Eucalyptol, 24:528
Eucalyptus grandis, cellulose pulp from, 11:251
Eucaryotic protein microarrays, 16:392
Eucheuma, common and scientific names, 3:188t
Eudialyte, 26:624
Eudigox, molecular formula and structure, 5:98t
Eugenol
in dental cements, 8:278, 284–286
registered for use in aquaculture in Japan, 3:221t
Eugenol–isoeugenol isomerization, microwaves in, 16:566–567
Eukaryotes, defined, 3:757t
Eukaryotic cell biology, study of, 26:446
Eukaryotic chromosomes, 17:610
Euler equations, 11:742
Eulerian model, 11:822
Euler integration method, 20:688
Euler number, 11:745; 23:190
Euphococcinine, 2:73
Euphorbiaceae, alkaloids in, 2:75
Eurasian Patent Convention, 18:198
Europe
acrylic fiber production in, 11:189, 220
aliphatic fluorocarbon production in, 11:870–871
bans against vinyl in, 25:682
cosmetics regulation, 7:823–824
diesel specifications in, 12:430
environmental policy in, 23:121
epoxy resin market in, 10:351–352
fine chemicals industry in, 11:440–442
gasoline composition regulations in, 12:419
natural graphite in, 12:780
olefin fiber production in, 11:242, 243
photovoltaic market in, 23:50–51
plant location in, 19:530–531
production and consumption of regenerated cellulose fibers in, 11:275, 276t
PVC capacity of, 25:676
regenerated cellulose fibers in, 11:249, 250
silicon carbide analysis in, 22:538
sodium hydrosulfide applications in, 22:871–872
sodium sulfide applications in, 22:874
titanium uses in, 24:866, 868
vinyl packaging in, 25:682
European Agency for the Evaluation of Medicinal Products (EMEA), 12:150
European Association of Nonwoven Fabrics (EDANA), 17:480
European Center for Coal Specimens, 6:744
European chemical industry, 24:194
European Chemical Marketing and Strategy Association (ECMSA), 15:646
European Commission
innovation authorization procedure in, 24:193
White Paper of, 24:192–194
European Commission on Combinatorial Catalysis, 7:387, 392
European Community Cosmetic Directive, 18:389
European Community Cosmetic Ingredient Inventory, 18:389
European Community Trademark (CTM) System, 25:267
European dynamic filter, 11:384
European Inventory of Existing Chemical Substances (EINECS), 26:901
European Molecular Biology Laboratory (EMBL) database, 12:512
European patent, 18:198
European Patent Classification (ECLA) scheme, 18:209, 230
European Patent Convention (EPC), 18:189, 191
European Patent Information and Documentation Systems (EPIDOS), 18:212
services from, 18:228–229
European Patent Office (EPO), 18:189, 203
European Patent Office Bulletin, 18:236
European Pharmacopoeia (EP; PhEur), 12:151
in fine chemical production, 11:435
suture standards in, 24:207
European Requirement Document (EUR), 17:556
European standards, for lime and limestone products, 15:67
European Synchrotron Radiation Facility (ESRF), 26:412
European Union (EU), 1:696
aquaculture chemicals registered in, 3:219, 220t
banned asbestos, 3:317
biotechnology regulation in, 18:543
chemical production in, 24:264
COST 847 project, 11:617
enzyme guidelines in, 10:308–309
fine chemical production regulation in, 11:435
food additive regulations in, 12:36–37
organic compound emissions in, 24:165
sugar regime reform in, 23:469–470
European Union energy supply, biomass in, 24:168
European Union Sweeteners Directive, 24:241
European Uremic Toxin Work Group (EUTox), 26:820
European Waste Catalogue, 23:121
European wine grape, 26:306
Europium (Eu), 14:631t, 634t, 644, 645 electronic configuration, 1:474t
Europium-enhancer chelation complex, 14:149
Europium(III) reduction, 14:640
Eutectic alloys, solidification of, 16:173
Eutectic temperature, of sodium chloride–water system, 22:801, 802
Eutectoid austenite, 23:275
Eutectoid carbon steel, phase change on heating, 23:275
Eutectoid steels, 23:273, 274

- Eutectoid carbon steel, phase change on heating, 23:275
- Eutectoid steels, 23:273, 274
  - Isothermal transformation diagram for, 23:279
  - Typical curve for, 23:278
Eutomer, 6:74
Eutrophic conditions, defined, 3:757t
Eutrophic effects, of fertilizers, 11:126
Eval, 3:383
Evaluated Nuclear Data Files (ENDF) database, 17:566
Evaluated Nuclear Structure Data File (ENSDF), 21:314
Evaluation. See Nondestructive evaluation (NDE)
Evanescent field, 24:112
  - Interaction with absorbing medium, 24:113
Evans diagram, 7:802–804
Evaporated salt, in water softening, 22:819
Evaporation
  - Of ascorbic acid, 25:771
  - For chemical recovery from brines, 5:786–787
  - Deposition via, 23:7
  - In hazardous waste management, 25:815–816
  - In radioactive waste treatment, 25:853
  - Salt production via, 22:797
  - After sodium chloride solution mining, 22:802–805
  - In sodium nitrite production, 22:855–856
  - In solar salt harvesting, 22:806–808
  - Use of steam in, 23:240
  - In vapor–compression refrigeration systems, 21:541
  - In wastewater treatment, 25:889t, 894–895
Evaporation equipment, 10:154–155
Evaporation retardants, in finish removers, 18:78
Evaporative condensers, in refrigeration systems, 21:537
Evaporative-cooling crystallizers, 8:135
Evaporative crystallizers, 8:134
Evaporative efficiency, 9:97
Evaporative emissions, 10:58–59 standards, 12:417
Evaporative light scattering detector, liquid chromatography, 4:623
Evaporators
  - Multiple-effect, 23:238
  - In refrigeration systems, 21:537–538
Evaporite basin sulfur deposits, 23:238
Evaporites, 15:323
Evapotranspiration, increased use of, 26:3
Evatate, 7:640
Event data
  - For ammonia plant, 26:997
  - Reliability and, 26:994
Event trees, 13:163–165
Evett’s sale, 6:580
Evolutionary computing, 10:341–342
Evolutionary modification, 22:297, 298
Evolutionary molecular design (EMD), 10:341–342
Evolved gas analysis (ega), 14:234
Ewens-Bassett numbers, 17:391, 392
Examiners’ citations, 18:237, 238
Exanta, 4:100t, 102
Excess properties, ideal mixture and, 24:674–675
Exchange constant, of M-type ferrites, 11:67, 68
Exchange current density, 9:611
Exchange energy coefficient, of M-type ferrites, 11:68
Exchanger design equation, 13:195
Exchange repulsion, 23:93
Excimer lamp technology, 19:107–108
Excimer lasers, 14:691–693; 17:372; 19:115
  - Applications of, 14:693
  - Species of, 14:692t
Vitreous silica irradiation by, 22:437, 438
Excimer molecule, 14:691
Excitation  

human heart, 5:81–83  
multiphotonic, 19:109  

Excitation pulses, nanosecond, 14:619  

Excited singlet states, photofading via, 9:385  

Excited-state relaxation, in photochemical technology, 19:109–111  

Excitons. See also Frenkel exciton  

in “double heterostructure” OLEDs, 22:217  
in molecular LEDs, 22:218  
in photovoltaic devices, 22:221–222  
in single layer OLEDs, 22:215–216  

Exclusive Economic Zone, aquaculture regulation, 3:185  

Excretion  

of body salt, 22:812  
of radioactive tracers, 21:279  

Exercise, 2:823  

Exfoliation corrosion, aluminum alloys, 2:337  

Exhaust  

diesel, 10:60–61  
dyeing, 9:200  

Exhaust controls, 26:717–719  

Exhaust control system, selection of, 10:74t  

Exhaust control technology, 10:78–79, 96–104  

Exhaust emission control devices, add-on, 10:72  

Exhaust emission standards, 10:31; 12:415–417  

Exhaust gas composition, 10:35–38  

Exhaust gas recirculation (EGR), 10:58, 61; 13:855  

Exhaustion, 9:175–176, 196  
of a dye, 9:163  

Exhaust mix, 10:37–38  

Exhaust releases, industrial, 10:67  

Exhaust streams, categories of, 10:67–68  

Exit span areas, in thermal design, 13:258  

Exocellular bacterial polysaccharides, 20:573  

Exons, 20:824  

Exopolyhedral metalloboranes, 4:208–210  

Exopolyhedral metallocarbonanes, 4:215–216  

Exo-receptors, divergent, 16:774  

Exothermal chemical runaways, controlling, 22:720  

Exotherm control, 10:457  

Exothermic chemical reactor, cascade control of, 20:697  

Exothermic chemical reactions, 25:299–301  
catalytic converter, 10:45  
formaldehyde manufacture by, 12:115  
temperature-dependent enthalpy changes for, 25:303–305  

Exothermic polymerization, 10:709  

Exotic radioactive decays, 21:305–306  

Expandable polystyrene (EPS), 23:405–406  

Expandable polystyrene molding, 19:554–555  

Expanded-film membranes, 15:802–803  

Expanded graphite, 12:794–795  

Expanders, in nitric acid production, 17:178  

Expansion, in vapor–compression refrigeration systems, 21:542  

Expansion coefficient (α)  
of silicon carbide, 22:526t, 527, 538, 539  
of vitreous silica, 22:426–427  

Expansion ratios, of foams, 12:20  

Expansive cements, 5:493, 500t, 501  

Expected safe human dosage, 25:238–239  

Expected Value of Perfect Information (EVPI), 26:1028  

Expeller cocoa butter, 6:359  
properties and composition, 6:360t  

Experimental boiling water reactor (EBWR), 17:580  

Experimental breeder reactor (EBR-I), 17:586  

Experimental data, fitting dynamic models to, 20:689–691  

Experimental design, sampling techniques for, 26:1038–1939  

Experimental fluid mechanics, 11:781–786  

Experimental program planning, for pilot plants, 19:467–468  

Experimental reactors, common practices used in, 21:352–353  

Experimental techniques, for supercritical fluids, 24:11–12  

Experimental trials, of inventions, 18:174  

Experimental variables, 8:384–389  

Explosibility, of ethylene oxide, 10:661  

Explosion(s), 7:436  
as a cause of tank spills and leaks, 24:309  
liquid propylene, 20:781
Explosion hazard(s)
  in electrochemical process industries, 9:645–646
  of ethyl chloride, 10:588–589
  of hydrogen peroxide, 14:61–63
PVC as, 25:678
of titanium and water, 24:865
VDC as, 25:694
vinyl chloride as, 25:651
Explosion model, 13:166
Explosion prevention/protection, 21:858–861
Explosive behavior, acetylene, 1:181–186
Explosive compounds, properties of, 10:728t, 733t, 737t
  See also Explosives and propellants
degree of hazard of, 13:155–156
hydrazine in, 13:597–598
cellulose ester applications, 5:403–404
liquid chromatography applications, 6:464
mercury in, 16:52
sodium nitrate in, 22:843, 852
sodium tellurite in, 24:428
Explosive molecules, 10:741–742t
Explosives and propellants, 10:719–744.
  See also Explosive materials (explosives)
burning to detonation, 10:721
chemical data on explosive materials, 10:727–738
classification of, 10:723
during combustion, 10:719
compounds used in explosive compositions, 10:738–739
deflagrating explosives, 10:719–720
detonating explosives, 10:720–721
gas generating propellants, 10:727
gun propellants, 10:724–725
primary explosives, 10:723–724
propellant composition, 10:725–726
recent developments in, 10:739–743
rocket propellants, 10:726–727
secondary explosives, 10:724
shock to detonation, 10:721–722
Explosivity, ozone, 17:769
Exports, of vanadium compounds, 25:540
Exposed workers, sampling, 14:214
Exposure. See also Eye exposure
lead, 14:763–764
photographic, 19:202
in toxicity, 25:203, 210
uranium, 25:442–443
Exposure assessment, generic, 14:220
Exposure effects, special, 19:202–204
Exposure guidelines, safe, 25:225
Exposure limits, organic ester, 10:513
Exposure reduction measures, decision process concerning, 14:218–220
Exposure reduction, operability, reliability, and acceptability of, 14:222
Exposure route, influence on toxicity, 25:210–211
Expression analysis, microarrays in, 16:390–392
“Expression cloning,” 10:263, 10:264
Expression profiling, 13:354–355
Expression vectors, 12:474
in Escherichia coli, 12:476
Ex situ bioremediation
defined, 3:759t
in soil and ground water treatment, 25:836, 842–843
Ex situ nonbiological waste treatment, 25:846
miscellaneous techniques for, 25:846
soil leaching, 25:846
soil washing, 25:846
Ex situ silver halide grains, as photocatalysts, 19:344
Extended absorption fine structure (EXAFS), 26:441–442
Extended absorption method, 17:183
Extended aeration, in biological waste treatment, 25:828
Extended-chain crystallinity, 20:398–399
Extended-DLVO theory (EHT), 16:736
Extended HMO theory (EHT), 16:736
Extended patent families, 18:207
Extended shelf life (ESL) packaged products, 18:32
Extended-solution-diffusion model, 21:640
Extended X-ray absorption fine structure (EXAFS), 24:72
analysis, 22:564
Extender blacks, 21:776
Extender pigments, 19:410
Extenders
paint, 18:59
in tire compounding, 21:809–810
Extensibility, of fibers, 11:181, 182, 184–185
Extensional strain rate, 21:718
Extensional viscosity, 21:717–718
measurement techniques for, 21:739–741
“Extension cables,” 24:463
Exterior house paints, 7:139–140
Exterior wood coatings, 18:67–68
External bremsstrahlung, 21:312
External catalytic surface, temperature
ion, 25:273–276
External floating-roof (EFR) tank, 24:291–292
External fluid film resistance, and
adsorption kinetics, 1:595–596
External heating chamber convection
furnace, 12:291–292
External heat/mass transfer resistances,
25:271
External humidification, 12:213
External interface management, in
technology transfer, 24:366
External loop airlift bioreactors, 1:741, 742
Externally manifolded fuel cells, 12:200
External magnetic field, 23:835
External mass transfer, 15:728–729
External mass transfer resistance
dimensionless parameter and,
25:290–292
packed catalytic tubular reactor design
with, 25:293–298
significant, 25:292–293
External pressure, 24:287
External quantum efficiency, 14:843
External reflectance, 14:231–232
External stimulus flowmeters, 11:669
External thermodynamic variables,
perturbation of, 14:614–617
External transport resistances, 25:316
Extracellular matrix, 21:2
Extracellular microbial enzymes, 10:271
Extracellular polysaccharides, 20:454–455
Extracorporeal membrane oxygenation
(ECMO), 3:715
Extracative agents
commercially available, 21:401t
improved, 10:791
organophosphorus, 14:641–642
for uranium ores, 25:404
Extracting agent, methyl isobutyl ketone
as, 16:346
Extraction(s). See also Liquid–liquid
extraction; Mining and extraction
aqueous, 10:767
aqueous two-phase, 15:717
chelant applications, 5:734–735
coffee, 7:261–262
economics of, 10:781
fractional, 10:759–760
general separation heuristics for, 22:321
membrane, 10:765–766
of natural flavoring ingredients, 11:570
of silver, 22:638, 646–647
for sucrose, 23:456–459
supercritical, 10:766–767
use of foams in, 12:22–23
Extraction cells, experimental, 10:755
Extraction chromatography, 6:388
Extraction plant operation, 10:768
Extraction processes, 10:299–300
Extraction rate, 10:751
Extraction rate constant, 10:756
Extraction solvent, methylene chloride as,
16:378
Extraction stripping, 10:766
Extractive distillation(s), 8:786–852,
801–815. See also Azeotropic and
effective distillation; Distillation(s)
general separation heuristics for, 22:318
maximum boiling azeotropes, 8:807–808
minimum boiling azeotropes, 8:802–807
nonazeotropic mixtures, 8:809–811
in petroleum processing, 18:647
Extractive metallurgy, 16:126, 133–165
electrometallurgy, 16:158–164
floculating agents in, 11:625
history of, 16:133–134
hydrometallurgy, 16:151–157
pyrometallurgy, 16:136–151
scientific basis of, 16:133
sources of metals and ore preparation,
16:134–136
stages of, 16:136
tungsten, 25:361–363
Extractives, in wood, 21:15–16; 26:335
Extract library, 17:646
Extractor performance, drop size and,
10:764
Extractors
commercial, 10:769–777
laboratory, 10:768
large-scale commercial, 10:768–769, 779
Extractor Selection Chart, 10:770–771t
Extracts, 23:156
Extra hard copper alloys, 7:723t
Extra heavy oil, 18:641
Extra long staple cotton, 8:2, 13
Extra-low interstitial (ELI) alloys, of titanium, 24:855
Extramolecular cavity inclusions, 14:170–182
Extrapolating properties, defined, 16:729
Extra spring copper alloys, 7:723t
Extreme ambient conditions, lubrication and, 15:252–256
Extreme-case analysis, 9:547
Extreme environments, solid and liquid lubricants for, 15:256
Extremely low toxic substances, 23:113
Extreme pressure (EP) lubrication regime, 15:214. See also EP entries
Extreme purity gases, analyses of, 13:468
Extreme ultraviolet lithography, 15:189–191
Extrinsic detectors, 22:180
Extrinsic fiber-optic sensors, 11:148
Extrinsic photoconductors, 19:138
Extrinsic semiconductors, 22:236–237
Extrinsic wastes, 10:68
Extruded food packaging, 18:45
Extruded lead–copper alloys, 14:776
Extruded lead–tellurium alloys, 14:778
Extruded rigid foam, 23:404–405
Extruders
  screw diameter and length of, 19:539–540
  single-screw, 16:723
  for VDC copolymers, 25:726
Extrusion(s). See also Monofilament fiber
  extrusion; Monolayer blown-film extrusion; Multilayer cast-film extrusion
ABS, 1:426–427
of aluminum alloys, 2:335
in bar soap manufacture, 22:748, 750–752
of blown film, 19:544–545
of carbon and graphite products, 12:731–732
of cast film, 19:545–546
in ceramics processing, 5:650
of copper, indirect, 7:693
of EPM/EPDM compounds, 10:715
of ethylene oxide polymers, 10:679
of ethylene–acrylic elastomers, 10:701
of FEP polymer, 18:314
flavor encapsulation by, 11:535, 536–537, 549–550
of foam, 19:549
fumes from, 14:207
of higher olefin polymers, 20:427
of linear low density polyethylene, 20:200–201
of magnesium, 15:360–361t
of magnesium alloys, 15:365–366
mechanism of, 19:540–542
mixing in, 19:542–543
of olefin fibers, 11:231–234
of polyamide plastics, 19:789–790
of polychloroprene, 19:851
of poly(ethylene oxide), 10:684
of PVA, 25:615
of pipe and tubing, 19:543–544
in plastics processing, 19:539–549
profile, 19:544, 790
sheet, 19:546–547
in solid enzyme formulations, 10:273
of styrene polymers, 23:398
of Teflon PFA resin, 18:336
of thermoplastics, 10:179; 19:538
of titanium, 24:859
in toilet soap making, 22:734
of wire and cable coating, 19:548–549
Extrusion blow molding, 19:553
of food packaging, 18:50
Extrusion chemical finishing, 17:514
Extrusion coating, 7:19–20; 19:547–548
LDPE in, 20:232–234
method summarized, 7:5t
multiplayer, 7:22–23
Extrusion compounding process, in polyamide plastic manufacture, 19:783–784
Extrusion-formed web nonwoven processes, 17:496
Extrusion reactions, aromatic system formation by, 21:148
Extrusion rheometers, 21:730–731
Exudate gums, 13:61, 63t
Exudation, from TNT, 10:734
Ex-works prices, 15:37
Exxal 6
  chain length and linearity, 2:12t
Exxon, 24:259. See also ExxonMobil
  advanced materials research, 1:692
  aromatics recovery technology, 25:170
Exxon Donor Solvent (EDS) process, 6:766, 837–838
ExxonMobil
  aromatic recovery process, 25:173
cyclohexane process, 25:171
**EXXON VALDEZ OIL SPILL**

Exxon Valdez oil spill, 3:764–765
- hopane as marker in bioremediation, 3:788–789

Exxpro, 4:438, 443–444

Eye(s)
- color vision, 7:307–308
- drug delivery to, 9:50
- injury to, 21:833–836
- light-sensitive cells in, 19:231–232

Eyebrow pencils, 7:862

Eye contamination, in fluence on toxicity, 25:211

Eye exposure, to hydrogen fluoride, 14:18

Eye irritation, in spas/hot tubs, 26:833–836

Eyeliner, 7:862

Eye makeup, 7:861–862

Eye shadows, 7:862

Eyewash fountains, 21:849

Eyewear, polycarbonate, 19:809

Eyring equation, 13:407

Eyring transfer matrix technique, 1:32

Ezetimibe (zetia), 5:143–144
- molecular formula and structure, 5:140t

Faber du Faur retorting, 14:752

Fabricability, of shape-memory alloys, 22:345

Fabricated parts
- tantalum, 24:327
- titanium, 24:866, 867, 868

Fabrication
- of aluminum alloys, 2:335–336
- of composite materials, 26:765–773

Fabrication ease, in selecting membrane modules, 15:822–823

Fabrication technologies
- for compound semiconductors, 22:182–193
- for sensors, 22:267

Fabricators, 7:671

Fabric blends, 9:195
- dye combinations for, 9:217

Fabric dyeing machinery, 9:207–210

Fabric filter, 13:179
- design considerations for, 26:709–712

Fabric filtration, 26:706–713
- mechanism of, 26:709

Fabrics. See also Spunbonded nonwoven fabrics; Staple-fiber nonwoven fabrics
- chemical resistance and maximum temperatures of, 26:711t
- detergent use, 8:424
- dye-sensitized degradation of, 9:519
- felted, 17:506
- PVA sizing for, 25:615–617
- silicone treatment of, 22:592–594
- Fabric shrinkage, mechanisms of, 26:390

Fabric softeners
- acute oral LD50 ranges, 8:446t
- ethyleneamines application, 8:500t, 504–505
- fragrances for, 18:363
- fatty amines, 2:533
- quaternary ammonium compounds, 2:749–751

Fabry–Perot cavity, 14:849, 850

Fabry–Perot etalons, 11:151, 152

Face-centered cubic (FCC) crystal structure
- in Ni-base alloys, 13:512
- of spinel ferrites, 11:60

Facial makeup, 7:846–847

Facial preparations, 7:842t

Facial tridendate ligand, 7:578

Facilitated transport, 15:826–827
- carrier, 15:845–846

Facilities and administrative costs (F&A), in technology transfer, 24:376–377

Facilities design, safety of, 21:846–852

Facilities operation, safe, 21:853–854

Facility control hierarchy, 20:673–676

Facility erection, nondestructive evaluation during, 17:414

Facility-siting checklist, 19:532–535t

FAC scale, 10:827

Facsimile machines, p–i–n junctions for, 22:138

Factice, 23:642

Factor II, 4:84

Factor IIa, 4:87

Factor V, 4:85, 87, 88, 89

Factor Va, 4:87, 89

Factor VII, 4:86–87, 89

Factor VIIa, 4:86–87

Factor VIII
- distribution of, 12:149t
- market for, 12:148, 149
- purification, 3:844, 845
- 4:87, 88, 89

Factor VIIIa, 4:86–87

Factor VIII concentrates, properties of, 12:152t
Factor VIII process, 12:143
Factor IX, 4:86–87
Factor IXa, 4:86–87, 89
Factor IXa inhibitors, 4:103
Factor IX concentrates, properties of, 12:152t
Factor IX processes, 12:144–145
Factor X, 4:84, 86–87, 89
Factor Xa, 4:82–83, 86, 87
Factor Xa inhibitors, 4:102–103, 106
Factor XI, 4:86, 87
Factor XIa, 4:86–87
Factor XIa inhibitors, 4:103
Factor XII, 4:86–87, 87
Factor XIIa, 4:86–87
Factor XIIa inhibitors, 4:103
Factor XIII, 4:89
Factor XIIIa, 4:87
Factor XIIIa inhibitors, 4:103
Factor analysis, 6:36
Factorial designs, 8:396
amount of coverage in experimental design texts compared, 8:395t
Factor product cost estimation, 9:533–534
Factory Inspection Amendment, 18:684
Factory mutual corner test, 11:458–459
Factory Mutual Engineering Corp., 15:768
Facultative aerated lagoon, 25:904
Facultative anaerobes, in nitrogen fixation, 17:302
FADH, requirement as cofactor, 3:672–673
Fahrenheit scale, 24:283
Failure(s)
in ammonia plant, 26:994–995
causes and severity of, 26:982
of chemical plants, 26:980
defined and classified, 26:981
hidden, 15:477
maintenance and, 15:462–463
probability of, 13:166
of sealants, 22:29
over time, 26:987, 988–989
Failure mechanisms, 26:983–984
Failure mode and effects analysis (FMEA), 13:154, 159–161
objectives of, 26:984–985
Failure mode, effects, and criticality analysis (FMECA), objectives of, 26:984, 985–986
Failure modes
for ammonia plant, 26:994–995
consequences of, 15:476–477
defined, 26:981
in image collapse, 15:186
Failure rate data, 13:167, 168t
Failure rate function, 26:987–988
Fair Packaging and Labeling Act, 7:822
Fair use doctrine, 7:793
Falcon concentrators, 16:632
Falex wear test, 9:714, 715t
Falling ball viscometers, 21:737–738
Falling film continuous SO3 sulfonation plant, process flow diagram for, 23:550–552
Falling film continuous SO3 sulfonation processes, 23:553
Falling film continuous SO3 sulfonation technology, 23:531
Falling film sulfonation, modeling of, 23:555
Falling needle viscometer, 21:738
Falling rate drying, 9:109–110, 113–115
Falling rate period, 9:97
Falling rod viscometer, 21:738
False Irish moss, common and scientific names, 3:188t
False twist texturing (FTT), of polyester fibers, 20:18–19
Family patent information searches, 18:236
Fanning friction factor, 13:260
Fan spray atomizers, 23:179
Fan sprays, 23:182
Fansteel process, 24:319
FAO “Flax Group,” 11:592
Faraday, Michael, 11:398
Faraday constant (F), 3:410
Faraday cup construction, 14:444
Faraday’s law of electrolysis, 24:748
Faraday’s laws, 9:593, 772; 11:669
Far-Go/Triallate, 2:549t
Farina, 26:284
Far-infrared (ir) spectroscopy, 23:142
Far-ir region, 14:234–236
Farm animals. See also Animal genetic engineering
gene targeting in, 12:466
transgenic, 12:455–456, 463–466
FARMDOC service, 18:244. See also Derwent entries
Farmland changes, fertilizers and, 11:126
Farnesol, 24:546
Farnesyl pyrophosphate, 2:78, 101
role in cholesterol synthesis, 5:142
F/A/S (flavor/aroma/solvent) molecules, VDC polymer permeability to, 25:707, 710–711, 712
Fasidotril, 5:159
Fast-breeder reactors (FBR), 17:585–588 liquid-metal, 22:763
knowledge base for, 17:586
Fast color bases, 9:409–410t
Fast color salts, 9:409–411
Fast-curing agents, 10:409–410
Fastening, ABS, 1:428
Fast extrusion furnace (FEF) blacks, 4:775
Fast fluidized regime, 11:724–725, 801, 802, 803
Fast flux test facility (FFTF), 17:587
Fast Fourier transform (fft) algorithm, 23:137. See also Fourier entries
Fast gas chromatography, 6:434–437
Fastin, 3:91, 93t
Fast-ion conductors, ceramics, 5:589–592, 590t
Fast kinetic methods, 24:127
FASTMET process, 14:520
Fastness
of fibers, 11:169–170
of organic pigments, 19:427–428
Fastness tests, textile, 9:227–230
Fast neutron irradiation, of vitreous silica, 22:435
Fast pulse production, in lasers, 14:673–678
Fast reactors, 17:568
Fast relaxation time, 24:127
Fast Track Drug Approval programs, 18:697
Fat acidity value, 26:275
Fathead minnow, common and scientific names, 3:187t
Fatigue, 13:480–495
ion implantation and, 14:450–451
in metal–matrix composites, 16:184–188
in optical fiber strength, 11:143
stiffness loss in, 16:187–188
Fatigue behavior
factors affecting, 13:481, 483–484
of titanium alloys, 24:841, 845
Fatigue crack growth behavior, 13:484
Fatigue crack growth profile, 16:188
Fatigue crack growth rate (FCGR), 13:483
testing of, 13:489, 493–494
Fatigue crack initiation, in metal–matrix composites, 16:185
Fatigue crack initiation sites, 13:481
Fatigue crack propagation tests, 16:185–187
Fatigue data analysis, 13:494–495
Fatigue failures, 13:481, 486–487
Fatigue loads, 13:481
Fatigue performance, sample size and surface finish in, 13:486–487
Fatigue properties
determining, 13:483–484
effect of environment on, 13:494
materials and microstructures and, 13:484–486
practical aspects of characterizing, 13:489–494
Fatigue ratio, 13:486
Fatigue resistance
copper wrought alloys, 7:740–742
impact of temperature on, 13:487–488
temperature and, 13:487
Fatigue strength, 13:486
of ordered alloys, 13:499
Fatigue testing. See also Fatigue crack growth rate testing; High cycle fatigue (HCF) testing; Low cycle fatigue (LCF) testing
of polymers, 19:581
principles of, 13:481–489
Fatigue tests
for electroplating, 9:792–793
for styrene-based plastics, 23:362
Fatigue wear, 15:205
Fat lime, 15:27
Fat replacement, 12:52
Fats and fatty oils, 10:801–836. See also Oils
analytical methods for, 10:825–828
citric acid in, 6:646
in cocoa shell from roasted beans, 6:357t
composition in typical fatty acids, 2:519t
composition of, 10:802–806
temperature and, 6:369t
derivatives of, 10:829
composition of, 10:802–806
tin in cosmetic molded sticks, 7:840t
enzymatic modification of, 10:306
"F/A/S (flavor/aroma/solvent) molecules, VDC polymer permeability to, 25:707, 710–711, 712t
Fasidotril, 5:159
Fast-breeder reactors (FBR), 17:585–588 liquid-metal, 22:763
knowledge base for, 17:586
Fast color bases, 9:409–410t
Fast color salts, 9:409–411
Fast-curing agents, 10:409–410
Fastening, ABS, 1:428
Fast extrusion furnace (FEF) blacks, 4:775
Fast fluidized regime, 11:724–725, 801, 802, 803
Fast flux test facility (FFTF), 17:587
Fast Fourier transform (fft) algorithm, 23:137. See also Fourier entries
Fast gas chromatography, 6:434–437
Fastin, 3:91, 93t
Fast-ion conductors, ceramics, 5:589–592, 590t
Fast kinetic methods, 24:127
FASTMET process, 14:520
Fastness
of fibers, 11:169–170
of organic pigments, 19:427–428
Fastness tests, textile, 9:227–230
Fast neutron irradiation, of vitreous silica, 22:435
Fast pulse production, in lasers, 14:673–678
Fast reactors, 17:568
Fast relaxation time, 24:127
Fast Track Drug Approval programs, 18:697
Fat acidity value, 26:275
Fathead minnow, common and scientific names, 3:187t
Fatigue, 13:480–495
ion implantation and, 14:450–451
in metal–matrix composites, 16:184–188
in optical fiber strength, 11:143
stiffness loss in, 16:187–188
Fatigue behavior
factors affecting, 13:481, 483–484
of titanium alloys, 24:841, 845
Fatigue crack growth behavior, 13:484
Fatigue crack growth profile, 16:188
Fatigue crack growth rate (FCGR), 13:483
testing of, 13:489, 493–494
Fatigue crack initiation, in metal–matrix composites, 16:185
Fatigue crack initiation sites, 13:481
Fatigue crack propagation tests, 16:185–187
Fatigue data analysis, 13:494–495
Fatigue failures, 13:481, 486–487
Fatigue loads, 13:481
Fatigue performance, sample size and surface finish in, 13:486–487
Fatigue properties
determining, 13:483–484
effect of environment on, 13:494
materials and microstructures and, 13:484–486
practical aspects of characterizing, 13:489–494
Fatigue ratio, 13:486
Fatigue resistance
copper wrought alloys, 7:740–742
impact of temperature on, 13:487–488
temperature and, 13:487
Fatigue strength, 13:486
of ordered alloys, 13:499
Fatigue testing. See also Fatigue crack growth rate testing; High cycle fatigue (HCF) testing; Low cycle fatigue (LCF) testing
of polymers, 19:581
principles of, 13:481–489
Fatigue tests
for electroplating, 9:792–793
for styrene-based plastics, 23:362
Fatigue wear, 15:205
Fat lime, 15:27
Fat replacement, 12:52
Fats and fatty oils, 10:801–836. See also Oils
analytical methods for, 10:825–828
citric acid in, 6:646
in cocoa shell from roasted beans, 6:357t
composition in typical fatty acids, 2:519t
composition of, 10:802–806
tin in cosmetic molded sticks, 7:840t
enzymatic modification of, 10:306
ether-containing, 24:168
etherylated, 24:150
fatty acid compositions of, 10:816t
fatty acid manufacture from, 5:46–53
higher alcohol manufacture from, 2:1, 12–19
hydrogenation of, 10:809–814; 13:798
packaging, 18:34
in pet foods, 10:853
physical properties of, 10:818–823
processing of, 10:806–809
quaternary ammonium compounds from, 2:741
renewable, 12:812
saponification of, 22:736–741
in soap making, 22:732–734, 735–736
sources of, 10:814–818
specific heats of, 10:819
sulfonated, 23:538
typical composition of selected, 5:56t
uses of, 10:828–832
Fat-soluble vitamins, 12:68
Fatty acid amides, 2:442–463
analysis, 2:448
chemical reactions, 2:445
economic aspects, 2:448
health and safety factors, 2:448–451
manufacture, 2:445–448
melting points, 2:443t
nomenclature, 2:443t
physical properties of, 2:443–445
producers and trade marks, 2:447t
uses of, 2:451–459
Fatty acid clathrates, 14:184
Fatty acid content of soap, determining, 22:754
Fatty acid esters, 9:142
Fatty acid ester sulfonates, 23:528–529
Fatty acid ethoxylates, 24:149–150
Fatty acid methyl esters (FAME), 12:429; 13:26t
as plant growth regulators, 13:38
Fatty acid neutralization, in soap making, 22:738–741
Fatty acid nitriles, 17:246–247
Fatty acids, 5:27–28; 10:380. See also Carboxylic acids
acetylenic, 5:34t
with alicyclic substituents, 5:36t
alkyds from, 2:147, 161–164
arrangement of, 10:817
common, 10:802
composition of, 10:826
content of raw cocoa beans/cocoa butter, 6:371t
dispersant moieties, 8:706t
found in triglycerides, 10:803t
from petroleum, 5:53–54
higher alcohol manufacture from, 2:12–19, 28t
manufacture of, 10:831
molecular distillation, 8:777
from natural fats and oils, 5:46–53
in naturally occurring triglycerides, 10:803t
in paper recycling, 21:438
polyunsaturated, 5:33t
quaternary ammonium compounds from, 2:741
reaction with ammonia, 2:445
reactions with alkanolamines from olefin oxides and ammonia, 2:126
reduction to alcohols, 5:42
soap and, 22:723
as soap bar additives, 22:742–743
in soap making, 22:732, 736, 738–741
sulfonated, 23:538
in super-fatted mixed soap formulation, 22:730
tall oil, 9:143–144t
in ternary soap–water systems, 22:727–728
in toilet soap making, 22:732, 733t
typical composition, 2:519t
in waxes, 26:206
Fatty acid synthesis, in plants, 13:295
Fatty alcohols
production of α-olefins from, 17:722–723
quaternary ammonium compounds from, 2:741
sulfation with ClSO3H, 23:541
Fatty alkyl sulfates, emulsifiers, detergents, and dispersants, 8:710t
Fatty amine oxides, 2:20
Fatty amines, 2:518–537
chemical reactions, 2:522–524
commercial, 2:528–531t
economic aspects, 2:527–528
health and safety factors, 2:532–533
manufacture by alcohol process, 2:526–527
manufacture by nitrile process, 2:524–525
melting points, 2:521t
physical properties of, 2:520–522
shipment, 2:527
specifications and analysis, 2:528, 532
uses of, 2:533–534

Fatty esters, emulsifiers, detergents, and dispersants, 8:710t

Fatty foods, excess consumption of, 10:829
Fatty nitriles, preparation, 2:524–525
Fatty odor, 2:542
Fatty oils, composition in typical fatty acids, 2:519t
Faujasites, 5:240–241. See also Zeolite X; Zeolite Y
pore dimensions, 5:239t
for liquid separation adsorption, 1:674
structure of, 1:675

Fault-current limiters, 23:867–868
Faults, defined, 26:981
Fault tree analysis (FTA), 13:161–163; 26:984, 986
for ammonia plant, 26:995

Faure sequence, in quasi-Monte Carlo sampling, 26:1011

Favorski–Babayan conditions, 24:479
FCC catalyst coolers, 11:728–729
FCC catalysts. See also Fluid catalytic cracking (FCC)
contaminant metals and, 11:681–685
deactivation of, 11:685
design of, 11:679–681, 685–686
development of, 11:679t
manufacturing flow scheme for, 11:680
stability of, 11:682–683
FCC crystal structure, in Ni-base alloys, 13:512
FCC feed, sulfur compounds in, 11:716
FCC unit emissions, 11:714
controlling, 11:689–694
FCC unit regenerators, 11:713
air distribution systems in, 11:726
catalyst emissions from, 11:714–715
CO₂ emissions from, 11:720–721
configuration and mechanical hardware in, 11:722–731
cyclones in, 11:726–728
design of, 11:722–723
flue gas handling in, 11:729
fluidization in, 11:723–725
nitrogen oxide emissions from, 11:718–720
operating parameters of, 11:721–722
power recovery in, 11:729–731
regenerator vessel and internals in, 11:725–726
SO₂ emissions from, 11:715–718

FCC units
CO combustion in, 11:710
coke burning in, 11:706–713
coke formation in, 11:703–706
environmental aspects of, 11:713–721
environmental regulations and, 11:697–698
heat balance in, 11:702–703
hydrocarbon feed rate to, 11:708
hydrogen-burning rates in, 11:709
“petrochemicals mode” for, 11:695
production of light olefins in, 11:694–697
germination of, 11:700–734

FD&C color additives, certified, 12:49.
See also Food, Drug & Cosmetic (FD&C) Act
FD&C Red No. 4, function as ingredient in cosmetics, 7:829t
FD&C Yellow No. 5, pigment for plastics, 7:366t
FD&C Yellow No. 5 Aluminum Lake, in nail-care products, 7:853

FDA Bureau of Drug Abuse Control, 18:685. See also Food and Drug Administration (FDA); U.S. Food and Drug Administration (FDA)

FDA Center for Food Safety and Applied Nutrition (CFSAN), 23:667
FDA certified colors, 12:35
FDA Fast Track Drug Approval programs, 18:697

FDA flavoring and food adjunct lists, 11:575. See also Food and Drug Administration (FDA)

FDA GMP regulation, 21:168
FDA Sugars Task Force, 23:478
Select Committee on Nutrition and Human Needs, 23:479

Fe(IV), mixed oxides of, 14:543. See also Iron entries
Fearragillin, registered for use in aquaculture in Europe, 3:220t
Feather meal, 10:856
Fe-base superalloys, 13:503
Fecal coliform analysis, of water, 26:45–46
Fe-complexed dyes, 9:446–447. See also Iron entries
Federal agencies, functions of, 21:569t. See also United States entries; U.S. entries
Federal Anti-Tampering Act, 18:686
Federal Communications Commission (FCC), 16:512
Federal emission standards, 10:32
Federal Energy Regulatory Commission (FERC), 25:332
Federal Environmental Pest Control Act (FEPCA), 18:537
Federal Hazardous Substance Labeling Act, 21:854
Federal Hazardous Substances Act (FHSA), 19:452
Federal Hazardous Substances Act protocols, for anthropogenic silicas and silicates, 22:467
Federal income tax (FIT), 9:539–540
Federal Insecticide Act of 1910, 18:524
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 13:285, 327; 16:525, 537; 21:568, 591. See also FIFRA amendments registration and reregistration of pesticides under, 18:536, 544
Federal legislation, related to movement of hazardous materials, 25:337–338
Federal Maritime Commission (FMC), 25:332
Federal Motor Carrier Safety Administration (FMCSA), 25:332, 337
Federal Reformed Gasoline (RFG) Phase 2 specifications, 11:686
Federal Register, 21:570; 25:255
Federal registration, 25:258
Federal regulations, tank-related, 24:304–305
Federal Reserve Act, 12:683
Federal Test Procedure (FTP), automotive emission, 10:33–35
Federal Trademark Dilution Act, 25:256
Federal Water Pollution Control Act Amendments (FWPCA), 21:581
Federation of European Food Additives and Food Enzyme Industries (ELC), 12:37
Federation of German Industries (BDI) study, 24:194
Feed(s). See also Animal feeds; Nonruminant feeds; Pet foods; Ruminant feeds for aquaculture, 3:202–205 FCC unit, 11:705 for reforming, 25:167 silica in, 22:375
Feed Additive Compendium, 10:846
Feedstock(s). See also Fermentation

Feedstock

- ethane and propane, 18:558, 559
- ethylene, 10:626t
- hydrocarbon use in, 13:688
- in hydrogen production, 13:778
- hydroprocessing, 18:654
- low hydrocarbon, 25:177t
- oil as, 24:254–255
- oxidation of, 10:135
- petrochemical, 18:556–570, 674
- petroleum, 23:530–531
- prices for, 10:625
- purity of, 10:654–655
- residual, 11:681
- sucrose in, 23:479–480
- Feed syrup, 10:290–291

Feedwater

- heaters, 23:218
- preheating, 10:148
- in steam-generating systems, 23:221
- treatment of, 23:222–225
- Feedwater pH, in the nuclear cycle, 23:235–236
- Feely-Beavers procedure, 21:99
- Feldspar(s), 2:344; 5:640. See also Acid grade feldspar
  - in clays, 6:685
  - in coal, 6:718
  - in kaolinite, 6:659
- Feline central retinal degeneration (FCRD), 10:856
- Feline Nutrition Expert (FNE) subcommittee, 10:857
- Fellgett advantage, 14:228
- Felodipine, 5:131–132
  - molecular formula and structure, 5:126t
- Felspathic matrix dental ceramics, 8:275
- Felt, mechanical process for producing, 17:506
- Felting fabric shrinkage, 26:390
- Felting shrinkage, 24:622–623
- FeMo-cofactors, 17:302, 303, 308, 309, 310, 315. See also Iron entries;
  - Molybdenum entries
- Femtosecond lasers, 14:620
- Fenac, 13:315
- Fenbendazole, registered for use in aquaculture in Europe, 3:220t
- α-Fenchol, 24:510
- Fenchone, 24:541
- Fendilar, molecular formula and structure, 5:119t
- Fendiline, 5:122
  - molecular formula and structure, 5:119t
- Fenfluramine, 3:93, 97
- Fe-Ni-Co alloys, 13:522. See also Cobalt entries; Iron entries; Nickel entries
- Fenitrothion
  - in microcapsule formulations, 7:564t
  - photocatalytic degradation pathway of, 19:91
- Fennel seed, 23:167
- Fenofibrate, 5:146
  - molecular formula and structure, 5:141t
- Fenoldopam, 5:187
- Fenotard, molecular formula and structure, 5:141t
- Fen-phen, 3:91
- Fenske relationship, 8:757
- Fenticlor, 23:642
- Fenton process, in wastewater treatment, 25:910
- Fenton's reagent, 14:38–39, 65
- Fenton's reagent effluent treatment, 9:435
- Fenugreek, 23:167
- Fenuron, 13:324
- FEP copolymer dispersion, 18:309
- FEP fluorocarbon resins, permeability of, 18:313t
- FePorLX complexes, five- or six-coordinate, 14:554
- FEP polymer, 10:220; 18:306–307. See also Fluorinated ethylene propylene (FEP);
  - Perfluorinated ethylene–propylene (FEP) copolymers
  - applications of, 18:315–316
  - chemical properties of, 18:313
  - dispersion processing of, 18:314
  - economic aspects of, 18:315
  - effects of fabrication on properties of, 18:315
  - electrical properties of, 18:311
  - fabrication of, 18:314–315
  - health and safety factors related to, 18:315
  - mechanical properties of, 18:311, 312t
  - optical properties of, 18:313
  - properties of, 18:309–313
  - radiation effects on, 18:310
  - testing and standards for, 18:315
  - thermal stability of, 18:310
transitions and relaxations in, 18:310
weathering of, 18:313
Feret’s diameters, 18:147
Fermentable sugar yield, 10:293t
Fermentation(s), 3:669; 11:1–55. See also Fermentation products
advantages over organic synthesis, 11:6
alternative methods of, 11:14
as anaerobic process, 11:1–2
aseptic automation of, 11:40–41
beer, 26:466
in biodegradation, 25:836
biologicals from, 11:5–6, 21–22
biomass from, 11:3–4, 21
as biotechnology, 11:1–2
brewery, 26:465
broth sample measurements during, 11:37t
carbon dioxide recovery from off-gases, 4:809–810
care of microorganisms for, 11:42
citric acid from, 6:639
continuous measurements during, 11:37t
defined, 11:1
defoamer applications, 8:246
distillers’, 26:470
economic aspects of, 11:14–22
enzyme production by, 10:265, 266–267
enzymes from, 11:4–5, 21
equipment for, 11:31–41
food preservation by, 12:86
good manufacturing practice in, 11:47–49
history of, 11:6–14
in p-hydroxybenzoic acid manufacture, 22:22
inoculum development in, 11:41–42
isolation in, 11:43
by living organisms, 11:1–2
medium development and feeding in, 11:25–29
microbiological aspects of, 11:22–31
off-line measurements during, 11:37t
on-line measurements during, 11:37t
product quality from, 11:46–47
production strain in, 11:22–25
regulation of, 11:46–49
safety issues with, 11:49
scale-up of, 11:41, 42–43
sequencing of, 11:40–41
sterilization in, 11:35–36
utilities for, 11:44–46
in vaccine production, 11:11
whole-cell biocatalysts from, 11:4–5
wine, 26:303, 312–314
yeasts and, 26:446, 458–459
Fermentation enzymes, 10:292–293
Fermentation ethanol, 10:532–536, 546
Fermentation feedstocks
for polyhydroxyalkanoates, 20:258–259
sucrose as, 23:480–481
Fermentation (microbial) gums, 13:63t
Fermentation kinetic profiles, 11:29
Fermentation processes, 10:251
Fermentation products, 11:14–22
amino acids as, 11:2–3
classes of, 11:15t
by company, 11:17–20t
organic acids as, 11:2–3
polyols as, 11:2–3
primary metabolites as, 11:2–3
in ruminant feeds, 10:865
secondary metabolites as, 11:3, 21
solvents as, 11:2–3
types of, 11:2–6
worldwide production of, 11:16
Fermentation scales, 11:31
Fermentation synthesis
of ascorbic acid, 25:754–755
Fermentation technology, 18:569
Fermentation time, 10:295
Fermentative metabolism, in yeasts,
26:454–455
Fermentor(s), 10:266; 11:1
Fermentor agitators, 11:34
Fermentor vent, 11:40
Fermi-1 fast-breeder reactor, 17:586
Fermi-Dirac statistics, silicon-based semiconductors and, 22:235–236, 237
Fermi energy, in silicon-based semiconductors, 22:241, 245–246
Fermions, 17:352, 354
Fermium (Fm), 1:463–491, 464t
electronic configuration, 1:474t
FERRAMS (ferroelectric random access memories), 11:100
Ferrates, 14:543. See also Iron entries
Ferrate salts, 14:543
Ferredoxins, 14:555
Ferric 1,3-propylenediaminetetraacetic acid, (ferric 1,3-PDTA), 19:265
Ferric ammonium citrate
molecular formula, 6:638t
solubility in water, 6:649t
Ferric ammonium ferrocyanide
pigment used in makeups, 7:836t
Ferric bromide, physical properties of, 4:328
Ferric chelates, 14:596
Ferric chloride
economic aspects of, 14:559
end use of chlorine, 6:135t
in vinyl chloride manufacture, 25:634, 642
Ferric citrate, molecular formula, 6:638t
Ferric ethoxide, 14:533
Ferric ethylenediaminetetraacetic acid
(ferric EDTA), 19:261
Ferric ferrocyanide, 8:186; 22:810
pigment used in makeups, 7:836t
Ferrichromes, 14:557
Ferric ion, acrylamide stabilizer, 1:289
Ferric nitrate bright pickle, 15:375
Ferric oxide
carrier mobility at room temperature,
5:597t
in cement, 5:468
energy gap at room temperature,
5:596t
in ferrites, 5:584
semiconductor, 5:600–601
Ferric sulfate, in water treatment, 26:110
Ferric titanate, 25:46–47
Ferricyanic acid, 14:536
Ferricyanide(s), 19:221, 260–261
in photographic processing, 19:217
Ferrite, pore dimensions, 5:239t
Ferrier rearrangement products,
microwaves and, 16:547
Ferriferrocyanide Blue (Iron Blue),
pigment for plastics, 7:370t
Ferrimagnetic materials, 22:714
Ferrimagnetism, of spinel ferrites,
11:60–61
Ferroxamines, 14:557
α-Ferrite, 23:274
Ferrite (dicalcium ferrite), phase in
Portland cement clinker, 5:472t
Ferrite (tetracalcium aluminiate), phase in
Portland cement clinker, 5:472t
Ferrite (tetracalcium aluminoferrite),
phase in Portland cement clinker,
5:472t
Ferrite grain size, 23:294
Ferrite precipitates, 23:275
Ferrite reds, 19:399
Ferrites, 5:583–584; 11:55–91; 14:543;
22:272. See also Iron entries
hydration, 5:477–478
in Portland cement, 5:467
in Portland cement clinker, 5:473t
classification of, 11:55–58
energy losses in, 11:67–66
physical properties of, 11:59–71
processing of, 11:71–75
properties of spinel and M-type,
11:59
uses for, 11:75–87
Ferrite spinels, 5:602–603
Ferritic nitrocarburizing, case hardening
by, 16:210–211
Ferritic stainless steels, 23:305
Ferritic steel, tellurium in, 24:422–424
Ferroalloy furnace, 12:306
Ferroalloys, 22:515; 23:262
composition of typical chromium
ferroalloys, 6:501t
chlorination of, 24:321
Ferboron, 4:136, 244
Ferrocene, 14:551
Ferrocenyl synthesis, microwaves in,
16:541
Ferrochromium, 6:469
chemical specifications, 6:508–512t
composition of typical, 6:501t
economic aspects, 6:496–497
prices, 6:484–486
production, 6:479–480
specifications, 6:500–502, 501t
U.S. trade, 6:487
world production by country, 6:490
Ferrochromium–silicon, 6:500
Ferrocyanide, 14:534
Ferroelasticity, ceramics, 5:623
Ferroelectric ceramic–polymer composites,
11:100–101
Ferroelectric effect, smart materials
exhibiting, 22:709–710, 721t
Ferroelectric LCDs, 15:115
Ferroelectric materials, 11:94–98.
See also Ferroelectrics
preparation of, 11:98–101
producers of, 11:107–108
See also Ferroelectric materials
applications of, 11:101–107
economics of, 11:107–108
as nonlinear dielectrics, 11:92
normal and relaxor, 11:105–106
optical nonlinearity in, 11:94
polymer, 11:106–107
properties of, 11:92–94
thin-film, 11:100, 107
Ferromagnetic materials, 15:434; 16:516; 22:714
Ferromanganese, 15:538, 547
crust, 17:693
high carbon, 15:548–555
refined, 15:556–557
world production of, 15:550–551t
Ferromanganese electric furnace, operating data for, 15:554t
Ferromanganese furnaces, safe operation of, 15:561
Ferromanganese plant safety, 15:561
Ferroniobium, 17:136; 23:829
chlorination of, 17:137
Ferrophos, 19:17
in phosphorus manufacture, 19:10–11, 12
Ferrophosphide, chlorination of, 19:33
Ferrophosphorus, 19:59
Ferrophosphorus alloy, 19:606
Ferroseelenium, 22:73t, 87
Ferrosilicon(s), 15:338–339, 340; 22:512–515
casting, 22:514–515
economic aspects of, 22:517
high purity, 22:517
magnesium, 22:517–518
phase diagram for, 22:513
production of, 22:512–514
regular 515–516
in silica manufacture, 22:367–368
smelting of, 22:505, 506
supply and demand for, 22:517
worldwide production of, 22:517, 518
zirconium-bearing, 22:521
Ferrosilicon–chromium, 6:500
Ferrosilicon–zirconium, 26:638
Ferrosiliciferous brome, 20:630
Ferrotellurium, 24:411
Ferrous-based alloys, in fatigue testing, 13:484–485
Ferrous bromide, physical properties of, 4:328
Ferrous castings industry, 21:414
Ferrous chromite, 5:602
Ferrous dititanate, 25:46
Ferrous foundries, types of, 21:412
Ferrous iron salts, in selenium recovery, 22:79–81
Ferrous metallurgy
  nitrogen in, 17:286
  silicon carbide in, 22:540–541
Ferrous metals. See also Ferrous scrap
  recycling, 21:407–417
  selenium and metallurgy of, 22:97–98, 98–99
tellurium in, 24:425
Ferrous metatitanate, 25:46
Ferrous orthotitanate, 25:46
Ferrous oxide
  phase in Portland cement, 5:471
  transference number of cations, anions, and electrons or holes, 5:586t
Ferrous scrap
  analyses of, 21:413
  economic aspects of, 21:414–415
  grades of, 21:413–414
  prices of, 21:414–415
  primary uses of, 21:412–414
  residual elements in, 21:412–414
  sources of, 21:410–411
  standards for, 21:415
  supply and demand for, 21:407–408
  types of, 21:408–410
Ferrous scrap recycling, environmental and regulatory aspects, 21:415–417
Ferrous shape-memory alloys, 22:342t, 352–353
Ferrous sulfate
  economic aspects of, 14:559
  in water treatment, 26:110–111
Ferrous sulfate titration, for nitric acid determination, 17:191
Ferrovanadium, 25:517–518
  aluminum reduction of, 25:518
  carbon reduction of, 25:518
  silicon reduction of, 25:518
Ferroxplana, 11:57
Ferrozirconium, 26:638
Ferruginous limestone, 15:27
Ferruginous manganese ores, 15:540
Fertilization, of sugar beets, 23:454
Fertilizer application
rates of, 11:124–126
techniques for, 11:124
Fertilizer coating, ionomers as, 14:483
Fertilizer industry
growth of, 23:789
potassium compounds in, 20:637–639
Fertilizer plants, sulfuric acid in, 23:788
Fertilizers, 11:111–128
condensed phosphoric acids in, 18:830
defoamer applications, 8:247
environmental impacts of, 11:126–127
kaolin application, 6:688t, 696
liquid chromatography applications,
6:465
magnesium-containing, 15:414
nitrogen, 11:113–117, 123–124, 127
nitrogen compounds in, 11:115–117
polygorskite/sepilite application, 6:700t
phosphate, 11:117–122, 125, 127; 23:590
potassium, 11:122–123, 125–126, 127
potassium compounds used in, 20:640
slow-release, 12:122
smectite application, 6:698
sodium nitrate in, 22:843, 852
use in aquaculture ponds, 3:192
use in bioremediation of hydrocarbons,
3:764–765
uses for, 11:123–126
world consumption of, 11:112t, 113
Ferulic acid, 10:806
FE-SEM systems, 24:78. See also Field
emission scanning electron microscopy
(FE-SEM)
Fe(II) sulfate metallizing agent, 9:447
Fetotoxic effects, of ethylene glycol, 12:655
Fettkohle coal grade (Germany), 6:713t
$^{18}$F fludeoxyglucose, 21:280–281
$[^{18}F]fluoride$-radiolabeled molecular
imaging probe, 26:974
FGD-gypsum, 4:591–593
economic aspects, 4:595–597, 596t
uses of, 4:598–599
FI-800 high speed integral color film,
19:312
Fiber(s), 11:163–188. See also Acrylic
fibers; Carbon fibers; Filled fibers;
High performance fibers; New fibers;
Olefin fibers; Optical fiber(s);
Polyamide fibers; Regenerated
cellulose fibers; Vegetable fibers
antimicrobial acrylic, 11:215–219
applications for, 11:163
aramid, 19:725–726
aromatic polyamide, 19:714
attractive forces with dyes, 9:160–162
bicomponent, 11:175, 213–214, 240
bicomponent and biconstituent,
19:760–762
carbon, 11:214–215
classification of, 11:163–166
in cocoa shell from roasted beans, 6:357t
ductive, 11:219
defined, 11:163
Dolanit, 11:214, 215t
dyeing, 9:157–165
economic aspects of, 11:167, 175–176
fibrillated, 11:219
flame-resistant, 11:214
hardwood, 21:2
high-bulk acrylic, 11:213–214
high-performance, 26:740t
history of, 11:163
hybrid silk, 22:634
limiting oxygen values of, 13:385t
lyocell, 11:261
major commodity, 11:172–175
manufactured, 11:165, 174–175;
24:616–618
MDPE, 20:209
meltblown, 11:240–241
melt-spun, 16:9
modacrylic, 11:188, 189, 190, 194, 195
morphology of, 11:170–172
natural, 24:615–616
naturally occurring, 11:164
for nonwovens, 17:497
in pet foods, 10:854
phenolic resin, 18:797–798
physical properties of commercial, 11:226t
pigmented, 11:213
polyamide, 19:725
polyimide, 20:282–283
polymeric, 11:171
polypropylene, 20:547
porosity of, 13:390
preparing for papermaking, 18:102–106
production trends for, 24:614–615
prices of, 11:166–170
propylene polymer, 17:705
PVA, 25:619
reactive, 9:486–489
regenerated, 11:164, 165, 174
silicon carbide, 22:534
silk, 22:632, 633
softwood, 21:2
sol–gel, 23:80
speciality, 11:215–219
spunbound, 11:240–241
spurted, 11:240–241
structure of, 11:171–172
surface treatment of, 26:759
synthetic, 11:164, 165–166, 174, 176
tensile strengths of, 24:624
types of, 9:157–159
uses for, 11:176–185
wood, 21:1–4
world production of, 11:176
Fiber and tow coloration, 9:205–206
Fiber B, 13:372
Fiber blends
dyeing, 9:198–204
ignition resistant, 13:385
Fiberboard, corrugated, 18:17
Fiber bonding, phenolic resins in, 18:791–792
Fiber Bragg gratings (FBGs), 12:615–616
Fiber braiding, in metal–matrix composites, 16:181t
Fiber demand, worldwide, 24:615t
Fiber diameter, filtration efficiency and, 11:341
Fiber diffraction, 26:432
Fiber dimensions, for hemodialysis, 16:6–7
Fiber disposal, viscose process and, 11:279
Fiber draw tower, 11:143
Fiber drum and can packaging, converting, 18:22
Fiber drums, as industrial materials packaging, 18:9–10
Fiber dyebath, damage to, 9:169
Fiber etalons, 11:151, 152
Fiber extrusion, VDC copolymers in, 25:725, 727–728
Fiber filaments, “crystalline” and “amorphous” regions in, 24:613
Fiber finishes, 19:755–756; 20:17
Fiber finishing applications, of silicones, 22:592–594
Fiber flax properties, effect of treatment on, 11:609t
Fiber-forming polymers, characteristics of, 24:612–613
Fiberglass, kaolin application, 6:688t, 695
Fiberglass insulation
borate application, 4:243
Fiber-glass-reinforced plastic (FRP), 20:96.
See also Fiber reinforced plastic (FRP) pipe
Fiber glass-reinforced plastic tanks, 24:299
Fiber grating, 11:150–151
Fiber length (FL), 18:148
Fiber manufacture, sodium bisulfite in, 23:673
Fiber–matrix bonding, 26:771–772
Fiber modification, chemical, 16:14
“Fibernodes,” 11:595
Fiber-optic probes, 16:524
Fiber optics, 11:128–162, 15:469
attenuation in, 11:132–133
dispersion in, 11:134–135
fiber drawing in, 11:141–145
fiber strength in, 11:141–145
history of, 11:128–131
inside processes for, 11:136–140
near-infrared, 23:141
optical amplifiers with, 11:145–146
optical fiber fabrication for, 11:135–141
outside processes for, 11:140–141
principles of, 11:131–135
Fiber-optic sensors
intrinsic and extrinsic, 11:148
for smart structures, 11:146–159
Fiber-optic smart structure systems, 11:146–159
applications of, 11:154–159
Fiber orientation, in textile spinning, 17:470
Fiber pretreatment, 9:481–486
Fiber properties
of aromatic polyamides, 19:728
effect on dye affinity, 19:759–760
Fiber-reactive dyes, 9:173–178, 216
application methods, 9:176–178
profiles, 9:175–176
for wool, 9:187–188
Fiber-reinforced composites, subcritical damage mechanisms in, 16:188
Fiber-reinforced metal–matrix composites, 16:171
Fiber reinforced plastic (FRP) pipe, 23:783. See also Fiber-glass-reinforced plastic (FRP)
Fiber-reinforced plastics, recycling, 21:456
Fiber reinforcement
ceramic–matrix composites, 5:554–557, 558t
Fiber swelling, in paper pulping, 21:434
Fiber volume fraction, 26:775, 776
Fiber-wall morphology, 16:3–5, 11
Fiber width (FW), 16:3
Fibrates, 5:145
Fibrillated fibers, acrylic, 11:219
Fibrillation, 3:711; 5:80, 87, 88–89
of lyocell fibers, 11:271–272
Fibrils, 11:171
Fibrin, 4:82
Fibrinogen, 3:821; 4:87; 12:144, 146–147
glycoprotein receptors for, 4:85
Fibrinolytic system, 4:83, 88–89
Fibrinopeptide A, 4:87
Fibrinopeptide B, 4:87
Fibroin(s)
in commercial silk processing, 22:631
in vivo processing of, 22:630–631
in silk genetic engineering, 22:633
in silkworm silk, 22:627, 628, 629
Fibronectin, 12:144
Fibrous composites, 26:752
Fibrous fillers, 11:302t
Fibrous materials
use in heat pipes, 13:233
uses for, 11:176–180
Fibrous products, properties of, 11:180–185
Fibrous proteins, 20:829
Fick’s law, 1:39–43; 26:154, 156
Fibrous products, properties of, 11:180–185
Fibrous materials, 10:450–451
Field assays, enzyme immunoassay kits for, 14:144
Fieldbus, 20:672
impact of, 20:673
Fieldbus standard, for smart transmitters, 20:664
Field dependence, of critical current density, 23:847–848
Field-desorption mass spectrometry (fdms), 21:278
Field effect transistors (FETs), 19:155;
22:144, 162–166, See also Transistors
caracteristics of, 22:164–166
in CMOS logic circuits, 22:251–253
compound semiconductors in, 22:160, 161–162
fabrication of, 22:162–164
HBTs versus, 22:166
hydrogenated amorphous silicon in, 22:135
long-channel behavior of, 22:249–251
Moore’s law and device scaling of, 22:253–255
scaling to deep submicron dimensions, 22:255–257
silicon based semiconductors in, 22:249–257
Field emission devices, 17:49–50
Field emission FPDs (FEDs), 22:259
Field emission microscope (FEM), 16:503
Field emission microscopy (FEM), 24:74
Field emission scanning electron
microscope (FESEM), 16:492
Field emission scanning electron
microscopy (FE-SEM), 24:74. See also
FE-SEM systems
Field emission sources, 24:102
Field erection, piping system, 19:484–485
Field-flow fractionation, 8:722
in particle size measurement, 18:144–146
principles of, 18:145
Field ion microscopy (FIM), 16:503; 24:74
Field network protocols, 20:672
Field separation, in petroleum processing, 18:645
FIFRA amendments, 18:537, 538
50% rayon grade of caustic soda, 22:838
Figures of merit (FOM)
for all-optical processing, 17:454–456
in univariate regression, 6:30–31
Filament(s), 11:177, 247
with Accordis Tencel process, 11:268, 269
in dry spinning, 11:205–206
in fabric web formation, 17:471–473
HDPE, 20:175
textile yarns from, 11:177–178
Filamentary superconductors, metal–matrix composites in, 16:192–193
Filament drawing, 20:18
Filamentous bulking sludge, 25:898, 899
Filamentous fungi, as host systems for gene expression, 12:479–480
Filament processes, for polyester fibers, 20:18
Filament stretching rheometer (FSR), 21:740, 741
Filament winding, 26:767, 768
of thermosetting resins, 19:558
Filament-winding resin-impregnated glass rovings, 20:117
Filament yarns, 11:250
acrylic, 11:212
Filiform corrosion, 7:174
Filled fibers, encapsulation spinning of, 16:26
Filled polymers, 11:306–311
chemical compatibility with fillers, 11:305
filler particles and properties of, 11:303
mechanical properties of, 11:308–309
mixing and dispersion of, 11:307–308
optical properties of, 11:310
permeability of, 11:310–311
rheology and processability of, 11:306–307
thermal properties of, 11:309–310
Filled polypropylenes, properties of, 20:527t
Filled PTFE compounds, properties of, 18:296t
Filled resins, 18:292
Filled silicone networks, 22:570–572
Filler hybrid preparation method, 13:539
Filler loading, 10:430, 457
Fillers, 10:430–434; 11:301–321. See also Filled polymers
applications of, 11:301–302
butyl rubber applications, 4:448–449
calcium carbonate, 22:41
calcium carbonate applications, 4:555
carbon, 11:316–317
carbon nanotubes as, 11:317
classification of, 11:303
defined, 11:301
economic aspects of, 11:318
effects of, 10:433t
for EPM/EPDM compounding, 10:71
health and safety factors related to, 11:318
history of, 11:302–303
kaolin application, 6:688t, 689, 694t, 695
loading and density of, 11:305–306
metals as, 11:316
mineral, 11:311–313
nanoclays, 11:313–314
nanoscale oxides as, 11:316
in paper, 18:99
in paper manufacture, 18:107–109
in polychloroprene compounds, 19:848
in polychloroprene latex compounding, 19:858
particle morphology of, 11:303–304
physical properties of, 11:303–306
polyamideimide, 10:215–216
for powder coatings, 7:45–46
properties of, 10:431–432t
properties of network, 22:571–572
in PVA, 25:617
for PVC polymers, 25:675
for RTV silicones, 22:596
for rubber, 21:772–785
in silicone heat-cured rubber, 22:580
for silicone networks, 22:570–572
strength, hardness, and abrasivity of, 11:304
surface area, chemistry, wetting, and coupling of, 11:304–305
synthetic, 11:314–316
types of, 11:311–317
in urethane formulations, 22:37
use in commercial polymers, 11:302t, 303
worldwide production of, 11:318
Fill factor (FF), 22:136
Film(s)
additive color, 19:308–311
cadmium sulfide photoconductive, 19:155–156
defects in coatings, 7:119–124
digitization of, 19:266–267
dried, 9:147
energy barrier between, 12:7
in examining solid samples, 14:229–230
formation in coatings, 7:77–83
instant, 19:274, 311–314
integral, 19:302–308
liquid-phase epitaxial, 19:159–160
LLDPE resin, 20:206–207
lubricant, 15:213–214
in OLEDs, 22:215
peel-apart and integral, 19:274
PEN, 10:188
in photovoltaic devices, 22:220–221
Polacolor, 19:298–302
poly(4-methyl-1-pentene), 20:432
poly(ethylene oxide), 10:679, 681t
polyimide, 20:281–282
polypropylene, 20:547
poly(vinyl fluoride), 20:590–592
silicone rubber, 22:583
silk, 22:632
tantalum, 23:829
Film absorption characteristics, of
hydrogenated amorphous silicon, 22:133–134
Film adhesives, 25:582–583. See also
Monolayer blown-film extrusion;
Multilayer blown-film extrusion;
Multilayer cast-film extrusion
Film and sheet market, LDPE in, 20:231–232
Film applications, low density resin for, 20:232t, 233t
Film casting, of PPTA, 19:726
Film coatings, microcapsules in, 16:459
Film drug coatings, 18:707
Filmer IBT, 4:461, 467
Film fabrication, sequential-synthesis, 17:447
Film fabrication prototype devices, 17:447–448
Film factors, in binary counterdiffusion, 1:42
Film HAp, 14:105
Filming amines, in industrial water
treatment, 26:136–137
Film manufacture
higher olefin polymers in, 20:427–428
from linear low density polyethylene, 20:199–200
Film morphology, substrate temperature
and, 24:742. See also Thin film entries
Film-penetration theory, 1:47
Film processors, one-step, 19:276–278
Film production process, preservation of
stoichiometry during, 24:739
Film properties
of aromatic polyamides, 19:728
of latex, 14:711
of VDC copolymer latex, 25:736t
Film quality, in color photography, 19:261–265
Film reactors, Chemithon, 23:544–547
Film reactor systems, 23:544
Film rupture, 12:14
Film sharpness, in color photography, 19:264–265
Film stretching process, 19:546
Film sulfonating–sulfating systems,
Chemithon, 23:544–547
Film theory, 1:37, 46; 21:642
model, 21:643
Film-to-fiber technology, 11:239, 240
Filoviruses, 3:138
Filtchar, 4:741
Filter aids
kaolin application, 6:688t, 696
in food manufacturing, 12:66
See also Cake entries
Filter cleaners, for swimming pools,
26:193
Filter coefficient, in depth filtration theory,
11:337–339
Filter cycles, 11:344–346
batch, 11:344, 345–346
continuous, 11:344–345
Filter drag model, 26:712
Filter housing, 11:322
Filter media, 11:322, 325–326. See also
Media
for filter presses, 11:360
in liquid filtration, 11:322–323
properties of, 11:326t
selecting, 11:349
testing and evaluating, 11:349
types of, 11:325t, 349
Filter paper processing, cure-oven exhaust
in, 10:109
Filter papers, 18:129
Filter presses, plate-and-frame,
11:358–362
Filter rating, for cartridge filters, 11:369
Filters
chemical process unit, 14:207
clogging of, 11:325–326, 330–332
dynamic, 11:383–387
fabric, 13:179
ferrites in, 11:77
magnetic, 15:450
Filtrate, 11:322
Filtration, 11:321–397; 15:824–825. See also Filter cycles; Filter performance; Filters; Microfiltration; Nanofiltration membranes; Ultrafiltration as advanced wastewater treatment, 25:908–909
batch pressure filters, 11:358–373
beer, 3:584
cake filtration theory, 11:330–337
cake removal in, 11:382
in cane sugar refining, 23:452
centrifugal filters, 11:388–393
continuous pressure filters, 11:373–388
cross-flow, 11:383–388
depth, 11:322, 323, 337–341
driving forces in, 11:323–324
high performance fibers in, 13:393
liquid, 11:322–323
particle shapes and sizes in, 11:326–328
plating tank, 9:775
purposes of, 11:321–322
in radioactive waste treatment, 25:853
scale-up of, 11:392–393
in solid–liquid separation, 16:657–659
solid–liquid separation equipment for, 11:346–348
solid–liquid separation stages in, 11:341–344
sterile, 12:138
surface, 11:322–323
swimming pool, 26:193–194
vacuum filters, 11:349–358
viscose, 11:255–256
volume fraction versus mass fraction in, 11:328
in wastewater treatment, 25:888–889
in water treatment, 26:103–105
of wine, 26:317
Filtration centrifuges, 5:542–548
power, 5:522
Filtration rate, 11:330–332
Filtration time, optimizing, 11:346
Fina-Badger’s PAR technology, 23:335
Fina-Badger styrene process, 23:339, 340
Finaclear, commercial block copolymer, 7:648t
Final cover, in landfill design, 25:879
Final product specification, 5:779–780
Financial conflicts of interest, 24:370
Financial risk assessment, uncertainty analysis in, 26:1001
Finaprene, commercial block copolymer, 7:648t
Finasteride, 2:816–817
Fin-drum dryer, 9:134
Fine art examination/conservation, 11:397–423
authenticity and provenance studies in, 11:418–419
degradation studies in, 11:414–418
history of, 11:397–399
material and methods for treating and cleaning works, 11:409–414
preservation studies in, 11:407–409
sample analysis for, 11:404–407
technical investigation in, 11:399–407
Fine bubble diffusers, 26:163
See also Fine chemicals industry applications for, 11:423–424
classification of, 11:423–424
history of, 11:423
production of, 11:427–440
research and development related to, 11:425–426
specifications for, 11:424–425
suppliers of, 11:424
synthesis of, 26:941–943
value added chain for, 11:424, 425t
Fine chemicals industry, See also Fine chemicals
economic aspects of, 11:440–446
markets in, 11:444–446
platinum-group metals in, 19:622–623
products from, 11:442–444
sizes and locations of companies in, 11:440–442
structure of, 11:441t
Fine fibers, 13:389–390
Fine fragrances, 18:354, 356–361. See also Perfumes
Fine-grain sugar, 23:482
Finely ground (ultrafine) cement, 5:500t, 501
Fine-mesh screen printing, 9:221
Fine ore drums, 15:453
Fine particles, suspensions of, 22:54
Fine particulate matter (PM$_{2.5}$), 1:799
Fine-pore wick structure, 13:232
Fine precipitated alumina hydroxides, 2:430
properties of commercial, 2:429
Fine quicklime, 15:27
Fines removal, in crystallization, 8:124
Fine structural properties, of polyester fibers, 20:5
finFET structure, in scaling to deep
submicron dimensions, 22:256, 257, 258. See also Field effect transistors (FETs)
Finishes, common and scientific names, 3:187–188
Fingering process, 11:763–764
Fingerprints, 12:91
latent, 12:101–102
types of, 12:101
Fining, of wine, 26:317–318
Finings, 3:584
Finishes
phosphonate, 11:498
polyamide fiber, 19:755–756
silica in, 22:375
Finishing. See also Metal finishing
in bar soap manufacture, 22:748, 751–752
evaluation methods in, 22:754
of ferroelectrics, 11:99
information sources for, 15:766
of magnesium and magnesium alloys, 15:369–375
of staple-fiber nonwoven fabrics, 17:512–516
of textiles, 24:622–623
Finishing drums, magnetic, 15:446
Finishing lime, 15:27
Finishing requirements, for magnesium
and magnesium alloys, 15:374–375
Finish removers, 18:76–88
activators and thickeners in, 18:79
components of, 18:77–79
corrosion inhibitors in, 18:79
cosolvents and diluents in, 18:78
emulsifiers in, 18:78–79
evaporation retardants in, 18:78
formulation of, 18:77
health and safety issues related to, 18:80–81
inorganic, 18:84–86
liquid alkaline, 18:84–85
major ingredients of, 18:77–78
manufacturers of, 18:87t
methylene chloride, 18:79–81
organic, 18:79–84
paste-type alkaline, 18:85
petroleum and oxygenate, 18:81–82
Finite-volume method (FVM), 11:778
FIOR process, 14:516–520
Fire(s), 11:447–448. See also Combustion entries; Dow Fire and Explosion Index;
Flammability
as a cause of tank spills and leaks, 24:309
in ethylene oxide production units, 10:652
wood reaction to, 26:348–351
hydrazine, 13:586
Tefzel-resin, 18:328
Fire assay, 12:697–698
for silver, 22:650
for tin content, 24:791
Fire bombs, 5:825
Fire channels, 10:734
Fireclay, 6:686
ASTM classifications and specifications
for, 21:508, 509t
for ceramics, 6:688
as a refractory raw material, 21:488, 504, 516
Fire control, for ethylene oxide, 10:661
Fire-detection devices, in warehouses, 21:855–856
Fired heater reboilers, 19:510
Fired heaters
operation and maintenance of, 10:161–162
in plant layout, 19:511–512
Fire extinguishers, portable, 21:860
Fire extinguisher systems, virtual two-way
SMA devices in, 22:348
Fire-extinguishing compounds, 21:859–860
Fire-fighting agents, hydrofluorocarbons
as, 13:726–727
Firefighting
foams in, 12:20–21
potassium-related, 20:603
Fire-flood sulfur extraction method, 23:574
Fire hazard(s)
of Grignard reactions, 12:831
niobium as, 17:144
from organic materials, 25:682–683
pentane as, 13:702f
PVC as, 25:678, 682–683
of titanium and its compounds, 24:865
vinyl chloride as, 25:651
Fire modeling studies, 19:588
Fire point, of fats and oils, 10:822
Fireproofing, stannic chloride pentahydrate in, 24:804
Fire protection, hydrogels in, 13:752
Fire refining, copper, 7:685–686
Fire retardancy, ammonium phosphates in, 18:835
Fire-retardant additives, 11:450, 451, 452–453
Fire-retardant chemicals, materials, and products, 11:448. See also Flame retardant entries
effect on wood, 26:351
encapsulated, 16:460
Fire retardant treatment, for wood, 26:348
Fire science, 11:450
Fire test methods, 11:449–450
Fire test terminology, 19:588
Fire-tube furnaces, 12:319–320, 327
Firing, of ferrites, 11:73
Firming agents, 12:32
as food additives, 12:57
First aid and rescue, 21:858
First aid, for nitric acid exposure, 17:192
First failure, time to, 26:987
First falling rate period, 23:67
First-generation ionic liquids, 26:837–838, 841, 865
First law of thermodynamics, 24:645–648
First limiting amino acid, 2:601
First-order irreversible chemical kinetics, 25:286–287, 292–293
First-principle approach, in particle size measurement, 18:153
First sale doctrine, 7:793
Fischer, Emil, 16:768
Fischer carbene reaction, 24:35–36
Fischer esterification, 10:499
Fischer formula, 4:697
Fischer-Indole synthesis, 9:288
Fischer “lock and key” hypothesis, 24:38
Fischer-Tropsch (FT) synthesis, 6:791, 827; 12:431
of hydrocarbons, 10:532, 621; 13:768
in indirect coal liquefaction, 6:764–765, 859–865
for transportation fuels from coal gasifier syngas, 6:778
Fischer–Tropsch waxes, 26:220
Fish
mercury concentrations in, 16:49
packaging, 18:31–32
Fish and Wildlife Service, aquaculture regulation, 3:185
Fish diagram, 16:426–427
Fishery applications, high performance fibers in, 13:395
Fish meal, 10:852
Fish oils, 5:28; 9:143; 10:814
Fission
nuclear, 25:851
spontaneous, 21:304–305
Fission-fragment track detection, 19:700
Fission process, products of, 19:674
Fission products
actinide separation from, 17:550
wastes from, 17:549–550
Fission rate, in nuclear power facilities, 17:536
Fission weapons, plutonium in, 19:686
Fissure sealants, 8:334–335
Fitness-for-Service guide, 19:491
Fitting, in kettle soap making, 24:683–684, 685
Furomithromycin, 15:286
5A zeolite. See Zeolite 5A
Five-dimensional (5D) rendering, 16:733
5HT3 inhibitors, 10:334
Five-membered ring chemistry, 21:151–152
FIVESUB 5-substituted oxazolidinones, 17:730–731
Fixation, 9:165, 213, 215, 216
of atmospheric nitrogen, 11:111–112
of phosphate fertilizers, 11:122
in photography, 19:173, 177, 213–214
Fixed-angle head bottle centrifuge, 5:529
Fixed-angle mixers, 16:710
Fixed-bed bioreactor, defined, 3:759t
Fixed-bed butane process, 15:498
Fixed-bed centrifuges, 11:389–391
Fixed-bed gasifiers, 6:729, 789–790, 792–796, 827
for biomass gasification, 3:693–694 operating conditions and product distributions using bituminous coal, 6:788t
Fixed-bed ion-exchange water softening, 26:120
Fixed bed photoreactors, 19:99
Fixed-bed process technology
  benzene-based, 15:505–506
  butane-based, 15:501–502
Fixed-bed reactors, in vinyl chloride
  manufacture by oxychlorination, 25:640
Fixed beds, 12:331
  in carbon adsorption units, 25:812
Fixed-bed solid fuel combustion, 7:463
Fixed-bed-type hydrogenator, 14:48–49
Fixed burnable poison, 17:576
Fixed capital, 9:527–529
Fixed conductance heat pipe, 13:227
Fixed Dose Method, 25:217
Fixed hearth incinerators, 13:177
Fixed levitation, 23:866
Fixed-path length sealed cells, 14:228
Fixed-point blackbodies, 24:454, 455
Fixed-point cells, performing calibrations
  with, 24:443–444
Fixed-point realization, procedures for
  achieving, 24:444
Fixed points, secondary, 24:442t
Fixed-point thermometer calibration,
  24:440–444
Fixed-roof tanks, 24:288–289
Fixed surface aerators, 26:159, 160
Fixed valve plates, 8:763–764
Fixing agents
  color film, 19:261
  photographic, 19:213
Fixolide, 24:494
Flake
  salt, 22:805
  silver, 22:646
  sodium sulfide, 22:873
Flake graphite, 12:793
  recovery from kish, 12:783–784
Flambant gras coal grade (France), 6:713t
Flambant SCC coal grade (France), 6:713t
Flame agents, 5:814, 824–825
Flame arrestors, for acetylene, 1:185
Flame attenuation process, 13:387
Flame detectors, 21:851
Flame heating, case hardening by, 16:199
Flame hydrolysis, in vitreous silica
  manufacture, 22:412, 413–414
Flame ionization detector (FID)
  gas chromatography, 4:613; 6:380, 427t, 427–428
supercritical fluid chromatography,
  4:631
Flame photometric detector (FPD)
  gas chromatography, 4:615; 6:381, 432
  supercritical fluid chromatography,
  4:631
Flame resistance
  of cotton, 8:27
  of ethylene–acrylic elastomers, 10:700
  of MPDI fibers, 19:733
Flame-resistant fibers, 13:389
  acrylic, 11:214
  high performance, 13:395
Flame-resist treatment, of wool, 26:404
Flame retardance, 10:454
Flame-retardant agents, 19:805. See also
  Flame retardants
Flame-retardant behavior, of
  polycarbonates, 19:805–808
Flame-retardant epoxy resins, 10:349
Flame-retardant mechanisms
  condensed-phase, 11:484–485
  vapor-phase, 11:485–486
Flame-retardant resins, formulation of,
  20:104
  See also Fire retardant entries;
  Halogenated flame retardants;
  Phosphorus flame retardants
  antimony compounds in, 3:54
  brominated and chlorinated additive,
  11:461–470
  bromine applications, 4:315t
  bromine-containing organic compounds,
  4:349, 354, 355–358t
  cellulose ester applications, 5:404
  chlorinated paraffins applications, 6:129
  consumption of, 11:451t
  in continuous-filament yarns, 19:758
  cyanuric acid, 8:212
  cyclopentadiene and dicyclopentadiene
  applications, 8:232
dilution via, 11:456
  in flexible foams, 25:469
  improving performance of, 11:450–453
  measuring performance of, 11:448–450
  molybdenum compounds in, 17:39
  need for, 11:447–448
  in polyamide plastic manufacture,
  19:785
  polymeric/oligomeric, 11:470–474
  polymers containing, 23:366
Flammable vapors, 21:408
as protective coatings, 11:456
for PVC polymers, 25:675
reactive, 11:474–479
terminality related to, 11:448
Flame-retardant silicone foam rubber, 22:585–586
Flame-retardant silicone rubber, 22:584
Flame spray coatings, 5:665
Flame temperature, 12:322
Flame temperature, 7:443
Flame throwers, 5:824
Flame working, of vitreous silica, 22:415–416
Flammability, 11:455–456
of acrylic fibers, 11:194, 195t, 214
of others, 10:579–580
of ketones, 14:578–580t
of olefin fibers, 11:230
of organic esters, 10:509
of ozone, 17:769
of phenolics, 18:780
of polyamide plastics, 19:778
of propylene oxide, 20:808
of unsaturated polyesters, 20:115–116
Flammability hazards, 21:839–842
Flammability limits, 7:436
for solvents, 23:115–116
Flammability properties testing, 11:456–459
on plastics, 19:587–588
of thermoplastics, 10:175–176
Flammable and unstable materials, as a hazard class, 25:340. See also Flammable materials
Flammable finish removers, 18:81–82
Flammable liquids, 25:340
Flammable liquid storage tanks, spacing requirements for, 19:514
Flammable materials, 7:436
degree of hazard of, 13:155–156
storage and transfer of, 21:841
Flammable products, 11:447
Flammable residues, 12:100
Flammable vapors, 21:849
Flanges, fugitive emissions from, 10:71
Flank wear, cutting tool failure mode, 4:658–659
Flare noise, 19:522
Flares, effluent from, 14:207
Flash, 26:770
Flash calculation, 24:681
Flash evaporation, 23:787
Flash furnace slag, 14:745
Flash evaporation, 23:787
Flash furnace slag, 14:745
Flash point, 7:436–437; 21:839; 24:285
determination of, 23:115, 116
of diesel fuel, 12:424
of fats and oils, 10:822
Flash pyrolysis, coal liquefaction, 6:854–856. See also Flash vacuum pyrolysis (FVP)
Flash roasting
technique of, 23:660–661
of zinc, 26:562
Flash rusting, 7:185
Flash smelting, 16:145, 146
Flash spun fabrics, 17:479–480
Flash vacuum pyrolysis (FVP), 21:134–158. See also Flash pyrolysis; FVP entries
alkanes and, 21:141–142
alkenes and, 21:142–144
alkynes and, 21:144–145
allenes and, 21:149
application in synthetic organic chemistry, 21:141–154
aromatics and, 21:145–149
equipment for, 21:135–136
gas-phase analytical methods and, 21:139–140
heteroatom-containing functional groups and, 21:149–150
heterocycles and, 21:150–154
isotopic labeling studies and, 21:137–139
main parameters in, 21:135–136
matrix isolation and, 21:140–141
reactions in, 21:136–137
reactive intermediate studies related to, 21:137–141
substrate volatility in, 21:136
temperatures required for, 21:134–135
Flat-pack pressure filter, 11:379
Flat-bed screen printing, automatic, 9:220–221
Flat-blade turbine (FBT), 16:673, 678
Flat-bottom steeps, 15:528
Flat-bottom tanks, 24:292–293
Flat-pack film cameras, 19:276–277
Flat-panel displays (FPDs)
glass as a substrate for, 12:580
silicon-based semiconductors in, 22:259
Flat plate, flow parallel to, 15:719t
Flat-screen printing, 26:398
Flat wall paint, 7:137–139
Flavanthrone dye, 9:336
Flavanthrone Yellow, pigment for plastics, 7:366t
Flavin adenine dinucleotide (FAD), 14:148; 25:796
Flavin mononucleotide (FMN), 25:796
cofactor regeneration using, 3:673
Flaviviruses, 3:137–138
Flavones, microwave-assisted synthesis of, 16:575
Flavonoids, 17:297, 667
in chocolate and cocoa, 6:367
Flavor and Extract Manufacturers Association (FEMA), 11:569, 575
Flavor characterization, 11:510–527
chemical methods for, 11:516–524
sensory methods for, 11:511–516
Flavor chemists, 11:575
Flavor compositions, 12:47–49
Flavor compounding, 25:551
chiral separation, 6:74
retention during spray drying, 11:538–539
Flavor contributory items, 11:576
See also Flavor encapsulation, Glass encapsulation
applications of, 11:553–557
encapsulation technologies, 11:530–543, 543–553
structures of, 11:531
Flavor descriptor lists, 11:514
Flavor deterioration, 11:578
Flavor development
yeast fermentation in, 26:463
Flavor differential items, 11:576
Flavor encapsulation
cyclodextrins in, 11:552–553
by extrusion, 11:535, 536–537
in hydrocolloids, 11:547
matrices for, 11:537
Flavor enhancers, 12:32, 46–49
most popular, 12:49
in pet foods, 10:855, 857
Flavor Extracts Manufacturers Association (FEMA), 12:35
Flavor formulas, 11:577–581
Flavor inclusions, reducing, 11:550
Flavor industry, 11:558
Flavoring agent, 12:32
Flavoring preparations, 12:48
Flavoring proportions (dosage), 11:576
Flavorings. See also Flavor materials
classifications of, 11:571
fruit, 11:571–574
regulations related to, 11:581–582
salt in, 22:815
Flavoring substances, classes of, 12:47–48
Flavor materials, 11:569. See also
Flavorings
Flavor perception, principles involved in, 11:564–565
Flavor precursors, enzyme, 11:578–581
Flavor production, economic aspects of, 11:581
Flavor release
controlling, 11:528–529, 540–541
principal mechanisms of, 11:557
from spray-chilled beads, 11:551
Flavor release systems, controlled, 11:543–553, 554–555
Flavors, 3:226; 11:563–588; 12:46–49. See also Artificial flavorings; Flavor materials; Natural flavorings; Odor; Taste
in beer, 3:582t; 26:466–467
benzaldehyde applications, 3:594
character impact items for, 11:571, 572–574t
as chemical mixtures, 11:516
chemicals used in, 11:569t
chloroform application, 6:288
compounding, 11:575–581
encapsulation of, 11:527–528, 530–543
extruded, 11:553
food acceptance and, 11:564
function of, 11:563–564
glass-encapsulated, 11:535
hydrophobic, 11:534
ingredients used in, 11:570t
manufacturing process flow for, 12:48t
market share, 3:226t
ozone use in, 17:810
sensory evaluation of, 11:582–583
shelf life of, 11:542
of spices, 23:154
terms related to, 11:583–585
transport in barrier polymers, 3:403–405
Flavor specification
for vanillin, 25:548–549
Flavor substances, 12:35
Flaws, in ceramics, 5:616–617
Flax. See also Flax fiber; New Zealand hemp/flax
  bleaching, 4:72
  cottonization of, 11:617
Flax bales, variation in, 11:605
Flax fiber, 11:287, 292, 588–623
  applications for, 11:593–594
  assessment of, 11:618
  CIELAB color values of, 11:614t
  composition of, 11:597–599
  cultivation of, 11:592t, 600
  fineness of, 11:614–616
  future of, 11:617–618
  history and status of, 11:589–594
  importance of, 11:589–590
  mechanical cleaning of, 11:610–613
  processing of, 11:602–613
  production of, 11:599–602
  properties and grading of, 11:613–617
  retting of, 11:602–610, 618
  scutched, 11:610–612
  standards for, 11:616–617
  stem cuticle of, 11:595–597
  structure and chemistry of, 11:594–599
  uses of, 11:299t
  world production of, 11:591
Flax fiber graders, 11:617
Flax fiber industry, in the United States, 11:592–593
Flax fiber widths, image analysis of, 11:615
Flaxseed polysaccharide
  classification by structure, 4:723t
Flax seeds, 11:589
Flax spinning systems, 11:615–616
Flaxzyme, 11:608, 609
Fleahoppers, 8:9
Flecaine, molecular formula and structure, 5:92t
Flecainide, 5:101
  molecular formula and structure, 5:92t
Fleetcol, commercial defoamer, 8:241t
Fleroxacin, 21:223
Flex circuit materials, 17:848
Flex cracking
  effect on rubber aging, 21:785
  protection against, 21:787
Flex fatigue resistance, in tire compounds, 21:812
Flexibility index, 26:1041
Flexibilizing agents (flexibilizers), 10:376–377, 434–436
  effect of, 10:435t
Flexible design, 7:510–511
Flexible encapsulation technology, 11:557
Flexible foams
  processing of, 25:468–470
  tertiary amine catalysts for, 25:458t
  uses for, 25:481
Flexible food packaging, 18:45–47
Flexible fuel engines, 3:690
Flexible graphite, 4:736–737
Flexible impeller pumps, 21:74
Flexible intermediate bulk containers (FIBC), 18:13
Flexible packaging, applications of, 18:46–47
“Flexible plastic glass,” 16:275
Flexible polyester foils, as insulation materials, 23:9
Flexible polyurethane foam, 19:559
Flexible printed circuits, 10:456
Flexible searches, 6:10–11
Flexible tube pumps, 21:74
Flexocoking (fluid coking), 18:651, 652; 20:778
Flexipac 1–4, characteristics, 8:774t
Flexitray valve, 8:763
Flexographic inks, 14:320, 322–324
FlexS, 6:11
Flexsorb SE, 1:72
Flexural modulus, 10:177, 223, 224
  of filled polymers, 11:303
Flexure strength, of silicon carbide, 22:528t
FLEEx, 6:13
FlexX method, 10:337
Flicker noise, silicon-based semiconductors and, 22:237
Flint, 5:640; 22:480
  chemical analysis of archaeological materials, 5:744
Flint clays, 6:688
  lithium in, 15:124
Flip-chip materials, 17:836–837
Float glass, 23:4–5
Floating, coating film defect, 7:122–123
Floating-roof tanks, 24:289–292
Floating solids, entrainment of, 16:694–696
Floating zone technique, fabrication method for inorganic materials, 7:415t
Float zone crystal growth, silicon purification via, 22:496
Float zone refining, of silicon, 22:492–493
Flocculant addition point, 11:639
Flocculant chemistry, selection of, 11:638
Flocculants, 8:709–710; 16:659. See also Flocculating agents dispersants contrasted, 8:687
organic, 11:627–631
performance and selection of, 11:635–639
producers of, 11:643–644t
using in centrifugation, 5:527–528
Flocculant sludge, in biological wastewater treatment, 25:898, 899
Flocculant testing, laboratory, 11:638–639
Flocculated material, compaction of, 11:637
Flocculating agents, 11:623–647; 22:55. See also Flocculants; Flocculation analytical methods for, 11:640
applications of, 11:623–625
in automatic control and instrumentation systems, 11:639–640
chemical composition of, 11:625–639
economic aspects of, 11:642–644
health and safety factors related to, 11:641–642
high molecular weight polymeric, 11:633–634
inorganic, 11:625–627
operating parameters and control for, 11:639–640
organic polymeric, 11:632–633
in settling of suspensions, 22:54
in thickeners, 22:65
toxicity of, 11:641–642
Flocculation, 8:709; 10:118, 119; 16:655; 22:55–56. See also Depletion flocculation
in accelerators, 22:61
defined, 11:623
environmental legislation related to, 11:625
ethylene oxide polymers in, 10:688
in hazardous waste management, 25:821, 822
mechanism of, 11:631–635
orthokinetic, 22:56
perikineti, 22:55
of pigments, 19:428–429
reaction flow chart for, 11:634
sedimentation settling tests and, 22:56–57
selective, 8:711
in settling of suspensions, 22:54
of silica sols, 22:393
in solid–liquid separation, 11:343
in wastewater treatment, 25:911
in water treatment, 26:106–111
Flocculation rate, 22:55
Flocculation washing, 19:185
Flocculator, orthokinetic, 22:59
Flocculator-Squarex clarifier, 22:60
Flocking, polyamide fiber, 19:755
Flocs
behavior of, 11:636–639
formed by bridging, 11:633–635
Floc size, 11:637–636
Floc strength, 11:637, 638
Flooding, 10:764–76
bubble tray absorption columns, 1:89–90
coating film defect, 7:122–123
in distillation columns, 8:765–7665
packed absorption columns, 1:81–83
Flooding limit, heat pipe, 13:230
Floor and wall cleaners
acute oral LD50 ranges, 8:446t
Flooring, epoxy resins in, 10:452–453
Floor refractories, 12:600
Floor scales, 26:244
precision, 26:245
Floor tiles, asbestos applications, 3:315
Floral bouquet perfumes, 18:357
Floral fragrances, 18:357
Floral odor, 3:228t
Florfenicol
promising new uses for aquaculture, 3:223
registered for use in aquaculture in Canada, 3:218t
registered for use in aquaculture in Chile, 3:222t
registered for use in aquaculture in Europe, 3:220t
registered for use in aquaculture in Japan, 3:221t
Floristry
silver–thiosulfate complex in, 22:686
silver thiosulfate in, 22:659, 669
Florol, 18:382
Flor-Huggins interaction parameter, 20:404
Flory polymerization mechanism, 23:377, 378
Flory’s melting-point depression theory, 25:700

Flow

defined, 16:127
gold recovery by, 12:689
in paper recycling, 21:437–438
in potassium chloride refining, 20:618–619
in wastewater treatment, 25:889t, 891

Flotation agents, fatty amines, 2:533
Flotation columns, 16:653
Flotation cycles, graphite, 12:781–782
Flotation equipment, 16:652–655
Flotation machines, 16:652–653
Flotation melter, 21:391
Flotation reagents, 16:645
search for, 16:647
Flotation separation, of silver, 22:646–647
Flotation systems
complex, 16:646
research on, 16:653–654

Flounder, aquaculture, 3:189

Flours
bleaching of, 12:56–57
types of, 26:282–284

Flour treating agent, 12:32
“Flow model,” of polymer growth, 26:528

Flow(s). See also Cross-flow filtration;
Reverse flow
compressible, 11:760–761
around cylinders, 11:753–757
defined, 21:702
free shear, 11:757–760
internal, 11:749–751
Marangoni, 12:4
past a solid surface, 15:717–718
past deformable bodies, 11:775–777
past solid bodies, 11:753–757
through porous media, 11:330–332,
766–767
near solid walls, 11:751–753
turbulent, 11:778
two-phase, 11:771–777
unstable and secondary, 11:761–766

FLOW-3D software package, 7:448

Flow behavior
of filled polymers, 11:303
types of, 21:703–704
Flow capacity settler, 10:776
Flow characteristics, as wastewater parameter, 25:886t
Flow charts, 21:174–175. See also Flowsheets
in sensor technology, 22:265–266
Flow control system, 13:169
Flow cytometry, microfluidics in, 26:971
Flow distribution. See also Flow maldistribution effect
effect of area ratio on, 13:273
flow header static pressure and,
13:274–275
in manifolds, 13:272t
Reynolds number and, 13:275

Flower/fruit setting agent, 13:57
Flowery odor, 3:228t
Flow geometries, 15:719–721t
Flow-induced coalescence
of droplets, 20:331–332, 333
in polymer blends, 20:331–332
Flow-induced vibrations, 13:270
Flow injection, capillary electrophoresis, 4:634
Flow injection analysis (FIA), 9:587
Flow-injection immunoanalysis, 6:400
Flow maldistribution effect, 13:258,
270–271
Flow manifolds, dividing and combining, 13:272

Flow measurement, 11:647–678. See also Flowmeters
flow calibration standards in, 11:651–653
Flowmeters, 11:782–783. See also Fluid energy activated flowmeters; Master flowmeters
accuracies of, 11:651
ambient environment of, 11:649
axial-flow angular-momentum, 11:672–673
classifications of, 11:653–654
coriolis-type, 11:671–673
correlation, 11:675–676
differential-pressure, 11:656–663
Doppler, 11:673
ey economic considerations related to, 11:651
electromagnetic, 11:669–676
external stimulus, 11:669
fluid energy activated, 11:654–669
fluid properties and, 11:648–649
head-area, 11:664–666
laser Doppler, 11:675
measurement requirements for, 11:649–651
momentum, 11:671
oscillatory, 11:667–669
selecting, 11:648–651
thermal, 11:676–677
transit time, 11:673–675
ultrasonic, 11:673–675
variable-area, 11:663–664
Flow mixing, 14:612–613
Flow models, 21:704–706
Flow nozzles, 11:660
Flow pattern, impeller, 16:684
Flow profile conditioning devices, 11:649
Flow profiles, 11:649
Flow rate(s)
in fermentation, 11:34
measurement of, 11:781–783
in microfluidics, 26:962
water treatment system, 14:396
Flow rate ratio measurements, 20:227
Flow rate sensors, 20:680–681
Flow reactors, 21:332–333
Flow regimes, 11:772–774
Flow separation, 11:754–755
Flowsheets. See also Flow charts
in chemical process design, 20:710
design, 20:718–720
constructing, 22:307–312
evolutionary modification of, 22:298
for methyl acetate separations system, 22:332–337
in minerals recovery and processing,
16:603–605
for reactive systems, 22:329–337
Flow tests, 19:575
Flow transition, relationships for estimating, 15:719–721
Flow turning, pressure drop from, 13:262
Flow velocity, pressure drop and, 19:473
Flow visualization, 11:785–786
“Floxed” genes, 12:46
Fluacrypyrim, 14:348
Flubendazole, registered for use in aquaculture in Australia, 3:222t
Fluctuation analysis, 14:622
Flue dusts, rhenium from, 21:682
Flue gas desulfurization (FGD), 15:407
citric acid application, 6:647
limestone in, 15:39
magnesium sulfite in, 15:421–422
slaked lime in, 15:64
Flue gas desulfurization system, 10:101
Flue gas emissions, minimization of, 20:760
Flue gases
carbon dioxide recovery from, 4:808–809
commercial gas absorption processes, 1:26
crushing, 11:716–717
temperature of, 10:100–101
Flue gas handling, in FCC unit regenerators, 11:729
Flue gas to air exchange, 10:144
Fluellite, 2:363
FLUENT software package, 7:25, 448
Fluid atomizers, flow through, 23:181–182
Fluid-bed behavior, describing, 11:822.
See also Fluidized-bed entries
Fluid-bed direct oxidation process, 10:656
Fluid-bed dryers, 9:122–123, 130–131
two-stage, 9:125
Fluid-bed roasters, 16:141
Fluid catalytic cracking (FCC), 11:678–699, 700–734; 18:651, 653; 20:777; 24:257, 271. See also FCC entries; Fluidized-bed catalytic cracking (FCC)
clean fuels production and, 11:686–689
defined, 11:700
environmental issues related to,
11:689–694
reaction mechanism of, 11:687–688
residual oil processing and, 11:681–685
short contact time cracking and,
11:685–686
activated alumina applications,
2:399–400
Fluid-catalytic-cracking off-gas, 23:330
Fluid-catalytic-cracking riser technology, 16:835
Fluid-catalytic-cracking units, 10:622;
18:564; 24:258–259
Fluid coking, 18:650–651
Fluid-column roaster, 26:564–565
Fluid deposits, 17:694–695
Fluid-dynamic separating devices, 22:275,
283. See also Classifiers
Fluid energy activated flowmeters,
11:654–669
cup and vane anemometers, 11:666
current meters, 11:666
differential-pressure flowmeters,
11:656–663
head-area meters, 11:664–666
oscillatory flowmeters, 11:667–669
positive-displacement flowmeters,
11:654–656
Fluids. See also Complex fluids; Gas entries; Geopressured fluids; Liquid entries.

Fluids. See also Complex fluids; Gas entries; Geopressured fluids; Liquid entries.

Fluid resistance of ethylene–acrylic elastomers, 10:699 of poly(fluorosilicones), 20:241

Fluids. See also Complex fluids; Gas entries; Geopressured fluids; Liquid entries.

Fluid oscillation, 11:667–668

Fluid motion, 15:497

Fluid mechanical pressure, 11:740

Fluid mechanics, 11:735–791. See also Flow(s); Fluid motion; Rheology computational, 11:777–781
dimensional analysis in, 11:743–748 experimental, 11:781–786
nomenclature related to, 11:786–788 principles of, 11:736

Fluid mixing, 16:669

Fluid motion, 11:735–749. See also Fluid mechanics; Fluids in motion

Fluid nozzles, 23:175

Fluid resistance of ethylene–acrylic elastomers, 10:699 of poly(fluorosilicones), 20:241

Fluids. See also Complex fluids; Gas entries; Geopressured fluids; Liquid entries.
Fluorescence, 8:256; 22:716. See also EDXRF instruments; Micro X-ray fluorescence (MXRF) analysis; Total reflection X-ray fluorescence spectrometry
micro X-ray, 26:437–439
Raman scattering and, 21:324, 325
sensors using, 22:271
Fluorescence-activated cell sorter, 26:971
Fluorescence band maxima, 20:512
Fluorescence detection, 17:635
Fluorescence detectors, liquid chromatography, 4:622; 6:386–387, 449
Fluorescence immunoassay, 14:148–150
Fluorescence labeling, polymethine dyes in, 20:519–521
Fluorescence microscopy, 16:483
Fluorescence polarization (FP), 14:149–150
Fluorescence polarization immunoassay (FPIA), 12:97
Fluorescence protection immunoassay, 14:150
Fluorescence quantum yields, 20:512–513
Fluorescence resonance energy transfer (FRET), 17:636; 26:804
Fluorescence spectra, of polymethine dyes, 20:512–513
Fluorescent brightening, of fibers, 11:181
Fluorescent brightening agents (FBAs), 9:266
Fluorescent lamp coatings, ethylene oxide polymers in, 10:688–689
Fluorescent lamps, mercury in, 16:41
Fluorescent lighting phosphors, cerium application, 5:688–689
Fluorescent photo-induced electron transfer (PET) sensor, 24:54
Fluorescent pigments, for inks, 14:318
Fluorescent probes, 11:150; 16:388
modified-base oligonucleotides as, 17:633–634
Fluorescent whitening, of wool, 26:401–402
Fluorescent whitening agent (FWA), 26:400, 402
in paper manufacture, 18:114
Fluorescers, as soap bar additives, 22:744
Fluoridation, sodium fluoride in, 22:825
Fluoride(s), 11:828–829
binary noble-gas, 17:335–336
dental application, 8:339–341
as food salt additives, 22:816
glass-ceramics based on, 12:642
iridium, 19:648
osmium, 19:641
palladium, 19:650
perfluoroacyl, 11:883
platinum, 19:654–655
reactivity of, 11:853–854
rhodium, 19:644
ruthenium, 19:638
fluorine (F), 11:826–852. See also ArF laser; KrF laser
analytical methods for, 11:843–844
burns from, 11:845
catalyst poison, 5:257t
chemical properties of, 11:828–832
commercial production of, 11:826
disposal of, 11:845

fluorine-containing polymers, 11:866
fluorinated compounds, synthesis of,
11:861
fluorinated diacyl peroxides, 18:472
fluorinated epoxy resins, 10:366–367
fluorinated ethylene propylene (FEP), for
copper wire, 7:691. See also FEP polymer
fluorinated ethylene–propylene
copolymer, 15:248
fluorinated ethylene propylene resin, 24:15
fluorinated ethylene propylene materials,
acid resistance of, 23:785
fluorinated heterocyclic compounds,
11:867
fluorinated liquids, physical properties of,
11:878t
fluorinated olefins, 11:866
fluorinated organics, production of, 11:847
fluorinated polyimides, 20:278
fluorinated thermoplastics, 10:8
fluorinated titanocene, 25:118
fluorinating agents, electrophilic, 11:847
fluorination, 9:281, 678–679
amorphic ring, 11:866
chlorocarbons, 6:235
direct, 11:864, 882
electrochemical, 11:864–865, 882
of germanium, 12:552
halogen exchange, 11:861–864
selective, 11:831
fluorine cells
anodes of, 11:835–837
assembly of, 9:624
commercial, 11:832–837
components of, 11:837
heat transfer by, 11:837–838
types of, 11:832–837
fluorine compounds. See also Inorganic
fluorine compounds; Organic fluorine
compounds
reactivity of, 11:828–832
stability of, 11:854
fluorine-containing minerals, 11:853
fluorine-containing polymers,
10:218–220
fluorine derivatives. See Morphactins
fluorine ores, 11:854–855
fluorine perchlorate, 18:279
fluorine production, 9:635
economic aspects of, 11:841–843
equipment flow sheet for, 11:840
equipment used in, 11:839–841
processes used in, 11:838–839
raw materials for, 11:838
fluorinert electronic liquids, 11:884
fluorine surface preparation, 11:846
fluorite, 4:570
color, 7:337
fast-ion conductor, 5:590
hardness in various scales, 1:3t
fluoroalkylations, 12:168
fluoroalkyl-substituted titanates, 25:73
fluoroaluminates, naturally occurring,
2:364
fluoroantimonic acid, 3:65
fluoroaromatics, preparation of, 11:862
fluorobenzene, 3:602
fluoroborates, 4:149–159
properties of metal, 4:152t

fluorine analysis, of water,
fluorimetric techniques, in platinum-
fluorinated titanocycle,
fluorinated polyimides,
fluorinated organics, production of,
fluorinated thermoplastics,
fluorinated olefins,
Fluoroboric acid, 4:149–159; 24:807
health and safety factors, 4:153
manufacture, 4:151
physical properties of, 4:150t, 150–151
uses of, 4:153
Fluorobromonium
hexafluorobismuthate(V), 4:22
Fluorocarbon elastomer (FKM) polymers,
20:246, 247
Fluorocarbon elastomers, 9:563. See also
Fluoroe lastomers (FKM)
Fluorocarbon groups, containing titanium
complexes, 25:98
Fluorocarbon industry, 18:303
Fluorocarbon production, 11:869
Fluorocarbons
boiling points of, 11:860t
hydrogen fluoride in the production of,
14:18–19
Fluorocarbon surfactants, 24:133, 152
Fluorochloridone, 13:295, 325
Fluorelastomers (FKM), 21:769, 795.
See also Fluorocarbon elastomer
entries
Fluoroethene. See Vinyl fluoride
Fluoroether and fluoroamine production,
economic aspects of, 11:884
Fluoroethers and fluoroamines, 11:877–888
chemical properties of, 11:879–881
health and safety factors related to,
11:884–885
physical properties of, 11:877–879
solubility of gases in, 11:881t
solvent properties of, 11:880–881
uses for, 11:885–886
Fluoroformyl peroxide, 18:477
Fluorogermanates, 12:552–553
Fluorgypsum, 4:593
Fluoroionophores, 20:517–518
6-Fluoro isomers, 24:596
Fluoro methylpyridinium tolenesulfonate
(FMP) method, for covalent ligand
immobilization, 6:396t
2-Fluoronicotinic acid, 21:107
Fluoroolefins, hydroboration of, 13:643
4-Fluorophenyl sulfone, block copolymer
synthesis, 7:647t
Fluorophore-labeled antibodies, 14:148
Fluorophores, commonly used, 14:148, 149t
Fluoropolymers
properties of, 10:219t
synthesis of, 12:809
Fluoroquinolones, 3:29; 21:215, 230
adverse effects of, 21:231
antibacterial activity of, 21:218t
future design of, 21:221
bacterial resistance mechanisms, 3:32t
Fluorosilicate fusion, of zircon, 13:82;
26:629
Fluorosilicate glass-ceramics, 12:634–637
Fluorosilicates, 12:631
Fluorosilicone bases, 20:243
Fluorosilicone blends, 20:247
Fluorosilicone compounds, 20:243
Fluorosilicone rubber, 20:246–247
Fluorosilicones, 20:241; 21:772. See also
Poly(fluorosilicones)
Fluorosulfuric acid, 12:191
Fluorotitanates, 25:48–49
Fluoroxenates, alkali metal, 17:329–330
Fluorozirconate crystallization, of hafnium,
13:84
Fluor process, carbon dioxide recovery from
natural gas, 4:814
Fluorspar, 4:570–580; 11:826, 854, 855
analysis, 4:577t
consumption by end use, 4:579t
in hydrogen fluoride manufacture, 14:10
U.S. exports, 4:577t
uses of, 4:579–580
world mine production, reserves, and
reserves base, 4:572t; 14:16t
Fluorspar supply, hydrogen fluoride
production and, 14:14–16
Fluosilicic acid, recovery of, 14:12
Fluosol-DA, 4:113
FluoSols roaster, 26:563
Fluwet, commercial defoamer, 8:241t
Flurenoxybutyl morphactin, 13:44t
Fluridone (Sonar), herbicide/algicide for
aquaculture in U.S., 3:215t
Fluridone, 13:325
Fluroxypyr, 13:322
Flurprimidol, 13:42t, 52
Flushed ink colors, 14:316
Flushing, dispersions, 8:711
Fluvastatin sodium, 5:142
molecular formula and structure, 5:139t
Flux, 23:803. See also Fluxes; Mass flux
membrane, 15:830–832, 833
Flux density, 23:806, 813–814
maximum trapped, 23:844
in the Meissner effect, 23:802–803
Flux-density profile, 23:816
Flux drop, in reverse osmosis, 21:638
Fluxes. See also Flux
dental applications, 8:316–319
for glass production, 13:386
in ironmaking, 14:499
Flux flow, in superconductors, 23:823–825
Flux-flow transistor (SFFT), 23:872
Fluxing lime, 15:27
Fluxionality, 16:61–62
Flux lattice melting line, 23:819
Flux lines, shape of, 23:822
Flux motion, velocity and force diagrams
for, 23:824
Fluxoids, 23:803, 813
pinning force on, 23:826
Fluxon lattice, 23:812–815
Fluxline lattice, 23:813–814
Fluxons, 23:803, 817, 823–824
in Type II superconductors, 23:813–814
Flux pattern, in Type II superconductors,
23:813–815
Flux pinning mechanisms, 23:833
Flux pumps, 23:865
Flux values, 23:187
FMEA table, 13:159–161
Foamable ABS systems, 23:404
Foamaster, commercial defoamer, 8:241t
Foam boosters, cosmetic surfactants, 7:834t
Foam control, polyfluorosilicones in,
20:245
Foamed boards, 23:403–404
Foamed polystyrene, 23:403
Foamed sheet polystyrene, 23:408
Foamex, commercial defoamer, 8:241t
Foam extrusion, 23:822
Foam-forming materials, injection of,
12:22–23
Foam fractionation, 12:22
Foaming
coating films, 7:124
carbon dioxide, 24:20–22
during fermentation, 11:39
in latex processing, 14:722
Foaming agents, 9:23; 12:20–21
for PVC polymers, 25:675–676
Foaming-in-place beads, rigid foam from,
23:405–406
Foam inhibitors, for lubricants, 15:226
Foam mat drying, 9:119
Foam blowing, 19:552–553, 818
Foam products, use of latex in, 14:712
Foam rubber, properties and applications
of, 22:585–586
Foams, 7:272t; 8:697; 12:1–29
aerosols, 1:773, 774
applications for, 12:19–25
beer, 12:21
classification of, 12:3
and detergency, 8:425–426
detrimental effects of, 12:20
drainage in, 12:12–14
dry, 12:8–10
economic aspects of, 25:477
extinguishing capability of, 21:859
in food, 12:21
gas diffusion in, 12:14–15
linear rheology of, 12:16–17
liquid distribution inside, 12:10
measurement of, 12:10–11
microstructure of, 12:1–2
nonequilibrium nature of, 12:2–3
nonstabilized, 17:510
occurrences of, 7:273t
in oil recovery, 12:22–23
phenolic resin, 18:795–796
physical chemistry of interfaces in,
12:3–19
polychloroprene latexes in, 19:860–861
polyimide, 20:282–283
production of, 12:19
rheology of, 12:15–19
stability of, 12:11–12, 15, 21
structure of, 12:7–11
sulfur use in, 23:593
in tertiary oil applications, 12:23
3D structure of, 12:10
unjamming, 12:18
very wet, 12:7
viscous behavior of, 12:18
wet, 12:7–8
Focal plane array (FPA) detectors,
14:233
Fog
as colloid, 7:272t
occurrences of, 7:273t
Foil adhesives, 25:582–583
Foil strain gauge, 26:230, 231
Folate, in beer, 3:588
Folate biosynthesis, inhibitors of, 23:503
Folate–dendrimer conjugates, 26:797
Folate inhibitors, bacterial resistance mechanisms, 3:32t
Folate metabolism, 23:502
Folic acid, 13:43t, 52
Folded guide microwave applicator, 16:522
Folding-carton inks, 14:321
Folding carton packaging, converting, 18:21–22
Folding paperboard food cartons, 18:36
Folex, 13:43t, 52–53
Folic acid, 2:822; 17:655; 25:800–803
ascorbic acid and, 25:769
cofactor forms of, 25:801–802
dietary sources of, 25:803
drug–nutrient interactions involving, 25:802–803
metabolic function of, 25:802
Folcysteine, 14:hydrogen peroxide in, 13:hydrocarbon use in, 14:iodine determination in, 14:irradiation, 8:664–666
irradiation with radioactive cobalt, 7:219
lead content of, 14:763–764
liquid chromatography applications, 6:465
low density polyethylene contact with, 20:230
methylcellulose applications, 5:459t
microencapsulation of, 16:454–459
nonvolatile components in, 11:522–523
oxidative degradation of, 12:59
potassium content in, 20:641–642
release agents and, 21:605, 608
restoration, enrichment, and fortification of, 12:70
salt in, 22:814–815
silica in, 22:374
supercritical fluid extraction for, 24:13
texture of, 11:564, 565
U.S. citric acid/citrate distribution, 6:643t
uses of succinic acid and succinic anhydride in, 23:428t
yeast-fermented, 26:455–457
Food absorption measurement, 280
radiotracers in, 21:280
Food acceptance, 11:563
aspects of, 11:564
Food Additive petition, 12:35, 36
Food additives, 12:29–74
approval process for, 12:36
ascorbic acid as, 25:760
categories of, 12:34, 37–38
EU rules for, 12:37
flavor, taste, appearance, and texture enhancers, 12:44–57
function of, 12:30–33
government regulations for, 12:33–38
kaolin application, 6:688t
liquid chromatography applications, 6:465
market overview for, 12:70–71
nutrients, 12:67–70
palygorskite/sepiolite application, 6:700t
phosphoric acids as, 18:829–830
preservatives, 12:57–63
processing aids, 12:63–67
smectites application, 6:697t
stannous chloride as, 24:803
sweeteners, polyols, and bulking agents, 12:38–44
terms associated with, 12:31–33
use pattern for, 12:71
Food Additives Amendment of 1958, 12:34, 35–36
Delaney Clause of, 21:578–579
Food additives law (EU), 12:36–37
Food additive suppliers, 12:70
Food analysis
chromatographic methods in, 23:476
mass spectrometry in, 15:669
Food and Agriculture Organization (FAO), 11:592
Food and beverage processing, reverse osmosis in, 21:650–651
Food and Drug Administration (FDA), 10:848; 11:47; 18:682; 21:568. See also FDA entries; U.S. Food and Drug Administration (FDA)
anthropogenic silicas and silicates and, 22:468
aquaculture chemical regulations, 3:209
basic structure of, 18:687
cosmetic and pharmaceutical packaging requirements, 18:24
Daily Values of, 25:784–787
ink regulation under, 14:332
Investigational New Drug meetings with, 18:695–696
jurisdiction over food additives, 12:33
PVA regulations by, 25:612–613
regulation of feed additives, 10:846–847
regulation of vaccines by, 25:487
role in cosmetic and pharmaceutical packaging, 18:26–27
salt standards by, 22:808, 810, 813
Food and Drug Administration Modernization Act of 1997 (FDAMA), 18:686, 688, 689
Food and Drugs Act, 18:683
Food and Nutrition Board (FNB), 17:646
Food antioxidants, 12:59–61
Food applications
lactic acid in, 14:124–125
microbial transformations in, 16:397
petroleum waxes in, 26:218
polyethylene waxes in, 26:219
of sucrose, 23:479
Food-based therapies, 11:14
Food canisters, composite paperboard, 18:36–37
Food carton liners, 18:36
Food cartons, folding paperboard, 18:36
Food Chemicals Codex (FCC), 10:309, 310; 11:575; 23:790
in fine chemical production, 11:435
p-hydroxybenzoic acid in, 22:23
sodium nitrate specifications, 22:851t
sodium nitrite specifications, 22:856
Food Chemistry Division of the Ministry of Health and Welfare (Japan), 12:37
Food color additives, certification-exempt, 12:51t
Food colors
certified, 12:49–50
noncertified, 12:51
Food commodities, freezing temperatures of, 21:563t
Food components, fats and fatty oils as, 10:828–829
Food deterioration, water activity in, 12:76–77
Food distribution system, modern, 21:565
Food, Drug & Cosmetic (FD&C) Act, 11:581; 18:682. See also FD&C color additives; Food Additives Amendment
Food Additives Amendment to, 12:34
Food, Drug, and Insecticide Administration, 18:682
Food enzymes, 10:309–310
functions of, 12:64
Food flavoring compounds, vanillin in, 25:551–553
Food freezing, 21:561–563
advantages and disadvantages of, 12:82–83
Food freezing equipment, 12:82, 83–84
Food-grade extra pure vanillin, 25:549–550
Food grade fermentation, lactic acid, 14:124
Food grade hydrogen peroxide, 14:59
Food grade sodium nitrite, 22:856, 857t
Food-guide pyramid, 26:289–290
Food industry
enzyme applications in, 12:65t
enzyme catalysts for, 10:296–300
nitrogen use in, 17:285–286
preparation of yeast in, 26:459–464
Food ingredients. See Food(s); Food additives
Food laws, British, 23:160–161. See also Food Additives Amendment of 1958; Food and Drug Administration Modernization Act of 1997 (FDAMA); Food Chemicals Codex (FCC); Food Quality Protection Act of 1996 (FQPA)
Food manufacturing aids, 12:66–67
Food manufacturing, computer integrated, 12:87–88

Food packaging, 18:30-54
  - barrier polymer applications, 3:405
  - blow molding, 18:49–51
  - classification of, 18:31–35
  - coextruded, 18:44, 45
  - flexible, 18:45–47
  - glass, 18:39–40
  - LLDPE, 20:207
  - metal can, 18:37–39
  - monoorganotins in, 24:830
  - paper for, 18:35–37
  - plastic, 18:40–51
  - semirigid, 18:47–51
  - stannous 2-ethylhexanoate in, 24:826–827
  - thermoformed, 18:48–49
  - three-dimensional, 18:48–49

Food polymers, 11:550

Food precooling/cooling, 21:559–561
  - systems for, 21:560–561

Food preparation processes, novel, 11:555

Food preservation, 12:77–88
  - by fermentation, 26:475
  - theory, 12:75–76

Food preservation technology
  - alternative, 12:86–87
  - thermal, 12:79–81

Food preservatives, antimicrobial peptides
  - as, 18:265

Food processing, 12:74–89. See also Food preservation
  - computer integrated manufacturing, instrumentation, and controls for, 12:87–88
  - firms, 12:78–79
  - industry, 12:74
  - lubricants and, 15:260
  - operations, 12:75
  - optimization of, 12:75–77
  - regulations related to, 12:75
  - use of lignosulfonates in, 15:20

Food processing
  - flocculating agents in, 11:625
  - ion exchange in, 14:418–419
  - microwave technology in, 16:526–529
  - salt in, 22:814–815
  - solvent extraction in, 10:787
  - sulfur dioxide in, 23:667
  - use of aqueous hydrochloric acid in, 13:834

Food processing aid, 12:33

Food-producing animals, subtherapeutic antibiotic levels in, 13:8t

Food products
  - consequences of polymorphism in, 10:819–820
  - FDA regulation of, 21:578–579
  - gelatin in, 12:442
  - high pressure treatment of, 13:436
    - processed, 18:32–35
  - shipping containers for, 18:37

Food Quality Protection Act of 1996 (FQPA), 18:538–539; 21:591

  - minor use pesticides under, 18:539–540

Food refrigeration, 21:558–566
  - importance of, 21:559

Food Safety and Inspection Service (FSIS), 13:17

Food-to-microorganism (F/M) ratio, in biological waste treatment, 25:830, 896, 897, 898

Food/water consumption, in toxicology studies, 25:216

Fool’s gold, color, 7:334

Foot-and-mouth disease vaccine, 5:345t

Foot preparations, 7:842t

Foraflon, 7:641

Forages, as ruminant feed, 10:863

Foraminifera, 17:690

Forastero cocoa beans, 6:353

Ford nuclear reactor, 17:594
Formaldehyde, 2:107–128
 annual consumption by region, 2:67t
 antimicrobial used in cosmetics, 7:831t, 832
 chemical properties of, 12:109–113
 condensation of, 12:110
 condensation with acetylene, 1:220
 condensation with alcohols, 12:111–112
 condensation with olefins, 12:111
 condensation with propylene, 12:111
 demand for, 12:118
 derivatives of, 12:124
 electrohydrodimerization of, 12:652
 emissions, 10:59, 60
 health and safety factors related to, 2:67; 12:120–121; 18:780
 in hollow fiber post-treatment, 16:13
 indoor air pollutant, 1:804
 manufacture of, 24:265
 in modified viscose processes, 11:259–260
 monomeric, 12:108t
 oxidation of, 14:41
 from PAN in photochemical smog, 1:795
 in phenolic resin production, 18:758–759
 physical properties of, 2:60t; 12:107–109
 polymerization, 10:183–184
 reactions with PVA, 25:602
 reaction with carbon monoxide, 5:10
 reaction with di(hydroxymethyl) peroxide, 18:458
 salicylic acid and, 22:5, 6
 scavenging by alkanolamines from nitro alcohols, 2:120
 sol–gel polymerization with resorcinol, 1:751–752
 specifications for, 12:118, 119t
 storage and handling of, 12:119–120
 terpenoids from, 24:480
 typical commercial gas absorption process, 1:266
 uses for, 12:121–124; 16:314
 vinyl chloride reactions with, 25:632
 Formaldehyde–alcohol solutions, 12:109, 123
 properties of, 12:119t
 Formaldehyde emission regulations, 15:776
 Formaldehyde gas, 12:110
 Formaldehyde–hydroquinone developers, 19:210
 Formaldehyde manufacture, 12:113–117.
 See also Formaldehyde production by exothermic reaction, 12:115
 metal oxide catalyst, 12:115–117
 methanol process for, 12:113
 new processes for, 12:117
 silver catalyst, 12:113–115
 Formaldehyde plant
 metal oxide catalyst, 12:115–116
 silver catalyst, 12:114
 Formaldehyde production, economic aspects of, 12:117–118. See also Formaldehyde manufacture
 Formaldehyde resins, 2:622–623
 Formaldehyde scavenger resins, 15:780
 Formaldehyde solutions
 analytical methods for, 12:118–119
 distribution of, 12:109
 vapor pressure above, 12:108–109
Formalin, 2:622
promising new uses for aquaculture, 3:223
registered for use in aquaculture in
Australia, 3:222t
registered for use in aquaculture in
Canada, 3:218t
registered for use in aquaculture in
Europe, 3:220t
therapeutant for aquaculture in U.S.,
3:205t, 211t
Formal urea kinetic modeling (UKM),
26:823
Formamide, solvent for chiral separations,
6:78
Formamidine sulfinic acid, for bleaching of
recycled pulps, 21:52
9-Formamido-mine, 24:598
Formaminoimidazole carboxamide ribotide
(FAICAR)
folic acid and, 25:801
Formate esters, 10:512
Formate process, for sodium dithionite
manufacture, 23:674–675
Formates, iron, 14:537
Formazan dyes, 9:264, 400–401
Formic acid, 5:27
dissociation constant, 5:40t
physical properties, 5:29t
production from carbon monoxide,
5:5–6
water–formic acid–1,2-dichlorethane
azeotrope, 8:823
Formic acid–water–m-xylene azeotrope,
8:821
Forming, of thermoplastics, 10:179.
See also Molding
Forming additives/processing aids,
ceramics processing, 5:646–648
Forming-die alloys, zinc, 26:594
Forming limit analysis, copper wrought
alloys, 7:736–737
Formonitrile, 8:171
Formulation aid, 12:32
Formylation, 12:177–178
Formyfluoride (HCOF), 12:178–179
Formylglycine ribotide (FGAR), folic acid
and, 25:802
N-Formylpiperidine, 21:128
Formyl prefix, 2:58
N (^3)-Formyl tetrahydrofolic acid, 25:803
N (^10)-Formyl tetrahydrofolic acid, 25:801
Fornacite, 6:471t
Frster-Dewar-Knott (FDK) rule, 20:510
Frster energy transfer, 22:218
Forsterite, as a refractory raw material,
21:490, 518
Fortification, of vitamin C, 25:765
Fortified food groups, 12:69
Fortified wines, 26:300–301
Fortisan
cellulose II form, 5:377
strength, 5:360–361
Fortune 500 corporations, as sponsors of
research, 24:385
45S5 bioactive glass, 12:611
40-nucleotide hammerhead ribozyme,
17:619
Forward approach, to qualitative reliability
analysis, 26:984
Forward-roll coaters, 7:12–13
method summarized, 7:5t
shear rates, 7:32t
Fosamine–ammonium, 13:320
Fosinopril sodium, molecular formula and
structure, 5:150t
Fossil-based hydrogen production
processes, 13:844
Fossil fuel cycles, real conventional,
23:234
Fossil-fuel-fired boilers, 23:216
Fossil fuel plants, combined cycle,
23:236
Fossil fuels, 3:683; 23:26
combustion system design
considerations, 7:467–469
greenhouse gas emissions produced by,
3:703
Fossiliferous limestone, 15:27
Fossil reserves
lyocell process and, 11:280
viscose process and, 11:278
Fossil steam turbine system, 23:229
Fossil turbines, 23:229
Foster, Jackson W., 11:50
Fosterite, carbon monoxide compatibility with, 5:4t
Fougere fragrances, 18:360
Foulants, pretreatment steps for, 21:662–664
Fouling
in industrial water treatment, 26:140
membrane, 15:830, 831, 832, 833
in membrane filtration, 25:818
Fouling catalysts, 5:256t, 263–270;
10:90–94
prevention of deactivation after, 5:304, 309
Fouling precursors, coal, 6:782
Fouling resistance, in selecting membrane
modules, 15:821–822, 823t
Fouling resistant membranes, 16:28
Foul release antifoulings, 7:162–164
Foundries, copper,
7:690–691
Foundry alloys
zinc, 26:591–594
Foundry binders
kaolin application, 6:688t, 696
smectites application, 6:697, 697t
Foundry facings, natural graphite in,
12:794
Foundry industry, furfuryl alcohol resins
in, 12:272
Foundry resins, phenolic, 18:788–789
Foundry sand, chromite application,
6:493–494, 497
4A zeolite. See Zeolite 4A
Four-component color matching system,
19:382
Four-component mixtures, separation of,
22:301
Fourdriner paper former, 18:118,
119–120
“Four-equivalent” couplers, 19:249
Four-equivalent pyrazolinones, 19:255
4f elements, 14:630. See also Lanthanide
tables
4GT crystals, 20:71
4GT-PTMEG-T elastomers, 20:73
mechanical properties of, 20:74t
4HB, 20:257
400-series stainless steels, 13:511
Fourier derivation, 14:236
Fourier’s law of heat conduction,
13:242–243
Fourier’s nonsteady-state conduction
equation, 9:112
Fourier spectroscopy, 23:137
Fourier transformation, essential
equations for, 14:226–227
Fourier transform (FT) infrared (FTIR)
analysis, 19:563–564, 813. See also
Microscopy–FTIR technique
dichroism, in silicone network
characterization, 22:569
instruments, 23:138
advantages of, 14:228
resolution for, 14:227
microscopy, 14:232
Fourier transform infrared spectroscopy,
10:14; 14:225–228; 16:486;
24:109–110
attenuated total reflectance,
24:111–114
application in combinatorial chemistry,
7:404
archaeological materials, 5:743–744
Fourier transform mass spectrometry
(FTMS), 15:663–664
Fourier transform methods, in fine art
examination/conservation,
11:402
Fourier transform nuclear magnetic
resonance (NMR), 21:278
Fourier transform spectrometers, 19:671;
24:137
Fourier transform spectroscopy
diffuse reflectance infrared, 24:72,
110–111
for lignin characterization, 15:9
4-kDa peptides, 18:258
Four-level lasers, 14:666–668, 681
inversion in, 14:669
14-membered macrolides, 15:272–280
semisynthetic, 15:280–287
Fowler-Nordheim (FN) tunneling,
22:258
Fox, C. L., 22:679
Foxing, 11:409
FPAT file, 18:230, 235
Fractal gelation model, 23:63–64
Fractal objects, formation of, 23:63
Fractile distribution, 26:1021
Fractional carbonation, gallium extraction
by, 12:345
Fractional crystallization, 20:615
in potassium chloride refining,
20:624–625
steps in, 20:625
Fractional distillation of crude pine oil, 24:510
of crude sulfate turpentine, 24:476
Fractional extraction, 10:745, 759–760
Fractional factorial designs, 8:396
amount of coverage in experimental design texts compared, 8:395t
commercial experimental design software compared, 8:398t
Fractional velocity plots, 10:319–321
Fractions, 9:343, 345
Fracturing process, for high density polyethylene, 20:157
Fragmentation systems, 18:242
Fragmin, 5:174
molecular formula and structure, 5:172t
Fragrance agents, salicylic acid esters as, 22:12, 16. See also Perfume
Fragrance industry
analytical chemistry in, 18:379–381
focus on chirality in, 24:508
process research and development in, 18:384–386
safety, regulatory, and environmental aspects of, 18:388–389
Fragrance ingredients
myrcene as, 24:485–486
terpenoids used as, 24:474
Fragrance Materials Association (FMA) of the United States, 11:571, 575
Fragrances, 3:226. See also Fine fragrances; Functional fragrances;
Perfumes
bleach product, 18:363
deorator and antiperspirant, 18:364
detergent, 18:362
environmental, 18:364
fabric softener, 18:363
floral, 18:357
market share, 3:226t
men’s, 18:359–361
ozone use in, 17:810
performance of, 18:355
physiological and psychological effects of, 18:386–387
soap, 18:362–363
women’s, 18:357–359
Framatome 1500 MWeN4 reactor, 17:595
Frame coolers, 23:780
Framed bar process, in bar soap manufacture, 22:749
Frame-mounted pumps, 21:64
Frame transfer image shuttering, 19:147
Framework electron count, boranes, 4:172, 175t
France. See also French Patent Office aquaculture production, 3:189t
piezoelectric ceramics research, 1:708
regenerated cellulose fibers in, 11:249
Franck-Condon shift, 22:215
Frank-Caro cyanamide process, 17:292
Frankia species, in nitrogen fixation, 17:299
Frank-Wen flickering cluster model, of liquid water, 26:15, 16
Frascati Manual, 21:610
Frasch sulfur extraction process, 23:564, 570–573
Fraunhofer diffraction, 8:715; 23:193, 194
Free available chlorine (FAC), 13:98
Freeboard area, 7:203–204
Free charge carriers, 23:35
Free-cutting brass, 7:697, 748
mechanical properties, 7:678t
Freedom of Information Electronic Reading Room (CDER), 18:701–702
Free electron lasers (FELs), 1:720
Free energy, of antigen–antibody binding events, 14:138
Free energy of formation, 10:115
sodium, 22:766
Free energy of micellization, 24:130
Free enzyme-catalyzed reactions
ionic liquids in, 26:397–398
Free fatty acids, 10:802–804, 825–826
removal of, 10:807
as soap bar additives, 22:742–743
Free-flow agents, in sodium chloride (salt), 22:808
Free-flow electrophoresis, 9:752
Free lime, 15:27
hydration, 5:478
phase in Portland cement clinker, 5:472t, 473t
Free-living microorganisms, in nitrogen fixation, 17:301
Free-machining steels, tellurium in,
24:422–424
Free market, for silver, 22:648
Free moisture content, 9:97
Free on board (FOB), 25:329
Free-radical addition polymerization,
20:406–407
of butylenes, 4:408–409
Free-radical copolymerization, 7:611–624
Free-radical copolymerization reactivity ratios, 23:389t
Free-radical cure mechanism, silicone network preparation via, 22:568–569
Free-radical cyclization process, 21:147
Free-radical-initiated polymerization,
20:211
Free-radical initiators, 14:274–311
tert-alkyl hydroperoxides, 14:290–291
tert-alkyl peroxoesters, 14:284–286
azo compounds, 14:293–296
carbon–carbon initiators, 14:296–297
chemical methods for radical generation, 14:299
diacyl peroxides, 14:282–284
dialkyl peroxydicarbonates, 14:289–290
diperoxoyketalts, 14:287–288
di(tert-alkyl) peroxides, 14:288
economic aspects of, 14:303
ketone peroxides, 14:291–292
for mediated radical reactions, 14:297–299
monoperoxy carbonate, 14:286
peroxides as, 14:279–293
in styrene polymerization, 23:379
using radiation and photoinitiators,
14:299–303
in vinyl acetate polymerizations, 25:568
Free-radical nitrations
chemistry of, 17:165–167
of paraffins, 17:165–168
Free-radical polyethylene process,
20:149–151
Free-radical polymerizations, 16:273, 280;
20:375–376. See also Living free-
radical polymerization (LFRP)
of ABS, 1:419
of acrylic ester monomers, 1:377–380
of LDPE, 20:213
methodologies of, 20:486
of polychloroprene, 19:829–832
of styrene, 23:376, 377–384
of vinyl acetate, 25:557
processes in, 20:407–408
Free-radical polystyrene (FRPS)
polymerization, 23:372
Free-radical reactions, 10:606; 13:648–649
of maleic anhydride, 15:491
VDC polymerization via, 25:694, 695
Free-radical ring-opening polymerization,
23:705
Free radicals
and antiaging agents, 2:813–814
ascorbic acid and, 25:769
formation and use of, 14:274–279
structure-reactivity relationships in,
14:276–278
Free radical scavengers, 15:220
in VDC polymer stabilization, 25:719
Free-radical sources, in VDC emulsion polymerization, 25:723
Free-radical styrene polymerization,
general chemistry of, 23:381
Free-radical thermal cracking mechanism,
10:599–600
Free shear flows, 11:757–760
Free sintering, 18:300
Free spectral range (FSR), 14:671–672
Free surface vaporization, 24:724–725
Free-vibration instruments, 21:745
Free-volume coefficient of self-diffusion,
23:102
Free-volume theory, 23:106–107
do diffusion, 23:101
Free-vortex counterflow classifiers, 22:288–289
Freeze casting, ceramics processing, 5:652–653
Freeze-desalination, 26:71
Freeze dryers, 9:135–136
Freeze drying, 9:93, 116; 11:543
coffee, 7:262
encapsulation by, 11:539
of plasma derivatives, 12:138–139
Freeze spray atomization, 9:74–75
Freeze-thaw resistance testing, of paint, 18:70
Freezing
of food, 21:561–563
heat modes in, 21:562
Freezing/cooling agents, 12:32
Freezing, food preservation by, 12:81–84
Freezing points
of caustic soda solutions, 22:830
of high purity metals, 24:441–443
Freight, classification of, 25:334
Freight bill, 25:330
Freight forwarders, domestic, 25:328
Freight loss/damage, 25:335–336
Freight rates, 25:334–335
regulation of, 25:332–333
Freight shipments, U.S., 25:324t
Frey’s salt, 21:263
French Patent Office, 18:212, 230
Frenkel defects, 5:586
Frenkel equilibrium, 19:188
Frenkel exciton, 22:218
Frenkel’s theory, 23:74
Frequency
exponents of dimensions in absolute, gravitational, and engineering systems, 8:584t
in ferrite operation, 11:82
of transmission signals, 11:130
Frequency-agile laser sources, 17:452
Frequency allocations, for microwave power, 16:510–512
Frequency-difference method, 11:674
Frequency domain measurements, 14:621–622
Frequency-doubled Ar ion lasers, 19:115
Frequency doublers, commercial, 17:452t
Frequency doubling materials for, 17:451–452
second-order nonlinear optical materials for, 17:444
Frequency factor, 14:278
Frequency plots, in particle size measurement, 18:137
Frequency-shift flowmeters, 11:673
Frescolat MGA, 24:525
Frescolat ML, 24:525
Freshening, of silicone rubber, 22:580
Fresh food products, packaging of, 18:31–32
Fresh groundwater withdrawals, in the United States, 26:4
Freshwater, human appropriation of, 26:3–4
Freshwater manufacture, via desalination, 26:58–61
Freshwater muds, 9:3, 4
Freshwater shrimp, common and scientific names, 3:188t
Freshwater use, in the United States, 26:52
Freskomenthe, 24:526
Freundlich isotherm, 1:593, 626
Friction
ceramics, 5:631–632
coefficient of, 15:204–205
lubrication and, 15:204
Frictional force microscopy (FFM), 24:84
Frictional pressure drop, in heat exchanger design, 13:260–261
Friction and Wear Databank, 15:205
Friction coefficients, 10:178; 11:749, 750; 13:247
correlations for, 13:248t
Friction factor, 11:749, 750
Frictionless flow theory, 11:742
Friction materials
information sources for, 15:764
phenolic, 18:787–788
Friction modifiers, 15:213, 224–225
Friction polymers, 15:225
Friedel–Crafts acids, 12:172–173; 14:265, 266, 267
cationic polymerization and, 14:270
Friedel–Crafts acylation, 12:173–188; 24:181
benzene, 3:603
Friedel–Crafts alkylation, 12:160–173
benzene, 3:603
zeolites, 5:334
Friedel–Crafts catalysts, 10:586, 597
supported, 5:328–329, 332
Friedel–Crafts reactions, 12:159–199;
14:592, 593; 16:320; 20:795–796
acidic solid catalysts in, 12:160
of allyl alcohol with benzenes, 2:239
catalysts in, 12:188–192
of m-hydroxybenzoic acid, 22:21
of p-hydroxybenzoic acid, 22:22
ionic liquids in, 26:892–893
of salicylic acid, 22:5
of succinic anhydride, 23:421
of vinyl chloride, 25:632
Fried Test, 11:609
Frielnder synthesis, of quinolines, 21:190
Fries rearrangement, 16:566
Fringed fibril structure, 11:171
Fringed micelle structure, 11:171
Frittled glasses, 12:585
Frogs, alkaloids in, 2:75
Frhlich, Theodor, 25:747
Frontal analysis, 6:404–405
Frontal chromatography, 6:375–376
Frontier molecular orbital theory, 14:277
Frostbite, from vinyl chloride contact,
25:650–651
Froth, structure of, 12:7. See also Foams
Froth cameras, 16:654
Frothers, 14:733; 16:644
role in flotation, 16:650
Froth flotation, 12:21–22; 14:497, 733;
16:644–652
silver extraction via, 22:638, 646–647
in plastics recycling, 21:448
of potassium chloride, 20:615–616
Froude number (Fr), 11:745, 761, 819;
15:685, 686t; 22:57
Frozen foods
citric acid in, 6:645–646
packaging, 18:33–34
β-D-Fructofuranose, 4:707
Fructooligosaccharides (FOS), 23:442
Fructose, 23:437–438, 484–486
in coffee, 7:254
in beer making, 3:577
sweetness of, 23:484–485
D-Fructose, 4:707; 23:484
Lobry de Bruyn–Alberda van Ekenstein
reaction, 4:712
D-Fructose 1,6-bisphosphate, 4:711
reduction, 4:709
Fructose separation
adsorbents, 1:587t
liquid adsorption, 1:665, 674
with zeolite KX, 1:610
Fructosyloligosaccharides (FOS), 23:480
Fruit(s)
citric acid in, 6:632t
controlled atmosphere storage of,
21:564–565
frozen, 21:562, 563
as source of ascorbic acid, 25:764–765,
767t
Fruit flavor with other natural flavors
(WONF), 11:571
Fruit-hair fibers
processing of, 11:297
uses of, 11:299t
Fruit juices
deacidification of, 14:419
estimated maximum oxygen tolerance,
3:381t
Fruit sugar, 23:482
Fruity odor, 3:228t
Frumkin-Fowler-Guggenheim equation,
24:139
Frye rule, 12:90
F-silicalite
adsorption of oxygen and water on, 1:634
FT pair, 14:227
Fucans, 20:571–573
Fuchsine, 6:471t
Fucoidans, 20:571–573
Fuel(s), See also Motor fuel; Used fuel
acetylene, 1:221–222
alternative, 26:720
antioxidant applications, 3:123–124
biomass conversion for, 20:840
burning, 17:750
butylenes, 4:422–423
carbon/hydrogen ratio of, 12:321–322
catalyst poisons from, 10:53–54
combustion characteristics of, 15:41
dewaxing of, 16:844
effect on emissions, 26:719–721
for fuel-fired furnaces, 12:321–323
heteroatom removal from, 13:769
industrial furnace, 12:323, 324t
in lime kilns, 15:40s
natural gas as, 12:382–383
nuclear reactor, 17:568–569
properties of, 13:839t
propylene as, 20:782
Fuel cell research, 19:369–370
scrap rubber, 21:463–466
startability of, 12:397
tire-derived, 21:463–464
Fuel additives
  cerium applications, 5:686–687
coordination compound applications, 7:597
cycloaliphatic amines, 2:511
ethyleneamines application, 8:500t, 500–501
  metal-based, 10:54
Fuel alcohol
  from grains, 26:274
  program, 10:535
Fuel atomizers, 23:174
Fuel cell catalysts, high throughput experimentation, 7:395–396
Fuel cell electrodes, carbon black application, 4:800
Fuel cell interconnect, design and manufacture of, 12:200–201
Fuel cell research, 19:627–628
  alkaline, 13:858
  alkaline electrolyte, 12:214–216
  “balance of plant” for, 12:202
  bipolar plate for connecting, 12:201
  ceramics for, 5:610
  cobalt applications, 7:247
  direct methanol, 12:214
  efficiency and efficiency limit for, 12:209–211
  electrodes, 5:598
  electrolyte dissolved fuel alkaline, 12:216
  hydrazine-based, 13:599
  molten carbonate, 12:219–223; 13:860
  phosphoric acid, 12:216–219; 13:858–860
  platinum-group metal catalysts and, 19:626–627
  principles and problems related to, 12:199–202
  proton exchange membrane, 12:211–213; 13:861–862
  range of applications of, 12:205
  thermodynamics of, 12:205–211
  types of, 12:202–205; 13:859t
Fuel cell technology, graphite in, 12:797
Fuel cell vehicles, 13:800–801
Fuel cell voltage equation, 12:208
Fuel cell voltages, 12:206–209
  versus current densities, 12:208
Fuel cooling, in pressurized water reactors, 17:544
Fuel crossover, 12:214
Fuel economy, 12:388–389, 414
diesel engine, 12:420
Fuel efficiency, in furnaces, 12:332–333
Fuel-fired furnaces, 12:318–336
  analysis of, 12:332–333
  classification of, 12:320–321
  development of, 12:319–320
  industrial furnaces, 12:327–330
  power-plant furnaces, 12:323–327
Fuel gas
  carbon monoxide application, 5:24
  from coal gasification, 6:772
Fuel-grade MTBE, specifications for, 10:579
Fuel injection, diesel, 10:60–61
Fuel injection systems, 10:51
Fuel injector detergents, 12:408–409
Fuel metering system dynamic (lag time), 10:50
Fuel octane number, 12:392, 395
Fuel oil, as a petroleum product, 18:669
Fuel oil additives
  amine oxides, 2:473
  fatty amines, 2:534
Fuel properties, of ethers, 10:574
Fuel sources, chemical industry, 10:136
Fuel spills, hydrazine, 13:588
Fuel production, hydrocracking for, 16:842–844
Fuel sulfur, 10:54
Fuel sulfur reactions, TWC catalyst, 10:49
Fuel to air ratio (FAR), 7:435–436
Fuel volatility targets, 12:396–397
Fuelwood, as biomass, 3:684
Fugacities, 14:608; 24:665–666
  of a species in a mixture, 24:678–680
Fugacity coefficient, 8:746; 24:11, 666
Fugen reactor, 17:585
Fugitive emissions, 14:205
  from equipment leaks, 10:68–71
  sources and control effectiveness of, 10:69t
Fuji ACE (FI-800) integral film, 19:314, 315
Fuji Digital In-Printer Camera, 19:321
Fuji FI-10 integral film, 19:312–314
Fuji instant color films, 19:290
Fuji instant films, 19:312–314
Fuji Instax integral system, 19:314
Fuji peel-apart film FP-100, 19:314
Fuji photothermographic systems, 19:317–320
Fuji print films, 19:282
Fujix Pictrography, 19:290
Fujix Pictrography 1000, 19:317–318
Fulgides, photochromic materials, 6:599
Fulgimides, photochromic materials,
Fulgurites, 22:407
Full-color flat-panel displays, silicon-based semiconductors in, 22:259
Fullerene derivatives, 6:68–69
Fullerene formation, methods of, 12:229–230
Fullerene diagrams, 12:236
Fullerene polymers, 12:250–252
Fullerene pyrrolidine dicarboxylic acid (FDA), 17:57
bond lengths and structure of, 12:233–234
chemical reactivity of, 12:236–254
dimeric and fused, 12:233
discovery and synthesis of, 12:228–233
electron affinities and electrochemistry of, 12:234–235
electronegativity and bond fixation in, 12:237
elongated, 12:232
endohedral, 12:230–231
functionalization of, 17:51–52
heterofullerenes, 12:231–232
most abundant, 12:228
multiwall, 12:231
opened, 12:232
physical properties of, 12:233–236
properties and applications of, 17:48–50
quasifullerenes, 12:232–233
solubility and stability of, 12:234
spectroscopic properties of, 12:235
superconductivity in, 12:235–236
types of reactions with, 12:238–254
Fullerenols, 12:247–248
Fuller-Kinyon pump, 11:378
Fuller–Schettler–Giddings diffusivity equation, 15:674
Fuller’s earth, 6:666, 686
powder used in cosmetics, 7:841t
Full factorial design, commercial experimental design software compared, 8:398t
Full-text patent databases, 18:241, 247–248
Full width at half-maximum (FWHM), 14:691
Fully developed flow, 11:749–750
Fully integrated pilot plants, 19:458
Fully oriented yarn (FOY), 20:15
Fully processed foods, packaging,
18:33–35
Fully promoted catalyst system, 11:712–713
 Fully reversed fatigue test, 13:489
Fulminating silver, 22:674
Fumarate, in silicone network preparation, 22:566
Fumarate polymers, reaction rate with styrene, 20:105–107
Fumarate polymers, 20:100
Fumarates, iron, 14:537
Fumaric acid, 12:45; 15:481–482, 507
in citric acid cycle, 6:633
health and safety factors related to, 15:511
hydration of, 15:492
oxidation of, 15:494
physical properties of, 15:482–483
resin grade and food grade, 15:509
uses for, 15:512
Fumed silica, 22:33, 367–368, 374t, 383, 400, 581. See also Pyrogenic silica in synthetic fillers, 11:315–316
Fumed xerogel, powder used in cosmetics, 7:841t
Fumigants, 12:32
chloroform application, 6:288
for insect and pest control, 12:62
phosphides as, 19:58–59
Fuming, of tin slags, 24:788
Fuming sulfuric acid, 24:330
Function, smart materials classified by, 22:708t
Functional antibodies, expression of, 12:475
Functional biomaterials, 13:553
Functional chemicals, 20:712
Functional dyes, anthraquinone, 9:338–341
Functional failures, 15:476
Functional fluids, alkanolamines from nitro alcohols, 2:119
“Functional food” enhancers, 11:14
Functional food market, 17:674
Functional foods, 17:646
Functional fragrances, 18:361–364
Functional group analysis, for lignin, 13:550–552
Functional properties, of wax, 26:215
Functional unit, in life cycle assessment, 14:809
Functional failures, 18:259–286. See also Furfural
applications of, 12:279–280
as solvents, 12:279–280
health and safety factors related to, 12:280–281
physical properties of, 12:262–263t
Furan emissions, 13:181–181
limits on, 13:183
Furan hot-box resins, 12:273
Furan No-Bake (FNB) resins, 12:272–273
Furanones, 7:257t
Furanose ring, 4:698–699, 700
alpha and beta configurations, 4:699
Furan-resin-coated polysulfone hollow fiber, 16:15
Furan resins, 12:268
reinforced, 12:273–274
Furcellaran, 4:724t, 725–726; 13:67–68
classification by structure, 4:723t
Furcellaria gigantea, 11:296
Furfural, 12:259, 260–269
analysis of, 12:266–267
chemical properties of, 12:261–265
commercial importance of, 12:261
extractive distillation solvent, 8:802
formation of, 12:261
isolation and recovery process for, 12:267
Fused state baths, 18:85

Fusarium oxysporum, 6:46
Fusarium graminearium, 6:46

Fused-state baths, 387

Further exploitation of advanced shell technology (FEAST), 26:941

Fusain, 5:169
molecular formula and structure, 5:164t

Further Exploitation of Advanced Shell Technology (FEAST), 26:941

Fusarium graminearium, 11:4
Fusarium oxysporum, 13:351

Fused alumina, 1:2, 5–6
hardness in various scales, 1:3t
Fused alumina/zirconia, 1:6
hardness in various scales, 1:3t

Fused cast alumina

carbon monoxide compatibility with, 5:4t
Fused fullerenes, 12:233
Fused magnesia, 15:412
Fused pyridines, 21:153

Fused quartz, 22:411. See also Fused silica manufacture of, 22:413
viscosity–temperature curve for, 22:425

Fused ring aromatics, in petroleum, 18:587
Fused-ring naphthalene configuration, 17:70–71
Fused-ring polynuclear aromatic hydrocarbons, 18:588t

Fused salt electrolysis, 14:643
Fused-salt manganese metal electrolysis, 15:558–559

Fused salts, electrowinning from, 9:639–642
Fused silica, 22:401–402, 407–408, 411
dielectric properties of synthetic, 22:401t
manufacture of, 22:413–415
in optical fibers, 22:444
Fused state baths, 18:85

Manufacture of, 12:265–268
oxidation, nitration, and halogenation of, 12:264
physical properties of, 12:261
reactions with, 12:264
resinification of, 12:264
as a solvent, 12:261, 268–269
uses for, 12:268–269
worldwide capacity for, 12:267–268

Furfural derivatives, 12:268

Furfural process, of adiponitrile production, 17:235

Furfuryl alcohol, 10:429, 12:268, 269–274
chemical properties of, 12:270–271
esters and ethers of, 12:279
industrial value of, 12:272
manufacture of, 12:271
physical properties of, 12:269–270
polymerization of, 12:270, 272
resinification of, 12:272
as a solvent, 12:272
uses for, 12:271–274
worldwide capacity for, 12:271

Furfuryl alcohol resins, 18:794

Furfurylidene acetone monomer, 12:269
2-Furfurylthiol, 7:257t

Furnace atmospheres, 12:290–291

Furnace blacks, 19:409

Furnace electrodes, types of, 12:305

Furnace firing schedules, 12:735–736

Furnace–kettle refining, 14:747, 749

Furnace production, increasing, 12:598

Furnaces, 10:152. See also Blast furnace entries; Electric arc furnace (EAF);
Electric furnaces; Fuel-fired furnaces;
Imperial smelting furnace (ISF);
Incinerators; Isasmelt furnace; Lead
blast furnace; Old high bloomery
furnace; QSL furnace; Reaction
furnace; Reverberatory furnace; Shaft
furnace; Sinter-blast furnace
technology; Smelting furnaces;
Stuckofen furnace

baking, 12:734–735
energy consumption by, 10:156–157
glass melting, 12:598–599
halogen acid, 13:179
heat pipes and, 13:238
Isasmelt, 14:760
for melting scrap aluminum, 21:390–391
in phosphorus manufacture, 19:8–11
refractory linings for, 12:300–301

rotary, 14:759
rotary hearth, 13:177–178
for secondary slags, 14:759–760
silicon carbide heating elements in,
22:529–530, 539
silicon carbide preparation in, 22:533
silicon carbide production via, 22:524
use of molybdenum in, 17:13–14
vitreous silica in, 22:440

Furnace temperature, in fiber optic fabrication, 11:142

Furniture, spunbonded fabrics in, 17:484–485
Furniture industry, release agents in, 21:607–608

Furosemide, 5:169

Further Exploitation of Advanced Shell Technology (FEAST), 26:941

Fuse, 6:704

Fusarium graminearium, 11:4
Fusarium oxysporum, 13:351

Fused alumina, 1:2, 5–6
hardness in various scales, 1:3t
Fused alumina/zirconia, 1:6
hardness in various scales, 1:3t

Fused cast alumina
carbon monoxide compatibility with, 5:4t
Fused fullerenes, 12:233
Fused magnesia, 15:412
Fused pyridines, 21:153

Fused quartz, 22:411. See also Fused silica manufacture of, 22:413
viscosity–temperature curve for, 22:425

Fused ring aromatics, in petroleum, 18:587
Fused-ring naphthalene configuration, 17:70–71
Fused-ring polynuclear aromatic hydrocarbons, 18:588t

Fused salt electrolysis, 14:643
Fused-salt manganese metal electrolysis, 15:558–559

Fused salts, electrowinning from, 9:639–642
Fused silica, 22:401–402, 407–408, 411
dielectric properties of synthetic, 22:401t
manufacture of, 22:413–415
in optical fibers, 22:444
Fused state baths, 18:85
Fused zirconia, 1:5 hardness in various scales, 1:3t
Fusel oils, 2:770
Fuses, virtual two-way SMA devices in, 22:349
Fusible alloys
  bismuth alloy applications, 4:13
  bismuth applications, 4:11
cadmium addition to, 4:502–503
Fusible-core injection technology, 19:789
Fusidic acid, bacterial resistance mechanisms, 3:32t
Fusinite, 6:707t, 719, 828
Fusion, PVC, 25:663–664. See also Cold fusion; Deuterium fusion
Fusion-bonded-epoxies (FBE), 10:440
Fusion carburization, 4:674–675
Fusion-cast refractories, 21:504
  shapes of, 21:481–482
Fusion method, for tin content assays, 24:791, 792
Fusion power, noble gases and, 17:375
Fusion reactors, vanadium in, 25:526
FutureGen Program (Department of Energy), 13:845
Fuzzy logic control, 20:698–699
Fuzzy rules, 20:699
F values, 13:252
FVP-gas electron diffraction (FVP-GED), 21:139. See also Flash vacuum pyrolysis (FVP)
FVP-microwave (FVP-MW) spectroscopy, 21:139, 140
FVP-MS, 21:139
FVP-photoelectron spectroscopy (FVP-PES), 21:139
Fyrol 6, 11:497
Fyrol 51, 11:497
Fyrol 99, 11:492

GA (Tabun), 5:820
GA₃, 13:24t, 32, 33–35
GA₄, 13:25t, 33
GA₅, 13:25t, 33
GaAs-AlGaAs quantum well arrays, 19:166. See also Gallium entries
GaAs–AlGaAs QWIPs, 22:181–182.
  See also Gallium arsenide (GaAs) semiconductor
GaAsP system
heterostructures and superlattices in, 22:158
  in LED technology, 22:175
GABA-gated chloride channels, in insects, 14:347
Gadoleic acid
  percent in important fats and oils, 5:47t in toilet soap making, 22:733t
Gadolinite, 14:630
Gadolinium (Gd), 14:631t, 635t electronic configuration, 1:474t
Gadolinium(III) complexes, 26:795–796
Gage, Simon, 16:468
Gain, in lasers, 14:664–666
β-Gal-(1-3)-α-GalNAc, 26:798
GAL4 transcription factor, 26:488–489
Galactaric acid, 4:708–709
Galactoglucomannans, 4:717; 21:8–9. See also Galactomannans; Glucomannans
classification by structure, 4:723t galactosic bonds in, 21:29
Galactomannans, 13:66–67; 20:564–565
classification by structure, 4:723t
β-D-Galactopyranosyl-α-D-glucopyranose, 4:702
Galactoquin, molecular formula and structure, 5:90t
D-Galactose, 4:697, 698
  ascorbic acid biosynthesis from, 25:762, 763–764, 766
Galactose oxidase, copper containing, 7:776
α-L-Galactosyltransferase gene, 12:466
α-1,3-Galactosyltransferase gene, 12:466
Galanthamine, 2:857
Galbanum gum, in perfumes, 18:368
Galanine, 4:472t; 14:728, 731
color and bad gap, 7:335t
Gallates, 12:358–359
Gall bladder disease, and obesity, 3:87
Gallic acid, 2:96
  chemiluminescence reagent, 5:857
Gallium (Ga), 12:337–364; 15:251. See also AlGaInN compounds; GaAs entries;
  Indium–gallium–arsenide (InGaAs) photodiodes
  abundance of, 12:337–339, 340
  addition to plutonium, 19:682–683.
alloys and intermetallic compounds of,
  12:353–355
  aluminum embrittling by, 12:343–344
  analytical methods for, 12:349–350
  in bauxite/laterite, 12:339–340
carbon compounds of, 12:360–361
chemical properties of, 12:344

effect on copper resistivity, 7:676t
in epitaxial technologies, 12:351–352
extraction of, 12:344–346
foreign trade in, 12:346–348
health and safety factors related to, 12:350–351
high pressure forms of, 12:342
known reserves of, 12:340–341
medical uses of, 12:351
physical properties of, 12:342–344
production of, 12:346–348
purification of, 12:345–346
recycling of, 12:345–346
in rocks and minerals, 12:338t
speculative resources of, 12:341–342
ultrahigh purity, 12:345
U.S. consumption of, 12:351t
uses for, 12:351–353

Gallium alloys, dental applications, 8:304
Gallium aluminum arsenide, 3:270
Gallium antimonide, 3:53, 58
Gallium–arsenic (GaAs) photodiodes, 19:156
Gallium arsenide (GaAs), 3:270–271

carrier mobility at room temperature, 5:597t
in semiconductor lasers, 14:699, 700
as a semiconductor material, 17:825

toxicity of, 12:351t
uses for, 12:351–353

Gallium arsenide phosphite, 3:270

Gallium arsenide semiconductor. See also GaAs entries; InGa- entries
abrupt interfaces in, 22:159
band structure of, 22:142–144
epitaxial growth of, 22:152–153, 154
in LED technology, 22:175
in near-ir VCSELs, 22:180
reaction mechanisms for, 22:156–157
silicon versus, 22:488

Gallium arsenide wafers, U.S. imports of, 12:347t
Gallium(III) azide, 12:360
Gallium-based laser diodes, 12:349
Gallium chalcogenides, 12:359
Gallium compounds, 12:344, 355–361

with ammonia, 12:357–358

with phosphorus, arsenic, and antimony, 12:360
Gallium-enriched fluids, 12:342
Gallium(III) fluoride, 12:356

Gallium halides, 12:356–358

properties of, 12:356t
Gallium halogenates, 12:357
Gallium hydrides, 12:355
Gallium hydroxides, 12:358t
Gallium hydroxychloride, 12:356
Gallium–indium–tin alloy, for bearings, 15:253
Gallium nitride, 12:360; 17:213–214.
See also GaN entries; InGaN alloy
ion implantation doping of, 22:188
for LEDs, 22:174–175e
Gallium nitride crystals, growth of, 14:96
Gallium nitrogen compounds, 12:360
Gallium oxides, 12:358
Gallium oxyhalides, 12:357
Gallium phosphate (GaP), 19:59
carrier mobility at room temperature, 5:597t
Gallium phosphide semiconductor
band structure of, 22:142–143
in LED technology, 22:175
Gallium production, economic aspects of, 12:348–349
Gallium salt solutions, purification of, 12:345
Gallium tribromide, 12:356
Gallium trichloride, 12:356
Gallium trihalides, 12:356, 357–358
Gallium triiodide, 12:356
Gallopamil, 5:121–122
molecular formula and structure, 5:119t
Galvanic corrosion, 7:804–806
as failure mechanism, 26:983
in industrial water treatment,
26:126–127
of magnesium and magnesium alloys, 15:373–374
Gamma aminobutyric acid (GABA), 13:24t
as a plant growth regulator, 13:32
Gamma-cellulose, 4:716; 5:362
Gamma-cameras, 21:277
Gamma iron, 14:490
Gamma phase soaps, 22:729
Gamma radiation scattering analyses, 16:626
Gamma-ray counters, sodium iodide in, 22:827
γ-ray detectors, efficiency of, 21:314
γ-ray emission, alternatives to, 21:299–301
γ-ray energies, for 24Na and 60Co, 21:301t
γ-ray irradiation
of silicon, 22:487
silicone network preparation via,
22:567
siloxane polymerization via, 22:561
of vitreous silica, 22:435–437
Gamma (γ) rays, 21:285–286
for disinfection, 8:663
energies of, 21:299
internal-conversion coefficients for,
21:308–309
measuring the energies of,
21:313–314
γ-ray transitions, partial half-lives for,
21:300
γ0-strengthened alloys, 13:523
Gamma spectrometry, in thorium analysis,
24:774
Γ symmetry point, in compound
semiconductors, 22:148–151
GaN-based HEMTs, 22:165–166. See also
Gallium nitride
GaN-based laser diodes, 22:179
GaN devices, market for, 12:348
Gandolfi cameras, in fine art examination/
conservation, 11:406
Ganglionic blockers, antihypertensive
agents, 5:159
Gangue, 14:731, 735; 15:544
defined, 16:127
Gangue content, of direct reduced iron,
14:510
Gangue minerals, 16:135
GaN high electron mobility transistors
(HEMTs), 17:221–224
Gapmers, 17:632
Gap paper former, 18:120
Garbage collection, 25:862, 864. See also
Waste collection systems
Gardner color scale, 7:310; 10:827
Garenxacin, 21:226–227
Garlic, 23:167
Garment dyeing, 9:210–211. See also
Dyeing
Garments, high performance fibers for,
13:393
Garnet(s), 1:1, 8–9; 5:602–603; 14:543;
17:499
colorants for ceramics, 7:347t
dental abrasive, 8:339
in coal, 6:718
hardness in various scales, 1:3t
Garnet ferrites, 11:55, 56t, 57
Garnet–hydrogarnet solid solution series,
5:479t
Gas absorption. See also Absorption
ion exchange in, 14:423
measurement equation for, 24:456–457
two-film theory of, 26:154–158
Gas–air explosions, prevention of,
21:860
Gas analysis, of water, 26:36–40, 41–42
Gas antisolvent (GAS) technique,
24:17
Gas-assisted injection molding (GAIM),
19:552
GasBarrier design, for pumps, 21:82
Gas-barrier properties, of PVA,
25:598–599
Gas-based muds, 9:3
Gas bulk separation, 1:646–647
commercial processes, 1:618t
Gas burners, 7:455–460
Gas burner technology, 12:382–383
Gas carburizing
carbon diffusion in, 16:203–204
case hardening by, 16:201–205
chemical thermodynamics of,
16:201–203
commercial, 16:202–203
selective, 16:205
Gas centrifuge, 5:506; 25:415
Gas centrifuge uranium-enrichment
process, 25:413–415
“Gas-ceramic,” 12:642
Gas chromatographic analyses, 13:467
Gas chromatography (gc; GC), 4:610–613;
6:375, 408–440
acoustic wave sensors and, 22:270
antibody based columns with,
6:401–402
applications, 4:618
in biotransformation analysis, 16:407,
408
brief overview, 6:377–384
carrier gas, 4:611
chiral separation validation, 6:99
chiral stationary phases, 6:94–99
columns, 4:615
columns and liquid phases, 6:422–425
in composition measurements, 20:683
data collection and handling, 6:432–433
detectors for, 4:613–615; 6:380–381,
425–432
fast, 6:434–437
in herbicide analysis, 13:312
hyphenated techniques, 4:616–618
inlet systems, 6:382–383, 414–422
instrumentation, 4:611; 6:413–414
in methyl chloride analysis, 16:325
micro-GC, 6:434–437
multidimensional, 4:617–618;
6:433–434
in phenolic resin analysis, 18:776
for phosphorus measurement, 18:807
of silicones, 22:598, 600–601
of soap, 22:754
sample injection, 4:611–613
stationary phases, 4:615–616, 617t
temperature considerations, 6:383–384
temperature programming, 6:411–413
in wax analysis, 26:224
Gas chromatography–Fourier transform
infrared spectroscopy (GC-FTIR), 4:616
Gas chromatography–mass spectrometry
(gc/ms; GC-MS), 4:616; 6:381, 431
archaeological materials, 5:743
use in forensic toxicology, 12:97
Gas-controlled heat pipe, 13:234–235
Gas cracking furnaces, additives to, 10:609–610
Gas diffusion
in aeration water treatment,
26:154–158
in foams, 12:14–15
Gas disposal, 10:77–78
Gas drying, 9:94
Gaseous ambient, propagation of plasma
in, 24:740–741
Gaseous detoxification systems, based on
hydrogen peroxide, 14:64–65
Gaseous effluents
lyocell process and, 11:280
viscose process and, 11:278
Gaseous emissions
control of, 26:678–694
energy usage and, 10:137
Gaseous ethylene, thermodynamic and
transport properties of, 10:595t
Gaseous feedstocks, transferline exchanger
fouling for, 10:608
Gaseous formaldehyde, 12:123; 18:759
Gaseous fuel combustion technology,
7:455–460
Gaseous hydrogen, physical and
thermodynamic properties of, 13:763t
Gaseous hydrogen chloride
construction materials resistance to,
13:825–826
thermal stability of, 13:812t
Gaseous impurities, in high purity gases,
13:464–465
Gaseous metal, reduction to, 16:146–147
Gaseous molecules, rotational transitions
in, 23:129
Gaseous ozone, decomposition of,
17:770–771
Gaseous pollutants
disposal of, 26:690
sampling, 26:674
Gaseous vent streams, in vinyl chloride
manufacture by-product disposal,
25:644
Gases, See also High purity gases;
Geopressed gas; Natural gas; Vapor
entries
bulk, 13:457–461
concentration of, 14:238
control methods for, 26:687–694
diffusion coefficients for dilute gases in
liquids at 20°C, 1:67t
diffusion in vitreous silica, 22:421–422,
423t
diffusivity in, 15:673–675
fluorine reactivity with, 11:831–832
as food ingredients, 12:62
as a hazard class, 25:340
from landfills, 25:880
polymer blend permeability to,
20:357–358
production of high purity using
cryogenics, 8:40
reactions of refractories with, 21:516
in semiconductor dry etching, 22:185
solubility in ethylene oxide, 10:636t
solubility in silicone fluids, 22:578
solubility of, 1:29–36; 15:683; 23:213
specialty purification of, 13:461–462
in transparent thermal insulation,
23:9–10
used in semiconductor materials
manufacture, 13:456
Gas excitation, as cause of color, 7:326t, 328
Gas feeders, for swimming pools, 26:178
Gas-film coefficient, 15:695
Gas flammable coal grade (Germany),
6:713t
Gas flooding, in oil recovery, 18:615–617
Gas flow, in MOCVD reactors, 22:154–155
Gas-flow counting, 21:277
Gas–gas heat exchangers, in sulfuric acid manufacture, 23:781
Gas generating propellants, 10:727
Gas-Heated Reformer (GHR), 16:304–305
Gas-heated reforming, in methanol synthesis, 16:304–305
Gas hourly space velocity (GHSV), 10:89
Gas hydrate deposits, 17:691–692
Gas hydrates, 14:170
Gasification processes, integrated combined cycle, 20:747–748
Gasification project, economics of, 13:781–783
Gas impingement, 9:105
Gas inducement, 16:704–705
Gas injection, in enhanced oil recovery, 18:618
Gas injection molding, 19:789
Gaskohle coal grade (Germany), 6:713t
Gaskool coal grade (Netherlands), 6:713t
Gas lasers, 14:681–696
carbon dioxide, 14:693–696
excimer lasers, 14:691–693
helium–neon, 14:681–683
ion lasers, 14:683–688
molecular nitrogen, 14:688–691
Gas lift electrolyte circulation, 9:621
Gas–liquid base stocks, 15:217
Gas–liquid chromatography (glc), 6:374
analysis of sugars via, 23:476
silylation for, 22:692, 697
Gas–liquid contactor, reciprocating jet, 15:709–710
Gas–liquid contactors, 16:700–701
Gas–liquid equilibria, simulation, 1:30
Gas/liquid extractions, ionic liquids in, 26:876
Gas–liquid flows, 11:771–774
Gas–liquid fluidization, 11:791–792
Gas–liquid interfaces, 26:155
Gas–liquid mass transfer, 15:670, 675–683, 690–696
factors influencing, 15:678t
Gas–liquid mass transfer coefficient, volumetric, 15:677–678
Gas–liquid mass transfer correlations, for bubble columns, 15:701–702t
Gas–liquid mixing, 16:700–705
Gas–liquid–solid fluidized bed reactors, 15:710–711
Gas–liquid systems, static mixing of, 16:715–716
Gas–liquid volumetric mass transfer coefficient correlations, for airlift reactors, 15:704–705t
Gas lubrication, 15:252
Gas mantles
cerium in, 5:689
thorium in, 24:757
Gas masks, 5:832–835
Gas meter provers, liquid displacement, 11:652
Gas mixing, in fluidized beds, 11:807–808
Gas mixture, hydrogen content of, 13:790
Gas mobility control processes, issues in, 18:626
Gas nitriding, case hardening by, 16:205–207
Gasochromic thin films, 23:22
Gasohols, 10:533–534; 12:405
Gas oil, 18:594
catalytic conversion of, 11:704–705
See also Motor fuels
activated carbon for emission control, 4:755
additives to, 12:406
biodegradation, 3:763
blending of, 12:411–414; 18:666
bromine addition, 4:315t
butylenes, 4:422–423
chelant application for sweetening, 5:734
chemical cleanliness of, 12:399–400
from coal gasifier syngas, 6:778
composition regulation of, 12:419–420
demand for, 12:388–389; 18:647
distribution of, 12:411–414
environmental issues related to, 12:414–420
ethanol blends, 3:690
evolution of, 12:388
fatty amines, 2:534
high energy battery system (theoretical), 3:432t
manufacture of, 12:411
oxidative degradation of, 12:399–400
paraffin alkylation for, 2:170
as a petroleum product, 18:665–667
Gas-phase inhibitors, 10:649
Gas-phase manufacture, of high density polyethylene, 20:169–170
Gas-phase mass transfer coefficient (k_G), 1:37–38
experimental determination, 1:67–70
Gas-phase mass transfer coefficients, 25:278, 311
Gas-phase methanol hydrochlorination process, 16:322–323
Gas-phase mirage-effect spectroscopy, 19:567
Gas-phase oxidations, photocatalytic, 19:85
Gas-phase paraffin nitration, 17:165
Gas phase polymerization, 20:540
of linear low density polyethylene, 20:194–195
Gas-phase process, of ethylene–propylene polymer manufacture, 10:711
Gas-phase reactions
flow mixing for, 14:613
pressure and, 14:623
Gas-phase reactor (GPR), 20:533
Gas-phase sedimentation, 18:142
Gas-phase synthesis, in silicon carbide manufacture and processing, 22:533
Gas pipeline systems, 12:366
Gas pretreatment, 13:841
Gas processing, in petroleum refining, 18:663
Gas producers, 6:789
Gas propellants
compressed gas, 1:779
liquefied gas, 1:775
Gas-purged hopper dryers, 9:123–124
Gas purification, 1:645–646; 18:663
alkanolamines from olefin oxides and ammonia, 2:137–138
commercial processes, 1:618t
Gas reduction, metal recovery via, 16:154–155
Gas seal system, blast furnace, 14:507
Gassed power draw, during fermentation, 11:39–40
acoustic wave sensors and, 22:270
Gas separation, 15:826, 838–839, 840–842. See also Gas separation adsorption
adsorbents for, 1:612
catalysts for, 1:611
total process for, 16:824
commercial separations, 1:618t
hollow-fiber membrane modules for, 15:823
membrane technology in, 15:837–842
polysulfone membranes for, 16:21
spiral-wound membrane modules for, 15:823–824
technology of, 15:798
using ethylcellulose hollow fiber, 16:19
Gas separation adsorption, 1:617–663
adsorbent types, 1:630–632
adsorption dynamics, 1:629
adsorption forces, 1:619–621
commercial separations, I:618t
deactivation, I:635–636
electrostatic properties of common molecules, I:621t
equilibrium, I:652–653
heats of adsorption, I:623–626
mass transfer, I:653–654
nonregenerative processing, I:649–650
pressure drop, I:657–658
pressure swing adsorption (PSA), I:614t, 615, 642–647
purge swing adsorption, I:636–642
reactive, I:650–651
regeneration, I:655–657
selectivity, I:621–622
temperature swing adsorption (TSA), I:636–642
Gas separation membranes, conducting polymer applications, 7:539
Gas–solid chromatography, adsorption, I:610–611
Gas–solid mass transfer behavior, 15:717–730
Gas–solid reactions
catalyst deactivation mechanism, 5:256t, 274–278
noncatalytic and catalytic, 21:331
Gas–solids fluidization, 11:791, 792–793
Gas solids velocity, 11:817
Gas solubilities, in ionic liquids, 26:864
Gas storage, activated carbon application, 4:757
Gas streams
hydrogen sulfide recovery from, 23:635
removal of carbonyl sulfide from, 23:623
Gas to liquids (GTL) conversion, 15:217
Gas-to-particle heat transfer, 11:809
Gas Transmission and Distribution Piping, 19:480
Gas treating amines, molecular structure of, 23:599
Gastric bypass surgery, 3:89
Gastric flotation/retention devices, 9:45
Gas turbine oils, 15:235
Gas turbines, 10:142–143
application to coal gasification, 6:814
hydrogen-fuel, 13:856–857
turbine oils for, 15:239–240
Gas velocity, fluidized-bed regimes and, 11:801
Gasvlam–kool coal grade (Netherlands), 6:713t
GA-synthesis inhibitors, 13:306–307
Gate–channel capacitance (\(C_{\text{GC}}\)), in compound semiconductors, 22:164
Gatekeeping, in R&D, 21:619
Gate metal, in FETs, 22:162–163
Gates Foundation, 26:976
Gate valve, 19:474
Gatifloxacin, 21:223, 224, 226
Gating, in ion channels, 5:83, 84
Gattermann–Koch reaction, 2:66; 12:187
Gattermann–Koch synthesis, 12:178
Gattermann reaction, 2:66
Gaudfrin disk filter, 11:374–375
Gauge pressure, 20:645
Gauges
cold-cathode ionization, 20:662–663
diaphragm, 20:649–650
hot-cathode ionization, 20:660–662
mechanical, 20:646
strain, 20:654–655
thermal conductivity, 20:659–660
Gauging, exposure control applicable to, 14:207
Gaussian80 program, 16:751
Gaussian distribution, 13:257; 26:1020
of asperity heights, 22:116
Gaussian emission spectrum, 14:853
Gaussian functions, 16:737
Gaussian mode (TEM\(00\)), 14:672. See also TEM\(00\) mode
Gaussian model, of ion implantation, 22:186
Gaussian plume odor impact model, 26:725
Gauss–Markov conditions, 6:39
Gaylusite, 5:785t
Gazettes, patent of
Gazowoplomienny coal grade (Poland), 6:713t
Gazowo koksowy coal grade (Poland), 6:713t
Gazowoplomieny coal grade (Poland), 6:713t
GB (Sarin), 5:819, 821
physical properties, 5:820t
GC. See Gas chromatography entries
GC-FTIR. See Gas chromatography–Fourier transform infrared spectroscopy
GC-MS. See Gas chromatography–mass spectrometry (gc/ms)
GD (Soman), 5:819, 820
Gear crimping, 19:754
Gearksutite, 2:364t
Gear meters, 11:655–656
Gear oils, automotive, 15:236–237
Gear pumps, 21:71–73
  clearances of, 21:71
  uses for, 21:72
Gear’s algorithm, 10:607
Gear-type couplings, for pumps, 21:79
Gehlenite
  phase equilibria in the C–A–S system, 5:468
  phase in Portland cement clinker, 5:472t
  See also Gels
amphoteric character of, 12:438–439
analytical test methods and quality standards for, 12:441–442
chemical composition and structure of, 12:436–437
colloid and emulsifying properties of, 12:439–440
conversion temperature for, 12:438
derivatized, 12:443–444
as a diet supplement, 12:443
killing rate of E. coli, 8:641t
manufacture and processing of, 12:440–441
physical and chemical properties of, 12:437–440
stability of, 12:437
swelling property of, 12:439–440
uses for, 12:442–444
Gelatin-developer interactions, 19:210
Gelatin drug coatings, 18:707
Gelatin hardening, in photography, 19:214
Gelatin jelly strength, 12:438
Gelatinous alumina, 2:422, 426–427
  decomposition sequence, 2:392
  production, 2:430
Gelatinous boehmite, 2:427–428
Gelatinous material, high pressure treatment of, 13:437–438
Gelatin point, 22:395
Gelatin production, economic aspects of, 12:441
Gelatin sponge, absorbable, 12:443
Gelation, 10:422, 423; 12:437–438
  encapsulation by, 16:440
  of printing inks, 14:313–314
PVC, 25:663–664
  reversible, 9:63
of silica sols, 22:393
in the sol–gel process, 23:60, 62–64, 77–78
  theories of, 23:63–64
  thermal, 13:73
Gelators, 24:54
Gel-based activated aluminas, 2:397–398
Gelcasting, ceramics processing, 5:652
Gel coats, 20:116
Gel dehyration, use of chlorine compounds in, 23:73
Gel-derived glasses, 23:73–74
Gel-derived silica optical components, physical properties of, 23:75–76
Gel dyeing, 9:194
Gel effect, 16:281–282
  in styrene polymerization, 23:382
Gel electrophoresis, 12:499
Gel encapsulation, 11:548–549
difficulties with, 11:549
Gel–glass transition, structural evolution of, 23:75
Gelinite, 6:707t
Gellan(s), 4:724t; 13:69; 20:575–576
classification by structure, 4:723t
properties of, 13:74t
Gellan gum, 12:54; 20:576
Gellan polysaccharides, 20:455
Gelled explosives, organic titanium compounds in, 25:132
Gelled polymers, 19:833
Gelling polymers, 20:570–571
Gelo-Inertinite, 6:707t
Gelovitrinite, 6:707t
Gel-permeation chromatography (GPC), 10:387, 685
  in molecular weight determination, 19:570
  in phenolic resin analysis, 18:775–776
  polyester fiber molecular weight distribution and, 20:21
  protein separation via, 3:831–839
  in wax analysis, 26:224
Gel phase, in PVC polymerization, 25:667
Gel point, 10:422
Gel polymer electrolytes, 3:418
Gel porous structure, stabilization of, 22:71–73
Gel processing, defects introduced during, 23:71
Gel properties, changes during aging, 23:65–66
Gels, 23:54. See also Aerogels; Hydrogels; Polymer gels; Silica gels; Xerogels. 
Acrylamide concentration of, 9:750. 
Classification by body part and use, 7:842t. 
as colloid, 7:272t, 273t. 
Cracking of, 23:71. 
Cross-linked macromolecular, 12:188. 
Crystallization of, 16:830. 
Diffusivity in, 15:672–673. 
Drying of, 23:78. 
Evaporation rate from, 23:67. 
Gas phase hydrogenation over, 26:882. 
Polymer in situ, 9:75. 
Red seaweed extract, 13:68. 
Shrinkage and densification mechanisms for, 23:74. 
Sintering behavior of, 23:74. 
Structural analysis of, 23:78. 
Structure of, 23:63. 
With PVA, 25:603. 
Gel time tests, 10:425. 
Gemfibrozil, 5:146. 
Molecular formula and structure, 5:141t. 
Gemifloxacin, 21:224. 
Geminal silanol groups, 22:380, 381. 
Silica surface chemistry and, 22:373. 
Geminate recombination, 14:620. 
Gemopatrilat, 5:159. 
Gemstones, silicon carbide, 22:541. See also Jewelry. 
GenBank, 12:474, 512. 
Gender, influence on toxicity, 25:212. 
Gene alteration, 12:472. 
Gene amplification, 12:471–472. 
Gene arrays, yeast, 26:490, 491. 
Gene cassettes, 3:31. 
GeneChip HFV PRT, 16:390. 
Gene deletion libraries, yeast, 26:490–492. 
Gene expression in a heterologous host, 12:517. 
Host systems for, 12:475–480. 
in plants, 12:485. 
Gene expression profiles, 12:473. 
Gene expression vectors, for Saccharomyces cerevisiae, 12:479. 
Gene function, understanding, 12:467. 
Gene insertion, random, 12:453. 
Gene isolation, by recombinant DNA techniques, 12:500–509. 
“Gene knock-out” animals, 12:459. 
Gene knock-outs, conditional, 12:461. 
Gene manipulations, on yeast biotechnology, 26:492–494. 
Genencor, 11:12. 
Genentech, 11:12. 
General Agreement on Tariffs and Trade (GATT), 15:756; 18:158, 198, 540. 
General Electric advanced materials research, 1:696. 
nanocomposite development, 1:716–717. 
General Electric boiling-water reactor, 17:595. 
Generalized Bender’s decomposition (GBD), discrete optimization via, 26:1023–1024. 
Generalized scaling, of FETs, 22:253. 
General labeled magnitude scales (gLMBs), 11:513. 
General Learning Objective (GLO), 15:475. 
Generally recognized as safe (GRAS) feed additives, 10:846. 
Generally recognized as safe (GRAS) materials/substances, 11:571, 575; 12:34, 35; 21:578. See also GRAS affirmation process. 
Sodium silicate as, 22:468. 
Generally recognized as safe (GRAS) procedures, 11:49. 
Generally regarded as safe (GRAS) rating, 15:260. 
General Mills mixer–settler, 10:774, 775. 
General Motors, nanocomposite development, 1:717–718. 
General properties paint testing, 18:66–71. 
General purpose rubbers (GPR), 21:759. 
General Services Administration (GSA), 25:354. 
General toxicology studies, 25:215–216
Generation-and-test approach, in computer-aided molecular design, 26:1037
Generation–recombination current, 22:135
Generation TV International Forum (GIF), 17:557
Generators, superconducting, 23:869–870
Gene-regulating proteins, zinc finger in, 20:831–832
Generic Drug Enforcement Act, 18:686
Generic drugs, 21:575–576
Generic exposure assessment, in industrial hygiene, 14:220
Genes
  growth-promoting, 12:463
  nitrogen-fixation, 17:304
  phenotypic selection of, 12:503–504
Gene silencing, 17:619–620, 622
Genesis project, 11:267
Gene-targeted animals, applications of, 12:463–467. See also Animal genetic engineering
Gene-targeted mice, for biomedical research, 12:466–467
Gene-targeted transgenics, 12:452
Gene targeting
  in farm animals, 12:466
  genetic modification by, 12:459
Gene technologies, for isolating and manipulating microbe genes, 12:470–475
Gene therapy, 9:83
  in humans, 12:467–468
Genetic algorithms (GA), 6:69; 10:341
  discrete optimization via, 26:1023, 1024–1025
  optimization of stochastic problems via, 26:1029, 1032
  for reliability, 26:1045
Genetically engineered materials (GEMs), 18:552
Genetically engineered microbes, products from, 12:480–482
Genetically modified organisms (GMOs), 11:13
Genetically modified crops, 18:533–534
  herbicide-tolerant, 18:534–535
Genetic complementation, 12:503
Genetic differences, influence on toxicity, 25:212
  See also Animal genetic engineering;
  Genetic engineering procedures;
  Microbe genetic engineering; Plant genetic engineering
  of enzymes, 12:65
  of Pseudomonas, 12:476
  of silk, 22:633
  vaccine technology and, 25:501–503
  of yeasts, 26:481–483
Genetic engineering procedures, 12:496–521
  analysis of DNA information, 12:497–500, 509–510
  array methodologies, 12:513–517
  computer analysis of DNA sequence information, 12:510–512
  experimental protocols in, 12:520
  gene expression in a heterologous host, 12:517
  mutagenesis of cloned DNA, 12:518
  for protein pharmaceutical products, 12:518–520
  regulatory and safety issues related to, 12:520
  uses of sequence information, 12:512–513
  “Genetic fingerprint,” 12:513
  Genetic function algorithm (GFA), 10:341, 342
  Genetic markers, restriction sites as, 12:500
  Genetic methods, in multiobjective optimization, 26:1033
  Genetics, of yeast, 26:480–481
  Genetic selection, 12:452
  Genetic software techniques, 10:342
  Gene transfection, dendrimers in, 26:791–792
  Gene transfer. See also Gene transfection; Transgenic entries
  with embryonic stem cells and somatic cells, 12:457–459
  in microbes, 12:470–471
  sperm-mediated, 12:456–457
  Geneva nomenclature system, 17:395, 396
  Genistein, 17:667–669
  Genlip, molecular formula and structure, 5:141t
  Genome, 12:449
  Genome database searches, 12:512
  Genome maps, clones linked to form, 12:508–509

GENOME MAPS, CLONES LINKED TO FORM 397
Genomic analysis, microarrays in, 16:390–392
Genomic DNA libraries, 12:503
Genomics, 20:450
    microbial, 12:472
Genotoxicity
    studies of, 25:220–221
    as a toxic effect, 25:206
Gentamicin, 3:25, 30–31
    bacterial resistance mechanisms, 3:32t
Gentianales, alkaloids in, 2:75
Gentianine, 2:101
Geochemical material balance, 26:8, 10t
Geochemical processes, role of weathering in, 26:7
Geochemistry
    stream water, 26:22–27
    of steam-dominated geothermal resources, 12:530
Geomembrane blowing operations, 20:174
Geometric mean, 18:136
Geometric properties
    of fibers, 11:166–167
    of staple fibers, 11:166–167
Geon balanced vinyl chloride process, 25:636, 672
Geophotocatalysis, 19:100–101
Geophysical logging operations, 12:527
Geopressured brine, 12:537t
Geopressed fluids, direct uses of, 12:538
Geopressured gas, composition of, 12:536t
Geopressured resources, 12:535–538
    technology associated with, 12:537–538
Georgeericksenite, 6:471t
Georgywood, 24:486
Geosmin, 3:207–208
Geosynthetic clay liner (GCL), in landfill design, 25:879
Geotechnical grouting, 5:500t
Geotextile applications, nonwoven fabrics in, 17:487–488
Geotextiles, 17:480
Geotextile structures, 13:393–394
Geothermal brines, lithium in, 15:124
Geothermal drilling industry, 12:527
Geothermal energy, 12:521–547. See also Geoprocessed resources
    economics of, 12:533–534
    high levels of, 12:522
    hot dry rock (heat mining), 12:539–544
hydrothermal resources, 12:524–535
magma energy, 12:544–545
resources for, 12:523–524
Geothermal fields, mapping, 12:532–533
Geothermal fluids
    dispersant applications, 8:688
    natural sources of, 12:522
Geothermal operations, terrestrial problems from, 12:535
Geothermal reactor concept, 14:84
Geothermal reservoir, 12:524
Geranium, 24:530
Geraniales, alkaloids in, 2:75
    grades of, 24:505
    hydrogenation of, 24:505, 506
    price of, 24:505
    sources of, 24:504
Geranium, in perfumes, 18:368
Geranyl, 24:479
Geranyl acetate, 24:505
Geranyl acetone, 24:485, 502, 547, 550
Geranyl diethyl amine, 24:479, 516
Geranyl esters, 24:505
Geranylgeranyl pyrophosphate, 2:102
Geranyl nitrile, 24:531
Geranyl pyrophosphate, 2:78
    role in cholesterol synthesis, 5:142
Germanate glasses, 12:575
Germanates, 12:553
German chemical industry, energy use in, 24:166
Germanes, 12:553, 559; 13:612
    thermochromic materials, 6:619
Germanides, 12:553
Germanium (Ge), 12:548–564
    amorphous, 22:128
    analytical methods for, 12:558–559
    atomic structure of, 22:232
    bipolar transistor performance and, 22:249
    chemical properties of, 12:549–554
    chemical vapor deposition precursor, 5:805t
    in coal, 6:718
    demand for, 12:558
    effect on copper resistivity, 7:676t
    grades and specifications for, 12:558
    health and safety factors related to, 12:559
in new product introductions, 12:561–562
manufacturers of, 12:560
manufacturing and processing of, 12:554–557
optical properties of, 12:551
process flow of, 12:555
producers of, 12:548
properties of, 12:549, 550–551t
purification of, 12:555–557
recycling and scrap recovery of, 12:559–560
sources and supplies of, 12:548–549
uses for, 12:548, 560–562
Germanium alloys, 12:554
Germanium-based night vision systems, 12:562
Germanium compounds, 12:553–554
Germanium crystals, 12:561
Germanium difluoride, 12:552
Germanium dioxide, 12:558, 561
properties of, 12:553t
Germanium disulfide, 12:554
Germanium dopants, in optical fiber manufacturing, 11:145
Germanium fluoride, 12:552–553
Germanium metal, 12:549–551, 558, 561
analysis of, 12:559
Germanium monoxide, 12:553
Germanium nitride, 12:553–554
Germanium ore, processing of, 12:554–555
Germanium oxides, 12:553
Germanium photoconductors, doped, 19:164–165
Germanium photodetectors, 19:137
Germanium point-contact transistor, 9:730–731
Germanium production, economic aspects of, 12:557–558
Germanium refinery flow diagram, 12:556
Germanium tetrabromide, 12:552
Germanium tetrachloride, 12:551–552, 559, 560
in fiber optic fabrication, 11:138–139
vinyl chloride reactions with, 25:631
Germanium tetrafluoride, 12:552
Germanium tetraiodide, 12:552
German universities, role in technology transfer, 24:352–353
Germany
advanced materials research, 1:692, 696
bioengineering research program, 1:702
catalyst development in, 24:260
catalyst, coal grades, 6:713t
Deutsches Electronen-Synchrotron (DESY) aerogel application, 1:766
nanoceramics research, 1:706
nanocomposite development, 1:717
natural graphite in, 12:780
organic chemical production in, 24:253
photovoltaic market in, 23:50, 51
piezoelectric ceramics research, 1:708
renewable raw materials used in, 24:167–168
smart hybrid polymer coatings research, 1:715
Germicides, quaternary ammonium compounds, 2:751–752
Germination, in beer making, 3:566–567
Germ theory, fermentation and, 11:7
Gersdorfficte, 3:263t
Gerzon’s rule, 15:305
GETEK system, 10:456
GET software, 18:244
Getters, cerium application, 5:682
Geyser’s-Clearlake thermal anomaly, 12:528–529
Geyser’s steamfield, 12:528–529
gastrochemistry and environmental considerations related to, 12:530
Ghana cocoa beans
composition, 6:369t
minerals content, 6:371t
tocopherols, 6:370t
vitamin content various samples, 6:370t
Ghatti gum, 12:54
GI (gastrointestinal) tract, drug delivery via, 9:44–45
Gianmarco–Vetrocoke process, 4:812
GIAP reciprocating-plate columns, 10:780
Gibberella fujikuroi, 13:32
Gibberellic acid, 13:35; 24:555
use in beer making, 3:567
in malt modification, 15:531
Gibberellins (GAs), 13:24–26t, 305–306
as plant growth regulators, 13:32–35
Gibbs adsorption equation, 24:137, 138
Gibbs adsorption isotherm, 1:626–627; 24:135
Gibbs approach, for treating surfactant adsorption, 24:134–138
Gibbs dividing surface, 24:135
Gibbs–Duhem equation, 8:744; 24:134, 135, 672, 677
Gibbs elasticity, in foams, 12:4
Gibbs energies, equality of, 24:662. See also
Gibbs energy entries
Gibbs energy, 24:652, 653, 676
changes between states, 24:660
in thermodynamics, 24:643, 644
in a two-phase system, 24:661–662
Gibbs energy change, 16:136
Gibbs energy model, 24:134
for a binary mixture, 24:680
Gibbs ensemble, 1:32–33
Gibbs ensemble techniques, 26:1035–1036
Gibbs free energy, 10:746; 12:205–206, 209
Gibbs free energy change, 16:158; 19:111
Gibbs–Kelvin equation, 23:68
Gibbs Marangoni stability, 16:434
Gibbs’ phase rule, 22:329; 24:681–682
Gibbs-Thomson equation, 19:182, 208
Gibbs transition kernel, 26:1018
Gieseler plastometer, 6:735
Gifford–McMahon cryocooler, 8:43
Gilbert mechanism, 10:401, 402
Gilbert–Rideal wool dyeing theory, 26:394
Gilliland correlation, 8:760
Gilthead sea bream, common and scientific names, 3:187t
Ginger, 23:167–168
Gingnet’s green, 19:406
Ginning, of cotton, 8:11–12
Ginzburg-Landau (G-L) parameter,
23:807–809
Girbotol amine process
 carbon dioxide recovery from flue gas, 4:809
 carbon dioxide recovery from natural gas, 4:812–814
Gittinsite, 26:624
Givescone, 24:571
GL-5 gear lubricants, test requirements
for, 15:236–237
Glacial acetic acid (vinegar), 1:115,
116–117, 131
handling and safety, 1:128, 132
manufacture, 1:126–127
physical properties of, 1:118t
solubility of higher alcohols in, 2:3t
therapeutant for aquaculture in U.S., 3:211t
Glanzmann’s thrombasthenia, 4:85
Glaserite, 5:785t
Glass, 5:582; 12:565–626. See also Glasses
for aerosol containers, 1:782
antimony compounds in, 3:54
arsenic applications, 3:271
arsenic demand pattern in U.S., 3:270t
attaching vitreous silica to, 22:416
barium carbonate applications, 3:361
for biomedical devices, 3:709
boron in, 4:279–282; 12:572–573, 585
cerium application, 5:683–684
cesium application, 5:705
chalcogenide, 12:575, 584, 587
chemical analysis of archaeological materials, 5:746–747
chemical durability of, 12:584–585
cosmetic applications, 3:279
coatings on, 23:24
cobalt applications, 7:218–219, 246
colorants, 7:342–344
coloration of, 12:583
crushing, 12:415–416
detergent systems for, 8:413t
electrical conduction in ceramics, 5:592–593
electrical properties of, 12:585–587
experimental results related to,
12:580–581
fluorspar applications, 4:580
germanate, 12:575
halide, 12:575–576
hardness compared to metals, 5:627t
lubrication with, 15:255–256
mechanical properties of, 12:589–592
medical applications for, 12:611–612
metallic, 12:576
in microfluidic fabrication, 26:964, 965, 966
monooorganotin treatment of, 24:826
nitride, 12:583
for nuclear waste disposal, 12:616
optical properties of, 12:581–584
organic, 12:576
oxide components in, 21:377t
phosphate, 12:573–575, 585, 587t
photochromic, 12:584; 22:658, 686
photonic applications for, 12:613–614
postconsumer, 21:377–378
postforming and finishing operations for, 12:597–598
precipitation of silver on, 22:686
properties of, 12:580–592
recycling of, 12:607; 25:871
refining, 12:596–597
Glass chemistry, 21:376
Glass-cloth-reinforced laminates, silane performance in, 22:702
Glass coatings, thin-film, 12:608–609
Glass components, 12:595t
Glass compositions, 12:594t; 13:387
bioactive, 12:611
Glass container cullet, 21:378. See also Cullet entries
markets for, 21:377
Glass container manufacturing facilities, 21:384
Glass containers
approaches to collecting, 21:382
processing, 21:383
recycling, 21:377, 378, 379
Glass decolorization
cerium applications, 5:683–684
Glass electrode potential, 14:28
Glass electrodes, 14:27–29
in dehydrating media, 14:29
in industrial pH measurement, 14:33
response mechanism of, 14:28
Glass-encapsulated flavors, structural defects of, 11:535
Glass encapsulation, 11:529, 530–536
Glass encapsulation systems, 11:553, 554
characteristics of, 11:530t
comparison of, 11:542–543
imperfections in, 11:536
molecular weight dependence of properties of, 11:533
morphologies of, 11:532
Glasses. See also Glass
gel-derived, 23:73–74
as solar energy materials, 23:4–5
sol–gel bioactive, 23:82–83
self-cleaning, 19:101
specialty, 20:632
Glass fiber, 11:165
Glass fiber, in polyamide plastic manufacture, 19:785–786
Glass-fiber-reinforced plastics (GRPs), 20:96; 21:456
Glass fibers, 13:386–387, 394; 24:614
advantages of, 26:758
in communication and electronics applications, 12:612–616
composition range of, 12:590t
continuous, 12:597
demand for, 12:617
properties of, 13:387

release agent use with, 21:605–606
resistance to hydrochloric acid, 13:827
selenium uses in, 22:96–97
in silica/silicate manufacture, 22:461–463
silicate, 12:571–572, 584–585
silver-coated thermal-control, 22:660–661
silver halide-containing photochromic materials, 6:589–590
silver halides in, 22:639
soluble, 22:452
soluble silicates as, 22:452
strength and fatigue of, 12:590–591
structure of silicate, 22:453–454
tellurium in, 24:427
thermal properties of, 12:588
uses for, 12:607–617
use with nitric acid, 17:188
uv transmission of, 12:582–583
viscosity range of, 12:589
vitreous silica as, 22:407, 416–438
volume–temperature relationships for, 12:565
Glass-based materials, development of, 12:611
Glass beneficiation, 21:383–384
Glass capillaries, 9:751
Glass capillary viscometer, 21:727–729
Glass carboys, 18:13
Glass-ceramic materials, 12:630
Glass-ceramic processing
bulk, 12:627–628
powder, 12:628–629
Glass-ceramic products, 12:627
Glass-ceramics, 12:577–578, **626–644**
advantages of, 12:626
applications for, 12:642–643
based on nonsilicate crystals, 12:641–642
based on silicate crystals, 12:631–640
commercial, 12:579t
cordierite, 12:639–640
Cu+ conducting, 12:586
design of, 12:629
families of, 12:631–642
processing, 12:627–629
properties of, 12:629–631
secondary processing (strengthening) of, 12:629
Glass chemistry, 21:376
Glassmaking, sodium sulfates in, 22:597–598
Glass-filled polycarbonate, 10:196
Glass food packaging, 18:39–40
Glass formation, 12:597
kinetic theory of, 12:566–569
Glass-formation ability (GFA), 12:578
Glass-forming systems, structural
descriptions of, 12:569–576
Glass hollow-fiber membranes, 16:23–24
Glass industry
molybdenum in, 17:14
refractories used in, 12:601t
stannic oxide in, 24:805
use of rare earths in, 14:650
Glass–ionomer dental cements, 8:282–283, 340
classification and composition, 8:279t
Glassmakers, sensors and controls for, 12:602
Glassmaking, sodium sulfates in, 22:869.
See also Glass manufacture
Glass-making furnaces, 12:329–330
Glass manufacture, 12:592–607
limestone in, 15:39
stages in, 12:593–596
Glass–matrix composites, 13:502
Glass melters, in silica/silicate
manufacture, 22:461
Glass melting, 12:596–597
advanced techniques for, 12:606–607
computer modeling of, 12:605–606
Glass-melting furnaces, types of, 12:599t
Glass-melting tanks, 12:598–606
Glass microspheres, for hydrogen
containment, 13:786
Glass powders, 12:628–629
Glass properties, of vitreous silica,
22:416–438
Glass recycling, 21:376–385
California legislation related to, 21:380
economic aspects of, 21:379
glass storage in, 21:384
improving, 21:380
levels of, 21:377–379
optimal, 21:378
quality and specifications for, 21:379–382
single stream, 21:382–384
sources of recoverable glass for, 21:382
Glass refractories, 12:599–602
Glass-reinforced composites, phenolic
resins in, 18:792–793
Glass-reinforced ethylene–
tetrafluoroethylene (ETFE)
copolymers, friction and bearing wear
of, 18:321
Glass-reinforced plastics, 26:751
Glass-reinforced polycarbonates, 19:811
Glass-reinforced styrene polymers, 23:371
Glass-rubber transition, 11:531
Glass sorting platform, 21:383
Glass structure, computer modeling of,
12:576–577
Glass-surface coating, organic titanium
compounds in, 25:121
Glass surfaces, 12:580
flaw generation and strengthening in,
12:592
techniques for studying, 12:581t
Glass systems, inorganic, 12:568t
Glass-to-rubber phase transition, 24:8–9
Glass transitions
in ionomers, 14:468–470
in shape-memory polymers, 22:358, 359t
Glass-transition temperature ($T_g$), 9:158,
190–191, 195, 553; 10:422–423; 11:500,
530, 531–532
in the drying process, 23:104
of ethylene oxide polymers, 10:674–675
increases in, 14:461–462
measurement of, 16:273
of methacrylic ester polymers,
16:273–274
of organic semiconductors, 22:209
of polycarbonates, 19:805
of polymers, 20:400
of PVA, 25:594
for substituted styrene polymers, 23:367t
of thermoplastics, 10:177
of VDC copolymers, 25:701–702, 703,
706–707
of wool, 26:381–382
Glassware, detergents for, 8:440–441
Glass whisker reinforcement, 5:574t
Glass wool, asbestos substitute, 3:314t
Glassy carbon, 4:738
Glassy films, in OLEDs, 22:215
Glassy point transition temperature,
12:76–77
Glassy polymers, 16:27
aging in, 10:424
Glassy polyphosphates, 18:846–847
Glauber's salt, 5:785t
recovery from brine, 5:801
in sodium sulfate production, 22:865
Glaucodot, 3:263t
Glaucosite deposits, 17:688–689
Glaze coatings, 5:665
Glazes
chemical analysis of archaeological materials, 5:745
opacifiers for, 19:410
Glazing, methacrylic ester polymers in, 16:293–294
Glazing agents, as food additives, 12:57
Glazing coatings
dynamic properties of, 23:20–23
static properties of, 23:16–19
GLIADER Wafer drug-delivery device, 13:741
Global chemicals industry, 24:264. See also World entries
Global climate change (GCC), 26:692–693.
See also Global warming as a major environmental problem, 21:529–530
Global economy, technology transfer in, 24:361
Global Linearizing Transformations (GLT), nonlinear method, 6:53
Global mercury releases, 16:47
Global ocean resources, 17:684–686
Global pinning force scaling, 23:828
Global rate expression, in reactor technology, 21:345–346
Global reaction rate, 21:342, 356–357
Global science and technology (S&T) system, R&D efforts in, 21:610–614
Global sensitivity analysis (GSA), in parameter estimation, 26:1039
Global shipping, of inks, 14:335
Global systems, role of weathering in geochemical processes in, 26:7
Global warming, 1:806–808; 26:28. See also Global climate change (GCC)
Global warming potential (GWP), 13:723; 14:819, 820; 21:530
Global wine production, 26:320–323
Globe-type valves, 20:685
Globe valve, 19:474
Globular proteins, 15:829, 830; 20:829
Globulins, as foaming agents, 12:21
Gloss, 7:305, 316
coatings, 7:112
Gloss control, in paint, 18:66
Gloss enamel paints, 7:140–142
Gloss meters, 7:325; 18:71
Glossy surfaces, and object mode perceptions, 7:306t
Glucagon-like peptide 1 (GLP-1), target of antiobesity drugs, 3:98
D-Glucaic triacetate, 4:713
β-Glucanases, 10:300
β-1,4-Glucan cellulose, 5:362
Glucans, 20:453
β-Glucans, 10:292
d-Glucitol (sorbitol), 4:709
Glucoplasty, 12:64
Glucosaminans, 4:717; 20:565. See also Galactoglucomannans
classification by structure, 4:723t
hardwood, 21:10
softwood, 21:8–9
Glucosates, iron, 14:541
Gluconic acid, molecular formula, 5:712t
d-Glucono-1,5-lactone (d-glucono-d-lactone), 4:708
Glucosobacter, 11:4–5, 7
Glucosamine, 17:672–673
as antiaging agent, 2:824
Glucosamine sulfate, as antiaging agent, 2:824
Glucose
chemical formula, 4:696
fermentation in beer making, 3:577
in cocoa shell from roasted beans, 6:357t
in coffee, 7:254
aldehyde-d-Glucose, 4:700
x-d-Glucose, mutarotation of, 16:548
d-Glucose, 4:697, 698, 699, 701, 708
in ascorbic acid production, 25:753, 754–755, 756
forms in solution, 4:700
Lobry de Bruyn–Alberda van Ekenstein reaction, 4:712
uses of, 4:714
Glucose-6-phosphate dehydrogenase, cofactor regenerating system, 3:673
Glucose dehydrogenase, cofactor regenerating system, 3:673
Glucose-dependent insulin release, 9:68
Glucose isomerases, 4:712; 12:64; 10:252
immobilized, 10:272, 290–291
Glucose isomerization, 10:290–291
Glucose meter, for diabetics, 3:811
Glucose oxidase (GOD), 4:708
biosensor for, 3:797–798
hydrogen peroxide biogeneration for bleaching, 4:65–66
immobilized, 9:68
regioselective oxidation by, 3:674
Glucose-oxidase-immobilized membrane, 9:70
Glucose-responsive insulin delivery, 9:66–71
Glucose separation adsorbents, 1:587t
with zeolite KX, 1:610
Glucose syrups, 10:286–287; 26:288–289
Glucose tolerance, chromium(III) compounds may improve, 6:549–550
Glucose tolerance test, intravenous, 9:67
Glucose utilization, by yeasts, 26:455
Glucosyl linkages, in the wood cell wall, 21:15
Glucosyl-fructose, 24:237
d-Glucuronic acid, 4:711
Glucuronic pathway, of ascorbic acid biosynthesis, 25:762–763, 763–764
Glue, kaolin application, 6:688t
Glueckauf approximation, adsorption, 1:608, 609
Glue resin mixes, for the application of melamine resins, 15:791
Glufosinate, 13:299, 325, 326, 357
crop resistance to, 13:359–360
metabolism of, 13:360
Glutamic acid content in cocoa and chocolate products, 6:368t
systematic name, formula, and molecular weight, 2:558t
taste profile, 2:605
vitamin K and, 25:795
d-Glutamic acid, systematic name, formula, and molecular weight, 2:558t
dl-Glutamic acid, systematic name, formula, and molecular weight, 2:558t
l-Glutamic acid, systematic name, formula, and molecular weight, 2:558t
Glutamine in beet juice purification, 23:462
systematic name, formula, and molecular weight, 2:558t
taste profile, 2:605
d-Glutamine, systematic name, formula, and molecular weight, 2:558t
dl-Glutamine, systematic name, formula, and molecular weight, 2:558t
l-Glutamine, systematic name, formula, and molecular weight, 2:558t
Glutamic acid, 13:24t
Glutamine synthetase (GS) inhibitors, 13:359
Glutaral, antimicrobial used in cosmetics, 7:831t
Glutaraldehyde, 1:278–279
hemoglobin modifier, 4:114, 120–122
from vinyl ethers, 1:258
Glutaric acid, 1:278–279
from adipic acid, 1:554
Glutaric anhydride, 1:557
Gluten, celiac disease and, 26:290
Gluten flour, 26:284
Gluten proteins, 26:275–276
Glycals, 4:713
Glycan, 4:697
d-Glyceraldehyde, 4:698
d-aldoses derived from, 4:698
d-Glyceraldehyde 3-phosphate, 4:711
Glycerides partial, 10:802–804
structure of, 10:819
in fatty acid neutralization, 22:740
Glycerine esters, 24:159
Glycerol, 4:709; 20:37
carbonic acid inhibitor, 5:169
in continuous saponification, 22:738
in fatty acid neutralization, 22:739–740, 741
function as ingredient in cosmetics, 7:829t
skin conditioner/moisturizer, 7:843t
in soap bars, 22:742, 743, 754
in soap making, 22:732
solubility of boric acid in, 4:253t
in ternary soap–water systems, 22:727
wartime production of, 11:8
Glycerol tris (allyl carbonate), properties of, 2:253t
Glyceryl esters, emulsifiers, detergents, and dispersants, 8:710t
Glyceryl isostearate, cosmetically useful lipid, 7:833t
Glyceryl monostearate, in cosmetic molded sticks, 7:840t
Glyceryl PABA, cosmetic uv absorber, 7:846t
Glyceryl trinitrates, 5:113–114
molecular formula and structure, 5:110t
pharmacokinetics, 5:115
Glycidyl amine resins, 10:372
Glycidyl amines, epoxy content of, 10:385
Glycidyl-based resins, 10:354
Glycidyl esters, 10:381–382
Glycidyl ether of tetrakis(4-hydroxyphenyl)ethane, 10:371
Glycidyl ether reactive diluents, 10:377t
Glycidyl ethers of hydrocarbon epoxy novolacs, 10:369–370
monofunctional and aliphatic, 10:376–377
Glycidyl methacrylate (GMA), 10:382; 16:242; 23:728
in automotive coatings, 10:447
copolymerization with acrylic monomers, 1:380t
properties in powder coating, 7:43t
Glycidyl methacrylate-acrylic powder coatings, 10:441–442
Glycidyl neodecanoate, 5:69
Glycine, 1:138, 139; 20:823
chemical synthesis, 2:596
content in cocoa and chocolate products, 6:368t
derivatives of, 26:145
killing rate of E. coli, 8:641t
systematic name, formula, and molecular weight, 2:555t
taste profile, 2:605
Glycoconjugates, 4:705
Glycopolypeptides, 4:705–706
Glycodendrimers, 26:797
Glycodendritic architecture, effects of, 26:798
Glycogens, 4:704; 20:453
classification by structure, 4:723t
role in animals, 4:697
Glycol-based drilling fluid, 9:35
Glycol dibenzoates, from benzoic acid, 3:631, 632t
Glycol ethers, 10:665
derivation from ethanol, 10:555
production of, 20:812
Glycolic acid, 1:138; 2:816; 14:127
production of, 14:128
reaction with casein, 14:129
Glycolipids, 4:706
Glycol methyl ethers (glymes), 14:247
Glycolonitrile, 8:174
hydrolysis of, 14:128
Glycols, 12:644–682. See also Ethylene glycols (EGs); Propylene glycols
oxidation of, 12:663
reaction with dibasic acid anhydrides, 20:98
Glycol titanates, 25:87–88
Glycolurils, 2:621; 13:109–110
\( \alpha \)-Glycol values, 10:361
Glycolysis, in plastics recycling, 21:450
Glycopeptides, 3:26
bacterial resistance mechanisms, 3:32t
Glycoprotein Ia, 4:85
Glycoprotein IIa, 4:85
Glycoprotein IIb, 4:85
Glycoprotein IIb/IIIa receptor antagonists, antithrombotic agents, 5:170, 171t, 173–174
Glycoprotein IIIa, 4:85
Glycopyranose, dimerization of, 20:451
Glycopyrrolate, 4:359t
Glycosaminoglycans, 4:706
role in hemostatic system, 4:85
Glycosides, 4:700–704; 5:180t
Glycosidic linkage, 4:701
Glycosylamine, 4:705
Glycosylated insulins, 9:66–67
Glycosyl chlorides, 4:705
C-Glycosyl compounds, 4:705
Glycosyl fluorides, 4:705
Glycylcyclines, 24:598, 600
antibacterial activity of, 24:602
Glycyrrhiza root extracts, 24:240
Glycyrrhizin, 24:240
Glyoxal, 1:102; 12:659
antimicrobial used in cosmetics, 7:831t
Glyoxal resins, 2:641–642
Glyoxylic acid, hemoglobin modifier, 4:117
Glyphosate (Rodeo), 8:2; 13:38–39, 300, 313, 325–326
as an aid to retting, 11:606
bioremediation substrate, 3:777
crop resistance to, 13:355–359
herbicide/algicide for aquaculture in U.S., 3:215t
Glyphosate tolerance, bioengineering of, 12:487–490
Glyphosate-tolerant EPSPS, 12:488–490
Glytac A pretreatment, 9:482, 484
Gmelin Handbook of Inorganic Chemistry, 24:753, 756, 761; 25:401
GNN method, 10:341
Godoleic acid, physical properties, 5:31t
Godrej–Lurgi α-olefin manufacture,
Gold (Au), 6:13; 12:682–713
analytical methods for, 12:697–698
in bimetallic monetary system, 22:648
coke formation on, 5:266
colloidal precipitation color, 7:343t
colloidal suspensions, 7:275
color, 7:334
consumption of, 12:692
dental applications, 8:304–307
derivatives of, 12:705–708
economic aspects of, 12:694–696
effect on copper resistivity, 7:676t
environmental concerns related to, 12:699–700
estimated reserves of, 19:603t
extraction and refining of, 12:689–690
extraction by sodium cyanide, 12:699–700
fingerprinting, 12:698
grades, specifications, and quality control for, 12:696–697
health and safety factors related to, 12:700–701
history of, 12:682–685
hydrometallurgical treatment of, 16:156
manufacturing and processing, 12:691–694
mining, 16:37–38, 134
occurrence of, 12:685–686
in photographic sensitization, 19:190–191
production of, 12:694
properties of, 12:687–689
purity of, 12:697
reactions with, 12:687
recycling and disposal of, 12:698–699
silver versus, 22:640
sodium alloy with, 22:780
in solder for dental applications, 8:316
solubility limits and electrical conductivity effects on copper, 7:750t
sources and supplies of, 12:686
uses for, 12:701–705
value of, 12:685
Gold alloys, 12:687, 691, 703
dental applications, 8:304–307
Gold artifacts, 12:686
Gold assayers, 12:696
Gold-based interlevel wiring, 22:191
Gold-based Schottky contacts, 22:190–191
Gold baths, 9:812–813
Gold chloride, addition in ruby glass
manufacture, 7:344
Gold(III) chlorides, 12:706
Gold-coated reflectors, 12:704
Gold complexes, therapeutic,
12:700–701
Gold compounds, 12:705–706. See also
Gold-containing cluster compounds commercially available, 12:706
immune system and, 12:700
research potential for, 12:706
Gold-containing cluster compounds, 12:708
Gold deposits, 12:685–686
Gold dicyanide, 12:701
Golden antimony, 3:44
Golden sulfide of antimony, 3:65
Gold-exchange system, 12:694–695
Goldfish
aquaculture, 3:183
common and scientific names, 3:187t
Goldhoff-Sherby parameter, 13:478
Gold hydride, 12:707
Gold(III) iodide, 12:707
Gold leaf decoration, 12:693–694
Gold metallization, electroless, 9:697
Gold mining industry, 12:695–696
Gold particles, 12:704
Gold plating, 9:764; 12:692
for microelectronics, 9:811–813
Gold–platinum thermocouple, 24:461
Gold-producing countries, top ten, 12:694t
Gold refining capacity, world, 12:690
Gold reserves, 12:684
Gold–silver–copper alloys
cadmium addition to, 4:502
Gold standard, 12:683
Gold(I) sulfide, 12:707
Gold–sulfur complexes, 12:700
Gold tribromide, physical properties of, 4:328
Gold wire, 12:692, 702; 17:833
Golf clubs, titanium in, 24:868
Goniometer, 26:420, 423
Goniospectrophotometers, 7:325
Gonorrhea vaccine, 25:499–500
Good (Industrial) Large Scale Practice (G[I]LSP), 11:49
Good Automation Manufacturing Practice (GAMP), in fermentation, 11:48
Good Delivery Bar, silver, 22:649
Good Laboratory Practice (GLP), 25:223 standards in, 18:544
Goodman diagrams, 13:489
Good Manufacturing Practice (GMP) in fermentation, 11:47–49
 guidelines for, 19:457
 for sodium nitrite, 22:858
 standards in, 21:168–169
Goodyear, Charles, 21:461
Gore Tex fabric, 13:396
Gore-Tex membranes, 15:803
Gossypium arboreum, 8:3
Gossypium barbadense, 8:2
Gossypium herbaceum, 8:3
Gossypium hirsutum, 8:2
Gossypol inclusion compounds, 14:174–175
Goudy layer, 3:420
Gould-Jacobs cyclization, 21:228–229
Gouraud shading technique, 10:341
Government, role in technology transfer,
24:357–358, 393–394
Governmental requirements, isocyanate-related, 25:480. See also Regulation
Government recycling programs, in Europe, 21:373
Government Rubber Styrene (GRS) Project, 20:373–374
Government warnings, on wine, 26:329
GOX gene, 13:358
G-protein coupled receptors (GPCR), 20:832
Gracilaria, common and scientific names, 3:188t
Graded multilayer diffractometer, 26:427
Graded-refractive index (GRIN) devices, 12:613
Grade-efficiency curve, in sedimentation design methods, 22:57
Grades of food salt, 22:814–815
of silicon, 22:504t, 507–508
of silver, 22:649–650
of sodium carbonate (soda ash), 22:793, 794t
of sodium hydroxide (caustic soda), 22:838
of sodium nitrate, 22:850t
of sodium nitrite, 22:856, 857t
Gradient chromatography, 3:827
Gradient copolymers, classification in terms of monomer sequence distribution, 7:608t
Grading layer, in landfill design, 25:879
Grading systems, for flax fiber, 11:617
Gradual failures, 26:981
Graduate students, role in facilitating research partnerships, 24:383
Graft copolymerization, 20:327. See also Graft polymerization
Graft copolymers, 7:650–654; 20:391
 compatibilization efficiency of, 20:338
 formation of, 23:395
 in polymer blends, 20:324–325
 in reactive compatibilization, 20:325–326
 classification in terms of monomer sequence distribution, 7:608t
 IUPAC source-based classification, 7:609t
-graft- designation, 7:609t
Graft elastomers, 22:718
Grafting, in vinyl acetate polymerizations, 25:573–574
Grafting from method, 7:652–653
Grafting onto method, 7:654
Grafting process, 13:537
Grafting through method, 7:653
Graft polymerization. See also Graft copolymerization
 ABS, 1:419, 421
 acrylic ester monomers, 1:386
 of methacrylic ester polymers, 16:289–290
 polychloroprene, 19:835, 836
Graft polymers, 19:763–764
Graft polyols, 25:464
Graham’s law of diffusion, 15:837
Grain-based foods, recommendation for,
26:289–290
Grain boundaries, 23:276
  current percolation through, 23:842–845
  of polycrystalline alloys, 13:523
Grain boundary hardening, 13:502
Grain commodities, world production of
  and international trade in, 26:263t.
  See also Cereal grains
Grainer process, 22:800, 805
Grain milling, purpose of, 26:275
Grain-oriented steels, 23:309
Grain processing enzymes, 10:286–296
Grain size
  of carbon steels, 23:293–294
  of steels, 23:276–277
Grain size determination, microscopic,
  23:277
Grain size effects, material strength and,
  13:497
Gram, Christian, 11:7
Gram–Schmidt chromatogram, 14:233
Grand canonical ensemble, 1:33
Grand Composite Curve (GCC), 13:221,
  20:737–738
Grande yeasts, 26:449–451
Grandisol, 24:473
Grant Opportunities for Academic Liaison
  with Industry (GOALI) program,
  24:395
Granular activated carbons, 4:747
Granular activated carbon (GAC)
  in advanced wastewater treatment,
  25:909
  in hazardous waste management, 25:812
Granular ferric hydroxide (GFH), for
  arsenic removal, 3:279–280, 285
Granular flour, 26:284
Granularity
  DIR couplers and, 19:258
  photographic, 19:221
  root mean square, 19:264
Granular materials, for fertilizers, 11:127
Granular polytetrafluoroethylene (PTFE),
  18:288, 290
Granular quicklime, 15:27
Granular resins, 18:291–292
  fabrication of, 18:299–300
Granulated sugar, refined, 23:481
Granulation, 10:272–273
  as a spice quality parameter, 23:158
  of sugar, 23:472
  ceramics powders, 5:645–646
Granulation drug dosage form, 18:702–705
  Granule-bound starch synthases,
    12:492–493
Granules
  controlled release pesticides, 7:568–570
  silicon carbide, 22:541
Granulocyte macrophage colony
  stimulating factor (rhu GM-CSF),
  yeast-derived, 26:485
Granulocyte transfusions, 18:253
Grapefruit, citric acid in, 6:632t
Grape phenols, 26:299
Grapes, cultivation of, 26:297–298
Grape vines, girdling, 13:34
Graphical particle size measurement,
  18:137–138
Graphic arts, catalytic oxidation in, 10:105
Graphics tools, growth of, 16:731
Graphic-use paper, 18:129
Graphite, 4:736; 15:246. See also Artificial
  graphite; Carbon entries; Natural
  graphite
  carbon black structural similarity to,
    4:763–764, 767–769
  compounds with alkali metals, 4:650
  crystal structure, 4:734
  crystalline flake, 12:781–784
  elastic constants of, 12:717t
  fiber reinforcement for ceramic–matrix
    composite, 5:558t
  as filler, 11:317
  flexible, 4:736–737
  fluorine reactivity with, 11:832
  in galvanic series, 7:805t
  grinding, 12:772–774
  high crystalline, 12:784–785
  impervious, 12:745–746
  low permeability, 12:747
  oxidation of, 12:789
  porous, 12:747
  properties of, 12:719t
  pyrolytic, 4:737–738
  reactor-grade, 12:742–744
  resistance to hydrochloric acid, 13:827
  single-crystal, 26:741t
  strength of, 12:774
  synthetic diamond and, 8:530
  tabling and screening of, 12:783
  world production of, 12:786
  See also Carbon entries
  in cathodic protection, 12:759
  as a refractory raw material, 21:491
Graphite compounds, 12:777–778
Graphite crystal lattice, 17:46
Graphite crystals, 12:714, 776
Graphite–diamond equilibrium line, 8:531–532
grades of, 12:751
joining, 12:750–751
in open-arc furnaces, 12:301
operation of, 12:752
temperature properties of, 12:751
Graphite fiber-reinforced composites, 10:451
Graphite fibers, 4:735
asbestos substitute, 3:314t
Graphite fluoride, 12:778; 15:246
Graphite foam, 4:737
Graphite furnaces, in fiber optic fabrication, 11:142
Graphite heat exchangers, 12:746
Graphite oxide, 12:778
Graphite paper, 4:738–739
Graphite powders/particles, 12:761
Graphite products
extrusion of, 12:731–732
production of, 12:721
Graphite reactors, 17:569–573
Graphite shapes, applications for, 12:760–761
Graphite sulfate, 12:777
Graphite-to-diamond direct process, 8:535–538
Graphitic materials, characteristics of, 12:762
Graphitization, 4:735; 12:737–740
Graphitized carbon, 4:735
Gras a’courte flamme coal grade (France), 6:713t
GRAS affirmation process, 12:36. See also Generally Recognized As Safe (GRAS) substances
Gras coal grades (Belgium), 6:713t
Grashof number (Gr), 11:746; 15:685
Gras properment dit coal grade (France), 6:713t
Grass carp, common and scientific names, 3:187t
Grass growth inhibitors, 13:303
Grass lignins, 15:2
Grassroots plant design, 19:495–497; 20:724, 734
Grassroots plants, 9:528
Grate calciner, 19:5, 7
Grate furnaces, 26:611
Grate magnets, 15:441
Grating, spectrophotometers, 23:137
Gravel, unconsolidated deposits of, 17:687
Gravel-pump mining, of tin, 24:784
Gravimetric analysis, of platinum-group metal compounds, 19:637
Gravimetric iron compound analysis, 14:559
Gravimetric methods, tellurium determination by, 24:415
Gravimetric techniques. See also Acoustic wave gravimetric technique for anthropogenic silicas and silicates, 22:470
in platinum-group metal analysis, 19:618
in sodium analysis, 22:775
Gravitational sedimentation, 18:142
Gravitational system of dimensions, 8:584
Gravity effect on weighing, 26:239–241
values for, 26:240t
Gravity-casting zinc alloys, 26:593
Gravity concentration, 14:733; 19:607
method for, 16:626, 627–632
Gravity dense medium separators, 16:633–634
Gravity filtration, 11:323–324
Gravity flow, in granular materials, 9:110
Gravity flow concentrators, 16:631–632
Gravity ore sorting methods, 16:626–636
Gravity sedimentation, 22:51
Gravity separation in hazardous waste management, 25:818–819
in wastewater treatment, 25:889t, 891
Gravity separators, 16:627–632
types of, 16:628t
Gravity settling of single particles, 22:51–53
in spiral channel separator, 22:63
in vortex-induced separator, 22:62–63
Gravity settling tank, 22:57
Gravity sludge thickening, 25:913
Gravity thickener, 25:913
Gravure coating, 7:14–18
method summarized, 7:5t
shear rates, 7:32t
Gravure inks applications of, 14:326–327
solvents for, 14:324–326
types of, 14:324
Gray (Gy), 15:254
Gray cast iron pipe, 23:782–783
Gray cottons, detergents systems used in
scouring of raw, 8:413t
Gray iron, 14:522
Gray-King assay, 6:735
Graylock flange, 19:508
Gray pigments, 7:354
Gray scales, 9:228
Grazing angles of incidence, 14:231
Grazing incidence X-ray diffraction
(GIXRD), 24:72
Grease(s)
additives for, 15:219–226
lubricating, 15:242–243
Grease analysis, of water, 26:43
Grease application guide, 15:245t
Great Britain, history of soap consumption
in, 22:755. See also British entries;
National Coal Board (NCB; UK);
United Kingdom (UK)
Greater-than-class-C (GTCC) radioactive
waste, 25:853
Greatest Feret’s Diameter (GFD), 18:147
Greatest temperature difference (GTD),
26:64
Great Plains Coal Gasification Project,
6:777
Great Salt Lake, 5:784
chemical recovery from, 5:787–788
sodium sulfate recovery from, 5:801
Greeflex, 7:640
Greek gold, 4:502
Greek symbols, in mass transfer,
15:736–737
Green, CIE chromaticity diagram, 7:313,
315. See also Greens
Green body, 16:171
Green carbon, 4:735
Green chemistry, 12:799–818; 20:37
achieving the goals of, 12:816
concepts related to, 12:806–808
defined, 12:799–800
education related to, 12:814–815
financial analysis of, 12:813–814
historical context of, 12:800
industrial examples of, 12:808–812
principles of, 12:802–805
prospects for, 12:815–816
supercritical fluids in, 24:14–15
“Green Chemistry” approach, 18:83
Green Chemistry Institute (GCI), 12:816
Green Chemistry toolbox, 14:828
Green Chemistry Web site, 12:815
“Green Engineering,” 12:800
Green finishing/machining, of ceramics,
5:654–655
“Green” governments, 23:50
Greenhouse effect, 1:806–808; 26:28
as a major environmental problem,
21:529–530
Greenhouse gas emissions, 10:137
enhanced oil recovery and, 18:617
steel industry, 14:526
Greenhouse gases, 1:807t; 21:529; 26:669
analysis of, 15:666
biomass utilization to reduce, 3:703
Greenhouse trials, of phosphate fertilizers,
11:121
Green Label emission criteria, Carpet and
Rug Institute, 1:831t
Green nickel oxide, 17:106–108
Greenockite, 4:472t, 507
color and bad gap, 7:335t
Green odor, 3:228t
Green perfumes, 18:359
Green pigments, 7:352–353
chromium(III), 19:406
for inks, 14:318
Green-Rooney mechanism, 16:97
Greens
typical applications of inorganic in
plastics, 7:372t
typical applications of organic in plastics,
7:368t
typical soluble dye applications, 7:376t
Green-sensitive cones, in eye, 7:304, 308
“Green” solvents, 14:126
Green tea, 2:827
catechins in, 17:666–667
“Green tire concept,” 22:378
Green wood, 26:338
Grepafloxacin, 21:223, 224, 231
Grex, 11:182
Grid-connect photovoltaic systems, 23:49
growth in, 23:49–50
Grid diagram, 13:188
loops in, 13:201–202
in the Pinch Design Method, 13:198
Grid diagram, 20:737
Grid representation, of heat recovery
system, 13:188–189
Grid-type couplings, for pumps, 21:80
Grignard plant flow diagram, 12:826
Grignard process, 22:547
Grignard reaction mixture, hydrolysis of, 12:827
Grignard reactions, 10:505–506; 12:818–838. See also Grignard reagents
activated magnesium, 12:835
aqueous and nonaqueous work-up of, 12:830
economic aspects of, 12:828–830
health and safety factors related to, 12:831–835
value of, 12:820–823
of vinyl chloride, 25:630
alkyl cross-coupling reactions of, 12:835
alternative methods for making, 12:824–825
analysis of, 12:828
crystal structures of, 12:828
custom synthesis of, 12:830–831
ethylene oxide reaction with, 10:638
formation of, 12:825–827
handling, shipping, and storage of, 12:832–835
industrial manufacturing process for, 12:825–827
preparation of, 12:823–825
reactions and applications of, 12:835
reaction with a substrate, 12:827
regulation of, 12:832
in tetraorganotin preparation, 24:811–812
in triorganotin preparation, 24:815–816
Grignard-type reactions, maleic anhydride, 15:491
Grimaldiite, 6:471t
Grind gauge, 18:68–69
Grinding
chocolate liquor, 6:356–357
coffee, 7:258–259
electrochemical, 9:603
in dye manufacture, 9:292
mineral, 16:613–615
Grinding fluids, 1:22–23
Grinding mills, mineral, 16:610
Grinding techniques, in large-scale
pharmaceutical synthesis, 18:729
Grinding Wheel Institute (GWI), silicon carbide standards by, 22:537
Grinding wheels, 1:1, 2–3, 18–21
Grisalva, 24:576
Grizzlies, 16:617
Gross energy requirements (GER), 24:165, 179–180, 196
comparison of, 24:183
Gross National Photo-Product (GNPP), 19:216
Gross pathology, in toxicology studies, 25:216
Gross weight, 26:246
Grothhus-Draper Law, 19:233
Ground alumina hydroxides, 2:429
properties of commercial, 2:429t
Ground aluminas, 2:408, 414
Ground calcium carbonate (GCC), in paper manufacture, 18:107, 108
Ground ion-exchange resins, 14:420
Ground magnetite, screen analysis of, 15:445t
Groundnut oil, in soap making, 22:735
Ground quicklime, 15:28
production of, 15:54–56
quality control for, 15:70
uses for, 15:61–62
Ground rubber, uses for, 21:471, 472
Groundwater
air stripping of, 10:105
in the hydrogeochemical cycle, 26:12
Groundwater bioremediation
halogenated compounds, 3:776
halogenated solvents, 3:772
hydrocarbons, 3:766–768
inorganics, 3:781–782
metals, 3:785
military explosives, 3:780
nonchlorinated pesticides and herbicides, 3:778
Groundwater contamination
with chlorinated hydrocarbons, 10:103–104
by herbicides, 13:310
in the United States, 24:281
Groundwater flow systems, 12:838
Groundwater monitoring, 12:838–847; 21:588
aquifers, 12:838–839
groundwater flow calculation, 12:841–842
groundwater pressure and energy, 12:839–841
monitoring well design, 12:843–846
Groundwater monitoring program, design of, 12:845–846
Groundwater radioactive contamination, 17:549
Groundwater remediation, activated carbon application, 4:753. See also Groundwater bioremediation; Groundwater treatment
Groundwater samples, retrieving, 12:844–845, 846
Ground water treatment, 25:834–843, 843–845
bioremediation, 25:835–836
electrokinetics, 25:843–844
ex situ bioremediation, 25:836, 842–843
in situ bioremediation, 25:844
in situ air stripping, 25:844
plume containment, 25:835
soil flushing, 25:844
soil vapor extraction, 25:844
vitrification, 25:844–845
Ground Water Treatment Rule (GWR), 17:804
Group 1 (IA) peroxides, 18:393–394
Group II–VI semiconductors
abrupt interfaces in, 22:159
for LEDs, 22:174–175
Group 2 (IIA) peroxides, 18:394–395
Group III–V semiconductors, 22:153
abrupt interfaces in, 22:159
dopants for, 22:150t, 157–158
dry etching of, 22:183
for LEDs, 22:174
n-type dopants for, 22:187
p-type dopants for, 22:187
Group 3 (IIIB) catalysts, 16:79–81
Group III compounds, compound semiconductors from, 22:152–153, 156
Group III nitrides, as compound semiconductors, 22:148, 153, 160
Group III–N system, ion implantation doping of, 22:188
Group III organometallics, gas-ohase decomposition of, 22:156
Group 3 (IIIB) perchorlates, 18:278
Group III-Sb system, ion implantation doping of, 22:187
Group IVB metal carbides, 4:650–651

cemented carbides, 4:655
preparation, 4:650–677
Group 4 (IVB) catalysts, 16:79, 81
versus Ziegler-Natta catalysts, 16:82
Group 4 (IVB) metalloocene catalysts, 16:88, 89
Group 4 (IVB) metalloccenes, in monomer synthesis, 16:113
Group 4 (IVB) perchlorates, 18:278
Group VB metal carbides, 4:650–651

cemented carbides, 4:655
preparation, 4:650–677
Group 5 (VB) hydrides, 13:627
Group V hydrides, compound
semiconductors from, 22:152–153, 156
Group 5 (VB) perchorlates, 18:279
Group VIB metal carbides, 4:650–651

cemented carbides, 4:655
preparation, 4:674–677
Group 6 (VIB) perchlorates, 18:279
Group VIIIB metal carbides, 4:651–652
Group 8–10 (VIII) metal complexes, in silicne network preparation, 22:563
Group VIIIB metal carbides, 4:651–652
Group 11 (IB) perchorlates, 18:277–278
Group 12 (IIB) perchorlates, 18:278
Group 12 (IIB) peroxides, 18:397
Group 13 (III) elements
as n-type silicon dopants, 22:485, 487
as silicon-based semiconductor dopants, 22:236
Group 13 (IIIA) peroxides, 18:278
Group 13 (IIIB) peroxides, 18:398–401
Group 14 (IV) elements, atomic structure of, 22:232–233
Group 14 (IVA) perchorlates, 18:278
Group 14 (IVB) peroxides, 18:401–402
Group 15 (V) elements, as silicon-based semiconductor dopants, 22:236
Group 15 (VA) elements, as p-type silicon dopants, 22:485, 487
Group 15 (VA) perchorlates, 18:278–279
Group 15 (VB) peroxides, 18:402–404
Group 16 (VIA) perchorlates, 18:279
Group 16 (VIB) peroxides, 18:404–410
Group 17 (VIIA) perchorlates, 18:279–280
Group A particles, 11:798–799, 801, 809, 820
Group A powders, 11:805
Group B meningococcus vaccine, 25:498
Group frequencies, in spectral analysis, 14:234–236
Grouping, in impact assessment, 14:821
Group-specific affinity ligands, 6:393–394
Grout, 5:500t
Grouting, anthropogenic silicas and silicates in, 22:473
Grouting wells, 5:500t
Grove, William, 854
Growth hormone (GH), 12:463–464
Growth hormone releasing factor (GRF), 12:463
as an animal growth regulator, 13:13–14
Growth hormones, from fermentation, 11:12
Growth methods, growth techniques versus, 22:153
Growth/production kinetics, in fermentation, 11:29–31
Growth-promoting genes, transgenic animals with, 12:463–464
See also Animal growth regulators; Plant growth regulators
Growth retardants, 13:306
Growth techniques, growth methods versus, 22:153
Grubbs catalysts, 26:930, 933, 943, 947–948
GSH-transferases, 13:298
G-type polymers, 21:767
Guaiacol, vanillin preparation from, 25:546
Guaiacwood oil, 24:545
Guaiazulene, 24:545
Guaiol, 24:545
Guanethidine monosulfate, molecular formula and structure, 5:155t
Guanidine phosphate, 8:166
Guanidinium cation, 24:43
Guanidinium groups, 16:781
anion complexation and, 24:45
Guanine, pigment used in makeups, 7:836t
Guanine quadruplexes, 17:610
Guanosine, 4:359t
Guanylate cyclase, nitric oxide stimulates, 5:112
Guaran, 4:726–727; 13:66; 20:454
as a flocculating agent, 11:627–628
in paper manufacture, 18:115
properties of, 13:74t
Guar hydroxypropyl trimonium chloride, 7:842
Guerbet alcohols
cosmetic applications, 2:21
in cosmetic molded sticks, 7:840t
major producers, 2:27t
Guerbet process, 2:27t, 43
Guerbet reaction, 10:558
Guest-host LCDs, 15:115
Guest-host mode LCD systems, 9:339
Guggenheim process, for sodium nitrate, 22:846–848
Guided waves, generating in pipes, 17:433–434
Guidelines, environmental impact assessment, 10:231
Guidelines for Testing of Chemicals (OECD), 18:540
Guides for the Jewelry Industry, 12:691
Guide to Grades, Compounding, and Processing of Neoprene Rubber (Bament), 19:847, 851, 852
Guignet’s green, 6:556
L-Gulono-δ-lactone oxidase, in ascorbic acid biosynthesis, 25:762
D-Gulose, 4:698
Gum acacia, 4:727
Gum Arabic, 4:724t, 727; 12:53; 13:70–71
properties of, 13:74t
Gum arabics, classification by structure, 4:723t
Gum benzoin, 3:625
Gum ghatti, classification by structure, 4:723t
Gum guaiac, 12:61
Gum karaya, 4:724t
classification by structure, 4:723t
Gummel number, 22:248
Gum polymers, 20:242
Gums, 12:52–54; 13:60–77. See also Guar gum; Gum Arabic
agars, carrageenans, and furcellarans, 13:67–68
algins/alginites, 13:67
cellulose derivative, 13:63t, 71–73
characteristics of, 13:61–62
choice of, 13:65
in cocoa shell from roasted beans, 6:357t
exudate, 13:63t
fermentation (microbial), 13:63t
gypsum refractory dental dies, 13:69
    general applications for, 13:73–75
locust bean, 13:66–67
pectins, 13:68–69
performance criteria in cosmetic use, 7:860t
physical properties of, 13:65
plant extract, 13:63t
properties of, 13:64–66, 73, 74t
seaweed (algal) extract, 13:63t
seed, 13:63t
source, preparation, properties, and applications of, 13:63t, 66
structural features of, 13:62–64
synthetic, 13:63t
tuber, 13:63t
wealan, 13:69
xanthan, 13:70
Gum–saline, 4:110–111
Gum solutions, 13:64
    rheology of, 13:65
Gum tragacanth (tragacanthin), 4:724t
    classification by structure, 4:723t
Gum turpentine, 24:475, 476
Gum metals, 24:796
Gunning mixes, 21:482
Gun propellants, 10:724–725, 726
Gurvitch rule, 16:821
Gusev and Lusti equation, 11:310–311
Guth equation, 14:470
Guth-Gold model, 11:308
Guth model, 11:308
Guyanaite, 6:471t
Guyton de Morveau, Louis Bernard,
    chemical nomenclature of, 17:387–388, 390, 394
Gymnemic acid, 24:246
Gymnosperm fibers, 11:173
Gypsum, 4:583
Gypsum, 4:582–601; 5:467, 785t; 23:576
    forms and composition, 4:583t
    hardness in various scales, 1:3t
    in Portland cement, 5:467
    in Portland cement hydration, 5:477t
    thermal reduction of, 23:577
    thermodynamics and kinetics of formation-decomposition, 4:586–588
Gypsum board, 4:600–601
Gypsum processes, obtaining sulfur from, 23:576–577
Gypsum refractory dental dies,
    compressive strength, 8:289t
Gyratory crushers, 16:612
Gyrotrons, 16:517
H2S. See also Hydrogen sulfide entries
    absorption of, 23:598
    direct oxidation of, 23:616–617
    reduction of tail gas sulfur species to, 23:617–618
    small scale recovery of, 23:619
H2S/SO2 ratio, in Claus conversion chemistry, 23:611
Haber process, 22:792
Hackling, 11:292
Hackmanite, color, 7:338
Haemanthamine, 2:87
Hafnium (Hf), 13:78–97; 26:637. See also
    Hafnium compounds
    analytical methods for, 13:87–88
    chemical properties of, 13:80
    economic aspects of, 13:86–87
    health and safety factors related to, 13:88
    isotopes of, 13:79t, 89
    manufacture of, 13:81–86
    neutron absorption capabilities of, 13:89
    occurrence and mining of, 13:80–81
    physical properties of, 13:79
    production flow sheet, 13:83t
    reactivity of, 13:80
    reduction of, 13:84–85
    refining, 13:85–86
    separation of, 13:82–84; 26:630–631
    sodium in manufacture of, 22:777
    specifications and standards for, 13:87
    U.S. imports of, 13:86t
    uses as compounds, 13:89–90
    uses as metal, 13:89
    uses for, 13:88
    world statistics for, 13:81t
Hafnium acetate, 13:94
Hafnium boride, 13:90
Hafnium carbide, 4:649t, 686; 13:90–91
    cemented carbides, 4:656
    as industrial hard carbide, 4:674
    physical properties of, 4:684t
    stoichiometry, 4:651
Hafnium carbonate, 13:94
Hafnium compounds, 13:90–94
    physical properties of, 13:91–92t
Hafnium dioxide, 13:93–94
HALIDES 415

Hafnium-free zirconium alloys, 26:635t
Hafnium halides, 13:91–93
Hafnium hydride, 13:93
Hafnium hydroxide chloride heptahydrate, 13:92
Hafnium metal, analysis of, 13:87
Hafnium nitride, 13:89–90, 93
Hafnium oxide, 13:89, 93–94
reduction of, 13:84
Hafnium sulfides, 13:94
Hafnium tetrabromide, 13:93
vapor reduction of, 13:84–85
Hafnium tetrafluoride, 13:90, 91
Hafnium tetrahydridoborate, 13:90
Hagen–Poiseuille expression/law, 21:726, 729
Hagen–Poiseuille flow, in microfluidics, 26:961
Hägg rule, 4:652
Hagler force fields, 16:744–74!
Hahnium (Ha), 1:492t
Hair
bleaching, 4:73
chemical analysis of archaeological materials, 5:752
Hair cleansers, 7:850–851
Hair colorants, 7:856–858
Hair conditioners, 7:854–855
Hair creams, colloidal, 7:274t
Hair fixatives, 7:855–856
Hair loss, 2:810
antiaging agents for, 2:816
Hair products
cosmetics, 7:854–860
quaternary ammonium compounds, 2:751
Hair removers, 7:859–860
Hair treatments, silicones for, 22:593, 594
Hair waving/straightening products, 7:858–859
Hake’s empirical formula, 23:810
N-Halamides, 13:106
N-Halamine-functionalized elastomer
N-Halamine polymers, 13:113–114
N-Halamines, 13:98–122. See also N-
Halamine polymers
analytical methods for, 13:114–115
economic aspects of, 13:114
health and safety factors related to, 13:115
inorganic chloramines and bromamines, 13:101–104
organic chloramines and bromamines, 13:104–112
properties of, 13:98–101
substituted, 13:105
thermal and photostability of, 13:100–101
uses for, 13:115–116
Halazone, 13:109
Halex reaction, 11:862
Half-life, controlled-release pesticides, 7:553. See also Half-lives
Half-life data
initiator, 14:278–279
peroxide, 14:281
Half-life initiator, 14:278–279
Half-lives, 21:291–294. See also Half-life
theoretical, 21:299
Halgren force field, 16:745
Halide complexes
palladium, 19:652
rhenium, 21:699–700
uranium, 25:437–439
Halide-free ionic liquids, 26:842–843
Halide glasses, 12:575–576
Halide ligands, of iridium, 19:649
Halides, See also Halogen compounds;
Halogen salts
acid, 12:188–190
alkenyl, 12:167
alkyl, 12:172
carbonyl, 12:180
cross-coupling of organoboranes with, 13:651
diazonium, 12:171
diorganotin, 24:819, 820
ethylene oxidation and, 10:649
ethylene oxide reaction with, 10:638–639
gallium, 12:356–358
gold, 12:706–707, 708
of hydroxybenzoic acids, 22:3
iron, 14:537–540
lead, 14:784–786
manganese, 15:573–574
molybdenum, 17:31
nickel, 17:109–110
niobium, 17:147–150
phosphorus, 19:30–44
plutonium, 19:689–690
reactions with bromine, 4:298–299
rhenium, 21:699–700
selenium, 22:87–88
silver(I) complexes with, 22:675
Halogenated organic solvents, bioremediation, 3:770–772
Halogenated phosphate esters, 25:472
Halogenated resins, 20:115
Halogenated silylating agents, 22:694–695
Halogenated stream purification, 10:104
chloroform and, 6:281–282
of cyclopentadiene and dicyclopentadiene, 8:225
fullerene, 12:238
of maleic anhydride, 15:491–492
of naphthalene, 17:74
of salicylic acid, 22:4
Halogenation reactions, 21:845
of quinoline, 21:185
of toluene, 25:165
Halogen chemistry, effect on ozone depletion, 17:793
Halogen compounds. See also Halides; Halogens
hydrogen chloride reaction with, 13:820
reaction with ozone, 17:775–776, 781
reactions with acetaldehyde, 1:105
Halogen-containing elastomers, 21:795
Halogen-containing salts, silver, 22:671
Halogen exchange fluorination method, 11:861–864
Halogen fluorides, 11:853, 863–864; 13:122–135
acids and bases derived from, 13:128t
chemical properties of, 13:125–128
disposal of, 13:130
handling, 13:130
health and safety factors related to, 13:130
liquid, 13:128
manufacture of, 13:128–129
physical properties of, 13:123–125
reactions with inorganic compounds, 13:126–127
reactions with metals, 13:125
reactions with nonmetals, 13:125–126
reactions with organic compounds, 13:127
shipping, specifications, and analytical methods for, 13:129–130
uses for, 13:130–131
Halogen-free resins, 10:455
Halogenoaromatics, 12:248
\(\alpha\)-Halogeno carboxylic acids, amination, 2:571
Halogenofullerenes, 12:248
Halogenolysis, 13:648–649
Halogen radicals
catalytic cycles involving, 17:787–788
effect on ozone depletion, 17:786–790
ozone destruction by, 17:787
sources of, 17:786
Halogens, See also Bromine (Br); Chlorine (Cl); Fluorine (F); Iodine (I)
higher aliphatic alcohols, 2:5
in \(N\)-halamines, 13:98
reactions with acetaldehyde, 1:105
reactions with acetone, 1:163
reactions with acetylene, 1:180
reactions with alkanolamines from olefin oxides and ammonia, 2:125–126
reactions with aluminum, 2:284–285, 349–359
reactions with antimony, 3:44
reactions with benzene, 3:602
reactions with butylenes, 4:407
reaction with ammonia, 2:685–686
reaction with aniline, 2:788
selenium reactions with, 22:76
silicon reactions with, 22:490
sodium reactions with, 22:765
substituents in pyridines, 21:106–107
Halogen salts, nomenclature for, 17:391.
See also Halides; Salts
Halogen sources, activation of, 17:786–787
Halogen-substituted succinimides, 23:421–422
Halogen sulfides, 23:568
Haloing, 9:219
Haloisouquinolines, 21:206
Halometalation, 14:270
Halomethanes, boiling points of, 11:859t
N-Halo-N-alkylsulfonamides, 13:108
Halons, 4:348, 348t; 13:727; 17:788
ozone depleting potential of, 1:809t
Haloperoxidases, as bleaching agents, 4:66–67
Halophosphazenes, 19:56
Halophosphine halides, 19:65
Halophosphines, 19:61, 65
N-Halophthalimides, 13:109
Halopredone acetate, 4:359t
Haloprogesteron, 4:360t
Halo-pyrimidine-based dyes, 9:475
418  N-HALOQUINOLIMIDES

N-Haloquinolimides, 13:109
Haloquinolines, 21:199
Halostibines, 3:69–71
N-Halosulfinylamines, 13:104
N-Halosulfonylamidates, 13:105
Halothanea, 4:359t
Halowaxes, 13:144
Halphenic acid, 5:36t
Halpin-Tsai equations, 26:778
Halso 99 solvent, 6:346
Halso 125 solvent, 6:346
Halton sequence, in quasi-Monte Carlo sampling, 26:1011, 1013
Hamaker constants, 3:323; 8:732; 12:5
Hamaker equation, 8:732
Hamamelis, astringent, 7:847
Hammersley sequence, in quasi-Monte Carlo sampling, 26:1011
Hammersley sequence sampling (HSS), 26:1005, 1011–1015, 1024, 1025
in control systems, 26:1046
future trends in, 26:1047–1048
HSGA algorithm and, 26:1032
HSTA algorithm and, 26:1030
with MMC method, 26:1036
in process synthesis and design, 26:1041 for risk analysis, 26:1045
Hammersley stochastic annealing (HSTA), optimization via, 26:1030–1032, 1038
Hammersley stochastic genetic algorithm (HSGA), optimization via, 26:1032, 1038
Hammett acidity function, 5:207; 14:9
Handbook 44 (National Institute of Standards and Technology), 26:237–238
Handbook of Surfactants (Porter), 24:144
Hand creams, surfactants in, 24:158–159
Hand-dishwashing liquids, acute oral LD50 ranges, 8:446t
Hand lay-up fabrication techniques, 26:767–768
Handling
of halogen fluorides, 13:130
of inorganic fluoride compounds, 11:856
of magnesium acetate, 15:382–384
of methacrylic monomers, 16:277–279
Handling property, of sutures, 24:215–216
Hand-molded refractories, 21:482
Hand preparations, 7:842t
Hand printing, 9:220
Handylab, 26:976
Hanford N reactor, 17:572–573
Hanford production reactors, 17:570
Hanksite, 5:785t
Hansa yellows, 14:317
Hansch equation, 10:329
Hansenula polymorpha, 12:479
Hantaviruses, 3:137
Hantzsch pyridine synthesis, 16:550
Hantzsch-Widman nomenclature system, 17:399
HAp ceramics, 14:103–104. See also Hydroxyapatite (HAp)
HAp coatings, 14:105
HapMap project, 20:839
Hapten-antibody interactions, 9:64
Haptic sensor, for skin conditions, 3:749
Harcos antifoam, commercial defoamer, 8:241t
Hard and soft acid and base (HSAB) principle, 16:780
Hard blacks, 21:775
Hard-burned quicklime, 15:28
Hard coals, 6:703 classification, 6:712
Hard copper alloys, 7:723t
relief annealed, 7:723t
Hard copy systems, 9:513–514
Hard core repulsion, 23:93
Hard-elastic olefin fibers, 11:242
Hardenability, of steel, 23:283–284
Hardened MF resins, analysis of, 15:790
Hardeners, in photography, 19:197
Hardener structure, effect of, 10:418, 420t
Hardening, 1:528. See also Case hardening
of melamine resins, 15:780–788
of steels, 16:196–199
Hard facing, 25:375
Hard fibers, 11:285
mechanical properties of, 11:290t
processing of, 11:295–297
Hard-gelatin pharmaceutical capsules, 18:708
Hargrove grindability index (HGI), 11:813
Hard industrial carbides, 4:674–695
Hardness, 10:178
of abrasives, 1:3–4
of ceramics, 5:626–628
of fillers, 11:304
measurements, 19:582
of platinum-group metals, 19:600
of quicklime, 15:42
of silicon carbide, 22:527
of slaked lime, 15:45
various materials and hardness scales, 1:3
of vitreous silica, 22:429
of waxes, 26:222t
Hardness (calcium and magnesium) analysis, of water, 26:37
Hardness measurements, for steel, 23:284
Hardness test, for electroplating, 9:791–792
Hard oils, in toilet soap making, 22:734
Hard polymer–elastomer combinations, 24:700, 708
applications of, 24:716–717
Hard sphere intermolecular potential energy, 25:302
Hard-sphere model, 14:464
Hard-sphere potential model, 23:93
Hard surface cleaners, bleaching agent applications, 4:70–71
Hardware, inorganic electrochemical processing, 9:618–626
Hardware acquisition costs, 15:753
Hard water, salt in softening, 22:817–819
Hard-wheat flours, 26:282
Hardwood(s), 21:1–2
hemicelluloses in, 21:10
Hardwood lignins, 21:11
Hardwood lignosulfonates, 15:16
Hardwoods, 26:333–334
Hargreaves metal chloride decomposition process, 13:824
Hargreaves process, of sodium sulfate production, 20:626; 22:866–867, 868
Harmine, 2:92
Harmonic light generation, 14:678–680
Harmonic spectroscopy, 23:139
Harringtonine, 2:90
Harrison Narcotic Act, 18:683
Harris slag refining process, 16:150
Harris softening process, 14:750, 754
Hartree–Fock SCF techniques, 16:736
Harvest aids, economic aspects of, 18:535–536
Harvesting
of cotton, 8:10–11
of vegetable fibers, 11:291–292
Hassium (Hs), 1:492t
HASTELLOY alloys, 17:102, 103
Hastelloy B, 13:519
Hastelloy B-2, 23:784–785
Hastelloy-C, 14:14
Hastelloy C series alloys, 13:520
Hatch Act of 1887, 24:353–354
Hatta number, 21:345
Haulage distances, 15:60–61
Hausmannite, 15:540
Hayashi-Williams equation, 22:561
Haylage, 10:863
Haynes alloy 6B, composition of wear-resistant alloy, 7:221t
Haynes alloy 25, 7:225
properties, 7:225t
Haynes alloy 25 (L605), composition of wear-resistant alloy, 7:221t
Haynes alloy 188, composition of wear-resistant alloy, 7:221t
Hayward Tyler agitator, 1:739
HAZARD I method, 11:449
Hazard acceptance, 13:170
Hazard Analysis and Critical Control Point (HACCP) protocol, 15:260
probability, 13:166–170
purpose of, 13:152
scenario identification, 13:165
source modeling and consequence modeling, 13:165–166
sustainable development and, 24:183–188
techniques for, 13:152–154
Hazard and operability (HAZOP) analysis, 13:154, 157–159
guide words for, 13:158t
sample, 13:159
Hazard and operability study, 20:732; 21:861
Hazard assessment, 12:813–814
pilot-plant, 19:464
Hazard classes, 25:340
Hazard communication, 25:339–343
Hazard Communication Standard (OSHA), 21:592
Hazard evaluation, 14:213–220
pesticide registration requirements for, 18:547–549
HAZARD EVALUATION RESULTS, INTERPRETATION OF

Hazard evaluation results, interpretation of, 14:219–220
HazardExpert, 6:19
Hazard function, 26:987–988
Hazard identification, 13:153
checklists, 13:155
Dow Chemical Exposure Index, 13:156
Dow Fire and Explosion Index, 13:155–156
event trees, 13:163–165
failure mode and effects analysis, 13:159–161
fault tree analysis, 13:161–163
what-if analysis, 13:156–157
Hazard identification/characterization function, 25:202
Hazard identification/risk assessment flow chart, 13:152
Hazard management strategies, 24:187t
and coal gasification, 6:810
Hazardous and Solid Waste Amendments (HSWA), 21:586, 588
Hazardous chemicals
- toxic effects associated with, 25:224–225
- regulation of, 21:589–590
Hazardous constituents, of lubricants, 15:259–260
Hazardous dust, pneumatic classification and, 22:293
Hazardous events, consequence analysis of, 21:860–861
Hazardous incident investigation, 21:862
Hazardous location, Class 3, 10:577
Hazardous material(s)
- determining packaging requirements for, 18:3–4
- limiting the inventory of, 20:731–732
- marking and labeling, 25:341–343
- metallic sodium as, 22:775–776
- packaging and labeling standards for, 18:86
- packaging and shipping regulations for, 18:2
- quartz as, 22:521
- safe handling of, 25:338–339
- security of, 25:343
- soda ash as, 22:794
- sodium tetrasulfide as, 22:875
- transport of, 25:337
Hazardous materials incidents, emergency response to, 25:343
Hazardous Materials Regulations (HMR), 18:2
- hazardous materials classes in, 18:3
- for shipping, 21:839–840
Hazardous Materials Table (HMT), 25:340
Hazardous Materials Transportation Act (HMTA), 25:338
Hazardous Materials Transportation Uniform Safety Act (HMTUSA), 25:338
Hazardous organic materials, transport of, 24:263
Hazardous potassium chemicals, 20:640t
Hazardous waste
- anthropogenic silicas and silicates as, 22:467–468
- defined, 13:172; 25:862
- disposal of, 21:856
- hydrothermal processing of, 14:109–110
- medical/biological, 25:865
- regulation of, 21:586–589
- silver as, 22:654
Hazardous waste directives (EU), 23:121
- air pollution control and emissions, 13:179–181
- operation and monitoring of, 13:182
- regulations affecting, 13:182–185
Hazardous waste incinerators, 13:174–179
- prevalence of different types of, 13:175t
Hazardous waste management, 25:809–850
- biological treatment, 25:825–830
- ex situ nonbiological treatment, 25:846
- extraction techniques in, 25:845
- in situ nonbiological treatment, 25:843–845
- physical–chemical treatment, 25:809–825, 843–845
- pump and treat, 25:845
- soil and ground water treatment, 25:834–843, 843–845, 846
- technologies for, 25:809, 810t
- thermal treatment, 25:831–834, 843–845
Hazardous waste treatment, quantity of, 13:175t
Hazard quotient (HQ), 25:238
Hazards. See also Fire hazards; Radiation hazards; Safety entries
assessments of, 21:839, 846
of ethylene–propylene polymers, 10:716
of hydrogen peroxide, 14:61–63
oxygen-related, 17:760–761
penalties for, 13:155–156
recognition in industrial hygiene, 14:205–213
steel-related, 23:311–313
workplace, 14:204t, 205
Hazards and Operability (Haz-Op) studies, pilot-plant, 19:464
Hazards checklist, 13:155
Hazelett casting machine, 26:597
Haze meters, 7:325
HAZOP committee, 13:157. See also Hazard and operability (HAZOP) analysis
HAZOP form, 13:157, 160
H-Beta zeolite, nitration using, 5:333
HB-LED market, 12:348
HBV. See Hepatitis B virus (HBV)
HC Blue 2, semipermanent hair dye, 7:857t
HCFC-142b, 13:718. See also Hydrochlorofluorocarbons (HCFCs)
HCFC-225ca, 13:725
HCFC-225cb, 13:725
HCFC blowing agents, 25:469
HCG β-HCG (beta subunit human chorionic gonadotropin), 9:64
H-Coal process, 6:766, 838–841
HCV. See Hepatitis C virus (HBV)
HC Yellow 4, semipermanent hair dye, 7:857t
HD (mustard gas), 5:816
physical properties, 5:817t
HDPE filament, 20:175. See also High density polyethylene (HDPE)
HDPE melt, 20:160
Head-area meters, 11:664–666
Headboxes, in paper manufacture, 18:106
Header design, 13:271–276
Head group/substrate interaction, 24:139
Headspace analysis, 11:518
capillary chromatography sample preparation, 4:609
in the fragrance industry, 18:381
Headspace gas chromatography assay, 12:96
Head-to-head polymerization, 19:837–838
Health
effect of methacrylic monomers on, 16:277–279
fillers and, 11:318
nutraceuticals and, 17:643–644, 645–649
Health advisory (HA) drinking water levels, 13:311
Health and Safety at Work Act (UK), 21:396–397
Health hazard potential, rating, 13:156
Health issues, emulsion-related, 10:128
“Health Professionals Follow Up” study, 17:662
Health R&D (research and development) expenditures, 21:612
Health standards, at nuclear power facilities, 17:551–554
Health uses, for iodine, 14:372–373
Heap and dump leaching, 16:153
Heap leaching, 12:689–690, 699–700; 16:128
of silver, 22:647
Heart. See also Cardiovascular agents
anatomy, 5:79
congestive heart failure, 5:179–187
electrophysiology, 5:79–80
excitation and contraction coupling, 5:81–83
Heart attack, 3:710–711
acetylsalicylic acid and, 22:20–21
Heartbeat, 5:79–80
Heart block, 5:86, 108
Heart disease, 2:811
Hearts
channel induction furnace, 12:312–313
coreless induction furnace, 12:311
Heart–lung machine, 3:711–712, 717
Heart rate, 5:108
Heart valves, 3:719
Heat, See also High temperature entries;
Hot entries; Temperature entries;
Therm-entries
effect on rubber aging, 21:785
in ethylene oxidation, 10:650
exponents of dimensions, 8:585t
external resistance to, 25:312–316
in industrial hygiene, 14:221
wood reaction to, 26:348–351
Heat aging, of polychloroprene polymers, 19:844–845
Heat and mass exchange processes, catalytic converter, 10:44–46
Heat bodied oils, 9:148–149
Heat capacity, of vitreous silica, 22:427
Heat conduction
Fourier’s law of, 13:242–243
Newton’s cooling law of, 13:245
Heat-cured rubber, properties and applications of, 22:579–584
Heat deflection temperature (HDT), 10:176, 177, 223
Heat demand and supply diagram, 13:188
Heated tanks, 24:301–303
Heat engines, 24:434
Carnot efficiency of, 24:654
thermodynamics of, 24:653–654, 655
Heaters, feedwater, 23:218
Heat exchange, 10:144
Heat exchanger design equation, 13:189
Heat-exchanger effectiveness method, 13:253–256
Heat-exchanger industry revenue, 13:266
Heat exchanger network design, 13:187–224; 20:719, 721. See also Heat exchanger networks
factors in, 13:219
Pinch design problem example, 13:203–211
Pinch design shortcomings, 13:211–212
Pinch Design Method, 13:197–203
practical design considerations for,
13:217–224
systematic problem decomposition in,
13:212–217
using intensified heat transfer,
20:756–757
workability of, 13:219
Heat exchanger networks. See also Heat exchanger network design
area of, 13:194–196
vertical and nonvertical matching in,
13:196
automatic design of, 20:755–756
retrofit of, 20:756
Heat exchangers. See also Micro-heat exchangers
capital cost of, 13:192–196
choosing, 13:218–219
cleaning cycles for, 10:161
compact, 13:218
cryogenic applications, 8:61–62
deposit prevention in, 10:543s
direct contact, 13:268
electrohydrodynamic-based, 13:269–270
elevated, 19:508
flow maldistribution in, 13:270–271
graphite, 12:746
heat-pipe, 13:238
high temperature, 13:267
issues involved in using, 13:266–267
low temperature difference, 13:267–268
in the malting industry, 15:532
multiphase flow in, 13:271
performance enhancement in,
13:276–278
in plant layout, 19:507–511
plate-and-frame, 13:217–218
pressure drops in, 13:249
rating, 13:254
rotary regenerative, 13:238
selecting, 13:242
shell-and-tube, 13:217–218, 267
size of, 13:192, 193
sodium, 22:763
stacking, 19:510
support for, 19:509–510
thermal design methods for, 13:248–263
thermal performance of, 13:270
thermal sizing of, 13:252–253
types of, 13:263–265
use of, 13:265–271
using non-Newtonian fluids, 13:268–269
waste heat recovery from, 13:267
Heat exchange units, number of, 13:193–194
Heat flow analysis, 10:163
Heat flow tables, 23:284
Heat-flux transformation, in heat pipes, 13:228
Heat generation, in electric fields, 9:741
Heat induced separation system design, 20:757
Heating. See also Temperature
chemical changes in foods from, 12:79
in fermentation, 11:34
induction, 12:307–308
pilot plant, 18:730
radiative, 23:25–26
in sterilization, 11:35–36
Heating devices, vitreous silica in, 22:440
Heating elements
chrome–nickel alloy, 12:294
electric furnaces, 12:291
silicon carbide, 22:529–530, 539
Heating materials, molybdenum
compounds in, 17:38–39. See also
Thermal entries; Thermo- entries
Heating methods, in thermal bonding,
17:510–511
Heating value of municipal solid waste,
25:873
Heating, ventilation, and air conditioning
(HVAC) systems, 1:823–826
for air cleaning, 1:831–834
Heat-initiated catalysts, 20:107
Heat integration, 20:735–738
Heat integration and utility systems,
applications of, 20:764
Heat intervals, 13:194–195
Heat load
Pinch match, 13:207t
stream matches and, 13:200–201
Heat mining, 12:539–544
Heat of adsorption, gas adsorption,
1:623–626
Heat of formation, 24:687
of sodium hydrosulfide, 22:869–870
Heat of fusion, of polyester fibers, 20:9
Heat of hydration, of quicklime, 15:43
Heat of reaction, 24:670–671
Heat of solution, and nonisothermal gas
absorption, 1:59–61
Heat of sorption, of wool, 11:168t
Heat pipe exchanger, 10:144, 145
Heat-pipe heat exchangers, 13:238
Heat pipe liquids, 21:538
Heat pipes, 13:225–241
chemical industry applications of,
13:237–240
components of, 13:227
condensate return in, 13:226
deign features and operational limits of,
13:227–230
dual-wall heat exchange characteristics
of, 13:238
gas-controlled, 13:234–235
heat flux exchange and self soot-blowing
characteristics of, 13:238
homogeneous temperature and heat
shielding performance of, 13:240
loop, 13:236–237
operating lifetime of, 13:231
operating principles of, 13:225–227
properties of interest to designers,
13:227–229
pulsating, 13:235
sintered-powder metal-wick, 13:232
variable-conductance, 13:233–235
working fluids and materials selection
for, 13:230–233
Heat pipe technology, in refrigeration
systems, 21:537–538
Heat pipe vessels, impermeable, 13:233
Heat-process materials, in photography,
19:211–212
Heat-process photographic systems, silver
compounds in, 22:686
Heat pumps, 10:146
thermodynamics of, 24:653–654, 655
Heat-reactive resins, 18:782
Heat recovery, 10:144–146. See also Heat
recovery system
economics of, 13:189–197, 219
in heat exchanger network design,
13:215–216
minimum total annual cost of,
13:196–197
shell-and-tube design for, 13:217
equipment for, 10:157
Heat recovery match algorithms, 13:192
Heat recovery steam generators (HRSGs),
23:215, 218
design of, 23:236
Heat recovery system (HRS), 13:190
ergy demand in, 13:190–192
grid representation of, 13:188–189
Heat recovery system process, 23:786–787
Heat release calorimeters, 11:458
Heat removal, from direct HDC
chlorination reaction, 25:638
Heat resistance
of EPM/EPDM vulcanizates, 10:716
in ethylene–acrylic elastomers, 10:698
of poly(fluorosilicones), 20:241
Heat resistant ABS, physical properties of,
1:415t
Heat-resistant fibers, 13:389
Heat-resistant spores, inactivation of,
12:79
Heat-shrinkable films, 18:46
“Heat shrinkable” polymers, 22:364
Heat sinks, 26:756
silver in, 22:658
Heatsink slugs, 14:864
Heats of reaction, in DR Processes,
14:512t
Heats of sulfonation, 23:524t
Heat stability, of inorganic pigments, 19:383
Heat-stabilized molding, of food packaging, 18:51
Heat stabilizers lead phthalate, 14:795
in polyamide plastic manufacture, 19:784
Heat-stable fermentation, lactic acid, 14:124
Heat-stress standards, 21:849
Heat sublimation inks, 14:330
Heat transfer, 13:242–281. See also Heat exchangers
in agitated tanks, 16:716–719
conduction, 13:242–245
convection, 13:245–248
design margins for, 13:256–263
electrochemical cell, 9:659–660
enhancement of, 13:269
header design and, 13:271–276
in a fluidized bed, 11:808–810
in fine chemical production, 11:428
multilevel, 13:223
nomenclature related to, 13:278–279
in nuclear reactors, 17:564
two-phase, 13:225
Heat Transfer and Fluid Flow Service (HTFS), 13:266
Heat-transfer area, minimum, 20:738
correlations for, 13:247–248
overall, 13:244
Heat-transfer components, silicon carbide in, 22:538–539
Heat-transfer device, nonequilibrium, 13:236
Heat-transfer enhancement techniques, passive, 13:267
Heat transfer enhancing technologies, 10:157
Heat-transfer equations, 13:249–252
basic, 13:252
for a parallel-flow heat exchanger, 13:250
for a single-pass counterflow heat exchanger, 13:251
Heat-transfer fluids, 12:668, 669
advanced, 13:276–278
Prandtl numbers of, 13:247
Heat transfer inks, 14:329–330
Heat-transfer medium, sodium as, 22:778
Heat-transfer modes, 13:242–248
Heat-transfer printing, 9:221, 417
Heat-transfer rate across tubular walls, 13:244–245
through a plane wall, 13:243–244
Heat-transfer reactor experiment (HTRE-1), 17:590
Heat Transfer Research Inc. (HTRI), 13:266
Heat-transfer salts, sodium nitrate in, 22:852–853, 859
Heat-transfer surfaces, 16:717
Heat-transfer surface area, 13:249, 256
infinite, 13:253
Heat-transfer units, targets for, 20:738
Heat transport capability, of heat pipes, 13:229–230
Heat-treated products, trends in, 23:277t
Heat treatment(s). See also Annealing; Precipitation heat treatment;
Quenching
of aluminum alloys, 2:329–333
of anodic oxide film on tantalum, 24:329–330
of as-spun fibers, 13:382
of carbon steels, 23:296
case hardening by, 16:199–208
effect on corrosion resistance, 9:711–712
in food processing, 12:75–76, 78
of magnesium castings, 15:357–358
nitrogen in, 17:286
of PVA, 25:595, 596, 610
sodium cyanide application, 8:191
sodium nitrite in, 22:859
Heavy-cut detergent alcohols, 2:2
Heavy duty diesel engine oils, for trucks, agricultural, and construction vehicles, 15:233–235
Heavy fuel oil, 18:669
Heavy lanthanides, 14:631
Heavy liquids, 16:633
Heavy media separation (HMS), 16:633–636; 21:390
in potassium chloride compaction, 20:622–624
Heavy-media separation plants, 15:442
Heavy melting steel, 21:409
Heavy-metal additives, in PVC, 25:682
Heavy-metal alloy process, of tungsten recycling, 25:357
Heavy metal fluoride glasses (HMFG), 12:576
Heavy metals
  catalyst poisoning by, 10:93
  emissions, 13:180–181
  in pigments, 19:413
  as poisons, 5:257t, 258t
  pollution by, 9:443–446
Heavy-metal selenides, 22:87
Heavy mineral sands, 13:80–81
Heavy oil, 18:640–641
Heavy oil upgrading, in enhanced oil recovery, 18:618–620
Heavy spar (barite), 3:343
Heavy steel drums, 18:6
Heavy water, 9:635. See also Deuterium entries
  physical properties, 8:459t
Heavy water power reactors (HWPRs), 24:759
Heavy water reactors (HWR), 17:582–585
Heck reaction, ionic liquids in, 26:889–890
Hectoral, 25:793
  powder used in cosmetics, 7:841t
  occurrence and geology of major deposits, 6:666
  structure and composition, 6:669
Hedging technique, 12:695
Heideite, 6:471t
Height equivalent to a theoretical plate (HETP)
  batch liquid adsorption, 1:665
  chromatographic adsorption, 1:610, 611
  distillation packed column, 8:775
  experimental determination in absorption, 1:70–71
  gas chromatography, 6:381–382
  packed column absorbers, 1:52, 70–71
Height of an equivalent theoretical stage (HETS), 10:768, 778, 780
Height of a transfer unit (HTU), 10:761–762
Heisenberg Uncertainty Principle, 16:735
Helical Bourdon tube, 20:648
Helical complexes, chirality in, 16:803–804
Helical polypeptide, 24:58
Helical ribbon impeller, 16:690, 691
*Helicobacter pylori*, 15:303
  antibiotic resistant, 3:36
“Helio-photocatalysis,” 19:78, 95
Heliotridine, 2:80
Helium (He), 17:343–344. See also Liquid helium entries
  in the aerospace industry, 17:376
  bulk quantities of, 17:363
  commercial distribution of, 17:362
  commercial specifications for, 17:367t
  cryogenic methods used for purification, 8:42
  cryogenic purification and liquefaction, 8:57–60
  cryogenic recovery in air separation, 8:56–57
  diffusion through vitreous silica, 22:421–422, 423t
  economic aspects of, 17:364–365
  in HeNe lasers, 14:660
  high purity, 13:461
  liquefaction, 8:40
  occurrence of, 17:344
  as a reactor coolant, 17:571
  recovery from natural gas, 17:357–358
  solid phase of, 17:351
  sources of, 17:345
  thermophysical properties, 8:41t
  uses for, 17:368–370
  U.S. production and exports of, 17:365t
  as a war material, 17:346
Helium II
  liquid, 17:353–354
  oscillatory phenomena of, 17:354
Helium-3, 17:344, 351
  dilution refrigerators, 17:373
  liquid, 17:354–355
  superfluid phases of, 17:354–355
Helium-3 ions, uses for, 17:375
Helium-4, 17:344, 351
  lambda point of, 17:353
  liquid, 17:352–354
Helium Act Amendments, 17:346
Helium-bearing natural gases, helium concentrations of, 17:346t
Helium–cadmium (HeCd) laser, 14:685–686
Helium Conservation Act, 17:346
Helium containers, 17:363–364
   See also Inert gas entries; Noble gases mixtures of, 17:355–357
   physical properties of, 17:348–349t
   radioactive isotopes of, 17:376
   solid mixtures of, 17:356–357
Helium industry, 17:347
Helium isotopes, 17:350, 351
Helium leak detector, 17:370
Helium–neon (HeNe) lasers, 14:654–655, 656, 681–683
   applications of, 14:683
Helium Privatization Act of 1996, 17:347
Helium shielding, 17:368
Hellige color scale, 7:310
Helmholtz energy, 7:24
Helmholtz planes, 9:569, 570, 609–610
Helvetolide, 24:488
HEMA/DMA gels, 24:643, 644
Hemimicelle formation, 24:142
Hemimucins, 14:552
Hemicalciferols, 16:786
Hemicellulases, 21:48
Hemicellulose(s), 4:717; 5:362; 11:253;
   20:563; 26:335
   in paper, 18:92
   polymers, 21:10
   degradation of, 21:28
   in nonwoods, 21:10
   in the wood cell wall, 21:8–10
Hemicellulose A, 4:718
Hemicellulose B, 4:718
Hemicellulosic constituents, of flax fiber, 11:597
Hemicyanine dyes, 9:257
Hemihedrite, 6:471t
Hemiisotactic microstructures, 16:108
   4,6-Hemiketals, 24:595
   Hemimicelle formation, 24:142
Hemins, 14:552
Hemisodium orthophosphate, 18:833
Hemiterpenoids, 24:483
Hemizygous transgenics, 12:456
Hemocyanin, copper containing, 7:776
Hemodiafiltration (HDF), 26:832–833
Hemodialysis, 16:20; 26:813–835
   cellulose fibers in, 16:18–19
   dialyzer design and performance, 26:831
   fiber dimensions for, 16:6–7
   future directions in, 26:832–834
   market trends in, 26:831–832
   membrane materials in, 26:825–
   membrane pore size, distribution, and density in, 26:829
   operating conditions for, 26:817–818
   system and process of, 26:813–818
   treatment time and frequency of,
   26:833–834
Hemodialysis machine, 26:814
Hemodialysis potting, 16:17
Hemodialysis prescription, 26:817–818
Hemodynamic chromatography, 8:722
Hemofiltration, 16:20
   fibers for, 16:22
   polysulfone hollow fibers in, 16:21
Hemofiltration, 26:832
Hemoglobin
   cell-free, 4:113
   conjugated, 4:122–124
   modifications for blood substitutes, 4:113–124, 116t
   purification, 3:845
   recombinant, 4:124, 126
   sources, 4:125–126
   zero-linked, 4:122
Hemoglobin-S (Hb-S), liquid crystalline aggregates and, 15:113
Hemoperfusion, 16:26
Hemophilus influenzae Serotype b, 25:486, 490, 491
Hemostatic system, 4:84–90
Hemp, 11:292, 293. See also Mauritian hemp
  ; New Zealand hemp/flax; Sunn hemp
   uses of, 11:299t
Henequen, 11:296
   uses of, 11:299t
HeNe tubes, 14:682. See also Helium (He); Neon (Ne)
Henkel process, 25:184
Henna, colorant in cosmetics, 7:835
Henry's coefficient, 25:810
absorption and, 1:29, 591
distillation and, 8:745
Henry's law constant (HLC; \( K_H \)), 1:591, 611; 14:563; 15:683; 17:769
Henry reaction, 16:565
Hepadnaviruses, 3:136
Heparan sulfate, 4:706
Heparin, 4:90–92, 706; 20:457; 23:725
classification by structure, 4:723t
clinical uses of, 4:92–94
low molecular weight, 4:94–96, 95t, 105–106
oral, 4:97–98
synthetic, 4:96–97
Heparin cofactor II (HCII), 4:87
Heparin-induced thrombocytopenia (HIT), 4:94
Heparin sodium, 5:174
molecular formula and structure, 5:172t
Heparitin sulfate, 4:706
Hepatitis A vaccine, 25:492–493
Hepatitis B vaccine, 25:491
from yeast, 26:487
Hepatitis B virus (HBV), 3:135
antiviral therapy, 3:154–159
infection process, 3:153–154
Hepatitis B virus detection, method for, 14:153–154
Hepatitis C virus (HCV), 3:135, 137–138
antiviral therapy, 3:161–164
infection process, 3:159–161
Hepatitis infection, immunoglobulin- transmitted, 12:139
Hepatitis viruses, 12:153
Haplotoxic agents, exposure to, 23:118–119
Hepatotoxicity. See also Liver cancer
fluoroquinolone, 21:231
as a toxic effect, 25:207
of VDC, 25:694
Hepes, buffer for ion-exchange chromatography, 3:830t
Heptacesium dioxide, 5:700
Heptadecanoic acid, physical properties, 5:29t
Heptadecene, biodegradation, 3:762, 763t
9-Heptadecenoic acid, physical properties, 5:31t
3-Heptafluorobutanoyl-(1R,2S)-pinanone-4-ate, 6:98
Heptafluorobutyryl chloride, chiral
derivatizing agent, 6:96t
Heptafluoroisobutyl methyl ether, 13:724
Heptfluoroisobutyl methyl ether, 13:724
Heptafluoropropane, physical properties of, 1:781t
1,1,1,2,3,3,3-Heptafluoropropane, 13:726t
Heptafluorozirconate(IV), 7:578t
Heptafulvalene, 21:148
Heptaldehyde. See Heptanal
Heptamethine dyes, 9:505
Heptamolybdate, 17:21
Heptanal, physical properties of, 2:61t
Heptane
solvent for cosmetics, 7:832
spontaneous ignition temperature, 7:438t
n-Heptane
acrylamide solubility in, 1:290t
azeotrope with benzene, 3:598t
diffusivities in zeolite 5A, 1:599
solubilities of fatty acids in, 5:40t
terminal activity coefficients of mixture
with n-hexane, 8:743t
Heptanoic acid, physical properties, 5:29t
1-Heptanol, physical properties of, 2:3t
Heptenes, production from butylenes, 4:425
trans-2-Heptenoic acid, physical properties, 5:31t
Heptoses, pyranose rings, 4:699
6-Heptynoic acid, 5:34t
Herador, gold-based dental alloy, 8:307t
Herbac, 24:488
Herbaceous odor, 3:228t
Herb equivalents, 11:579t
Heredicide action modes, 13:286–307
amino acid and nucleotide biosynthesis inhibitors, 13:300–302
bleaching herbicides, 13:294–295
cell division inhibitors, 13:302–304
chlorophyll biosynthesis inhibitors, 13:295
damage to antioxidative systems and cellular components inducers,
13:297–298
electron transport, 13:288
herbical inhibition of enzymes, 13:298–300
lipid and wax synthesis inhibitors, 13:295–297
Photosystem I inhibitors, 13:286–288
Photosystem II inhibitors, 13:288–294
plant growth regulator synthesis and function inhibitors, 13:304–307
Herbicide analysis methods, 13:312–313
Herbicide atomizer, 23:197
Herbicide binding, polypeptide conformational changes through, 13:293
Herbicide fates, environmental, 13:307–313
Herbicide formulations, encapsulated, 16:458–459
Herbicide groups, 13:313–326
acid amide herbicides, 13:319–320
aliphatic-carboxylics, 13:324
amino acid analogues, 13:325–326
benzonitrile, acetic acid, and phthalic compounds, 13:315–318
bipyridiniums, 13:315
dinitroaniline and derivative herbicides, 13:318–319
heterocyclic nitrogen derivative herbicide, 13:323–324
imidazoles, 13:323
metal organics and inorganics, 13:324–325
miscellaneous, 13:326
phenoxyalkanoic herbicides, 13:314–315
phenylcarbamate herbicides, 13:320
pyridine and pyrazinoic herbicides, 13:322
sulfonylureas, 13:322–323
thiocarbamate herbicides, 13:320–321
triazines, 13:321–322
trifluoromethyl compounds, 13:325
ureas and uracils, 13:324
Herbicide ionization, 13:314
Herbicide leaching potential, mobility ranking of, 13:312
Herbicide leads, allelochemicals as, 13:355–357
Herbicide market, 13:285–286
Herbicide-resistant crops (HRCs), 13:358–363, 361, 363
future of, 13:362–363
regulatory approval for growing, 13:362t
See also Environmental fate of herbicides; Growth retardants; Herbicide action modes; Herbicide groups
arsenic applications, 3:271
bioremediation of nonchlorinated, 3:776–779
chlorate application, 6:116
classification of, 13:313
colloids, 7:273t
commercial, 13:34
constraints on developing, 13:285–286
crop resistance to, 13:361–362
development of, 13:283–286
environmental fate of, 13:307–313
environmental health advisories for, 13:316–318t
environmental impact of, 13:357
EPA registration of, 13:327
foliage-applied, 13:310
formulation and application of, 13:328
importance of, 13:281
natural product-based, 13:356
natural products and allelopathic compounds as, 13:329–331
organic esters as, 10:520
preemergence or postemergence, 13:313
promising chemicals for aquaculture, 3:224
registered for aquaculture in U.S., 3:217–218
selective, 13:284–285, 349
synthetic, 13:284
world market for, 13:326–327
Herbicide-tolerant crops, genetically modified, 18:534–535
Herbs, fresh, 23:154
Herceptin, cell culture technology product, 5:346, 346t
Hercosett process, 26:392
Hercules size test (HST), 18:101
Hercynite, 5:602
in chromite, 6:474
“Here and now” problems, 26:1025, 1028
Hermetic coatings, in optical fiber strength, 11:143–144
Heroin, acetic anhydride used in illegal synthesis, 1:157
Herpes simplex vaccine, 25:498–499
Herpes simplex viruses, 3:136
Herpesviruses, 3:136
Herpes zoster vaccine, 25:496–497
Herschel–Bulkley model, 21:705
Herschel effect, 19:204
Herz compounds, 23:643
Hetastarch, 4:112
Heter-ionic interactions, 8:77
Heteroatom-containing functional groups, flash vacuum pyrolysis and, 21:149–150
Heteroatoms
boron replacement by, 13:647–650
removal from fuels, 13:769
Heterobenzenes, 21:153
Hetero-bifunctional reactive dyes, 9:473, 475
Heteroboranes, 4:169, 172, 197–205.
See also Carboranes
structural systematics, 4:172–179
weakest anions and strongest acids, 4:202–204
Heterocumulenes, 25:106
Heterocycles, 9:288
aromatic, 9:283–291
flash vacuum pyrolysis and, 21:150–154
sulfur and sulfur-nitrogen, 9:289
Heterocyclic amine ligands, rhodium compounds containing, 19:644–645
Heterocyclic amines, 9:351–352
Heterocyclic azo dyes, 9:251–253
Heterocyclic compounds, 13:109–112. See also Heterocyclics
aroma chemicals, 3:259–260
fluorinated, 11:867
formylation of, 12:179
microwave-assisted synthesis of, 16:574–580
N^1-Heterocyclic derivatives, 23:508
Heterocyclic disperse dyes, 9:419–420
Heterocyclic glycidyl imides and amides, 10:375
Heterocyclic hydrazones, oxidative coupling of, 9:360
Heterocyclic ligands, thorium and, 24:767
N^1-Heterocyclic-N^4-acylsulfanilamides, 23:508
Heterocyclic nitrogen derivative herbicides, 13:323–324
Heterocyclic nuclei, substituent effects in, 20:509–510
Heterocyclic reactive groups, 9:320–321
Heterocyclics. See also Heterocyclic compounds
hydrazine, 13:576, 599
reaction with ozone, 17:783
in vacuum gas oils, 18:589
N^1-Heterocyclic sulfanilamides, 23:507–508
Heterocyclic sulfides, 23:645
Heteroepitaxial layers, for compound semiconductors, 22:145
Heteroepitaxy, on lattice mismatched substrates, 22:160
Heterofullerenes, 12:231–232
chemistry of, 12:252–253
Heterogeneous azotropic distillation, 8:819–845
Heterogeneous catalytic polymerization, 10:683
Heterogeneous catalytic rate, 25:277
Heterogeneous catalytic reactions, dominating factors related to, 21:354
Heterogeneous catalysts, continuous esterification with, 18:518–519
Heterogeneous catalysis, 5:201, 220–249
bifunctional catalysis, 5:246–248
catalyst components, 5:227–229
catalyst deactivation mechanisms, 5:255–287, 256t, 279t
catalyst preparation, 5:231–232
catalyst treatments, 5:229–231
cerium application, 5:687–688
chemisorption, 1:583
example processes, 5:232–234
high throughput experimentation, 7:393
mass transfer effects, 5:224–227
by metal oxides and zeolites, 5:237–245
by metal sulfides, 5:248–249
by metals, 5:234–237
properties of solid catalysts, 5:221–224
shape-selective catalysis, 5:242–244
by supported metals, 5:245–248
surface processes characterized, 5:220–221
Heterogeneous chemical reactions, 21:331–332, 339
Heterogeneous combustion, 7:449–454
Heterogeneous copolymerization of acrylonitrile, 11:203–204
with VDC, 25:698–699
Heterogeneous enzyme systems, 10:255–256
Heterogeneous gas–solid catalytic reactions, 21:340–341
Heterogeneous Ideal Adsorbed Solution Theory (HIAST), gas separation under, 1:628, 629
Heterogeneous kinetic rate law, 25:286
Heterogeneous nuclear RNA (hnRNA), 12:454
Heterogeneous particle morphology, in polymer colloids, 20:387
Heterogeneous photocatalysis, 19:73, 103 principles of, 19:74–75
Heterogeneous polymer blends, 20:343.
See also Binary heterogeneous polymer blends
Heterogeneous polymerization, of VDC, 25:695–696, 696–697
Heterogeneous reaction, 15:728–729
Heterogeneous reactors, 17:568
Heterogeneous stereospecific polymerization, 20:410–411
Heterogeneous vapor-phase fluorination, 11:863
Heterogeneous wetting, 22:111
Heterogenite, 7:209t
Heterogenous immunassays, 14:151–152
Heteroglycans, 4:697, 702; 13:64
Hetero-interface, 24:71
Heterojunction, 23:83
Heterojunction bipolar transistors (HBTs), 22:166–169
characteristics of, 22:168–169
compound semiconductors in, 22:160, 161–162
design and fabrication of, 22:166–168
FETs versus, 22:166
Heterojunction diode arrays, 19:163
Heterojunction FETs (HFETs), 22:163–164.
See also Field effect transistors (FETs)
Heterojunction insulated gate FETs (HIGFETs), 22:164. See also Field effect transistors (FETs)
Heterojunction photodiode arrays, 19:161
Heterojunction with intrinsic thin layer (HIT) photovoltaic cell, 23:46–47
Heteroleptic uranium complexes, 25:441
Heterolous promoters, 12:453
Heteronano interface (HNI), 23:838
Heteronium bromide, 4:359t
Heteronuclear metal carbonyls, synthesis of, 16:69–71
Heteronuclear multiple bond connectivity (HMBC), 20:137
Heterophase polymerization, 14:707
Heterophase propylene copolymers, polypropylene, 20:533–534
Heterophasic propylene copolymers, physicomechanical properties of, 26:539t
Heteropolyacid color lakes, 25:387
Heteropolyacids, dyes used as complexes with, 19:440t
Heteropoly compound supported catalysts, 5:329–330
Heteropolyoxymolybdate ion, 17:22
Heteropolysaccharides, 4:697
Heteropoly salts, 25:384
Heteropolytungstates
principal species of, 25:384t
structures of, 25:383–384
Heteropoly tungsten compounds, 25:383
Heteropolytungstic acids, uses for, 25:388
Heterostructure geometries, for semiconductor lasers, 22:176–177
Heterostructure laser diode, 14:700
Heterostructures, 14:844
via MOCVD, 22:158–160
Heterotrophic conditions, defined, 3:757t
Heubach 3 method, 10:273
Heulandite, pore dimensions, 5:239t
Heuristic distillation sequencing, for nonazeotropic mixtures, 22:298–301
Heuristics, 20:725
\(\text{L-\text{\textthreo}}\)-Hex-2-enoic acid \(\gamma\)-lactone, 25:745.
See also Ascorbic acid
Hexaalkyicyclotrisiloxanes, polymerization of, 22:559–560
Hexamminenickel(II) tetrafluoroborate, 4:144t
Hexammineplatinum(IV), effective atomic number of noble gas, 7:590t
Hexaaquachromium(III) ion, 6:533
Hexaaquamolybdenum(III) ion, 17:26–27
Hexaarylbiimidazolyl (HABI), piezochromic materials, 6:608
Hexabis(benzylthiomethyl)benzene, 14:180
Hexaborane(10), physical properties of, 4:184t
Hexaborane(12), 4:186
Hexabromocyclododecane, 11:467–468
formulations of, 11:460t
physical properties of, 4:355t
Hexabromocyclohexane, 3:602
Hexachlorobenzene, 3:602
Antoine constants, 6:215t
physical and thermodynamic properties, 6:214t
Hexachlorobutadiene, solubility of chlorine in, 6:133t
Hexachlorocyclohexane, 3:602
Hexachlorocyclopentadiene, 11:479; 13:145–147
chemistry and environmental impact of, 13:146
Hexachlorocyclotriphosphazene, 19:479; 13:145–147
Hexachlorocyclotriphosphazene, 19:55
Hexachloroethane, 6:269
Hexachloromelamine, 13:111
Hexachlorophene, bioremediation substrate, 3:773–776
Hexachlorophene, bioremediation substrate, 3:773–776
Hexachlorothiuranates, 25:53
Hexacosanoic acid, physical properties, 5:30t
1-Hexacosanol, physical properties of, 2:3t
cis-17-Hexacosenoic acid, physical properties, 5:32t
Hexacryony complexes, 14:534–536
Hexadecane
biodegradation, 3:762, 763t
spontaneous ignition temperature, 7:438t
Hexadecanoic acid, physical properties, 5:29t
1-Hexadecanol, physical properties of, 2:3t
n-Hexadecanol, toxicological properties of, 2:7t
6,10,14-Hexadecatrienoic acid, physical properties, 5:33t
cis-9-Hexadecenoic acid, physical properties, 5:31t
trans-9-Hexadecenoic acid, physical properties, 5:31t
1-Hexadecylamine, melting point, 2:521.
See also Palmitylaminet
1,5-Hexadiene, 4:374
2,4-Hexadiene, color, 7:33
trans-1,4-Hexadiene, from butadiene, 4:384 1
2,4-Hexadienoic acid, physical properties, 5:33t
Hexadecane, 2:364
Hexafluoroaluminate octahedron, 2:364
Hexafluoroantimonic acid, 3:65
Hexafluorogallates, 12:357
Hexafluorosilane (HFS), 15:177
Hexafluoronicelates, 17:111
Hexafluoro-phosphate-based ionic liquids, 26:847
Hexafluoropropylene (HFP), 18:289, 306
copolymerization with
tetrafluoroethylene, 18:307–309
properties of, 18:307, 308t
Hexafluorosilicate(IV), 7:578t
Hexagonal crystal system, 8:114t
Hexagonal ferrites, 11:56t, 57–58
Hexagonal lattice approach, 24:43
Hexagonal lattice receptor, 24:55
Hexagonal liquid crystals, surfactants and, 22:725, 727
Hexagonal phosphorus pentoxide, 19:49
Hexagonal prism lattice, 8:114t
Hexagonal soap phase, 22:726, 727
mixed soap crystals in, 22:729
Hexagonal structure of M-type ferrites, 11:65f, 66
of silicon, 22:482
Hexagonal symmetry, 8:114t
Hexahosts, 14:180
Hexahydrate, 5:785t
Hexahydro-2,4,6-triisopropyl-s-triazine, butyraldehyde derivative, 4:62
Hexahydrophthalic anhydride–cured epoxy resins, 10:404t
Hexakis-cyanoferrate salts, 14:536
Hexakis-cyanoferrates, 14:534–536
Hexamethaphosphoric acid, molecular formula, 5:712t
Hexamethonium, 5:159
Hexamethyl-N,N,N,N,N,N-hexa N1-chelating agent, 5:710
molecular formula, 5:713t
Hexamethyldisilazane, 22:573, 580
as silylating agent, 22:692
Hexamethyldisiloxane, 22:598
plasma polymerization of, 22:562
Hexamethylene diamine, 8:485; 13:797
nylon-6,6 production, 19:747
physical properties, 8:486t
prices of commercial, 8:496t
typical specifications, 8:496t
Hexamethylene diisocyanate (HDI), 25:463
1,6-Hexamethylene diisocyanate (HDI), 25:455
Hexamethyleneetetramine (HMTA), 1:315, 543; 12:122; 16:373; 18:759, 779
Hexamethylphosphoramide (HMPA), as PVDC solvent, 25:705
Hexamethylphosphoramide/N-methylpyrrolidinone (HMPA/NMP), 13:374
Hexamethylphosphoric triamide (HMPT), in anionic polymerization of cyclic siloxanes, 22:560

Hexamine, 12:112

Hexanal
  physical properties of, 2:61t
  measurement of, 10:

Hexane(s), 13:703–706
  azeotrope with n-butyaldehyde, 4:460t
  azeotrope with pentane, 8:812
  compositions of, 13:705t
  health and safety factors related to, 13:705
  manufacture of, 13:703–705
  properties of, 13:703, 704t
  removal from indoor air, 1:833–834
  solubility of benzoic acid in, 3:626t
  solubility of butanediol in, 1:235t
  solubility of butynediol in, 1:235t
  solvent for anionic copolymerization, 7:626t
  spontaneous ignition temperature, 7:438t
  terminal activity coefficients of mixture
    with water, 8:743t
  uses for, 13:705–706

n-Hexane
  adsorption isotherm for activated carbon, 1:585
  terminal activity coefficients of mixture
    with n-heptane, 8:743t
  1,6-Hexanediyne, 1:553, 556
  preparation, 1:574
  Hexanedioic acid. See Adipic acid
  1,6-Hexanediol bischloroformate
    DOT regulations for shipment, 6:301t
    molecular formula, 6:291t
  2,5-Hexanediene, 14:599
  1,2,6-Hexanetriol, 1:279
  Hexanitrostilbene (HNS), 10:737
  Hexanoic acid, 5:29t
    dissociation constant, 5:40t
    solubilities of alkanoic acids in, 5:39t

Hexanol
  permeation in selected barrier polymers, 3:389t
  properties of commercial, 2:12t
  1-Hexanol, physical properties of, 2:3t

n-Hexanol
  list pricing, 2:9t
  thermal, flammable, and critical properties of, 2:4t
  toxicological properties of, 2:7t
  Hexaorganoditins, 24:826
  4,7,13,16,21,24-Hexazabicyclohexoxacane, 7:588
  Hexarhodium hexadecacarbonyl, 16:64–65
  1,3,6,9,11,14-Hexathiacyclohexadecane, 23:732
  Hexavalent chromium, 19:217
  Hexavalent plutonium cations, 19:692
  Hexavalent tellurium, 24:414
  Hexavalent uranium coordination complexes, 25:434
  1-Hexene, 17:722; 20:414
    Alfrey–Price parameters, 7:617t
    catalytic aerogels for epoxidation, 1:763t
  2-Hexenoic acid, physical properties, 5:31t
  3-Hexenoic acid, physical properties, 5:31t
  trans-2-Hexenal, transport through barrier films, 25:711t
  Hexogen, 10:735
  Hexoses, pyranose rings, 4:699
  Hexosulose, 4:696
  Hextend, 4:112
  Hexuronic acid, 25:748
  n-Hexyl benzoate, 3:635
  n-Hexyl bromide, physical properties of, 4:351t
  n-Hexylcinnamaldehyde, 3:595
  Hexylene glycol, production from acetone, 1:174, 175
  Hexyllithium, 15:147
  Hexyl methyl carbonate
    molecular formula, 6:305t
  1-Hexyn-3-ol, 1:249t
  5-Hexynoic acid, 5:34t
  Hexynol
    LD₅₀ for mice, 1:253t
    physical properties of, 1:250t
  HFC-32, 13:720–721
  HFC-43-10-mee, 13:724–725
  HFC-125, 13:721–722
  HFC-134a, 13:719–720
  HFC-152a, 13:722
  HFC-245fa, 13:717–718
  HFC-365mfc, 13:716–717
  HFC blowing agents, 13:715–719. See also Hydrofluorocarbons (HFCs)
    manufacture of, 13:716–718
    physical properties of, 13:715–716
  HFC refrigerants, physical properties of, 13:719t
HFC solvents, applications of, 13:725
Hg-based superconductors, 23:842. See also
Mercury (Hg)
HgCdTe–CdTe system, 22:181. See also
Cadmium (Cd); Tellurium (Te)
HgCdTe photodiodes, performance of, 19:163–164
HHP technique, 14:106–107
HIAC particle counter, 18:150
Hibernia Scholven three-step MIBK
process, 16:338
Hibiscus cannabinus, 11:293
Hibiscus sabdariffa, 11:293
Hi-Capacity thickener, 22:66
Hicks and Turner experimental design
text; versus other texts, 8:395t
Hidden failure, 15:477
Hide, in paints, 18:57–58, 59
Hide paint, 18:62
Hiding power
of inorganic pigments, 19:380–381
of organic pigments, 19:429
Hierarchical structure, of PVC, 25:659–661, 662
Hi-Gee solvent extractors, 10:781
Higgins Loop, 14:408
High abrasion furnace (HAF) blacks, 4:775
“High activity” Ziegler catalysts, 20:154
High alarm, 20:672
High alumina, as a refractory raw
material, 21:488
High alumina brick, ASTM classifications
and specifications for, 21:508
High alumina catalysts, 11:724
High alumina refractories, 21:515, 518
High analysis fertilizers, 11:123, 124
High aspect ratio micromachining
(HARM), of MEMS devices, 26:964
High base lube sulfonates, 23:533
High boiling esters, 10:489
production of, 10:481
High boiling node, in separating nonideal
liquid mixtures, 22:303
High-bulk acrylic fibers, 11:213–214
High calcium quicklime, 15:28
BOS specification for, 15:68t
High calcium quicklime products, sales of, 15:60
High carbon ferromanganese,
15:548–555
High carbon yield, furfuryl alcohol in, 12:274
High ceiling diuretics, 5:169
High chrome–nickel stainless steels,
pickling, 16:223
High color carbon blacks, 4:798t
High contrast films, fine metal particles in,
19:368–369
High contrast image-setting films,
19:349–350
High contrast imaging materials,
sphere-of-influence and, 19:358
High copper alloys, 7:751
High copper–lead alloys, 14:776
High coppers
nominal composition and UNS
designation, 7:722t
UNS designation, 7:721t
High crystalline graphite, 12:784–785
High cyanide–zinc plating solution,
9:780
High cycle fatigue (HCF), of titanium
alloys, 24:841
High cycle fatigue testing, 13:489–491
High density cleaning, in paper recycling,
21:436
High density extruded planks, 23:404
High density lipoproteins (HDLs),
5:135–137; 10:829
niacin and, 25:798
High density polyethylene (HDPE),
20:149–179; 24:267, 268. See also
HDPE entries
analysis of, 19:566
as barrier polymer, 3:377
bimodal reactor technology for, 20:170
blow molding of, 20:171–172
blown film applications, 20:173–174
catalysts used for, 20:152–155
chemical resistance of, 20:166
commercial applications of,
20:171–175
degradation of, 20:166–167
diffusion of oxygen and carbon dioxide
in, 3:382t
food packaging, 18:40–42
forced elongation of, 20:164
gas-phase manufacture of, 20:169–170
health and safety factors related to,
20:170
hip implants, 3:728, 730–731
history of, 20:149–152
injection molding of, 20:171
inorganic pigment applications, 7:372t
manufacturing processes for, 20:167–170
mechanical properties of, 20:162–166
molecular weight of, 20:164–165
morphology of, 20:162
organic pigment applications, 7:368t
permeability to selected permanent
gases, 3:381t
in pipe and tubing, 20:174
polymerization mechanism and reactor
control for, 20:156–157
polymer properties of, 20:162–167
polymer structure of, 20:157–162
recycling of, 21:451–452; 25:681
resins, 17:701, 702
rheology and long-chain branching in, 20:160–162
rotomolding of, 20:175
short-chain branching in, 20:159
slurry manufacture of, 20:168–169
thermoforming of, 20:174
typical soluble dye applications, 7:376t
U.S. usage of, 20:171t
water-vapor transmission rate (WVTR), 3:387t
in wire and cable insulation, 20:174–175
Ziegler-Natta catalysts for, 26:541–542
High density polyethylene grades,
properties of, 20:158t
High-density tungsten alloy machine chips, 25:371
High-density tungsten nickel iron alloys, 25:375
High deviation alarm, 20:672
High dust plant, 10:101
High early strength cements, 5:498t,
500–501
High Efficiency Absorption (HEA)
technology, 17:183
High efficiency combustor regenerator,
11:724–725
High efficiency filtration, 13:463
High efficiency fired heaters, 19:511–512
High elasticity thermoplastic thiopoly
(ester-urethane)s, 23:743
High electron mobility transistors
(HEMTs), 22:164
GaN, 17:221–224
performance of, 22:165–166
High energy dyes, 9:196, 416
High-energy ion scattering (HEIS), 24:74

High-energy irradiation, silicone network
preparation via, 22:567
High energy ruminant feeds, 10:864–865
High enriched uranium (HEU), 17:526
Higher aliphatic alcohols
aldol process, 2:41–43
analysis, 2:9–10, 10t
chemical reactions, 2:4–6
economic aspects, 2:7–9
health and safety factor, 2:6
manufacture from fats and oils, 2:12–19
oxo process (odd-numbered alcohols), 2:1, 10, 36–41
paraffin oxidation process, 2:27t, 29t,
40t, 43
physical properties of, 2:2–4, 3t, 4t
shipment and storage, 2:6
specifications and analysis, 2:9–12, 10t
survey, 2:1–24
synthetic processes, 2:26–43
toxicological properties of, 2:7t
Ziegler process (even-numbered
alcohols), 2:1, 10, 32–36
Higher aliphatic amines
applications, 8:499–507
chemical properties, 8:487–493
economic aspects, 8:495–496
health and safety factors, 8:499
manufacture, 8:493–495
physical properties, 8:485–487, 486t
specifications and test methods, 8:496–497
storage and handling, 8:497–499
Higher alkyl methacrylates, 16:240–242
Higher α-olefins, 17:708
Higher fullerenes, 12:228
Higher heating value (HHV), 6;
7:435–436
Higher olefin polymers, 17:724–725;
20:412–435
analytical methods and quality control
for, 20:428–429
applications for, 20:430–433
catalysts and polymerization processes
for, 20:424–426
cationic polymerization of, 20:425
chemical properties of, 20:422
commercial aspects of, 20:429–430
crystalline polymers of higher α-olefins,
20:412–413
electrical properties of, 20:418–419
extrusion of, 20:427
film manufacture from, 20:427–428
gas and moisture permeability of, 20:423–424
health and safety factors related to, 20:430
injection molding of, 20:427
mechanical properties of, 20:418
melt crystallization of, 20:417
metallocene catalysts for, 20:425
monomers of, 20:413–415
physical properties of, 20:415
in pipe manufacture, 20:427
polymerization with metallocene catalysts, 20:426
polymer morphology in, 20:415–417
processing of, 20:427–428
rheology of, 20:427
solubility of, 20:423
thermal properties of, 20:417
thermal, thermooxidative, and photooxidative degradation of, 20:422–423
transformations in the solid state, 20:418

Higher olefins, 17:707–708, 709–72
chemical properties of, 17:710–711; 20:414–415
commercial manufacture of, 17:713–724
commercial reactions of, 17:712–713 in detergents, 17:725–726
electrophilic addition in, 17:712
free-radical addition in, 17:712
free-radical substitution in, 17:712
health and safety factors related to, 17:727
in lubricants, 17:726
markets for, 24:271–273
physical properties of, 17:710; 20:4148
uses for, 17:724–727

Higher performance trains, HTS transformers for, 23:863

Higher polyamines
prices of commercial, 8:496t
typical specifications, 8:496t

OLED emission and, 22:218
in organic semiconductors, 22:209
in single layer OLEDs, 22:216
High expansion foams, 12:20

High extraction efficiency structures, 14:845–848
High fidelity reproduction, lithographic resists and, 15:156
High flux dialyzers, 26:818
High frequency coreless induction furnace, 23:253
High frequency losses, in superconductors, 23:818
High fructose corn syrups (HFCS), 10:253, 290; 23:484; 26:288–289
High fructose corn sweetener (HFS), 14:419
High-fructose syrup (HFS), 4:714
High gradient magnetic separation (HGMS) kaolins, 6:675–677
High gravity brewing, 3:580
High heat ABS resins, 23:371
High impact ABS, physical properties of, 1:415t
High impact polystyrene (HIPS), 11:466; 20:353, 359–360; 23:359, 368
antioxidant applications, 3:121
surface appearance of, 23:363–364
thermoforming of, 23:398–399
High intensity cross-belt magnetic separators, 15:454–455
High intensity dry magnetic separators, 15:450–452
High intensity induced-roll magnetic separators, 15:453–454
High intensity sweeteners, 12:38, 41–43
High internal-efficiency structures, 14:844–845
High internal phase ratio emulsions, 10:114
High-level radioactive waste (HLW), 25:851
disposal of, 25:856–857
Highly enriched uranium (HEU), 17:518; 25:398, 412
de-enrichment of, 17:527–528
Highly oriented yarns (HOY), 19:753; 20:15
Highly toxic substances, 23:113
High maltose syrups, 23:486, 487
High manganese slag practice, 15:553–554
High-methoxyl pectins (HM pectins), 4:728; 13:69
properties of, 13:74t
High modulus (HM) fibers, 26:759
High molecular weight (HMW) epoxy resin compositions, 10:348
High molecular weight (MW) linear polymers, 23:733
High molecular weight methylphenylsilicones, 22:575
High molecular weight monoglycidyl aliphatic epoxy, 10:381–382
High molecular weight phenoxy resins, 10:365
High molecular weight polyester, 20:23
High molecular weight poly(ethylene oxide) resins, 10:674
High molecular weight polyisobutylene, 4:434
High molecular weight poly lactides, 20:298
High molecular weight polymeric flocculating agents, 11:633, 636–637
High molecular weight polymers, 20:4, 12; 23:377, 730
dissolving, 11:630
preparation by ROP, 23:711–712
producing, 10:683
High molecular weight poly(norbornene), 20:432
High molecular weight polysulfonates, 23:723
High molecular weight poly(thioether ketone)s, 23:710–711
High molecular weight PPS, 23:714.
See also Poly(phenylene sulfide) (PPS)
High molecular weight PPSA, 23:709
High molecular weight products, 11:442
High molecular weight silicone oils, 22:573, 575
High molecular weight synthetic alkylated aromatic feedstocks, 23:533
High nuclearity carbonyl clusters, 16:64–66
High nuclearity metal carbonyl synthesis, 16:66–69
from salts, 16:68
from smaller carbonyls, 16:68–69
High ortho novolacs from phenolic resin polymerization, 18:761–762
production of, 18:767–768
High oxygen demanding fermentations, aeration biotechnology applications, 1:743
High performance adhesives, 1:545
High performance affinity chromatography support, 6:394–395
High performance concrete (HPC), 13:542
High performance fibers, 13:369–401
applications of, 13:388–392
carbon-nanotube, 13:385–386
characteristics of, 13:369
classification by types of application, 13:391–398
classification of, 13:388t, 392t
gel spun, 13:382–383
modified carbon fibers, 13:383–385
preparation and properties of, 13:370–388
properties of, 26:740t
rigid-rod polymers, 13:370–382
silicon carbide ceramic, 13:386
structure/property classification of, 13:388–391
vitreous fibers, 13:386–388
High performance fiber technology, drawdown of coagulated fiber in, 13:375
High performance immunoaffinity chromatography (hpiac), 6:400–402
analytical methods using, 23:554
application in combinatorial chemistry, 7:405
applications of, 6:457–465
cellulosic and amylosic phases, 6:82t
chiral separation validation, 6:93–94
chiral stationary phases, 6:81–82, 82t
detectors, 6:448–450
for determination of polyether antibiotics, 20:132
equipment for, 6:441–443
for fermentation, 11:39
in microfluidic assays, 26:970
in phenolic resin analysis, 18:776
postcolumn reaction detection, 6:450–452
reversed-phased, 6:453–454
sample preparation, 6:443–448
silylation for, 22:697–698
of soap, 22:754
sugar analysis by, 23:476–477
High performance liquid chromatography–mass spectrometry (hplc-ms), of archaeological materials, 5:743
High performance liquid crystalline all-aromatic polyesters, 20:31
High performance pigments (HPPs), 19:424
High performance polyethylene fibers (HPPE), 13:382–383
High performance resin systems, 10:452
High performance sealants, 22:28
High phosphorus alloys, corrosion performance of, 9:710–711
High pinning Type II superconductors, 23:
High pressure apparatus, 13:413
High pressure applications, 13:436–448
in commercial products, 13:436–438
in inorganic chemistry reactions, 13:440–448
in mechanistic organic chemistry, 13:439–440
in organic synthesis, 13:438–439
High pressure boiler water treatment, in industrial water treatment, 26:133–135
High pressure cell, two-window, 13:418
High pressure chemistry, 13:402–455
apparatus, techniques, and methods in, 13:410–436
basic principles and aspects of, 13:404–405
inorganic chemistry reactions, 13:403
organic chemistry reactions, 13:403
theoretical aspects of, 13:405–410
theoretical studies related to, 13:448–449
uses of, 13:449
High pressure electrochemical cell, 13:431
High-pressure gas separation, hollow-fiber membrane modules for, 15:823
High pressure liquid chromatography (hplc), 9:234; 21:275
in herbicide analysis, 13:312
polymer analysis using, 19:566
High-pressure methanol, production process, 16:300–301
High pressure methods, specialized, 13:430–431
High pressure nmr (hpnmr) spectroscopy, 13:430, 431–435
High pressure processing equipment, 13:410–412
High pressure processors, 13:411
“High pressure” scanning electron microscopy (hpsem), 16:466
High pressure solvent exchange kinetics studies, 13:433–435
High pressure stopped-flow (hpsf) apparatus, 13:421–424
disadvantages of, 13:422
High pressure temperature-jump apparatus, 13:427
High pressure treatment, advantages of, 13:411
High pressure valves, manual, 13:415
High pressure vessel suppliers, 13:412
High production volume (HPV) chemicals, 24:186
High purity ferrosilicon, 22:517
High purity gases, 13:455–469
analysis and certification of, 13:464–468
applications for, 13:456, 468
delivery and control of, 13:462–463
production and purification of, 13:456–462
purity demands for, 13:468
recontamination of, 13:463
sampling and analysis guidelines for, 13:466–468
separations processes used for, 13:456–457
technology for, 13:456
High purity metals, freezing points of, 24:441–443
High purity selenium, 22:92
High purity silicon, 22:481
High purity silicon carbide, manufacture and processing of, 22:532
High purity vanadium pentoxide, 25:519
High purity water systems, 17:807–808
High Q-state, 14:674
High rank coal defined, 6:
Stopes–Heerlen Classification, 6:707t
High reliability systems, for safety shut downs, 20:671
High resiliency (HR) foams, 25:469, 470
High-resolution electron energy loss spectroscopy (HREELS), 24:74
High shear impellers, 16:674–675
High shear mills, 8:701–703
High shear mixer granulation, 10:272
High silica glasses, 12:588
High-silicon bronze A, mechanical properties, 7:678t
High silicon steels, 23:309
High solids binders, 10:445
High solids emulsions, latex, 14:722
High solids oxidizing alkylds, 2:154–156
High strength (HS) fibers, 13:389; 26:759 from solution spinning, 11:214
High-strength, high-expansion dental stone, 8:292
High strength low alloy (HSLA) steels, 15:563; 17:16; 23:294, 295, 296, 297, 298–299
High-strength olefin fibers, 11:241–242
High strength steels, 23:308–309
High strength zinc alloys, 26:591–593 compositions of, 26:592t properties of, 26:592t
High surface area hydrated limes, 15:55
High temperature carbonization, 6:758–760
High temperature chemical vapor deposition, 24:744
High temperature compression molding, 20:117
High temperature corrosion, of magnesium and magnesium alloys, 15:374–375
High temperature epoxy systems, 10:454
High temperature fatigue, 14:451
High temperature gas-cooled reactors (HTGRs), 17:571; 24:758
High temperature heat exchangers, 13:267
High temperature lithium cells, 3:349–351
High temperature long-stem standard platinum resistance thermometers, 24:445
High temperature nuclear thermochemical cycles, hydrogen production by, 13:847–849
High temperature operating bias (HTOB), 10:10
High temperature properties, of platinum-group metals, 19:600–602
High-temperature radiation furnaces, 12:293–295
High temperature reforming, 23:238
High temperature scale-control chemicals, 26:73
High temperature service, heat-resisting steels, 23:306–308
High temperature short time (HTST) continuous sterilization, in fermentation, 11:35–36, 45
High temperature steam electrolysis, 13:784
High temperature steels, alloy composition of, 23:307t
High temperature strength, 13:470
High temperature superconducting ceramic, 23:836–851
High-temperature superconducting power cable system, 23:854
High tenacity staple fibers, 11:260
High test molasses, 23:483
High $T_g$ monomers, for latex acrylic polymers, 22:41–42

High-throughput characterization, 7:419–420

High-throughput experimentation, 7:380, 387–405
commercial environment, 7:387–389
inorganic materials, 7:413–421
with inorganics, 7:413–421
methodology, 7:383–387
with organics, 7:380, 387–405

High-throughput photoluminescence, 7:

High-throughput screening (HTS), in pharmacological research, 17:646–647

High-throughput synthesis, 7:405

High touch fibers, 13:396

High $T$ processes, Claus furnace, 23:605, 606

High vacuum distillation, general separation heuristics for, 22:318–319

High value chemicals, manufacturing considerations, 5:777t

High value protein products, from yeast, 26:484–486

High velocity air freezing, 12:83

High velocity gas, in continuous SO$_3$ single-pass sulfonation processes, 23:549

High viscous fluids, preparation of, 12:188

High volatile bituminous A coal grade (U.S.), 6:713t
classification by rank, 6:711t
rank and heating values, 6:726t
vitrinite reflectance limits and ASTM coal rank classes, 6:708t

High volatile bituminous B coal grade (U.S.), 6:713t
classification by rank, 6:711t
vitrinite reflectance limits and ASTM coal rank classes, 6:708t

High volatile bituminous C coal grade (U.S.), 6:713t
classification by rank, 6:711t

High volatile bituminous coal 1, empirical composition, 6:730t
High volatile bituminous coal 2, empirical composition, 6:730t
High volatile bituminous coal 3, empirical composition, 6:730t
High volatile bituminous coal 4, empirical composition, 6:730t
High volatile coal grade (U.K.), 6:713t

High voltage insulation materials, self-cleaning coatings for, 22:123
High Volume Instrument (HVI) systems, for classifying cotton, 8:13–14
High water velocities, in industrial water treatment, 26:141
Highway construction, sulfur use in, 23:591–593
Highways, salt use on, 22:817
Highway system, 25:327
High wet modulus (HWM) rayons, 11:250
High yield, high selectivity (HY/HS) catalysts, 20:536, 537, 544
Hildebrand-Scatchard hypothesis, 23:97
Hill climbing, 7:400
Hindered amine light stabilizers (HALS), 3:109; 11:230
in VDC polymer stabilization, 25:719
Hindered amines, radical scavengers, 3:109
Hindered esters, 17:726
Hindered phenols
butyl rubber antioxidants, 4:449
radical scavengers, 3:105–107
Hindered settling, 22:53–54
HipHop method, 10:333
Hip implants, 3:727
biomaterials, 3:733–734
prosthesis design, 3:732–733
Hip joint replacement surgery, 3:729–733
Hippuric acid, 3:625
Hi-prob sizer, 22:283
HIP technique, 14:107
Hiragonic acid, physical properties, 5:33t
Hirudin, 4:100, 100t, 101
Hirulog, 4:100, 100t, 101
HiSmelt process, 14:521
Histidine
alkaloid precursor, 2:78
systematic name, formula, and molecular weight, 2:557t
taste profile, 2:605
content in cocoa and chocolate products, 6:368t
D-Histidine, systematic name, formula, and molecular weight, 2:557t
DL-Histidine, systematic name, formula, and molecular weight, 2:558t
L-Histidine
buffer for ion-exchange chromatography, 3:830t
systematic name, formula, and molecular weight, 2:557t
Histograms, 21:176–177
Histoplasmosis, 26:476
HIV (human immunodeficiency virus), 3:135
antiviral therapy, 3:148–153
immunosensors for antibodies, 3:805
infection process, 3:146–148
and need for blood substitutes, 4:109
HIV-1, 3:136
HIV-2, 3:136
HIV fusion inhibitors, 3:151–152
HIV neuramidase inhibitors, target structure-based database searches, 6:14
HIV protease inhibitors, target structure-based database searches, 6:14
HLB (hydrophilie–lipophile balance) system, 10:126
HLB value, 12:54, 55
HMG–CoA, role in cholesterol synthesis, 5:142
HMG–CoA reductase, role in cholesterol synthesis, 5:142
HMG–CoA reductase inhibitors (Statins), 5:137, 138–140t, 142–143
HMX (High Melting eXplosive; octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine), 10:735–736
bioremediation substrate, 3:779–780
HN1–3 chemical agents, 5:816
physical properties, 5:817t
Hoboken vacuum retort, 14:750
Hockenhull, D., 11:50
Hock process, 14:593
Hodge-Sterner table, 23:113
Hoechst/Halcon process, 19:621
Hoechst method, 16:321
Hoechst process, 20:168–169
Hoffman reaction, acrylamide polymers, 1:315–316. See also Hofmann reaction
quaternary ammonium compounds, 2:737
Hofmann elimination, quaternary ammonium compounds, 2:737
Hofmann-Gerhardt nomenclature, 17:395
Hofmann–Martius rearrangement, 2:786
Hofmann reaction, 16:320. See also Hoffman reaction
Hofmann rearrangement, 17:741
Hofmann-type inclusion compounds, 14:171–172
HOKO nitric acid process, 17:185
Holding furnaces, 12:313
Holds (ships), corrosion protection coatings, 7:205
Holdup, 10:764–765
Hole drilling, via electrochemical machining, 9:598–600
Holes, valence band, 9:728
Hole–transport layer (HTL) in “double heterostructure” OLEDs, 22:216–217
in single layer OLEDs, 22:215–216
Hole trap, 19:187
Hollander beater, 18:103–104
Hollandites, 25:43
Hollow articles, blow-molded thermoplastic, 20:46–47
Hollow cathode sputtering, 24:735–736
Hollow-cone sprays, 23:182–183
Hollow electrode technology, phosphorus furnace, 19:10
Hollow-fiber bundles, potting of, 16:16–18
Hollow fiber cell culture systems, 5:350, 355–356
pros and cons of, 5:351t
Hollow-fiber dialyzer, 26:815–816
Hollow fiber geometry, 26:829–830
Hollow fiber kidney dialyser, 15:845
Hollow-fiber membranes, 15:815–818
Hollow-fiber membrane modules, 15:819–821, 823, 838
Hollow fiber membrane(s), 10:766; 16:1–31
additional types of, 16:24
advantages of, 16:3
categories of, 16:2–3
in desalination, 16:22
development of, 16:1
extractors, 10:787
fiber treatment for, 16:12–18
future prospects for, 16:26–28
glass and inorganic, 16:23–24
handling and unit assembly of, 16:15–18
interpenetrated wall matrix in, 16:15
low pressure, 16:24–26
macrovoids in, 16:12
materials associated with, 16:18–24
melt spinning of, 16:9–10
in microfiltration and ultrafiltration, 16:24–26
polyethylene, 16:21
poly(methyl methacrylate), 16:21
polysulfone, 16:20–21
properties of, 16:3–7
solution (wet) spinning of, 16:10
sorbed fibers in, 16:26
studies of, 16:27
wet- and dry-jet wet spinning of, 16:10–11
Hollow-fiber permeators, 16:22
Hollow fibers, 13:389–390
cellulose ester, 16:19
cellulosic, 16:18–20
ion-exchange, 16:15
mechanical considerations and dimensions for, 16:5–7
natural polymer, 16:23
polyacrylonitrile, 16:23
polyamide, 16:21–22
post-treatment of, 16:13–14
preparation of, 16:3
production of, 19:757
wet spinning of, 16:27
with sorbent walls, 16:26
technology of, 16:27
Hollow-fiber spinning processes, 16:7–12
Hollow fiber spinning technology, 26–829
Hollow sprays, 23:188
Holmes and Narver mixer–settler, 10:775
Holmium (Ho), 14:631t, 635
electronic configuration, 1:474tt
Holocellulose, 5:362
Holograms, silver and, 22:639, 657–658
Holographic applications, spectrally sensitized materials for, 9:519
Holographic interferometry, 19:588–589
Holography, optical, 17:421
Holst, Axel, 25:747
Homatropine hydrobromide, 4:360t
Homatropine methylbromide, 4:360t
Home desalinators, 26:55
Home scrap, 23:261, 262
Home water softeners, 22:818–819
Homobenzoate esters, aroma chemicals, 3:257
Homobenzylic esters, aroma chemicals, 3:256
Homochiral bisphosphines, 19:26
Homocysteine, folic acid and, 25:802
Homodimetric cyanine dyes, 20:520
Homofarnesic acid, biomimetic cyclization of, 24:575
Homofullerene dendrimer, 12:252
Homogeneous aqueous reactors, 17:589
Homogeneous azetropic distillation, 8:793–801
Homogeneous catalysis, 5:201, 204–220
catalyst deactivation mechanisms, 5:287–289, 288–289t
element processes, 5:205–220s
high throughput experimentation, 7:393
mass transfer effects, 5:205
phase-transfer catalysis, 5:220
solution processes characterized, 5:204
Homogeneous catalysts, 26:545, 839
Homogeneous Charge Compression Ignition (HCCI), 12:421
Homogeneous chemical reactions, 21:339
Homogeneous copolymerization, of acrylonitrile, 11:202–203
Homogeneous difunctional initiators, 14:246
Homogeneous immunoassays, 14:152
Homogeneous membrane models, 21:638, 639
“Homogeneous” metallocene catalysts, 16:82
Homogeneous reactor experiments (HREs), 17:589
Homogeneous wetting, 22:111
Homogenization, 16:699
aluminum alloys, 2:329
Homogenizers, 8:703; 10:127
Homoglycans, 4:697, 701; 13:62–64
classification by structure, 4:723t
Homo-interface, 24:71
Homo-ionic interactions, 8:77
Homojunction BJTs, 22:166
Homojunction devices, LEDs asm 173
Homojunction diode arrays, 19:163
Homojunction laser diode, 14:699
Homoleptic tetranuclear carbonyl complexes, 16:63
Homologation, of boronic esters, 13:671
Homologous enzyme structures, 10:337
Homologous promoters, 12:453
Homologous recombination, 12:459–460
Homologous temperature, 13:487
Homology, of proteins, 20:833–834
Homology modeling, 20:837
Homomethyl salicylate, 22:16
physical properties of, 22:14t
Homonuclear Hartmann-Hahn spectroscopy, 20:137
Homopolymerization, 10:183
of \(\alpha\)-olefins, 16:110
ethene, 16:102–103
propene, 16:104–110
of VDC, 25:695–697
Homopolymers
bulk density of polymer particles in,
26:533
of dibromo/tribromo styrene monomers, 11:470
interfacial layer between, 20:337–338
melt-blends of, 20:51
methacrylate, 16:272t
polypropylene, 20:524–532, 26:535–536
Homopolypropenes, 16:86
Homopolysaccharides, 4:697
Homosalate, cosmetic uv absorber, 7:846t
Homo[60]fullerenes, 12:243
Honda emission control system, 10:57
Honeycomb arrays, 24:61
Honeycomb catalyst, 10:82–83
Honeycomb roof, 24:292
Honeycombs
target of crystal engineering, 8:86t
Honeycomb structures, phenolic resins in, 18:796
Honeywell
advanced materials research, 1:696
nanocomposite development, 1:717
Honing stones, 1:19
Hoogsteen hydrogen bonding, 17:609, 610
Hooke’s law, 21:719
Hookean region of stress–strain curve,
11:183, 184
“Hook” molecule, 18:264, 265
Hop \(\alpha\)-acids, 3:570–571
Hopane, marker in bioremediation of oil spills, 3:788–789
Hop \(\beta\)-acids, 3:570–571
Hope diamond, 7:336; 8:524
Hop essential oils, 3:572
Hopper dryers, 9:123–124
Hopper scales, 26:244, 246
design considerations for,
26:252–260
discharging, 26:259–260
feeding equipment for, 26:258–259
Hopper-tank sludge-blanket clarifier,
22:61–62
Hops, 3:569–572
composition of whole dried, 3:571t
Hop strainer, 3:579
Horizontal belt filters, 11:345, 354–355; 16:658
Horizontal belt pressure filters, 11:379
Horizontal belt vacuum filter, 11:354–355
Horizontal box heaters, 19:511
Horizontal current classifiers, 16:619
Horizontal Feret’s Diameter (HFD), 18:147
Horizontal injection wells, 18:613
Horizontal leaf filters, 11:366–367
Horizontal magnetic field-type (HMC), 23:857
Horizontal mills, 18:65
Horizontal reactor, 22:154, 155
Horizontal retort process, for zinc, 26:577
Horizontal rotary tilting-pan filters,
11:344, 345, 353–354
Horizontal rotating pan vacuum filter,
11:353–354
Horizontal tanks, 24:280
Horizontal thermosiphon reboilers, 19:510
Horizontal tube multi-effect (HTME),
26:65, 66
Horizontal tube ozone generators, 17:799
Horizontal-tube vapor compression (VC) desalination plant, 26:68
Horizontal vacuum filters, 11:350
Horizontal vessels
horizontal leaf filters, 11:367
in plant layout, 19:504
vertical leaf filters, 11:364–366
Hormone replacement therapy, key manufacturing steps, 5:781–782
Hormones
antiaging agents, 2:814–815
in ruminant feeds, 10:868
Horner–Emmons reaction, 2:65
Horner–Wittig reaction, 2:65
Horse liver alcohol dehydrogenase, 3:672
Horseradish peroxidase (HRP), in biosensor, 3:798
Horticulture, high performance fibers in,
13:394. See also Agriculture
Hostaflon TFA, 7:641
Hostaflon TFB, 7:641
Host compounds, in supramolecular chemistry, 24:29–30
Host–guest chemistry, 14:160; 24:30
Host–guest chemistry-carborane anticrowns, 4:216–217
Host–guest complexes, binding constants for, 24:39t
Host–guest hydrogen bonds, 14:169
Host lattices, 14:172
phenol, 14:174
Host microorganisms, for industrial enzyme production, 10:264–265
Host oxide lattice structure, 19:403
Hot air food dryers, 12:85
Hot and cold composite curves, 13:222
Hot-box resins, 12:273
Hot briquetted iron (HBI), 14:492–494, 509; 21:412
uses for, 14:528
Hot briquetting, in the MIDREX process, 14:513
Hot-cathode ionization gauges, 20:660–662
accuracy of, 20:662
Hot-coating process, phenolic resins in, 18:788–789
Hot composite curve, 13:191–192
Hot corrosion, 13:504, 506–507
Hot-dip galvanizing, 26:583
Hot dry rock (HDR), 12:539–544
technology associated with, 12:540–542
Hot dry rock geothermal energy system, operation of, 12:541–542
Hot dry rock operations environmental considerations related to, 12:542–543
outside the United States, 12:543–544
Hot dry rock resources, economics of, 12:542
Hot-filament chemical vapor deposition (HFCVD), 17:214–215
Hot-fill market, 20:50–52
Hot-film anemometers, 11:676
Hot flocking, 7:59
Hot-fluid flow maldistribution, 13:271
Hot forging
ceramics processing, 5:662
of titanium, 24:859
Hot isostatically pressed (HIPed) polyimide powder, 20:284
Hot isostatic pressing (HIP), 16:169
cemented carbides, 4:657
ceramics processing, 5:662
Hot isostatic pressure impregnation carbonization (HIPIC), 26:767
Hot-melt adhesives, 1:530–532
polyurethane and polyester copolymers as, 24:716
Hot melt silicones, 22:35
Hot molding, 12:733
“Hot-pressed” carbon brick, 12:764
Hot pressing, ceramics processing, 5:662
Hot process streams, 13:187, 188
Hot process water softening method, 26:121
Hot-rod rolling, 25:373
Hot salt-stress corrosion cracking (HSSCC), of titanium alloys, 24:845
Hot-spring gold deposits, 12:685–686
Hot stamping, 7:695
foils, 21:607
Hot stream, heat capacity flow-rate of, 13:191
Hottel zoning method, 12:333
Hot trub (hot break), 3:579
Hot tubs, water treatment for, 26:194–196
Hot water fields, 12:530–531
Hot-water resources, electricity production from, 12:532
Hot wire and hot film anemometry (HWA), 11:784
Hot-wire anemometers, 11:676
Hot working of carbon steels, 23:294–295
in SMA processing, 22:353
standard for, 21:854
of steel, 23:271
Houben-Hoesch reaction, 12:179
Household appliances, virtual two-way SMA devices in, 22:348
Household laundering, 4:45–46
detergent systems for, 8:413t
Household products emulsion use in, 10:129
organic esters in, 10:518–519
Household uses, sodium sulfates in, 22:869
Household waste, 25:864
“House-of-cards” glass-ceramic microstructure, 12:635
Housewares, LLDPE, 20:207–203
Housewrap, 17:482
Housings, for cartridge filters, 11:369
Hoveya-Grubbs catalysts, 26:934
H-phosphonate DNA synthesis method, 17:624–625
Hplc, See High performance liquid chromatography
HQSAR analysis, 10:331
HSV-1, 3:136
HSV-2, 3:136
HTS fault-current limiters, 23:868
HTS Josephson devices, 23:870–872.
  See also Josephson entries
HTS materials, 23:819, 839. See also High temperature superconductors (HTS)
HTS superconducting current leads, 23:855
HTS tapes, 23:854
HTS transformers, for higher performance trains, 23:863
HTS transmission cables, 23:852–854
HTU values, 15:696
Huang-Minlon reaction, 13:569–570
Huckel molecular orbital theory (HMO), 16:736
Hue, 7:305
Huff'n puff method, in oil recovery, 18:617
HUP'T theory, 14:714
Huggins viscosity constant, 21:711
Hughes-Agree method, 12:266
Hull coatings, 7:203
Human activities, effect on stream water, 26:26–27
Human blood plasma, citric acid in, 6:632t
Human chorionic gonadotropin (Chorulon), spawning aid for aquaculture in U.S., 3:214t
Human exposure, to ethylene oxide, 10:660
Human exposure, to ozone, 17:815
Human factors, in process hazards control, 21:861–862
Human genome, 20:834
Human genome microarray, 16:391
Human Genome Project (HGP), 17:639, 619; 20:839
Human growth hormone (hGH), 3:817
  regulatory treatment, 3:826
  selling price, 3:817t
Human growth hormone-releasing factor (hGRF), 13:13
  effects on growth and gain in lambs, 13:11t
Human health effects, of polychlorinated biphenyls, 13:140–142
Human IgG (hIgG), detection of, 14:155, 156. See also Immunoglobulin G (IgG)
Human immunodeficiency virus (HIV). See also HIV entries; Nevirapine entries
  inactivation of, 12:139
  lactoferrincins and, 18:258
  vaccine, 25:500–501
Human insulin
  purification, 3:841–842
  selling price, 3:817t
  separation from E. Coli, 3:817–821
  separation over DEAE, 3:
Human metabolites, large-scale production of, 16:398
Human milk, citric acid in, 6:632t
Human papilloma virus (HPV) vaccine, 25:497
Human relations, safety and, 21:857–858
Human serum albumin (HSA), yeast-derived, 26:485–486
Humans
  gene therapy in, 12:467–468
  pesticide hazards to, 18:547–549
Human T-cell leukemia virus-I (HTLV-I), 3:136
Human T-cell leukemia virus-II (HTLV-II), 3:136
Human toxicology
  lindane and hexachlorocyclopentadiene, 13:146–147
  PBDE-related, 13:143
  polychlorinated naphthalenes, 13:144–145
Human transferrin, yeast-derived, 26:486
Human whole blood, citric acid in, 6:632t
Humectants
  in food, 12:65
  propylene glycol, 12:668–669
Humic coals, 6:703, 706
Humid heat, 9:97
Humidity, 9:97
  effect on permeability in barrier polymer, 3:393
  fibers and, 11:169
  in fine art examination/conservation, 11:407–408
  heat of sorption of wool and, 11:168t
  polymer permeability and, 25:711
Humidity sensors, acoustic wave sensors and, 22:270
Huminite, 6:706
Humira, cell culture technology product, 5:346t
Humphrey’s spiral gravity flow concentrator, 16:632
“100% product” philosophy, 10:165
Hünig's Base, 2:549t
Hunter Color Spaces, 7:321
Hunter-Nash procedure, 10:757
Huntsman fixed-bed maleic anhydride process, 15:501
Huntsman solvent-based collection and refining system, 15:506
Huron–Dow process, 14:42, 53
Huygens’ principle, 17:424
H values, 23:284
Hyaluronan, 20:577
Hyaluronic acid, 4:706; 20:456
 classification by structure, 4:723t
 function as ingredient in cosmetics, 7:829t
 in skin aging products, 7:843
Hybrid biomaterials, 13:552–553
Hybrid desalination systems, 26:94–96
Hybrid electrochemical machining processes, 9:603–604
Hybrid electromagnets, 23:854
Hybrid integrated circuit (HIC), 19:631
Hybrid macrolides, 15:301–302
Hybrid materials, 13:533
 based on mineral solids, 13:541
 based on organic polymers, 13:541–544
 based on siloxane bonds, 13:536–538
 based on transition metal oxides, 13:540–541
 chemistry of, 13:535
 conducting organic polymer doped with electroactive molecular clusters, 13:544–546
 cross-breeding of, 13:533–534
 functional, 13:550–552
 history of, 13:534–535
 “intelligent,” 13:550
 large active anions in, 13:545
 mesostructured, 13:548–549
 structural, 13:549–550
Hybrid nanocomposite materials, 13:533–561. See also Nanocomposites
 properties and applications of, 13:549–553
 structural aspects and types of, 13:546–549
 types according to chemical criteria, 13:553–546
Hybrid negatives, Polacolor, 19:301–302
Hybridoma cell lines, 14:152–153
Hybridomas, 11:12
 cell culture technologies used for, 5:351t
 Hybrid paper former, 18:120
 Hybrid power plants, economics of, 12:538
 Hybrid power systems, 6:
 Hybrid silk fibers, 22:634
 Hybrid solvents, in hydrogen sulfide recovery, 23:600–601
 Hybrid striped bass, aquaculture, 3:183
 Hybrid systems, in wastewater treatment, 25:911–912
 “Hybrid technology” nanofiltration system, 26:73
 Hydac, molecular formula and structure, 5:126t
 Hydantoin(s), 13:110
 formation from amino acids, 2:569
 Hydantoin-based epoxy resins, 10:375
 Hydeal process, 3:607
 Hydnocarpic acid, 5:36t
 Hydrafiner, 18:105
 Hydralazine, 5:169
 molecular formula and structure, 5:165t
 Hydraphiles, 24:58, 59
 Hydrapel, 18:103
 Hydargillite. See Gibbsite
 Hydrated alumina. See Alumina hydrates
 Hydrated chromium(III) green pigment, 19:406
 Hydrated Chromium Oxide Green, pigment for plastics, 7:370t
 Hydrate deposits, seafloor stability and, 17:692
 Hydrated hydraulic limes, 15:55
 Hydrated lime(s), 15:28, 61
 aquaculture application, 3:207
 high surface area, 15:55
 production of milk of lime from, 15:56
 quality control for, 15:70
 reactions, 15:45
 storage and transport of, 15:56–57
 Hydrated magnesium silicate (steatite), powder used in cosmetics, 7:841t
 Hydrated silica, 22:383, 385
 dissolution of, 22:388
 Hydrated sodium sulfate, vinyl chloride reactions with, 25:630
 Hydrated stannic oxide, 24:805–806
 Hydrated titanium oxides, 25:15
 Hydrates, natural gas, 12:374–375
 Hydration(s)
 acetylene, 1:180
asymmetric, 16:402

catalytic, 10:598
cement, 5:475–482
indirect, 10:536–538
maleic anhydride, 15:492
quicklime, 15:54–55
of soap bars, 22:730–731
in sodium carbonate recovery, 22:791
thorium, 24:764
Hydration antifouling coatings, 7:158
Hydraulic atomizers, 23:175
Hydraulic cements, 5:54
Hydraulic-centrifugal classifiers, 22:275
Hydraulic classifiers, 16:619
Hydraulic conductivity, of landfill liners, 25:878
Hydraulic desliming, of sylvinitic ores, 20:617
Hydraulic diameter, 13:246
Hydraulic entanglement, 17:474–475
Hydraulic Institute (HI) standards, 21:54, 56
Hydraulic lime(s) (HL), 5:502; 15:25, 28, 55
hydrated, 15:55
manufacture, 5:494–495
natural, 15:53–54
sales of, 15:60
Hydraulic permeability/ultrafiltration coefficient, of a dialysis membrane, 26:818–819
Hydraulic properties, of ion-exchange resins, 14:399–403
Hydraulic retention time (HRT), in biological waste treatment, 25:829
Hydraulic scales, 26:229–230
Hydraulic-settling classifiers, 22:275
Hydrazide(s), 10:504; 13:573–576
as a nucleating agent for high contrast PTG films, 19:350
Hydrazide method, for covalent ligand immobilization, 6:396t
aqueous grades of, 13:585
chemical properties of, 13:566–576
as a corrosion inhibitor, 13:595
economic aspects of, 13:584–585
electrode potentials of, 13:566t
explosive limits of, 13:566
handling and storage of, 13:586–588
as a hazardous material, 13:585
health and safety factors related to, 13:589–591
manufacture of, 13:576–583
as a nucleophile, 13:568–569
personnel exposure to, 13:596
physical properties of, 13:562–566
reaction with iron, 13:596
reaction with phosgene, 18:805
as a reducing agent, 13:569–571
shipment and specifications for, 13:585–586
uses for, 13:562, 591–599
Hydrazine-based blowing agents, 13:592t
Hydrazine-based pesticides, 13:594t
Hydrazine–borane compounds, 13:569
Hydrazinecarbothioamides, 13:575
Hydrazinecarboxamides, 13:575
Hydrazine derivatives, 13:562
agricultural uses for, 13:593–595
aromatic, 13:573
solid, 13:597
uses for, 13:599
Hydrazine hydride, 13:563
Hydrazine-in-water analyzer, 13:589
Hydrazine \(k_{\text{LaL}}\) measurement method, 15:680
Hydrazine perchlorate, 18:278
Hydrazine-sensitive detector, 3:812
Hydrazine solutions applications of, 13:584–585
production capacity of, 13:584t
world demand for, 13:584
Hydrazine sulfate, 13:581, 599
Hydrazine synthesis, hydrogen peroxide in, 14:66
Hydrazine vapor, explosive range of, 13:587
Hydrazine–water azotrope, breaking, 13:579
Hydrazinium nitroformate (HNF), 10:739, 742
Hydrazinium salts, 13:567–568
2-(4-Hydrazinocarbonylphenyl)-4,5-diphenylimidazole (HCPI),
chemiluminescence reagent, 5:851
Hydrazone formation, microwaves in, 16:565
Hydrazone reduction, 13:572
Hydrazones, 13:576, 580
hydrazone tautomeric form, 9:365–367
Hydride ions, 13:767
Hydride reagents, functional group behavior toward, 13:615–616t
alkali metal, 13:608–610
alkaline-earth metal, 13:610–611
aluminohydrides, 13:621–624
complex, 13:613–621
covalent, 13:611–613
gallium, 12:355
health and safety factors related to, 13:627–628
ionic, 13:608–611
lanthanide, 14:634
low temperature, 13:786
metallic, 13:624–627
plutonium, 19:690
rhenium, 21:700
simple, 13:608–613
sodium in production of, 22:777
thallium, 24:632
thorium, 24:761
zirconium, 26:639–640, 653–654
Hydride vapor-phase epitaxy (HVPE), compound semiconductors and, 22:145
Hydriodic acid, in sodium iodide manufacture, 22:826–827
Hydroaccumulator, 13:237
Hydroblasting, 7:198
Hydroboracite, 4:133t
Hydroborating agents, 13:633–640
    See also Enolboration; Hydroboration reaction
    asymmetric, 13:665–667
    asymmetric synthesis via chiral organoboranes, 13:664–671
    of butylenes, 4:408
    catalytic, 13:644–646
    catalytic asymmetric, 13:667
    kinetic resolution of racemic olefins and alkenes by, 13:667
    mechanism of, 13:633
    organoborane reactions, 13:647–664
    selectivity in, 13:640–644
    solvents and, 13:640
Hydroboration–cyanidation, 13:656
Hydroboration–isomerization–oxidation, of alkenes, 13:661
Hydroboration–protonolysis, 13:648
Hydroboration reaction, 13:632–646
Hydrobromic acid, 4:150
Hydrobromic acid, 4:319; 22:823
    use in selenium analysis, 22:94
Hydrocarbon-based epoxy novolacs (HEN), 10:458
glycidyl ethers of, 10:369–370
Hydrocarbon blends, aerosols, 1:777, 777t
Hydrocarbon chains, soap and, 22:725, 726–727
Hydrocarbon emissions, in coil coating, 10:108
Hydrocarbon emissions, polymerization-process, 20:231
Hydrocarbon film, 24:750
Hydrocarbon injectants, in oil recovery, 18:617
Hydrocarbon materials, 10:180
Hydrocarbon propellants, 1:775
physical properties of, 1:776t
Hydrocarbon raw materials, 13:686–687
Hydrocarbon release hazard, 10:627
Hydrocarbon remediation, technologies for, 23:112
Hydrocarbon resins, 12:188
Hydrocarbon resources, classes of, 13:685–686
Hydrocarbons (HCs), 13:684–714
    acetylene manufacture from, 1:187–204, 216, 218
    in acetylsalicylic acid manufacture, 22:19
    adsorbent affinity, 1:674
    adsorption isotherm for coconut-shell activated carbon, 1:635t
    aroma chemicals, 3:236–238
    aroma compounds in roasted coffee, 7:256t
    in beer, 3:582t
    bicyclic monoterpenoid, 24:494–499
    biodegradability of, 25:826
    bioremediation substrates, 3:760–770
    boiling points of, 11:860t
    butanes, 13:695–700
    categories of, 24:255
    condensable, 13:691
    in crude oils, 18:592–593
cyclohexane, 13:706–711
early uses for, 13:685, 686–690
exhaust unburned, 10:36
free energy of formation of selected, 1:187
    free-radical oxidation, solution catalyzed, 5:218–219
    in gasoline, 18:665
halogenated, 13:135–151
heterogeneous combustion, 7:449–454
hexanes, 13:703–706
importance of, 13:685
isomerization of, 12:172
in kerosene, 18:668
masses and isotope abundances for, 15:651
methane, ethane, and propane, 13:690–695
monocyclic monoterpenoid, 24:491–494
monoterpenoid, 24:484–499
oxidation of, 16:401
in oxygen, 17:759–760
partial oxidation of, 13:780–783
pentanes, 13:700–703
poisons in representative reactions, 5:258t
reaction with sulfur to produce carbon disulfide, 4:830–832
reactions with cesium, 5:694
as refrigerants, 21:524
separation of, 18:522
in silicon carbide whisker fabrication, 22:534
silver and oxidation of, 22:685
sodium dispersions in, 22:777
sulfonation of, 23:513
synthesis of, 10:532; 13:768
thermal cracking of, 10:599
three-way catalytic oxidation of, 10:49
unsaturated, 10:486–487; 23:526–527
in waxes, 26:205–206
Hydrocarbon sensors, in leak detection, 24:311
Hydrocarbon-soluble dilithium initiators, 14:253
Hydrocarbon sulphonates, 23:531
Hydrocarbon surfactants, 24:133
Hydrocarbon waxes, 26:220
Hydrocarbonyl complexes
of thorium, 24:773
of uranium, 25:441–442
See also Hydrogen chloride
in ascorbic acid manufacture, 25:757
chlorine from, 6:172–175
constant boiling, 13:814t
density and concentration of, 13:808t
end use of chlorine, 6:135t
for fermentation, 11:38
in integrated manufacturing process, 6:237t
purified, 13:825
PVC and, 25:679
quantitative analysis of, 17:191
reaction with ethyl alcohol, 10:588
selenium reactions with, 22:76
in selenium recovery, 22:79–81, 84
in sodium carbonate recovery, 22:792
solubility of boron halides in, 4:140t
in steam, 23:214
Hydrochloric acid dips, 9:787
Hydrochloric acid emission limits, 13:183
Hydrochloric acid solutions, hydrogen chloride from, 13:824
Hydrochlorofluorocarbons (HCFCs), 1:775, 777; 11:859; 13:715, 716, 718, 727;
21:529; 25:456. See also HCFC entries
ozone depletion and, 17:813–814
physical properties of, 1:778t
as refrigerants, 21:524
role in stratospheric ozone depletion, 1:809–811
Hydrochlorothiazide, 5:168
molecular formula and structure, 5:161t
Hydrocolloids, 4:722; 12:51
flavor encapsulation in, 11:547
natural, 12:52–54
semisynthetic, 12:54
Hydrocooling, of food, 21:560
Hydrocortisone production, yeast in, 26:493
Hydrocracked vacuum gas oil (HVGO), 10:608
Hydrocracking, 18:655–656
molecular sieves in, 16:842–844
poisons, 5:258t
Hydrocyanic acid, 8:171
Hydrocyclone classifier, 16:620–622
air-sparged, 16:653–654
Hydrodealkylation (HDA) operations, 25:179
Hydrodenitrogenation, catalytic aerogels for, 1:763t
Hydrodesulfurization (HDS), 12:722;
16:303; 23:630, 635
molybdenum compounds in, 17:37
catalytic aerogels for, 1:763t
Hydrodimerization, ionic liquids in, 26:885–887
HydroDiural, molecular formula and structure, 5:161t
Hydrodynamic chromatography (HDC), in particle size measurement, 18:146
Hydrodynamic flow, in microfluidics, 26:962
Hydrodynamic injection, capillary electrophoresis, 4:633–634
Hydrodynamic lubrication regime, 15:210–211
Hydrodynamic pressure, 15:211
Hydrodynamics, 11:736
in MOCVD reactors, 22:154–155
Hydrodynamic separator, 22:62–63
Hydrodynamic stability, 11:762
Hydrodynamic sulfur extraction process, 23:573
Hydrodynamic volume (HDV), of water-soluble polymers, 20:437–439
Hydroelectric power, usage for energy in U.S., 6:744t
Hydroelectric turbines, virtual two-way SMA devices in, 22:349–350
Hydroentanglement, 17:507–508
Hydrofinishing, 15:216
Hydrofluoroxybenzene, molecular formula and structure, 5:162t
Hydrofluoric acid (HF), 4:579t. See also Hydrogen fluoride
North American capacity of, 14:15t production of, 14:15
silicon solubility in, 22:491–492
in sodium fluoride manufacture, 22:825
solubility of boron halides in, 4:140t
solubility of metal fluoroborates in, 4:152t
uses for, 14:20
U.S. imports for consumption of, 14:15t
Hydrofluoroboric acid, 4:150
Hydrofluorocarbons (HFCs), 1:775, 777; 11:859; 13:714–729, 727. See also HFC entries
as blowing agents, 13:715–719
as fire-fighting agents, 13:726–727
fluorine substituent and, 13:714
physical properties of, 1:778t, 781t
as refrigerants, 13:719–723
role in stratospheric ozone depletion, 1:809–811
as solvents, 13:723–725
Hydrofluoroethers, 11:877, 879, 880
azeotropic mixtures containing, 11:881t
health and safety factors related to, 11:884
uses for, 11:885–886
Hydrofluoropolyethers, 11:877, 879, 883
health and safety factors related to, 11:884
Hydrofoil impellers, 16:673–674
Hydroformulation, 13:768
Hydroformylation, 10:598
allyl alcohol, 2:236–237
ionic liquids in, 26:882–885
maleic anhydride, 15:492
metal carbonyls in, 16:72–73
rhodium-catalyzed, 19:647
Hydroformylation reactions, 13:448
Hydrogasi
Hydrogel-based drug delivery, 13:748–750
Hydrogel drug carriers, 18:710
Hydrogel formation, PVA and, 25:603
Hydrogel processes, for preparing synthetic zeolites, 16:831–833
Hydrogels, 13:729–759. See also Microgels;
Superabsorbent polymers (SAPs)
AMPS polymer, 23:721
applications for, 13:747–753
biodegradable, 13:739–742
bioerodible, 9:63
conducting, 7:524
cross-linked poly(ethylene oxide), 10:687
degradable-cross-linking-agent, 13:740–741
degradable-pendant-chain, 13:741
degradable-polymer-backbone, 13:739–740
monomers used for synthesizing, 13:730
PEG, 13:736–737
pH-sensitive, 13:743
PHEMA, 13:733–734, 749, 750
poly(acrylamide)-based, 13:737–738
poly(acrylic/methacrylic acid), 13:734
poly(N-vinyl 2-pyrrolidone), 13:739
polyurethane, 13:739
porous, 13:750–751
preparation methods for, 13:731–732
properties and preparation of, 13:732–747
PVA, 13:734–736
safety and health aspects of, 13:754
silica, 22:370, 394, 474
smart, 13:742–743, 747; 22:716
as superabsorbent materials, 13:752–753

swelling rate of, 13:748
thermosensitive, 13:743
Hydrogel wound dressings, 13:751–752
Hydrogen, 13:759–808. See also Atomic hydrogen; 1H- and 13C-nmr spectroscopy; Hydrogen economy; Hydrogen energy; Liquid hydrogen tank levitation system; Synthesis gas; Tritium
absorption in metals, 13:772
in ammonia synthesis, 2:688; 11:114
analytical methods for, 13:789–791
boron replacement by, 13:647–650
as a by-product, 13:773–775
carbon dioxide production with, 4:808
in catalyst systems, 20:157
catalytic combustion of, 13:799
chemical properties of, 13:772
from coal gasification, 6:771, 772, 773–774, 775
cryogenic liquefaction, 8:52–54
cryogenic methods used for purification, 8:42; 8:51–52
cryogenic purification with light olefins and LPG recovery, 8:52
delivery and infrastructure for, 13:852–853
detecting trace impurities in, 13:791
detecting traces in atmosphere, 13:791
diffusion coefficient for dilute gas in water at 20° C, 1:67t
diffusion coefficient in air at 0° C, 1:70t
direct combination with oxygen, 14:53–54
economic aspects of, 13:787–789, 779–780
electrostatic properties of, 1:621t
embrittlement, 9:792
as an energy carrier, 12:201–202; 13:863
environmental concerns related to,
13:791–793
fluorine reactivity with, 11:830
as a fuel, 13:799
future production processes for, 13:844–850
gas bulk separation, 1:618t
gas purification, 1:618t
in growing amorphous silicon, 22:129–131
health and safety factors related to,
13:796–797
high purity, 13:460–461
hydrogen chloride synthesis from, 13:822
importance of, 13:759–760
liquefaction of, 8:40; 13:850
manufacture and production of,
13:775–784
molecular, 13:759
new production methods for,
13:783–784
normal, 13:761
photocatalytic reactions involving, 19:79, 87, 94
physical and thermodynamic properties of, 13:760–766
prices of, 13:788–789
process and plant design for, 13:778–779
producers of, 13:787–789
production of, 9:634; 13:840–850
properties of amorphous semiconductors and, 22:131
in pyridines, 21:98–100
reactions of, 13:769–771
reactions with bromine, 4:298–299
reaction with carbon monoxide, 5:9
as a reducing agent, 13:770
recycling and disposal of, 13:793–796
separation of high purity by pressure swing adsorption, 1:646
shipment of, 13:784–786
in silica manufacture, 22:367–368
in silylation, 22:691
in sodium hydroxide manufacture, 22:832, 833, 834, 837
sodium reactions with, 22:765
solubility in aluminum at various temperatures, 2:283t
sources and supplies of, 13:773–775, 788
specifications for, 13:789–790t
storage of, 13:625, 784–786, 850–852
suppliers of, 13:789
technology selection for, 13:796
thermal conductivity for, 13:764
thermophysical properties, 8:41tn
third party suppliers of, 13:788
urethanes and, 22:36
uses for, 13:797–798, 838, 854–862
vitreous silica reaction with, 22:419
in Ziegler-Natta polymerization, 26:525
ortho-Hydrogen, 13:759, 760–761
vapor pressure of, 13:764
Hydrogen abstraction, 10:600
quinones in, 21:245–246
Hydrogenases, cofactor regenerating systems, 3:673
Hydrogenated amorphous silicon (a-Si:H), 22:128
  crystalline silicon versus, 22:134
  in growing amorphous silicon, 22:131
  optoelectronic parameters for, 22:132
  properties of, 22:131–134
  stability of, 22:139–140
Hydrogenated bisphenol A (HBPA), 20:97
Hydrogenated butadiene–styrene triblock copolymers, sulfonation of polystyrene segments in, 23:536
Hydrogenated cocoglycerides, in cosmetic molded sticks, 7:840t
Hydrogenated DGEBA, 10:374–375
Hydrogenated films, optical absorption of, 17:206
Hydrogenated MDI (HMDI), 25:463
Hydrogenated palm kernel glycerides, cosmetically useful lipid, 7:833t
Hydrogenated polyisobutene, in mascara, 7:862
Hydrogenated rice bran wax, cosmetically useful lipid, 7:833t
Hydrogenated rosin, accelerator for dental cements, 8:285
Hydrogenated starch hydrolysates (HSH), 12:59
Hydrogenated tallowalkylamines, melting point, 2:521t
Hydrogenated vegetable oil, in cosmetic molded sticks, 7:840t
Hydrogenation(s), 13:769
  acetylene, 1:180; 10:613–614
  alkylanthraquinone, 14:47
  asymmetric, 5:210–212
  butadiene, 4:370
  carbon monoxide, 5:3
  carbon dioxide, 26:881
  catalytic, 10:504
  catalytic aerogels for, 1:763t
  chlorocarbons, 6:235
  conditions of, 10:810
  cyclopentadiene and dicyclopentadiene, 8:224–225
  dimethyl adipate, 1:557
  in direct coal liquefaction, 6:834–851
  fats and oils, 10:809–814
  fatty amines, 2:524
  fullerene, 12:238; 239
  furfuryl alcohol, 12:270
  hydrazine, 13:569–571
  ionic liquids in, 26:879–882
  metal carbonyls in, 16:72–73
  microwave-assisted, 16:544, 582–583
  naphthalene, 17:75–77
  toluene, 25:162, 165
  of vinyl chloride, 25:632
Hydrogenation agitators, 18:731
Hydrogenation catalyst(s)
  disposal of, 10:811
  nickel, 17:122
  regeneration of, 14:51–52
Hydrogen atom abstraction, 14:277
Hydrogen barrier, gold as, 12:703
Hydrogen-based cationic resins, in hazardous waste management, 25:817
Hydrogen bond dissociation energy (BDE), 14:276–277
Hydrogen bond dominated recognition, 16:781–782
Hydrogen-bond formation, in sucrose, 23:438
Hydrogen bonding, 13:767. See also
  Hydrogen bonds
  in acid dyes, 9:390
  in cellulose I and cellulose II, 21:6–7
  in dihydroxyazo dyes, 9:395
  in liquid crystalline materials, 15:105
  in organic separations, 21:657–660g
  in phosphoric acid solutions, 18:818–819
  in PVA, 25:595
  in silk, 22:631
  in solvent–solute interactions, 23:94–95
  in water molecules, 26:1
Hydrogen bond motifs, in supramolecular chemistry, 24:31
Hydrogen bonds
  crystal engineering based on, 8:72–74
  crystal engineering based on coordination networks with hydrogen bonds, 8:84–85
  crystal engineering based on hydrogen bonds between ions, 8:76–81
Hydrogen bromide (HBr), 4:319–321
  physical properties of, 4:319t
  uses of, 4:321–322
Hydrogen chloride (HCl), 13:808–837
  17:788. See also Anhydrous hydrogen chloride; Dehydrochlorination; Hydrogen gas; Hydrochloric acid addition, 6:229–230
analytical methods for, 13:808–810
anhydrous, 13:809–813
in the atmosphere, 13:829
from burning PVC, 25:682–683
as by-product from chemical processes, 13:824
chemical properties of, 13:818–822
determination of impurities in, 13:830
diffusion coefficient for dilute gas in water at 20° C, 1:67t
economic aspects of, 13:827–
electrostatic properties of, 1:621t
elimination, 6:230–231
health and safety factors related to, 13:830–831
history and occurrence of, 13:808–809
from hydrochloric acid solutions, 13:824
manufacturing and processing of, 13:822–827
in methyl chloride manufacture, 16:320–321
physical and thermodynamic properties of, 13:809–818
production costs for, 13:829t
purification of, 13:824–825
role in stratospheric ozone depletion, 1:810
in salicylic acid synthesis, 22:8
solubility of, 13:813, 819t
storage and handling of, 13:830
synthesis from hydrogen and chlorine, 13:822
uses for, 13:831–835
U.S. production of, 13:t
in vinyl chloride manufacture, 25:638, 644
from waste organics incineration, 13:824
Hydrogen chloride absorption, 12:746
Hydrogen chloride hydrates, 13:813
Hydrogen chloride–organic compound systems, 13:818
Hydrogen chloride solutions, 13:828
Hydrogen chloride–water system, 13:813–817
Hydrogen composite curves, 20:746, 747
Hydrogen compounds. See Hydrides
Hydrogen content, determination of, 13:789–790
Hydrogen conversion devices, 13:854
Hydrogen cyanide (HCN), 8:171–172;
17:228
in adiponitrile production, 17:236
economic aspects, 8:179
ethylene oxide reaction with, 10:639
health and safety factors, 8:180–183
homopolymer, 8:174
manufacture, 8:175–179
nitrogen in coal gasification converted to, 6:775
properties, 8:172, 173t, 174
reaction with acetylene, 1:180–181
specifications and analysis, 8:179–180
tetramer, 8:174
uses, 8:180–183
Hydrogen dibismuth heptachloride trihydrate, 4:21
Hydrogen-donating antioxidants, 3:104–105
Hydrogen donors, 10:421
Hydrogen economy, 13:798–801
Hydrogen electrodes, 3:408
standard potential, 3:413t
Hydrogen embrittlement
copper wrought alloys, 7:744
in industrial water treatment, 26:131
Hydrogen energy, 13:837–866
economic and environmental aspects of, 13:862–864
importance of, 13:863–864
systems of, 13:838–840
Hydrogen fluoride (HF), 11:853, 861, 863;
14:1–22. See also Anhydrous hydrogen fluoride
alternative processes for, 14:12–14
chemical properties of, 14:6–9
economic aspects of, 14:14–16
emission from aluminum smelting cells, 2:302–303
environmental concerns related to, 14:17
health and safety factors related to, 14:17–18
manufacture of, 14:9–14
materials of construction for handling, 14:14
physical properties of, 14:2–5
production of, 11:855
purity of, 14:15–16
safety of, 11:856
as a solvent, 14:9
specifications, shipping, and analysis of, 14:16–17
Hydrogen peroxide, 453

supported, 5:327
technology associated with, 14:11
uses for, 14:18–21
vinyl chloride reactions with, 25:631
World War II uses of, 14:1
Hydrogen fluoride–water system, 14:2, 4t
Hydrogen–fluorine reaction, 13:770
Hydrogen-free films, optical absorption of, 17:206
Hydrogen fuel cells, 17:50
\( \Delta g \) and maximum electromotive force for, 12:206t
Hydrogen gas, 13:766
diffusion of, 13:764
storage of, 13:785
Hydrogen halides, 13:770
ethylene oxide reaction with, 10:638–639
vinyl chloride reactions with, 25:632
Hydrogen hybrid electric vehicle, 13:800
Hydrogen induced cracking, 7:812
Hydrogen integration, in oil refining, 20:745–746
Hydrogen iodide (HI), 14:358, 374. See also Hydroiodic acid (HI)
Hydrogen–iodine reaction, 13:770
Hydrogen-ion activity, 14:23–34
nonaqueous solvents, 14:32
pH determination, 14:24–27
pH measurement systems, 14:27–31
Hydrogen ion concentration (total acidity), 14:23
Hydrogen ions, in stream water, 26:25–26
Hydrogen isotopes, 13:667–668, 759
vapor pressures of, 13:765t
Hydrogenolysis, 18:654–655
high pressure, for higher alcohol manufacture, 2:14–19
Hydrogenolysis reaction technology, 14:123
Hydrogen peroxide, 9:369; 14:35–78, 292; 18:392. See also uv-H\(_2\)O\(_2\) pool sanitizers; Peroxide entries
activators of, 21:48
alternative methods of producing, 14:53–54
analytical and test methods for, 14:59–60
antimicrobial properties of, 14:42
aryloxalate reagents for chemiluminescence measurements, 5:853–855
biogeneration for bleaching, 4:65–66
in bioremediation design considerations, 25:839–840
as bleaching agent, 4:44, 55–56
for bleaching of recycled pulps, 21:51
bleaching mechanism of, 4:47
chemical properties of, 14:37–42
chemical uses for, 14:66
consumption of, 14:63–64t
decomposition of, 14:37–38
derivatives, 18:425
economic aspects of, 14:56–57
electrolytic methods of producing, 14:52–53
environmental applications of, 14:64–67
enzymes for residual in textile bleaching effluents, 4:67–69
formation of derivatives of, 14:67
free-radical formation from, 14:38–39
grades, specifications, and quality control of, 14:58–59
handling, 14:60
in hazardous waste management, 25:820
health and safety factors related to, 14:60–63
high-strength, 14:62
hydroperoxide formation from, 18:433, 434
luminol reagents for chemiluminescence measurements, 5:841–842
manufacture of, 14:55
occurrence of, 14:35
as an oxidant, 14:41
as an oxidizing agent, 14:41t
in photochemical smog, 1:789
physical properties of, 14:35–37
production, 9:636–637
as pulp bleaching agent, 21:32–33, 46
purification and concentration of, 14:54–55
reaction of dye with, 9:376
reactions with acetic anhydride, 1:148
reaction with alkyl hydroperoxides, 18:444–445
reaction with fatty amines, 2:523
recovery of, 14:50–51
as a reducing agent, 14:42
registered for use in aquaculture in Canada, 3:218t
registered for use in aquaculture in Europe, 3:220t
registered for use in aquaculture in Japan, 3:221t
specialty uses for, 14:68
stabilization of, 14:39–40
storage and transportation of, 14:55–56
substitution reactions of, 14:40–41
therapeutant for aquaculture in U.S., 3:211t
in totally chlorine-free bleaching processes, 21:44
transport regulations for, 14:56t
uses for, 14:63–68
water-free organic solution of, 14:55–56
for wool bleaching, 26:401
Hydrogen peroxide manufacture,
platinum-group metal catalysts in, 19:622
Hydrogen peroxide plants, North American, 14:58t
Hydrogen peroxide production, 13:798
Hydrogen peroxide processes, for propylene oxide production, 20:806
Hydrogen peroxide stabilizer packages, 14:40
Hydrogen pinch, applications of, 20:764
Hydrogen polysulfides, 23:568, 639–640
Hydrogen processing, 12:404; 15:217
Hydrogen-producing reactions, 13:766–767
Hydrogen product oxidation, in styrene manufacture, 23:343
Hydrogen purification units, effective use of, 20:746
Hydrogen purifiers, 13:460
Hydrogen release, in an electrolytic cell, 24:749
Hydrogen selenide, 22:75t, 86–87
health factors related to, 22:214
toxicity of, 22:95
Hydrogen-storage alloys, 13:626, 627
Hydrogen storage properties, of rare earths, 14:652
Hydrogen streams, 13:461
See also H2S
absorption from CO2-rich sour gases using MDEA, 1:72–76, 78–80
analytical methods for, 23:636
chemical properties of, 23:630–634
commercial-scale processes for producing, 23:635
conversion to elemental sulfur, 23:601–610
corrosivity of, 23:635–636
diffusion coefficient for dilute gas in water at 20° C, 1:67t
dissociation of, 23:632
economic aspects of, 23:636
ethylene oxide reaction with, 10:638
exposure to, 19:48
health and safety factors related to, 23:636–638
manufacture of, 23:634–635
in natural gases, 12:376
oxidation of, 23:632–633
physical properties of, 23:630, 631t
protective measures against, 23:638
reactions of, 23:633–634
recovery from gas streams, 23:635
recovery of, 23:597–620
in refinery gas streams, 18:680
removal using alkanolamines, 23:597–600
removal using aqueous ethanolamines, 23:597–601
separation from carbide-generated acetylene, 1:207
in sodium hydrosulfide manufacture, 22:870
sodium reactions with, 22:766
sodium tetrasulfide and, 22:875
sulfur converted to in coal gasification, 6:772, 775
superadiabatic decomposition of, 23:631
thermodynamic properties of, 23:631t
typical commercial gas absorption process, 1:26t
uses for, 23:638
vinyl chloride reactions with, 25:631
Hydrogen sulfide analysis, of water, 26:41–42
Hydrogen sulfide burning, 23:772
Hydrogen sulfide inhalation, effects of, 23:637t
Hydrogen sulfide–nitrogen system, 23:630
Hydrogen sulfide oxidation, 14:129
Hydrogen sulfide–water system, 23:630
Hydrogen synthesis gas, 13:777. See also Synthesis gas
Hydrogen telluride, 24:419
Hydrogen tetrabromoferrate, 4:320
Hydrogen tetroxide, formation of, 17:778
Hydrogen tribromocuprate, 4:320
Hydrogen trioxide, formation of,
17:777–778. See also Hydrotrioxides
Hydrogen uranyl phosphates, 25:433–434
Hydrogeochemical cycle(s), 26:4–12.
See also Hydrologic cycle
chemical weathering in, 26:4–7
coupling of atmosphere, land, and water in, 26:7–12
Hydrohalogenation, 10:597
Hydroiodic acid (HI), 14:360, 374. See also Hydro iodide
Hydroisoquinolines, 21:205, 206
Hydrolases, 3:675–676
Hydrologic cycle, 26:2–3. See also Hydrogeochemical cycle(s)
carbon circulation in, 26:27–30
chlorine circulation in, 26:31
nitrogen circulation in, 26:32
sulfur circulation in, 26:30–31
Hydrology, in radioactive waste disposal,
25:856, 857
of acrylamide polymers, 1:312–313
of actinides, 1:478–481
of aluminum alkoxides, 23:76
of L-ascorbic acid, 25:751
cation effect on, 18:849–850
of cellulose, 10:535
of condensed phosphates, 18:848–850
of diorganotins, 24:819, 820
in fatty acid neutralization, 22:738–739,
739–740
N-halamine, 13:99
herbicide, 13:309
hydride, 13:628
in hydrometallurgical recycling,
21:396–399
metal ion, in silicate solution, 22:459–460
in plastics recycling, 21:451
of polyamide plastics, 19:781–782
in proteolytic reactions, 10:298
of Pu ions, 19:696–698
of PVA, 25:591, 592–593
in RTV silicone preparation, 22:594
of salicin, 22:24
in silanol condensation, 22:567
in silica gel preparation, 22:395
in silicone network preparation, 22:564
in silicone polymerization, 22:555
of silicon tetrachloride, 22:367
in soap–water system, 22:727
in the sol–gel process, 23:61–62
of starch to sugar, 10:534
by steam, 10:503
of sucrose, 23:442–443
in TD resin preparation, 22:588
of thorium, 24:764
in T resin preparation, 22:589, 590
transformations in, 16:400–401
in vinyl alcohol polymerization,
25:608–609, 610, 612t
in vitreous silica manufacture, 22:412,
413–414
of wood, 26:358–359
Hydrolysis, in sugar analysis, 15:777–778
Hydrolytic behavior, of polycarbonates,
19:808–809
Hydrolytic enzymes, 10:303
Hydrolytic polymerization, 19:748
Hydrolytic process, influences on, 10:281
Hydrolytic reactions, selective, 16:400
Hydrolytic stability, of ethylene–
tetrafluoroethylene copolymers,
18:322–325
Hydrolyzable chloride (HyCl) content, of
epoxy resins, 10:385–386
Hydrolyzates, in stream water, 26:24
Hydrolyzed collagen, hair cleaner
ingredient, 7:850t
Hydrolyzed glycosaminoglycans, skin
conditioner/ moisturizers, 7:843t
Hydrolyzed proteins, in pet foods, 10:855
Hydrolyzed reactive dyes, recovery and
reuse of, 9:452, 453
Hydrolyzed soy protein, skin conditioner/
moisturizer, 7:843t
Hydrometers, in sugar analysis,
23:474

HYDROMETERS, IN SUGAR ANALYSIS 455
Hydronium ion, 14:23
Hydroperoxides, 18:411
Hydroperoxide process, for propylene oxide manufacture, 20:798, 801–806
alkylation of, 18:445
\( \alpha \)-oxygen-substituted, 18:448–460
chemical properties of, 18:430–433
decomposition of, 14:279; 18:431–432
liquid-phase epoxidation with, 10:656
physical properties of, 18:427–430
preparation by autoxidation, 18:434
synthesis of, 18:433–435
Hydrophilic–lipophile balance system, 14:717
Hydrophilic–lipophilic balance (HLB), 24:143, 155–156
in paper recycling, 21:436
Hydrophilic–lipophilic balance temperature, 16:430
Hydrophilic colloids, in water treatment, 26:106
Hydrophilic dyes. See Soluble hydrophilic dyes
Hydrophilic ends, of surfactants, 22:725
Hydrophilic fibers, 9:158; 11:168
Hydrophilic flavor compounds, 11:551
Hydrophilic fumed silica, 22:368
Hydrophilic head group, 24:137
Hydrophilic-hydrophobic block copolymers, 20:485
Hydrophilic inorganic pigments, 19:383
Hydrophilicity
in organic separations, 21:657
of surfaces, 22:111–112
Hydrophilic membranes, 18:510
Hydrophilic moieties, 8:706t
Hydrophilic polymer membranes, 18:520
Hydrophilic polymers, irradiation of, 13:731
Hydrophilic precipitated silica, 22:398–399
Hydrophilic surfaces, 1:584–585
Hydrophilic/tunably hydrophilic/hydrophobic block copolymers, 20:485–487
Hydropillite, 5:785t
Hydrophobic additives, in paper manufacture, 18:113
Hydrophobic alkoxy silanes, as silylating agents, 22:697
Hydrophobically associating polymers, 1:326
Hydrophobically modified hydroxyethylcellulose (HMHEC), 5:455t, 456
Hydrophobic coagulation, 16:655
Hydrophobic effect, 23:95
in binding neutral molecules, 24:47
in micelle formation, 24:132
Hydrophobic ends, of surfactants, 22:725
Hydrophobic fibers, 9:158–159; 11:168
Hydrophobic fumed silica, 22:368
Hydrophobic interaction chromatography, 3:843–844; 6:405
Hydrophobic interactions, in solvent–solute interactions, 23:95
Hydrophobic ion liquids, 26:850, 860–861
Hydrophobicity. See also Superhydrophobicity of silicone fluids, 22:578
of silicones, 22:603
solvent, 20:517
of surfaces, 22:111–112
Hydrophobic materials, encapsulation of, 11:545–546
Hydrophobic polar surfaces, adsorption of ionic surfactants on, 24:140–141
Hydrophobic precipitated silica, 22:399
Hydrophobic solvents, 16:413
Hydrophobic surfaces, 1:584–585
adsorption of ionic surfactants on, 24:138
Hydrophones, composite ferroelectric materials in, 11:104–105
Hydroporons, 26:57–58
Hydroprene, 14:344
Hydropulping, 10:535
Hydropyrolysis, coal liquefaction, 6:854
Hydroquinolines, 21:198–199
Hydroquinone (HQ)
from benzene, 3:620
as a black-and-white chemical reducing agent, 19:205–206
in bleaching preparations, 7:847
cratrates, 14:160
dye releaser, 19:291–292
inclusion compounds in, 14:172, 174
intermediate used in oxidation hair dyes, 7:858t
manufacture of, 20:38
as a resin stabilizer, 20:105
Hydrothermal energy, 14:79–113.
See also Hydrothermal synthesis;
Natural hydrothermal systems
of advanced bioceramics, 14:102–104
of advanced ceramics, 14:100–111
advantages of, 14:80
apparatus used in, 14:88–92
of composites, 14:104
crystal growth of quartz and related
materials, 14:92–97
defined, 14:79–80
development of, 14:83t
methods related to, 14:106–108
physical chemistry of, 14:85–88
rational approach to, 14:86–87
Hydrothermal reservoirs, 12:525
Hydrothermal resources, 12:524–535
applications of, 12:522–523
development of, 12:533–534
water-dominated, 12:530–533
Hydrothermal solutions, flow of, 26:19
Hydrothermal–solvothermal processing, 14:109
Hydrothermal steam, 12:528–529
Hydrothermal synthesis
of advanced inorganic materials, 14:97–99
fabrication method for inorganic
materials, 7:415t
Hydrothermal technique, uses for, 14:100
Hydrothermal technology
first commercial application of, 14:81
future of, 14:81
Hydrothermal treatment–recycling–alteration technology, 14:108–111
Hydrothermal waste treatment, 23:240–242
advantages of, 23:241
goals in, 23:242
Hydrothermal wells, drilling, 12:525–527
Hydrotreating, 11:716, 719, 18:656–657, 660
activated alumina applications, 2:399
catalytic aerogels for, 1:763t
poisons, 5:258t
sulfur removal from organic compounds
by, 18:655t
Hydrotreating catalysis, molybdenum
compounds in, 17:37–38
Hydrotroïdes, 18:435–436
Hydrotroïdes, formation of, 17:784. See also Hydrogen trioxide
Hydrotropes, cosmetic surfactants, 7:834t
Hydrous aluminas, decomposition
sequence, 2:392
Hydrous ferric hydroxide (HFO), for
arsenic removal, 3:279, 283–285
Hydrous manganese dioxide, 15:581
Hydrous manganese oxides, 15:585
Hydrothermal drilling, 12:525
Hydrothermal drilling fluid (mud), 12:526
Hydrothermal-electrochemical technique, 14:108
Hydrothermal energy
direct uses of, 12:527–528
environmental issues related to,
12:534–535
Hydrothermal epitaxy, 14:107–108
Hydrothermal fluid, action on solid-state
materials, 14:83t
Hydrothermal processing, 14:79–113.
See also Hydrothermal synthesis;
Natural hydrothermal systems
of advanced bioceramics, 14:102–104
of advanced ceramics, 14:100–111
advantages of, 14:80
apparatus used in, 14:88–92
Hydrothermal alteration zones, gallium in,
12:341–342
Hydrothermal autoclaves. See Autoclaves
Hydrothermal cooking, 14:81
Hydrothermal crystallization, 14:85
Hydrothermal development, worldwide,
12:533
Hydrothermal drilling fluid (mud), 12:526
Hydrothermal-electrochemical technique,
14:108
Hydrothermal energy
direct uses of, 12:527–528
environmental issues related to,
12:534–535
Hydrothermal epitaxy, 14:107–108
Hydrothermal fluid, action on solid-state
materials, 14:83t
Hydrothermal processing, 14:79–113.
See also Hydrothermal synthesis;
Natural hydrothermal systems
of advanced bioceramics, 14:102–104
of advanced ceramics, 14:100–111
advantages of, 14:80
apparatus used in, 14:88–92
Hydrothermal energy
direct uses of, 12:527–528
environmental issues related to,
12:534–535
Hydrothermal epitaxy, 14:107–108
Hydrothermal fluid, action on solid-state
materials, 14:83t
Hydrothermal processing, 14:79–113.
See also Hydrothermal synthesis;
Natural hydrothermal systems
of advanced bioceramics, 14:102–104
of advanced ceramics, 14:100–111
advantages of, 14:80
apparatus used in, 14:88–92
of composites, 14:104
crystal growth of quartz and related
materials, 14:92–97
defined, 14:79–80
development of, 14:83t
methods related to, 14:106–108
physical chemistry of, 14:85–88
rational approach to, 14:86–87
Hydrothermal reservoirs, 12:525
Hydrothermal resources, 12:524–535
applications of, 12:522–523
development of, 12:533–534
water-dominated, 12:530–533
Hydrothermal solutions, flow of, 26:19
Hydrothermal–solvothermal processing, 14:109
Hydrothermal steam, 12:528–529
Hydrothermal synthesis
of advanced inorganic materials, 14:97–99
fabrication method for inorganic
materials, 7:415t
Hydrothermal technique, uses for, 14:100
Hydrothermal technology
first commercial application of, 14:81
future of, 14:81
Hydrothermal treatment–recycling–alteration technology, 14:108–111
Hydrothermal waste treatment, 23:240–242
advantages of, 23:241
goals in, 23:242
Hydrothermal wells, drilling, 12:525–527
Hydrotreating, 11:716, 719, 18:656–657, 660
activated alumina applications, 2:399
catalytic aerogels for, 1:763t
poisons, 5:258t
sulfur removal from organic compounds
by, 18:655t
Hydrotreating catalysis, molybdenum
compounds in, 17:37–38
Hydrotroïdes, 18:435–436
Hydrotroïdes, formation of, 17:784. See also Hydrogen trioxide
Hydrotropes, cosmetic surfactants, 7:834t
Hydrous aluminas, decomposition
sequence, 2:392
Hydrous ferric hydroxide (HFO), for
arsenic removal, 3:279, 283–285
Hydrous manganese dioxide, 15:581
Hydrous manganese oxides, 15:585
Hydrous metal oxide powders, 25:100
Hydrous oxides, zirconium, 26:647
Hydrous silicates, in silica/silicate manufacture, 22:463–464, 465, 468
Hydrovacuum cooling, of food, 21:561
Hydroxamate-containing siderophores, 14:557
Hydroxamic acid complexes, 24:769–770
Hydroxide precipitation, in hazardous waste management, 25:821
Hydroxides
gallium, 12:358
iron, 14:541–542
nickel, 17:111
potassium, 12:215
solubility in steam, 23:212
thallium, 24:632–633
triorganotin, 24:815
uranium, 25:430
zirconium, 26:647
Hydroxiodobis(2,6-dimethylphenyl)antimony, 3:77
Hydroxinitrotetracyclohexylantimony, 3:77
2-Hydroxy-1,3-benzenedicarboxylic acid, 22:5
4-Hydroxy-1,3-benzenedicarboxylic acid, 22:5
2-Hydroxy-3-(trimethylammonio)propylguar gum, 4:727
4-Hydroxy-4-methyl-2-pentanone. See Diacetone alcohol
1-Hydroxy-4-methyl-6-(2,4,4-trimethylpentyl)-2-(1H) pyridinone, 7:851
2-Hydroxy-4-methylquinoline, 21:189
4-Hydroxy-6-methylpretetramid, synthesis of, 24:595
16-Hydroxy-7-hexadecenoic (ambrettolic) acid, physical properties, 5:35t
18-Hydroxy-9,11,13-octadecatrienoic (kamolonic) acid, physical properties, 5:35t
8-Hydroxy-17-octadecene-9,11-diynoic (isanolic) acid, physical properties, 5:35t
γ-Hydroxy acids, 14:131
γ-Hydroxybutyric acid, 14:131
Hydroxyacetaldehyde (HAA), 17:780
N-Hydroxyacetamide, 14:127
4-Hydroxyacetanilide, 2:670
physical properties of, 2:666
Hydroxyacetic acid, 14:126–130
applications for, 14:128–129
grades of, 14:128
production of, 14:127–128
Hydroxy acids, achiral derivatizing agents, 6:96
β-Hydroxy acids, 14:130, 131
γ-Hydroxy acids, 14:131
α-Hydroxyadipaldehyde, 1:279
Hydroxyalkyl alkyl peroxides, 18:453–454
boiling points of, 18:453
hydrolysis of, 18:454
Hydroxyalkylecellulos (HECs), 4:724
Hydroxyalkyl hydroperoxides, 18:448–449, 450–452
acidic hydrolysis of, 18:452
decomposition of, 18:452
Hydroxyalkyl hydroperoxalkyl peroxides, 18:458–459
Hydroxyalkylmethylcelluloses, 4:730–731
Hydroxyalkyl peroxysterers, 18:454
Hydroxyalkylpyridines, uses for, 21:125–126
o,o'-Hydroxyaminoazo dyes, 9:398
Hydroxyamphetamine hydrobromide, 4:359
2-Hydroxyaniline. See 2-Aminophenol
3-Hydroxyaniline. See 3-Aminophenol
4-Hydroxyaniline. See 4-Aminophenol
Hydroxyapatite (HAp), 8:341; 11:119; 18:838. See also HAp entries
isoelectric point, 8:674
bioceramics, 14:104
crystals, 14:104–105, 107
Hydroxyapatite system, 14:86, 87, 88
o-Hydroxyarylcarboxylic acid naphthols, 9:408
Hydroxyazo dyes, 9:248–249
o-Hydroxybenzaldehyde. See Salicylaldehyde
Hydroxybenzene, 18:747. See also Phenol
4-Hydroxybenzoic acid (HBA), 20:38
in liquid-crystal polymers, 20:80
m-Hydroxybenzoic acid, 22:1, 21–22
manufacture of, 22:21
reactions of, 22:21
uses of, 22:21–22
o-Hydroxybenzoic acid, 22:1. See also
  Salicylic acid
p-Hydroxybenzoic acid, 22:1, 22–23
manufacture of, 22:22
physical properties of, 22:2, 3t
reactions of, 22:22
uses of, 22:22–23
6-Hydroxybenzothiazole,
  chemiluminescence reagent enhancer, 5:845
(m-Hydroxybenzoyl)tropane, 22:21, 22
o-Hydroxybenzyl alcohol, 22:23
Hydroxybutylmethylcellulose (HBMC),
  4:731; 5:456–457
commercially available in range of
  substitutions, 5:457t
physical properties, 5:458t
γ-Hydroxybutyrate, 20:257
γ-Hydroxybutyric acid, 14:131
o,o′-Hydroxy carbazoxazo dyes, 9:398
α-Hydroxy carboxylic acid complexes,
  25:88–89
Hydroxy carboxylic acid esters, 10:498
Hydroxy carboxylic acids, 14:114–134
  aliphatic α-hydroxy acids, 14:130
  γ-butyrolactone, 14:131–132
  chelating agents, 5:712t
  hydroxyacetic acid, 14:126–130
  β-hydroxy acids, 14:130, 131
  γ-hydroxy acids, 14:131
  lactic acid, 14:114–126
  mevalonic and aldonic acids, 14:132
(R)-Hydroxy carboxylic acids,
  enantiomerically pure, 20:257
4-Hydroxy cinnamamic acid,
  chemiluminescence reagent enhancer,
  5:845
12-Hydroxy-cis-9-octadecenoic (ricinoleic)
  acid, physical properties, 5:35t
14-Hydroxy-cis-11-eicosenoic (lesquerolic)
  acid, physical properties, 5:35t
Hydroxy citronellal, 24:489, 490, 533–534
Hydroxy containing organics, 20:794–795
3-Hydroxycyclohexanecarboxylic acid,
  22:21
2-Hydroxy cyclohexanone, 1:557
Hydroxy Empetal, 24:486
1-Hydroxyethane-1,1-diphosphonic acid
  (HEDP), 19:53
Hydroxy ethers, 10:529
2-Hydroxyethyl-2,3-dibromo-propionate,
  4:358t
2-Hydroxyethyl acrylate
  comonomer with acrylonitrile, 1:451t
  copolymerization with acrylic monomers,
  1:380t
2-Hydroxyethyl aryl ethers, 10:639
Hydroxyethylcelluloses (HECs), 4:730;
  5:451–456, 460–461; 9:13, 14; 20:458,
  561
  applications, 5:454t
  manufacture, 5:453
  physical properties, 5:453t, 461t
  properties of, 13:74t
Hydroxyethyl cetlyldimonomium chloride, hair
  conditioner ingredient, 7:855t
β-Hydroxyethyl esters, 10:487
Hydroxyethylcellulose, applications,
  5:461t
2-Hydroxyethylidendiminediamine, 8:488
N-Hydroxyethylidendiminediamine,
  molecular formula, 5:712t
Hydroxyethyl ethylenediamine triacetic
  acid (HEDTA)
  function as ingredient in cosmetics,
  7:829t
  molecular formula, 5:712t
Hydroxyethyl guar gum, 4:724t, 727
Hydroxyethylhydrazine, 13:572
Hydroxyethylidenediphosphonic acid,
  molecular formula, 5:713t
2-Hydroxy ethyl methacrylate (HEMA),
  13:733–734
  copolymerization with acrylic monomers,
  1:380t
Hydroxyethylmethylcellulose (HEMC),
commercially available in range of
  substitutions, 5:457t
physical properties, 5:458t
Hydroxy ethyl starch(es), 4:720; 4:724t; 20:563
Hydroxyfullerenes, 12:247–248
Hydroxy functional methacrylates,
  16:241–242
Hydroxygallium phthalocyanine,
  9:513–514
α-Hydroxyisobutyramide, conversion to
  methyl α-hydroxyisobutyrate, 16:249
α-Hydroxyisobutyramide sulfate, 16:246
Hydroxyisoquinoline, 21:206
Hydroxylamines, radical scavengers,
  3:109–110
Hydroxylated amino acids, 2:554
Hydroxylated PCBs, 13:143–144
  biochemical effects of, 13:143–144
Hydroxylation, 9:278; 12:183–184
Hydroxyl compounds
  amine curing and, 10:393
  zirconium, 26:647
Hydroxyl concentrations, of vitreous silica, 22:433t
Hydroxyl compounds, amine curing and, 10:393
  zirconium, 26:647
Hydroxyl concentrations, of vitreous silica, 22:433t
Hydroxyl groups, 9:390–391
  in salicylic acid reactions, 22:4
  biodegradability of compounds with, 25:826
  in gel silica materials, 23:438, 441–442
Hydroxylation, 9:390–391
  in salicylic acid reactions, 22:4
  biodegradability of compounds with, 25:826
  in gel silica materials, 23:438, 441–442
Hydroxyl ion initiated ozone decomposition, 17:771–772
2′-Hydroxyl modified oligonucleotides, 17:631–632
Hydroxypropylcellulose, applications, 5:463t
Hydroxyl-protected initiators, 14:255
Hydroxyl radical(s), 9:377; 14:39, 276; 17:778–779
  effect on ozone depletion, 17:786
  as an oxidant, 14:65
  reactions of, 9:380–381; 17:791–792
Hydroxyls, 12:645
  function as ingredient in cosmetics, 7:829t
  liquid crystals, 5:385
  physical properties of, 5:463t
  properties of, 13:74t
Hydroxypropylcelluloses, 4:730
2-Hydroxypropyl cyclodextrin-based chiral stationary phase, 6:87
N-(2-Hydroxypropyl)ethylendiamine, physical properties of, 2:124t
Hydroxypropylguar gum, 4:724t, 727
Hydroxypropylmethylcellulose (HPMC), 4:731; 5:456–457; 20:458–459
  commercially available in range of substitutions, 5:457t
  for cosmetics emulsification, 7:837
  function as ingredient in cosmetics, 7:829t
  physical properties, 5:458t
Hydroxypropylmethylcelluloses, 13:72
  properties of, 13:74t
Hydroxypropylstarches, 4:720; 4:724t
3-Hydroxypyrrolidine, 21:111
Hydroxypyrrolidines, uses for, 21:125–126
Hydroxyquinolines, 21:199
4-Hydroxystyrene (HOST), phenolic resins based on, 15:175–176
Hydroxy-substituted
tetrahydroisoquinolines, 21:202
N-Hydroxysuccinimide ester (NHS)
method, for covalent ligand
immobilization, 6:396t
12-Hydroxy-trans-9-octadecenoic
(ricinoleic) acid, physical properties,
5:35t
8-Hydroxy-trans-11-octadecene-9-ynoic
(ximenylic) acid, physical properties,
5:35t
Hydroxytetracyclines, 24:596
5-Hydroxytryptamine. See
Serotonin
3-Hydroxyuridine, 13:26t, 29–30
Hydroxyxanthones, salicylic acid and, 22:6
HydroZinc process, 26:577
Hydrozirconation process, 26:653
HYGAS process, 6:766, 777, 828
Hygiene, industrial, 14:203–224
Hygrine, 2:79
Hygroscopic fibers, 11:168
Hygroscopicity, of ionic liquids,
26:861–862
Hygroscopic materials, 9:107, 108
HYL I process, 14:513–516
HYL III process, 14:516, 517
Hyoscyamine hydrobromide,
4:359t
Hypalon, carbon monoxide compatibility
with, 5:4t
Hypacarb, 4:624
Hyperactivity, sugar and, 23:478
Hyperbaric oxygenation, 17:764
Hyperbar vacuum filtration, 11:377
Hyperbilirubinemia, photochemical
treatment of, 19:120
Hyperbranched copolymers, 7:610t, 654–655
Hyperbranched poly(chloromethyl
styrene), 7:610t
Hyperbranched polyurethanes, 25:461
Hypercarotenosis, 25:791
Hypercloso designation, for boron hydrides,
4:174
Hypercube. See also Latin hypercube
sampling (LHS)
for Hammersley sequence sampling,
26:1012–1013
pseudorandom number generation and,
26:1002
Hyperdispersants, 8:677
Hyperfiltration, 25:890
Hyperglycemia, as cause of age-related
conditions, 2:813
Hyperhomocysteinemia, 2:822

Hypericum, 13:356
Hyperlipidemias, 25:798
and obesity, 3:87
Hyperoxides, 18:392
Hyperparathyroidism, 25:793
Hypersensitivity reaction, immune-
mediated, 25:205
Hypersorption process, 1:664; 4:757
Hypertension, 5:147–148
antianginal agents for, 5:110t, 119t
obesity and, 3:87
nenin–angiotensin system, 5:148
salt and, 22:813
Hyperthermophilic enzymes, 3:669
Hypervirulent biocontrol agents,
13:351–352
Hypervitaminosis A, 25:789
Hypervitaminosis biotin, 25:800
Hypervitaminosis cobalamin, 25:804
Hypervitaminosis D, 25:792
Hypervitaminosis E, 25:794
Hypervitaminosis folic acid, 25:803
Hypervitaminosis K, 25:795
Hypervitaminosis niacin, 25:798
Hypervitaminosis niacinamide, 25:798
Hypervitaminosis pantothenic acid, 25:799
Hypervitaminosis pyridoxine, 25:799
Hypervitaminosis riboflavin, 25:797
Hypervitaminosis thiamine, 25:796
Hyphenated techniques
capillary electrophoresis, 4:641
gas chromatography, 4:616–618
liquid chromatography, 4:624–625
supercritical fluid chromatography,
4:631
hypho designation, for boron hydrides,
4:170, 172–174, 176
Hypobromite bleaches, 4:53
Hypobromous acid, 4:332–333; 13:101
Hypoclorite(s), 9:369, 372
decomposing, 13:180
for disinfection, 8:605
ions, 9:627
oxidation of ammonia with, 13:577
pool pH and, 26:184
as a pulp bleaching agent, 21:47–48
Hypochlorite–ketazine process
flow sheet, 13:580
versus Raschig process, 13:581
Hypochlorous acid, 4:49–50, 53; 8:544,
550–558, 614–615; 9:627
oxidation state and stability, 8:545t
Hypoeutectoid steels, 23:275
Hypohalous acid, 13:100
Hypermagnesia, 15:414
Hypermanganate, 15:592
Hypoparathyroidism, 25:791
Hypophosphites, 19:55
Hypophosphorous acid, 19:20, 54
Hypotension, antianginal agents for, 5:111t
Hypochromic shifts, 20:510, 511
Hysomer process, 16:844
Hysteresis
of shape-memory alloys, 22:345, 346
of shape-memory alloys for biomaterials, 3:742
Hysteresis loop, 23:815–818
of dielectric displacement, 11:92
with shape-memory effect, 22:340
Hysteresis (hysteretic) losses, 23:846
alternating current, 23:815–818, 856
in spinel ferrites, 11:64
in superconductors, 23:818
Hysteric magnetization loop, 23:816
Hysys software package, 1:76
Hytrex, commercial block copolymer, 7:648t
Hytrin, molecular formula and structure, 5:156t
Hyzaar, molecular formula and structure, 5:153t
HZSM-5, 5:241; 12:192
nitrination using, 5:333
shape-selective catalysis, 5:243–244
HZSM5 zeolite. See Zeolite HZSM5
HZSM-11, nitrination using, 5:333
IB-367 protegrin analogue, 18:261
IBM
advanced materials research, 1:696
nanotube program, 1:720, 721
Ibuprofen, 2:820
production by lipases and esterases, 3:676
synthesis of, 12:810–811
Ibutilide, 5:102, 103, 106
molecular formula and structure, 5:96t
ICC specification containers, 10:578.
See also Interstate Commerce Commission (ICC)
ICC Termination Act of 1995, 25:331, 326
Ice. See also Water entries
elastic properties, 5:614t
hydrogen-bonded structure of, 26:15
properties of, 26:17t
“Ice wines,” 26:315
Iceberg model, 23:95
Ice formation, in food processing, 12:82
Iceland, bioengineering research program, 1:702
Iceland spar, 15:28
ICI deep shaft wastewater treatment process, 1:744
ICI Gas-Heated Reformer (GHR), 16:304–305
ICI Leading Concept Methanol (LCM) process, 16:305
Icon, formulation, 7:564t
ICUMSA tables, 23:474. See also
International Commission for Uniform Methods of Sugar Analysis (ICUMSA)
Idaho National Engineering and Environmental Laboratory, bioengineering research program, 1:702
iDEA (In Vitro Determination for the Estimation of ADME) simulation system, 6:18
Idea development, in chemical product design, 5:758, 766–771
Idea generating, in R&D, 21:619
Ideal Adsorbed Solution Theory (IAST), 1:594
gas separation, 1:628–629
Ideal batch reactor, 21:348, 349
Ideal depth medium, in depth filtration theory, 11:338
Ideal diameter, 23:283, 284
Ideal gas equation of state, 24:656
Ideal gas mixture (IGM), 24:673–674
preparing, 24:674
Ideal isothermal packed catalytic tubular reactors, 25:286–287
Ideal isothermal tubular reactors, analytical versus numerical solutions for, 25:313
Ideal mixture (IM), excess properties and, 24:674–675
Ideal nonisothermal packed catalytic tubular reactors, complete strategy for, 25:310–316
Ideal packed catalytic tubular reactors,
25:279–281
isothermal design of, 25:287–289
pseudo-first-order irreversible chemical kinetics in, 25:312–316
Ideal plug-flow tubular reactors,
Ideal quench, 23:283
Ideal reactors, 25:284
Ideal tubular reactor performance, design parameters for, 25:312–313
Idea screening, 19:322–323
Idemitsu ω-olefin manufacture, 17:720
Identification, instant photographs for,
19:322–323
Idiolytes, 11:3
D-Idose, 4:698
Idraparinux, 4:91, 95t
L-Iduronic acid, 4:706
IEC standards, reliability and, 26:993.
See also International Electrotechnical Commission (IEC)
IFI/Plenum Data Corp. patent products,
18:229–230
IgG (immunoglobulin G), 12:145
Ignition, 7:437–442
acetylene, 1:181–185
acetylene mixtures, 1:186
energy required for, 23:117
sources of, 23:116–118
Ignition improvers, diesel, 12:427
Ignition quality, diesel fuel and,
12:422–423
Ignition Quality Tester (IQT), 12:422–423
Ignition resistant (IR) fiber blends, 13:385
Ignition-resistant applications, VDC copolymers in, 25:737
Ignition-resistant materials, 11:449–450
Ignition suppression, by silver, 22:640
Ignition temperatures, 10:87t; 21:840
of ethers, 10:579
Ignition temperature tests, 19:588
IHS Engineering, 15:762
\(^{131}\)I isotope
decay scheme for, 21:302–303
uses for, 21:319
Illicit substances, testing for, 12:96–98
Illinois Basin Coal Sample program,
6:744
Illinois no. 6 (HVB) coal carbon structural distribution based on
NMR, 6:715t
empirical composition, 6:730t
Illite
structure and composition, 6:670, 672
in unit layer mixtures, 6:671
ILLIUM alloys, 17:102
Illumination, film design for, 19:262
Ilmenite, 19:387–388, 389; 24:840; 25:11, 12, 31–33
in bauxite, 2:347
in clays, 6:685
sulfate-process refining of, 24:849, 850
world mine production of, 24:848t
worldwide deposits of, 24:846t
Image analysis
computer-automated, 18:146–149
of flax fiber, 11:615
Image analyzers, 18:146
calibration of, 18:149
Image blur effects, in CA resists, 15:182
Image detectors, charge-coupled devices as, 19:149
Image development, tribromomethyl stabilizers in, 19:364–365. See also
Development entries
Image formation/stabilization. See also
Image tone/stabilization
in photography, 19:199–202
using Polacolor film, 19:300–301
Image manipulation, 19:323
Image processing software, advanced, 16:487
Image-receiving layers, in instant photography, 19:279–282
Image sensors
CMOS, 19:154–155
hydrogenated amorphous silicon in, 22:135
p–i–n junctions for, 22:138
Image-setting films, high contrast, 19:349–350
Image sharpness, DIR couplers and, 19:258–259
Image shuttering, in video camera charge-coupled devices, 19:147
Images, nature of metallic silver in, 19:366–369
Image structure, in color photography, 19:264–265
Image tone/stabilization, in instant photography, 19:280–281
Image transfer devices, 15:117
Image transfer technique, 19:323
Imaging agents, deindrimers as, 26:795–797
Imaging materials, 9:506
Imaging
- microencapsulation in, 16:451–452
- spectral sensitization for, 9:506–515
Imaging radiation, lithography without, 15:191–195
Imaging techniques, in fine art
- examination/conservation, 11:400
Imazaquin, 13:323
Imazethapyr, 13:323
Imdur, molecular formula and structure, 5:110t
IMFET, 3:799
Imhoff tank, 25:916
Imidacloprid, 14:342
Imidazole(s), 10:363, 405, 412
- buffer for ion-exchange chromatography, 3:830t
- tri-substituted, 16:551
Imidazole herbicides, 13:323
Imidazole system, 26:933
Imidazolidinones, 13:111
Imidazolidinyl urea, antimicrobial used in cosmetics, 7:831t
Imidazolines, 10:400; 24:147
Imidazolinones, 13:301
- crop resistance to, 13:361
Imidazolium-based ionic liquids, 26:841, 846
Imide-based polymers, 10:8
Imide-containing monomers, polyimide synthesis using, 20:272
Imide ring formation, polyimide synthesis via, 20:265
Imides
- heterocyclic glycidyl, 10:375
- reactions with bromine, 4:302
Imidic moieties, 10:217
Imidization
- chemical, 20:271
- thermal, 20:269–270
Imidized polymers, 10:213
Imido alkylidene complexes
- tantalum, 26:927
Imidosulfonates, 13:104
Imine synthesis, microwaves in, 16:564
Imino-amino methylene base intermediates, 15:781
Iminobispropylamine, 8:485
- physical properties, 8:486t
- prices of commercial, 8:496t
- typical specifications, 8:496t
Imidodiacetanitrile, 8:174
Imipenem, 3:33
- bacterial resistance mechanisms, 3:32t
Immediately dangerous to life or health (IDLH) concentration, 13:694; 23:644; 24:334
Immersion-cell continuous pH measurement, 14:33
Immersion cleaning, of metal surfaces, 16:212–213
Immersion electrodes, 14:27
Immersion freezing, 12:83
Immersion plating, 9:687; 24:747
of metal–matrix composites, 16:173
Immiscible liquid–liquid mixing, 16:696–700
Immiscible liquids, static mixing of, 16:715
Immiscible polymer blends, 20:318–319
- barrier polymers, 3:396–398
- heterogeneous, 20:357–358
Immiscible polymers, compatibilization of, 20:324–325
Immiscible sedimentation, 22:50–51
Immobile benzisoxazolone dye releasers, 19:290
Immobile hydroquinone dye releaser, 19:291–292
Immobile sulfonylhydrazone dye releasers, 19:292
Immobilines, 9:747
Immobilized antibody-based microarrays, 16:392
Immobilized catalases, for textile bleaching effluent treatment, 4:68–69
Immobilized cells, 3:670
Immobilized enzyme biosensors, 3:796–799
Immobilized enzymes, 3:670; 10:270–272
- industrial-scale applications of, 10:272
- silylating agents and, 22:700–701
Immobilized glucose oxidase, hydrogen peroxide biogeneration for bleaching, 4:65–66
Immobilized metal–ion affinity chromatography (IMAC), 6:403
Immune-mediated hypersensitivity toxicology studies, 25:218–219
Immune-mediated hypersensitivity reaction, as a toxic effect, 25:205
Immune system
antiaging agents for, 2:823–824
deterioration with aging, 2:811
molecules of, 20:831
Immune system response, antimicrobial peptides and, 18:255–256
Immunity, transgenic animals with, 12:464
Immunizations, 25:486. See also Vaccine technology
cost-benefit analyses for, 25:506–507
Immunization schedule, recommended, 25:489t
Immunoadsorption, in hemodialysis, 26:833
Immunoaffinity chromatography (IAC), 6:400–402; 12:137, 145
Immunoanalyzers, automated, 14:150
Immunoassay(s), 14:135–159. See also
Immunoassay–DNA probe hybrid assays; Immunoassay methods;
Immunobio(sensors
antibody–antigen reaction, 14:136–138
basic technology in, 14:138–140
chemiluminescent, 14:150–151
classification of, 14:140–153
design of, 14:139–140
enzyme, 14:143–148
fluorescence, 14:148–150
highly specific, 14:153
historical perspective on, 14:136
microarrays and, 14:156–157
microfluidics in, 26:968–969
monoclonal versus polyclonal antibodies in, 14:152–153
organoselenium compounds in, 22:102
turbidimetric agglutination, 14:140–142
Immunoassay–DNA probe hybrid assays, 14:153–154
Immunoassay kits, 14:152
Immunoassay methods
alternative, 14:151
comparison of, 14:151–153
Immunoassay technology, 12:97
Immunoblotting, 9:756
Immunochromatographic assay, 14:141–142
Immunocompromised patients, 18:253
Immunocytochemical staining methods, for
flax fiber, 11:599
Immunodiffusion, 14:136
Immunoelectrophoresis, 14:136
Immunoelectrophoretic techniques, 9:753–755
Immunextraction, 6:401–402
ImmunopET, 3:799
Immunoglobulin(s), 12:464; 20:831. See also IgG (immunoglobulin G)
distribution of, 12:149t
in milk, 12:465
properties of, 12:152t
Immunoglobulin G (IgG). See also Human IgG (hIgG)
detection of, 14:149
surface plasmon resonance studies of binding, 3:802–803
Immunoglobulin processes, 12:145
Immunological tests, for species identification, 12:103
Immunology, 25:501
Immunoprecipitation, 14:136, 141
Immunosensors, 3:799, 800–805
Immunobio(sensors, 14:154–156
Immunosuppression, as a toxic effect, 25:205
Impact, ceramics, 5:630
Impact analysis activities, EIA, 10:236
Impact analysis, EIA, 10:240t
Impact assessment types, 10:230, 231t
Impact categories, in life cycle assessment, 14:817–818
Impact copolymer production, in the Spheripol process, 20:538
Impact copolymers, 26:538
Impact ionization avalanche transit time (IMPATT) diodes, compound semiconductors in, 22:160–162
Impact modifiers
for PVC polymers, 25:672
in polyamide plastic manufacture, 19:785
IMPACT Resid Cracking Catalyst, 11:683
performance of, 11:684t
Impact resistance, of ductile polymers, 20:355
Impact-resistant copolymers, properties of, 20:526t
Impact resistant propylene polymers, 17:704
Impact strength (impact resistance), 10:177
of polycarbonates, 19:810–811
of styrene-based plastics, 23:362–363
Impact testing, 19:580
Impact tests, for polymer blends, 20:352
Impedance, batteries, 3:410, 425–426
Impedance area product (ZA), 19:139
Impeller-between-bearings pumps, 21:67–68
Impeller-diffusor gaps, in pumps, 21:84
Impeller pumps, flexible, 21:74
Impellers
  for aeration, 1:738–740
  axial flow, 16:672–673
  characteristics of, 16:676–687
  close-clearance, 16:672, 675, 690, 719
gas-inducing, 16:704–705
  helical ribbon, 16:690, 691
  high shear, 16:674–675
  hydrofoil, 16:673–674
  radial flow, 16:673
  Zwietering constant values for, 16:694t
Impeller types, in mixing and blending, 16:672–675
Impenforate basket centrifuge
  operation, 5:529
  theory of performance, 5:508
Impenforate bowl centrifuge, theory of performance, 5:508–510, 515, 516
Impenforate tubular centrifuge, theory of performance, 5:518
Imperial smelting, 14:736–739
Imperial Smelting Furnace (ISF), 14:734; 26:560
  plant, 14:738
  zinc process, 26:574–576
Imperial smelting process, 16:147
Impervious graphite, 12:745–746
Impervious (impregnated) graphite coolers, 23:780
Impingement nozzle, 23:179
Implantable ports, 3:720–721
Implant drug delivery, 18:711–712
Implanted species concentration, ion implantation and, 14:434
Implants
  HAp-coated, 14:105
  medical, 13:396–397
  shape-memory polymers in, 22:355
Implitapide
  novel potential antihyperlipemic agent, 5:144t
Importance sampling, 26:1005–1007
Imports, of vanadium compounds, 25:540
Impregnated graphite anodes, 12:758–759
Impregnation, 17:509
  of nonwovens, 17:513
  supercritical, 24:19–20
Impregnation coating, 10:12
Impression dental plasters, 8:290
  compressive strength, 8:289t
Impression dental wax, 8:298–299
  specification, 8:300t
Impressions
  in blood, 12:102
  in forensic examinations, 12:100–101
Imprinting technique, 16:795
Improved Chemical Agent Monitor (ICA), 5:831
Improvement teams, Six-Sigma, 21:174
Impurities. See also Contaminants; Metal ion impurities; Purification
cautious soda in removing, 22:832
in limestone, 15:33, 34t, 40
in magnesium, 15:342–343
in manganese ore, 15:542–545
in metal, 16:130
in MOCVD growth, 22:157
removal in vinyl chloride manufacture, 25:641, 642
in silicon, 22:481, 493t, 498–499
in silicon carbide manufacture and processing, 22:533
in silicon carbide whisker fabrication, 22:534
silicon conductivity and, 22:485
in soap making, 22:735–736
in sodium chloride (salt), 22:811, 812t
in sodium chloride solution mining, 22:803
in sodium iodide manufacture, 22:827
in sodium nitrite analysis, 22:857
in sodium-process titanium manufacture, 24:853
in solar salt harvesting, 22:806–807
in tin refining, 24:788–789, 791
VDC polymer degradation and, 25:718
in vinyl chloride monomer, 25:648t
in vitreous silica, 22:410, 411t
in water softening, 22:818
Impurity removal
  in ion exchange, 14:409
  from lead, 14:751
Impurity separation, in plastics recycling, 21:448
IMSWorld Drug Patents international database, 18:212
Inabenfide, 13:43t, 53
Inactive dried yeasts, food uses for, 26:474
InAsSb alloy, superlattices in, 22:159. See also Antimony (Sb); Arsenic (As); Indium (In)
InAsSb semiconductor, in LED technology, 22:175
Incandescence, cause of color, 7:326t, 327–328
Incandescent lamps, vitreous silica in, 22:441
Incapacitants, 5:822–823
Incarfullerenes, 12:230–231
chemistry of, 12:253
Incident investigation, 21:862
Incineration. See also Hazardous waste incineration
in hazardous waste treatment, 25:831
in odor control, 26:725
in radioactive waste treatment, 25:853
for sludge disposal, 25:914
in solid waste management, 25:862–863, 870, 872–873
in VOC control, 26:683–685
Incinerators, 12:328–329; 13:172. See also Kilns
catalytic, 10:79
fixed hearth, 13:177
fluidized-bed, 13:176–177
liquid, 13:178
moving-hearth, 13:177
regulations governing, 13:173
rotary kiln, 13:175–176
types and operation of, 13:174–179
Incinerator scrubbing systems, waste PVC in, 25:680–681
Inclined conveyors, correction factors for, 15:437
Inclined sorting table, 21:383
Inclined substrate deposition (IDP) processes, 23:842
Inclusion complexation, 11:552–553
Inclusion compounds, 14:159–190, 170–182
amylose, 14:168
anionic guest, 14:170
cailixarene, 14:165–166
categories of, 14:160
crown macroring, 14:160–161
cucurbituril, 14:168–169
cyclodextrin, 14:166–167
cyclophane host, 14:163–165
deoxycholic acid, 14:175
eextramolecular cavity inclusions, 14:170–182
gossypol, 14:174–175
Hofmann- and Werner-type, 14:171–172
intramolecular cavity inclusions, 14:160–170
macrocyclic and oligocyclic lattice host, 14:177–179
molecular cleft, 14:169
phenolic host, 14:172–174
preparation and characterization of, 14:182
stabilities of, 14:182
urea, thiourea, and selenourea, 14:172
use in organized media effects, 14:184
use in retardation and control, 14:183
use in shielding and stabilization, 14:183–184
use in solubilization and activation, 14:184
uses for, 14:183–185
Inclusion hosts, artificial, 14:170
Inclusion pigments, 19:405
INCOLOY alloys, 17:101, 102–103
Income tax, 9:539–540
INCONEL alloys, 17:102, 103, 104
Incubation times, microfluidic shortening of, 26:968
Incubators, use of oxygen in, 17:764
INDAC (+)-Indacrinone, 6:74
Indanes, 12:169
Indano[1,2-b]aziridines thermochromic materials, 6:625
Indanthrone, 19:417, 445
Indanthrone Blue, 19:446
pigment for plastics, 7:367t
Indanthrone dyes, 9:331–332
Indapamide, 5:168
molecular formula and structure, 5:162t
Indazolone couplers, 19:254, 256
Indene, comonomer with acrylonitrile, 1:451t
Indentation tests, 21:743
Independent chemical reactions, 21:336–337
Independent toxic effects, 25:213
Inderal, molecular formula and structure, 5:93t
Inderide, molecular formula and structure, 5:93t
INDEXED LASERS, 14:701
INDEXING CLOTH MACHINES, 11:355
INDEX OF REFRACTION, 14:680; 17:454
- of compound semiconductors, 22:150t, 151
- of silicon, 22:488-489
- of silicon carbide, 22:526t, 541
- of silicones, 22:600
- of vitreous silica, 22:432–433, 434–435
INDIA
- advanced materials research, 1:696
- aliphatic fluorocarbon production in, 11:871
- aquaculture history, 3:183
- aquaculture production, 3:189t
- ethylene market in, 24:270
- food adulteration in, 23:160, 161
- natural graphite in, 12:780
- silver in, 22:648–649
- spice growing in, 23:155
INDIAN CHILDHOOD CIRRHOSIS, 7:710
INDICA RICE, 26:284
INDICATED PETROLEUM RESERVES, 18:595
INDICATOR pH DETERMINATION METHOD, 14:24, 25
INDICATOR pH MEASUREMENTS, 14:32–33
INDICATORS
- as smart materials, 22:716
- bromine-containing organic compounds, 4:362t
- water in, 22:720
INDIGENOUS BIOCONTROL SPECIES, 13:347
INDIGO, COLOR, 7:332
INDIGO DYES, 9:256
INDIGOID DYES, 7:376t
INDIGOID SOLUBLE DYES, 7:373t
INDIGO VAT DYE, 9:181
INDIRECT-ARC FURNACES, 12:297–298
INDIRECT COAL LIQUEFACTION, 6:858–867
INDIRECT COOLER EVAPORATORS, 21:537
INDIRECT EXTRUSION, COPPER, 7:693
INDIRECT FOOD ADDITIVES, 12:29, 34
- categories of, 12:31
- gap semiconductors, 14:837; 22:234–235
- band structure of, 22:143
- versus direct gap semiconductors, 22:151–152
- heat dryers, 9:127–136
- agitator dryers, 9:131–133
- atmospheric dryers, 9:129–130
- calciners, 9:130
- drum dryers, 9:133–134
- fluid-bed dryers, 9:130–131
- freeze dryers, 9:135–136
- screw conveyors, 9:131
- vacuum dryers, 9:134–135
- heat resistance furnaces, 12:287
- hydration, 10:536–538
- indirect immunosensors, 14:754
- injection (IDI) diesel engines, 12:421
- liquefaction, 6:828
- reading gauges, accuracy of, 20:661–662
- reduction, 14:501
- sequence heuristic, for simple distillation, 22:299
- sulfonating reagents, 23:522–523t
- vacuum gauges, 20:657
- (French) zinc oxide process, 26:612–613
INDISAN, 24:498
INDIUM (In), 14:190–203. See also AlGaInN compounds; InAsSb entries; InGa-entries; InSb photodiode detectors/arrays
- analytical methods for, 14:201
- economic aspects of, 14:199–201
- effect on copper resistivity, 7:676t
- environmental concerns related to, 14:201
- forms of, 14:198
- health and safety factors related to, 14:202
- in barium alloys, 4:12t
- in gold-based dental alloys, 8:307t
- manufacture, processing, and shipment of, 14:197–198
- occurrence of, 14:191
- plastic nature of, 14:191
- principal commercial source of, 14:191
- processing of, 14:199
- properties of, 14:191
- purity range of, 14:198
- reactions with, 14:191
- recovery of, 14:191–192, 199
- recycling, 14:201–202
- Russian stockpile of, 14:200–201
with selenium in pigments, 22:102
selenium sources and supplies of, 14:191–194
selenium supply of, 14:199
selenium uses for, 14:194–197
wetting ability of, 14:194
with gold in dental applications, 8:305
world production of, 14:197
Indium(III), concentration formation
constant of chelates, 5:717t
Indium alloys, 14:195–196
Indium compositions of, 14:198
Indium antimonide, 3:53, 58; 14:197
Indium arsenide, 3:270, 271; 14:197
Indium compounds, 14:196–197
Indium fluoroborate hydrate, 4:157t, 158, 159
Indium gallium arsenide (InGaAs), 3:271
Indium–gallium–arsenide photodiodes, 19:156–157
Indium hydroxide, 14:197
Indium mines, 14:192–193
Indium oxide, 5:600; 14:195, 196
Indium phosphide, 14:197
Indium plating, for microelectronics, 9:813
Indium-point realization, 24:444
Indium tin oxide (ITO), 7:530; 14:196–197; 24:805
Indium trichloride, 14:197, 201
Indo-3-lyl acetic acid, 13:284
Indole-3-acetic acid, 13:35, 38. See also Indoleacetic acids (IAAs)
Indole-3-butyric acid, 13:25t
as a plant growth regulator, 13:35–36
Indoleacetic acids (IAAs), 13:284, 304. See also Indole-3-acetic acid
Indolenine-derived polymethine dyes, 20:507
Indoles, 9:288
Indoles: aroma chemicals, 3:260
aroma compounds in roasted coffee, 7:256t
chemiluminescence reagents, 5:856
soluble dyes, 7:373t
Indole thionaphthene, soluble dyes, 7:373t
Indolinospirooxazines, photochromic materials, 6:598
Indonesia, aquaculture production, 3:189t
Indoor air pollution, 1:802–805, 816–818; 26:669–670
air cleaning as control method, 1:831–834
control, 1:816–839
desirable characteristics for indoor materials, 1:827t
low emitting indoor materials, 1:829t
selection criteria for indoor materials, 1:827t
source categories, 1:822t
source management as control method, 1:826–831
ventilation to control, 1:820, 823–826
Indoor air quality, 1:816
methods of providing good, 1:820
poor, 1:818
standards and guidelines, 1:818–819
Indoor materials
emissions criteria, 1:826–829, 827t
emissions testing, 1:829–830
Green Label emission criteria established by Carpet and Rug Institute, 1:831t
product testing and labeling, 1:830, 831t
selection criteria, 1:826, 827t
Indoor pollution, solvents in, 23:111. See also Indoor air pollution
Indophenol dye developer, 19:287
Indoxacarb, 14:347–348
Indoxyl, soluble dyes, 7:373t
Indoxyl-β-D-galactose, chemiluminescence reagent, 5:856
“Induced fit” process, 10:338
Induced-roll magnetic separators, high intensity, 15:453–454
Induced roll separator, 16:639–641
Inductance
exponents of dimensions, 8:585t
ferrite cores and, 11:75–77
Induction furnaces, 12:307–313, 23:253
applications for, 12:315–316
channel, 12:311–313
coreless, 12:309–311
Induction heating, 12:307–308
case hardening by, 16:199–200
Induction heating coil, 12:309
Induction melting, 12:308–309
Induction period, 10:399
Induction welding, copper wrought alloys, 7:748
Inductively coupled plasma (ICP), 25:370
Inductively coupled plasma atomic emission spectrometry (ICP-AES), in thorium analysis, 24:774, 775
Inductively coupled plasma etching, 22:184
Industrial ef
Industrially produced catalysts, 19:625–626
Industrial emission control, 10:67–112
alternatives for, 10:72
biofiltration systems, 10:75–77
environmental technology verification, 10:109
equipment leak emissions, 10:68–75
exhaust control technologies, 10:96–104
oxidization devices, 10:77–96
strategies for, 10:68
uses for catalytic oxidation of exhaust streams, 10:104–109
Industrial enzymes, 10:248–317
applications for, 10:249–250t, 273–307
early, 10:251–253
economic aspects of, 10:310–311
effect of temperature and pH on, 10:256–257
environmental and safety aspects of, 10:307–310
enzymatic catalysis, 10:253–258
enzyme classification and nomenclature, 10:258–261
enzyme discovery, 10:261–265
enzyme production, 10:265–273
history of, 10:250–253
host microorganism for producing, 10:264–265
Industrial ethanol, classifications of, 10:553–554
Industrial exhaust pollutants, sources of, 10:67
Industrial facilities, EPA pretreatment standards for, 21:582
Industrial fibers, modulus tenacity map for, 19:732
Industrial fluid lubricants, viscosity system for, 15:237t
Industrial force generators, superelastic and pseudoelastic SMA devices for, 22:352
Industrial furnaces, 12:286, 327–330
fuels for, 12:323, 324t
for thermal cracking, 10:601–609
Industrial gas streams, removal of hydrochloric acid, 23:597
Industrial-grade toluene, specifications for, 25:178t
Industrial gums, 4:722, 13:62, 63t, 64
Industrial hard carbides, 4:674–695. See also Tantalum carbide; Tungsten carbide
actinides, uranium, and thorium, 4:689–690
Industrial hard carbides, 4:674–695. See also Tantalum carbide; Tungsten carbide
actinides, uranium, and thorium, 4:689–690
Industrial hard carbides, 4:674–695. See also Tantalum carbide; Tungsten carbide
actinides, uranium, and thorium, 4:689–690
Industrially produced catalysts, 19:625–626
Industrial emission control, 10:67–112
alternatives for, 10:72
biofiltration systems, 10:75–77
environmental technology verification, 10:109
equipment leak emissions, 10:68–75
exhaust control technologies, 10:96–104
oxidization devices, 10:77–96
strategies for, 10:68
uses for catalytic oxidation of exhaust streams, 10:104–109
Industrial enzymes, 10:248–317
applications for, 10:249–250t, 273–307
early, 10:251–253
economic aspects of, 10:310–311
effect of temperature and pH on, 10:256–257
environmental and safety aspects of, 10:307–310
enzymatic catalysis, 10:253–258
enzyme classification and nomenclature, 10:258–261
enzyme discovery, 10:261–265
enzyme production, 10:265–273
history of, 10:250–253
host microorganism for producing, 10:264–265
Industrial ethanol, classifications of, 10:553–554
Industrial exhaust pollutants, sources of, 10:67
Industrial facilities, EPA pretreatment standards for, 21:582
Industrial fibers, modulus tenacity map for, 19:732
Industrial fluid lubricants, viscosity system for, 15:237t
Industrial force generators, superelastic and pseudoelastic SMA devices for, 22:352
Industrial furnaces, 12:286, 327–330
fuels for, 12:323, 324t
for thermal cracking, 10:601–609
Industrial gas streams, removal of hydrochloric acid, 23:597
Industrial-grade toluene, specifications for, 25:178t
Industrial gums, 4:722, 13:62, 63t, 64
Industrial hard carbides, 4:674–695. See also Tantalum carbide; Tungsten carbide
actinides, uranium, and thorium, 4:689–690
auxiliary, 4:683–686
complex, 4:692
economic aspects, 4:693–694
iron group metals, 4:690–692
physical properties of auxiliary, 4:684t
physical properties of primary, 4:679t
physical properties of uranium and thorium carbides, 4:690t
preparation, 4:674–677
quality control, 4:692–693
reduction, 4:676–677
solid solutions of major, 4:686–689
Industrial hydrogen-producing reactions, 13:766
Industrial hygiene, 14:203–224
evaluations of agents in, 14:221–222
functions of, 14:204
generic exposure assessment, 14:220
hazard evaluation, 14:213–220
hazard recognition in, 14:205–213
Industrial hygienists, 14:203, 205
Industrial initiatives, 24:192
Industrial ketones, 14:572–575
environmental regulations on, 14:582t
Industrial laminates, phenolic resins in, 18:789–790
Industrial laundering, detersive systems
Industrial lignins, 10:15
Industrial maintenance coatings, 10:442–444
Industrial materials
bulk handling of, 18:5–6
transportation and storage of, 18:4
Industrial materials packaging, 18:1–14
bags, 18:10–12
boxes, 18:14
carboys and bottles, 18:13
fiber drums, 18:9–10
flexible intermediate bulk containers, 18:13
plastic drums, 18:7–8
steel drums and pails, 18:6–7
wooden barrels, 18:8–9
Industrial membrane gas-separation processes, 15:798
Industrial minerals, 17:686–687
Industrial mineral screening, 16:616–617
Industrial mixing systems, 16:670
Industrial nations, R&D expenditures in, 21:611
Industrial nitrogen, grades of, 17:283t
Industrial nylon applications, 19:765–766
Industrial oil, viscosity classification and guide recommendations for, 15:237–239
Industrial oil absorbants
palygorskite/sepiolite application, 6:700t
smectites application, 6:697t
Industrial organic chemicals, production of, 24:263
Industrial platinum resistance thermometers (IPRTs), 24:447
calibration of, 24:448–449
resistance-temperature characteristics of, 24:448
temperature coefficient of, 24:448
Industrial platinum resistance thermometry, 24:447–450
Industrial polymer colloids, 20:382–383
Industrial polymer coatings, high throughput experimentation application, 7:412–413
Industrial polysaccharides, 20:450
Industrial precipitation water softening methods, 26:120–123
Industrial processes
Friedel–Crafts chemistry in, 12:160
pH control in, 14:33
polymer colloid, 20:376
use of steam in, 23:238–240
Industrial products, microencapsulated, 16:459–460
Industrial radiation thermometry, 24:455–458
Industrial reactions
applications of kinetic principles to, 10:474
sodium hydride, 13:610
Industrial reactors, 21:356, 357
design of, 20:742–744
Industrial recycling, 21:361–362
Industrial refractories, 21:515
Industrial Research Institute, 24:372, 375
Industrial resistance thermometers, lead-wire configurations for, 24:449–450
Industrial samples, See also Industrial sampling
analysis of, 14:218
duration measurement method and, 14:216
factors influencing, 14:218
number required, 14:216
time to submit, 14:216
Industrial sampling, See also Industrial samples
accuracy of, 14:217
integrity of, 14:218
intrusiveness of, 14:216
systematic, 14:215
Industrial-scale extractors, scale-up for, 10:768–769
Industrial scales, 26:243–245
Industrial, scientific, and medical (ISM)
frequency allocations, 16:510–512
Industrial screens, types of, 16:616
Industrial separations, 16:633
Industrial sheeting, LLDPE, 20:207
Industrial solvents, 23:85–124
behavior of, 23:96–109
characteristics of, 23:89–96
classification of, 23:85–87
electronic and electrical effects of, 23:96–97
environmental impact of, 23:109–112
groups and average properties of, 23:87–89
health and safety factors related to, 23:112–120
special, 10:553
Industrial state business climate, rating of, 19:523, 524t, 525t
“Industrial textiles,” 24:623
Industrial thermotropic LCPs, 13:381–382
Industrial used oil, contaminant levels in, 21:424t
Industrial uses of noble-gas compounds, 17:336
Industrial waste(s)
as biomass, 3:684
characterizing, 25:866–869
slaked lime in, 15:64
Industrial waste gas disposal, 10:77–78
Industrial waste treatment, slaked lime in, 15:64
Industrial wastewater, oxygen demand and organic carbon in, 25:887t
Industrial wastewater flow, 25:885
Industrial wastewater pollution control, ozone use in, 17:808–809
Industrial wastewater treatment. See also Industrial water treatment
activated carbon application, 4:752–753
and bioremediation, 3:755
Industrial water treatment, 26:125–150
biofouling in, 26:146–149
boilers in, 26:129–136
condensate systems in, 26:136–137
corrosion in, 26:125–129
macrofouling organisms in, 26:149–150
Industrial weighing applications, 26:227
Industrial yeasts, 26:482–483
Industry
hydrogen peroxide use in, 14:57
microfluidic applications in, 26:976
role in technology transfer, 24:354–357
sodium chloride (salt) in, 22:819
sodium nitrate in, 22:852
“triple bottom line” for, 12:807
water in, 26:56–57
Industry-government cooperation, 12:816
Industry University Collaborative Research Centers (IUCRC), 24:395
Inelastic mean free path (IMFP), 24:87
Inert fluids, 11:877
properties of, 11:879
Inert gas dilution, 11:456
Inert gases, 13:456; 17:376–377. See also Helium- group elements; Noble gases
narcotic potency and solubility of, 17:377
Inert gas generators, 17:280
Inertial confinement fusion targets, microcapsules as, 16:460
Inertial impaction, in depth filtration theory, 11:339
Inertial impaction-type mist eliminators, 23:781
Inert ingredients, in pesticides, 18:530
Inertinite, 6:706, 707t, 719
Inert materials, as soap bar additives, 22:745
Inertodetrinite, 6:707t
Infant formula, liquid chromatography applications, 6:465
Infection-responsive drug delivery, 9:63
Infections, sulfonamides for, 23:499
Infectious Bursal Disease Virus (IBDV)
vaccine, from yeast, 26:487–488
Infectious diseases
peptide-based antimicrobials for, 18:255
tetracycline use for, 24:604t
yeast as a model for, 26:494–496
Infectious particle control, 1:833
Infectious plasma donations, 12:153
Infectious substances, as a hazard class, 25:340
Infectious waste, 25:865
e-beam disinfection, 8:666–667
Inferred petroleum reserves, 18:595
Infinite dilution coefficients, 8:743
Infinite heat-transfer surface area, 13:253
Infinity point, 14:611
Inflammation, as a toxic effect, 25:204–205
Inflammation-responsive drug delivery, 9:63
Inflated–collapsed rayon, 11:261, 262
Inflation
  effects of, 9:547
  of rayon, 11:262
Influenza A Virus, 3:137
Influenza vaccine
  inactivated, 25:493–494
live intranasal, 25:494–495
Informatics, 7:385, 400
  future developments, 7:421–422
Information Collection Rule (ICR), 17:807
Information disclosure statement, for patents, 18:181
Information gathering, in industrial hygiene, 14:217–218
Information management, ink industry, 14:335
Information overload, 21:613
Information science, 11:13
Information storage/read out, in molecular recognition, 16:769
Informed opinion technique, 15:637
Infrared (ir)-absorbing gases, in transparent thermal insulation, 23:10
Infrared (ir) analysis. See also Ir entries
  composition determinations using, 19:564
  sampling for, 23:138–139
Infrared detectors, liquid chromatography, 6:450
Infrared drying, ceramics processing, 5:656
Infrared dyes, 9:500
Infrared emission spectroscopy, 23:142
Infrared inks, 14:315
Infrared lasers, 22:180
Infrared LEDs, 22:175, 176
Infrared measurements, in growing amorphous silicon, 22:130
Infrared microspectroscopy, 16:486
Infrared reflection-absorption spectroscopy (irras), 24:72, 114–116. See also IR spectra
Infrared reflection, in inorganic pigments, 19:380
Infrared reflective surfaces, use of gold in, 12:704–705
Infrared reflectography (irr)
  in art forgery detection, 11:419
  in fine art examination/conservation, 11:400–401
Infrared remote sensing, 23:141
Infrared (ir)-sensitizing polymethine dyes, 20:513
Infrared spectra, of fats and oils, 10:823
Infrared spectral region, 19:564
Infrared spectroscopy, 14:224–243; 23:136–143. See also Chromatography-infrared spectroscopy; Far-infrared spectroscopy; ir-selective surfaces; Ir (infrared) spectroscopy; Near-infrared spectroscopy; Thermal analysis-infrared spectroscopy
  applications of, 14:239–240; 23:140–141
  in composition measurements, 20:682
  in fiber optic fabrication, 11:138
  industrial applications of, 14:240
  instrumentation in, 14:225–228; 23:137–138
  null-background techniques in, 23:139–140
  in phenolic resin analysis, 18:774
  polymer analysis using, 11:196
  quantitative, 14:239
  sampling methods in, 14:228–230
  silica surface chemistry and, 22:373
  of silicate solutions, 22:458
  of silicones, 22:599t
  in silicone network characterization, 22:569
  spectral analysis in, 14:234–239
  in wax analysis, 26:224
Infrared technology, 15:469
Infrastructure, sodium chloride impact on, 22:813–814, 817
Infringement patent information searches, 18:207, 233–234, 241
Infusion mashing, 3:577–578
InGaAsP alloy, abrupt interfaces in, 22:159. See also Arsenic (As); Gallium (Ga); Indium (In); Phosphorus (P)
InGaAsP semiconductor, in laser communication systems, 22:180
InGaAs semiconductor
  in laser diodes, 22:179–180
  in LED technology, 22:175
  in near-infrared VCSELs, 22:180
InGaN alloy, heterostructures and superlattices in, 22:158
Ingestion, influence on toxicity, 25:210–211
Ingot casting, 23:266
Ingot production, titanium, 24:857
Inhalation. See also Dust inhalation hydrofluoride, 14:17–18
influence on toxicity, 25:211
of PVC dust, 25:676–677
of sodium tetrasulfide, 22:875
studies of, 25:227t
of sulfuric acid, 23:794
of toluene, 25:179t
of VDC, 25:692–694
Inhalation anesthetics, 11:867–868
Inhalation exposure to ethylene oxide, 10:659, 660
to manganese compounds, 15:614
Inhalation studies formaldehyde, 12:121
related to ethyl chloride, 10:589–590
Inhalators, oxygen, 17:764
Inherent safety, 13:170
Inherent valve characteristic, 20:685
Inherent viscosity, 19:717
Inhibitor docking, 10:337–339
two-step process for, 10:339
Inhibitor–enzyme interaction, modeling, 10:335
Inhibitor releasing developers (IRDs), 19:260
Inhibitors of hemostatic system, 4:83, 88–89
silicone network preparation, 22:565
In-house pilot-plant design/construction, 19:462
In-house training, as a technical service function, 24:344
Infer controlled initiation method, 14:269
Infilters, 14:297
Inipol EAP22, 3:765
Initial breeding, in nucleation, 8:105
Initial modulus, 19:743
Initial reacting species, in pulp bleaching, 21:32–33
Initiating systems, nature of, 14:267–268
Initiating systems, stereoelective, 20:303–306
Initiation, polymer autoxidation, 3:102, 103
Initiation rate constants \(k_i\), in VDC polymer degradation, 25:715–716, 717t
Initiation sites, in VDC polymer degradation, 25:714–715
Initiator bonds, breaking, 14:278
Initiators. See also Anionic initiators;
Cationic initiators; Free-radical initiators
alkoxide, 14:259
copolymerization, 14:252
difunctional and trifunctional, 14:252–254
efficiency of, 14:244
enolate, 14:258
functionalized, 14:255
half-life of, 14:278–279
metal-free, 14:258–259
stability of, 14:278
in styrene polymerization, 23:379
in synthetic latex manufacture, 14:719
in vinyl chloride manufacture by pyrolysis, 25:643
Injection blow molding, 19:554
Injection fluids, in oil recovery, 18:615–617
Injection molded food packaging, 18:47–48
Injection molded products LLDPE, 20:207–208
poly(4-methyl-1-pentene) in, 20:431
PVC in, 25:685
Injection-molded structural foams, 23:407
Injection molding, 19:549–554
of ABS, 1:424–426
of bulk molding compounds and sheet molding compounds, 20:118
of FEP polymer, 18:314
heat pipes in, 13:239
of high density polyethylene, 20:171
of high impact polystyrene, 23:363
of higher olefin polymers, 20:427
of linear low density polyethylene, 20:200
of liquid-crystal polymers, 20:81, 83
of low density polyethylene, 20:236–237
of polyamide plastics, 19:788–789
of polyesterether elastomer parts, 20:76
of styrene plastics, 23:397–398
of Teflon PFA, 18:336–337
of thermoplastics, 10:179; 19:538
of thermosetting resins, 19:557
of VDC copolymers, 25:727
Injection molding machines, 19:550–551; 23:397
Injection-molding operations, automated, 23:398
Ink-jet printing, 

Injection stretch blow molding, of food packaging, 18:50–51

Injection wells, 18:613

Ink industry business model, globalization of, 14:334–335

Ink-jet inks, 9:513

Ink-jet printing, 9:221–222; 14:327; 19:32

silica in, 22:376–377

of textiles, 24:622

Ink-jet printing papers, PVA in, 25:618–619

Inks, 14:311–336

ball-point, 14:328

cellulose acetates, 5:438

cellulose ester applications, 5:403–404

cobalt applications, 7:244–245

as colloid, 7:272t, 273t

color and coloring materials for, 14:316–318

current business practices related to, 14:334–335

deal, 14:329

dispersant applications, 8:690–691

duplicator and business form, 14:321

economic aspects of, 14:330

electrographic, 14:329

engraving, 14:329

environmental considerations and regulatory compliance related to, 14:331–335

epoxies used in, 10:449–450

flexographic, 14:320, 322–328

folding-carton, 14:321

heat sublimation, 14:330

heat transfer, 14:329–330

infrared, 14:315

iodine in, 14:371

kaolin application, 6:688t, 691, 695

lamination, 14:327–328

letterpress, 14:318

liquid, 14:315

litho newsprint, 14:318–322

manufacture of, 14:321–322, 323–324

metal container, 14:321

microwave, 14:315

paste, 14:315–316

for plastics, 14:321

printing inks, 14:312–318

quality control and testing of, 14:331

rotogravure and jet, 14:322–328

screen process, 14:328

sheet-fed offset, 14:320

silica in, 22:376–377

stamp-pad, 14:328

typical properties of, 14:312t

uv, 14:314

water-based, 14:326, 328

web offset, 14:319–320

web offset heat-set publication and commercial, 14:320

Inlay and crown investments, compressive strength, 8:289t

Inlet piping configurations, for pumps, 21:82–83

Inlet terminal filtration, for fermentation, 11:45

In-line extrusion, 19:543

In-line filtration, 15:827

Inline motionless mixers, 16:711–716

In-motion checkweighers, 26:245

Inner–Helmholtz plane (IHP), 3:419

Inner transition-metal perchlorates, 18:278

Inner tubes, butyl rubber for, 4:434, 453

Innohep, 4:95t; 5:175

molecular formula and structure, 5:172t

Innovations, political conditions for, 24:191–192

Innovene process, 20:194

Innovex, 7:636

Inocor, molecular formula and structure, 5:181t

Inoculation, in iron, 22:516

Inoculum development, in fermentation, 11:41–42

Inorganic aerogels, 1:749–750

Inorganic anions, in photocatalytic water decontamination, 19:87

Inorganic antimony compounds, 3:57–67, 62t

Inorganic archaeological materials, 5:744–748

Inorganic bismuth compounds, 4:17–26

Inorganic bromamines, 13:101–104

Inorganic bromine compounds, 4:318–339

Inorganic cellulose esters, 5:394–412

physical properties, 5:402–403

preparation, 5:396–402

uses of, 5:402–408
Inorganic chemistry reactions
high pressure applications in,
13:440–448
pressure-treated, 13:403, 416–431
slow, 13:416
Inorganic chloramines, 13:101–104
Inorganic chlorine, 24:263
Inorganic coagulants, 26:108t
Inorganic color pigments. See also
Inorganic pigments
complex, 19:402–406
for inks, 14:317
Inorganic compound extraction, ionic
liquids in, 26:875–876
Inorganic compound–hydrogen chloride–
water systems, 13:817–818
Inorganic compound lubricants, 15:246
Inorganic compounds, 13:104
hydrochloric acid reaction with,
13:821–822
hydrogen chloride reaction with,
13:818–819
hydrothermal technique for the
synthesis of, 14:81–82
reactions with halogen fluorides,
13:126–127
as refrigerants, 21:524
of selenium, 22:75t, 86–89
Inorganic constituents, determination in
sugar, 23:477–478
Inorganic Crystal Structure Database
(ICSD), 26:426
Inorganic electrochemical processing,
9:618–652. See also Organic
electrochemical processing
electrochemical waste treatment,
9:642–643
electrowinning of metals, 9:637–642
hardware for, 9:618–626
industrial process conditions, 9:626–637
Inorganic electrochromic materials, 6:577
Inorganic esters, of PVA, 25:601
Inorganic fibers, 24:614, 618
Inorganic fillers, 11:302t
Inorganic finish removers, 18:84–86
economic aspects of, 18:86
health and safety aspects of, 18:85
manufacturing and processing of,
18:85–86
test methods for, 18:86
Inorganic flocculating agents, 11:625–627
analysis of, 11:640
Inorganic fluorine compounds, 11:852–858
analysis and characterization of,
11:855–856
history of, 11:854
safety, toxicity, and handling of, 11:856
sources and applications of, 11:854–855
synthesis of, 11:855
Inorganic germanium compounds, 12:553–
554
Inorganic glass systems, 12:568t
Inorganic halogen compounds, hydrogen
chloride reaction with, 13:820
Inorganic hollow-fiber membranes,
16:23–24
Inorganic iodine compounds, 14:374–375
Inorganic light emitting diodes, 14:832
Inorganic lithium compounds, 15:136–142
Inorganic mass spectrometry, 15:666
Inorganic materials, second harmonic
generation coefficients of, 17:451t
Inorganic nickel compounds, 17:106–113
Inorganic nomenclature, 17:387–394
Inorganic nonlinear optical materials,
17:444
Inorganic–organic hybrid aerogels,
1:752–753
Inorganic–organic hybrid compounds,
preparation of, 24:17
Inorganic–organic materials, 13:535, 536,
539, 540, 541, 542, 543, 544
Inorganic ozone reactions, 17:774
Inorganic ozonides, 18:392
Inorganic paint pigments, 18:57–58
Inorganic peroxides, 18:391–425
actinide peroxides, 18:410
anhydrous sodium perborate, 18:401
arsenic peroxides, 18:404
barium peroxide, 18:397
boron compounds, 18:398
calcium peroxide, 18:395–396
Caro’s acid, 18:405–406
economic aspects of, 18:418
as free-radical initiators, 14:292–293
Group 1 (IA), 18:393–394
Group 2 (IIA), 18:394–395
Group 12 (IIB), 18:397
Group 13 (IIIB), 18:398–401
Group 14 (IVB), 18:401–402
Group 15 (VB) peroxides, 18:402–404
Group 16 (VIB) peroxides, 18:404–410
history of, 18:392–393
magnesium peroxide, 18:395

ozonides, 18:417–418
peroxo carbonates, 18:401
peroxodisulfates, 18:408–410
peroxodisulfuric acid, 18:407–408
peroxo hydrates, 18:411–415
peroxomonomosulfates, 18:406–407
peroxomonosulfuric acid, 18:404–405
peroxonitrous acid/salts, 18:402
peroxophosphoric acids/salts, 18:402–404
peroxopolyoxometallates, 18:415–416
peroxosilicates, 18:402
peroxosulfuric acids/salts, 18:404–405
peroxotin compounds, 18:401
peroxosilicates, 18:416–417
transition-metal, 18:410
zinc peroxide, 18:397
Inorganic peroxygen compounds, 14:40
Inorganic petrochemicals, 18:678–680
Inorganic phosphate ligands, 25:432
Inorganic phosphides, 19:58–59
Inorganic phosphines, 19:57–58
Inorganic phosphorus compounds, 11:487–488
Inorganic photochromic materials, 6:589–592
Inorganic pigments, 19:375–417
black pigments, 19:408–410
chemical properties of, 19:377–378
classification of, 19:402
colored pigments, 19:397–408
crystal structure of, 19:377–378
durability of, 19:382–384
environmental aspects of, 19:413–415
lead- and cadmium-containing, 19:414–415
lead-containing, 19:413
metals present in, 19:414t
miscellaneous, 19:411–413
optical properties of, 19:379–382
particle size of, 19:378–379
physical form of, 19:375
physical properties of, 19:378–379
production volumes of, 19:384–386
properties of, 19:376–384
specifications, standards, and quality control for, 19:384
white pigments, 19:387–397
Inorganic pollutants, in photocatalytic water decontamination, 19:87–89
Inorganic reagents, hydrogen peroxide and, 14:62
Inorganic salts, as membrane foulants, 21:664
Inorganic salts/bases, slaked lime in, 15:65
Inorganic silicate coatings, 7:200
Inorganic surfaces, silylation of, 22:697–698, 701
Inorganic tellurium compounds, 24:417–422
Inorganic thermosteric materials, 6:618–619
Inorganic tin compounds, 24:801–808
halides, 24:801–804
metal stannates, 24:806
oxides, 24:804–806, 808
salts, 24:806–807
toxicology of, 24:807–808
Inorganic titanates, 25:43–47
Inorganic titanium compounds, 25:1–71
analytical methods for, 25:59–60
environmental concerns related to, 25:61–65
health and safety factors related to, 25:60–61
thermochemical data related to, 25:3, 4
titanium borides, 25:5–6
titanium bromides, 25:54
titanium carbides, 25:6–9
titanium halides, 25:47–55
titanium–hydrogen system, 25:3–5
titanium–nitrogen compounds, 25:9–12
titanium phosphorus compounds, 25:56–57
titanium silicon compounds, 25:55–56
titanium sulfur compounds, 25:57–59
Inorganic water-soluble polymers, 20:459
INOSI myo-Inositol, 4:710
Inotropist agents, glycosides, 5:180t, 184
Inotropist state, 5:108
INPADOC bibliographic file, 18:246. See also International Patent Documentation Center (INPADOC)
INPADOC database, 18:236–237
INPADOC standards, 18:245
In-process controls (IPCs), 18:726
in commercial-scale pharmaceutical operations, 18:734

In-process dressing, electrolytic, 9:603

InSb photodiode detectors/arrays, 19:158.
See also Antimony (Sb); Indium (In)

Insect behavior, compounds affecting, 14:345–346
Insect cell culture, 5:346
applications, 5:351t

Insect control
fumigants for, 12:62
role of chemicals in, 14:338–340
Insect disease vectors, 14:337–338
Insect growth regulators, 14:343–345
Insecticide analysis, of water, 26:43–44
Insecticide management, 14:351. See also Integrated pest management (IPM)
Insecticide resistance, 14:340

Insecticides, 11:868; 14:337–352
acting on mitochondrial respiration, 14:348–349
\( \gamma \)-aminobutyric acid (GABA) receptor/chloride ionophore complex, 14:347
bioremediation of nonchlorinated, 3:777
chloroform application, 6:288
classes and modes of action of,
14:340–343
colloids, 7:273t
economic aspects of, 18:532–534
insect growth regulators, juvenile hormones, and analogs, 14:343–345
integrated pest management and,
14:349–351
isophorone in, 14:587
kaolin application, 6:688t, 696
neonicotinoid, 14:346
organophosphorus, 19:47
for protecting wool textile products,
26:402–403
role of chemicals in insect control,
14:338–340
screening programs for, 14:342
synthetic organic, 14:339
value of, 14:339–340
voltage-gated sodium channel effectors, 14:347–348

Insect metabolic pathways, compounds affecting, 14:345
Insect pheromones, 14:346
Insect repellents, 14:345
Insect-resist agents, for wool treatment,
26:403–404
Insect resistant plants, 12:486
Insect-resist treatment, of wool,
26:402–404

Insects
crop damage by, 14:337
wax esters in, 26:204
as weed control agents, 13:331–332
Insect waxes, 26:206, 207
Insensitive munitions, 10:742
Insert injection molding, 18:47
Insertion/extraction electrochromic materials, 6:577–582
Inside battery limit (ISBL), 19:494
for equipment spacing, 19:518
Inside processes, in fiber optic fabrication,
11:136–140
In situ air stripping, in soil and ground water treatment, 25:844
In situ bioremediation, in soil and ground water treatment, 25:836–842
In situ combustion enhanced oil recovery method, 18:630–631
In situ composites, 13:503
In situ diagnostics, for MOCVD, 22:155–156
In situ encapsulation processes, 16:445
In situ leaching, 16:153
In situ metal–matrix composite processing, 16:173–175
In situ nonbiological waste treatment,
25:843–845
In situ silver halide grains, as photocatalysts, 19:344–345
In situ synthesis, in microarray fabrication, 16:386–387
Insolubilization, cotton, 8:29
Insoluble ammonium polyphosphate, 11:487–488
Insoluble anodes, 9:776, 778
Insoluble dietary fiber, 12:67
Insoluble matter, determination in sugar,
23:478
Insoluble polymers, 23:717
Insoluble silicates, synthetic, 22:474–475
Inspecting, piping system, 19:488–491
Inspection programs, for tanks, 24:312
Installation qualification (IQ), 11:48
  in fine chemical production, 11:433
Instant active dry yeast (IADY), 26:461
Instant coffee, 7:257, 260–262
  processing and packaging, 7:260–262
Instant color films, 19:298–314
Instant color imaging processes, 19:283–298
Instant color photography system, 19:241–242
Instant dye images, stability of, 19:297–298
Instant film printers, 19:322
Instant films
  black-and-white, 19:282
  Fuji, 19:312–314
  Kodak, 19:311–312
Instant images, formation of, 19:278–279
Instant imaging processes, black-and-white, 19:279–282
Instant photography, 19:273–329
  applications for, 19:322
  black-and-white diffusion transfer reversal processes, 19:283
digital/instant film imaging systems, 19:321
economic aspects of, 19:321–322
  historical background of, 19:273–274
photothermographic imaging in, 19:314–320
principles of, 19:274–279
product information related to, 19:274
reagents for, 19:274–275
  thermographic imaging in, 19:320–321
Instax film units, 19:312
Institute for the Study of Business Markets (ISMB), 15:636
Institute of Nuclear Power Operations (INPO), 17:532–533, 539, 597
Institute of Scrap Recycling Industries (ISRI), ferrous scrap grades, 21:408–411
Institut Francais du Petrole (IFP) process, for 1-butene from ethylene, 17:720–722
Institutional conflicts of interest, 24:371
Institutional Review Board (IRB), 18:698
Instrument accuracy, in process control, 20:679
Instrument air dryers, PSA cycle use by, 1:646
Instrumental analysis methods
  for selenium, 22:95
  in silver quantitative analysis, 22:677
Instrumental aroma analysis, 11:519
Instrumental broadening, 23:131
Instrumental neutron activation analysis (INAA), archaeological materials, 5:742–743
Instrumental resolution, 23:132
Instrumentation. See also Instruments calibration of, 21:161
capillary electrophoresis, 4:633
  composition measurement, 11:785
  for fermentation, 11:36–40
  flow rate, 11:781–783
  flow visualization, 11:785–786
  fluid mechanics, 11:781–786
  food processing, 12:87–88
  gas chromatography, 4:611; 6:413–414
  infrared spectroscopy, 14:225–228;
    23:137–138
  liquid chromatography, 4:620–621;
    6:441–443
  mass spectrometry, 15:650–665
  microwave, 16:517–524
  molecular uv–vis absorption spectrometry, 23:143–144
  pH, 14:30–31
  pilot-plant, 19:462–463
  pressure measurement, 11:783
  process control, 20:677–687
  radio wave and microwave spectroscopy, 23:135–136
  Raman scattering, 21:325–326
  sims, 24:108–109
  spray, 23:192–195
  supercritical fluid chromatography, 4:629–630
  tem, 24:80
  temperature measurement, 11:783–784
  velocity measurement, 11:784–785
  xps and aes, 24:100–107
Instrumentation standards, 15:766–767
Instrumentation Systems and Automation Society (ISA), 15:766
Instrumented impact, 19:581
Instruments. See also Equipment
  powder diffraction, 26:426–43
  hyphenated, 23:140
  for X-ray single-crystal diffraction, 26:419–422
Instrument standardization, 6:66–67
Insulated dye developers, 19:285–286
Insulated gate bipolar transistors (IGBTs), silicon carbide in, 22:539–540
Insulating brick, ASTM classifications and specifications for, 21:508, 509t
Insulating castables, classification of, 21:510t
Insulating films, T resin in, 22:590
Insulating materials, thermocouple, 24:463
Insulating polymers, 13:541, 542
Insulating refractories, 21:482
Insulation asbestos applications, 3:311
energy management and, 10:157–158
HDPE, 20:174–175
high performance fibers in, 13:393
industrial hygiene and, 14:211
in ion implantation, 22:188
LLDPE, 20:208–209
rigid foam, 23:358
vitreous silica in, 22:440
Insulation foams, 12:24; 25:472
Insulators band gap, 5:596
Group 14 (IV) elements as, 22:232, 233
organic semiconductors and, 22:201, 202
Insulator sputtering, 22:192
Insulin(s), 3:817
controlled release of, 13:750
glycosylated, 9:66–67
regulatory treatment, 3:826
synthetic, 11:11
yeast-derived, 26:484
Insulin Amendment, 18:684
Insulin-containing drugs, regulation of, 21:576
Insulin delivery, glucose-responsive, 9:66–71
Insulin-like growth factor-I (IGF-I), 12:463
Insulin permeation rate, 9:69
Intake valve deposits (IVD), 12:409–410
Intake valve detergents, 12:409
Intalox saddles, 1:28; 8:770
characteristics of ceramic, metal, and plastic, 8:774t
Integer programming (IP), 26:1023
Integral color films, 19:286
Integral equations, 11:736
of motion, 11:737–738
Integral films, 19:274, 307
Polaroid, 19:302–308
stability of, 19:296
Integrals, Monte Carlo evaluation of,
26:1003–1004, 1005–1007
Integral tripack film structure, 19:241, 243, 244–245
Integrated circuit (IC) chips, 22:229, 230
in MEMS, 22:260
in sensors, 22:266, 268–269
Integrated circuit processes, microfluidic devices via, 26:963–964
Integrated circuits (ICs)
gallium use in, 12:352
for lab-on-a-chip, 26:974
silica aerogel application, 1:766
vitreous silica in, 22:442–443
Integrated-circuit sensors, 20:655
Integrated combined cycle gasification processes, 20:747–748
Integrated crop management (ICM), 14:350; 18:551
Integrated enhancement ratio, 14:852
Integrated environmental protection, 24:196
Integrated gasification combined cycle (IGCC), 6:757–758, 760, 805, 806, 821, 828
impact of technology advances on cost and performance, 6:822t
Integrated gasification combined cycle power plants, 23:239
Integrated membrane system (IMS), 26:84
Integrated pest management (IPM), 14:339, 349–351; 18:551–552
cotton, 8:8–9
primary goals of, 14:350
Integrated pest management programs, 13:286
Integrated product policy, 24:196
Integrated solid waste management (ISWM), 25:863. See also Solid waste management
Integrated Two-Stage Liquefaction (ITSL), 6:841
Integrelin, 4:104t, 105; 5:173
molecular formula and structure, 5:171t
Integrins, 4:85
Integrons, 3:31
Intellectual assets
  development and extraction model for valuation of, 24:363
  management of, 24:362
Intellectual property, 7:783
  product design considerations, 5:773–774
  in technology transfer, 24:377
Intellectual property pricing, risk assessment and, 24:365–366
Intelligent 3D models, 19:520–521
  “Intelligent concrete,” 10:453
Intelligent engineering, in hydrothermal processing, 14:101
  “Intelligent” hybrid materials, 13:550
Intelligent textiles, 24:624–625
Intensified heat transfer, heat-exchanger network design using, 20:756–757
Intensifier pumps, 13:411
Intensive mixers, 16:722
Intensive smelting processes, 23:773
  Intent-to-use trademark applications, 25:264, 260–261
IntEnz database, 10:260
Interacting solvents, 23:99
Interacting surfaces, in relative motion, 15:202–204
Interaction, of fiber polymers, 11:174–175
Interaction parameters
  for polymer blends, 20:322
  in surfactant adsorption, 24:138
Interaortic balloon pump, 3:746
Intercalated disks, myocardium, 5:79
Intercalate hybrid materials, 13:546–548
Intercalation adducts, 13:536–537
Intercalation compounds, 12:777
Intercritical annealing, 23:298
Interdiffusion, 26:772
Intralaminar shear strength (ILSS), 26:744
Intralaminar shear strength (ILSS), 26:744
Interface trapped charge, in silicon-based semiconductors, 22:240
Interfacial adhesion, in binary heterogeneous polymer blends, 20:349
Interfacial catalysis, 10:255, 256
Interfacial composite membranes, 15:811–812
Interfacial condensation, 23:730
  of aromatic-(poly)cycloaliphatic diphens, 23:723–724
  polysulfonate preparation by, 23:723–724
Interfacial contact area, 10:755–756
Interfacial effects, in CA resists, 15:182
Interfacial energy, 24:157
  colloids, 7:281–284
  interfacial forces, in foams, 12:4
Interfacial free energy, 24:119
Interfacial in situ polymerization, in microencapsulation, 16:442–446
Interfacial mass-transfer coefficients, 10:751–753
Interfacial polarization, 10:21–22
Interfacial polycondensation, 10:189–190, 194
Interfacial polymerization
  for aromatic polyamides, 19:720
  phases of, 19:812–813
  polycarbonate preparation via, 19:811–814
Interfacial polymerization processes, in microencapsulation, 16:445–446
Interfacial tension, 24:134
  in polymer blends, 20:323, 333
  of fats and oils, 10:822
  interference, as cause of color, 7:326t, 339–340
  Interference color chart, 16:476
  interferograms, 14:227, 233
  interferometers, 14:671; 23:137
  sensors using, 22:271
  Interferometric fiber sensors, 11:151–152, 153, 154
Interferon, 5:345t
Intergranular corrosion, in industrial water treatment, 26:127–128
Interhalogens, 13:125–126
Interior paint, 18:67
Interlaced interferometric fiber sensors, 11:153
Interlaminar shear strength (ILSS), 26:744
Interleukin-1 (IL-1), 4:89
See also Oxide–water interfaces
Interleukin-6 (IL-6), 4:89
Interlevel wiring
    for compound semiconductors, 22:188, 191
dielectrics for, 22:192
gold-based, 22:191
Interline transfer image shuttering,
    19:147–148
Interlocking, of fibers, 11:178–179
Intermediate alloy tool steels, 23:300
Intermediate bulk containers (IBCs),
    18:5–6
Intermediate cover, in landfill design,
    25:879
Intermediate density silica gel,
    22:394–395
Intermediate frequency (IF),
    23:142
Intermediate heat exchanger (IHX), in fast reactors,
    17:586
Intermediate modulus (IM) fibers,
    26:759
Intermediate neglect of differential overlap (INDO) technique,
    16:737
Intermediates. See also Chemical intermediates
    furan derivatives as, 12:280
    safer, 12:809–810
Intermediate silicon steels, 23:309
Intermetallic alloys, 13:530
Intermetallic compounds, 26:755
gallium, 12:353, 354–355t
    selenium recovery from, 22:79
uranium, 25:411
vanadium, 25:533–534
Intermetallic superconductors, with A15 structure, 23:831
INTERMIG impeller, 16:672–673
Intermittent-contact mode atomic force microscopy (AFM), 3:326; 24:84
Intermittent failures, 26:981
Intermixing, in ion implantation, 22:188
Intermodal dispersion, 11:134
Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), 21:468
Intermodal transportation, 25:328–329
Intermolecular acetalization, of PVA, 25:602
Intermolecular chain transfer, 20:220
Intermolecular forces, in solvent–solute interactions, 23:91
Intermolecular hydrogen abstraction,
    14:299–300
Intermolecular-transfer reactions, 20:299
Internal Analgesic Panel (FDFA), on salicylic acid salts, 22:12
Internal bremsstrahlung, 21:309, 310t
Internal combustion engines (ICEs),
    13:854, 855–856
    use of pure hydrogen in, 13:799–800
Internal-conversion coefficient (ICC), 21:307
Internal-conversion electrons, 21:309
Internal-conversion process, 21:300, 306–309
Internal development, 15:639
Internal diffusion, 9:97
Internal energy, as a property of steam,
    23:204
Internal floating-roof (IFR) tank, 24:291, 292
Internal flows, 11:749–751
    in liquid atomization, 23:176–182
    in a swirl atomizer, 23:181
Internal fouling, 15:831
Internal heating-element convection furnace, 12:292, 293
Internal image grains, 19:201
Internal impedance batteries, 3:410
Internal loop airlift bioreactors, 1:742
Internal manifolding method, 12:200
Internal microwave field, 16:513
Internal olefins, sulfonation of, 23:527
Internal-pair formation (IPF),
    21:300–301
Internal pressure, 24:287
Internal quantum efficiency, 14:842
Internal radiation, protection against,
    19:701–702
Internal reflection, 24:111–112
    Beer's law expression for, 24:113
Internal resistance, batteries, 3:410
Internal return rate (IRR), 9:544–545
Internal sizing, in paper manufacture, 18:109–113
Internal stress tests, for electroplating,
    9:793–794
Internal-surface reversed phase (ISRP) column, 6:447
International Agency for Research on Cancer (IARC), 17:120; 23:794; 25:561
    on PVC, 25:678
    on vinyl chloride, 25:651
International Association for Properties of Water and Steam (IAPWS), 23:202
International Atomic Energy Agency (IAEA), 17:533–534, 593; 25:416
International Building Code plumbing codes, 19:481
International Bureau of Weights and Measures, 15:768
International Center for Diffraction Data (ICDD), 26:428
International chemical congresses, 17:385–386
International Code of Conduct on the Distribution and Use of Pesticides, 18:541
International Commission on Enzymes, 10:259
International Commission on Radiation Protection, 19:701
International Commission for the Reform of Chemical Nomenclature, 17:396
International Commission for Uniform Methods of Sugar Analysis (ICUMSA), 23:470–471, 472. See also ICUMSA tables
International Conference on Harmonization (ICH), 18:688
in fine chemical production, 11:435 guidelines, 21:168, 169
International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use, 18:702
International Convention for the Protection of Industrial Property, 25:263, 267
International copyrights, 7:794–795
International Council of Scientific Unions Committee on Data (CODATA), 15:747, 756
International Council for Control of Immune Deficiency Disorders (ICCIDD), 22:816
International Electrotechnical Commission (IEC), 15:755
reliability and, 26:993 tests, 19:588
International Fragrance Association (IFRA), 18:388
International Isocyanate Institute, 25:480
International Jamaica Agreement, 12:695
International kilogram, 26:239
International Lubricant Standardization and Approval Committee (ILSAC), 15:228–230
Internationally agreed Numbers for Identification of Data (INID) codes, 18:203
International Marine Organization (IMO) Marine Pollution Treaty (MARPOL), sulfur limit by, 23:589
International Microwave Power Institute (IMPI), 16:510
International Monetary Fund (IMF), 12:694
International Natural Rubber Specification, 21:761
International Occupational Hygiene Association (IOHA), 14:203
International oil production patterns, 24:255–258
International organizations, 15:756–757 role in pesticide regulation, 18:540–541
International organic chemical industry economic patterns, 24:263–265
International patent application, 18:188
International Patent Documentation Center (INPADOC), 18:228. See also INPADOC entries
International patent documents, 18:198
International Patent Classification (IPC) system, 18:208–210
International petroleum specifications, 18:642
International Pharmaceutical Excipients Council (IPEC) guidelines, 21:168, 169
International Programme on Chemical Safety (IPCS), 18:540–541
International Society of Blood Transfusion (ISBT), 12:151
International Society of Thrombosis and Haemostasis (ISTH), 12:151
International Society of Hypertension, on sodium restriction, 22:813
International Solvent Extraction Conferences (ISEC), 10:746, 766
International Standard (ISO) 2370, for flax fiber, 11:614, 616, 617
International standards, 15:755–757
growing role of, 24:262
International Standards Organization (ISO). See also International Organisation for Standardization (ISO); ISO entries
reliability and, 26:993
silicon carbide standards by, 22:537, 538
International Sugar Scale, 23:473
International System of Units (SI Units), 1:xi–xxvi; 2–26:ix–xxiv. See also SI Units
“International Titanium Association, The” (ITA), safety committee of, 24:865
International Technical Roadmap for Semiconductors (ITRS), 15:181
International temperature scales (ITS), 15:749; 24:436
International Temperature Scale of 1990 (ITS-90), 24:436. See also ITS-90 entries
components of, 24:437, 438
fixed points of, 24:441
International Trademark Bureau, 25:267
International Tungsten Association (ITA), 25:367
International Union of Biochemistry (IUB), 10:259
International Union of Pure and Applied Chemistry (IUPAC), 12:816; 15:757. See also Nomenclature of Inorganic Chemistry (IUPAC)
nomenclature principles, 17:384
system, 18:594
International Union of Biochemistry and Molecular Biology (IUBMB), 10:260; 17:401
International Year of Freshwater 2003, 24:164
Internet
and copyrights, 7:794
role in technical service, 24:349–350
Internet domain names, as trademarks, 25:258
Internodal pathways, 5:80
Interparticle forces, 11:800–801
Interpellet axial dispersion, 25:281–283, 288
inclusion in nonideal tubular reactor models, 25:283–285
Interpellet axial dispersion coefficients, 25:289, 291
Interpellet Damköhler number, 25:291, 294, 295
Interpellet porosity, 25:294
Interpenetrated wall matrix, in hollow-fiber membranes, 16:15
Interpenetrating polymer networks (IPNs), 19:834
in polymer blend synthesis, 20:327
in pressure-sensitive adhesives, 22:590
Interpolating properties, defined, 16:729
InterPro database, 10:261
Interstate commerce, 25:330–331
Interstate Commerce Act, 25:335
Interstate highway system, 25:327
Interstitial compounds, tungsten, 25:385–387
Interstitial fluid velocity, 25:290
Interstitial-free steels, 23:263, 296, 299
Interstitial solid solutions, alloying, 13:498
Interstitial vanadium compounds, 25:533–534
Interstitial velocity, 11:766
Intertinite, 6:703
Intestinal fatty acid transport protein (FATP4)
target of antiobesity drugs, 3:98
Intimatan, 4:98
Intraaortic balloon pump, 3:718
Intramolecular acetalization, of PVA, 25:602
Intramolecular cavity inclusions, 14:160–170
Intramolecular chain transfer, 20:220
Intramolecular cycloacylations, 12:177
Intramolecular self assembly, 20:482
Intramolecular stretching modes, 14:236
Intraoperative autotransfusion, 3:719
Intraparticle mass transfer, 15:729–730
Intrapellet Damköhler number, 25:294, 295, 276, 277, 279, 280, 301, 311
Intrapellet diffusional fluxes, 25:308
Intrapellet resistances, 25:270
Intrapellet temperatures, 25:303
dimensional analysis of, 25:300–301
Intrapellet thermal energy balance, 25:299
Intrastate commerce, 25:330–331
Intrauterine drug delivery, 18:711
Intravenous aqueous injection drug dosage, 18:714
Intravenous glucose tolerance test (IVGTT), 9:67
Intrinsically conducting polymers, 13:540
Intrinsic bioremediation, 3:767
Intrinsic detectors, 22:180
Intrinsic fiber-optic sensors, 11:148
Intrinsic magnetic properties, of M-type ferrites, 11:67–68
Intrinsic photoconductors, 19:138
“Intrinsic” rate expressions, 21:341
Intrinsic semiconductors, 22:235–236
energy gap at room temperature, 5:596t
Intrinsic strength, of vitreous silica, 22:428
Intrinsic-type detectors, cooling, 19:136
Intrinsic viscosity (IV), of thermoplastics, 10:178
polymer, 20:530
of polysaccharides, 20:551–552, 553
of PVA, 25:600
of VDC copolymers, 25:706
In-use properties, of soap, 22:728, 730–731
Introcor, molecular formula and structure, 5:128t
Introns, 12:449; 17:619; 20:824
Intrusive uranium deposits, 17:520
Inulin, classification by structure, 4:723t
In-use properties, of soap, 22:728, 730–731

Invention. See also Patents
background description of, 18:164
benefits and advantages of, 18:178
best mode of, 18:177
detailed description of, 18:165
determining the scope of, 18:172–177
disclosure of, 18:176–177
evaluation of, 18:172
experimental trials and, 18:174
first date of, 18:168
nature of, 18:159–168
nonobviousness of, 18:175–176
novelty of, 18:172–175
origin of, 18:167–168
process of, 18:158–159
summary of, 18:164
utility of, 18:176
Invention title, 18:160
Inventors’ citations, 18:237

Inventorship
contest over, 18:171
legal guidelines for, 18:168

Inventory analysis
data requirements of, 14:824
in life cycle assessment, 14:816
Inventory data
for ammonia plant, 26:996–997
reliability and, 26:994
Inventory management, 15:471
waste minimization via, 25:884t
Inverse comonomers, 26:541
Inverse coordination compounds, 7:573
Inverse emulsion polymerization,
acrylamide polymers, 1:321–322, 323–324
Inverse gas chromatography (gc), 19:586
in silicone network characterization, 22:569
Inverse least squares, 6:39–41
Inverse micelles, 20:487
Inverse microemulsion polymerization,
20:461
Inverse photoemission spectroscopy (ipes), 24:74
Inverse Power Law, in reliability modeling, 26:989
Inverse spinels, 11:60, 61
Inversion temperatures, 25:307
Inverted bell-type pressure element, 20:647
Inverted microscope, 16:471
Inverting filter centrifuge, operation of, 5:545
Invert oil-emulsion muds, 9:5
In-vessel composting, 25:874
Investigational Device Exemption (IDE), 21:577

Investigational New Drug (IND)
Applications, 18:687–696, 21:573. See also New drug approval (NDA) process
assay limits in, 18:692
FDA meetings concerning, 18:695–696
FDA review of, 18:693
guidance documents for, 18:689–690
information submitted with, 18:690
Investigator’s Brochure in, 18:691
pharmacology and toxicology information in, 18:692–693
Phase I, 18:690–693
resources for preparing, 18:689–690
summary report in, 18:693

Investigational New Drugs (INDs), See also
Food and Drug Administration
Modernization Act of 1997 (FDAMA) biologics, 3:826
eMERgency use, 18:689
investigator, 18:688–689
research, 18:689
treatment, 18:689
types of, 18:688–689
Investigational New Drug studies
Phase I, 18:693
Phase II, 18:694–695
Phase III, 18:695
Phase IV, 18:695
Investigator’s Brochure, in Investigational New Drug Applications, 18:691
Investigator information, for Investigational New Drug Applications, 18:690
Investment
in gold mines, 12:695
platinum-group metals for, 19:632–633
Investment capital, 9:539
Investment castings, magnesium phosphate, 15:416
Investment costs, in fine chemical production, 11:433
Inviscid flow, in microfluidics, 26:960
In vitro biosynthesis, of
polyhydroxyalkanoates, 20:262
In vitro embryo culture, 12:453
In vitro testing of nutraceuticals, 17:646–647
In vivo oxygen imaging, 26:796
In vivo processing, of silk, 22:630–631
Involuntary sulfur, 23:564
In-well bioreactors, defined, 3:759t
Iodamines, 13:98
Iodargyrite, natural occurrence of, 22:668
Iodates, 14:374–375
Iodate solutions, 14:362
Iodic acid, 14:375
Iodide analysis, of water, 26:41
Iodide ion, 14:367–368; 18:488
Iodide-refining method, 16:149
for vanadium, 25:520
Iodides, 14:374
thorium, 24:763
tungsten, 25:379–380
uranium, 25:439
Iodimetric titration, 23:670–671, 676
Iodination, 21:274
Iodination reaction, 9:281; 13:649
Iodine (I), 14:353–380. See also Blend.
iodine value; $^{131}$I isotope
analytical methods for, 14:367–368
catalyst poison, 5:257t
chemical properties of, 14:358–360
Chilean, 14:366
for disinfection, 8:628–630
economic aspects of, 14:365–366
environmental concerns related to, 14:369
as food additive, 22:815–816, 827
grade specifications/standards and shipping of, 14:366–367
health and safety factors related to, 14:368
heat capacity of, 14:356
manufacture and processing of, 14:360–365
microbicidal efficiency of, 14:373
occurrence in nature, 14:353–354
as an oxidizing agent, 14:359
physical properties of, 14:354–358
as protection from radioactive iodine, 14:372–373
radioactive isotopes of, 14:373
reactions in aqueous media, 14:359–360
reactions with PVA, 25:603
recovery from brine, 5:795–796
sodium reactions with, 22:765
solubility of, 14:356–357
from subsurface brines, 14:362–365
thermal conductivity of, 14:356
thiosulfate titration of, 14:367, 368
use in selenium analysis, 22:94–95
uses for, 14:369–374
Iodine bromide, 4:332
Iodine catalysts, 14:370
Iodine chlorides, 23:653
Iodine compounds, 14:358
inorganic, 14:374–375
organic, 14:375–377
Iodine deficiency disorders (IDDs), salt and, 22:815–816
Iodine derivatives, 14:374
Iodine electrodes, 3:408
Iodine elution, 14:365
Iodine finishing, 14:364
Iodine heptafluoride, 13:125
Iodine monochloride, 14:375
Iodine pentafluoride, 13:125, 127, 128
manufacture of, 13:129
uses for, 13:131
Iodine tribromide, 4:332
Iodine values, 9:144
of waxes, 26:223
Iodine vapor, 14:357–358
diffusion coefficient of, 14:354
ION-EXCHANGE RESINS 487

Iodism, 14:368
Iodized salt, 22:815–816
Iodoacetate, antiaging agent, 2:813
Iodoacetic acid, 1:143
Iodoacetyl/bromoacetyl methods, for covalent ligand immobilization, 6:396t
Iodobenzene, 3:602
Iodobenzene diacetate (IBD), alumina-supported, 16:570
Iodobromite, 4:304
Iodoethane, 14:376
Iodoform, 14:376
production from acetaldehyde, 1:105
vinyl chloride reactions with, 25:632
Iodogallates, 12:357
Iodomethane, 14:376
Iodometric assay method, for organic peroxides, 18:488
Iodometric methods, for permanganate analysis, 15:612
Iodometric ozone analysis, 17:811
Iodometric titration, 13:588
Iodonium salts, 15:–
iodine in silicone network preparation, 22:568
4-Iodophenol, chemiluminescence reagent enhancer, 5:844–845
4-Iodophenylboronic acid, chemiluminescence reagent enhancer, 5:845
Iodophors, 14:371
Iodopropynyl butylcarbamate, antimicrobial used in cosmetics, 7:831t
Iolite (cordierite), color, 7:332
Ion-adsorption clay deposits, 14:636
Ionamin, 3:91
ion assisted deposition (IAD), 14:441–442
Ion-beam amorphization, 14:447
Ion-beam-assisted deposition (IBAD), 14:441–442; 23:842, 844; 24:736
Ion-beam-induced epitaxial crystallization (IBIEC), 14:447–448
Ion-beam lithography in compound semiconductor processing, 22:193
thin film applications, 1:725
Ion-beam milling, 22:183, 184
Ion-beam mixing (IBM), 14:441
Ion beams, 14:426
processes utilizing, 14:441–442
Ion channel gates, 5:83
Ion channel mimics, 24:58
Ion channels, 5:83
Ion chromatography, 4:626–628; 6:388; 14:424
applications, 4:626–628
in perchlorate analysis, 18:283–284
Ion concentration-flow rate effect, 14:396–397
Ion conducting glasses, 12:585–586
Ion-cut process, 14:448–449
Ion cyclotron (ICR) analyzers, 15:663–664
Ion cyclotron resonance instrument, 15:664
Ion–dipole interactions, 14:477–478
Ion doping, in photocatalysis, 19:94–95
Ion doses, measuring, 14:444–445
Ion engines, cesium application, 5:705
Ion exchange, 14:380–426
cellulose ester applications, 5:404
cyclic operation in, 14:408–412
in hazardous waste management, 25:816–817
in lanthanide separation, 14:640
molecular sieves in, 16:846
in nonaqueous systems, 14:397
recovery of silver via, 22:654
recovery of uranium via, 25:403
resin manufacture, 14:384–391
types of ion-exchange resins, 14:381–384
uses for, 14:415–424
in wastewater treatment, 25:889t, 892t, 893
in water softening, 22:818, 819
in zeolites, 16:826–827
Ion-exchange chromatography, 6:387–388, 454–455; 12:137
antibody based columns with, 6:401
for arsenic removal, 3:280t, 282–283
protein separation, 3:829–846
Ion-exchange drug delivery systems, 9:79–80
Ion-exchange equipment, 14:403–405
Ion-exchange hollow fibers, 16:15, 17
Ion-exchange lithium recovery processes, 15:126
Ion-exchange membranes, 9:625, 634, 656–657
Ion-exchange metal recovery, 16:155
Ion-exchange production facility, 14:391, 392
Ion-exchange reactions, reversible, 14:382
Ion-exchange resin drug carriers, 18:710
Ion-exchange resin, 14:54, 380; 18:757
as catalysts, 14:420
catalyst supports, 5:337
economic aspects of producing, 14:413–414
gallium extraction by, 12:345
in hazardous waste management, 25:817
physical and chemical properties of, 14:391–403
shipping, 14:413
specifications, standards, and storage related to, 14:414–415
in the sugar and corn sweetener industries, 14:418
use on brines, 14:365
Ion-exchange systems, 14:405–408
activated carbon columns in, 14:408
columnar operation of, 14:381
types of, 14:405, 406
Ion-exchange technology, for potassium sulfate production, 20:627
Ion-exchange water-softener regeneration, salt production for, 22:810–811
Ion exchange water softening method, 26:119–120, 122
Ion exclusion chromatography, of ascorbic acid, 25:760
Ion hopping, 14:469
Ionic aggregates, 14:463–466
Ionically conducting polymers, 13:540
Ionic carbides, 4:647
Ionic compounds, rubidium, 21:822
Ionic conduction, ceramics, 5:587–589
Ionic crystals, 19:185. See also Silver halide crystals
Ionic dyes, 9:159, 161
Ionic electroactive polymers (EAPs), 22:718–719
Ionic hydrazides, 13:567
Ionic hydrides, 13:608–611
Ionic interactions
hydrodynamic volume and, 20:437
strength of, 14:472
Ionic lattices, 14:710
Ionic liquid/CO2 mixtures, 26:868
Ionic liquid–cosolvent mixtures, structural studies of, 26:868–869
Ionic liquids, 21:120–121, 26:836–920
in biocatalysis, 26:897–898
characteristics of, 26:848–865
in chromatography, 26:876–877
conductivity of, 26:852
in coupling reactions, 26:889–892
defined, 26:836–838
density of, 26:858
as designer solvents, 26:840
determination of impurities in, 26:845
in dimerization, hydrodimerization, oligomerization, and polymerization, 26:885–887
electrochemical applications of, 26:877–878
electrochemical windows in, 26:852–853
in Friedel–Crafts and Diels–Alder reactions, 26:892–893
future challenges related to, 26:900–902
handling, safety, and toxicology of, 26:865–866
history and new developments related to, 26:838–840
in hydroformylation and carbonylation reactions, 26:882–885
in hydrogenation, 26:879–882
hygroscopicity of, 26:861–862
industrial applications for, 26:899–900
laboratory applications of, 26:872–899
laboratory synthesis of, 26:841–844
liquid structure of, 26:868
lubrication and, 15:256
in metathesis, 26:887–889
molecular state of dissolved water in, 26:871
in nitration, 26:896–897
nomenclature related to, 26:840–841
in oxidation reactions, 26:894–896
phase behavior and liquid range of, 26:848–851
polarity of, 26:853–856
preparing, 26:842–844
refractive index of, 26:859, 860t
solubility in, 26:863–865
solubility of water in, 26:859–863
solvent-free preparation of, 16:583–584
as solvents for separations, 26:873–877
stability of, 26:845–848
structural studies of, 26:866–872
transition metal-catalyzed reactions in, 26:878–897
vapor pressure of, 26:851–852
viscosity of, 26:856–858
Ionic liquid–water mixtures, structural studies of, 26:870–872
Ionic metallocene catalysts, 20:193
Ionic modulus, 14:471, 472
Ionic nitration reactions, 17:158–165
mechanism of, 17:158–161
Ionic photoacid generators, 15:166–167
“Ionic plateau,” 14:471
Ionic polarization, 10:21
Ionic polychloroprene emulsions, 19:555–556
Ionic polymers, 25:475
Ionic reactions, VDC polymerization via, 25:694, 697
Ionic styrene polymerization, 23:384–388
Ionic surfactant adsorption, 24:137
Ionic surfactants, 24:133
area per surfactant of, 24:136
critical micelle concentration of, 24:122
in the mass action model, 24:130
microemulsions based on, 16:428
temperature-dependent solubility of, 24:125
Ionic tellurides, 24:407
Ion implantation, 14:426–460; 17:208; 19:154. See also Ion beams; Ion-cut process; Ion implantation systems
advantages and limitations of, 14:429
case hardening by, 16:208–209
channeling effect and, 14:435
in compound semiconductor processing, 22:185–188
implanted species concentration and, 14:434
ion-solid interactions and, 14:429–442
masks and, 14:446
radiation damage and, 14:435–436
radiation enhanced diffusion and, 14:436–437
range theory and, 14:431–434
semiconductor doping in, 14:446–447
simulations of, 14:440–441
sputtering and, 14:437–440
ultraclean, 14:445–446
Ion implantation profile, sputtering and, 14:439
Ion implantation systems, 14:442–453; 22:186
beamline in, 14:443–444
endstation in, 14:444–445
wafer contamination in, 14:445–446
Ion–ion interactions, 14:476–477
Ion irradiation, 14:436
Ionizable Surface-Group Model, 20:381–382
Ionization
chemical, 15:653–654
herbicide, 13:314
Ionization detectors, gas chromatography, 4:613–614
Ionization gauges
accuracy of, 20:661–662
cold-cathode, 20:662–663
hot-cathode, 20:660–662
triode, 20:660–661
Ionization potential (IP), plutonium, 19:673
Ionization reactions, 17:159
Ionizers
as pool sanitizers, 26:177–178
for swimming pool/spa water treatment, 26:196
“Ionizing” agents, 20:154–155
Ionizing irradiation, in wastewater treatment, 25:911
Ionizing radiation
for hydrogel synthesis, 13:731
food preservation by, 12:86
resist materials for imaging with, 15:158–160
Ionizing radiation detectors, 17:370–371
Ion lasers, 14:683–688
applications of, 14:687–688
current density in, 14:686
gas replenishment system in, 14:686–687
internal optics in, 14:687
size range of, 14:687
Ion microscopes, 16:464
Ion neutralization spectroscopy (INS), 24:74
Ion nitriding, 16:205
Ionomer blends, 14:476–478
Ionomer food packaging, 18:44
Ionomer peak, 14:464
Ionomer properties, effects of polar plasticizers on, 14:479
Ionomers, 14:460–489
applications for, 14:481–483
characterization of, 14:463–467
glass transitions in, 14:468–470
LDPE, 20:214
mechanical properties of, 14:461–462
melt viscosity of, 14:463
morphology of, 14:463–466
plasticization, 14:478–481
polystyrene, 23:364–365
properties of, 14:470–478
as proton exchange membranes, 14:482
stress relaxation results of, 14:472–473
styrene, 14:470–473
transport properties of, 14:462–463
Ionomycin, 20:130
total synthesis of, 20:138
α-Ionone, 24:563–564
β-Ionone, 24:562, 564
γ-Ionone, 24:565
Ionones, 24:561, 562–565
hydrogenated, 24:563
Ψ-Ionones, 24:562–563
Ionophores, 9:584; 20:119
as animal growth regulators, 13:2, 6–7
in ruminant feeds, 10:868, 869–870t
Ionophorous anticoccidials, 20:135–136, 139t
Ion-pair chromatography, 6:388, 454–455
Ion pair–ion pair interaction, 14:477
Ion plating, 5:803; 24:736–738
advantages of, 24:738
configurations in, 24:737
Ion product, of water, 23:207–209
Ion ranges
in compound targets, 14:434
parameters determining, 14:435
in semiconductor doping, 14:446
Ion recognition, polymethine dyes in, 20:517–519
Ion removal, silylating agents and, 22:700
Ion retardation, 14:421
Ions, 9:759
energy-loss rate of, 14:430
as excitation and detection species, 24:74
Ion scattering spectroscopy (ISS), 24:74.
See also ISS technique
Ion-selective electrodes, 9:582–585; 11:855–856
sensors using, 22:271
Ion-selective field-effect transistors (ISFETs), 3:799; 9:585; 14:24. See also Field effect transistors (FETs)
Ion-selective membranes, cavities in, 9:584
Ion size, cluster glass transition and, 14:469, 470
Ion sources, 14:443; 15:652–658
Ion spectroscopies, 24:106–107
Ion stopping, 14:430–431
Ion traps, 15:662
Iotech steam explosion process, 26:359
Ioxynil, 14:373–374
IPA–water system, evolving separation strategies for, 22:322–325. See also Water–IPA–hexane system
(-)-Ipecoside, 2:84, 85
Ipratropium bromide, 4:360t
Iproclozide, 13:49
Ipurolic acid, physical properties, 5:35t
Iran–Iraq war, 5:815
Iranite, 6:471t
Ir beam transmission, through fiber optics, 23:139. See also Infrared entries
Irbesartan, 5:187
molecular formula and structure, 5:152t
Ir cells, window material in, 14:228–229
Ireland ester enolate Claisen rearrangement, 20:138–139
Irgal dyes, 9:400
Irgarol 1051, biocide for antifouling coatings, 7:156
Iridium (Ir), 19:600
effect on copper resistivity, 7:676t
with gold in dental applications, 8:305
thermal degradation of catalysts, 5:272
demand for, 19:616t
Iridium compounds, 19:648–650
synthesis of, 19:650
uses for, 19:650
Iridium dioxide, 19:608–609, 650
Iridium oxides, electrochromic materials, 6:579–580, 580t
Iridium–platinum alloys, 19:602
Iripallidal degradation products, 24:577
Irish moss, common and scientific names, 3:188t
Iron (Fe), 14:490–529. See also Fe entries; Ferr- entries; Iron compounds; Ironmaking processes; Manganese ferroalloys; MoFe protein; Nickel–chromium–iron alloys; Nickel–iron–aluminum catalyst; Ni-Fe-base alloys; VFe protein
allotropic forms of, 23:272, 274
cast, 22:516
cast-iron production, 14:521–522
catalyst poison, 5:257t
chemical analysis of archaeological materials, 5:748
chemical vapor deposition precursor, 5:805t
in coal, 6:718
in cocoa shell from roasted beans, 6:357t
coke formation on, 5:266
Iron alkoxides, formula and DCMA number, 14:533
Iron(III) alkoxides, 14:533
Iron alloys, 14:490
Iron alloys, selenium and metallurgy of, 22:98. See also Ferrosilicon
Iron aluminide
  aluminum extraction from, 2:295
Iron(III) ammonium citrate, 14:533
Iron and steel production, quicklime in, 15:61–62
Iron-base alloys, for contact with steam, 23:242
Iron blacks, 19:401–402
Iron blast furnace, 16:141–143
Iron Blue, pigment for plastics, 7:370
Iron blue pigments, 19:407
Iron(II) bromide, 14:539
Iron(III) bromide, 14:539–540
Iron brown hematite, formula and DCMA number, 7:347
Iron browns, 19:402
Iron carbide, 4:649t, 690–692
  lattice, 4:652
  thermodynamic properties of, 4:651
Iron(II) carbonate, 14:533
Iron(III) carbonate, 14:533
Iron(II) chloride, 14:538
Iron(III) chloride, 14:539
Iron(III) chloride hexahydrate, 14:539
Iron(II) chloride tetrahydrate, 14:538
Iron Chromate Black, pigment for plastics, 7:369
Iron–carbon equilibrium diagrams, 23:275–276
Iron–carbon phase diagram, 16:196–197
Iron castings, tellurium in, 24:424
Iron(II) chloride, 14:538
Iron(III) chloride, 14:539
Iron(III) chloride hexahydrate, 14:539
Iron(II) chloride tetrahydrate, 14:538
Iron Chromite Brown, pigment for plastics, 7:369
Iron–chromite, 6:474
Iron Chromite Brown, pigment for plastics, 7:369
Iron chromite brown spinel, formula and DCMA number, 7:348
Iron–chromium alloys, 6:468
Iron citrate, 14:533
Iron cobalt black spinel, formula and DCMA number, 7:348
Iron–air cells, 3:515–516
Iron(III) alkoxides, 14:533
Iron alloys, 14:490
Iron alloys, selenium and metallurgy of, 22:98. See also Ferrosilicon
Iron aluminide
  aluminum extraction from, 2:295
Iron(III) ammonium citrate, 14:533
Iron and steel production, quicklime in, 15:61–62
Iron-base alloys, for contact with steam, 23:242
Iron blacks, 19:401–402
Iron blast furnace, 16:141–143
Iron Blue, pigment for plastics, 7:370
Iron blue pigments, 19:407
Iron(II) bromide, 14:539
Iron(III) bromide, 14:539–540
Iron brown hematite, formula and DCMA number, 7:347
Iron browns, 19:402
Iron carbide, 4:649t, 690–692
  lattice, 4:652
  thermodynamic properties of, 4:651
Iron(II) carbonate, 14:533
Iron(III) carbonate, 14:533
Iron(II) chloride, 14:538
Iron(III) chloride, 14:539
Iron(III) chloride hexahydrate, 14:539
Iron(II) chloride tetrahydrate, 14:538
Iron Chromate Black, pigment for plastics, 7:369
Iron–carbon equilibrium diagrams, 23:275–276
Iron–carbon phase diagram, 16:196–197
Iron castings, tellurium in, 24:424
Iron(II) chloride, 14:538
Iron(III) chloride, 14:539
Iron(III) chloride hexahydrate, 14:539
Iron(II) chloride tetrahydrate, 14:538
Iron Chromite Brown, pigment for plastics, 7:369
Iron–chromite, 6:474
Iron Chromite Brown, pigment for plastics, 7:369
Iron chromite brown spinel, formula and DCMA number, 7:348
Iron–chromium alloys, 6:468
Iron citrate, 14:533
Iron cobalt black spinel, formula and DCMA number, 7:348
Iron–air cells, 3:515–516
Iron(III) alkoxides, 14:533
Iron alloys, 14:490
Iron alloys, selenium and metallurgy of, 22:98. See also Ferrosilicon
Iron aluminide
  aluminum extraction from, 2:295
Iron(III) ammonium citrate, 14:533
Iron and steel production, quicklime in, 15:61–62
Iron-base alloys, for contact with steam, 23:242
Iron blacks, 19:401–402
Iron blast furnace, 16:141–143
Iron Blue, pigment for plastics, 7:370
Iron blue pigments, 19:407
Iron(II) bromide, 14:539
Iron(III) bromide, 14:539–540
Iron brown hematite, formula and DCMA number, 7:347
Iron browns, 19:402
Iron carbide, 4:649t, 690–692
  lattice, 4:652
  thermodynamic properties of, 4:651
Iron(II) carbonate, 14:533
Iron(III) carbonate, 14:533
Iron(II) chloride, 14:538
Iron(III) chloride, 14:539
Iron(III) chloride hexahydrate, 14:539
Iron(II) chloride tetrahydrate, 14:538
Iron Chromate Black, pigment for plastics, 7:369
Iron–carbon equilibrium diagrams, 23:275–276
Iron–carbon phase diagram, 16:196–197
Iron castings, tellurium in, 24:424
Iron(II) chloride, 14:538
Iron(III) chloride, 14:539
Iron(III) chloride hexahydrate, 14:539
Iron(II) chloride tetrahydrate, 14:538
Iron Chromite Brown, pigment for plastics, 7:369
Iron–chromite, 6:474
Iron Chromite Brown, pigment for plastics, 7:369
Iron chromite brown spinel, formula and DCMA number, 7:348
Iron–chromium alloys, 6:468
Iron citrate, 14:533
Iron cobalt black spinel, formula and DCMA number, 7:348
Iron Cobalt Chromite Black, pigment for plastics, 7:369t
Iron cobalt chrome black spinel, formula and DCMA number, 7:348t
Iron(II) complexes, 14:530–531
Iron complex geometries, 14:531
Iron compounds, 14:530–561
analytical methods for, 14:559–560
of biochemical relevance, 14:551–557
economic aspects of, 14:557–559
encapsulated, 16:456
health and safety factors related to, 14:560
organometallic, 14:550–551
salts and simple coordination compounds, 14:532–550
Iron(III) compounds, 14:531
Iron(V) compounds, 14:543
Iron cyanides, 14:533–537
Iron disulfide electrodes, 3:408
Iron(III)-enterobactin complex, 14:557
Iron, 24:577
Iron(II) ethylenediaminetetraacetic acid, 14:546
Iron(III) ethylenediaminetetraacetic acid, 14:546
Iron(II) fluoride, 14:538
Iron(III) fluoride, 14:538
Iron(II) fluoride tetrahydrate, 14:538
Iron(III) fluoride trihydrate, 14:538
Iron fluoroborate hexahydrate, 4:157t, 158, 159
Iron(II) formate dihydrate, 14:537
Iron(II) fumarate, 14:537
Iron gelbs, 19:399, 400
Iron(II) gluconate dihydrate, 14:541
Iron group carbides, 4:690–692
Iron halides, 14:537–540
Iron hydroxide, water exchange rates and activation parameters of hexaaqua complexes, 7:589t
Iron(II) hydroxide, 14:542
Iron(III) hydroxide, 14:542
Iron hydroxides, 14:541–542
Iron(II) iodide, 14:540
Iron(III) iodide, 14:540
Iron/iron alloy plating, 9:813–814. See also Fe entries
bath composition and operating conditions, 9:815–816t
Iron–iron carbide phase diagram, 23:274–283
Ironmaking processes, 14:498–521
blast furnace, 14:498–509
direct reduction, 14:509–520
direct smelting, 14:520–521
Iron–manganese–silicon steels, 22:712
Iron melting channel melting furnaces, 12:316
Iron–nickel alloys, 17:101
Iron–nickel martensitic alloys, 23:308
Iron(II) nitrate hexahydrate, 14:541
Iron(III) nitrate hexahydrate, 14:541
Iron ore(s), 14:494–497
agglomeration of, 14:497
beneficiation of, 14:495–497
economic aspects of, 14:523
high- and low-grade grade, 14:495–496
reduction of, 14:510–513
sources of, 14:494–495
U.S. consumption of, 14:527t
Iron ore pelletizing, smectites application, 6:697t, 698
Iron overload, ascorbic acid and, 25:770
Iron(II) oxalate dihydrate, 14:547–548
Iron oxide(s), 14:541–542
with activated alumina dust, 2:398
for arsenic removal, 3:279, 283–285
in bioremediation design considerations, 25:841
CO and H2 reactions with, 14:511
natural, 19:397–398
pigment used in makeups, 7:836t
synthetic, 19:398–402
transparant, adsorption energy to pigments or fillers, 8:683t
Iron(II) oxide, 14:541
Iron(III) oxide, 14:541–542; 19:398, 399
Iron Oxide Black, pigment for plastics, 7:369t
Iron Oxide Brown, pigment for plastics, 7:369t
Iron Oxide Buff, pigment for plastics, 7:369t
Iron oxide-coated sand (IOCS), for arsenic removal, 3:279, 284–285
Iron oxide control, in industrial water treatment, 26:133
Iron oxide pastes, 19:402
Iron oxide pigments, 19:397–402
production of, 19:385
transparent, 19:412
economic aspects of, 14:557–559
Iron oxide–potassium oxide catalyst, 23:336
Iron Oxide Red, pigment for plastics, 7:370t
Iron oxide reds, synthetic, 19:398–399
Iron Oxide Yellow, pigment for plastics, 7:370t
Iron oxide yellows, 19:399–401
Iron pellets, 14:498–499
Iron pentacarbonyl, 7:591; 14:550; 16:71
effective atomic number of noble gas, 7:590t
Iron(II) perchlorate hexahydrate, 14:543–544
Iron phosphate glasses, 12:585, 616
Iron phosphating, 18:839
Iron phosphating, 16:214–215
applications for, 16:215
Iron phthalocyanine, isolation of, 24:36
Iron(II) phthalocyanine, 14:547
Iron plating baths, 9:814t
Iron(II) porphyrin complexes, four-coordinate, 14:552–553
Iron(III) porphyrin complexes, 14:554
Iron porphyrins, 14:552–555
Iron(II) porphyrins, 14:553
Iron(III) porphyrins, 14:553
Iron(IV) porphyrins, 14:554
Iron production
quicklime in, 15:61
sulfur use in, 23:591
Iron removal, in municipal water treatments, 26:124
Iron salts
as flocculating agents, 11:626
ingestion of, 14:560
Iron–selenium, 22:73t
Iron sponge batch process, 12:376
Iron–steel industry, magnesium in, 15:350–351
Iron(II) sulfate, 14:544–545; 19:398, 399
Iron(III) sulfate, 14:544–545
Iron(II) sulfate tetrahydrate, 14:544
Iron(II) sulfide, 14:545
Iron(III) sulfide, 14:545
Iron sulfide nitrosyl compounds, 14:556
Iron sulfides, 14:545
Iron sulfur compounds, 14:555–556
Iron telluride, 24:411
Iron Titanate Brown, pigment for plastics, 7:369t
Iron titanates, 25:46–47
Iron titanium brown spinel, formula and DCMA number, 7:348t
Iron trimer, 16:62
Ironworks, early American, 14:492
Iron/Zinc/Magnesium Oxide Tan pigment for plastics, 7:369t
Irradiated uranium, plutonium separation and purification from, 19:674–675
Irradiation
of poly(ethylene oxide), 10:684
of spices, 23:157
in wastewater treatment, 25:911, 912
of water-soluble silicone species, 22:604
Irreducible structure, creating, 20:725–726
Irreversibility field, 23:819, 832
Irreversibility line, 23:841–842
in superconductors, 23:818–819
Irreversible chemical kinetics, first-order, 25:286–287, 292–293
Irreversible enzyme inhibition, 10:256, 322
Irreversible perturbation reactions, 14:617
Irreversible thermodynamics models, 21:638, 661
Irrigation, in the United States, 26:4
Irritants, 5:823–824; 21:836
Irrotational flow, 11:742–743
Ir-selective surfaces, cooling power of, 23:14
Ir spectra, of surface layers, 24:110. See also Infrared reflection-absorption spectroscopy (IRRAS)
ir spectrometers, 23:132
Ir (infrared) spectroscopy, for analysis of MF resins, 15:790. See also Infrared technology
Isanic acid, 5:34t
Isanolic acid, physical properties, 5:35t
Isasmelt furnace, 14:760
Isasmelt lead smelting process, 14:743–745
ISA Standards and Practices Committee 50 (SP50), 20:664. See also Instrument, Systems, and Automation Society (ISA)
ISCC-NBS Centroid (color) system, 7:310
I-section rayon, 11:262, 263
Ishizuka multipolar cell, 15:337
ISIS, 6:11
Ismelin Sulfate
molecular formula and structure, 5:155t
Iasmine, 2:86
Ismo, molecular formula and structure, 5:110t
ISO 2000 technically specified rubbers, 21:763t
ISO 9000 quality-control requirements, 25:369
ISO 9000 standards, 15:757
ISO 11600 sealant specification, 22:46. See also International Standards Organization (ISO)
ISO 14000 environmental management standards, 21:580–581
Iso acids, 5:28
Isoalcohols, 2:2
Isoamyl alcohol. See also 3-Methyl-1-butanol
solubility of boric acid in, 4:253t
Isoamylase, 10:288
Isoamyl chloroformate, molecular formula, 6:291t
Isoamyl salicylate, 22:16
physical properties of, 22:13t
Isobaric–isothermal ensemble, 1:33
Isobenzofurans, 12:259
Isobetanidine, 2:92
Isobornyl acetate, 3:231
Isoborneol, 3:231; 24:497, 528
Isobornyl acetate, 24:497, 528
Isobornylcyclohexanol (IBCH), 24:498
Isobutane
alkylation of, 2:175; 12:171
catalytic aerogels for preparation by isomerization, 1:763t
physical properties as propellant, 1:776t
reactivity as VOC, 1:792t
vapor pressure equation constants, 4:403t
vapor pressure ratio relative to n-butane, 4:404
Isobutane reactions, 13:698
Isobutane route, to methacrylic acid, 16:256
Isobutene, feedstock for higher aliphatic alcohols, 2:40
Isobutyl acetate, butyraldehyde derivative, 4:467
Isobutyl acrylate, physical properties of, 1:344t, 376t
Isobutyl alcohol
azeotrope with ethylenediamine, 8:487t
azeotropic mixtures, 4:395t
from isobutyraldehyde, 4:460
manufacture, 4:397
physical properties of, 4:394t
uses of, 4:398–399
Isobutylamine, 2:538t
physical and chemical properties of, 2:540t
specifications and economic data, 2:551t
Isobutyl bromide, physical properties of, 4:351t
Isobutyl chloroformate
DOT regulations for shipment, 6:301t
molecular formula, 6:291t
toxicity, 6:302t
Isobutylene, 4:402; 10:575–576. See also Butyl rubber
ammoxidation of, 16:256
butyl rubber polymers from, 4:433–454
catalytic aerogels for partial oxidation to methacrolein, 1:763t
chemical reactions, 4:406–410
comonomer with acrylonitrile, 1:451t
glass transition and melting temperature for soft/hard segments, 7:649t
living homo- and sequential block copolymerization of, 14:272
methyl methacrylate from, 16:254–256
monomer purification, 4:440
percentage in equilibrium distribution of butylenes at selected temperatures, 4:409t
physical properties of, 4:405t
polymerization mechanism, 4:434–440
polymerization of, 14:270; 22:43
terpenoids from, 24:480
vapor pressure equation constants, 4:403t
vapor pressure ratio relative to n-butane, 4:404
Isobutylene-based (C-4) process, for methyl methacrylate production, 16:244, 254–257
Isobutylene–isoprene–divinylbenzene terpolymers, 4:437
Isobutylene isoprene rubber (IIR), in tire compounding, 21:807
Isobutyl formate, physical properties, 6:292t
Isobutyl heptyl ketone (IBHK), 14:585
Isobutylidene diurea (IBDU)
butyraldehyde derivative, 4:462, 468
in nitrogen fertilizers, 11:117
Isobutyl isobutyrate, 4:460–461, 468
Isobutylparaben, antimicrobial used in cosmetics, 7:831t
Isobutyl propyl carbonate, molecular formula, 6:305t
Isobutyltrimethoxysilane, as silylating agent, 22:697
Isobutyaldehyde, 4:459; 14:584
animal toxicity, 4:466t
effect of unsaturation on toxicity, 2:69t
isobutyl alcohol manufacture from, 4:397
oxidative dehydrogenation of, 16:252
physical properties of, 4:459t
quality specifications, 4:465t
Isobutylraldol, butyaldehyde derivative, 4:461
Isobutyric acid, 4:460
oxidative dehydrogenation of, 16:251–252
physical properties, 5:35t, 37t
ISO-certified batch plants, 20:703. See also International Standards Organization (ISO)
Isocetyl alcohol, in cosmetic molded sticks, 7:840t
Isocitric acid, in citric acid cycle, 6:633
Isocontour surfaces, discrete, 10:340
Isocorrosion diagrams, 23:784
Isocratic chromatography, 3:827
Isocrotonic acid, physical properties, 5:31t
Isocyanate-based resins, in paper manufacture, 18:116
Isocyanate curing agents, 10:410
Isocyanate group, urethanes and, 22:36
Isocyanates
  carbon monoxide as reducing agent in preparation of, 5:11
  health and safety factors related to, 25:479–480
  reactions with PVA, 25:601
  in urethane polymers, 25:461–464
Isocyanatoethyl methacrylate, 16:242
Isocyanic acid, 8:200
  hemoglobin modifier, 4:117–118
Isocyanurates, 13:111
  formation of, 25:473
Isocyanuric acid, 8:199–219. See also Cyanuric acid
Isodecanol, toxicological properties of, 2:7t
Isodecyl alcohol, list pricing, 2:9t
Isodecyl myristate, cosmetically useful lipid, 7:833t
Isoelectric focusing (IEF), 9:738, 742, 746–747, 755
Isoelectric point (IEP), 20:479
Isoelectronic point, 8:674
  selected inorganic particles, 8:674t
Iso E Super, 24:485
Isoflavones, 17:668
Isoflavonoids, 17:297, 667
Isohexyl alcohol, list pricing, 2:9t
Isophoronic acid, physical properties, 5:31t
2H-Isopindol-4,7-diones, preparation of, 21:258–259
Isoindolines, 19:447
Isoindoline Yellow, pigment for plastics, 7:366t
Isoindolinones, 19:446
Isoionic point, 12:438–439
Isolait, molecular formula and structure, 5:111t
Isolated Pentagon Rule, 12:228
Isolated silanol groups, 22:380, 381
  silica surface chemistry and, 22:373
Isolation
  in fermentation, 11:43
  in ion implantation, 22:188
Isolectins, purification, 3:845
Isoleucine
  center of symmetry, 2:554
  content in cocoa and chocolate products, 6:368t
  systematic name, formula, and molecular weight, 2:555t
  taste profile, 2:605
D-Isoleucine, systematic name, formula, and molecular weight, 2:555t
DL-Isoleucine, systematic name, formula, and molecular weight, 2:555t
L-Isoleucine, systematic name, formula, and molecular weight, 2:555t
Isolongifolene, 24:543
Isoluminol, chemiluminescence reagent, 5:842–843
Isomalt, 12:40
ISO management system standards, in fine chemical production, 11:435. See also International Organisation for Standardization (ISO)
Isomenthol, 24:512, 513
(+)-Isomenthol, 24:521
Isomenthone, 24:539
Isomer distribution, 17:160
  for selected toluene reactions, 25:164t
Isomerism, coordination compounds, 7:577–579
Isomerization, 12:163, 404
  of n-butane, 13:697
  butylenes, 4:409–410, 410t
carbohydrate hydroxyl groups, 4:712
carboxylic acids, 5:44
catalytic aerogels for, 1:763t
of cyclohexane, 13:706
facilitation of, 20:100
maleic, 20:99–100
maleic anhydride 492, 15:493
paraffin, 16:844
in petroleum refining, 18:658–659
  radical, 10:600
of saturated hydrocarbons, 12:172–173
  using microbial enzymes, 16:403
Isomerization–disproportionation (I/D) process, 17:720
Isomerization process, 24:257
Isomerization reactions, microwaves in, 16:566–567
Isomerization technology, 15:217
Isomers
  of ascorbic acid, 25:748
  of fullerene, 12:233–234, 237
  of propylene glycols, 12:664, 665t
  of salicylic acid, 22:1, 2
torsional, 16:108
cis-Isomers, 21:15
threo-Isomers, 21:15
Isomethylpseudoionones, 24:563
Isomethyl-\(^{-}\)l-iones, 24:563
Isometric filler particles, in polymer blends, 20:356
Isomorphous monomers, 19:762
Isoniazid, 25:798
Isonicotinic hydrazide, 21:103
Isonitrile complexes, platinum, 19:656
Isonitrile-nitrile rearrangement, 21:149
Isononanoic acid, physical properties, 5:35t
Isononyl alcohol, properties of commercial, 2:12t
Iso-octadecanol, physical properties of, 2:3t
Isooctane, 4:407; 18:665
  spontaneous ignition temperature, 7:438t
  terminal activity coefficients of mixture with ethanol, 8:743t
Iso-octanol, toxicological properties of, 2:7t
Isooctyl alcohol
  production from butylenes, 4:425
  properties of commercial, 2:12t
Isoparaffins
  gas bulk separation, 1:618t
  in petroleum, 18:582
Isoparaffin separation, molecular sieves in, 16:841
Isopentane, 13:703
  polystyrene beads and, 23:406t
  reactivity as VOC, 1:792t
Isopentenyl pyrophosphate, 2:78
  role in cholesterol synthesis, 5:142
Isopentyl-mercaptan (3-methyl-but-2-enyl-thiol)
  beer breakdown product, 3:572
Isophorone, 14:585–589
  production from acetone, 1:164, 174, 175
  \(\alpha\)-Isophorone, 14:585
  \(\beta\)-Isophorone, 14:585
Isophorone diamine (IPDA), 10:395; 14:588
cis,trans-Isophoronediadime
  physical properties of, 2:500t
Isophorone dienamine–acrylonitrile reaction, 13:438
Isophorone diisocyanate (IPDI), 14:587–588; 25:463
Isophthalic (m-phthallic) acid (IPA); 10:216, 20:96, 102–103
Isophthalic resin(s), 20:114
  formulation of, 20:102–103
  mechanical properties of, 20:111–112
  strength characteristics of, 20:112t
Isophthalonitrile, 17:245
Isophthaloyl chloride, polymers derived from, 23:730
Isophthaloyl chlorides, 19:715
Isophytol, 24:502, 550
Isopolytungstate compounds
  structures of, 25:383–384
“Iso” prefix, 18:594–595
Isoprene, 24:501
  Alfre–Price parameters, 7:617t
  block copolymer synthesis, 7:647t
  butyl rubber polymers, 4:433
  commercial block copolymers, 7:648t
glass transition and melting temperature for soft/hard segments, 7:649t
  monomer purification, 4:440
  polymerization, 4:434–440
  production from acetylene, 1:219
reactivity as VOC, 1:792t
reactivity ratios in anionic copolymerization, 7:626t
synthesis of, 12:111
terpenoids from, 24:482
Isoprene units, coupling of, 24:469
Isoprenoids, 18:592, 24:468. See also Terpenoids

Isopropenyl acetate, 1:148; 14:596
m-Isopropenyl-α,α-dimethylbenzyl isocyanate (TMI), 25:463
Isopropenyl methyl ether, production from acetone, 1:163
Isopropoxytriisostearyl titanate, 25:129
2-Isopropyl-5-methylphenol, 24:526–527
Isopropyl acetate, separation from acetic acid–isopropyl acetate mixtures, 8:836–841
N-Isopropylacrylamide, 1:295
Isopropyl alcohol
azeotrope with acrylonitrile, 1:399t
dehydrogenation to acetone, 1:167–168, 169
one-step MIBK coproduction process from, 16:340–341
production from acetone, 1:163l
propylene hydrolysis to, 20:785
solvent for cosmetics, 7:832
synthesizing, 24:259
Isopropylamine, 2:537t
ACGIH TLV, 2:548t
physical and chemical properties of, 2:540t
specifications and economic data, 2:551t
Isopropylbenzene, 8:147
Isopropyl bromide, physical properties of, 4:351t
Isopropyl chloroformate
DOT regulations for shipment, 6:301t
molecular formula, 6:291t
toxicity, 6:302t
Isopropyl ether, 10:576, 577
uses for, 10:582
Isopropyl formate, physical properties, 6:292t
Isopropylidenedi(cyclohexylamine) manufacture, 2:505
physical properties of, 2:500t
Isopropylideneglycerol, preparation of, 16:554
Isopropylisocyanate, chiral derivatizing agent, 6:96t
Isopropyl methylphosphonofluoridate (Sarin), 5:819, 820
Isopropyl myristate, in cosmetic molded sticks, 7:840t
Isopropynaphthalenes, 17:75, 85
Isopropyl palmitate, in cosmetic molded sticks, 7:840t
Isopropylparaben, antimicrobial used in cosmetics, 7:831t
Isopropylstibine, 3:68
Isoproterenol, 5:185
Isoptin, molecular formula and structure, 5:119t, 119t
Isopulegol, 24:517–519, 526
Isoquinoline. See also Isoquinolines reduction of, 21:201
uses for, 21:206–208
Isoquinoline derivatives. See also Isoquinolines drugs, 21:207–208t
synthesis of, 21:201–206
uses for, 21:206–208
Isoquinoline N-oxide, 21:200–201
Isoquinolines, 21:182, 200–208
alkyl, 21:205
chemical properties of, 21:183
commercially available, 21:194t
miscellaneous synthetic reactions for, 21:204–205
physical properties of, 21:183
reactions of, 21:200–201
synthesis of, 21:201–206
toxicology of, 21:206
Isordil, molecular formula and structure, 5:110t
Isotactic polystyrenes (IPS), 10:23
Isothermal annealing, 23:288–290
transformation diagram for, 23:289
Isothermal dehydrogenation, 23:337
Isothermal evaporation, general separation heuristics for, 22:319–320
Isothermal forging, of titanium, 24:859
Isothermal furnace liners, 13:239–240
Isotactic nitration process, continuous, 17:253
Isothermal temperature, fatigue resistance and, 13:488
Isothermal transformation (IT) diagrams, 17:16; 23:277–280
for eutectoid steel, 23:279
Isothiazolone marine antifoulant, environmentally safe, 12:811–812
Isothiocyanates, 13:127; 23:625
4-Isothiocyanatophthalhydrazine, chemiluminescence reagent, 5:843
6-Isothiocyanobenz(g)phthalazine-1,4-(2H,3H)-dione (IPO), chemiluminescence reagent, 5:843
Isotonic injections, 18:714
Isotope distribution, 15:350
Isotope ratio mass spectrometry (IRMS), archaeological materials, 5:743
Isotopes, 21:287. See also Radioisotopes; Table of Isotopes; Thorium isotopes
hafnium, 13:79t, 89
hydrogen, 13:667–668, 759, 765t
manganese, 15:567t
selenium, 22:72–74
silicon, 22:481t
sodium, 22:761t
tellurium, 24:405
thallium, 24:628–629
tin, 24:786
zirconium, 26:622t
Isotope shifts, plutonium, 19:672
Isotopically labeled compounds, synthesis of, 13:664; 16:553
Isotopic mixture studies, 21:137–139
Isotopic mixtures, hydrogen, 13:765
Isotrate ER, molecular formula and structure, 5:110t
Isotretinoin, 25:789
Isotopic etching, in sensor fabrication, 22:267
Isotopic fibrous materials, 11:176–177
Isotopic microporous membranes, 15:798
Isotopic moldings, 23:397
Isotropic pitch-based carbon fibers, 26:734–735
Isotropie properties, silicon, 22:482, 483t
Isotropic soap phase, 22:726
Isovaleraldehyde. See also 3-Methyl butanal
butyraldehyde derivative, 4:462
Isovaleric acid, physical properties, 5:35t
Isoviolanthrone dyes, 9:331
ISO viscosity grades, 15:238
Isoxaben, 13:323
Isoxsuprine, 5:115
  molecular formula and structure, 5:111t
Isradipine, 5:132
  molecular formula and structure, 5:126t
Israel, advanced materials research, 1:696
Israeli Mining Industries pump–mixer–settler, 10:774, 775
ISS technique, 24:106–107. See also Ion scattering spectroscopy (ISS)
Istin, molecular formula and structure, 5:124t
Istle, 11:296
Itaconic acid, copolymerization with acrylic monomers, 1:380t
ITALPAT files, 18:248
Italy
  coal grades, 6:713t
  sulfur deposits in, 23:573
Iterative procedure, in phase equilibrium calculations, 24:685
Ito processes, 26:1022, 1023
  in control systems, 26:1047
ITRS 2004, 22:231t, 255
ITS-90 platinum resistance thermometer range, 24:444–447
ITS-90 radiation thermometer range, 24:452–455
Ixn, 3:383
Izod test, 10:177
I-Zone cameras, 19:307–308

J-acid, 9:402, 403
Jackets, heat-transfer, 16:717–718
Jacobsen’s ligand, 20:305
Jacobson-Stockmayer theory, in siloxane polymer manufacture, 22:558
Jacquinot advantage, 14:228
J-aggregation, 9:508
Jahn-Teller distortion, 22:203
Jahn–Teller effect, 6:611
Jai Tire process, 21:476
Jameson cell, 16:653
Jamming phase diagram, 12:18
Jams
  citric acid in, 6:645
  estimated maximum oxygen tolerance, 3:381t
JANAF Interim Thermochemical Tables, 12:107

Japan
  acrylic fiber production in, 11:189, 220
  advanced ceramics research, 1:704
  advanced materials research, 1:696
  aquaculture chemicals registered in, 3:219, 221t
  aquaculture history, 3:183
  aquaculture production, 3:189t
  chemical production in, 24:264
  cosmetics regulation, 7:824
  epoxy industry in, 10:352
  ethylene production in, 24:270
  ferroelectric materials in, 11:107–108
  fine chemical production regulation in, 11:435
  food additive regulations in, 12:37–38
  gallium production in, 12:346
  hot dry rock operations in, 12:543
  iodine production in, 14:366
  nanoceramics research, 1:706
  nanocomposite development, 1:706
  olefin fiber production in, 11:242, 243
  paper recycling in, 21:442–443
  patenting procedures in, 18:203, 216
  photovoltaic market in, 23:50, 51
  piezoelectric ceramics research, 1:708
  quality improvement in, 21:171–172
  regenerated cellulose fibers in, 11:250
  salt production in, 22:808
  Si-hybrid sealants from, 22:38, 39
  silicon carbide analysis in, 22:538
  silicon carbide standards in, 22:537
  sodium hydrosulfide applications in, 22:872
  sodium sulfide applications in, 22:874
  sulfur deposits in, 23:573
  titanium production of, 24:861, 862
  titanium sponge production in, 24:853
  titanium uses in, 24:866, 868
  Japanese atomic bomb survivors, medical monitoring of, 17:551
  Japanese Food Sanitation Law (1995), 12:37
  Japanese rice wine, 26:470
  Japanese seabream, world aquaculture production in 1996, 3:186t
  Japan Patent Information Organization (JAPIO), 18:241
  Japan wax, 26:210
    cosmetically useful lipid, 7:833t
  JAPIO files, 18:248
  Japonica Rice, 26:284
Jarlite, 2:364t
 meta-Jarlite, 2:364t
Jar molding, 12:732–733
Jarosite process, 26:567–568
Jar test, 22:56
Jarvis Patrick algorithm, 6:17
Jasmine, in perfumes, 18:368
Jaumave istle, 11:296
Javanol, 24:536
Jaw crushers, 16:611
JDF-20, 16:820
Jeans, number produced from one bale of cotton, 8:133t
Jeffox, commercial defoamer, 8:241t
Jeger’s ketal, 24:576
Jellies as colloid, 7:273t
citric acid in, 6:645
estimated maximum oxygen tolerance, 3:381t
Jet air diffuser aerators, 26:165
Jet dyeing, 9:208–210
Jet engines
 high throughput experimentation, 7:414t
titanium in, 24:866–867
Jet fuel, 18:668
Jet impingement reactors, 17:255
Jet-laced nonwovens, 17:507
Jet mixers, 16:707–708, 711
Jet penetration, 11:812
Jet pumps, 21:69–70
Jets
 confined, 11:759–760
 for continuous filament textile yarn, 11:256
Jet spray, 23:183
Jeweler’s rouge, 1:1
Jewelry. See also Gemstones
electroplating, 9:767
gold, 12:691, 701
platinum-group metals in, 19:632–633
recovery of silver from, 22:653
recycled, 12:699
silver in, 22:649, 657
Jewelry alloys, 12:691
J-function, 1:655
Jig dyeing, 9:207–208
Jigging, ceramics processing, 5:650–651
Jigging, stages of, 16:629
Jigs, 16:627–629
Job loading, 15:474
Job planning, 15:471
Job scheduling, 15:474
Jockey shorts, number produced from one bale of cotton, 8:133t
Johnson noise, silicon-based semiconductors and, 22:237
Joining
 ABS, 1:428
titanium, 24:857–858
Joint authorship, of copyright, 7:787
Joint Chemical Agent Detector (JCAD), 5:831–832
Joint Commission on Biochemical Nomenclature, 17:401–402
Joint dispersion relation, 14:834–835
Joint Expert Committee of Food Additives (JECFA), 24:240
Joint FAO/WHO Expert Committee on Food Additives (JECFA), 10:309, 310
Joint meeting on pesticide residues (JMPR), 18:541
Joint ownership, of copyright, 7:787
Joint product costing, 9:531
Joint replacement, 3:727–735
Joints, 3:722, 724
electrode, 12:752
piping system, 19:484
Joint Service Lightweight Integrated Suit Technology (JSLIST), 5:832
Joint Service Lightweight Nuclear, Biological, Chemical Reconnaissance System (JSLNBCRS), 5:832
Joint Service Standoff Chemical Agent Detector (JSLSCAD), 5:832
Joint Service Warning and Reporting Network (JWARN), 5:832
Jojoba oil, 26:212–213
Jojoba wax, cosmetically useful lipid, 7:833t
Jokai, Maurus, 22:798
Jominy test, 23:284
Jones’ separator, 15:449
Jones high intensity separator, 16:641
Jordan continuous refiner, 18:104–105
Josamycin, 15:287
 registered for use in aquaculture in Japan, 3:221t
Josephson coupling energy, 23:841
Josephson devices, HTS and LTS, 23:870–872
Josephson interaction, 23:841
Josephson junctions, 23:820, 821
Josephson string, 23:827
Josephson vortex, 23:827

Jost Report, 15:201, 202

Joule–Thompson effect, 12:374
Joule–Thomson expansion, 24:647, 648, 650–651
Joule–Thomson expansion cycle, 8:42–43
Joule–Thomson expansion coefficients, for hydrogen, 13:764

Journal bearing, 15:211
Journal of Biotechnology and Bioengineering, 11:10
Journal of Physical and Chemical Reference Data, 15:747, 769

Journal of Research of the National Institute of Standards and Technology, 15:769
Journal of Testing and Evaluation, 15:769

Journals, standards and specifications, 15:768–769
JTT-705, novel potential antihyperlipemic agent, 5:144t

Judd–Hunter color difference scale, 7:321
Juglone, in skin coloring products, 7:847
Juglone derivatives, 21:264–265
Juice softening, 23:463

Junctional heart rhythm, 5:107
Junction capacitance, 22:244
Junction devices, 22:180–181
Junction FETs (JFETs), 22:163, 164. See also Field effect transistors (FETs)

physics of, 22:241–245, 249
Junction potentials, 9:582
Junctions, stacking, 23:38–39. See also Josephson junctions; p–n junction

Just-in-Time technique, 21:172
Jute, 11:287, 288, 292, 293. See also China jute

bleaching, 4:72
uses of, 11:299t

Juvenile hormones, insect, 14:343–345

KA (cyclohexanol and cyclohexanol) preparation by oxidation of cyclohexane, 1:558–562
preparation from phenol, 1:562–564
Kabikinase, molecular formula and structure, 5:172t
Kady mill, 18:65
Kaempferol, antioxidant useful in cosmetics, 7:830t

Kainite, 5:785t; 20:626–627
Kaldo process, 14:742–743
Kaldo rotating converter, 16:151
Kalina cycle, 12:532
Kallikrein, 4:86–87
K$_2$ photon, 26:432
Kalrez, 7:641
Kaluszite, 5:785t
“Kaminsky–Brintzinger” systems, 16:82
Kaminsky catalysts, 17:702; 20:426
Kaminsky metalloocene catalysts, 20:191–192
Kamlolene acid, physical properties, 5:35t
Kanamycin A, 3:25, 30
Kanamycin B, 3:35
Kanawha, West Virginia, salt production at, 22:800
Kané chamber, 8:479
KAN$^R$ gene, 26:482, 491
KA oil, 1:558

Kaolin, 2:345t. See also Kaolins in dental ceramics, 8:275
powder used in cosmetics, 7:841t
uses, 6:688t
Kaolin clay, 11:388
as filler, 11:312
in paper manufacture, 18:108–109
processing, sulfur dioxide in, 23:668
in reinforced rubber, 22:703

Kaolin deposits, 6:687
occurrence and geology of major, 6:659–667

Kaolinite, 2:345t; 6:659–664, 686–687, 718
composition in bauxite used for alumina production, 2:346t
structure and composition, 6:668
in unit layer mixtures, 6:671
Kaolins, 6:686. See also Kaolin dry process, 6:673–675
estimated total production, 6:683
grades for polymer applications, 6:694t
properties relating to applications, 6:686t
uses, 6:686–696
wet process, 6:675–679

Kapok, 11:297
mechanical properties of, 11:290
uses of, 11:299t

Kappa numbers, 21:21, 47
for pulps, 15:9t

Kappa phase soaps, 22:729
hydration of, 22:731
in soap bar processing, 22:731
Karakul wools, 26:401
Karanal, 24:576
Karate Zeon, formulation, 7:564t
Kareit MC, formulation, 7:564t
Karl Fischer titrators, 23:477
Karr RPC plate, 10:779–780
Karstedt’s catalyst, in silicone network preparation, 22:563
Karstenite, 5:785t
Karyoplasts, 12:451, 458
Kashin-Beck disease, selenium and, 22:101
Kaspar’s dynamic filter, 11:384
Katapinands, 24:44
Kauri-butanol value, 23:89
Kazakhstan rhenium from, 21:683, 684, 685t, 687, 688
titanium production in, 24:846, 861
KBr disks, 14:238–239. See also Potassium entries
KCl-langbeinite ore, 20:628. See also Potassium chloride
KDF continuous pressure filter, 11:375–376
KDH pressure filter, 11:376–377
k-dimensional unit hypercube for Hammersley sequence sampling, 26:1012–1013 pseudorandom number generation and, 26:1002, 1010–1011
Kefauver-Harris Drug Amendments, 18:685
Kekulé ring formula, of benzene, 3:598–599
Kelcogel, 20:576
Kel-F, 7:641
carbon monoxide compatibility with, 5:4t
Kellogg Advanced Ammonia Process (KAAP), 19:621
Kelly leaf filter, 11:365
Kelp, 14:360
as biomass, 3:684
Kelsey centrifugal jig, 16:629
Keltan, 7:637
Kelvin, defined, 24:434–435
Kelvin, Lord, 24:433
Kelvin equation, 9:113; 19:182
Kelvin-Helmholtz instability, 11:762–763, 765, 772
Kelvin probe microscopy, 3:332
Kemira mixer–settler, 10:775
Kenaf, 11:292, 293–294
uses of, 11:299t, 300
Kendall structure, 19:204–205
Kennecott rhenium technology, 21:682
Kennecott wet chlorination plant, 22:84
Kenyaite, 22:455
Kenzen, molecular formula and structure, 5:152t
k-equation, 11:780
Keratan sulfate, 4:706
classification by structure, 4:723t
Keratinous materials, insect attack on, 26:402
Keratin proteins, in wool, 26:378–379
Kermesite, 3:41
Kerner equation, 11:309
Kernite (rasortie), 4:133t, 243t, 245; 5:785t
Kerogen, 18:572, 591
Kerosene
diffusion coefficient for dilute benzene gas at 20°C, 1:67t
as a petroleum product, 18:667–669
solvent in commercial gas absorption processes, 1:26t
spontaneous ignition temperature, 7:438t
surface tension, 8:244t
Kerr effect, 17:454
Kerr effect materials, comparison of, 17:456t
Keshan disease, selenium and, 22:101
Kessner brush aerators, 26:162
Kestner-Johnson dissolver, 22:672
Kestner process, 2:723
Ketals, aroma chemicals, 3:253
Ketazine processes, 13:576, 579–581
disadvantages of, 13:581
Ketene(s), 10:484
in acetic anhydride production, 1:147, 156
for acrylate production, 1:357–358
flash vacuum pyrolysis for generating, 21:149
from pyrolysis of acetone, 1:163
Ketimines, 10:394–395
α-Keto acids, amination, 2:572
β-Ketoester chelates, 25:91
α-Ketoglutaric acid, in citric acid cycle, 6:633
Ketone–water azeotropes, 14:563
Ketone–water mixture properties, 14:568–569t
Ketose, 4:696
Fischer formula, 4:697
$\alpha$-Ketoxime, reduction, 2:572
Kettle soap making, 22:723, 736–737
Kettle-type reboilers, 19:510
Kevlar, 10:211, 212; 19:742; 20:79, 399
TD resins in, 22:589
Kevlar fibers, 13:373–376; 26:760
Kew laboratories, 11:248–249
Key-and-lock principle, 7:574
Keyword-in-context (KWIC) index, 18:239
KF alumina, 5:337
Kharrasch process, 19:114
Kidney, citric acid in, 6:632t
Kidney Disease Outcome Quality Initiative (K/DOQI), 26:823
Kidney failure, 26:813
Kidney function, normal, 26:813
Kieselguhr; 22:402
compression effects in centrifuges, 5:513, 514
dental abrasive, 8:339
Kieserite, 5:785t; 20:627
Kikuchi lines, 24:47
Killed steels, 22:515; 23:291
Killed vaccines, 25:487
Killer fog, 1:788
Killer plasmid, 26:482
Killer toxins, 26:452
Kiln drying, of wood, 26:341–342
Kiln furniture, 21:481
Kilning
in beer making, 3:567
of malts, 15:529–531
Kiln reactor, 21:334
Kilns
cement, 13:178
countercurrent shaft, 15:47–48
incineration, 13:174
lightweight aggregate, 13:179
lime, 15:46
parallel-flow regenerative, 15:50–52

2-Ketogulonic acid (2-KGA)
in ascorbic acid synthesis, 25:753, 754
conversion to ascorbic acid, 25:755, 758
Ketohexose, 4:696
Ketoisophorone, 14:589
Ketolides, 15:280, 286–287, 303–304
Ketone bodies, role in cholesterol synthesis, 5:142
Ketone oxidation, 14:570
Ketone peroxides, 14:281
as free-radical initiators, 14:291–292
Ketones, 10:488; 14:562–606. See also Aldehydes
achiral derivatizing agents, 6:96t
adsorbent affinity, 1:674
aliphatic, 14:581–585
amine preparation using, 14:570
aroma chemicals, 3:249–252
aroma compounds in roasted coffee, 7:256t
aromatic, 14:592–593
in beer, 3:582t
in carbohydrates, 4:696
chemical properties of, 14:565–571
common, 14:564–565t
cyclic, 14:590–592
diketones, 14:593–599
economic aspects of, 14:571
enolboration of, 13:672
environmental aspects of, 14:575–581
flammability and stability of, 14:578–580t
health and safety factors related to, 14:571–575
industrial, 14:572–575t
monoterpenoid, 24:536–541
oxidation of, 14:570
physical properties of, 14:566–567t
polarity relative selected molecules, 8:813t
predicted deviations from Raoult’s law
based on hydrogen-bonding interactions, 8:814t
reactions with acetaldehyde, 1:103–104
reactions with alkanolamines from olefin oxides and ammonia, 2:127–128
reactions with alklyphenols, 2:208–210
reactions with aluminum, 2:285
reactions with boron trifluoride, 4:144t
reactions with bromine, 4:302
reaction with acrylamide, 1:289, 292
reaction with phosgene, 18:805
Kilns
reduction of, 14:565–570
reduction to chloroform, 6:284
thermal stability of, 14:570–571
toxicity of, 14:576–577t
unsaturated, 14:585–590
in waxes, 26:206
Kiln reactor, 21:334
Kiln furniture, 21:481
Kiln reactor, 21:334
Kiln drying, of wood, 26:341–342
Kiln furniture, 21:481
Kilning
in beer making, 3:567
of malts, 15:529–531
Kiln reactor, 21:334
Kilns
cement, 13:178
countercurrent shaft, 15:47–48
incineration, 13:174
lightweight aggregate, 13:179
lime, 15:46
parallel-flow regenerative, 15:50–52
Kimberlite pipes, 8:519, 520, 522
Kimitsu injection (KIP) process, 23:264
Kimura-Sourirajan analysis, 21:661
Kinematic viscosity, 15:206; 21:704
exponents of dimensions in absolute, gravitational, and engineering systems, 8:584t
Kinetically controlled epoxy curing reactions, 10:423
Kinetic barriers, 11:529
Kinetic friction, 15:224
Kinetic incompatibility, in acrylonitrile copolymerization, 11:203
Kinetic measurements, 14:607–629. See also Very fast kinetics
combined methods for unstable reagents, 14:621
experimental variation of chemical rates with temperature and pressure, 14:622–623
frequency domain, 14:621–622
macroscopic behavior and the rate law, 14:607–610
measurement strategies based on perturbations, 14:614–621
microscopic models used in, 14:623–629
mixing methods, 14:611–614
on one or a few molecules, 14:622
Kinetic models, for cracking furnace design, 10:606–607
Kinetic parameters
converting data into, 13:433–435
effects of temperature and pressure on, 13:407
Kinetic profiles, fermentation, 11:29
Kinetic pumps, 21:54–56
types of, 21:63–70
Kinetic rates, 14:607
Kinetics. See also Adsorption kinetics
batteries, 3:421–423
chemical vapor deposition, 5:810–812
colloids, 7:291–292
controlled-release pesticides, 7:557–558
crystallization, 8:103–107
electrochemical reactions in corrosion, 7:801–804
of growth and production, 11:29–31
ion-exchange, 14:396–398
mammalian cell growth, 5:348–349
methanol, 16:301–302
of MOCVD, 22:154
of PVC polymerization, 25:669
of synthetic latex manufacture, 14:713–715
zeolite, 16:827
of Ziegler-Natta polymerization, 26:521–526
Kinetic studies, of esterification reaction, 10:473–474
Kinetin, 13:23t, 28–29
Kinidin, molecular formula and structure, 5:90t
Kiminogen, 4:86–87
Kirchhoff-Love hypothesis, 26:780
Kirchhoff’s law, 14:234; 23:4
Kish, leaching, 12:783–784
Kiss coater, 7:12
Kitasamycin, 15:287
Kivcet lead smelting process, 14:739–740; 16:146
Kjeldahl digestion, 22:88
Kjeldahl nitrogen determinations, for paper, 18:99
Kjeldahl technique, 13:87
klado designation, for boron hydrides, 4:174
Klaproth, Martin H., 11:398
Klatte, Fritz, 25:628
Kleiner nitric acid process, 17:186
Klosterboer-Rutledge (KR) model, 19:356
Kluveromyces lactis, 12:479
genome of, 26:450t
Klystrons, 23:135–136
K-matrix methods, 14:239
Kneading process, in paper recycling, 21:439–440
Knelson concentrator, 16:632
Knife coatings, 7:7–8, 10–11
method summarized, 7:5t
Knife-over-roll chemical finishing, 17:513
Knight and Allen method, for reducing sugars, 23:475
Knitgoods, dyeing, 9:171, 200, 201
Knitted fabrics, 24:619–620
Knitting, 11:178
cotton, 8:17–18
Knock, engine, 12:390–392
Knock-in mice, 12:462
Knock-out mice, 12:462
conditional, 12:467
Knock sensors, 12:394
Knoevenagel condensation reactions, 16:545
  microwaves in, 16:563–564
Knoop hardness scale, 1:3, 4 selected materials, 1:3t
Knoop indentation hardness of silicon carbide, 22:527t
  of vitreous silica, 22:429
Knorr ringite, 6:471t
Knot tenacity, 19:742
Knot tie-down performance, of sutures, 24:213, 215–216
Knowledge-based economy, 21:611
Knowledge sources, extra-organizational, 21:626–627
Knowledge sufficiency, 21:627–628
Knox Out 2FM formulation, 7:564t
  toxicity, 7:564t
Knudsen diffusion, 15:837
  macropore diffusion, 1:596, 597
Knudsen diffusivity, 15:730
Knudsen number, 11:747
KoA (mass transfer coefficient times surface area), 26:818, 819
Kobe channel enclosure, 19:509
Koch, Robert, 11:7
Koch carbonylation, 5:6
Kocheshkov redistribution reaction, 24:810, 811
  in diorganoginot preparation, 24:820
  in monoorganoginot preparation, 24:825
  in triorganoginot preparation, 24:816
Koch-Haaf reaction, 12:187
Koch reaction, amyl alcohols, 2:763, 768
Kodachrome film, 19:248–249
Kodachrome process, 19:242
Kodacolor film, 19:242
Kodacolor system, 19:241
Kodaflex TXIB, 4:468
Kodak DryView recording film, 19:349
Kodak instant films, 19:311–312
Kodak Personal Picture Maker PPM 200, 19:321
Kodel, 20:33, 37
Koenigs–Knorr reaction, 4:704
Kogenate, cell culture technology product, 5:346t
Kohetisho, 12:37
Kohleol–Integrated Gross Oil Refining (IGOR+) process, 6:844, 848
Kohler, George, 11:12
Kohrausch’s law of independent migration of ions, 3:416
KOH plants, environmental awareness in, 20:634. See also Potassium hydroxide
KOH solution, 12:215
meta-Koksowy coal grade (Poland), 6:713t
Kolbe-Schmidt reaction, 2:208
  of salicylic acid synthesis, 22:7–8
Kolmogoroff microscale, 16:697
Konica Dry Color System, 19:348
Konjac glucomannan, 4:724t
  classification by structure, 4:723t
Konjac mannan, classification by structure, 4:723t
Korean Peninsula, natural graphite in, 12:780
Korean Republic aquaculture production, 3:189t
  nanocomposite development, 1:717
  nanofiber research, 1:722
Korobov sequence, in quasi-Monte Carlo sampling, 26:1011
Kosher salt, 22:805
Kosmotropes, 3:843–844
Kovanol, 24:486
Kovar, 13:522; 17:838, 841
Kozeny-Carman approximation, 11:797
Kraft boundary
  in soap bar processing, 22:728
  of soap–water system, 22:726
Kraftt phenomenon, 24:125
Kraftt point, 24:128
  of mixed crystalline soap, 22:730
  of soap–water system, 22:726
Kraftt temperature, 19:342; 24:125–126, 145
Kraft chemical pulp process, 18:94
Kraft lignins, 15:19–20
  applications of, 15:19–20
Kraft paper process sodium sulfates in, 22:869
  sodium sulfides in, 22:874
Kraft process, 4:45; 21:43; 23:541
Kraft pulp bleaching, 14:63
Kraft pulping, 21:22, 23
Kramerite, 4:133t
Kramers–Kronig relationships, 7:338
Kramers–Kronig (K-K) transformation, 14:231
Kraton D, commercial block copolymer, 7:648t
Kraton G, commercial block copolymer, 7:648t
Krausening, in beer making, 3:584
Krebs cycle, 6:632–633
Kremser–Brown method, of bubble tray absorber design, 1:85
Kreysiginone, 2:91
KrF laser, 14:692, 693. See also Fluorine (F); Krypton (Kr)
Krieb–Dougherty equation, 21:717
KRIMZ reciprocating-plate column, 10:780
Krinovite, 6:471t
Kritchevsky amides, 2:453, 454
Kroll, Wilhelm J., 24:838
Kroll-Betterton debismuthizing process, 14:751. See also Betterton–Kroll process
Kroll process, 13:84–85; 15:337; 17:140
in titanium manufacture, 24:851–853
Kroll zirconium reduction process, 26:631
KRW gasifier, 6:797–798, 828
Krypton (Kr), 17:344
commercial, 17:368t
complex salts of, 17:333–334
doubly ionized, 14:685
hydroquinone clathrate of, 14:183
in light sources, 17:371–372
from nuclear power plants, 17:362
physical properties of, 17:350
Krypton-85, 17:375, 376
Krypton compounds, 17:333–334
Krypton derivatives, 17:334
Krypton difluoride, 17:333, 336
uses for, 17:336
Krypton fluorocationic salts, 17:333
Krypton lasers, 14:684. See also KrF laser in laser light shows, 14:688
Krypton–xenon, purification and separation of, 17:361–362
Krypton–xenon column, 17:359, 360
Kubelka–Munk equation, 7:317–318; 14:231; 23:127
Kubelka–Munk theory, 19:381; 24:111
Kubierschky three-column sequence, 8:828–832
Kubierschky two-column sequence, 8:832
Kuehl experimental design text; versus other texts, 8:395t
Kugelrohr apparatus, 26:843, 844
Kuhni column, 10:782
Kuhni contacters, 10:778
Kujimycins, 15:280
Kunster marrow needle, 3:743
Kurnakov test, 19:656
Kurrol’s salts, 18:848
Kuruma shrimp, common and scientific names, 3:188t
K X rays, 21:311
KX zeolite. See Zeolite KX
Kyanite, 2:345t
in clays, 6:718
in coal, 6:718
Kynar SL, 7:641
Kynol fibers, 18:797
Kyoto Protocol, 11:721
KY zeolite. See Zeolite KY
L-644-969, 13:14, 15
Laballenic acid, physical properties, 5:33t
Labdane family, 24:573
Labeled compounds
decomposition of, 21:276
purification of, 21:275
synthesis of, 21:274–275
Labeled magnitude scales, in flavor characterization, 11:513
Labeled nucleotide triphosphates, 21:281
Labeling
of cosmetics, 21:579
of hazardous materials, 25:341–343
of pharmaceuticals, 18:718–719
of spices, 23:159–160
of wine, 26:329–330
Labels, fluorescent, 17:635
Lab equipment, automated, 9:752
Labetalol HCl, 5:167
molecular formula and structure, 5:157t
Lab/medical uses, of mercury, 16:41–42
“Lab-on-a-chip” (LOC) devices, 20:683;
26:959, 973–975
future directions for, 26:976–977
product design for, 5:769–771
Laboratoire Aimée Cotton, 24:755
Laboratory, measurement quality in,
21:164
Laboratory applications, for noble gases, 17:370–371
Laboratory devices, gas–liquid mass transfer, 15:690–692
Laboratory extractors, 10:768
Laboratory flocculant testing, 11:638–639
Laboratory hydrogen-producing reactions, 13:766–767
Laboratory Information Management System (LIMS), 21:163–164; 24:349
Laboratory information management systems
gas chromatography, 6:432
liquid chromatography, 6:442
Laboratory instruments, calibration of, 21:161
Laboratory mineral sieves, 16:615–616
Laboratory notebook elements of, 18:170
record of invention and, 18:168–170
sample page from, 18:169
Laboratory performance, tracking, 21:164
Laboratory reports, 12:91
Laboratory results, communicating, 21:164
Laboratory testing, quality control and, 21:159–160
Labor availability, plant location and, 19:528
Labor costs, 9:533
Lab-scale bench-top pilot plants, 19:459
L-a-b tristimulus system, 19:585–586
LabVIEW program, 26:974
Laccase-catalyzed oxidation, 10:303
Laccases, 21:48
as bleaching agents, 4:67
Lacidipine, 5:132
molecular formula and structure, 5:127t
Lacipil, molecular formula and structure, 5:127t
Lacirex, molecular formula and structure, 5:127t
Lacquer resins, VDC copolymers in, 25:734–735
z-Lactalbumin, properties of standard, 3:836t
β-Lactam antibiotics, 24:603
β-Lactamases, 3:33
Lactamide, 14:118
β-Lactams, 3:32–34
bacterial resistance mechanisms, 3:32t
Lactase, 10:296
Lactic acid, 8:174; 12:45; 14:114–126. See also Lactide (LA)
annual consumption of, 14:123
in beer, 3:582t
chemical properties of, 14:116–118
conversion of corn starch to, 18:569
economic aspects of, 14:123
esters, 18:569
in fermentation, 11:7
manufacture of, 20:297–298
manufacturers of, 14:123
manufacturing and processing of, 14:123
physical properties of, 14:114–115
as a plant growth regulator, 13:36
production volume of, 14:114
in skin aging products, 7:843
specifications, quality control, and analytical methods for, 14:124
technical-grade, 14:124, 125
thermodynamic properties of, 14:115t
uses for, 14:124–126
worldwide consumption of, 14:119
L-Lactic acid, 13:25t
low molecular weight polymers of, 14:126
Lactic acid bacteria in distillers’ fermentations, 26:470
as host systems for gene expression, 12:478
Lactic-acid-based polymers, synthesis methods for preparing, 20:298
Lactic acid derivatives, 14:124
Lactic acid polymers, 14:125–126
Lactide (LA). See also Lactic acid entries early attempts to polymerize, 20:299
high purity, 14:123
polymerization mechanisms for, 20:300
ring-opening polymerization of,
20:298–311
Lactide polymers, manufacture of, 14:122
Lactisole, 24:246
Lactitol, 12:40
Lactobacillic acid, 5:36t
Lactobacillus, 12:478
Lactococcus, 12:478
Lactoferrins, 18:258
Lactones, 10:497; 12:663–664
aroma chemicals, 3:256
in beer, 3:582t
Laconitryl, 8:174
Laconitization, 10:499
in ascorbic acid biosynthesis, 25:763–764
Lactose, 4:702
uses for, 4:714; 23:487–488
Lactoylactic acid, 14:116
lacZ gene, 12:462
Ladder polymers, conducting, 7:522
Ladder studies, 10:419
Ladenburg’s formula, 23:132
Ladle metallurgy, 23:263–265
principal purpose of, 23:265
Lady Godiva reactor, 17:593
Laevosandol, 24:536
Lager beer fermentations, 26:466
Lagering, in beer making, 3:584
Lager yeast, 3:580
Lagoons
in biological waste treatment, 25:901t, 902–903
for sludge disposal, 25:914
Lagrangian-based model, 11:822
Laidomycin, 20:120–129, 133, 136
Laked azo pigments, 19:431
Lake pigments, 19:438
Lakes
aquaculture systems, 3:191
FD&C, 12:50
lithium in, 15:123
Lambda-cyhalothrin, in microcapsule formulations, 7:564t
Lambda-derived cloning vectors, 12:504–506
Lambda sensor, 10:56
Lambent, commercial defoamer, 8:241t
Lambert–Beer–Bouguer law, 23:126. See also Beer’s Law
Lambert–Beer law, 24:89. See also Beer–Lambert expression
Lambert cosine law, 23:127
Lambs
effects of β-agonists on, 13:15–16
effects of ovine somatotropin >> nd human growth hormone-releasing factor in, 13:11t
growth hormone-releasing factor in, 13:13
Lamb waves, acoustic wave sensors and, 22:270
Lamb wave technique, for plate inspector, 17:429–433
Lamella clarifier/thickener, 22:63, 67–69
Lamellar liquid crystals
in super-fatted mixed soap formulation, 22:730
surfactants and, 22:725
triethanolamine stearate and, 22:729
Lamellar micelles, 24:124
Lamifiban, 5:173
molecular formula and structure, 5:171t
Laminarans, 4:724t; 20:453
classification by structure, 4:723t
Laminar diffusion flames, 7:446–447
Laminar flow, 13:245; 14:704
in microfluidics, 26:960–961
relationships for estimating, 15:719–721t
Laminar flow elements, 11:782
Laminar flowmeters, 11:662–663
Laminaria, common and scientific names, 3:188t
Laminar premixed flames, 7:443–445
Laminar regime, viscous liquid blending in, 16:690–691
Laminated composites, 26:760
Laminated glass, as a solar energy material, 23:5
Laminated papers, in food packaging, 18:36
Laminated plate theory, 26:780
Laminated-textile bags, 18:10–11
Laminate materials, properties of, 17:844t
Laminates, 26:752–754
electrical, 10:453–457
fabrication of, 20:112
polyimide, 20:285
printed circuit board, 17:843
strength of, 26:782–783
Laminating, ceramics processing, 5:655
Laminating resins, amino acid resins, 2:630–631
Lamination, paper, 3:224t
Lamination inks, 14:159
Lamination, paper, 18:220
Laminating resins, amino acid resins, 2:630–631
Lamproite pipes, 26:388
Lampblacks, 4:112
Land cost, 9:527
Land cover, 8:438–439
Land-farming, 3:768
defined, 3:759t
Landfill gas, 25:880
Landfill leachate treatment, reverse osmosis in, 21:646–647
Landfill liners, 25:877–878
Landfills, 25:876–881
  design and construction of, 25:877–880
  economics of, 25:881
  monitoring of, 25:881
  operation of, 25:880–881
  for sludge disposal, 25:914
  in solid waste management, 25:863, 864, 869
toxic chemicals in, 25:876t
  waste PVC in, 25:680, 682
Landolal, 24:486
Land spreading, solid waste volume
  reduction via, 25:870, 874
Land transport, of food, 21:566
Land treatment, defined, 3:759t
Land use changes, effect on stream water,
  26:27–28
Lane and Eynon Constant Volume
  Procedure, for reducing sugars, 23:475
Laneth-5, cosmetic surfactant, 7:834t
Langbeinite, 5:785t; 20:627, 628
  in chemical fertilizer, 20:629
  screen analyses of, 20:629t
Langelier saturation index (LSI), 26:142–143
Langevin Dynamics, 16:748
Langite, 7:773
Langmuir–Blodgett (LB) technique, 17:55–57
Langmuir–Hinshelwood equation, 19:79, 80
Langmuir–Hinshelwood mechanism, 19:78
Langmuir–Hinshelwood type rate
  expressions, 25:192
  (LHHW) formulation, 21:341
Langmuir isotherm, 1:592–593, 626; 11:169
Langmuir monolayer formation, 17:56
Lanham Act, 25:259, 261, 265
Lanicor, molecular formula and structure,
  5:98t
Lankamycins, 15:280
Laonol, 26:208–209
cosmetically useful lipid, 7:833t
  in cosmetic molded sticks, 7:840t
Lanosterol, 2:104
Lanoteplase, 5:178
Lanoxicaps, molecular formula and
  structure, 5:98t
Lanthanide chelates, 14:149
Lanthanide distribution, in mineral
  sources, 14:637t
Lanthanide–gallium compounds,
  12:353–355
Lanthanides, 1:469–470; 14:630–654;
  25:392. See also Rare-earth entries
  arc and spark spectra of, 14:633
  cation binding of, 24:41
  electronic configurations, 1:474t
  economic aspects of, 14:643–647
  health and safety factors related to,
    14:647–648
  ionic radii, 1:489t
  major producers of, 14:647t
  mining of, 14:636–638
  occurrence of, 14:630–631
  processing of, 14:638–643
  properties of, 14:632–636
  thorium separation from, 24:756
  uses for, 14:648–652
Lanthanide series, 13:569
  solvent exchanges on, 13:442
Lanthanoide metallocene catalysts,
  16:79–81
Lanthanum (La), 14:630, 631t, 634t;
  25:374, 387
electronic configuration, 1:474t
  in M-type ferrites, 11:69
Lanthanum–barium–copper–oxide ceramic
  superconductivity in, 5:603
Lanthanum-based compounds, 14:646
Lanthanum carbide (1:2), 4:649t
Lanthanum chromite, 5:598
Lanthanum cobaltite, 5:598
Lanthanum cobalt trioxide, uses, 7:242t
Lanthanum hydrides, 13:627
Lanthanum nickelite, 5:598
Lanthanum–strontium–copper–oxide
  ceramic, superconductivity in, 5:604
Lanthanum titanium oxide, 5:598
Lanoxide process, 16:167
Lapis lazuli, color, 7:333
Laplace’s equation, 9:597, 613; 11:743
Laplace pressure, 10:127
Laplace transforms, in process control,
  20:688–689
Lapping papers and films, 1:10, 15–16
Laracor, molecular formula and structure,
  5:156t
Larch arabinogalactans, 4:718
LaRC-TOR series polyimides, 20:282
Lard, in soap making, 22:735
Large block carbons, 12:764
Large bulk superconductors, 23:869
Large coal dense medium separator (LARCODEMS), 16:634

Large eddy simulations (LES), 11:778–779
Large-grain specialty sugars, 23:481–482
Large Hadron Collider (LHC), 23:861–862
Large molecule permeation, in barrier polymers, 3:388–390
Large molecules, diffusivities of, 15:673t
Largemouth bass aquaculture, 3:183
common and scientific names, 3:187t
Large pore silica zeolites, 16:817–818
Large-scale fermentation, of
Large-pore gels, drying rate of, 23:67
Large tanks, blending in, 2:2
Large-scale integration (LSI) for lab-on-a-chip, 26:974
vitreous silica in, 22:442–443
Large-scale pharmaceutical synthesis, 18:722–746. See also Commercial-scale pharmaceutical operations
bench-scale experimentation in, 18:726–729
of nevirapine, 18:737–744
pilot plant in, 18:729–733
reaction stoichiometry and order of addition in, 18:728–729
reaction temperature in, 18:727–728
reaction time in, 18:728
route selection to molecules in, 18:724–725
scale-up for, 18:722–736
selection of reaction solvents for, 18:726–727
solid-state requirements in, 18:729
synthetic strategy in, 18:723–726
Large-scale polymer processing, supercritical fluids in, 24:20–22
Large tanks, blending in, 16:705–708
Larixol, 24:576
Larmor frequency, 23:857
Laromin C-260, 2:505
Larox chamber filter, 16:659
Larson-Miller parameter, 13:478, 479
Larval ecdisis, compounds affecting, 14:343
Larvik furnaces, 21:395–396
LASIII glass, matrix for ceramic–matrix composites, 5:55t
LAS acid, 23:554. See also Linear alkylbenzene sulfonate (LAS)

“Lasagna process,” in soil and ground water treatment, 25:844
Lasalocid, 20:132, 133, 135, 136, 139
Lasalocid A, 20:136
Lasentec time-of-flight analyzer, 18:150
Laser ablation in an inert gas background, 24:741
for thin-film deposition, 24:740
Laser ablation deposition (LAD), 24:739
Laser ablation spectroscopy (LAS), archaeological materials, 5:743.
See also LAS processing
Laser based patternators, 23:194
Laser cavity, 14:671–672
Laser chemical vapor deposition (LCVD), 5:806–807
Laser diffraction equipment, in particle size measurement, 18:153–154
Laser diffraction methodology, 23:193–194
See also Planar cavity surface-emitting laser (PCSEL) diodes; Vertical cavity surface-emitting laser (VCSEL) diodes
compound semiconductor-based, 22:179
Laser Doppler velocimetry (LDV), 11:784
Laser Doppler velocimeters, 11:675
Laser-drilled surgical needles, 24:206
Laser dye energy levels, 14:702–703
Laser fabrication techniques, titanium, 24:857
Laser flash photolysis, 13:429
Laser frequency, in Raman scattering, 21:324
Laser gain, 14:661–662
Laser glass, 12:616
Laser grooved buried contact cell (LGBG), 23:45–46
Laser heating, case hardening by, 16:200
Laser heterodyne radiometry, 23:142
Laser-induced breakdown spectroscopy (LIBS), archaeological materials, 5:743
Laser-induced EDC cracking, 25:646
Laser-induced fluorescence, 23:127
Laser-induced fluorescence imaging, application in combinatorial chemistry, 7:404
Laser-induced plasma spectroscopy (LIPS), archaeological materials, 5:743
Laser isotope separation, 25:416–417
Laser light, 14:655–656
Laser light sources, in photochemical technology, 19:107–108
Laser molecular beam epitaxy, fabrication method for inorganic materials, 7:415t
Laser photochemical vapor deposition (LPCVD), 19:114–116
Laser pointers, 14:678
Laser-promoted dehydrohalogenation, VDC polymer degradation via,
25:718–719
Laser-pumped dye lasers, 14:702, 703–704
Laser Raman spectroscopy, of silicate solutions, 22:456–457
Laser rods, 14:658
Lasers, 9:729; 14:654–706. See also Lasing atomic systems in, 14:666–669
basic mechanism of, 14:656–661
buried heterostructure, 14:701
carbon dioxide, 14:693–696
carbon monoxide application, 5:24
cavity optics and, 14:669–672
classes of, 14:666–667
cutting applications of, 14:695–696
dye, 14:702–705
effect of loss in, 14:670
excimer, 14:691–693
fast pulse production in, 14:673–678
fiber optics and, 11:129
in fine art examination/conservation, 11:412, 413
gain and loss in, 14:664–666
gas, 14:681–696
helium–neon, 14:654–655, 681–683
infrared, 22:180
ion, 14:683–688
modelocked, 14:677–678
molecular nitrogen, 14:688–691
nonlinear (harmonic) light generation, 14:678–680
passive mode-locking in, 20:514
in photomedicine, 19:121
practical aspects of, 14:661–666
silicon carbide in, 22:530–531
silver and, 22:639, 640
silver powder and, 22:646
solid-state, 14:696–699
steady-state conditions of, 14:664–665
theoretical aspects of, 14:655–661
thermal sensors in, 14:695
tunable uv–vis, 23:144
use in crime laboratories, 12:102
uses of, 23:128
in vitreous silica manufacture, 22:415
Laser scanning confocal microscope (LSCM), 16:471, 483, 484
Laser scattering, particle size distribution and, 19:378
Laser systems
glass, 12:583–584
vitreous silica in, 22:440–441
Laser technology, polymethine dyes in,
20:514–515
Lasik surgery, 14:693
Lasing, criteria for, 14:661–664
Lasing transitions, 14:669
Lasix, 5:169
molecular formula and structure, 5:164t
LAS processing, 23:549. See also Laser ablation spectroscopy (LAS)
La–Sr–Cu–O system, superconductivity in, 23:838
Latchup mode, 22:252
Latent acid catalysts, in liquid-injection molding, 18:795
Latent heat of vaporization, in heat pipes, 13:230
Latent-image centers, 19:189
formation of, 19:200–201
Latent-image formation in photography, 19:199–202
in the photothermographic process, 19:353–355
Latent images
stability of, 19:354
thermal migration of Ag+ intermediate complexes to, 19:355–358
Latent toxicity, 25:203, 204t
Lateral force microscopy, 3:332
Lateral guidance principle, 23:865
Laterites
chromium in, 6:474
gallium in, 12:339–340
Lateritic nickel ores, 17:89
nickel extraction from, 17:92–93
Latex (latices), See also Latex technology;
Latices
cement additive, 5:467
coating resins, 7:95–96
defined, 14:706
property improvement through compounding, 14:711
VDC copolymers in, 25:735–736
viscosity of, 14:710
Latex acrylic polymers, 22:41–43
Latex agglutination immunoassays, 14:141
Latex-based paper coatings, 18:124–125
Latex manufacturing equipment, 14:720, 721
Latex monomer production, exhaust from, 10:106
Latex paints
  formulation of, 18:61t
  poly(vinyl acetate), 25:583
Latex polychloroprene grades, 19:852
Latex polymers, 10:129–130
  molecular weight of, 25:584
Latex resins, 18:57
Latex silicones, 22:34–35
Latex technology, 14:706–727. See also
  Latex (latices); Latices
  high solids emulsions, 14:722
  inversion of nonaqueous polymers, 14:722–723
  latex applications, 14:711–712
  latex properties, 14:708–711
  synthetic latex manufacture, 14:712–723
Latex-type coatings, 18:55
Lather volume, of soaps, 22:731, 742, 743
Latices. See also Latex (latices); Latex technology
  applications for, 14:708, 711–712
  early use of, 14:707
  electrostatic stability of, 19:856
  as nonwoven binders, 17:508
  in paper, 18:99
  polychloroprene, 19:854–861
  synthetic, 14:707
Latin hypercube Hammersley sequence sampling (LHSS), 26:1013–1015
Latin hypercube sampling (LHS), 26:1005, 1007–1011, 1012, 1013, 1014, 1015
  future trends in, 26:1047
  in process synthesis and design, 26:1041
  for risk analysis, 26:1045
  in supply chain management, 26:1043
Lattice constant, of binary compound semiconductors, 22:145, 146–147t, 148
Lattice disorder, 14:435
Lattice-hardening reactions, 17:447
Lattice misfit/mismatch, 13:498, 501
Lattice mismatched substrates, heteroepitaxy on, 22:160
Lattice models, of microemulsion behavior, 16:431
Lattice parameter determination, diffractometers in, 26:428
Lattice polymers, fullerene, 12:250, 251
Lattice-type inclusion compounds, 14:170–182
Laudanosine, 2:87, 89
Laue method, for macromolecule X-ray diffraction, 26:442
Laundering
detersive systems for, 8:413t
  use of bleaching agents, 4:45–46, 70
Laundry amylases, 10:280–281
Laundry detergent enzymes, performance evaluation of, 10:276–278
Laundry detergents, 8:416
  acute oral LD50 ranges, 8:446t
  changes in, 23:516
  world market for, 10:275–276
Laundry presoak with enzyme
  acute oral LD50 ranges, 8:446t
Lauraceae, alkaloids in, 2:75
Lauramide DEA
cosmetic surfactant, 7:834t
  in liquid soap, 22:748
Lauric acid
  boiling point, 5:53t
  percentage in fats and oils, 2:519t; 5:47t
  physical properties, 5:29t
  in toilet soap making, 22:733t
Lauric diethanolamide, hydrolytic stability, 2:455t
Lauric isopropanolamide, hydrolytic stability, 2:455t
Lauric monoethanolamide, hydrolytic stability, 2:455t
Lauric monoethanolamide, hydrolytic stability, 2:455t
Lauric isopropanolamide, hydrolytic stability, 2:455t
Lauric monoethanolamide, hydrolytic stability, 2:455t
Lauric monoethanolamide, hydrolytic stability, 2:455t
Lauric oils/fats, 10:814, 825
  fatty acid composition, 5:56t
  in soap making, 22:732–734, 735
Lauryl alcohol
  batch sulfation of, 23:541
  properties of commercial, 2:11t
Laurylamine, 2:519
Lauryl betaine, cosmetic surfactant, 7:834t
Lauryl lactate, cosmetically useful lipid, 7:833t
Lauryl pyridinium bromide, surface tension, 8:244t
Lauryl pyrrolidone, cosmetic surfactant, 7:834t
Lauryl stearate, cosmetically useful lipid, 7:833t
Lautering, 3:575; 10:292
Lauter vessel, 3:578
Laux process, 19:401
Lavandin oil, in perfumes, 18:368–369
Laver, common and scientific names, 3:188t
Lavoisier, Antoine-Laurent, 17:388
Law of mass action, 10:480
Lawrencium (Lw), 1:463–491, 464t
electronic configuration, 1:474t
Lawson, in skin coloring products, 7:847
Lawson (0.25%), cosmetic uv absorber, 7:846t
Lawson (0.25%) plus dihydroxyacetone (33%), cosmetic uv absorber, 7:846t
Laws, versus regulations, 21:569–570.
See also Legislation; Regulations
Layered HTS, complex Lorentz force in, 23:827. See also High temperature superconductors (HTS)
Layered hybrid materials, 13:546–548
Layered oxides, of transition elements, 13:540
Layered silicates, in nylon–clay nanocomposites, 11:313
Layer–lattice solids, 15:246
Layers, in landfill design, 25:878–879
Lazurite, 19:406
LC. See Liquid chromatography (LC)
LD50, of wastewater, 25:887.
See also Lethal concentration (LD50)
LCP resins, prices for, 20:86t
LDL receptor (LDLR), 5:189
L-DOPA, 2:560, 606
LDPE copolymers, 20:213–214. See also Low density polyethylene (LDPE)
LDPE film, gels in, 20:229–230
LDPE homopolymer, 20:212
LDPE ionomers, 20:214
LDPE polymerization, peroxide initiators for, 20:218t
LDPE production, rate-limiting factor in, 20:215
LDPE resin(s)
differences in, 20:215
extrusion behavior of, 20:224
Leachability, in antidegradant selection, 21:786–787
Leachate chemistry, landfill liners and, 25:878
Leachate collection system, in landfills, 25:877, 879
Leachate treatment, using reverse osmosis, 21:646–647
Leaching, 16:128
chemistry of, 16:152–154
defined, 16:127
in Guggenheim process, 22:846–848
herbicide, 13:308
in hydrometallurgy, 16:151
of solid waste, 25:866–869
techniques for, 16:153–154
of uranium ores, 25:401–403
of zinc, 26:566–567
Leach residue, recovery of zinc from, 26:567–568
Leach solutions, recovery of uranium from, 25:403
Leach tests, for solid waste, 25:866–869
Lead (Pb), 14:727–782. See also Lead alloys; Lead compounds; Pb entries;
Secondary lead; U/Pb decay schemes
acid oxidation of, 14:731
as air pollutant, 1:789, 801
air pollution in mega-cities, 1:788t
analytical methods related to, 14:762
in antimony alloys, 3:52t
atomic structure of, 22:232
barium alloys with, 3:344
in bismuth alloys, 4:12t
bismuth removal from, 14:755
catalyst poison, 5:257t
chemical analysis of archaeological materials, 5:747–748
chemical properties of, 14:729–731
chromium pigments based on, 6:554
in coatings, 24:794, 795
corrosion resistance of, 14:766, 768
in cotton fiber, 8:20t
criteria pollutant, 1:813t
early use of, 14:727–728
economic aspects of, 14:760–761
effect on copper resistivity, 7:676t
exposure to, 14:763–764
in galvanic series, 7:805t
hardness compared to ceramics, 5:627t
health and safety factors related to, 14:763–766
mechanical properties of, 14:774t
metallic, 16:134
in M-type ferrites, 11:66, 69
occurrence of, 14:728–729
LEAD(II), CONCENTRATION FORMATION CONSTANT

in pewter, 24:798
physical properties of, 14:729, 730t
processing of, 14:731–760
production growth compared to
aluminum and other metals, 2:301t
recycled, 14:757
refining of, 16:150
removal of impurities from, 14:751
selenium and metallurgy of, 22:98
in selenium recovery, 22:85
silicone chemistry and, 22:550
silver smelting and, 22:636
smelting of, 14:734–745
sodium alloys with, 22:779–780
in solder, 24:795–796
solubility limits and electrical
conductivity effects on copper, 7:750t
standard electrode potential, 7:799t
toxicity of, 14:764–766
in type metals, 24:798
U.S. consumption of, 14:767t
uses for, 14:766
world reserves of, 14:729
Lead(II), concentration formation constant
of chelates, 5:717t
Lead 2,4,6-trinitroresorcinate, 10:729
Lead acetates, 14:792–793
Lead acetate trihydrate, 14:793
Lead–acid batteries, 3:431, 520–524;
14:766. See also Lead storage battery
antimony battery grids, 3:52
arsenic applications, 3:271
assembly, 3:539–540
barium in, 3:349
cell thermodynamics, 3:524–526, 527
charge–discharge processes, 3:527–531
economic aspects, 3:540–541
electrolyte, 3:538–539
fabrication, 3:531–538
lead grid corrosion, 3:526–527
lead–antimony alloys in, 14:769–771
overcharge, 3:550–531
recycling, 3:541
self-discharge, 3:529–530
temperature coefficients, 3:528t
transport processes in, 3:423–424
world market estimated, 3:410t
Lead–acid battery expanders,
lignosulfonates as, 15:18
Lead additives, in gasoline, 12:391
Lead alloys, 14:766–779
low melting, 14:779
mechanical properties of, 14:774t
reactive, 14:779
selenium and metallurgy of, 22:98
Lead anodes, 14:776
Lead antimonate, 14:792
Lead antimonate yellow pyrochlore,
formula and DCMA number, 7:347t
Lead–antimony alloys, 14:768–772
mechanical properties of, 14:769t
wrought, 14:771
Lead–antimony–silver alloy anodes, 14:777
Lead–antimony–tin alloys, 14:771–772
Lead–antimony–tin white bearing alloys,
3:52
Lead arsenates, 14:797
Lead azide, 10:727–729; 14:792
Lead babbitt, 3:52, 52t
arsenic addition to, 3:271
Lead-base babbitts, 24:797
Lead-based paint, 14:765
Lead-based paint remediation, 18:75
Lead-based pigments, 19:386. See also
Lead chromate pigments
Lead benzoate, 14:794
Lead bisilicate, 14:796
Lead blast furnace, 14:737
Lead borate, 14:797
Lead bromide, 14:785
Lead bullion, 14:742, 745
continuous drossing of, 14:746
Lead–cadmium alloys, 4:502
Lead–calcium alloy batteries, 14:772, 774
Lead–calcium alloys, 14:772–776
binary, 14:772–774
reactivity of, 14:774
Lead–calcium–aluminum alloys,
14:774–775
Lead–calcium–silver anodes, 14:777
Lead–calcium–tin alloys, 14:775–776
Lead carbonates, 14:794–795
Lead chalcogenides, 19:157
Lead chloride, 14:785
Lead chromate
air standards and classification, 6:549t
prohibited pigment in anticorrosive
coatings, 7:195t
silicon carbide reaction with, 22:531
uses, 6:523
U.S. exports, 6:544t
U.S. imports for consumption, 6:545t
Lead chromate(VI), 6:537
physical properties, 6:528t
Lead chromate pigments, 19:405, 407–408
Lead Chromate Yellow, pigment for plastics, 7:370t
Lead citrate, molecular formula, 6:638t
Lead compounds, 14:729, 782–804. See also
  Lead entries
  health and safety factors related to, 14:798–799
  methods of forming, 14:783
Lead concentrations, airborne, 14:798–799
Lead–copper alloys, 14:776
Lead dibromide, 14:785
Lead dichloride, 14:785
Lead diiodide, 14:785
Lead dioxide, 14:731, 768, 787
as curing agent, 22:41
Lead dioxide electrodes, 3:408
standard potential, 3:413t
Lead dioxide–lead sulfate electrodes, constant discharge curve, 3:414
Lead alloys, preparing for electroless deposition, 9:718
Lead brasses
  nominal composition, 7:722t
  UNS designation, 7:721t, 722t
Lead brasses,UNS designation, 7:721t
Lead gasoline, 10:53–54. See also
  Tetraethyllead (TEL)
Lead nickel silvers, UNS designation, 7:721t
Lead zinc oxide, 26:613
Lead electrodes, 3:408, 430
Leaders, R&D, 21:621
Lead fluoride, 14:784
Lead fluoroborate hydrate, 4:157t, 158, 159
Lead-free (LF) solder, 20:60–61; 24:796
Lead halides, 14:784–786
  physical properties of, 14:784t
Lead hydroxide, 14:788
Lead-induced central nervous system toxicity, 14:765
Lead industry, regulation of, 14:765–766
Leading Concept Methanol (LCM) process, 16:305
Lead iodide, 14:785–786
Lead–lithium alloys, 14:779
Lead–lithium–tin alloys, 14:779
Lead lead, 13:108–109
Lead manganese niobate (PMN), 5:583
Lead magnesium niobate:lead titanate (PMN:PT), 22:713
Lead materials, in electronic materials packaging, 17:840–841
Lead metaborate, 14:797
Lead metatitanate, 14:797
Lead Molybdate Orange, pigment for plastics, 7:370t
Lead Molybdate Red, pigment for plastics, 7:370t
Lead monosilicate, 14:796
Lead monoxide, 14:786
Lead nitrate, 14:790–791
Lead ores, 14:728–729; 16:144. See also
  Zinc–lead ores
dressing, 14:731–734
Lead oxides, 14:731, 735, 786–788
  physical properties of, 14:786t
Lead phosphorus, 14:791
Lead phthalates, 14:795–796
Lead poisoning, chelant applications, 5:736
Lead purity, determining, 14:762
Lead recycling, economic aspects of, 21:405
Lead refining, 14:747–756
  calcium application in, 4:530
  by cupellation, 14:753–754
  by dezincing, 14:754–755
  by liquidation, 14:752
  by oxidation, 14:747–750
  by vacuum retorting, 14:752–753
Lead–salt lasers, 22:180
Lead salts, 14:782–783
Leads, current, 23:855–856
Lead sesquioxide, 14:787–788
Lead shot, 14:771
Lead silicates, 14:796–797
Lead–silver alloys, 14:777
Lead sinter machine, 14:734, 735
Lead smelting
  Boliden’s Kaldo process of, 14:742–743
  Isasmelt process of, 14:743–745
  Kivcet process of, 14:739–740
  Outokumpu process of, 14:745
  QSL process of, 14:740–742
Lead stabilizers, for PVC polymers, 25:671
Lead storage battery, 14:783. See also
  Lead–acid batteries; Lead–calcium alloy batteries
  Lead–strontium alloys, 14:779
Lead stypnate, 10:729
Lead sulfate electrodes, standard potential, 3:413t
Lead sulfates, 14:789–790
physical properties of, 14:789t
Lead sulfide, 14:788–789
carrier mobility at room temperature, 5:597t
sulfide
color and bad gap, 7:335t
Lead telluride, 14:789
Lead tetraacetate, 14:788
Lead tetroxide, 14:788
Lead–tin alloys, 14:778
Lead–tin–bismuth–cadmium alloy (Wood’s metal), 4:502
Lead–tin solder (50/50), in galvanic series, 7:805t
Lead titanate (PT), 5:583
as ferroelectric, 5:605–608
Lead titanate, 14:797; 25:47
Lead titanate–zirconates, 14:797
Lead transport mechanisms, 25:394
Lead trioxide, 14:787–788
Lead users, role in product design, 5:761, 766
Lead whites, 19:397
in fine art X-radiography, 11:401
Lead–zinc ores, beneficiation of, 14:732
Lead zirconate, 14:797
Lead zirconate titanate (PZT), 5:583
ferroelasticity, 5:607, 623
Lead zirconate titanate (PZT) formations, as smart materials, 22:710
Lead zirconate titanium (PZT), 1:708–709
Leaf fibers, 11:285, 287, 289–290
mechanical properties of, 11:290t
processing of, 11:295–297
uses of, 11:299t
Leafhoppers, 8:9
Leaf miners, 8:9
Leaf vacuum filter, 11:352. See also
Horizontal leaf filters; OMD leaf filter;
Vertical leaf filters
Leakage, in FETs, 22:253, 254
Leakage prevention, pumps for, 21:76
Leak detection and repair (LDAR) program, 10:70, 71–75; 14:205
Leakers, 10:70, 72
Leak frequency, 10:72
Leak repair, fired heater, 10:162
Leaks and spills, secondary containment of, 24:311. See also Spills and leaks
Leaky Lamb waves, propagating, 17:430–431
Lean air/fuel mixtures, 10:36–37
“Leap-frog” technique, sampling via, 26:1016
Leaping techniques, 26:1048
Learning programs, steps in designing, 15:475
Learning, types of, 15:475t
Least Bounding Rectangle (LBR), 18:148
Least Feret Diameter (LFD), 18:147
Least-squares curve fitting, 14:237
Leather
defoamer applications, 8:247
dyeing, 9:224–227
information sources for, 15:764
Leather bating process, 10:251–252
Leather carp, 3:205
Leather fragrances/perfumes, 18:359, 361
Leatherhard point, 23:66
Leather industry
titanium dioxide in, 25:21
enzyme use in, 10:251–252
sodium sulfide in, 22:874
Leather-processing enzymes, 10:305–306
Leather tanning
chromium application, 6:523, 559
kaolin application, 6:688t
Leavening agents, 12:32, 65–66
Leavitt Loading Ratio Correlation (LRC) Method, 1:626, 628
Leblanc process, of sodium carbonate recovery, 22:792
Le Chatelier’s Law, 23:116, 603
Lecithin(s), 10:807; 12:55; 24:160
cosmetic surfactant, 7:834t
emulsifiers, detergents, and dispersants, 8:710t
in formulation for milk chocolates, 6:362t, 364
in formulation for sweet (dark) chocolates, 6:362t
Leclanché cell, 3:435
Lectin affinity chromatography, 6:399
LED emission, 14:836. See also Light emitting diodes (LEDs)
LED structures, current transport in, 14:840–842
Lees’ Loss Prevention in the Process Industries, 21:862–863
Left atrium, 5:79, 80
Left posterior fascicle, 5:80
Left ventricle, 5:79, 80
Legal actions, patent-related, 18:186
Legal aspects, of standardization, 15:754–755
Leghemoglobin, 17:297–298
Legionella infections, 15:303
Legionnaire’s disease, 1:805
role of copper in, 7:710
Legislation. See also Laws; Regulations
Clear Skies,” 16:45
environmental and health, 15:256
environmental impact assessment, 10:231–232
fragrance-related, 18:388–389
minerals recovery/processing, 16:609
pesticide-related, 18:537–539
regarding wastewater treatment, 25:883, 917–918
recycling, 21:373–374
safety, 21:827–828
scrap tire, 21:462
“Lego” chemistry, 26:788
LEGSTAT file, 18:246
Legume forages, 10:866
Legumes, in nitrogen fixation, 17:296–298
Leguminosae, alkaloids in, 2:75
Lehn, 24:J.-M., 29, 31
Leisure applications, for high performance fibers, 13:396
Lely process, 22:532, 534
Lemon chrome yellow, 6:554, 555t
Lemon juice, ascorbic acid in, 25:747
Lemons, citric acid in, 6:632t
LeMoyne, Simon, 22:798
Length, exponents of dimensions in absolute, gravitational, and engineering systems, 8:584t
Length–bandwidth product, 17:446–447
Length of unused bed (LUB)
adsorption columns, 1:605–607, 614
gas adsorption, 1:653
Length standards, 15:749
Lennard–Jones characteristic temperature, 25:303
Lennard–Jones energy, 15:674
Lennard–Jones gas dimensionless thermal diffusion ratio, 25:307
Lennard–Jones molecules, 25:302
Lennard–Jones potential, 1:620; 23:94
Lennard–Jones potential energy function, 25:302
Lennard–Jones temperature, 25:304
Lens blocking
bismuth alloy applications, 4:13
indium in, 14:195
Lenses
development of, 16:468
silver in, 22:658
Lens losses, in fiber optics, 11:129
Lens material, vitreous silica as, 22:437–438
Lenticular method, in color photography, 19:241
Lentinan, 20:578
Lenzing patent, 11:266–267, 268
Leonite, 5:785t
Lepidolite, 15:123
Lepidolite, rubidium-bearing, 21:818
Lepirudin, 4:100, 100t, 101
Leptin, 3:96–97
Lepton accelerator, 23:862
Leptons, 21:297, 298, 299
conservation of, 21:305
Leptophos, 4:358t
Lercanidipine, 5:132–133
molecular formula and structure, 5:127t
Lerdip, molecular formula and structure, 5:127t
Lescol, 5:142
molecular formula and structure, 5:139t
Lescol XL, molecular formula and structure, 5:139t
Lesquerolic acid, physical properties, 5:35t
Lessing rings, 1:28
Lethal agents, 5:815–822
Lethal concentration (LC50), 23:112–113.
See also LC50
Lethal dose (LD50), 23:112–113. See also LD50 data
Lethal synthesis, as a toxic effect, 25:206–207
Letterpress inks, 14:318
Letterset inks, for polystyrene, 14:321
Lettuce, citric acid in, 6:632t
LEU2d selectable marker, 26:483
LEU2 gene, 26:481
Leucamine, 9:312–313
Leucine
content in cocoa and chocolate products, 6:368t
killing rate of e. coli, 8:641t
systematic name, formula, and molecular weight, 2:555t
taste profile, 2:605
d-Leucine, systematic name, formula, and molecular weight, 2:555t
dl-Leucine, systematic name, formula, and molecular weight, 2:555t
l-Leucine, systematic name, formula, and molecular weight, 2:555t
Leucite, in dental ceramics, 8:275, 276
Leuckart reaction, 2:522
Leuco compounds, 9:329
Leuco dye system, 19:349
Leucomyccins, 15:288–289t
registered for use in aquaculture in Japan, 3:221t
Leucoquinizarin, 9:328–329
Leucoxenes, 25:31, 33
Leukocytes, 4:83, 89
Leuprolide acetate formulations, encapsulated, 16:453
Leurocristine (vincristine), 2:77, 98, 99
Leuseramycin, 20:136
Leutnizing hormone releasing hormone analogue, registered for use in aquaculture in Australia, 3:222t
Levans, 23:481
in beets, 23:463
Leveing
coating film defect, 7:119–120
of a dye, 9:163–164
Leveling acid dyes, 19:759; 26:395
Level measurement devices, 20:682
Levitra, molecular formula and structure, 5:183t
Levofloxacin, 21:223, 225
year of disclosure or market introduction, 3:6t
Levoglucosan, 4:705
Lewis acid catalysts, 12:162
Lewis acid mediated Diels–Alder chemistry, 21:257
Lewis acids, 10:413, 47; 12:188–190; 14:265; 19:31, 33. See also Bronsted-Lewis superacids; Super Lewis acids
in cationic polymerization of cyclic siloxanes, 22:560
ethers and, 10:574
in silicone chemistry, 22:554
strength of, 14:267
supported, 5:327–329
VDC polymer degradation and, 25:7187
Lewis bases, 10:405, 411–413
Lewis–Randall rule, 24:679
Lewis stirred cell, 10:755
Lewiston–Stockton (HVB) coal carbon structural distribution based on nmr, 6:715t
empirical composition, 6:730t
Lexan resins, molecular weight and viscosity of, 19:802t
LEXPAT database, 18:247, 248
Lexxel, molecular formula and structure, 5:126t, 149t
LFR reactor system, 23:396. See also Linear-flow reactor (LFR) polymerization process
Li2O–Al2O3–SiO2 (LAS) system, glass-ceramics in, 12:637. See also Lithium entries
Liberation grain size, 20:616
Licanic acid, physical properties, 5:35t
Licareol, 24:500
Licenses, clinical product, 12:150
Licensing
of biologics, 3:826
of copyrights, 7:788–791
exclusive and nonexclusive, 24:379 of a technology, 24:365
in technology transfer, 24:378–380
Licensing agreements, 24:379
Licensing arrangements, advanced materials, 1:693
Licensing event reports (LERs), for nuclear power facilities, 17:539
Lichens, in nitrogen fixation, 17:299
Licuri wax, 26:210–211
Lidesthesin, molecular formula and structure, 5:91t
Lidocaine, 5:100
molecular formula and structure, 5:91t
Lige Definitive Report, 17:396–398
Life, salt as essential to, 22:812, 816–817. See also Bio- entries
Life cycle analysis, 12:813. See also Life cycle assessment (LCA)
in plastics recycling, 21:447
Life cycle assessment (LCA), 10:244; 14:805–831; 24:177, 196
analysis modes of, 14:808
application of, 14:827–828
databases for, 14:824–825
future of, 14:828–829
goal and scope definition phase of, 14:808–809
impact assessment phase of, 14:816–821
interpretation phase of, 14:821–824
inventory analysis phase of, 14:809–816
involvement of stakeholders in, 14:826
key guidebooks on, 14:807
levels of sophistication of, 14:808
method of, 14:806–824
prime purpose of, 14:806, 808
procedural embedding and, 14:826–827
requirements for, 14:806
software and data related to, 14:824–826
software improvement for, 14:829
sustainable development and, 24:182–183
tools for, 20:311–312
Life cycle assessment studies, 14:826–827
phases of, 14:806–824
Life cycle cost (LCC), reliability and, 26:992–993
Life cycle management (LCM), 14:828
Life cycles, reliability and, 26:992–993
Life preservers, kapok-stuffed, 11:297
Life span, 2:811
Life-support applications, oxygen in, 17:765
Life-temperature relationship, in reliability modeling, 26:989
Lifetime average daily dosage (LADD), 25:242–243
Lifson force field approach, 16:744
Ligaments, 3:722
Ligand binding, in proteins, 20:829–830
Ligand-exchange phases, for chiral separations, 6:82–83
Ligands
chelating agents, 5:709–710
classification in coordination compounds, 7:575–579
defined, 7:573
macroyclic, 14:547
O-donating, 25:436
polypyridyl, 14:548–550
porphyrin, 14:554
redox activity and, 9:579
Ligand substitution reactions, 13:416, 432–433
pressure variable in, 13:442–444
LIGA (Lithographie, Galvaniformung, Abformung) technique, 15:159
in high aspect ratio micromachining, 26:964
Ligating clips, 24:205
Light. See also Optical entries;

Photo-entries
acrylic fiber resistance to, 11:193
bandwidth of, 11:128–129
coherence of, 14:655–656
color and, 7:304–307
effect on rubber aging, 21:786
fiber-optic transmission of, 11:129–131
in fine art examination/conservation, 11:408
pigment interaction with, 19:375
sensors using, 22:270–271
silicon interaction with, 22:487–489
silicone fluid transparency to, 22:579
silver chloride and, 22:670
silver compound instability to, 22:669
silver nitrate and, 22:672
VDC polymer degradation and, 25:718–719
Light absorption
by direct gap semiconductors, 22:143
in inorganic pigments, 19:379
Light-burned quicklime, 15:28
Light capture, in color photography, 19:234–240
Light-duty diesel vehicles, 10:60
Light emission, from silicon, 22:257
Light-emitting diode arrays, 22:138
Light-emitting diodes (LEDs), 14:832–867. See also Blue LEDs; LED entries;

Organic light-emitting diodes (OLEDs); Resonant cavity LEDs (RCLEDs); White LED
applications of, 22:174–176
basic properties of, 14:833–842
compound semiconductors in, 22:172, 173–176
device efficiencies of, 14:842–848
electrical properties of, 14:837–839
geometries of, 22:174
increasing light extraction from, 14:847
omnidirectional reflectors and, 14:857–860
packaging, 14:862–865
resonant-cavity enhanced structures in, 14:848–856
Light-focusing glass fibers, 22:176, 177
silicon carbide in, 22:261, 530–531
spectral power density function of, 14:836
uniform light generation in, 14:842
Light ends, constituents of, 18:664t
Lighter flints, cerium application, 5:682
Lighter noble gases, compounds of, 17:335
Light extraction efficiency, 14:843
Lightfastness, 9:256
of fibers, 11:169
of inorganic pigments, 19:382
of pigments, 19:428
Light-focusing glass fibers, 12:613
Light generation, nonlinear (harmonic), 14:678–680
Light guidance
attenuation in, 11:132–133
dispersion in, 11:134–135
principles of, 11:131–135
Light-harvesting, 12:237
Light hydrocarbons, BTX production from, 25:170–171
Lighting, vitreous silica in, 22:441–442
Lighting fixtures industry, glass in, 12:617
Light lanthanides, 14:631
Light microscopes, 16:464, 469
Light microscopy
in fine art examination/conservation, 11:405
of silica, 22:371
Light mixing, 7:316–317
Lightnin' A315 agitator, 1:739
Light nonaqueous phase liquids (NLAPLs), 3:766
Light olefins
recovery by cryogenic technology, 8:54–56
producing in FCC units, 11:694–697
Light properties, of fibers, 11:167. See also Optical properties
Light scattering, 7:307–308
cause of color, 7:326t, 339
dispersions, 8:714–717
in foams, 12:11
of organic pigments, 19:429
for polymer blend morphology determination, 20:340
Light sources
noble gases in, 17:371–372
in photochemical technology, 19:107–108
Light stabilizers, in VDC polymer stabilization, 25:719
Light water, physical properties, 8:459t
Light water nuclear reactors (LWRs), 17:518, 542; 24:758; 25:412
Light wavelength, effect on ozone decomposition, 17:773–774
Lightweight aggregate kilns, 13:179
Light-weight coated (LWC) paper, 18:128
Light Weight Radioisotope Heater Units (LWRHUs), 19:670
Lignification, 21:11–12
Lignin(s), 15:1–25; 26:335. See also Delignification; Kraft lignins
absorptivity values of, 15:9t
analytical methods for, 15:6–12
brominated, 15:7
cellulose in, 5:360
cellulose content of, 5:360
cellulose structure, 5:360
characteristics of, 21:12–13
detachment of, 21:12–13
detection of, 15:6–7
deposition of, 21:13–14
determination, 15:10–12
in flax fiber, 11:597–598, 599
functional group analysis for, 15:10–12
generation of, 15:2
hydrophilicity of, 21:35
hydroxyl content of, 15:10–11
industrial, 15:14–21
interunit linkages of, 21:12–13
laboratory-isolated, 15:21
laboratory-prepared, 15:21
organosolv pulping, 15:20–21
in paper, 18:93, 95
in the plant cell wall, 21:3
properties of, 15:12–14
structure and reactions of, 15:2–6
in vegetable fibers, 11:285
in the wood cell wall, 21:10–14
Ligninases, 21:48
Lignin–carbohydrate bonds/linkages
formation of, 21:16
in the wood cell wall, 21:14–15
Lignin content, determination of, 15:7–8
Lignin degradation, 3:756–757
Lignin-degrading bleaching, 21:31, 36
Lignin manufacturers, European and U.S., 15:15t
Ligninolytic enzymes, 15:14
Lignin reactions
under acid pulping conditions, 21:26
under alkaline pulping conditions, 21:23–25
during pulp bleaching, 21:33–38
Lignite, 6:703
classification, 6:712
composition, 6:720t
empirical composition, 6:730t
origin, 6:704
world reserves, 6:704
Lignite uranium deposits, 17:521
Lignite-wax, 26:213
Lignocellulose, classification by rank, 6:711t
Lignocellulose-based raw materials, isolation of, 10:295–296
Lignocellulosics, pretreatments of, 21:20
Lignoceric acid, physical properties, 5:30t
Lignolytic conditions, defined, 3:757t
Lignosulfates, 23:717
Lignosulfonate–metal complexes, 15:18
Lignosulfonates, 15:15–18; 23:516, 529–530, 540, 541
acrylic-graft copolymers of, 15:18
consumption of, 23:530
emulsifiers, detergents, and dispersants, 8:710t
isolation of, 15:15–16
in oil displacement efficiency, 18:629
properties of, 15:16, 20t
toxicology of, 15:20
uses for, 15:16–17
in volumetric sweep efficiency, 18:621
Lignosulfonate thinners, 9:16–17
Likelihood, in Bayesian inference, 26:1017
Lilerum, 7:639
Liliaceae, alkaloids in, 2:75
Lilial, aroma chemical derived from toluene, 3:234
Liliflorae, alkaloids in, 2:75
nor-Limbanol, 24:566
(+)-trans-nor-Limbanol, 24:566
Lime(s), 15:25–80
in bottom-blown processes, 23:260
calcium, 15:25
dolomitic, 15:25
environmental issues related to, 15:75–78
as a flocculating agent, 11:626–627
grades of, 15:65–66
in hazardous waste management, 25:823
health and safety factors related to, 15:74–75
high surface area hydrated, 15:55
history of, 15:26
hydrated hydraulic, 15:55
hydraulic, 15:25
in integrated manufacturing process, 6:237t
market overview and economic aspects of, 15:57–61
physical and chemical properties of, 15:41–45
physical testing and chemical analysis of, 15:72–73
in pyrometallurgy, 16:138
quality control for, 15:69–70
in sodium carbonate recovery, 22:792
 specifications for, 15:67–69
storage and transport of, 15:56–57
terminology related to, 15:26–29
uses for, 15:61–65
Lime bleach liquor, 4:52
Lime industry
energy usage in, 15:77
recycling and disposal in, 15:77–78
United Kingdom, 15:75
Lime kilns, 15:46
carbon dioxide recovery from, 4:810
energy usages of, 15:48t
Lime mortars, 5:467
Lime production, 15:54–56
global, 15:57t
Lime products, 15:39–70
commercial, 15:25–26
in main market segments, 15:59t
main uses of, 15:58t
recycling, 15:77
sales of, 15:58
Lime putty, 15:28
production of, 15:57
Lime saturation factor (LSF), cement, 5:474
Lime slurry, 15:21
Lime soda process, 22:795
Lime–soda sintering process, for alumina, 2:354–355
Limestone(s), 15:25–80; 23:569. See also
Calcium carbonate
calctitic, 15:33
defined, 15:25
economic aspects of, 15:35–37
environmental issues related to, 15:75–78
estimated extraction of, 15:36t
as filler, 11:311
formation, classification, and occurrence of, 15:29–31
hard water and, 22:818
health and safety factors related to, 15:74
heating in coal gasifiers, 6:775
history of, 15:26
market overview of, 15:35
physical testing and chemical analysis of, 15:71–72
processing of, 15:35
production cost of, 15:35
quarrying of, 15:33–35
ranges of impurities–trace elements in, 15:34t
raw material for cement, 5:467, 475t
reaction with aqueous acids, 15:33
reaction with carbon dioxide, 15:32–33
recycling of, 15:77
sales of, 15:36t
scrubbing of, 26:691
storage and transport of, 15:35
terminology related to, 15:26–29
use in making aluminate cement, 2:415
uses and specifications of, 15:37–39
Limestone decomposition, energy use in, 15:77
Limestone–gypsum roasting lithium recovery process, 15:126, 127
Lime water softening methods, 26:116–119
Liming, in beet juice purification, 23:459–462
Limited oxygen index (LOI) test, 10:175; 13:380, 384, 385. See also Limiting oxygen index (LOI)
Limiting drawability ratio, 7:735
Limiting equivalence ratio, 13:855, 856
“Limiting microemulsions,” 16:423
Limiting oxygen concentration (LOC), 21:840
Limiting oxygen index (LOI), 11:45; 18:328, 3407
of textile fibers, 11:194, 195t
Limiting oxygen index test, 19:58
Limit of detection, 6:31
Limonene, 24:484, 492–493, 538–539
(+)-Limonene, 24:519, 520
d-Limonene, 24:473
d-Limonene
binary azeotrope with benzaldehyde, 3:591t
permeability in selected household films, 3:387t
permeation in selected barrier polymers, 3:389t
(R)-Limonene, 24:493
Linaloe oil, 24:500
β-Linalolene, 24:487
Linalool, 3:231, 232, 233; 24:477, 495, 496, 500–503, 546
acid treatment of, 24:502
epoxidation of, 24:502
main producers of, 24:501
Linalool oxide, 24:502
Linalyl, 24:479
Linalyl acetate, 24:501
Linalyl alcohol, 24:500
Linalyl esters, 3:231
Linalyl oxide, 24:503
Lincomycin, registered for use in aquaculture in Japan, 3:221t
Lincosamide, bacterial resistance mechanisms, 3:32t
Lindane, 13:145–147
chemistry and environmental impact of, 13:146
Linderic acid, physical properties, 5:31t
Linde sieve tray, 23:338
Lind, James, 25:746–747
Linear geometry, for metal coordination numbers, 7:574, 575t
Linear 1-olefins, properties of, 17:711t
Linear acceleration, exponents of dimensions in absolute, gravitational, and engineering systems, 8:584t
Linear alcohols, feedstocks for higher aliphatic alcohols, 2:27t
Linear alkane sulfonates (LAS), from benzene, 3:620
Linear alkylbenzene (LAB), 17:725
cconversion to LAS, 23:553, 555
improved process for SO₃ film sulfonation of, 23:554
sulfonation of, 23:525, 553–554
Linear alkylbenzenesulfonate (LAS), 10:278; 23:516, 525–526. See also LAS entries
cconversion of LAB to, 23:553–554, 555
Linear alkyl benzene sulfonates (LABS), 24:146
Linear α-olefins, 20:414. See also Linear higher α-olefins
manufacture of, 17:713–724
world producers of, 17:710t
Linear blending value (LBV), 12:412–413
Linear burning rate, 10:720
Linear collider, 23:862
Linear low density polyethylene (LLDPE), 9:11
Linear kinetics, 15:15
Linear ion traps, 15:15
Linear internal olefins (LIOs), 17:17
Linear higher-molecular-weight degradation of, 20:199–201

Linear dielectrics, 11:11
Linear dielectrics, 11:11
Linear elastic fracture mechanics (LEFM), 1:509–510; 16:184; 20:350
Linear ethoxylates, 23:537
Linear ethylene copolymers, 20:179–180
Linear-flow reactor (LFR) polymerization process, 23:394, 395, 396
Linear free energy relationship (LFER) methods, 16:753, 754
Linear higher \( \alpha \)-olefins, 20:429
Linear internal olefins (LIOs), 17:724
Linear ion traps, 15:662
Linear kinetics, 9:612
Linear low density polyethylene (LLDPE), 10:596; 17:724–725; 20:179–211; 24:267, 268. See also LLDPE entries
\( \alpha \)-olefin content in, 20:185–186
analytical and test methods for, 20:203–205
blends with butyl rubber, 4:454
blow molding of, 20:200
branching uniformity (compositional uniformity) of, 20:186
catalysts for production of, 20:189–193
chain structure of, 20:182
chemical properties of, 20:205
compositional uniformity of, 20:182
crystallinity of, 20:184
degradation of, 20:183–184
economic aspects of, 20:201–203
electrical and optical properties of, 20:185
extrusion of, 20:200–201
film manufacture from, 20:199–200
gas-phase polymerization of, 20:194–195
health and safety factors related to, 20:205–206
injection molding of, 20:200
injection-molding grades of, 20:208
mechanical properties of, 20:185–189
molecular orientation in, 20:188–189
molecular structure and chemical properties of, 20:182–184
molecular weight and molecular weight distribution in, 20:186–188
physical properties of, 20:184–189
polymerization processes for, 20:194–199
prices of, 20:201
processing of, 20:199–201
reactivity of, 20:182–184
resins, 17:700, 701
rheology of, 20:199
rotational molding of, 20:200
slurry (suspension) polymerization processes for, 20:198–199
solution polymerization processes for, 20:196–197
specifications, standards, and quality control for, 20:203
structure and composition of, 20:203–205
thermal properties of, 20:184
uses for, 20:206–209
worldwide production capacities for, 20:202t
Ziegler-Natta catalysts for, 26:542–543
Linear low density polyethylene food packaging, 18:40
Linear models, 6:29
Linear momentum, exponents of dimensions in absolute, gravitational, and engineering systems, 8:584t
Linear monoterpenoid alcohols, 24:500–509
Linear monoterpenoid hydrocarbons, 24:484–491
Linear nonsegmented thiopolyurethanes, 23:745
Linear optical materials, 17:442
Linear perfluorinated PPS, 23:706. See also Poly(phenylene sulfide) (PPS)
Linear phosphonitrilic chlorides (LPNCs), silicone fluids and, 22:573
Linear photodiode arrays, 19:153
Linear polyesters, 14:116
Linear polyethylene fibers, 20:398
Linear polyimides, synthesis of, 20:273
Linear polymers, 20:391; 25:455
high molecular weight, 23:733
zero-shear viscosity of, 19:839
Linear poly(thioarylene)s, 23:705
Linear PPS, 23:704. See also Poly(phenylene sulfide) (PPS)
Linear programming algorithms, for gasoline blending, 12:411
Linear recognition, 16:779, 781
Linear regression analysis, 6:27
Linear step-growth polymerization, 20:405
Linear superelastic effect (LSE), 22:340
Linear temperature gradients, in microfluidics, 26:968
Linear thiopolysters, 23:738
Linear-variable-differential-transformer (LVDT) transducers, 20:652–653
Linear velocity, exponents of dimensions in absolute, gravitational, and engineering systems, 8:584t
Lineatin, 24:473
Line-block coilers, 7:691
Line-edge roughness (LER), 15:181
Line exposures, in photography, 19:209–210
Linen
bleaching, 4:72
supramolecular structure, 5:380
Linen, 11:588. See also Flax entries
history and status of, 11:589–594
market for, 11:593
promotion of, 11:591–592
Line notations, in chemoinformatics, 6:3
Linen production, 11:600
mechanical cleaning in, 11:610
Linerboard products, 18:130
Lineshape analysis, 24:98
Line-shape parameters, 23:130t
Linevol 79, chain length and linearity, 2:12t
Lineweaver-Burk equation, 14:627
Line widths, broadening, 23:131
Linewidth studies, 14:621–622
Linezolid, 3:26, 30, 36; 17:733, 735
year of disclosure or market introduction, 3:6t
Linker-scanning mutagenesis, 12:518
Linnaeite, 7:209t
Linoletic acid cross-linking, 9:146
Linoletic acid (LA), 10:828; 17:664
boiling point, 5:53t
percent in important fats and oils, 5:47t
physical properties, 5:33t
percentage in selected fats and oils, 2:519t
skin conditioner/moisturizer, 7:843t
in toilet soap making, 22:733t
Linolelaidic acid, physical properties, 5:33t
Linolenelaidic acid, physical properties, 5:33t
Linolenic acid
percentage in selected fats and oils, 2:519t
percent in important fats and oils, 5:47t
physical properties, 5:33t
in toilet soap making, 22:733t
Linoleum
dersive systems for, 8:413t
kaolin application, 6:688t
Linoxy, degradation of, 11:415
Linseed, varieties of, 11:599
Linseed oil, 9:143, 153
maleated, 9:151
in soap making, 22:735
Linseed straw, 11:593, 618
L’Institut National de la Propriété Industrielle (INPI), 18:230
Linum usitatissimum, 11:292
Linuron, 13:324
Linz–Donawitz–Kawasaki gas (LD-KG) process, 23:260
Lipantil, molecular formula and structure, 5:141t
Lipases, 3:675–676; 10:281–282
in cotton modification, 8:30
immobilized, 10:306
in leather processing, 10:306
in personal care products, 10:306
Lipid emulsions, 10:130
Lipidil, molecular formula and structure, 5:141t
Lipid metabolism, anabolic steroid implants and, 13:6
Lipid peroxidation, herbicides that induce, 13:297–298
Lipids
analysis in green coffee, 7:253, 253t
analysis in roasted, brewed, and instant coffee, 7:255t
in cereal grains, 26:274–275
chemical analysis of archaeological materials, 5:748–749
in cosmetic molded sticks, 7:840t
in cosmetics, 7:832
in ruminant feeds, 10:865
in wool, 26:379
Lipid surfactants, 24:161
Lipid synthesis inhibitors, 13:295–297
Lipitor, 5:142
molecular formula and structure, 5:138t
value added chain for, 11:424, 425t
Lip makeup, 7:861
Lipobay, molecular formula and structure, 5:138t
Lipoic acid, 17:672
(R)-α-Lipoic acid, 17:672
Lipase, 10:281
Lipooligosaccharide (LOS) bacterial, 25:498
Lipophilic amphiphiles, 24:154–155
Lipophilic interaction dominated substrate recognition, 16:783–786
Lipophilic moieties, 8:706t
Lipoproteins, 12:146

Lipstatin, 3:

Lipur, molecular formula and structure, 5:141t

Liquation, lead refining by, 14:752

Liquefaction process, 10:287–288

Liquefied gas propellants, 1:775
alternatives, 1:780

Liquefied natural gas (LNG), 8:40; 13:693
cryogenic technology, 8:49–51
production of, 17:357
role in transportation and storage of natural gas, 12:380

consumption of, 10:136
gas purification, 1:618t
as a motor fuel, 12:432
recovery by cryogenic technology, 8:54–56
 spacing requirements for, 19:514

Liquefied starch, saccharification of, 10:288–289

Liquid absorption, effect on wood, 26:347–348

Liquid aerosols, 7:272t
occurrences of, 7:273t

Liquid aliphatic polyamines, 10:393

Liquid alkaline finish removers, 18:84–85

Liquid ammonia, high energy reserve batteries, 3:467

Liquid anhydrous hydrogen fluoride, specific heat of, 14:3

Liquid argon, shipping, 17:364

Liquid atomization
breakup regime in, 23:182–183
droplet dispersion zone in, 23:183–184
internal flow in, 23:176–182
physics of, 23:176–184

Liquid atomizers, 23:172–173, 175–176

Liquid barrier stream, in Spherizone technology, 20:543

Liquid bubble-point line, 8:741

Liquid butyl rubber, 4:437

Liquid carbon dioxide, 4:816–817, 818–820

Liquid carburizing, case hardening by, 16:210

Liquid cathode lithium cells, 3:464–466

Liquid chromatography, 4:618–620; 6:375, 440–468; 14:233. See also High performance liquid chromatography; Ion chromatography
applications, 4:625–626; 6:457–465
brief overview, 6:384–388
column switching, 6:446–447
columns, 4:623
derivatization, 6:447–448
detectors, 4:622–623; 6:386–387, 448–452

hyphenated techniques, 4:624–625
instrumentation, 4:620–621; 6:441–443
as microfluidic assay technique, 26:969
mobile-phase delivery, 4:621
normal phase, 6:452–453
polymer analysis using, 19:566
postcolumn reaction detection, 6:450–452
protein separation, 3:827–829
sample injection, 4:621–622
sample preparation, 6:443–448
stationary phases, 4:623–624
systems, 6:452–457

Liquid chromatography–mass spectrometry (LC-MS), 4:624–625; 6:387, 450; 19:563
antibody based columns with, 6:402
archaeological materials, 5:743

Liquid column pressure measuring devices, 20:681

Liquid-crystal (LC) actuators, 22:718

Liquid crystal displays (LCDs), 15:113–116
hydrogenated amorphous silicon in, 22:136, 138–139
silicon-based semiconductors in, 22:259
Liquid crystal display system dyes, 9:338–341
Liquid crystal display technology, 15:113
Liquid crystal cellulosic and esters, 5:418
Liquid crystalline conducting polymers (LCPs), 7:523–524
Liquid crystal cellulose, 5:384–386
Liquid-crystalline thermotropic polyester, 20:44–45
Liquid-crystalline phase formation, trends in, 15:105
Liquid-crystalline mesophase pitch process, 15:118
Liquid-crystalline mesophase pitch processes, 13:384
Liquid crystal display technology, 15:113
Liquid crystal cellulose, 5:384–386
Liquid-crystalline conducting polymers (LCPs), 7:523–524
Liquid crystal compounds, 15:118
central linkages found in, 15:103
Liquid crystal materials, 15:81–120
applications of, 15:113–117
availability and safety of, 15:118
in biological systems, 15:111–113
blue phases of, 15:96
bond orientational order of, 15:85
-columnar phase of, 15:96
lyotropic liquid crystals, 15:98–101
orientational distribution function and order parameter of, 15:82–85
polymer liquid crystals, 15:107–111
polymerism in, 15:101–102
positional distribution function and order parameter of, 15:85
structure–property relations in, 15:102–107
thermotropic liquid crystals, 15:86–98
Liquid-crystalline mesophase pitch process, 13:384
Liquid crystal phases
in soap bar processing, 22:728
structure of, 24:126
Liquid crystalline polymers (LCPs), 10:374, 517–518; 13:370–372. See also Liquid-crystal polyester (LCPs); Liquid-crystal polymers (LCPs)
thermotropic, 13:381–382
Liquid-crystalline thermotropic polyester, 20:34
Liquid crystal melt, 20:45
Liquid crystal phase formation, trends in, 15:105
Liquid crystal phases, 15:100
Liquid-crystalline polymers (LCPs), 10:191–192; 20:38–39
manufacture of, 20:44–45
Liquid-crystalline polymers (LCPs), 15:110; 20:3, 78–86, 398. See also Liquid crystalline polymers (LCPs)
advantages of, 20:81
applications of, 20:85
chemical resistance of, 20:84–85
economics of, 20:85–86
injection molding of, 20:83
major commercial, 20:82
as molding resins, 20:81
molecular structure of, 20:80–81
properties of, 20:83, 84t
rheology of, 20:83–84
synthesis and properties of, 20:81–82
Liquid crystals (LCs), 24:53–54; 26:849
bent-core, 15:98
chromonic, 15:101
coordination compounds, 7:601
p-hydroxybenzoic acid in, 22:23
implication in diseases, 15:112–113
nematic, 15:86–92
decay, 15:107–111
producer of, 15:117–118
silylating agents and, 22:700
smectic, 15:92–94
surfactants and, 22:725
Liquid crystal sensors, 15:117
Liquid crystal synthesis, goals in, 15:105–107
Liquid crystal thermoplastics, 10:8
Liquid desiccants, 8:365–366
Liquid DGEBA resins, 10:460
Liquid diffusion, 9:109, 110–112
Liquid discharge treatment, ion-exchange, 14:422
Liquid displacement gas meter provers, 11:652
Liquid drug dosage forms, 18:712–713
Liquid effluents
yocell process and, 11:280
viscose process and, 11:278
Liquid emissions, from ethylene oxide units, 10:654
Liquid enzyme formulations
microbial stability of, 10:269–270
physical stability of, 10:270
stability of, 10:269
Liquid epoxy resin curing agents, 10:418, 419f
Liquid epoxy resins (LERs), 10:354–359, 383, 438, 439
characterization of, 10:384
Liquid ethylene, thermodynamic and transport properties of, 10:595t
Liquid ethylene oxide, hazards associated with, 10:661
LIQUID–LIQUID EXTRACTION(s) 527

Liquid feeders, for swimming pools, 26:178
Liquid fertilizers, potassium orthophosphates in, 20:637
Liquid-film coefficient, 15:695
Liquid filtration, 11:322–323
Liquid flavor forms, 11:576–577
Liquid flow control, in variable-conductance heat pipes, 13:233
Liquid film efficient, 15:695
Liquid filtration, 11:322–323
Liquid food ingredients, encapsulated, 16:456
Liquid fuel combustion technology, 7:460–463
Liquid–gas distribution constant (H), 17:769
Liquid/gaseous detoxification systems, based on hydrogen peroxide, 14:64–65
Liquid–gas separator system, in sulfonation systems, 23:552
Liquid halogen fluorides, 13:128
Liquid heat-transfer media, 12:83
Liquid helium containers for, 17:364
shipping, 17:364
storage and transport of, 17:363
in superconducting magnets, 17:373
Liquid helium-3, 17:354–355
Liquid helium-4, 17:352–354
Liquid helium-free superconducting electromagnet system, parameters of, 23:856t
Liquid hourly space velocity (LHSV), 23:336
Liquid hydrazine, 13:586
Liquid hydrocarbons, in fluidized-bed processes, 20:169–170
Liquid hydrogen delivery of, 13:853
energy density of, 13:839
physical and thermodynamic properties of, 13:762–763t
as a rocket fuel, 13:800
storage of, 13:785–786
Liquid hydrogen sulfide, 23:630, 633
Liquid hydrogen tank levitation system, 23:866
Liquid immersion lithography, 193-nm, 15:186–187
Liquid incinerators, 13:178
Liquid infiltration, of metal–matrix composites, 16:166–167
Liquid injection, in thermal waste treatment, 25:833
Liquid-injection-molded (LIM) rubber, properties and applications of, 22:584–585
Liquid injection molding (LIM), 18:792
phenolic resins in, 18:794–795
Liquid inks, 14:315
Liquid iodine, viscosity of, 14:354
Liquid ion-exchange rhenium recovery process, 21:689
Liquid-junction potential, 14:26, 27
Liquid junctions, 14:30
Liquid-like interface model, 14:464
Liquid–liquid chromatography, 6:374
Liquid–liquid dispersions continuous phase mass transfer coefficient correlations for, 15:715t
mass transfer coefficient inside, 15:715t
Liquid–liquid encapsulation process, 16:444
Liquid–liquid equilibrium data bank, 10:747
Liquid–liquid equilibrium calculations, 24:681, 686–687
Liquid–liquid equilibria (LLE), 22:302
strategic separation schemes and, 22:310–311t
with more than three components, 10:748–749
Liquid–liquid extraction(s), 10:744–800
of aromatics, 25:168
for capillary chromatography sample preparation, 4:609
equipment and processing in, 10:767–781
of gallium, 12:345
general separation heuristics for, 22:321
of hafnium, 13:82
hydrometallurgical applications of, 10:788–789
inorganic processes in, 10:788–791
from ionic liquids, 26:873–876
of lanthanides, 14:640–642
for liquid chromatography sample preparation, 6:444
in metal recovery, 16:155–156
nomenclature related to, 10:792–793
organic processes in, 10:781–788
principles of, 10:746–767
process of, 10:745
LIQUID/LIQUID (L/L) INTERFACE, ADSORPTION

Liquid/liquid (L/L) interface, adsorption of surfactants at, 24:133–138
Liquid–liquid mass transfer, 15:670, 714–717
equations for, 10:753t
Liquid–liquid sedimentation, 22:50–51
Liquid–liquid separation, 22:68
of minerals, 16:604
Liquid–liquid solvent extraction, 21:399
Liquid lithium, 15:131
Liquid low density polyethylene, 20:205
Liquid lubricants, for extreme environments, 15:256
Liquid lubricated system, coefficient of friction in, 15:209
Liquid magnesium, 15:336
Liquid manometers, 20:646–647
Liquid MDI, 25:462. See also MDI [4,4'-methylenebis(phenyl isocyanate)]
Liquid melamine resins, 15:773
Liquid membrane extraction, 10:766
Liquid membranes, 15:800, 814–815
supported, 16:28
Liquid metal cooled fast breeder reactors (LMFBRs), 24:758
Liquid-metal fast-breeder reactor (LMFBRs), 17:585, 587–588; 22:763
Liquid metals, 15:252–253
metal reduction to, 16:141–146
Liquid mixture, fugacity of a species in, 24:679
Liquid-molding resins, based on polycyclopentadiene, 20:432
Liquid monomer phase, in PVC polymerization, 25:667
Liquid NaK alloy, 20:603. See also NaK entries
Liquid nitriding, case hardening by, 16:210
Liquid nitrogen, 8:42; 13:457–458
in the chemical process industry, 17:284
in the food industry, 17:285, 286
health and safety factors related to, 17:283–284
shipment of, 17:280–282
storage vessel for, 17:281
Liquid oils, 10:831. See also Fats and fatty oils; Oils
Liquid oxygen, 17:754
shipment of, 17:755
Liquid packaging board, 18:130–131
Liquid penetrant testing (PT), in nondestructive evaluation, 17:417
Liquid penetrant testing piping system, 19:485
Liquid petroleum gas (LPG), 13:700
emissions control for, 10:60
Portland cement industry consumption, 5:497t
Liquid Petroleum Transportation Piping, 19:480
Liquid phase(s) chemical reaction between, 10:749–750
mass transfer between, 10:749
microwave-assisted organic reactions in, 16:540–555
Liquid phase adsorption, general separation heuristics for, 22:321–322
Liquid-phase diffusivities, 15:671
Liquid-phase epitaxy (LPE), 19:159
compound semiconductors and, 22:145, 158–159
in LED technology, 22:175
Liquid-phase epoxidation with hydroperoxides, 10:656
Liquid-phase fluorination technology, 13:721
Liquid-phase height of a transfer unit \( (H_L) \), 1:51–52
Liquid-phase homogeneous oxidation reactions, propylene oxide production via, 20:807
Liquid-phase impregnation (LPI), 26:767
Liquid-phase isophorone process, 14:585–586
Liquid-phase mass transfer coefficient \( (k_L) \), 1:37
experimental determination, 1:66–67
Liquid-phase metal sintering process, for nitrides, 17:217–218
Liquid-phase methanol hydrochlorination process, 16:322
Liquid-phase oxidation of n-butane, 13:697
potassium permanganate manufacture by, 15:601–603
Liquid-phase paraffin nitration, 17:165, 166
Liquid-phase reactions photocatalytic, 19:85
of titanium nitride, 25:10
Liquid-phase sedimentation, 18:142
Liquid-phase sintering, 5:661
Liquid phosgene assay, 18:808
Liquid phosphate esters, 19:51, 68
LIQUID WASTES

Liquid plutonium, properties of, 19:681–682
Liquid precursors, in chemical vapor deposition, 22:153
Liquid products, safe storage of, 21:855–856
Liquid propellants, 10:726
Liquid propylene, compressed, 20:770
Liquid pyridine, 21:93
Liquid range, of ionic liquids, 26:848–851
Liquid resins, viscosities of, 10:385
Liquid–resist interface, 15:187
Liquid resole resins, in air and oil filters, 18:790
Liquid resoles, chemical shifts of methylene carbons in, 18:775t
Liquid rocket propellants, 10:726–727
Liquid rubber technology, 9:563–566
Liquid runaround systems, 10:144
Liquids. See also Nonideal liquid mixtures
boiling points of, 24:284t
bulk handling of, 18:5
combustion of, 13:174
degree of fire hazardousness of, 24:284
density of, 24:282
diffusion coefficients for selected dilute gases in liquids at 20°C, 1:67t
flammable, 21:841
influence of pressure on, 13:404–405
pipeline velocities for, 19:473
reactions of refractories with, 21:515–516
safe handling of, 21:851–852
specific gravity of, 24:282t
storage tank types for, 24:301t
tank storage of, 19:513
thermal cracking of, 10:601
Liquid scintillation counting, 21:276–277
Liquid selenium, 22:74
Liquid separation, adsorbents for, 1:612.
See also Liquid separation adsorption
Liquid separation adsorption, 1:664–691
adsorbate–adsorbent interactions, 1:672–673
adsorbents for, 1:673–675
batch operation, 1:664–665, 683
continuous countercurrent processes, 1:665
continuous operation, 1:664–665, 684–685
economic aspects of pharmaceutical separation, 1:685–686
equilibrium, 1:680–682
moving-bed operation, 1:665–672
pharmaceuticals, 1:677–680
Liquid silicates, handling and storage of, 22:467
Liquid silicone rubber (LSR), 22:584
Liquid silicon, properties of, 22:484t
Liquid soaps, 22:748
Liquid soil detergency, 8:422–423
Liquid–solid chromatography, adsorption, 1:610–611
Liquid–solid phase-change materials, 13:276
Liquid–solid separation leaching, 16:153–154
Liquid-solid separations, pilot plant, 18:731
Liquid–solid suspension, effective thermal conductivity of, 13:277
Liquid-state metal–matrix composite processing, 16:166–169
Liquid steel, 23:250
Liquid stream dehydration, molecular sieves in, 16:840
Liquid streams, in vinyl chloride manufacture by-product disposal, 25:644
Liquid sucrose, 23:482
Liquid sulfur, 23:572
molecular constitution of, 23:565
Liquid sulfur dioxide, 23:656, 661, 663
Liquid sulfur trioxide, 23:517, 770, 778–779
extreme reactivity of, 23:519–520
Liquid/supercritical fluid extractions from ionic liquids, 28:873
Liquid–supercritical fluid solutions, 24:11
Liquid surface tension, effect of, 23:192
Liquid surfactants, 22:724
Liquid thermal-diffusion process, 25:417
Liquid-to-glass transition, isobaric, 24:9
Liquid-transfer operations, industrial hygiene and, 14:208
Liquidus diagram, sodium silicate glass, 22:461–462
Liquid vaporization cycle, 8:42
Liquid–vapor surface tension, 12:3
Liquid viscosity
effect on drop size, 23:192
effect on spray, 23:192
Liquid VOC incinerators, 26:684
Liquid wastes
from the chloride process, 25:63–64
from posttreatment operations, 25:64
Lithium aluminosilicates, 12:578. See also Li₂O–Al₂O₃–SiO₂ (LAS) system
Lithium aluminosilicate, 13:622–623
commercial manufacture of, 13:623
reactions with carboxylic acid group, 22:2–3
in silica surface chemistry, 22:372
Lithium–aluminum/metal sulfide cells, 3:549
Lithium amide, 15:129, 137
Lithium antimonide, 3:58
Lithium batteries, 15:135–136, 611
Lithium-bearing minerals, 15:122
Lithium bentonite, 6:696
Lithium benzoate, 3:635; 15:137
Lithium bismuthide, alloy-like
superconducting compound, 4:18t
Lithium borates, 15:137
Lithium borohydride, 13:620–621
Lithium bromide, 15:139–140
manufacture, 4:324
physical properties of, 4:322t, 328
solubility in water, 4:322t
Lithium bromite, 4:333
Lithium carbonate, 15:125–126, 127,
137–138
dessicant, 8:360
Lithium–carbon monofluoride cells,
3:461–462
characteristics, 3:462t
Lithium cells, 3:431, 459–460
companies manufacturing, 3:469t
liquid cathode cells, 3:464–466
resistivity of battery electrolyte, 3:417
solid cathode cells, 3:460–464
world market estimated, 3:410t
Lithium chemicals, U.S. exports of, 15:133.
See also Lithium compounds
Lithium chlorate, 6:117
Lithium chloride, 15:131, 139
corrosive effect on iron, 7:806
dessicant, 8:360
solvent for cotton, 8:21
Lithium chromate, 15:142
molecular formula, properties, and uses,
6:561t
Lithium citrate, molecular formula, 6:638t
Lithium cobalt dioxide, uses, 7:241t
Lithium complex greases, 15:243
Lithium compounds, 20:598–599. See also
Organolithium compounds
inorganic, 15:136–142
uses for, 15:134
Lithium cyanide, 8:194
Lithium δ-alumina, 2:406t
Lithium dichromate, molecular formula, properties, and uses, 6:562t
Lithium disopropylamide (LDA), 15:148
Lithium-drifted silicon [Si(Li)] detector, 26:434
Lithium electrodes, 3:408
standard potential, 3:413t
Lithium fluoride, 15:138–139
Lithium fluoroborate, 4:153
manufacture, 4:155
physical properties of, 4:152t
thermodynamic properties of, 4:154t
uses of, 4:157
Lithium glasses, advantage of, 14:28–29
Lithium halides, 15:134, 138–140
Lithium hexafluoroarsenate, in lithium cells, 3:459
Lithium hexamethyldisilazide (LHS), 15:148
Lithium hydroxide, 15:134, 140–141
Lithium hypochlorite, 4:52; 15:141
pool sanitizer, 26:175
Lithium iodide, 3:417; 15:140
Lithium–iodine cells, 3:463–464
characteristics, 3:462t
speciality for military and medical use, 3:430t
Lithium ion, 15:134
Lithium–iron disulfide cells, 3:462–463
characteristics, 3:462t
speciality for military and medical use, 3:430t
Lithium–magnesium alloys, 15:135
Lithium manganate(V), 15:592
Lithium–manganese dioxide cells, 3:461
characteristics, 3:462t
Lithium metaborate, 15:137
Lithium metaborate octahydrate, 4:277
Lithium metal, 15:132
uses for, 15:134
Lithium metal films, 15:128
Lithium methoxide, 15:148
Lithium nickelate, 15:142
Lithium niobate, 15:141; 17:153
growth on semiconductor substrates, 17:448
Lithium niobate devices, commercial suppliers of, 17:458
Lithium nitrate, 15:141
Lithium nitride, 15:141; 17:199
Lithium oxide(s), 15:134, 141
Lithium perchlorate, 3:417; 15:141–142
dessicant, 8:360
in lithium cells, 3:459
Lithium peroxide, 15:142; 18:393
Lithium phosphate, 15:142
Lithium–polymer cells, 3:551
in development, 3:431t
Lithium primary cells, 3:459–466
Lithium production, 9:640
Lithium products, sales of, 15:121
Lithium salts, 15:135–136, 142
Lithium secondary cells, 3:549–551
ambient temperature, 3:541–549
economic aspects, 3:551–552
high temperature, 3:549–551
Lithium silicate glass-ceramics, 12:631–632
Lithium-silicates, 12:577; 15:142; 22:452
in adhesives and binders, 22:472
solutions of, 22:465
Lithium soap greases, 3:417
Lithium SVO cells, speciality for military and medical use, 3:430t
Lithium sulfuryl chloride batteries, 23:654
Lithium SVO cells, speciality for military and medical use, 3:430t
Lithium t-butoxide, 15:148
Lithium tetraborate, 15:137
Lithium tetrafluoroborate, in lithium cells, 3:459
Lithium tetrahydridothallate(III), 24:632
Lithium tetrahydroborate, physical properties of, 4:194t
Lithium–thionyl chloride cells, 3:466
characteristics, 3:462t
speciality for military and medical use, 3:430t
Lithium titanate, 15:142
Lithium trifluoromethanesulphonate, in lithium cells, 3:459
Lithium tetrafluoroaluminate, 2:379
Lithographic resist exposure technologies future, 15:186–191
Lithographic resists, 15:154–201
essential attributes of, 15:154–156
extension to the nanoscale, 15:181–191
historical development of resist materials, 15:156–160
image collapse and, 15:185–186
lithography without imaging radiation, 15:191–195
resists for microlithography, 15:191–195

Lithography
CMC applications, 5:452t
in compound semiconductor processing, 22:192–193
extreme ultraviolet, 15:189–191
157-nm, 15:187–189
193-nm liquid immersion, 15:186–187
organic esters in, 10:521
without imaging radiation, 15:191–195
Lithography techniques, very high resolution, 15:159
Lithol reds, 14:317; 19:435–436
Lithol Rubine, 19:436
Litho newsprint inks, 14:318–322
Lithophane, 19:385, 395–397
preparation of, 19:396
Lithosphere, elements in, 26:23. See also Earth’s crust
Liver cancer, from vinyl chloride contact, 25:651. See also Hepatotoxicity
Livestock industry, feed ingredient usage by, 10:837t
Live vaccines, 25:487
Living cationic polymerization, 14:271–272
Living free-radical polymerization (LFRP), 23:388–389
Living organisms, fermentation by, 11:1–2
Living polymerization, 23:728
of acrylic ester monomers, 1:386
of methacrylic ester polymers, 16:291
Living polymers, 24:705
Living ring-opening metathesis
polymerization (LROMP), 20:442, 444
Living styrene polymerization, 23:388–389
LLDPE blends, 20:207. See also Linear low density polyethylene (LLDPE)
LLDPE blown film, physical properties of, 20:188t
LLDPE film, physical properties of, 20:187t
LLDPE resin film, 20:206–207
LLDPE resins
commodity-grade, 20:201
crystallinity and density of, 20:181
differences among, 20:180–182
molecular weight of, 20:181–182
Load-bearing, of high density polyethylene, 20:165–166
Load-bearing structures, design of, 23:307
Load-deformation curves, for fibers, 11:181, 184
Loaded adsorbents, 1:590
Loaded fiber membranes, 16:2, 3
Load-extension curves, for fibers, 11:181, 185
Loading, of fillers, 11:305–306
Loading amplitudes, fatigue and, 14:450
Loading cycles, 13:482
Loading Ratio Correlation (LRC) Method, 1:626, 628
Loading waveform, 13:482–483
Load limits, in waste collection, 25:870
Load-lock system, 24:724
Load variable, 20:666
Lobeline, 2:82
Lobry de Bruyn–Alberda van Ekenstein reaction, 4:712
Lobsters, aquaculture, 3:189
Local chain conformation, HDPE, 20:162
Local emergency planning committee (LEPC), 21:589
Local flux-density profile, 23:816
Localized molecular orbital (LMO) calculations, 10:633
Locally weighted regression, 6:53
Local oscillator (LO), 23:142, 143
Local toxicity, 25:202
Locard Exchange Principle, 12:99
Lochett, W., 11:8
Lochner and Matar experimental design text; versus other texts, 8:395t
Locholest, molecular formula and structure, 5:141t
Lock-and-key enzyme action theory, 20:830
“Lock-and-key” fit, between molecules, 16:768
Lock-and-key type receptor, 16:770, 771
Lockhart–Martinelli method, 16:716
Locking and tagging practices, 21:853–854
Locust bean (carob) gum, 4:724t, 726–727; 12:53; 13:67
properties of, 13:74t
Lode deposits, tin, 24:784. See also Ores
Lodestone, 11:55
Loeb-Sourirajan membrane technology, 15:797, 805, 808, 809, 811, 816, 827–829
Loellignite, 3:263t
Loganiaceae, alkaloids in, 2:75
Loganin, 2:78, 85, 94, 100
Logarithmic-mean driving force, packed
column absorbers, 1:53
Logarithmic mean temperature difference
(LMTD), 13:251, 252
Logic circuits, CMOS, 22:251–253
Logic gates, molecular-based, 17:61
Log-mean temperature difference (LMTD),
26:64
Logna, molecular formula and structure,
5:118t
Lognormal distribution, 26:64
Logna, molecular formula and structure,
5:126t
London Bullion Market Association
(LBMA), 12:696
London Bullion Market Association, silver
specifications by, 22:649
London coherence length, 23:806
London equations, 23:806
London–Norris equations, 23:845
London penetration depth, 23:805, 806
23:92. See also van der Waals forces
Long-chain aliphatic acids, 20:97
Long chain amphiphiles, 24:123
Long-chain branching, 19:840
extent of, 19:839
in HDPE, 20:160–162
in LDPE, 20:220, 232–234
in LDPE resins, 20:215
quantifying, 20:228–229
Long-chain polyphosphates,
18:846–848
hydrolysis of, 18:850
Long-channel behavior, of FETs,
22:249–251
Long fibers, 21:18
Longifolene, 24:543
Longitudinal modes, 14:671
Longitudinal waves, 17:422
Long-liquor dyeing, 9:470–471, 473
Long oil alkyds, 2:148
Long-range noise correlation function,
22:113
Long range order (LRO) hardening,
13:499–500
Long-stem standard platinum resistance
thermometers, 24:445
Long-term creep tests, 13:477
Long-term food storage, 12:78–79
Long-term radiation effects, 17:551
Long transverse properties, of aluminum
wrought alloys, 2:330t
Long Valley Magma Experiment, 12:545
Long-wall mining, 20:614
Long wavelength light, ozone generation
using, 17:800
Loop diuretics, 5:169
Loop heat pipes (LHPs), 13:236–237
Loop reactors, tubular, 15:710
Loops, in grid diagram, 13:201–202
Loop slurry process, 20:168
Loop tenacity, 19:742–743
Loose abrasive slurries, 1:2, 15
Lopac, composition, 3:386t
Lopantrol, molecular formula and
structure, 5:92t
Loparite, 14:638
digestion of, 14:639
Lopizite, 6:471t
Lophine, chemiluminescence reagent,
5:856
Lophocerine, 2:84
Lopid, 5:146
molecular formula and structure, 5:141t
Lopressor, molecular formula and
structure, 5:95t
Lorcanide, 5:101
molecular formula and structure, 5:92t
Lorentz force, 23:823–824, 825–827;
24:731, 736
complex, 23:827
Lorentz-Lorenz equation, 19:380
Lorivox, molecular formula and structure,
5:92t
Lorol alcohols, 2:8t
Lorol C1098, chain length and linearity,
2:12t
Lorol C1695, chain length and linearity,
2:10t
Los Alamos National Laboratory, fuel cell
research, 19:627–628
Los Alamos water boiler, 17:589
Losartan, molecular formula and structure,
5:153t
Loss, in lasers, 14:664–666
Loss factor, monitoring, 10:15
Loss-in-weight method, 26:248
Loss-in-weight systems, 26:249
Loss-of-coolant accident (LOCA), 17:577,
582, 595, 596
Loss on drying, of silica, 22:373
Low carbon martensites, 23:300
Low carbon silicomanganese, 15:555–556
Low carbon steels, 23:291–292, 294
Low colloid oil muds, 9:5
Low color carbon blacks, 4:798t
Low cycle fatigue (LCF), of titanium alloys, 24:841
Low cycle fatigue testing, 13:489, 491–493
Low density copolymer resins, for extrusion coating, 20:235t
Low density linear polyethylene (LDLPE), 20:201. See also Linear low density polyethylene (LLDPE)
Low density lipoproteins (LDLs), 5:135–137; 10:829
Low density lipoprotein oxidation, vitamin E and, 17:652
Low density polyethylene (LDPE), 10:594, 595–596; 11:225; 16:21; 20:149, 151, 211–239; 24:267. See also LDPE entries
analytical and test methods for, 20:227–230
as barrier polymer, 3:377
blow molding, 20:237
blown film properties of, 20:213t
chain propagation in, 20:218–220
diffusion coefficient of estrs in, 3:390
diffusion of oxygen and carbon dioxide in, 3:382t
dynamic viscoelastic properties of, 21:724
economic aspects of, 20:224–226
effect of calcium carbonate fillers on oxygen permeability, 3:398t
environmental impact of, 20:230–231
in extrusion coating, 20:232–234
in food packaging, 18:40
health and safety factors related to, 20:230–231
injection molded, 20:214t, 236–237
inorganic pigment applications, 7:372t
kinetics of, 20:222
markets for, 20:225t
monomer and comonomers for, 20:211–212
organic pigment applications, 7:368t
permeability to selected permanent gases, 3:381t
polymerization mechanism for, 20:218–222
polymerization reactors for, 20:214–218
post reactor process for, 20:217–218
processing of, 20:222–224
properties of, 20:212–214
short- and long-chain branching in, 20:220
specifications and standards for, 
20:226–227
supply/demand for, 20:226
typical soluble dye applications, 7:376t
water-vapor transmission rate (WVTR), 3:387t

Low density polyethylene resins, 17:700, 701
for wire and cable, 20:234–236
Low density resin
for film applications, 20:232t, 233t
for sheet and profile extrusion, 20:233t
Low density rigid polyurethane foams, 25:461
Low density silica gel, 22:394–395
Low-dextrose equivalent (DE) syrups, 26:288
Low dust (tail-end) plant, 10:101
Loweite, 5:785t
Low emittance coatings, 23:16
Low energy dyes, 9:195, 416
Low energy electron beam irradiation, 22:567
Low-energy electron diffraction (LEED), 24:74
Low-energy ion scattering (LEIS), 24:74
Low energy photons, in solar cells, 22:137
Low enriched uranium (LEU), 17:527;
25:398, 412
Low aliphatic amines, 2:537–552
chemical reactions, 2:539–542
commercial, 2:537–538t
economic aspects, 2:548–555, 549–550t
health and safety factors, 2:548, 548t
manufacture by alcohol amination, 2:544–545
manufacture by alkyl halide amination, 2:547
manufacture by nitrile reduction, 2:546–547
manufacture by olefin amination, 2:547
manufacture by reductive alkylation, 2:546
manufacture by Ritter reaction, 2:546
physical properties of, 2:539, 540t
shipping and handling, 2:547–548
specifications, 2:551t
Lower critical solution temperature (LCST), 9:62; 13:737–738; 20:320, 322
Lower explosive limit (LEL), 10:107, 109; 21:840
Lower flammability limit (LFL), 21:840; 23:115, 116
Lower heating value (LHV), 6:828
Lower molecular weight (MW) esters, 10:500
Lower oxides of phosphorus (LOOP), 19:49
Lower temperature cure (LTC) epoxy systems, 10:444
Lower-valence organotitanium compounds, 25:103t
Lower valent titanates, 25:102–104
Lowest achievable emission rate (LAER), 1:812, 814; 21:584
Lowest observable adverse effect level (LOAEL), 25:237
OLED emission and, 22:218
in organic semiconductors, 22:209
in single layer OLEDs, 22:216
Low expansion foams, 12:20
Low flow pump operation, 21:83–84
Low frequency sweep experiments, 10:15
Low grade copper scrap, 21:393, 394
Low hydrocarbon feedstocks, best-suited developing technology for, 25:177t
Low intensity magnetic pulley separators, 15:450
Low intensity wet drum magnetic separators, 15:442–449
Low internal phase ratio emulsions, 10:114
Low-level radioactive waste (LLW), 25:851.
See also Low level wastes (LLW)
disposal of, 25:857–859
medical/biological, 25:865–866
storage of, 25:855
treatment of, 25:853
Low-level radioactive waste disposal facility, operation of, 25:858
radioactive waste disposal under, 25:858–859
Low level wastes (LLW), 23:592. See also Low-level radioactive waste (LLW) from reactors, 17:598
Low-melting lead alloys, 14:779
Low-melting-point indium alloys, 14:196
Low-melting thiodiols, DBTDL-catalyzed step-growth solution and melt polymerization reaction of, 23:744
Low-methoxyl pectins (LM pectins), 4:728; 13:69
Low molecular weight (LMW) amines, 14:390
Low molecular weight aliphatic dissolution inhibitors, 15:177
Low molecular weight compounds, in reactive compatibilization, 20:325–326
Low molecular weight epoxy diluents, toxicity of, 10:461
Low molecular weight epoxy resins, 10:388
Low molecular weight heparin, 4:94–96, 95t, 105–106
Low-molecular-weight polyacrylamides (LMPAM), 1:321
Low molecular weight polycarbonate, 19:802
Low molecular weight polyisobutylene, 4:434
Low molecular weight polysulfides, 10:7
Low molecular weight products, 11:442
Low-molecular-weight thiopolyesters, with side benzylthiomethyl chains, 23:741
Low order detonation, 10:720
Low orientation yarns (LOYs), 19:752; 20:14
drawing, 20:15–16
Low performance affinity chromatography support, 6:394–395
Low performance sealants, 22:28
Low permeability graphite, 12:747
Low phosphorus plate/punchings scrap, 21:408
Low polarity plasticizers, 14:479
Low power package, 14:863
“Low pressure” catalytic processes, 20:151
Low pressure chemical vapor deposition (LPCVD), 5:807, 811–812
Low-pressure gas separation, spiral-wound membrane modules for, 15:823–824
Low pressure hollow-fiber membranes, 16:24–26
Low pressure low density polyethylene (LDPE), 10:595
Low pressure tanks, 24:288
Low Q-state, 14:674
Low rank coal, defined, 6:828
Low resistivity joints, 23:847
Low silica zeolites, 16:833
synthesis mechanisms of, 16:830
Low soda alumina hydroxides, 2:429–430
Low solid, high density drilling fluids, 9:36
Low solids solvent-borne coatings, 10:438
Low speed surface aerators, 26:161
Low stress epoxy encapsulants, 10:6
Low stress molding compounds, 10:11
Low stress epoxy resins, 10:388
Low viscosity low density polyethylene, 10:595
Low Q-state, 14:674
Low rank coal, defined, 6:828
Low resistivity joints, 23:847
Low silica zeolites, 16:833
synthesis mechanisms of, 16:830
Low-silica zeolites, 16:833
synthesis mechanisms of, 16:830
Low solid, high density drilling fluids, 9:36
Low solids solvent-borne coatings, 10:438
Low speed surface aerators, 26:161
Low stress epoxy encapsulants, 10:6
Low stress molding compounds, 10:11
Low stress epoxy resins, 10:388
Low viscosity low density polyethylene, 10:595
Low Q-state, 14:674
Low rank coal, defined, 6:828
Low resistivity joints, 23:847
Low silica zeolites, 16:833
synthesis mechanisms of, 16:830
Low-silica zeolites, 16:833
synthesis mechanisms of, 16:830
Low solid, high density drilling fluids, 9:36
Low solids solvent-borne coatings, 10:438
Low speed surface aerators, 26:161
Low stress epoxy encapsulants, 10:6
Low stress molding compounds, 10:11
Low stress epoxy resins, 10:388
Low viscosity low density polyethylene, 10:595
Low-to-medium viscosity liquids, blending of, 16:687–690
Low valent manganese compounds, 15:570–571
Low volatile bituminous coal rank and heating values, 6:726t
vitrinite reflectance limits and ASTM coal rank classes, 6:708t
Low volatile bituminous coal grade (U.S.), 6:713t
Low volatile coal classification by rank, 6:711t
empirical composition, 6:730t
Low vulnerability ammunition (LOVA) propellants, 10:725–726
Low water/monomer process, 11:200
Loxen, molecular formula and structure, 5:128t
Loxoribine, 2:823
Lozol, 5:168
molecular formula and structure, 5:162t
L-scan images, generating, 17:429, 430–433
LSD-25 (lysergic acid diethylamide), 2:93
L-shaped method, optimization via, 26:1028
LSS theory, 14:432, 433–434
L-Sugars, 4:697
LTS Josephson devices, 23:870–872.
See also Josephson entries; Low temperature superconductors (LTS)
Lube basestocks, dewaxing of, 16:844
Lube oil additives, maleic anhydride derivatives as, 15:512. See also Lube oil additives
Lubricant (lube) additives
Lube oil sulfonates
major producers of, 23:533
recent developments in, 23:534
Lubricant (lube) additives. See also Lube oil additives
cerium application, 5:688
plasticizer alcohols for, 2:23
sulfonates for, 23:533
trichloromethanesulfenyl chloride in, 23:629
Lubricant(s), 9:24–25
alkanolamines from olefin oxides and ammonia, 2:138
antioxidant applications, 3:123–124
antioxidants, 3:125
bonded solid-film, 15:248–251
ceramics processing, 5:647
chlorinated paraffins applications, 6:128
detergent alcohols for, 2:20
environmental and health factors related to, 15:256–260
fatty acid amides, 2:458
in fiber finishing, 22:594
in food, 12:66
food-grade, 15:260
higher olefins in, 17:726
hydrocarbon use in, 13:687–688
market for, 15:256, 257t
metalworking fluids, 15:240–242
organic esters as, 10:518
in polyamide plastic manufacture, 19:784
for PVC polymers, 25:672–673
recycling of, 15:258
selenium in, 22:102
silicone fluids as, 22:578
silver as, 22:641, 662
soaps as, 22:757
solid, 15:247t
synthetic, 12:672
tellurium in, 24:427
toxic and hazardous constituents of, 15:259–260
uses of succinic acid and succinic anhydride in, 23:428t
Lubricant/binder ratio, 15:250
Lubricant films, 15:213–214
Lubricant/release agent, 12:32
Lubricating grease, 15:242–243
Lubricating oil, as a petroleum product, 18:669–670
Lubricating oil additives (LOAs), 19:69
Lubricating oil base stocks, 15:214–219
biodegradable, 15:218–219
classification of, 15:214–215
manufacturing processes for, 15:215–217
rererefined, 15:219
synthetic, 15:215
Lubricating oil products, recycled, 21:421
Lubricating oils, 15:226–240
additives for, 15:219–226
applications for, 15:227t
catalyst deactivation by, 10:54
effect on refrigerants, 21:533
EPM as an additive to, 10:717
extraction of, 10:782
recycling, 21:420
worldwide production of, 21:421t
Luminescent guests, 8:269–271
luminescence of, 8:255–259
with luminescent core, 8:259–260
with luminescent units in periphery, 8:262–263
whose luminescence is governed by energy- transfer processes, 8:262–269
Luminescent lanthanide reporters, 26:802
Luminescent pigments, 19:411
Luminol, 14:151
chemiluminescence reagent, 5:840–845
Luminous efficacy of radiation, 14:843, 861
Luminous efficiency of the source, 14:844, 861
Luminous transmittance, polar plot of, 23:20
Lummus hypochlorite process, 10:655
Lummus-Transcat process, 25:647
Lummus–Unocal–UOP process, 23:331, 332
Lummus-UOP Classic process (Monsanto process), 23:339, 341
Lump glass, in silica/silicate manufacture, 22:462, 468t
Lump graphite, 12:784–785, 793
Lump quicklime, 15:28
Luna Innovations, 1:718
Lung cancer, asbestos and, 3:316
Lungs
drug delivery to, 9:49–50
effect of pulmonary conditions on heart, 5:107
Lung surfactants, 24:161
Lupolex, 7:636
Lupron Depot drug-delivery system, 13:741
Lurgi Arosolvan process, 10:782
Lurgi biomass gasifier, 3:695
Lurgi contactor, 10:775
Lurgi gasifier, 6:729, 761, 783t, 794–796, 828
Lurgi multistage mixer–settler, 10:782
Luster, of fibers, 11:167
Lusterant effects, in polyester fibers, 20:5
Lutein, 17:655–656, 657
Lutetium (Lu), 14:630,631t, 635t
electronic configuration, 1:474t
2,6-Lutidine, 21:114
Luttinger parameters, 22:148, 149t
L-valves, 11:819
LVDT dial gauge, creep strain measurement using, 13:475–476
L X rays, 21:311, 312
Lycopene, 17:644, 660–663; 24:557, 558
anticancer activity trials, 2:826
antioxidant properties of, 17:661
beneficial effects of, 17:661–662
dietary sources of, 17:661
synthesis of, 17:660
Lycopodine, 2:82
Lycorine, 2:86
Lye
in continuous saponification, 22:737–738
in kettle soap making, 22:737
Lygus bugs, 8:9
Lyocell fibers, 11:261, 265; 24:616
applications for, 11:269–272
production and consumption of, 11:277–278
Lyocell process, environmental issues related to, 11:279–280. See also Courtaulds lyocell process
Lyondell’s process, 23:345
Lyophilic colloids, 7:283–284
Lyophilization, 18:716
Lyotropic liquid crystalline polyesters, 23:722
Lyotropic liquid crystalline polymers, 13:372–373
Lyotropic liquid crystals, 15:86, 98–101
amphiphilic molecules in, 15:99–101
Lyotropic mesophases, 20:79
Lyotropic polymer liquid crystals, 15:107–108
Lyral, 1:278; 24:486
Lysergic acid, 2:100
Lysergic acid diethylamide (LSD-25), 2:93
Lysine
alkaloids derived from, 2:78, 80–82
systematic name, formula, and molecular weight, 2:556t
taste profile, 2:605
content in cocoa and chocolate products, 6:368t
D-Lysine, systematic name, formula, and molecular weight, 2:556t
DL-Lysine, systematic name, formula, and molecular weight, 2:556t
L-Lysine, systematic name, formula, and molecular weight, 2:556t
Lysoceillin, 20:120, 137
Lysozyme
purification, 3:844, 845
registered for use in aquaculture in Japan, 3:221t
Lyvelin, 11:608
D-Lyxose, 4:698
M2-Forming process, 3:609
M17A2 gas mask, 5:832–833
M40 gas mask, 5:833
M41S materials, 16:847
M42 gas mask, 5:833
M202/M74 flame thrower, 5:824
M258A1 decontamination kit, personal, 5:836
MABS polymers, 16:290. See also ABS
(acylonitrile–butadiene–styrene) materials
Macadam color difference scale, 7:321
MacAdams ellipses, 7:322
MacCoull equation, 15:207
Mace, 23:155, 168
Maceral groups, 6:706
Stopes–Heerlen classification, 6:707t
Macerals, 6:703, 706
Stopes–Heerlen classification, 6:707t
Machinability, copper wrought alloys, 7:748–749
Machine category, in patents, 18:166
Machine components, case hardening, 16:196
Machine dishwashing, detergents systems for, 8:413t
Machined surfaces, roughness values of, 15:203
Machine operator, responsibility of, 15:477
Machinery cast scrap, 21:410
Machine-tool accessories, molybdenum in, 17:14
Machine tools, high throughput experimentation, 7:382t
Machining
ceramics processing, 5:664
of copper, 7:697–698
of titanium, 24:859–860
Mach number, 11:745, 760, 761
Mach–Zehnder configuration, 17:445
Mach–Zehnder electrooptic modulators, 17:447
Mach–Zehnder interferometer, 11:153
Mackenzie-Shuttleworth model, 23:75
Mackie line effect, 19:209, 210
Macor glass-ceramic, 12:635
Macquartite, 6:471t
Macrine, 6:707t
“Macrobicyclic effect,” 24:39
Macrocyclic lattice host inclusion compounds, 14:177–179
Macrocyclic lattice hosts, 14:177
Macrocyclic mercuracarboranes, 4:216–217
Macrocyclic oligoesters, 25:125
Macrocyclic polymers, 14:252
Macrocyclic polythioethers, 23:756
Macrocyclic ligands, 7:576
Macroemulsions, 10:113; 16:433–434
Macrocycloligands, in industrial water treatment, 26:149–150
Macroleide antibiotics, 15:271–320. See also Macrolides
biological properties of, 15:302–305
biosynthetic patterns, conformational analysis, and discovery research for, 15:305–306
hybrid macrorides and combinatorial biosynthesis, 15:301–302
medical and economic aspects of, 15:306–307
naturally occurring 14-membered macrorides, 15:272–280
naturally occurring 16-membered macrorides, 15:287–298
pharmacokinetics and pharmacology of, 15:304–305
saccharides found in, 15:273–274t
semisynthetic 14-membered macrorides, 15:280–287
semisynthetic derivatives of 16-membered macrorides, 15:298–301
12-membered ring macrorides, 15:272, 275t
Macroleide products, commercial, 15:307t
Macrolides, 3:25, 30. See also Macrolide antibiotics
bacterial resistance mechanisms, 3:32t; 15:303
benefits of, 15:304
conformations of, 15:306
excretion of, 15:304
hybrid, 15:301–302
side effects of, 15:304–305
in veterinary medicine, 15:306–307
Macromixing, 16:683
Macromolecular chains, architectures of, 20:483
Macromolecular constructs, self-assembly of, 17:637
Macromolecular nomenclature, 17:403–404
Macromolecular structure, of polyamide fibers, 19:740
Macromolecular surfactants, 24:159
Macromolecule single-crystal structure determination, 26:426–427
Macromolecule structure, interactions related to, 13:742–743
Macromolecule X-ray diffraction, Laue method for, 26:442
Macrophages, role in hemostatic system, 4:89
Macropore diffusion, 1:596–597
Macroporous catalysts
maximum intrapellet temperature in, 25:301–303
maximum temperature in, 25:299–301, 303–305
Macroporous cation exchangers, 14:387
Macroporous gels, 13:738
Macroporous molecular sieves, 16:849
Macroporous particles, apparent effective diffusivity and, 15:730
Macroporous resins, 14:393, 397
Macroreticular sulfonated styrene–divinylbenzene copolymers, properties and applications, 1:587t. See also Styrene–divinylbenzene copolymers
Macro-routing, in waste collection, 25:869
Macroscopic charge polarization, 14:679
Macroscopic ordering, in smart materials, 22:707
Macrosoporin, 21:255
Macro-stress measurements, 9:707
Macrovoids, 16:12
Macular pigment optical density, 17:660
Madagascar, natural graphite in, 12:779–780
Mad cow disease, 10:866
Madrid Arrangement, 25:267
Madrid Protocol, 25:255, 264, 267
Maduramicin, 20:129, 139
Mafenide, 23:508
Magadiite, 22:455
Magainin(s), 18:254, 261–263
derivatives of, 18:261–262, 263
Magcan magnesium manufacturing process, 15:338
Magenta, CIE chromaticity diagram, 7:313, 315
Magenta azo dye developer, 19:287
Magenta couplers, in chromogenic chemistry, 19:254–256
Magenta dyes
in chromogenic chemistry, 19:249
stability of, 19:263
Magnesite acidi
Magnesite reserves, 15:713t
Magnetite, 12:192
Magnetite applications, 4:136
MAGLEV trains, 23:864–865, 867
Magma resources, 12:523, 544–545
Magnesite, 20:650
Magnesioferrite, in chromite, 15:412, 413
Magnesia products, 15:321, 387, 389–390
Magnesia–alumina–silica, catalytic aerogels, 1:763t
Magnesia–alumina–silica–chrome brick, 6:495
Magnesiodielsite, 3:288–289
Magnesite, 15:321, 387, 389–390
Magnesite acidification process, 15:403
Magnesite–chrome brick, 6:495
Magnesite reserves, 15:322t
Magnesium, 15:410
carbon monoxide compatibility with, 5:4t
dead-burned, 15:412, 413
hard-burned, 15:412
phase in Portland cement clinker, 5:472t,
473t
Magnesia–alumina–silica, catalytic aerogels, 1:763t
Magnesia–base refractories, 15:425
Magnesian quicklime, 15:28
Magnesia products, 15:323
Magnesioferrite, in chromite, 6:474
Magnesioriebeckite, 3:288–289
Magnesium, 15:321, 387, 389–390
carbon monoxide compatibility with, 5:4t
deposits, 15:321
occurrence of, 15:322
refractories, 21:518
as a refractory raw material, 21:490
Magnesite acidification process, 15:403
Magnesite–chrome brick, 6:495
Magnesite reserves, 15:322t
world, 15:389t
Magnesium (Mg), 15:320–381. See also
Aluminum–magnesium phase diagram; Aluminum–magnesium–zinc phase diagram; MgB2 entries
activated, 12:835
analytical methods for, 15:348
atmospheric exposures of, 15:369
beer as dietary source of, 3:588
behavior on contact with chemicals, 15:372t
caustic soda in removing, 22:832
chlorine from electrolysis of magnesium chloride, 6:175
in coal, 6:718
consumption of, 15:323
content in cocoa and chocolate products, 6:371t
corrosion and finishing of, 15:369–375
in cotton fiber, 8:20t
economic aspects of, 15:344–347
effect on beer making when present in water, 3:573
effect on copper resistivity, 7:676t
electrolytic production of, 12:759
electroplating of, 15:375
electrowinning of, 16:162
environmental concerns related to,
15:348–349
in galvanic series, 7:805t
grades, specifications, and quality control of, 15:347–348
health and safety factors related to,
15:349–350
imports of, 15:323–325, 345–346
machining of, 15:368–369
manufacturing of, 15:328–344
in metal incendiaries, 5:826
metallic impurities in, 15:343
nonmetallic inclusions in, 15:342–343
occurrence of, 15:321–323
in perovskites, 11:97
production growth compared to aluminum and other metals, 2:301t
properties of, 15:325–327
recycling and disposal of, 15:349
refining and casting of, 15:342–344
reserve batteries based on, 3:468
in ruminant feeds, 10:867
selenium and metallurgy of, 22:98
silver alloyed with, 22:658
solubility limits and electrical conductivity effects on copper,
7:750t
sources and supplies of, 15:323–325
tariffs and depletion provisions for,
15:347
uses for, 15:350–375
U.S. imports and exports of, 15:326t
in zinc die-casting alloys, 26:587–589
Magnesium(II), concentration formation constant of chelates, 5:717t
Magnesium acetate, 15:381–384
physical properties of, 15:383t
Magnesium alkyl reactions, 15:384
Magnesium alkyls, 15:384–385
Magnesium alloy M11630, 15:357
Magnesium alloy M11916, 15:357
Magnesium alloy parts, 15:367
Magnesium alloys, 15:353
chemical compositions and physical properties of, 15:355–356t
composition and properties of, 15:354–357
 corrosion and finishing of, 15:369–375
 fabrication of, 15:365–368
 grain size and structural characteristics of, 15:360–361
 metallurgy of, 15:358–365
 pickling, 16:223
 prices of, 15:346
 Magnesium aluminosilicates, 12:578
 Magnesium–aluminum alloys, 15:358–360, 364
 Magnesium analysis, of water, 26:37
 Magnesium assemblies, compatible metals for use with, 15:373–374
 Magnesium-base scrap, 15:349
 Magnesium β-alumina, 2:406t
 Magnesium bicarbonate, 15:389
 Magnesium bisulfite, 142
 Magnesium bromide, 15:385–387
 physical properties of, 4:328–329; 15:386t
 solubility in water, 4:322t
 Magnesium bromide hexammoniate, 15:387
 Magnesium bromide hexahydrate, 15:386t
 physical properties of, 15:388t
 powder used in cosmetics, 7:841t
 production of, 15:389–390
 uses for, 15:390–391
 Magnesium casting, sulfur dioxide in, 23:668
 Magnesium casting alloys, mechanical properties of, 15:358–359t
 Magnesium castings, heat treatment of, 15:357–358. See also Magnesium die castings
 Magnesium chloride, 15:321, 328, 391–396. See also MgCl₂ entries
catalyst support structure of, 20:525
 physical properties of, 15:392t
 preparation and manufacture of, 15:392–394
 recovery from brine, 5:797; 15:393–393
 role of weather in producing, 15:394
 uses for, 15:394
 Magnesium chloride brine, 15:394t
 uses for, 15:394
 Magnesium chloride hexahydrate, 15:394
dehydration of, 15:328
 Magnesium chromate, molecular formula, properties, and uses, 6:562t
 Magnesium chromite, molecular formula, properties, and uses, 6:563t
 Magnesium citrate, molecular formula, 6:638t
 Magnesium compounds, 15:381–433
economic aspects of, 15:424–425
 environmental concerns related to, 15:425–428
 recovery from brine, 5:797–798
 shipped and used, 15:428t
 statistics for, 15:425t
 U.S. exports of, 15:427t
 U.S. imports of, 15:427t
 U.S. producers of, 15:426t
 Magnesium Corporation of America, magnesium manufacturing by, 15:335–336
 Magnesium cyanide, 8:197
 Magnesium diboride. See MgB₂ entries
 Magnesium dichromate, molecular formula, properties, and uses, 6:562t
 Magnesium die castings, in North America-produced vehicles, 15:335t
 Magnesium electrodes, 3:408
 standard potential, 3:413t
 Magnesium extrusions, mechanical properties of, 15:360–361t
 Magnesium ferrosilicon, 22:517–518
 Magnesium fertilizer, 15:420
 Magnesium Carrada, 15:349–350
 Magnesium fluoride, 15:396–398
 chemical and physical properties of, 15:397t
 uses for, 15:397–398
 Magnesium fluoroborate, manufacture, 4:155
 Magnesium fluoroborate hexahydrate, 4:153
 Magnesium forgings, 15:366
 Magnesium halide, 15:385
 Magnesium hydride, 13:612
Magnetic concentration and purification, 15:442–457. See also Magnetic separators
Magnetic confinement, 14:686
Magnetic data storage, high throughput experimentation, 7:414t
Magnetic discharge rate, 15:445
Magnetic drums, 15:452–453
  in cobbing services, 15:445–446
  in roughing services, 15:446
  tramp iron, 15:439–441
Magnetic energy storage, superconducting, 23:862–863
Magnetic equipment, 15:434–435
Magnetic field exposure limits, long-term, 16:527
Magnetic field intensity, 15:434; 23:868–869
  exponents of dimensions, 8:585t
Magnetic fields, filtration and, 11:324
Magnetic filters, 15:450
Magnetic filtration, cell sorting via, 26:971–972
Magnetic finishing drums, 15:446
Magnetic flocculation, 16:639
Magnetic flow meters, 20:681
Magnetic flux, exponents of dimensions, 8:585t
Magnetic flux density, 15:434
  exponents of dimensions, 8:585t
Magnetic flux leakage tests, 17:419–420
Magnetic flux leakage technique, in nondestructive evaluation, 17:418–420
Magnetic force microscopy, 3:332
Magnetic gangue minerals, 25:401
Magnetic hysteresis loop, 23:817
Magnetic induction, for mineral extraction, 15:435t
Magnetic intragrain critical current density, 23:822–823
Magnetic leakage field, detecting, 17:419
Magnetic levitation, 23:864–865
Magnetic losses, 23:846
Magnetic material properties, of M-type ferrites, 11:69–71
Magnetic materials, coordination compound applications, 7:600
Magnetic moment, 23:857
  of spinel ferrites, 11:60–62
Magnetic oxide compounds, ferrites as, 11:55
Magnetic particle separation, 15:435
Magnetic particle testing (MT), piping system, 19:485
Magnetic permeability, of ferrites, 11:63–64
Magnetic phase diagram, of high temperature superconductors, 23:838–842
Magnetic properties, of M-type ferrites, 11:67–68
Magnetic properties, of rare earths, 14:651–652
Magnetic pulleys, 15:436–437, 452;
  16:636–639
  capacities of, 15:437t
Magnetic pulley separators, low intensity, 15:450
Magnetic recording techniques, 17:419
Magnetic recovery, in ore concentration, 15:447
Magnetic refrigeration, 8:43
Magnetic reluctance, 20:654
Magnetic resonance imaging (MRI), Nb–Ti wire for, 23:829
  cryogenic applications, 8:42
  metal fullerene application, 1:719
Magnetic resonance imaging agents, hydrated lanthanide ions as, 13:442
Magnetic resonance imaging systems
electromagnets for, 23:857–861
semiportable, 23:860–861
Magnetic resonance losses, in spinel ferrites, 11:64–66
Magnetic resonance testing, in nondestructive evaluation, 17:418
Magnetic saturation, 25:369
Magnetic sector instruments, 15:663–664
Magnetic semiconductors, dilute, 22:142
Magnetic separation, 15:434–459;
16:636–642; 23:870. See also Magnetic separators
commercial, 15:442
tramp iron magnetic separation, 15:436–441
Magnetic separators classification of, 15:442
dry, 15:450–452
high intensity cross-belt, 15:454–455
high intensity induced-roll, 15:453–454
improvements in, 16:641
low intensity wet drum, 15:442–449
manufacture of, 15:458
principal manufacturers of, 15:458t
types of, 16:637–638t
wet high intensity, 15:449–450
Magnetic strength, for ore concentration, 15:447
Magnetic susceptibility, 16:638
silver, 22:639–640
Magnetic tapes, chromium application, 6:565
Magnetism, effect on weighing, 26:243
Magnetite, 5:601; 11:55
in bauxite, 2:344, 347
in chrome, 6:474
color, 7:332
ground, 15:445t
Magnetization, of ferrites, 11:62, 66–71,
85–86
“Magnetization unit,” 23:870
Magnet market, 14:645
Magnetocrystalline anisotropy, in ferrites, 11:62–64
Magnetocrystalline anisotropy constant, of M-type ferrites, 11:67, 68
Magnetohydrodynamic (MHD) convection, in microfluidic mixers, 26:967
Magnetohydrodynamic power generation, cesium application, 5:704
Magnetometers, SQUID, 23:871
Magnetomotive force, exponents of dimensions, 8:585t
Magnetooptic recording, 14:651–652
Magnetoplumbite, 11:55, 56t, 57
M-type ferrites and, 11:66
Magnetoptical flux decoration, 23:812
Magnetoresistive (MR) head technology, 19:632
Magnetoresistive materials, high throughput experimentation, 7:414t
Magnetorheological (MR) effect, 21:718–719
Magnetorheological (MR) materials, 22:708t, 714–715, 721t
Magnetostriiction effect, in ferrites, 11:62–64
Magnetostriuctive materials, 22:708t, 714,
721t
Magnet pole configurations, 15:453
Magnetrons, 16:519, 520; 23:135–136
Magnetron sputtering, 24:731–732
Magnets
ferrites as, 11:58, 59–60, 60–62
grate, 15:441
M-type ferrites as, 11:85–87
nickel–iron alloy, 17:101
plate, 15:441
in superconducting levitation systems, 23:866–867
suspended, 15:437
Magnitude estimation, in flavor characterization, 11:513
Magnox reactor, 17:570–571
Mahimahi, aquaculture, 3:189
Maigre coal grade Belgium, 6:713t
France, 6:713t
Maillard reactions, 11:35, 580; 23:443–444, 462
amino acids, 2:568
aspartame in, 24:227–229
Mail surveys, 15:635
Main group metal coordination compounds, 7:580–582
Main malt mash, 3:577
Maintenance, 15:460–481. See also
Predictive maintenance (PdM);
Preventive maintenance (PM)
condition-based, 15:467
elements of, 15:460
failure and, 15:462–463
inventory management and, 15:470–471
outsource, 15:478
piping system, 19:488–492
planned component replacement and, 15:470
planning and, 15:471–473
quality in, 15:479
reliability-centered, 15:476–477; 26:991, 992
in hazard recognition, 14:209–213
scheduling and, 15:474
tank, 24:306
total productive, 15:477–478
training and, 15:474–475
Maintenance coatings, 7:142–144
Maintenance department, information flow in, 15:464–466
Maintenance management effort, 15:461t
Maintenance paints, 7:182–184
Maintenance repair and overhaul (MRO), 15:470–471
Maintenance technical library (MTL), 15:479–480
Maintenance warehouse, 15:470
Maize, 26:286. See also Corn
Major commodity fibers, 11:172–175
Major histocompatibility complex (MHC) molecules, 20:831
Makeup treatment, in steam-generating systems, 23:227
Makeup water, 23:221
Malaria
global eradication program for, 14:350
yeast as a model for, 26:495–496
Malaria vaccine, 25:499
from yeast, 26:488
Malathion, 18:525
Malaysia, aromatics market in, 24:276–277
Malcolm Baldrige National Quality Award (MBNQA), 21:168, 170, 173
MALDI spectra, 15:659
Maleic acid, 15:486
Maleamic acid, 15:487
Maleate, in silicone network preparation, 22:566
Maleated oils, 9:150–151
Maleate group-containing polyesters, sulfonation of, 23:536
Maleate polymers, 20:100
Maleic acid, 15:481–523
health and safety factors related to, 15:511
oxidation of, 15:494
physical properties of, 15:482–483
Maleic acid crystals, 15:482
hydrogen bonding in, 15:493
Maleic anhydride (MAN), 12:275;
acylation of, 15:486
alkylation of, 15:486
amidation of, 15:486–487
analytical and test methods for, 15:509–510
chemical properties of, 15:484–496
concerted nonpolar reactions of, 15:487–490
copolymers of, 15:494–495, 513
decomposition and decarboxylation of, 15:490
Diels–Alder adduct from cyclopentadiene, 8:222t
Diels–Alder reactions of, 15:488–489
economic aspects of, 15:507–509
electrophilic addition of, 15:490
in ene reactions, 15:490
esterification of, 15:491
free-radical reactions of, 15:491
from butadiene, 4:371
Grignard-type reactions of, 15:491
halogenation of, 15:491–492
health and safety factors related to, 15:510–511
hydration and dehydration of, 15:492
hydroformylation of, 15:492
hydrogenation technology for conversion of, 15:496
isomerization of, 15:492–493
ligation-to-metal atoms of, 15:493
manufacture of, 15:496–507
metal-induced cycloadditions of, 15:489
monoacid chlorides of, 15:484–486
nucleophilic addition to, 15:493–494
physical properties of, 15:482–483
polymerization of, 15:494–495
process technology evolution for, 15:496–498
production and sales data for, 15:507–509
production from benzene, 3:601
reactions with PVA, 25:601
reaction with coal, 15:488–489
recovery and purification of, 15:506
reduction of, 15:495–496
shipping, 15:507
specifications for, 15:509
step-growth polymerization of, 15:495
sulfonation, 15:of–496
2+2 cycloadditions of, 15:489–490
uses for, 15:511–514
U.S. production and sales of, 15:508t
Maleic anhydride capacity, world, 15:497t
Maleic anhydride-grafted polymers, 20:325
Maleic anhydride nameplate capacities, 15:509t
Maleic anhydride plant, utilization of waste heat from, 15:502
Maleic hydrazide, 13:43t, 53–54, 593; 15:487
Maleic isomerization, 20:99–100
Maleic resins, 20:100
Maleimide method, for covalent ligand immobilization, 6:396t
Maleimide terminated monomers, 20:273
Malic acid, 12:45
uses for, 15:512
(S)-Malic acid
in citric acid cycle, 6:633
Malignancies, vitamin A treatments for, 25:790
Malleability, of silver, 22:641
Malleable irons, 14:522
Malolactic fermentation, 26:313–314
Malonic acid, 23:419
Malononitrile, 8:174
Malting, 15:523. See also Malts
barley cleaning and grading for, 15:525–527
barley germination in, 15:528–529
barley steeping in, 15:527
in beer and brewing, 3:563, 564, 565–569, 574
economic aspects of, 15:532–534
material balance for, 15:526t
new technology for, 15:531–532
process of, 15:525
raw materials in, 15:523–525
Malting capacity
North American, 15:533
world, 15:532
Malting/fermenting aid, 12:32
Malting industry, commercial information on, 15:534
Malting quality, improving, 15:531
Maltitol, 12:40
Malt modification, gibberellic acid in, 15:531
Maltodextrins, 11:534
Maltodextrins, 4:714–715
Maltogenic amylase preparations, 10:297
Maltogenic amylases, 10:288
Maltol, 12:49
synthesis, 9:680
Maltopentaose, 4:702
Maltose, 4:701; 23:486–487
fermentation in beer making, 3:577
Maltose syrup production, 10:289–290
Maltotetraose, 4:702
Maltotriose, 4:702
Maltotriose fermentation, 26:465
in beer making, 3:577
Malts, 15:523–537; 26:464
health and safety factors related to,
15:535
investment, costs, and prices for, 15:534
kilning of, 15:529–531
manufacturing and processing of, 15:531
specialty products and by-products of,
15:535–536
specifications for, 15:534–535
storage, blending, and shipping of,
15:531
typical analysis of, 3:569t
Malt syrups, 15:536
Malvalic acid (halphenic), 5:36t
Mamanite, 5:785t
Mamutwan manganese ore mine, 15:545
Mammalian cell culture, 5:346
environmental parameters for, 5:347t
health risks, 5:358
processes, 5:349–356
Mammalian cells, 5:346–347
oxygen demands, 1:730t
nutritional requirements, 5:347–348
Mammalian metabolic pathways, microbial systems for predicting, 16:399
Management. See also Process management; Supply chain management
of collaborative research partnerships, 24:387–389
for reliability, 26:981, 992–994
of resources, 24:164–167
of toxic chemicals, 24:184–188
Management activities, EIA, 10:236
Management choices, EIA, 10:237–238
Management consultants, 15:635
Management Control and Automation Association, 15:767
Manganese (Mn), 15.538–565. See also Magnesium–manganese phase diagram
in coal, 6:718
content in cocoa and chocolate products, 6:371t
in cotton fiber, 8:20t
dispersoid former, 2:325, 327
economic aspects of, 15:559
effect on copper resistivity, 7:676t
effect on stainless steel corrosion resistance, 7:809
in ferrites, 11:60–62, 72, 73, 78–81t
in finished steel, 23:260
health and safety factors related to, 15:559–561
isotopes of, 15:567t
minerals and ores of, 15:538–545
in M-type ferrites, 11:66, 69
mutagenic effects of, 15:615
nonferrous uses of, 15:563
as a plant micronutrient, 15:613
polymer autoxidation catalysis, 3:104
properties of, 15:538, 539t
recovery of, 15:546–547
selenium and metallurgy of, 22:97
solubility limits and electrical conductivity effects on copper, 7:750t
solution color of ions in glass, 7:343t
U.S. economic statistics for, 15:560t
water exchange rates and activation parameters of hexaaqua complexes, 7:589t
Manganese(II), concentration formation constant of chelates, 5:717t
Manganese 2B, 19:436
Manganese(IV), 24:415
Manganese(III) acetate dihydrate, 15:578
Manganese allotropes, properties of, 15:539t
Manganese alloys, electrochemical oxidation of, 9:636
processing of, 15:546–557
Manganese alumina pink corundum, formula and DCMA number, 7:347t
Manganese antimony titanium buff rutile, formula and DCMA number, 7:347t
Manganese Antimony Titanate Buff, pigment for plastics, 7:370t
Manganese-based catalysts, 15:586
Manganese-bearing particulate matter, 15:614
Manganese borates, 4:282
Manganese boron, 4:136
Manganese bromide, physical properties of, 4:329
Manganese bronze
effect of alloying on mechanical properties, 7:677
in galvanic series, 7:805t
Manganese carbide, 4:690–692
lattice, 4:652
thermodynamic properties of, 4:651t
Manganese carbide (3:1), 4:649t, 692
Manganese carbide (23:6), 4:649t, 692
Manganese carbonate, 15:573
Manganese carbonyl, 15:570
Manganese-catalyzed dye oxidation, 9:382
Manganese chloride, 15:574
Manganese(III) chloride, 15:578
Manganese Chrome Antimony Titanate Brown, pigment for plastics, 7:370t
Manganese chromium antimony titanium brown rutile, formula and DCMA number, 7:348t
Manganese citrate, molecular formula, 6:638t
Manganese compounds, 15:566–629
analytical chemistry of, 15:611–613
divalent, 15:571–576
economic aspects of, 15:610–611
health and safety factors related to, 15:613–615
low valent, 15:570–571
occupational standards for, 15:617t
standard reduction potentials for, 15:569t
tetravalent, 15:579–592
thermodynamic data for, 15:568t
trivalent, 15:576–579
uses for, 15:615–621
U.S. federal guidelines for, 15:617t
Manganese(II) compounds, 15:571
  physical properties of, 15:572t
Manganese(III) compounds, physical properties of, 15:577t
Manganese(IV) compounds, 15:579–592
  physical properties of, 15:580t
Manganese(V) compounds, 15:592–594
  physical properties of, 15:593t
Manganese(VI) compounds, 15:594–596
  physical properties of, 15:595t
Manganese(VII) compounds, 15:596–610
  physical properties of, 15:599t
Manganese(I) cyanide, 15:571
Manganese(II) cyanides, 15:571
Manganese deficiency, 15:613
Manganese determination methods, 15:611–613
Manganese dioxide(s), 15:566
  battery-active, 15:617–618
  electrochemically active phases of, 15:583–584
  electrolytic, 9:633–634; 12:759;
  15:588–592
  imports of, 15:611
  in lithium battery applications, 15:618
  silica supported activated, 16:568
  structure of, 15:582
  synthetic, 15:586–588
  thermal transitions of, 15:582
  uses of, 15:619t
Φ-Manganese dioxide, 15:583
Manganese(IV) dioxide, 15:581
Manganese dioxide crystal phases, 15:582t
Manganese dioxide electrodes, 3:408
  sloping discharge curve, 3:414
  standard potential, 3:413t
γ-Manganese dioxide, 15:583
γ-Manganese dioxides, 15:584–585
Manganese dithionate, 23:677
Manganese electrowinning, 9:637–639
Manganese ethylenebis(thiocarbamate), 15:576
Manganese Ferrite Black, pigment for plastics, 7:369t
Manganese ferrite black spinel, formula and DCMA number, 7:348t
Manganese ferroalloys
  compositions of, 15:545t
  U.S. consumption of, 15:562t
Manganese(III) fluoride, 15:576
Manganese fluoroborate hexahydrate, 4:157t, 158
Manganese furnaces, eruptions of, 15:561
Manganese halides, 15:573–574
Manganese heptoxide, 15:597
Manganese hydroxide, 15:575
Manganese(II) ion, complexes containing, 15:573
Manganese(III) ion, 15:578
Manganese–magnesium ferrites, 5:602–603
Manganese metal, 15:557
  electrolytic processes for, 15:557–559
  manufacture of, 15:586
  reactions of, 15:570
  U.S. consumption of, 15:562t
  uses of, 15:561–563
Manganese minerals, 15:566, 570t
Manganese naphthenate, 20:108
Manganese niobium titanium brown rutile, formula and DCMA number, 7:348t
Manganese nitrate, 15:575
Manganese nitride, 15:557
Manganese nodules, 17:689, 690
  deep-sea, 15:542, 566–567
Manganese ore(s)
  chemical composition of, 15:541t
  impurities in, 15:542–545
  processing of, 15:545
  roasted, 15:558
  sintering, 15:545
  world production of, 15:543t
Manganese oxide(s), 15:561, 581–592
  for oxidizing iron in glass, 7:343
  for oxidizing iron in glass, 7:343
Manganese(II) oxide, 15:575
Manganese(III) oxides, 15:578–579
Manganese oxygen refining (MOR) process, 15:556
Manganese perchlorate compounds, 18:280
Manganese poisoning, 15:560
Manganese production reserves, world, 15:542t
Manganese removal, in municipal water treatments, 26:124
Manganese salts, 15:573
Manganese silicides, 15:568
Manganese–silicon alloys, 22:519
Manganese steels, austenitic, 15:562–563
Manganese sulfate, 15:571, 575–576
Manganese(II) sulfides, 15:573
Manganese tricarbide, 15:568
Manganese Tungsten Titinate Brown, 
pigment for plastics, 7:370t
Manganese Violet 
pigment for plastics, 7:370t 
pigment used in makeups, 7:836t
Manganese–zinc ferrites, 5:602–603
Manganism, 15:614–615
Manganites, 15:540, 579
Manganochromite, 6:471t
Mangroves, bioremediation of 
Man-made vitreous 
Manganese Violet 
Manganese Tungsten Titinate Brown, 
Manmade composites, 11:302
Man-made vitreous fibers (MMVF), 
Manifolds 
flow distribution studies on, 13:272t, 275
heat exchanger, 13:271–275
optimizing design of, 13:273
qualitative flow distribution in, 
Manila maguey, 11:296
Manmade composites, 11:302
Man-made vitreous fibers (MMVF), 
Mannan(s) 
analysis in green coffee, 7:253t, 254
analysis in roasted, brewed, and instant coffee, 7:255t
classification by structure, 4:723t
Mannanases, 10:284
Mannheim furnace, 13:823
Mannheim process, 20:626
of sodium sulfate production, 
Mannich base adducts, 10:395
Mannich reaction, 12:112; 14:590; 19:30; 20:471
Mannitol, 5:169; 12:40
molecular formula and structure, 5:164
solubility of boric acid in, 4:253t
d-Mannitol, 4:709 t
d-Mannose, 4:697, 698
Lobry de Bruyn–Alberda van Ekenstein reaction, 4:712
Manometers, 11:783; 20:681
capacitance, 20:658–659
liquid, 20:646–647
Manool, 24:576
Manor tower press, 11:379–381
Manson-Haferd parameter, 13:478
Manson-Succop parameter, 13:478
Manthine, 2:87
Manual code system, in searching patent literature, 18:223–225
Manual of Classification, 18:209
Manuals of Policies and Procedures (MAPPs), 18:688
Manufactured carbon, 4:735
Manufactured fibers, 11:165, 174–175; 
24:613–614, 616–618. See also
Regenerated fibers; Synthetic fibers olefin, 11:231–242
regenerated cellulose, 11:247
Manufactured graphite, 4:735
Manufactured products, nanotechnology and, 
17:44–45
Manufactured water, 26:96
Manufacturing 
and chemical product design, 5:759, 776–782
of fine chemicals, 11:427
high performance fibers in, 13:391–393
key characteristics of biotechnological and chemical, 11:440t
Manufacturing costs, 9:531. See also Cost entries; Economics
heat exchanger, 13:259
Manufacturing failure, 26:982
Manufacturing industry 
caustic-calcined magnesia in, 15:414
electrochemical machining in, 9:602
secondary-timber-related, 26:363t
Manufacturing information, for 
investigational new drug applications, 18:690
Manufacturing processes, epoxy resin, 
10:353–354
Manufacturing systems, molecular, 17:58
MAO/metallocene ratio, 16:94. See also
Methylaluminoxane (MAO)
MAO oligomer cage structures, 16:92
Maraging steels, 23:308
Marangoni effect, 10:127, 753; 15:686–687
Marangoni flows, in foams, 12:4
Marangoni instability, 11:764–765
Marangoni number, 11:747, 765
Marangoni stress, 20:335
Marble, 15:28
as filler, 11:311
synthetic, 16:283
Marburg virus, 3:137
Marching modulus, 21:793
Market analysis, of a technology, 24:365
Marketing, of food additives, 12:37
See also Market research
costs of, 15:639
data analysis for, 15:639–640
methodology of, 15:638–639
presentation and use of results of, 15:643
Marketing research organizations,
15:645–646
Marketing research studies, 15:638
Marketing strategy factors, 15:640–643
See also Marketing research
cost elements in, 15:636
data analysis in, 15:636–637
methodology of, 15:632–636
presentation and use of results in,
15:637–638
sales analysis, 15:631–632
Market researchers, protocol problems for,
15:633–634
Market research interviewing, 15:633
Market research organizations, 15:645–646
Market research seminars, 15:635
Market research studies, 15:630–631
Markets
correlation of, 15:636–637
epoxy coating, 10:442–449
for fermentation products, 11:14–22
for silver, 22:648
Markham and Benton model, 1:628
Mark-Houwink coefficients
for cellulose, 20:558t
for PBT, 20:64t
for PET, 20:58
for PTT, 20:69t
Mark-Houwink constants, for
poly(ethylene oxide), 10:677t
Mark-Houwink equation, 19:717, 839
Mark-Houwink relationship, 10:675;
21:711
Mark–Houwink–Sakurada (MHS)
parameters, 20:467
Mark–Houwink–Sakurada relationship,
1:309, 310t; 20:439–440
Markov chain, 26:1006, 1018, 1024, 1025
HSTA algorithm and, 26:1030–1031
Markov chain Monte Carlo (MCMC)
sampling method, 26:1017–1018
Markovnikov addition, in silicone network
preparation, 22:563
Markovnikov rule, 20:774
Markov property, 26:1022
Markush chemical structures, indexing and searching, 18:242. See also WPI entries
Markush DARC system, 18:212, 230, 245
Markush structures, 18:206
Markush TOPFRAG programs, 18:226
Marl, 15:28
raw material for cement, 5:467, 475t
MAR-M alloy 509
composition of wear-resistant alloy, 7:221t
properties, 7:225t
MAR-P database, 18:246
MAR-PAT Previews file, 18:235
MAR-PAT system, 18:242
Married fibers, 13:383
MARS-III Multifunction Axial Rheometer System, 21:741
Marshall and Swift (M&S) Equipment Cost Index, 9:526
Marshall’s acid, 18:407–408
Marshes
bioremediation of hydrocarbons, 3:765
bioremediation of nonchlorinated pesticides and herbicides, 3:778
Mars van Krevelen mechanism, 5:280
Martempering, 23:286–287
Martensite(s), 16:198; 23:273–274, 278
constituent properties of, 23:280–281
critical cooling rate for, 23:283
low carbon, 23:300
tempered, 23:281–282, 286
tempering, 16:198–199
crystallography of systems exhibiting 342–345
Martensitic reaction, 13:511
Martensitic stainless steels, 23:305
Martin’s diameters, 18:147
Martin Lake supercritical furnace, 12:325, 326
Mascaras, 7:862
Masdil, molecular formula and structure, 5:97t, 118t
Mash filter, 3:578
Mash filtration, 3:575
Mashing, in beer making, 3:576–578
Masked polyols, 25:474
Masking agents, catalyst performance decline and, 10:54–55
Masking catalyst, 10:90–94
Masking couplers, 19:243
colored, 19:256–257
Masks
in compound semiconductor lithography, 22:193
in ion implantation, 22:186
in metal deposition systems, 22:189
in semiconductor dry etching, 22:185
Mason, Gunst and Hess experimental design text; versus other texts, 8:395t
Mason number, 21:718
Masonry, 5:500t
Masonry cements, 5:493, 500t, 502
Masonry coatings, 18:68
Masons’ lime, 15:28
Mass
conservation of, 11:737, 738–739
exponents of dimensions in absolute, gravitational, and engineering systems, 8:584t
as a property of matter, 26:227
Mass (mole) balance, 24:669
Mass action equation, 14:137
Mass action law, 10:475
Mass action model, of micellization, 24:128, 129–131
Mass analyzers, 15:658–664
Mass and energy balances, in ironmaking, 14:505
Mass balance, stoichiometric relations generated from, 25:272
Mass balance equation, 24:644–645
Mass comparators, 26:245
Mass exchange. See Heat and mass exchange processes
Mass exchange composite curves, 20:740
Mass exchange network (MEN), 20:738, 739
Mass filter devices, 24:109
Mass flow, energy flow accompanying, 24:647–648
Mass flow controllers (MFCs), 20:681
Mass flux, 15:678
ways of expressing, 15:678t
Mass fraction, in filtration, 11:328
Mass integration technology, 20:738–741
applications of, 20:764
Mass loss, in monitoring VDC polymer degradation, 25:715
Mass market soap manufacture, 22:723
Mass Mean Diameter (MMD), 23:187
Mass of catalyst, in photocatalysis, 19:77–78
Mass particle diameter, 18:134
Mass polymerization, 10:206
ABS, 1:422
Mass separator, 14:443
Mass spectrum, 15:648–649
Mass standards, 15:749
“Mass to charge ratio,” 15:648–649, 655
Masstone test, 19:384
Mass transfer area coefficient (MTAC), 26:819
Mass-transfer composite curves, 20:738
Mass transfer correlations, for stirred tanks, 15:699t
Mass transfer effects, in membrane processes, 15:723–725
Mass transfer enhancement, by static mixers, 15:708–709
Mass-transfer flux, 10:752
Mass-transfer mechanisms, 9:102, 103, 109–110
Mass transfer Peclet number ($P_{eMT}$), 25:270, 279, 280, 281, 283, 285, 311, 316. See also Peclet numbers (Pe) critical value of, 25:283–285
effect on dimensionless reactant molar densities, 25:289t, 294–295
particle-based, 25:291
Mass-transfer rate, in liquid–liquid extraction, 10:751
Mass transfer rate processes, 25:279
Mass-transfer resistance, 11:808
external, 25:290–293
Mass-transfer theory, 10:761
Mass transport, electrochemical cell, 9:658–659
Mass transport overvoltage, 12:207–209
Master agreements, evaluation of, 24:389
“Master-alloy” production, 23:318–319
Masterbatching, 11:307–308
Master contracts, 24:373–374
Master curves, 21:746–747
uses for, 21:747
Master flowmeters, 11:653
Master Oscillator Power Amplifier (MOPA) configuration, 14:697
Masticatory substance, 12:32
Mastic, for protecting art, 11:410, 411
MATx cells, 26:453
Matched die molding, 20:117
Material balance problems, 10:748
Material balances, in minerals processing, 16:606
Material curing, 10:13–15
differential scanning calorimetry in, 10:13
Fourier transform infrared spectroscopy in, 10:14
microdielectrometry in, 10:14–15
Material dispersion, 11:135
Material flammability tests, 11:457
Material formulation, influence on toxicity, 25:213
Material handling, in hazard recognition, 14:208–209
Material processes, 10:11–13
casting, 10:12
molding, 10:11
potting, 10:11–12
saturation and coating, 10:12–13
Material properties, at nanoscale, 17:45.
See also Chemical properties;
Electrical properties; Mechanical properties; Physical properties
Material proportioning, 26:248–251
Material recovery facilities (MRFs), 15:435, 455; 21:367, 382, 383, 447
Material Requirements Plan (MRP), 15:460
Materials. See also Abrasive materials;
Hazardous materials; Industrial materials entries
critical value of, 13:496
determining creep behavior of, 13:474–477
fatigue properties of, 13:484–486
fully cured, 10:13
under high temperature, 13:470
information sources for, 15:763–766
oxidation damage to, 13:504
mechanical behavior of, 21:719
polylactides as building blocks for, 20:302–303
radionuclides for determining the age of, 21:317t
rare-earth, 14:646
scrap values of, 21:372t
Material Safety Data Sheets (MSDSs), 14:332, 335; 15:259–260; 16:224;
21:589, 833
for hydrogen sulfide, 23:637–638
Materials analysis, in fine art examination/conservation, 11:397
Material selection guides, 19:479
Materials flow properties, 10:10
Materials handling
in fine chemical production, 11:431
in minerals recovery and processing, 16:660–663
safe, 21:851–852
Materials processing, 14:79
supercritical fluids in, 24:19–22
in microwave power applications, 16:512–517
Materials science
of amorphous carbohydrates, 11:530–536
oligonucleotides in, 17:637
in supramolecular chemistry, 24:52–54
Materials selection
for heat pipes, 13:230–233
for nuclear power facilities, 17:537
for nuclear reactors, 17:569
for piping systems, 19:476–480
Materials separation, in plastics recycling, 21:447–448
Materials specifications, 15:751–773
content of, 15:752
objectives and types of, 15:751–752
sources of, 15:760–768
strategy and implementation of, 15:752–753
Materials standards, 15:741–773
chronological, 15:745–747
economic aspects of, 15:753–754
education for, 15:755
generation, administration, and implementation of, 15:743–744
objectives and types of, 15:741–743
reference materials related to, 15:744–745
sources of, 15:760–768
trends and outlook for, 15:755–757
Materials stress, 10:10
Materials testing reactor (MTR), 17:573, 579
Material strength
grain size effects on, 13:497
temperature and, 13:471
Material trials, technical service and, 24:342
Mathematical modelling, in biochemical engineering, 11:41
Mathematical models
of glass melting, 12:605
process-control, 20:687–691
Mathematical optimization approach, in computer-aided molecular design, 26:1037
Mathematical programming, in water system design, 20:758–759. See also Program-entries
Mathematical software, for process control, 20:694–695. See also Software
MATLAB program, 20:695
MatML extensible mark-up language, 15:759
Matrices, 6:27–28
Matrix-assisted laser desorption–ionization mass spectrometry (MALDI-MS), 18:774
Matrix-assisted laser desorption–ionization (MALDI) technique, 14:691; 15:658. See also MALDI spectra
Matrix assisted laser desorption
ionization–time of flight (maldi–tof) mass spectrometry, 15:13
Matrix drug delivery systems, 9:77
Matrix inversion, 6:28
Matrix isolation, flash vacuum pyrolysis and, 21:140–141
Matrix materials, 26:761–765
composite classification by, 26:751–752
Matsuzaka Elbow-Jet classifier, 22:292–293
Matter
interactions with light, 7:306–307
interaction with electromagnetic radiation, 23:125
Matte smelting/converting, 16:144–146
Matte surfaces, 7:306
and object mode perceptions, 7:306t
Maturation, of wine, 26:319
Maturing agents, as food additives, 12:56–57
Matzke technique, 12:10
Mäule color reaction, 15:7
Maumee saccharin process, 24:235
Mauritius hemp, 11:296
Mavik, molecular formula and structure, 5:151t
Maxam-Gilbert sequencing procedure, 21:282
MAX-DEWAX process, 21:655
Maxiban, 20:135
Maxillofacial prosthetic materials, 8:326326
Maximally Tolerated Dose (MTD), 25:221, 222
Maximum acceptable toxicant concentration (MATC), for silver nitrate, 22:682
Maximum achievable control technology (MACT), 1:802; 14:581; 16:345
rule, 13:182, 183, 185
standards, 21:585
Maximum Allowable Working Pressure (MAWP), 21:850
Maximum boiling azeotropes, 8:807–808
Maximum Contaminant Level Goals (MCLG) for lead, 14:765
for vinyl chloride, 25:649, 650
Maximum Contaminant Levels (MCLs), 21:583
for vinyl chloride, 25:649, 650
Maximum Contaminant Levels list, 22:681
Maximum conversion, importance of, 25:316
Maximum dimensionless temperature, 25:301
Maximum frequency of unity current gain ($f_1$), 22:165, 169
Maximum intrapellet temperatures, 25:305
Maxixe beryl, color, 7:337
Mayenite, phase in Portland cement clinker, 5:472t
McCumber parameter, 23:821
McDermitt caldera, lithium minerals in, 15:124
McDonald asphalt modification process, 21:468
McFadyen-Stevens reaction, 13:571
McGaskell rotary pressure filter, 11:374
McLafferty ester pyrolysis reaction, 20:43
MCLs (maximum contaminant levels), 17:804
for drinking water, 17:807
MDI [4,4'-methylenebis(phenyl isocyanate)], 25:456, 457, 459, 462
MDL-100240, 5:159
MDM hydantoin, antimicrobial used in cosmetics, 7:831t, 832
Mean cell residence time (MCRT), in biological waste treatment, 25:830
Mean centering, 6:35–38
Mean diameters, for statistical properties of droplets, 23:186
MD modeling, 12:576–577
Mean droplet size, effect of variables on, 23:191
Mean particle diameter, 18:134
Mean resident time (MRT), 9:53
Mean temperature difference (MTD), 13:251
Mean time between failures (MTBF), 21:54, 82
Measles vaccine, 25:490–491
Measles virus (MV), 3:137
Measurement-based methods, for reliability, 26:1044
Measurement devices, accuracy of, 20:679
Measurement method selection, in industrial hygiene, 14:216–217
Measurements, in minerals recovery and processing, 16:664
Measurement strategies, perturbation-based, 14:614–621
Measurement system attributes, comparison of, 14:217
Meat(s) estimated maximum oxygen tolerance, 3:381t
MECHANICAL ROUGHNESS, AND ADHESION 557

packaging, 18:31–32
Meat curing, sodium nitrite in, 22:859–860
Meat Inspection Act, 18:683
Meat meal, 10:852
Meat products
citric acid in, 6:646
in pet foods, 10:853
Meat working fluid, fatty acid amides, 2:458
Mebrofenina, 4:360t
“Mechanochemical” insulin pump, 9:71
Mechanical air classifiers, 22:289–291
Mechanical air separators, 22:291, 292
Mechanical analysis, in silicone network characterization, 22:569
Mechanical applications
of artificial graphite, 12:747–748
of polytetrafluoroethylene, 18:305–306
of vitreous silica, 22:441
Mechanical batch compression filters, 11:370–373
Mechanical bonding, 16:176
Mechanical carryover, 23:220
Mechanical cleaning, of flax fiber, 11:610–613
Mechanical deaeration, in industrial water treatment, 26:143–144
Mechanical degradation, catalysts, 5:256t, 280–285
prevention of, 5:302–303
Mechanical drives, steam turbine, 23:237
Mechanical finishing, of staple-fiber nonwoven fabrics, 17:514–516
Mechanical gauges, 20:646–651
Mechanical ignition sources, 23:116
Mechanically agitated columns, 10:777–781
Mechanically rechargeable batteries, 3:518
Mechanical needling, 17:475
Mechanical properties. See also Physical properties
of acrylic fibers, 11:191–193
of aluminum foundry alloys, 2:326t
of artificial graphite, 12:717–718
of carbon–carbon composites, 26:774
of carbon nanotubes and fullerene, 17:48–49
of copolyesterether elastomers, 20:73–75
of embedding materials, 10:10
of engineering thermoplastics, 10:223
of ethylene–acrylic elastomers, 10:699, 700–701
of ethylene–tetrafluoroethylene copolymers, 18:319
of FEP polymer, 18:312t
of fibers, 11:181–185
of filled networks, 22:571–572
of filled polymers, 11:308–309
of 4GT-PTMEG-T elastomers, 20:74t
of glass, 12:589–592
of glass-ceramics, 12:630
of high density polyethylene, 20:162–166
of higher olefin polymers, 20:418
of ionomers, 14:461–462
of isophthalic resins, 20:111–112
of lead and lead alloys, 14:774t
of linear low density polyethylene, 20:185–189
of methacrylic ester polymers, 16:275
of polyamide plastics, 19:779–781
of polycarbonates, 19:801–802
of polyester fibers, 20:6–7
of polyimides, 20:278
of PTT, 20:69–70
of PVDC, 25:706–707
of silicon carbide, 22:527–528, 529t
of silk, 22:632–633
of styrene-based plastics, 23:360t
of sutures, 24:214–215
of Teflon PFA, 18:331–332
of thermoplastic polyesters, 20:65–66, 73–75
of thermoplastics, 10:177–178
of titanium and its alloys, 24:841, 842t, 843–844t
of unsaturated polyesters, 20:111–112
of VDC copolymers, 25:706–707
of vegetable fibers, 11:290t
of vinyl alcohol polymers, 25:598–600
of vitreous silica, 22:428–430
of wood, 26:344
Mechanical properties testing, for plastics, 19:579–582. See also Mechanical testing
Mechanical pulp bleaching, 21:48–51
chelation in, 21:49
new developments in, 21:50–51
using weak alkali sources in, 21:50–51
Mechanical pulping, 21:20–21
Mechanical pulps, in papermaking, 18:93–94
Mechanical recycling, 21:370–371
Mechanical roughness, and adhesion, 1:511–512
Mechanical scales, 26:229–236
  functionality of, 26:251
Mechanical seals, for pumps, 21:81
Mechanical strength measurement, in tire compounding, 21:811
Mechanical stress, in piezoelectric materials, 22:709
Mechanical sugarcane harvesting, 23:446
Mechanical syneresis, 22:56
Mechanical testing, of acrylic materials, 11:196. See also Mechanical properties testing
Mechanical textile finishing, 24:622
Mechanical tire shredding, 21:470–472
Mechanical vapor recompression (MVR) crystallizers, sodium carbonate recovery via, 22:789
Mechanics, classical and quantum, 16:734–740
Mechanism-based enzyme inhibitors, 10:323
Mechanistic classification system, 13:441
Mechanistic kinetic expressions, 10:85–88
Mechanistic organic chemistry, high pressure applications in, 13:439–440
Mecoprop, 13:314
Medallions, gold, 12:705
Medals, silver in, 22:662
Media. See also Filter media
  complex ingredients in, 11:25–28
  composition of, 11:28–29
  sterilization of, 11:35–36
Media components, comparison of, 11:26–27t
Media mills, 18:64–65
Median droplet diameter, 23:186–187
Median Latin hypercube sampling (MLH3), 26:1010–1011, 1012, 1013, 1014, 1015
Median lethal dose, for hydrazine, 13:590
Median particle diameter, 18:136
Media recovery wet magnetic drums, 15:443
Media separators, 14:496
Media suppliers, 11:33t
Mediated radical reactions, initiators for, 14:297–299
“Mediator” compound, 10:303
Medical applications
  of acetylsalicylic acid (aspirin), 22:17–19, 20–21
  coordination compound applications, 7:597–598
  glass in, 12:611–612
  of dendrimers, 26:791
  of m-hydroxybenzoic acid, 22:21–22
  of instant photography, 19:323
  of ion lasers, 14:687
  for microwave technology, 16:529
  oxygen in, 17:764
  ozone use in, 17:811
  of platinum-group metals, 19:628–629
  of polycarbonates, 19:821
  of polymethine dyes, 20:521
  of ruthenium complexes, 19:640–641
  of salicylic acid, 22:10
  of salicylic acid derivatives, 22:17
  of salicylic acid esters, 22:12, 16–17
  of salicylic acid salts, 22:11–12
  spunbonded nonwoven fabrics in, 17:482, 490–491
  of supramolecular chemistry, 24:54–57
  of tellurium, 24:428
  of thorium, 24:758
  U.S. patents in, 12:612t
Medical device recalls, 18:24
Medical devices/equipment. See also
  Biomedical devices
  FDA regulation of, 21:576–578
  ion implantation for, 14:450
  poly(4-methyl-1-pentene) in, 20:431
  poly(4-fluorosilicones) in, 20:245
  superelastic and pseudoelastic SMA devices in, 22:350–351, 351–352
Medical diagnoses/treatments, radioisotopes in, 21:318–319
Medical gases, noble gases as, 17:376–378
Medical grade lanolin, 26:209
Medical implants, 13:396–397
Medical industry
  electrochemical machining in, 9:602
  electroless deposition in, 9:700
Medical programs, 21:857–858
Medical research, yeast in, 26:494–497
Medical waste, 25:864–866
  e-beam disinfection, 8:666–667
Medicated feed additives, 10:846
Medicated shampoo, acute oral LD50 ranges, 8:446t
Medication interactions, in hemodialysis, 26:824
Medical odor, 3:228t
<table>
<thead>
<tr>
<th>Topic</th>
<th>Pages/Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicinal products</td>
<td>ethyl alcohol in, 10:548–549</td>
</tr>
<tr>
<td></td>
<td>organic esters in, 10:519</td>
</tr>
<tr>
<td>Medicine</td>
<td>galium in use, 12:355</td>
</tr>
<tr>
<td></td>
<td>gold in use, 12:703–704</td>
</tr>
<tr>
<td></td>
<td>macrolide antibiotics in, 15:306–307</td>
</tr>
<tr>
<td></td>
<td>magnesium peroxide use in, 15:415</td>
</tr>
<tr>
<td></td>
<td>mercury in, 16:41–42</td>
</tr>
<tr>
<td></td>
<td>methacrylic ester polymers in, 16:294</td>
</tr>
<tr>
<td></td>
<td>quinolines in, 21:196</td>
</tr>
<tr>
<td></td>
<td>selenium in, 22:101–102</td>
</tr>
<tr>
<td></td>
<td>silk in, 22:634</td>
</tr>
<tr>
<td></td>
<td>silver coatings in, 22:656</td>
</tr>
<tr>
<td></td>
<td>silver in, 22:660, 678–682</td>
</tr>
<tr>
<td></td>
<td>silver ions in, 22:656</td>
</tr>
<tr>
<td></td>
<td>sodium iodide in, 22:827</td>
</tr>
<tr>
<td>Medicine capsules, gelatin in, 12:442</td>
<td></td>
</tr>
<tr>
<td>Mediterranean oregano, 23:169</td>
<td></td>
</tr>
<tr>
<td>Medium alloy steels, 23:272</td>
<td></td>
</tr>
<tr>
<td>Medium boiling esters, 10:489</td>
<td></td>
</tr>
<tr>
<td>Medium-chain-length PHA (PHAMCL), 20:249, 250–253, 257. See also PHAMCL biosynthetic genes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>nonsolvent-based extraction process for, 20:259–261</td>
</tr>
<tr>
<td>Medium chrome yellow, 6:554, 555t</td>
<td></td>
</tr>
<tr>
<td>Medium color, long flow carbon blacks, 4:798t</td>
<td></td>
</tr>
<tr>
<td>Medium color carbon blacks, 4:798t</td>
<td></td>
</tr>
<tr>
<td>Medium density polyethylene (MDPE) resins, 17:700, 701</td>
<td></td>
</tr>
<tr>
<td>Medium development and feeding, for fermentation, 11:25–29</td>
<td></td>
</tr>
<tr>
<td>Medium energy dyes, 9:195–196</td>
<td></td>
</tr>
<tr>
<td>Medium-energy ion scattering (MEIS), 24:74</td>
<td></td>
</tr>
<tr>
<td></td>
<td>technique for, 24:106</td>
</tr>
<tr>
<td>Medium expansion foams, 12:20</td>
<td></td>
</tr>
<tr>
<td>Medium impact ABS, physical properties of, 1:415t</td>
<td></td>
</tr>
<tr>
<td>Medium lanthanides, 14:631</td>
<td></td>
</tr>
<tr>
<td>Medium oil alkyds, 2:148</td>
<td></td>
</tr>
<tr>
<td>Medium performance sealants, 22:28</td>
<td></td>
</tr>
<tr>
<td>Medium pH, for fermentation, 11:38</td>
<td></td>
</tr>
<tr>
<td>Medium-temperature radiation furnaces, 12:292–293</td>
<td></td>
</tr>
<tr>
<td>Medium thermal blacks, 4:765t</td>
<td></td>
</tr>
<tr>
<td>Medium volatile bituminous coal rank and heating values, 6:726t</td>
<td></td>
</tr>
<tr>
<td></td>
<td>vitrinite reflectance limits and ASTM coal rank classes, 6:708t</td>
</tr>
<tr>
<td>Medicine capsules, gelatin in, 12:442</td>
<td></td>
</tr>
<tr>
<td></td>
<td>magnesium peroxide use in, 15:415</td>
</tr>
<tr>
<td></td>
<td>mercury in, 16:41–42</td>
</tr>
<tr>
<td></td>
<td>methacrylic ester polymers in, 16:294</td>
</tr>
<tr>
<td></td>
<td>quinolines in, 21:196</td>
</tr>
<tr>
<td></td>
<td>selenium in, 22:101–102</td>
</tr>
<tr>
<td></td>
<td>silver in, 22:660, 678–682</td>
</tr>
<tr>
<td></td>
<td>silver ions in, 22:656</td>
</tr>
<tr>
<td></td>
<td>sodium iodide in, 22:827</td>
</tr>
<tr>
<td>Meisenheimer’s rearrangement, 2:466</td>
<td></td>
</tr>
<tr>
<td>Meissner diamagnetic current, 23:813</td>
<td></td>
</tr>
<tr>
<td>Meissner effect, 23:802–803</td>
<td></td>
</tr>
<tr>
<td>Meissner process, 17:163–164</td>
<td></td>
</tr>
<tr>
<td>Meitnerium (Mt), 1:492t</td>
<td></td>
</tr>
<tr>
<td>MEK (methyl ethyl ketone) dehydration, 18:515</td>
<td></td>
</tr>
<tr>
<td>MEK (methyl ethyl ketone) double rubs, 10:425</td>
<td></td>
</tr>
<tr>
<td>MEKPs (methyl ethyl ketone peroxides), 18:489</td>
<td></td>
</tr>
<tr>
<td></td>
<td>formulations for, 18:455</td>
</tr>
<tr>
<td>Melagran, 4:100, 100t, 101</td>
<td></td>
</tr>
<tr>
<td>Melamine(s), 8:206; 13:111</td>
<td>analysis and toxicity, 8:168–170</td>
</tr>
<tr>
<td></td>
<td>manufacture, 8:167–168</td>
</tr>
<tr>
<td></td>
<td>markets for, 15:788</td>
</tr>
<tr>
<td></td>
<td>molecule, 15:775</td>
</tr>
<tr>
<td></td>
<td>properties, 8:167t</td>
</tr>
<tr>
<td>Melamine–formaldehyde adhesives, 1:544–545</td>
<td></td>
</tr>
<tr>
<td></td>
<td>important parameters for, 15:774–775</td>
</tr>
<tr>
<td></td>
<td>morphological characterization of, 15:783–786</td>
</tr>
<tr>
<td></td>
<td>in paper manufacture, 18:116</td>
</tr>
<tr>
<td></td>
<td>production of, 15:775</td>
</tr>
<tr>
<td></td>
<td>properties of filled molding compounds, 2:633t</td>
</tr>
<tr>
<td></td>
<td>toughness and mechanical characterization of, 15:786–787</td>
</tr>
</tbody>
</table>
Melamine-fortified UF (MUF) glue resins, 15:778

Melamine-fortified UF resins, 15:778, 779, 780
hardening of, 15:781

Melamine phosphates, 11:488

Melamine resins, 2:620, 621, 622;
15:773–796
analytical methods for, 15:788–790
combining with other adhesives, 15:791
composition and reactions of, 15:774–780
economic aspects of, 15:788
glue resin mixes for the application of,
15:791
hardening of, 15:780–788
uses for, 15:790–791

Melamine–urea–formaldehyde adhesives, 1:544

α-Melanocyte-stimulating hormone (α-
MSH), target of antiobesity drugs, 3:97

Melatonin, 2:819

Meldrum's acid chemistry, 21:151, 152, 153

Melengesterol acetate (MGA), 10:871

Melissic acid, physical properties, 5:30t

Melt behavior, of polycarbonates, 19:805

Meltblown fabrics, 17:478–479, 495

Meltblown fibers, 11:237, 240–241

Melt casting, 14:230

Melt crystallization, 8:137–141
general separation heuristics for, 22:320
of higher olefin polymers, 20:417
Melt emulsification, 10:129

Melt extrusion, encapsulation by, 11:535

Melt fiber spinning, 11:210–211

Melt flow index (MFI), 10:178, 681

Melt flow rate (MFR), 19:578; 20:530
impact of, 20:531
“Melt index,” 20:160

Melt index test, for low density polyethylene, 20:227

Melting
aluminum alloys, 2:333–334
copper–beryllium alloys, 3:654–655
glass, 12:596
induction, 12:308–309
of shape-memory polymers, 22:358, 359t

Melting behavior, of fats and oils,
10:819–820

Melting point(s). See also Melting
temperature (Tm)
of high density polyethylene, 20:163
of platinum-group metals, 19:597
polymer crystalline, 20:8–9

Melting properties, of fats, 10:827

Melting (floating zone) technique,
fabrication method for inorganic materials, 7:415t

Melting temperature (Tm). See also Melting point(s)
of PVDC, 25:700, 701t
of VDC copolymers, 25:703

Melt-mixing
of polymer blends, 20:326, 327
of powders for coating, 7:54–55

Melt polymerization(s), 13:372; 20:40, 43
advantages of, 19:816
of cyclic oligomers, 19:817
for polycarbonates, 19:814–818

Melt processable polyimides, 20:283–284

Melt processing
of ethylene–tetrafluoroethylene copolymers, 18:326
of Teflon AF, 18:341

VDC copolymers in, 25:725–726

Melt properties, of styrene plastics, 23:362

Melt rheology, of EMAA ionomers,
14:474–475

Melt-solution crystallization, 8:95

Melt spinning, 15:816, 818; 16:8, 9–10;
19:748–749
of continuous-filament yarns,
19:749–758
of polymer fiber, 24:617

Melt spinning apparatus, 19:750, 751

Melt-spun fiber, poly(4-methyl-1-pentene),
20:431

Melt-state testing, of polymers, 19:575

Melt-to-mold thermoforming, 18:49

Melt viscosities (MVs), 8:178, 681

Melt-to-mold thermoforming, 19:578
of continuous-filament yarns,
19:749–758
of polymer fiber, 24:617

Melt spinning apparatus, 19:750, 751
Melt-spun fiber, poly(4-methyl-1-pentene),
20:431

Melt-state testing, of polymers, 19:575

Melt-to-mold thermoforming, 18:49

Melt viscosities (MVs), 21:712–714
of ethylene oxide polymers, 10:680
of FEP resin, 18:306, 308

Membrane-based reactive separation
processes, 15:848

Membrane-based separation, lactic acid production and, 14:120

Membrane biocompatibility, in hemodialysis, 26:823–824

Membrane bioreactors, 16:26

Membrane-bound enzymes, 10:338

Membrane cell process, 9:620

Membrane cells
Membrane operating characteristics of, 9:631 in sodium hydroxide manufacture, 22:832, 834, 835, 836t, 837
Membrane cell technology, 9:630
Membrane cleaning methods, 21:665t
Membrane configurations, in reverse osmosis plants, 26:74–76
Membrane contactors, 15:846–847
Membrane desalination processes, 26:73–87
brackish and nanofiltration reverse osmosis systems, 26:80–83
electrodialysis, 26:87–88
energy consumption in, 26:85–87
reverse osmosis, 26:73–80
seawater desalting, 26:84–85
wastewater reclamation, 26:83–84
Membrane disturbance, DNA uptake following, 12:470–471
Membrane Electrode Assembly (MEA), 19:626
Membrane extraction, 10:765–766
Membrane fabrication techniques, 15:800
Membrane field, advances in, 26:97
Membrane filters, operating characteristics of, 26:114t
Membrane filtration(s), 15:723–725
in cane sugar refining, 23:453
in hazardous waste management, 25:817–818
supercritical fluid extraction in, 24:14
versus reverse osmosis, 26:113t
in water treatment, 26:111–114
Membrane fouling, 15:830, 831, 832, 833; 21:635–636
challenges associated with, 21:667–668
preventative maintenance for, 21:668–669
reverse osmosis and, 21:662–665
Membrane gas separation processes, status of, 15:841t
Membrane materials
common, 16:27
in hemodialysis, 26:825–828
reverse osmosis, 21:632–636
Membrane models, of microemulsion behavior, 16:431–432
Membrane module design characteristics, 15:823t
Membrane module models, 21:666
Membrane module network, 21:667
Membrane module network design, in reverse osmosis, 21:666
Membrane modules, 15:818–824; 21:636
hollow-fiber, 15:819–821, 823
plate-and-frame, 15:821
selecting, 15:821–824
spiral-wound, 15:818–819, 823–824
tubular, 15:821
Membrane performance, polymer impact on, 21:634–635
Membrane permeability, electrically controlled, 9:59
Membrane permeation systems, 17:278–280
Membrane phenomena, studies of, 15:796–798
Membrane plate presses, 11:370–372
Membrane preparation techniques, less widely used, 15:813t
Membrane processes. See also Silicone membranes
in water treatment, 26:111–115
mass transfer effects in, 15:723–725
Membrane reactors, 10:271, 619
Membranes, See also Hollow-fiber membranes
activated alumina applications, 2:400
asymmetric, 15:800, 804–813
cellulose ester applications, 5:405
conducting polymer applications, 7:539
controlled release pesticide applications, 7:560–561
dense symmetrical, 15:800–801
electrically charged, 15:799–800
hollow-fiber, 15:815–818
hydrogel, 13:750
interfacial composite, 15:811–812
ionomer, 14:481–482
irradiation of, 15:802
isotropic microporous, 15:798
liquid, 15:814–815
metal and ceramic, 15:813–814
microporous collodion, 15:797
microporous symmetrical, 15:801–804
nanofiltration, 21:651
nonporous dense, 15:799
nucleation track, 15:802
organic rejections by, 21:656–657
palladium and palladium alloy, 15:813–814
perspersion, 18:506, 510–511
polyimide, 20:282–283
polymeric, 16:22–23	hereverse osmosis, 21:632
silk, 22:632
solution-cast composite, 15:813
solvent-resistant, 21:656
sulfonated polystyrene, 23:720
Membrane science, 16:26–27
recovery of silver via, 22:654
in salt production, 22:808
Membrane separation technologies, 15:824t; 16:4
Membrane separators, 13:795–796
Membrane/sonication/wet oxidation (MEMSONIWO) systems
in wastewater treatment, 25:911–912
Membrane systems, as advanced wastewater treatment, 25:909
Membrane technology, 15:796–852
applications for, 15:824–848
in controlled drug delivery, 15:847–848
in electrodialysis, 15:836–837
in gas separation, 15:837–842
historical development of, 15:796–798
in microfiltration, 15:827
in pervaporation, 15:842–844
preparation of membranes and membrane modules, 15:800–824
in reverse osmosis, 15:834–836
types of membrane, 15:798–800
in ultrafiltration, 15:827–834
Membrane tortuosity, use of nanoparticles to increase, 21:671
Membrane transport models, 21:638–639
Membrane units, for acid gas removal,
12:377
Memory devices, high throughput experimentation, 7:414t
MEMS devices, fabrication of, 26:964
MEM software, 18:243
MEMSORT software, 18:244
Menadione, 25:795
Menaquinone-4, 25:794
Mendelevium (Md), 1:463–491, 464t
electronic configuration, 1:474t
“Mendel’s engineering,” 12:496
Mendehall design text; versus other texts, 8:395t
Meningococcus vaccine, 25:495–496, 498
Meniscus surgery, 3:723
Menispermaceae, alkaloids in, 2:75
Menke’s disease, 7:709
Menschutkin reaction, 20:490; 26:846
Men’s colognes/fragrances, 18:356, 359–361
Menstruum process carburation, 4:675
solid solutions of industrial carbides, 4:688–689
Menthadienes, 24:476
p-Menthadienes, 24:491, 492
Menthane-1,8-diamine, physical properties of, 8:486t
cis,trans-1,8-Menthane-1,8-diamine, physical properties of, 2:500t
Menthofuran, 24:529
Menthol, 3:232; 24:512–526
biochemical methods for the resolution of, 24:516
isomers of, 24:513
price of, 24:523
in shaving products, 7:852
total world production of, 24:523
(−)-Menthol, chiral derivatizing reagent, 6:76t
d,l-Menthol, 24:512–513, 515
l-Menthol, 24:512–513
from 3-carene, 24:516–517, 518
cooling activity of, 24:524
from (−)-limonene, 24:519–520
from mesityl oxide, 24:520
occurrence of, 24:514
from phellandrenes, 24:521–522
Symrise process for, 24:514–516
syntheses of, 24:514–516
Menthone, 24:539–540
permeation in selected barrier polymers, 3:389t
Menthone glycerol acetal, 24:525
(−)-Menthone acid chloride, chiral derivatizing reagent, 6:76t
Menthyl anthranilate, cosmetic uv absorber, 7:846t
(−)-Menthyl chloroformate, chiral derivatizing reagent, 6:76t
Menthyl esters, 24:524
Menthyl pyrrolidone carboxylate, 24:525
Menthyl salicylate, 24:524
physical properties of, 22:14t
Menthyl valerate, 24:524
Menthol, of technical service personnel, 24:346–347
Mepenzolate bromide, 4:359t
Mercury–cadmium–telluride (MCT), 14:226
Mercury–cadmium–telluride
photodetectors, 19:137, 158–164
crystal growth and, 19:159–161
Mercury-cell process, chlorine and caustic
soda preparation in, 16:40
Mercury cells, 9:628–630
in potassium hydroxide production,
20:633–634
in sodium hydroxide manufacture,
22:832, 833, 835, 836t
Mercury contamination, selenium pellets
versus, 22:103
Mercury fulminate, 10:727
Mercury–mercuric oxide electrodes
constant discharge curve, 3:414
Mercury–mercurous chloride electrode, 14:29
Mercury ores, 16:33
assay of, 16:44
Mercury poisoning, treatment of, 16:51
Mercury(I) perchlorate, 18:278
Mercury(II) perchlorate, 18:278
Mercury Reduction and Disposal Act of
2001, 16:42, 46
Mercury releases, anthropogenic, 16:47–49
Mercury removal, 1:650
Mercury sulfide (cinnabarite), color and
bad gap, 7:335t
Mercury sulfide (metacinnabar), color and
bad gap, 7:335t
Mercury-switch thermostats, 16:42
Mercury–thallium amalgam, 24:628
Mercury thermometers, 24:464, 465
Mercury vapor intoxication, chronic, 16:51
Mercury vapor lamps, vitreous silica in,
22:441
Mercury vapors, inhalation of, 16:49–50
Merensky Reef platinum-group metal
deposits, 19:604–607
Meridica, 3:93, 95
Meridional tridentate ligand, 7:578
Merino wool, 26:370–371, 373, 374, 380
amino acid composition of, 26:377t
Merocyanine 540 (MC540), 9:517
Merocyanine chromophores, 20:506
Merocyanine dyes, 9:503, 504, 511–512; 20:506
absorption spectra of, 20:517
in nonlinear optics, 20:515–516
MEROPS database, 10:261
Merry-go-round systems, 14:408
Mes, buffer for ion-exchange
chromatography, 3:830t
Mescaline, 2:84, 85
Mesh-belt furnace, 12:289
Mesh wick, 13:232
Mesitylene, production from acetone, 1:164
Mesityl oxide, 14:589–590
characteristics of, 16:337
hydrogenation, 16:337–338
hydrogen peroxide treatment of, 16:338
l-menthol from, 24:520
production of, 16:336–337
production from acetone, 1:164, 174
Mesogenic diols, 25:460
Mesogenic molecules, solids of, 15:82
Mesogens, 24:53, 54
Mesomixing, 16:683
Mesomorphic behavior, 24:53–54
Mesomorphic phase transitions, 15:102
Mesomorphism, 15:81. See also Liquid
crystalline materials
Mesophase pitch-based carbon fiber,
26:734–735
Mesophase state, 20:78
Mesophiles, in composting, 25:873
Mesophilic digestion, 3:702
Mesophilic enzymes, 3:669
Mesoporous molecular sieves, 16:847–849
Mesostructured hybrid materials,
13:548–549
Meso-tetraaryl porphyrins, 14:552
Mesothelioma, 3:316
Messenger ribonucleic acid (mRNA),
extpression profiling and, 13:354
Messenger RNAs (mRNA), 12:449, 454,
473, 515; 17:614, 627, 20:824. See also
mRNA synthesis
Metabolic activation, by biological systems,
25:213t
Metabolic detoxification, by biological
systems, 25:213t
Metabolic diseases, liquid crystal
accumulations and, 15:112–113
Metabolic engineering, 12:472–473
Metabolic functions, of vitamin A, 25:787–789
Metabolic pathways, as target of
antibiotics, 3:24
Metabolic processes, during food
dehydration, 12:85
Metabolism
of ascorbic acid, 25:771
influence on toxicity, 25:212
oxygen reactions in, 17:750
studies of, 25:220
Metabolism modifiers, 13:2
Metabolites
ascorbic acid, 25:771
isolation of, 16:398
Metabolome, 15:667
Metaborate anion, 4:256
Metaboric acid, 4:4
Metaborate anions
Metabolites
ascorbic acid, 25:771
isolation of, 16:398
Metabolome, 15:667
Metaborate anion, 4:256
Metaboric acid, 4:4
Metaborate anions
Metabolic, benzene, 3:3
Metabolism
acetylene, 24:5
Metal carbonyls, 15:570; 16:58–78
bonding and structure of, 16:59–64
from carbon monoxide, 5:12
in catalysis, 16:72–75
economic aspects of, 16:71
health and safety aspects of, 16:71
heteronuclear, 16:69–71
high nuclearity, 16:66–69
high nuclearity carbonyl clusters, 16:64–66
in hydroformylation and hydrogenation, 16:72–73
physical properties of, 16:66
preparation of, 16:66–71
in stoichiometric organic synthesis, 16:72
synthesis from salts, 16:68
synthesis of, 16:66–69
uses for, 16:72–75
in water–gas shift reaction, 16:73–74
Metal carboxylates, in VDC polymer stabilization, 25:720
Metal-casting cores/molds, furfuryl alcohol resins in, 12:272–273
Metal catalysis, dye degradation by, 9:381–384
Metal catalyst–initiator, postpolymerization quenching of, 20:302
Metal catalysts, 10:46–47
Metal-catalyzed addition, polymers prepared by, 15:179–180
Metal chelation, 9:424
Metal chloride salts, 13:817–818
Metal chlorides, decomposition by acids, 13:822–824
Metal cleaning
citric acid application, 6:647
detergents systems for, 8:413t, 441
postforming emulsion cleaning with detergents systems, 8:413t
Metal cleaning guidelines, ASTM, 9:779t
Metal cleaning, use of aqueous hydrochloric acid in, 13:834
Metal coatings, 7:124–137
adhesion, 7:90–91
tellurium in, 24:427
Metal complex catalysis, 5:209–210
Metal-complex catalysts, silylating agents and, 22:700–701. See also Metal compound catalysts
Metal complex dyes, 9:186–187, 190; 26:396–397
soluble, 7:373t
Metal complexed dye pollutants, 9:446–447
Metal complexes, 7:573
luminescent, 26:802
of azo dyes, 9:394–401
Metal Complex Yellow, pigment for plastics, 7:366t
Metal compound catalysts, 10:683
Metal compounds, nitriding, 17:207
Metal container coatings, 10:444–447
Metal container inks, 14:321
Metal corrosion, at various temperatures, 11:841. See also Corrosion entries
Metal cutting and grinding, lubrication in, 15:241
Metal deactivation, in antidegradant selection, 21:787
Metal deactivators
antioxidants, 3:115
in gasoline, 12:407
for lubricating oil and grease, 15:221
Metaldehyde, 1:103
Metal deposition processes, early, 9:760–761. See also Electrolless deposition
Metal deposition systems, in compound semiconductor processing, 22:188–189
Metal-dielectric composite-metal tandem solar absorbing surface, 23:11
Metal dithionates, 23:677–678
uses for, 23:677–678
Metal dopants, in photographic processing, 19:218
Metal effect pigments, 19:411
Metal emission limits, 13:183
Metal extractants, 10:750
Metal extruders, for VDC copolymers, 25:726
Metal films, as solid lubricants, 15:251–252
Metal finishing
chromium application, 6:523
sodium nitrite in, 22:859
Metal-finishing process wastewaters, reverse osmosis for, 21:645–646
Metal fixed-point cells, 24:443
Metal fluorides, 11:855
reaction with hydrocarbons, 11:864
solubility in anhydrous hydrogen fluoride, 14:9t
Metal-forming operations, lubrication in, 15:242
Metal-free initiators, 14:258–259
Metal fullerenes, 1:718–719
Metal–halogen exchange, in pyridine chemistry, 21:107–108
Metal hydrazides, 13:567
Metal hydrides, 13:611–613
amines by reduction, 2:493
hydrogen storage and, 13:851
nitriding, 17:206–207
storage of, 13:786
Metal-induced cycloadditions, of maleic anhydride, 15:489
Metal inert gas (MIG) welding, 17:369
Metal–insulator–semiconductor (MIS) capacitor, 19:140–143
Metal–insulator–semiconductor devices, 22:191, 192
Metal–insulator–semiconductor FETs (MISFETs), 22:162, 192. See also Field effect transistors (FETs)
Metal–insulator–semiconductor junction, 23:34
Metal ion impurities, silicate solubility and, 22:455–456
Metal ions. See also Silica polymer–metal ions
diffusion through vitreous silica, 22:422
high performance liquid chromatography and, 22:698
hydrolytic reactions of, 26:109t
in soap–water system, 22:727
in water treatment, 26:107
toxic, 9:445–446
Metal lactate, reaction with an alkyl halide, 14:118
Metallacyclobutane, 26:926
Metallic abrasives, 1:8
Metallic artworks. See also Metal sculptures
degradation of, 11:416–418
varnishes and protective coatings for, 11:411–412
Metallic behavior, conduction in organic semiconductors and, 22:201–202, 202–203
Metal carbides, 4:647, 648, 650–654
Metallic coatings
anti-corrosion, 1:713–714
on polyimide film, 20:281–282
zinc, 26:586
Metallic electrodes, 9:585
Metallic fibers, 24:614, 618
Metallic films, conductive, 9:689
Metallic glasses, 12:576
Metallic gold, 12:701
Metallic halides, ethylene oxide reaction with, 10:638–639
Metallic hydrides, 13:607, 624–627, 771
Metallic hydrogen, 13:765
Metallic impurities, in magnesium, 15:343
Metallic ions, reaction with ozone, 17:777
Metallic iron, 14:499
Metallic magnesium, 15:326
Metallic manganese, uses of, 15:561–563
Metallic nitrides, 17:199–201
uses for, 17:217–219
Metallic odor, 3:229t
Metallic plutonium, 19:668
Metallic powders, for inks, 14:318
Metallic replacement, recovery of silver via, 22:654
Metallic rhenium, 21:687
Metallic silver
growth of, 19:352
in images, 19:366–369
morphology of, 19:359
optical density of, 19:369
rate of formation of, 19:207
Metallic silver clusters, filamentary, 19:367–368
Metallics, nonferrous, 15:455–457
Metallic soaps, 15:423
powder used in cosmetics, 7:841t
Metallic sodium
as hazardous material, 22:775–776
in sodium analysis, 22:775
Metallic strontium, production of, 23:318
Metallic substrate catalytic converter, 10:44
Metallic sulfides, burning, 16:138–139
Metallic superconductors, parameters of, 23:807t
Metallic taste, 11:565
Metallic tungsten, 25:374
Metallic Type II superconductors, critical
current density value in, 23:822
Metallic vanadates, 25:513
Metalliding, 15:251
Metalliferous oxides
deposits of, 17:689–690
in ocean basins, 17:693
Metalliferous sulfide deposits, 17:690–691
Metalliferous sulfides, in ocean basins,
17:693–694
Metal–ligand bonding, 16:61
Metal–ligand bonds, 19:695
Metallization, 14:509, 510. See also
Metallizing
in compound semiconductor processing,
22:188–191
Metallized azo dyes, 9:250–251
Metallized dye developers, 19:286
Metallized dyes, stability of, 19:296
Metallizing, ABS, 1:428. See also
Metallization
Metallizing substrate materials, 9:695

Metalloboranes, 4:172
exopolyhedral, 4:208–210
main group element, 4:207–208
transition element, 4:205–207
Metallo–carbohedrene clusters, 4:648
Metallocarbanes, 4:170
as catalysts, 4:217–218
economic aspects, 4:229
exopolyhedral, 4:215–216
f-block element, 4:225–226
host–guest chemistry-carborane anticrowns, 4:216–217
structural systematics, 4:176–179
transition metal, 4:210–215
Metallocene catalysis, MAO in, 16:92–93.
See also Metallocene catalysts
Metallocene catalyst precursor, 16:87
Metallocene catalysts, 7:630–632;
16:79–125; 24:261
advantages and disadvantages of, 16:83–85
chain growth and chain transfer
mechanisms with, 16:97–102
chain transfer processes with, 16:103
cocatalysts of, 16:91–97
copolymerization with, 16:111
ethene copolymerization studies with,
16:112t
ethene homopolymerization, 16:102–103
in HDPE production, 20:154–155
heterogenization of, 16:87–88
for higher olefin polymers, 20:425, 426
historical development of, 16:88–91
homopolymerization of α-olefins, 16:110
industrial perspectives on, 16:82–88
in LLDPE production, 20:191–193
olefin oligomerization, 16:111
oscillating unbridged, 16:109
polymerization and copolymerization of
cyclic olefins, 16:112–113
polymerization of polar monomers,
16:113–114
polyolefin improvements with, 16:85–86
propene homopolymerization,
16:104–110
versus Ziegler-Natta catalysts, 16:82–83
Metallocene cations, 16:93
Metallocene complexes, 16:87–88; 26:652
Metallocene high-density polyethenyes,
16:102
Metallocene linear low density polyethene
(mLLDPE), 16:82
Metallocene/MAO catalysts, advantage of, 16:88
Metallocene polyethylene (mPE), 16:82
Metallocenes, 14:551; 26:537
  achiral, $C_{2v}$-symmetric unbridged, 16:104
  advanced, 16:107
catalysis technologies using, 10:711–712
chiral, $C_1$-symmetric (asymmetric) bridged, 16:108–109
chiral, $C_2$-symmetric unbridged, 16:108
$C_{v}$-symmetric bridged, 16:109–110
ansa-Metallocenes, 16:90, 94
Metallocene symmetries, 16:105
Metallocyclization, Friedel–Crafts, 12:170
Metalloenzymes, 5:201
Metallo-exoreceptor aggregation, 16:774
Metallography, steel, 23:271–274
Metalloheteroboranes, 4:172
Metalloid peroxides, 18:439
Metalloys, bioremediation, 3:782–785
Metalloimmunoassays, 14:151
Metalloimmunoassays, 15:97
Metalloporphyrins, studies of, 18:143
Metalloporphyrins, studies of, 18:591
Metalloreceptors, 16:787
Metalthermic magnesium, 15:343
Metalthermic reduction, rare-earth-metal production by, 14:643
Metallothioneins, as natural defense against silver, 22:655, 657, 681
Metal lubricant, indium and, 14:195
Metallurgical additives
  bismuth applications, 4:11, 12
  boron applications, 4:136
Metallurgical alloys, indium in, 14:195
Metallurgical applications
  for artificial graphite, 12:759–761
  indium in, 14:194
  niobium in, 17:145–146
  vanadium in, 25:523
Metallurgical changes, fatigue properties and, 13:485
Metallurgical fluorospar (met-spar), 4:577, 579t, 579–580
Metallurgical-grade alumina, 2:285, 350, 411
  properties of, 2:286t
Metallurgical industry, modern, 16:134
Metallurgical performance, 16:605–606
Metallurgical stability, 13:479
Metallurgy, 16:125–132. See also
  Extractive metallurgy
carbon monoxide application, 5:24
cerium applications, 5:681–683
definitions related to, 16:127–128
economic aspects of, 16:130–132
foundations of, 16:125–126
hydrogen sulfide in, 23:638
lithium in, 15:134–135
nitrogen in, 17:286
ore in, 16:128–129
oxygen in, 17:762
product specifications in, 16:130
quinoxalines in, 21:195–196
rhenium in, 21:695
selenium uses in, 22:97–99
silicon carbide in, 22:540–541
silicon in, 22:492
sodium in, 22:778–779
subdisciplines comprising, 16:126
uses of succinic acid and succinic anhydride in, 23:428t
use of rare earths in, 14:649
Metal-matrix composites (MMCs), 16:166–195, 26:751–752, 775. See also
  Particulate metal–matrix composites
aging of, 16:183–184
applications of, 16:191–193
creep in, 16:189–191
electronic-grade, 16:193
fabrication of, 26:767
fatigue in, 16:184–188
in situ processing of, 16:173–175
interfaces in, 16:176–178
liquid-state processing of, 16:166–169
processing, 16:166–175
properties of, 16:178–191
reinforcements used in, 16:167t
silicon carbide platelets for, 22:535
solid-state processing of, 16:169–173
stiffness loss in fatigue in, 16:187–188
strength of, 16:180
thermal expansion mismatch in, 16:182–183
thermal stresses in, 16:181–183
toughness of, 16:180–181
types of, 16:166
Young’s modulus of, 16:178–179
Metal membranes, 15:800, 813–814
Metal–metal bonding, in molybdenum compounds, 17:29–31
Metal-modified glass–ionomer dental cements, 8:283
classification and composition, 8:279–283
Metal-N₂ compounds, 17:312
Metaloporphyrins, photovoltaic effects in, 22:220
as a chemical vapor deposition technique, 22:153–154
compound semiconductors and, 22:144–145, 148
dopants for, 22:150t, 157–158
heterostructures and superlattices via, 22:155–160
in situ diagnostics for, 22:155–156
materials in, 22:156
reaction mechanisms for, 22:156–157
transport phenomena in, 22:154–155
Metal organic/inorganic herbicides, 13:324–325
Metalorganic superconductors, 23:851
Metal oxide catalyst formaldehyde manufacture, 12:115–117
Metal oxide catalysts, 10:81
Metal oxide electrodes, silylating agents and, 22:700
Metal oxides, 13:770–771
as membrane foulants, 21:664
as rubber fillers, 21:779
heterogeneous catalysis, 5:237–245
use of organofunctional in aerogels, 1:753
hydrogen chloride reaction with, 13:820
nitriding, 17:207
in semiconductor film sensors, 22:716–717
solubility in steam, 23:212
Metal oxide semiconductor (MOS) scanning capacitance microscopy, 3:326–327
tunneling atomic force microscopy, 3:327–331
Metal oxide semiconductor arrays, 19:153
Metal oxide semiconductor devices, 22:191
See also Field effect transistors (FETs)
in displays, 22:259
long-channel behavior of, 22:249–251
Moore's law and device scaling of, 22:253–255
physics of, 22:241–245
in power semiconductors, 22:260
scaling to deep submicron dimensions, 22:255–257
in semiconductor industry, 22:230, 231
silicon carbide in, 22:540
Metal oxide semiconductor capacitance, silicon- based semiconductors and, 22:239
Metal oxide sensors (MOS), smart, 22:717
Metal oxide supported catalysts, 5:336–337
coke formation on, 5:267–270
Metal passivation, in industrial water treatment, 26:137
Metal peroxides, 18:410
Metal phosphates, tertiary, 18:840
Metal–phosphorus alloys, 19:59
Metal phthalocyanines, electrochromic materials, 6:572t, 576–577
Metal refinement, detersive systems for, 8:413t
Metal processing, ion exchange in, 14:421
Metal (redox) promoters, 20:107
Metal properties
of actinium, 1:482t
of americium, 1:482t
of berkelium, 1:482t
of californium, 1:482t
of curium, 1:482t
of einsteinium, 1:482t
of neptunium, 1:482t
of plutonium, 1:482t
of protactinium, 1:482t
of thorium, 1:482t
of uranium, 1:482t
Metal protectants, silylating agents as, 22:701
Metal-recovery operations, phosgene in, 18:810–811. See also Metals recycling
Metal reductions
hydrazine, 13:569
to liquid metal, 16:141–146
Metal refining, 16:149–151
barium application, 3:349
limestone in, 15:38–39
Metal removal, in electrochemical machining, 9:593–595
Metal-rich phosphides, 19:59
Metals, See also Lignosulfonate–metal complexes

- l-ascorbic acid and, 25:751
- attaching vitreous silica to, 22:416
- band gap, 5:596
- bioremediation, 3:782–785s
- catalyst poisons, 5:257t
- causes of color, 7:326t, 333–335
- chelation, 5:708–736
- chemical analysis of archaeological materials, 5:747–748
- chemical fluid deposition of, 24:22
- conducting polymers, 7:532–534
- conductivity-density ratio for, 15:457
- corrosion resistance to HCl, 13:831ts
- demand for, 16:132
- effect on rubber aging, 21:786
- electrodeposition of, 26:878
- in electronic materials packaging, 17:838
- electrolyrefining of, 16:164
- electrolytlining of, 9:637–642;
  16:162–163
- extraction of, 10:791
- in FCC catalyst systems, 11:710–711
- as fillers, 11:316
- fluorine reactivity with, 11:828–829
- Group 14 (IV) elements as, 22:232
- heterogeneous catalysis by, 5:234–237
- hydrogen absorption in, 13:772
- hydrogen chloride reaction with,
  13:820
- hydrogen content of, 13:790
- in incendiaries, 5:826–827
- under increasing temperature,
  13:469–470
- information sources for, 15:764–765
- ion implantation of, 14:450, 453
- as ion lasers, 14:685
- liquid, 15:252–253
- in natural waters, 26:22
- nitriding, 17:206–207
- organic peroxides of, 18:435
- pickling, 16:222–223
- price fluctuations of, 16:130–132
- production of, 16:133
- reactions with halogen fluorides, 13:125
- reaction with aqueous hydrochloric acid,
  13:826
- reaction with ozone, 17:777
- recovery from Parkes crust, 14:752
- reduction to solid metal, 16:147–149
- refined, 16:130
- refractory properties of, 21:493
- release agent use with, 21:605–606
- replacement of boron by, 13:650
- selenium and, 22:76, 79
- silicon as, 22:489
- as solar energy materials, 23:6
- sources of, 16:134–136
- in thermal waste treatment, 25:832
- in VDC resin degradation, 25:726
- vitreous silica reactions with,
  22:417–418
- Metal salts, 9:394–395
  in water treatment, 26:107–111
- Metals analysis, of water, 26:40
- Metals Crystallographic Data File (CRYSTMET), 26:426
- Metal sculptures, X-radiography of,
  11:401–402
- Metal selenides, 22:87
- Metal semiconductor FETs (MESFETs),
  22:163. See also Field effect transistors (FETs)
- silicon carbide in, 22:539
- Metal shaping, by electrochemical machining, 9:597–602
- Metal silicides, 22:511
- Metals/metal hydrides, ester reduction with,
  10:504–505
- Metal soaps, emulsifiers, detergents, and dispersants, 8:710t
- Metal sodium systems, 22:779t
- Metals processing, noble gases in,
  17:368–370
- Metals recycling, 21:385–419
  economic aspects of, 21:402–406
  ferrous metals, 21:407–417
  hydrometallurgical methods of,
  21:396–402
  metals classification in, 21:389–390
  nonferrous metals, 21:385–407
  pyrometallurgical methods of,
  21:390–396
  in the United States, 21:385,
  386–387t
  waste management in, 21:406–407
- Metal stannates, 24:801, 806
- Metal sulfides, 23:574–57
  heterogeneous catalysis, 5:248–2495
  important, 23:575
- Metal superoxides, 18:416
- Metal surface cleaners, applications for,
  16:212–213
Metal surfaces. *See also* Metal surface treatments
alkaline cleaners for, 16:211–212
barrel cleaning of, 16:213
cleaning, 16:211–213
electrocleaning, 16:212
immersion cleaning of, 16:212–213
paint adhesion to, 16:217–218
solvent cleaning of, 16:213
spray cleaning of, 16:213
ultrasonic cleaning of, 16:212–213
Metal surface treatments, 16:196–227
anodizing, 16:220–222
case hardening, 16:196–211
chromating, 16:218–220
conversion, 16:214–222
environmental concerns related to, 16:224
health and safety factors related to, 16:224
phosphating, 16:214–218
pickling, 16:222–223
Metal tellurides, 24:411, 428
Metal toning, photographic, 19:220
Metal-to-poison mode transition, 24:734–735
Metal treatment, phosphoric acids in, 18:829
Metal-vapor discharge tubes, 17:371–372
Metal–vapor lasers, 14:667
Metal working
alkanolamines from olefin oxides and ammonia, 2:138
defoamer applications, 8:247–248
Metal-working fluids, 1:22, 15:240–242
types of, 15:240–241
Metal-working lubricants, chlorinated paraffins applications, 6:128
Metamerism, 7:318–319, 9:167
Metamorphic uranium deposits, 17:521
Metaphosphate glasses, 12:585
Metaphosphates, 18:815, 816, 847–848
Metaphosphoric acid, 18:829
Metasomatite uranium deposits, 17:521
Metastable vapor-phase deposition, of synthetic diamond, 8:538–539
Metastasis, 25:205
Metathenardite, phase in Portland cement clinker, 5:472t
Metathesis, 26:920–958
alkene, 26:924–937
alkyne, 26:948–953
defined, 26:920
ene–yne, 26:953–956
industrial applications of alkene metathesis, 26:937–948
ionic liquids in, 26:887–889
production of polymers using, 26:944–948
scope of, 26:921–924
Metathesis initiators, 26:932
unicomponent, 26:926–929
Metathesis reactions, carboxylic acids, 5:45
Metatitanates, 25:43
Metatungstates, 25:382–383
meta-xylene, 24:275
Metered-dose inhalers, 1:774–775
Metering pumps, 21:78
Meters, pressure, 20:651
Metfurazan, 13:296
METGLAS, 4:136
Methacrylic acid (MAA)/derivatives,
Methacrylic ester polymers; Methacrylic ester monomers; See also
Methacrylic monomers, 16:277–279.
See also Methacrylic ester monomers;
Methacrylic ester polymers;
Methacrylic monomers acute toxicity of, 16:260t
exposure to, 16:261
for 193-nm resists, 15:178–179
physical properties of, 16:227–235t, 278t
polymerization of, 14:259
Methacrylates copolymerization of, 16:240
functional monomers of, 16:241–242
handling, 16:262
higher alkyl and functional, 16:240–242
prices for, 16:258t
thermodynamic properties of, 16:279t
Methacrylic acid (MAA)/derivatives,
13:298; 16:227–270; 20:477. See also
Methacrylates; Methacrylic ester polymers copolymerization with acrylic monomers, 1:380t
Diels–Alder adduct from cyclopentadiene, 8:222t
economic aspects of, 16:257
health and safety factors related to, 16:261–262
isobutane route to, 16:256
manufacturing and processing, 16:243–257
physical properties of, 5:35t, 37t; 16:227–236
polymer, 16:258, 239–240
production from acetone, 1:174
production from butylenes, 4:427–428
properties of amides of, 16:233–234t
reactions of, 16:236–239
storage and handling of, 16:258–261
uses for, 16:257–258
Methacrylic acid–water system, vapor–liquid equilibrium (VLE) data for, 16:232
Methacrylic-based betaines, structures of, 20:479
Methacrylic ester monomers, 16:271. See also Methacrylate monomers polymerization data for, 16:279t
Methacrylic ester polymers, 16:271–298. See also Methacrylate monomers; Methacrylic esters
analytical test methods and specifications for, 16:291–293
bulk polymerization of, 16:281–282
chemical properties of, 16:276–277
electrical properties of, 16:276
emulsion polymerization of, 16:285–288
glass transition temperature of, 16:273–274
graft polymerization of, 16:289–290
health and safety aspects of, 16:293
ionic polymerization of, 16:290–291
living polymerization of, 16:291
manufacture and processing of, 16:279–291
mechanical properties of, 16:275
molecular weight of, 16:274
nonaqueous dispersion polymerization of, 16:289
optical properties of, 16:275–276
physical properties of, 16:271–276
radical polymerization of, 16:279–290
sheet production of, 16:282
solution polymerization of, 16:283–285
suspension polymerization of, 16:288–289
uses for, 16:293–294
Methacrylic esters. See also Methacrylic ester polymers copolymerization of, 16:258
properties of, 16:228–232t
Methacrylic monomers, polymerization of, 16:259–261, 280. See also Methacrylate monomers
Methacrylic polymers, copolymerization of, 16:281. See also Methacrylic ester polymers
Methacrylonitrile process, 16:256–257
Methacryloyl chloride, in polyhydric alcohol formation, 2:46
Methacylene, 24:592
Methallyl chloride, production from butylenes, 4:427
Methallyl chloroformate, molecular formula, 6:291t
Methamphetamine (Desoxyn Gradumet), 3:91
Methamphetamine hydrochloride, 3:92t
Metham–sodium, 13:321
Methanation, 13:768
Methane, 13:690–695. See also Methyl entries; Natural gas
acetylene manufacture from, 1:196–198, 201, 203
adsorbents for low pressure storage, 1:612
from anaerobic digestion, 3:701, 703
aromatics synthesis from, 3:609
bacterial formation of, 18:573
biodegradation, 3:760
chlorination of, 16:320, 321–322
clorination to chloroform, 6:283
from coal gasification, 6:772, 774, 775, 776–777
corversion into gasoline range hydrocarbons, 12:172
corversion to methanol, 16:311
diffusion coefficient in air at 0°C, 1:70t
formation of, 13:771
gas bulk separation, 1:618t
as greenhouse gas, 1:806, 807t
health and safety factors related to, 13:694
in integrated manufacturing process, 6:237
liquefaction, 8:40
manufacturing and processing of, 13:691–692
oxidative coupling of, 10:620–621
oxychlorination of, 16:374
oxychlorination to chloroform, 6:284
partial oxidation of, 12:117
as a petrochemical feedstock, 18:566–567
in petroleum gases, 18:582
pressure swing adsorption recovery from fermentation gases, 1:647
production and shipment of, 13:692–693
reactions with steam, 12:383–385
reaction with hydrogen sulfide to produce carbon disulfide, 4:832
reaction with sulfur dioxide to produce carbon disulfide, 4:833
reaction with sulfur to produce carbon disulfide, 4:830
reactivity as VOC, 1:792t
as a source of petrochemicals, 18:675
steam reforming to manufacture carbon monoxide, 5:12
thermal chlorination of, 16:321
thermophysical properties, 8:41t
uses of, 13:694–695
Methanedithiol, 4:827–828
Methane hydrate, 17:691, 692
Methane monooxygenase (MMO), 14:556
in bioremediation, 25:837–838
Methane reformers, small-scale steam, 13:844
Methane refrigeration system, 10:617
Methanesulfonamide, 23:684
Methanesulfonate esters, 23:682
Methanesulfonic acid, 15:168; 23:681–685
metal salts of, 23:684
Methanesulfonyl chloride, 23:653, 681–683
Methano[60]fullerenes, 12:242
Methanogenic conditions, defined, 3:757t
Methanoic acid, physical properties, 5:29t
Methanol, 16:299–316. See also Methanol synthesis
acrylamide solubility in, 1:290t
amination of, 16:360–361
azeotrope with acrylonitrile, 1:399t
azeotrope with benzene, 3:598t
azeotrope with ethanol, 8:812
azeotrope with methyl ethyl ketone, 8:801
azeotrope with n-butyaldehyde, 4:460t
carbonylation to acetic acid, 1:122–125, 129
chemical reactions of, 16:299–300
chiral derivatizing agent, 6:96t
from coal gasifier syngas, 6:776
combustion patterns for, 24:265–266
dehydriigenation of, 12:117
diffusion coefficient in air at 0° C, 1:70t
direct fuel applications of, 16:315
dissolution of amorphous silica in, 22:389
economic aspects of, 16:311–312
as a fuel, 12:203
future uses for, 16:315
global consumption of, 24:266t
global supply and demand for, 24:266
health and safety factors related to, 16:314
from indirect liquefaction, 6:865
in integrated manufacturing process, 6:237t
international trade in, 16:313
manufacture and processing of, 16:300–311
manufacture of, 13:788
in methyl acetate separations system, 22:333–337
physical properties of, 16:299
processing sequence for, 16:306
production from stoichiometric feed of carbon monoxide and hydrogen, 25:303–305, 312–316
purification of, 16:310
for purification of hydrocarbon-derived acetylene, 1:203
in RTV silicone preparation, 22:596
silicon reactions with, 22:551
solubility of benzoic acid in, 3:626t
solubility of boric acid in, 4:253t
solubility of dispersant tails in, 8:685
solubility of methylenedianiline in, 2:794t
solubility of trichloroacetic acid in, 1:141t
solution catalyzed carbonylation, 5:213–215
solvent for chiral separations, 6:78
specifications for, 16:312–313
storage and handling of, 16:313–314
terminal activity coefficients of mixture with benzene, 8:743t
thermodynamics and kinetics of, 16:301–302
U.S. and Canadian producers of, 16:311t
use in reversed-phase chromatography, 3:840
uses for, 16:314–315
U.S. production of, 24:266–267
Methanol–acetone azeotrope, 8:818
Methanol carbonylation, rhodium-catalyzed, 19:646
Methanol conversion, in formaldehyde manufacture, 12:115
Methanol converters, 16:308
Methanol–formaldehyde–water solutions, 12:109
Methanol–hydrogen chloride reaction, 16:320, 321, 322–323
Methanol–methyl ethyl ketone azeotrope, 8:818
Methanol oxidation, 12:214
Methanol plant reformers, 16:303
Methanol processes. See also Methanol-to-entries
commercial, 16:308
of formaldehyde manufacture, 12:113
future, 16:310–311
Methanol removal, using pervaporation, 18:520
Methanol synthesis, 16:307–310
gas generation routes for, 16:302–307
reactions for, 16:301–302
stoichiometry, 16:303
in tubular reactors, 25:270
Methanol-to-ethylene process, 10:621
Methanol-to-gasoline process, molecular sieves in, 16:846
Methanol-to-olefins (MTO) process, 16:820, 846
Methanol transportation fuel, 10:60
Methanalysis
in plastics recycling, 21:450
in silicone polymerization, 22:556
Methanotropic conditions, defined, 3:757t
Methanotropic bacteria, 3:760
Methantheline bromide, 4:359t
Methathesis reaction, 19:344
Methazolamide, 5:169
Methazole, 13:323–324
N⁵,N¹⁰-Methenyl tetrahydrofolic acid, 25:801, 802
Methicillin-resistant Staphylococcus aureus (MRSA), 21:216; 24:60
Methine-containing dye classes, 9:503–504
Methine groups, ethylene oxide reaction with, 10:639
Methines, typical soluble dye applications, 7:376t
Methiocarb, 14:589
Methionine
content in cocoa and chocolate products, 6:368t
in coffee, 7:255
synthesis from acrolein, 1:265, 268–269
systematic name, formula, and molecular weight, 2:556t
taste profile, 2:605
D-Methionine, systematic name, formula, and molecular weight, 2:556t
DL-Methionine
chemical synthesis, 2:596
systematic name, formula, and molecular weight, 2:556t
L-Methionine, systematic name, formula, and molecular weight, 2:556t
Method of initial rates, 14:610
Methods in Organic Synthesis database, 6:20
Methods/processes category, in patents, 18:166
Method transfer, in quality assurance, 21:167
Method validation study, 21:166
Methoprene, 14:344
Methotrexate, 2:824
folic acid and, 25:802–803
2-Methoxy-1-methylethyl alkyl peroxides, 18:454
2-Methoxy-3-methyl-1,4-benzoquinone, 21:250
2-Methoxy-7,8-epoxy-2,6-dimethyloctane, 24:488–489
Methoxyacrylates, insecticidal, 14:348
α-Methoxy-α-trifluoromethylphenylacetyl chloride, chiral derivatizing reagent, 6:76t
Methoxy-based RTV silicones, 22:595, 596
p-Methoxybenzaldehyde. See p-Anisaldehyde
8-Methoxychloretetracyclines, 24:601
Methoxycitronellene, 24:488
Methoxydihydropyran, 1:278
Methoxyethene. See Methyl vinyl ether
2-Methoxyethyl chloroformate, molecular formula, 6:291t
Methoxyfenozide, 14:345
Methoxyl groups, in lignin, 15:12
2-Methoxyethanol, solubility of cellulose acetates in, 5:417t
1-Methoxy-1,2-naphthoquinone, 13:724
2-Methoxyphenol, 10:576
uses for, 10:582
2-Methoxy-p-phenylenediamine sulfate intermediate used in oxidation hair dyes, 7:88t
Methoxypropanol, solubility of dispersant tails in, 8:685
Methoxypropene, terpenoids from, 24:479–480
3-Methoxypropionitrile, 1:411
Methoxypropyl acetate, solubility of dispersant tails in, 8:685
3-Methoxypropylamine, 1:411
Methscopolamine bromide, 4:359t
2-Methyl-1,3-butadiene monomer purification, 4:440
polymerization, 4:434–440
2-Methyl-1,3-dioxolane, production from acetaldehyde, 1:104
(–)-2-Methyl-1,4-naphthoquinone 2,3-epoxide, 21:242
2-Methyl-1-butanol physical properties of, 2:764t
specifications of commercial, 2:774t
3-Methyl-1-butanol, physical properties of, 2:764t
2-Methyl-1-butyne
3-Methyl-1-pentyn-3-ol, 1:249t
4-(1-Methyl-1-phenylethyl)phenol. See 4-Cumylphenol
2-Methyl-1-propanol, physical properties of, 4:394t
N-Methyl-2,2'-dichlorodiethylamine (HN2), 5:816
2-Methyl-2,4-pentanediol. See Hexylene glycol
2-Methyl-2-butanal, physical properties of, 2:764t
3-Methyl-2-butanal, physical properties of, 2:764t
3-Methyl-2-butenolic (β,β-dimethyl acrylic) acid, physical properties, 5:35t
4-Methyl-2-pentanol. See Methylisobutylcarbinol
4-Methyl-2-pentanol. See Methyl isobutyl ketone
2-Methyl-2-propanol, physical properties of, 4:394t
N-Methyl-2-pyrrolidinone acetylene-derived, 1:231, 249
extractive distillation using, 8:816
for purification of hydrocarbon-derived acetylene, 1:203, 204, 208, 216
solubility of acetylene in, 1:178t
2-Methyl-3-butyne-2-ol. See Methylbutynol
3-Methyl-3-methoxybutan-1-ol (MMB), 24:483
4-Methyl-3-penten-2-one. See Mesityl oxide
Methyl-4-(phenylthio)phenyl sulfoxide, 23:720
2-Methyl-8-hydroxyquinoline, 7:588
10-Methyl-9-acridinium carboxylate, chemiluminescence reagent, 5:846
Methyl abietate, 24:553
Methyl acetate
azeotrope with water, 8:799
carbonylation of, 10:506; 19:621
carbonylation to acetic acid, 1:120, 125
carbonylation to acetic anhydride, 1:151–155
diffusion coefficient in air at 0°C, 1:70t
manufacture of, 10:489
production of, 10:481–482
terminal activity coefficients of mixture with water, 8:743t
Methyl acetate system, 22:332
evolving separation strategies for, 22:335–337
flowsheet construction for, 22:332–337
p-Methylacetophenone, aroma chemical derived from toluene, 3:234
Methyl acetylene, carbonylation of, 16:245
Methyacrolein, catalytic aerogels for preparation by partial oxidation, 1:763t
Methyl acrylate (MA), 11:201; 20:211, 212, 213
in acrylonitrile copolymerization, 11:203
Alfrey–Price parameters, 7:617t
block copolymer synthesis, 7:647t
comonomer with acrylonitrile, 1:451t
copolymerization with VDC, 25:698–699, 700, 701, 703
physical properties of, 1:344t, 376t
Methylation

N-Methylacrylamide, 1:301

Methylation, 1:363t, 377t

VDC polymer degradation and, 25:717, 720

N-Methylacrylamide, 1:301

Methyld, formaldehyde production from, 12:117

Methyl alcohol. See Methanol

Methyl α-cyclohexanone, 24:569

Methyl α-hydroxyisobutyrate, 16:247

Methyl allyl carbonate, molecular formula, 6:305t

Methyl aluminoxide (MAO), 7:630–632; 10:181; 16:87, 91–95

as an alkylating agent, 16:93

Methyl aluminoxide (MAO) cocatalyst, 20:154–155

Methyamine reforming reactions, kinetic studies of, 16:362

Methyamines, 12:112; 16:355–370

commercial, 16:356t

economic aspects, specifications, and uses for, 16:364–368

end uses of, 16:365

exposure limits for, 16:364t

as feedstocks, 16:357–359

health, safety, and toxicology of, 16:364

manufacture of, 16:360–363

manufacturing data for, 16:367t

physical properties of, 16:356–357

production of, 16:300

products manufactured using, 16:366–367t

shipment and handling of, 16:363–364

Methylenium compounds, 16:356

3-(N-Methylamino)phenol, 2:668

physical properties of, 2:666t

4-(N-Methylamino)phenol, 2:669

physical properties of, 2:666t

p-Methylaminophenol, intermediate used in oxidation hair dyes, 7:858

1-Methylenioanthraquinone, 9:314

Methyl amyl ketone (MAK), 14:584

butyraldehyde derivative, 4:461, 467

Methyl anthranilate, aroma chemical derived from naphthalene, 3:235

N-Methylanthranilic acid, aroma chemical derived from naphthalene, 3:235

N-Methylanthrapyridone, 9:319

2-Methylantraquinone, 9:316–317

Methylation of fatty amines, 2:522

of fullerene, 12:240–241

polysaccharide analysis using, 20:551

Methyl benzoate, 3:635

Methylbenzyl alcohol, oxidation of, 14:52

α-Methylbenzyl isothiocyanate, chiral derivatizing reagent, 6:76t

α-Methylbenzyl isocyanate, chiral derivatizing reagent, 6:76t

Methyl β-cyclohexanone, 24:569

Methyl-β-naphthyl ketone aroma chemical derived from naphthalene, 3:235

4-Methylbismine, 4:31

Methylbismuthine, 4:18, 26

Methyl-β-tallow amine, 3:110

Methyborane, 13:635

Methyl borate, flame retardant for cotton, 8:27

Methyl bromide, 4:345–347; 12:62

chiral derivatizing agent, 6:96t

ozone depleting potential, 1:809t

2-Methyl butanal, physical properties of, 2:60t

3-Methyl butanal, physical properties of, 2:60t

2-Methylbutanoic acid, physical properties, 5:35t

3-Methylbutanoic (isovaleric) acid, physical properties, 5:35t

2-Methylbutanol, 7:257t

solubility of boric acid in, 4:253t

3-Methylbutanol, 7:257t

Methylobutenes, 18:594

Methylbutenol, terpenoids from, 12:459t, 250–253

health and safety factors, 1:253

LD₅₀ for mice, 1:253t

manufacture, 1:252–253

physical properties of, 1:250t

reactions, 1:250–252

uses of, 1:253

Methylcellulose(s) (MC), 4:724t, 730–731;


applications, 5:459t

deoamper application, 8:240

physical properties, 5:458t

properties of, 13:74t

Methyl chavicol, 3:232

Methyl chloride, 6:249; 13:833; 16:317–329, 374
alternative reactions producing, 16:323
analytical methods for, 16:325
chlorination of methane to, 16:322
chlorocarbon/chlorohydrocarbon of
industrial importance, 6:227t
consumption of, 6:244t
cylinders, 16:324
dry, 16:317, 319
economic aspects of, 16:324–325
end use of chlorine, 6:134t
environmental concerns and regulations
related to, 16:326
exposure to, 16:317
health and safety factors related to,
16:326
in integrated manufacturing process,
6:237t
manufacture of, 16:320–323
physical and chemical properties of, 16:317–320
reactivity of, 16:319–320
shipment and handling of, 16:323–324
in silicone chemistry, 22:549–551
silicone industry and, 22:548
standards for, 16:325
toxicity of, 16:326
uses for, 16:326–327
U.S. producers of, 16:324t
Methyl chloroacetate, 1:142
Methyl chloroform, chlorocarbon/
chlorohydrocarbon of industrial
importance, 6:227t
Methyl chlorofomate
DOT regulations for shipment, 6:301t
molecular formula, 6:291t
toxicity, 6:302t
Methylchloroisothiazolinone, antimicrobial
used in cosmetics, 7:831t
Methylchlorosilane(s) (MCS)
direct-process residue, 22:552
as silylating agents, 22:697
in TD resin preparation, 22:588
Methylchlorosilane process, 22:548, 549
\( \beta \)-Methylcinnamaldehyde, 3:595
2-Methyl-cis-2-butenolic (angelic) acid,
physical properties, 5:35t
Methylclothiazide, molecular formula and
structure, 5:162t
Methylcobalamin, 25:804
Methylcyclohexanediadime, physical
properties of, 2:500t
1-Methylcyclohexylamine, physical
properties of, 2:499t
2-Methylcyclohexylamine, physical
properties of, 2:499t
3-Methylcyclohexylamine, physical
properties of, 2:499t
4-Methylcyclohexylamine, physical
properties of, 2:499t
\((\pm)\)cis-2-Methylcyclohexylamine, physical
properties of, 2:499t
\((\pm)\)-cis-3-Methylcyclohexylamine, physical
properties of, 2:499t
cis-4-Methylcyclohexylamine, physical
properties of, 2:499t
N-Methylcyclohexylamine, physical
properties of, 2:499t
(+)-trans-2-Methylcyclohexylamine,
physical properties of, 2:499t
\((\pm)\)-trans-2-Methylcyclohexylamine,
physical properties of, 2:499t
\((-\rangle\)-trans-2-Methylcyclohexylamine,
physical properties of, 2:499t
\((\pm)\)-trans-3-Methylcyclohexylamine,
physical properties of, 2:499t
trans-4-Methylcyclohexylamine, physical
properties of, 2:499t
Methylcyclopentadienylmanganese
tricarbonyl (MMT), 12:391
Methylcyclopentane, azetrope with
benzene, 3:598t
2-O-Methyl-derivatized cyclodextrin,
6:98
Methyl di-1-naphthylbismuthinate, 4:31
Methyl dibromogluaronitrile,
antimicrobial used in cosmetics, 7:831t
N-Methylidicyclohexylamine, physical
properties of, 2:499t
Methyl diethanolamine (MDEA)
for absorption of hydrogen sulfide from
CO\(_2\)-rich sour gases, 1:72–76, 78–80
manufacture of, 2:130
physical properties of, 2:124t
Methyl diphenylbismuthinate, 4:31
l-\(\alpha\)-MethylDOPA, 2:560, 606
Methyl DS Hydroxyalkyl MS, commercially
available in range of substitutions,
5:457t
Methylene-5,5'-disalicylic acid, 22:6, 17
Methylenbis(4-phenyl isocyanate), 12:122
2,2-Methylenbis(6-tert-butyl-p-cresol),
3:107
N,N-Methylenebisacrylamide, 1:293
4,4′-Methylenebis(phenylisocyanate) (MDI), in shape-memory polymers, 22:362, 363

Methylene blue, 9:517–518
Methylene bromide, 4:348
Methylene carbenes, 21:144, 146

Methylene chloride, 16:371–380
analytical methods for, 16:376
binary azeotropes of, 16:373t
carbon monoxide in production of, 5:7–8
consumption, 6:244t
economic aspects of, 16:375
end use of chlorine, 6:243t
environmental concerns and regulations related to, 16:377–378
health and safety factors related to, 16:376–377
in integrated manufacturing process, 6:237t
manufacture of, 16:374–375
permisssible exposure limits for, 18:80
physical and chemical properties of, 16:371–374
as a polycarbonate solvent, 19:800
reactions of, 16:373–374
separations process synthesis and, 22:329, 330
solubility of chloroacetic acid in, 1:137t
specifications for, 16:375–376
transport and handling of, 16:375
uses for, 16:378
U.S. producers of, 16:375t
vapors, 16:376

Methylene chloride finish removers, 18:79–81
environmental impact of, 18:81

Methylene chlorobromide, 4:347

Methylene compounds, ethylene oxide reaction with, 10:639

Methylene derivatives, 12:110
Methylenedianiline (MDA), 2:793–794; 10:396
chemical reactions, 2:795–796
epoxidation of, 10:372–373
health and safety factors, 2:801–802
manufacture and processing, 2:796–799
physical properties of, 2:794–795, 795t
specifications and analysis, 2:800–801
uses of, 2:802

Methylene(methoxyphenylisocyanate) (MDI), in shape-memory polymers, 22:362, 363

Methylene blue, 9:517–518
Methylene bromide, 4:348
Methylene carbene, 21:144, 146

Methylene chloride, 16:371–380
analytical methods for, 16:376
binary azeotropes of, 16:373t
carbon monoxide in production of, 5:7–8
consumption, 6:244t
economic aspects of, 16:375
end use of chlorine, 6:243t
environmental concerns and regulations related to, 16:377–378
health and safety factors related to, 16:376–377
in integrated manufacturing process, 6:237t
manufacture of, 16:374–375
permisssible exposure limits for, 18:80
physical and chemical properties of, 16:371–374
as a polycarbonate solvent, 19:800
reactions of, 16:373–374
separations process synthesis and, 22:329, 330
solubility of chloroacetic acid in, 1:137t
specifications for, 16:375–376
transport and handling of, 16:375
uses for, 16:378
U.S. producers of, 16:375t
vapors, 16:376

Methylene chloride finish removers, 18:79–81
environmental impact of, 18:81

Methylene chlorobromide, 4:347

Methylene compounds, ethylene oxide reaction with, 10:639

Methylene derivatives, 12:110
Methylenedianiline (MDA), 2:793–794; 10:396
chemical reactions, 2:795–796
epoxidation of, 10:372–373
health and safety factors, 2:801–802
manufacture and processing, 2:796–799
physical properties of, 2:794–795, 795t
specifications and analysis, 2:800–801
uses of, 2:802

Methylene(methoxyphenylisocyanate) (MDI)
Methylhexahydrophthalic anhydride (MHHPA) hardener, 10:17
Methyl hydroperoxides, decomposition hazards of, 18:490
Methylhydroxylamine, chiral derivatizing agent, 6:96t
Methylidene chloride, 6:249
Methylidyne complex, 26:949
Methyliminodiacetic acid (MIDA), 19:265
Methyl isobutyl ketone (MIBK), 1:437
Methyl iodide, 14:376
Methyl ionone, 3:232
α-Methylionone, 24:562, 566
α-n-Methylionone, 24:565
β-Methylionone, 24:566
β-n-Methylionone, 24:565
Methyl isoamyl ketone (MIAK), 14:584
butyraldehyde derivative, 4:468
Methyl isobutyl carbinol (MIBC), 16:332, 337–338
production from acetone, 1:164, 174
adic acid solubility, 1:555t
aldol condensation of, 16:332
azeotropes and non-azeotropes of, 16:331t
chemical properties of, 16:330–332
economic aspects of, 16:341–342
general process chemistry for, 16:333–334
health, safety, and environmental issues related to, 16:344–345
manufacture of, 16:332–341
miscellaneous methods of preparing, 16:341
mixed-feed coproduction process for, 16:341
one-step process for, 16:338–340, 340–341
physical properties of, 16:329–330
production from acetone, 1:164, 168, 174
production of, 16:342t
regulations related to, 16:345
specifications for, 16:342–343
three-step process for, 16:332, 333, 335–338
uses for, 16:345–346
U.S. production of, 16:343t
Methyl isobutyrate, 16:252
Methyl isocyanate (MIC), 12:808
Methyl isopropenyl ketone, 14:590
Methylisopropylbenzene. See Cymene
Methyl isopropyl ketone (MIPK), 14:584
Methylisocyanates, 21:205
Methylisothiazolinone, antimicrobial used in cosmetics, 7:831t
Methyl isovalerate, azeotropic mixtures with butyl alcohols, 4:395t
Methyl ketones, acetic anhydride used in synthesis, 1:148
Methylithium, 14:249; 15:147
Methylmagnesium chloride, 16:319
(R)-(−)-Methylmandelic acid chloride, chiral derivatizing reagent, 6:76t
Methyl mercaptan production, 15:17
3-Methylmercaptopropionaldehyde (MMP), intermediate in methionine synthesis, 1:268, 269, 276
Methyl methacrylate (MMA), 16:227
Alfrey–Price parameters, 7:617t
azeotropic mixtures with, 16:236t
block copolymer synthesis, 7:647t
C-2 routes to, 16:252–254
C-3 routes to, 16:246–252
C-4 routes to, 16:254–257
carbon monoxide in production of, 5:6
chain-transfer constants for, 16:284t
comonomer with acrylonitrile, 1:451t
cumene as feedstock, 8:156
in flame-retardant resin formulation, 20:104
manufacture of, 10:486; 16:243–244, 24:265
mechanical properties of, 16:275t
Mitsubishi Gas Chemical Company process for, 16:245, 248–250
monomer for dental cements, 8:278
polymerization of, 14:256, 259
production from acetone, 1:174
production from acetone cyanohydrin, 16:246–248
production from butylenes, 4:427–428
production from ethylene, 16:252–254
production from isobutylene, 16:254–256
production from propyne, 16:250–251
propylene-based routes to, 16:251–252
reactivity ratio from Alfrey–Price scheme compared with experimental data, 7:618t
solubility of, 16:232
in styrene-based resins, 20:107
VDC copolymer with, 25:707
world production capacity of, 16:255t
Methyl methacrylate resins, manufacture of, 19:50
N-Methylmethanesulfonamide, 23:685
N-Methyl morpholine-N-oxide (NMMO) as cellulose solvent, 11:266, 267, 268
environmental issues related to, 11:279–280
as cellulose solvent, 11:266, 267, 268
environmental issues related to, 11:279–280
cellulose solvent (with lithium chloride), 11:266, 267, 268
environmental issues related to, 11:279–280
N-Methylolacrylamide (NMA), 1:293; 9:485, 486
N-Methylol-amino-triazine dyes, 9:478–479
Methylolated melamine, cotton cross-linking agent, 8:26
Methylolation, in amino acid resin formation, 2:624
Methylphilus methylotrophus, 11:3
Methylophilus methylotrophus, 11:3
Methylparaben, antimicrobial used in cosmetics, 7:829t
Methyl Parathion bioremediation substrate, 3:777
in microcapsule formulations, 7:564t
toxicity, 7:564t
1-Methylpentalene, 21:148
2-Methylpentane, reactivity as VOC, 1:792t
Methylpentynol
LD₅₀ for mice, 1:253t
physical properties of, 1:250t
2-Methylphenol, 2:223–224
health and safety data, 2:220t
physical properties of, 2:205t
production by alkylation, 2:196–197
3-Methylphenol, 2:224
health and safety data, 2:220t
physical properties of, 2:205t
4-Methylphenol, 2:225
health and safety data, 2:220t
physical properties of, 2:205t
Methylphosphonates, 17:630
1-Methylpiperazine, 8:488
2-Methylpiperidine, 21:128
2-Methylpropanal, physical properties of, 2:60t; 4:459t
2-Methylpropane, 18:594
2-Methylpropanoic (isobutyric) acid, physical properties, 5:35t
Methylpropanol, 7:257t
2-Methylpropene, 4:402; 18:594. See also Isobutylene
monomer purification, 4:440
polymerization, 4:434–440
2-Methylpropenoic (methacrylic) acid, physical properties, 5:35t
Methyl propenyl ketone, Diels–Alder adduct from cyclopentadiene, 8:222t
Methyl propionate, preparation of, 16:253–253
2-(1-Methylpropyl)phenol. See 2-sec-Butylphenol
iso-Methyl-β-ionones, 24:563
Methylpyridinium quaternary salts, 21:99
N-Methylpyrrolidone (NMP), 15:174, 175; 23:630
extractive distillation solvent, 8:802
finish removers, 18:82–83
as PVDC solvent, 25:705
solubility of dispersant tails in, 8:685
Methylquinolines, 21:195, 196
N-Methylquinolinium salts, 21:193
Methyl radicals, 14:277, 288
in MOCVD growth, 22:157
α-Methyl reactions, 16:239
Methyl rubber, 1:229
Methyl salicylate, 22:1, 12
function as ingredient in cosmetics, 7:829t
natural sources of, 22:7
permeation in selected barrier polymers, 3:389t
physical properties of, 22:14t
Methylsilicone oils, 22:575
Methyl silylating agents, 22:693t
Methylstibine, 3:68
Methylstibonic acid, 3:72–73
α-Methylstyrene (AMS), 23:354–355
comonomer with acrylonitrile, 1:451t
 cumene as feedstock, 8:156
para-Methylstyrene
meta-Methylstyrene, 25:182
p-Methylstyrene. See para-Methylstyrene (PMS)
para-Methylstyrene (PMS), 23:350–352
butyl rubber polymers from, 4:433
reactivity ratios in anionic copolymerization, 7:626
from toluene, 25:182
Methyl substituents, in chiral metallocene catalysts, 16:106
α-Methyl substituents, in chiral metallocene catalysts, 16:106
Methyl tert-amyl ether (TAME), 12:404–405
consumption of, 24:265
debottlenecking production of, 18:520
economic aspects of, 10:577
elimination of, 23:788
isobutylene for butyl rubber from, 4:440–441
as an oxygenated gasoline additive, 16:256
production from butylenes, 4:428–429
production of, 10:568; 16:299
regulatory control of, 24:262
separation from butadiene stream, 4:379
uses for, 10:581; 16:314
Methyl-tert-butyl ether analysis, of water, 26:44
Methyl tert-butylhydroquinone, 20:105
Methyl-tertiary-butyl ether. See Methyl-tert-butyl ether (MTBE)
Methyltestosterone, registered for use in aquaculture in Australia, 3:222t
N\(^5\)-Methyl tetrahydrofolic acid, 25:802
2-Methyltetrahydrofuran (METHF), 12:279–280
Methyltetrahydrophthalic anhydride (MTHPA), 10:406, 407t
Methyltetraphenylantimony, 3:79
N-Methyl-N-trimethylsilyltrifluoroacetamide (MSTFA), as silylating agent, 22:694
4-Methyl-THBA, 1:278t
2-Methylthio-4-tert-butylamino-6-cyclopropylamino-S-triazine, biocide for antifouling coatings, 7:156
2-(Methylthio)quinolines, 21:188
N-Methyltoluenediamine, 25:194
2-Methyl-trans-2-butenolic (tiglic) acid, physical properties, 5:35t
Methyltrichlorosilane, in silicon carbide manufacture and processing, 22:533
Methyl vinyl ether (MVE), 1:254, 258; 20:463
physical properties of, 1:255t
production from acetylene, 1:220
Methyl vinyl ketone, 14:590
conomomer with acrylonitrile, 1:451t
Diels–Alder adduct from cyclopentadiene, 8:222t
Methyl violet, 14:318
Methyl violagen, electrochromic behavior of, 22:224
Methymycin, 15:272, 279
Metobromuron, 4:358t
Metolachlor, 13:319, 320
Metolazone, 5:168
molecular formula and structure, 5:162t
Metomidate (AquaLife marinil), registered for use in aquaculture in Canada, 3:218t
Metoprolol, 5:103
Metoprolol succinate, molecular formula and structure, 5:95t
Metoprolol tartarate, molecular formula and structure, 5:95t
Metribuzin, 13:322
Metrics, 24:196
Metrologia, 15:769
Metropolis, Nicholas, 26:1001
Metropolis criterion, 26:1006, 1024, 1035
Metropolis Monte Carlo (MMC) method, 26:1035–1036
Met-spar, 4:577
Metsulfuron–methyl, 13:322
Mettler dropping point, 10:827
Mevacor, 5:142
molecular formula and structure, 5:139t
Mevalonate, role in cholesterol synthesis, 5:142
Mevalonate pyrophosphate, role in cholesterol synthesis, 5:142
Mevalonic acid, 2:93; 14:132
alkaloid precursor, 2:78
Mexican Molango ore, 15:544
Mexican oregano, 23:169
Mexico
energy production in, 19:527
natural graphite in, 12:781
silver from, 22:636–637
sugar production in, 23:469
Micellar-polymer processes, 23:1–12
Micellar-polymer enhanced oil recovery
Micellar equilibrium, relaxation processes
Micellar electrokinetic chromatography, 12:1–46
Mice, Cre, 12:462. See also Gene-targeted mice; Knock-out mice; Transgenic mice
Micellar gelation mechanism, 20:1–15
Micelles, 15:99, 100; 24:120. See also
Micellar-polymer (MP) chemical enhanced oil recovery systems, 23:531
Micellar-polymer enhanced oil recovery (EOR), 16:429
“Micellar” polymerization, 20:484
Micellar-polymer processes, 23:531–532
Micelle formation, as an entropy driven process, 24:132–133
Micelle geometry, characterizing, 24:124
MgATP hydrolysis, 17:305, 306. See also Magnesium (Mg)
MgB2, properties of, 23:832
MgB2 devices, 26:542
MgB2 superconductors
commercial exploitation of, 23:832–833
critical parameters for, 23:834
thermoelectric stability of, 23:833
MgCl2, crystalline structure of, 26:515–516
MgCl2-supported catalysts, 26:507–509
MgCl2–TiCl4 catalyst systems, 26:505, 530, 531, 542, 544
Mibefradil, molecular formula and structure, 5:116, 122, 187
Mica, 2:344
asbestos substitute, 3:314t
in clays, 6:685
as filler, 11:312–313
hexadecylamine-modified, 20:307
in kaolinite, 6:659
in nacreous pigments, 19:412
pigment used in makeups, 7:836t
Mica-based materials, 12:636
Micaceous iron oxide (MIO) pigment, 19:402
Micardis, molecular formula and structure, 5:153t
Mice, Cre, 12:462. See also Gene-targeted mice; Knock-out mice; Transgenic mice
Micellar gelation mechanism, 20:1–15
Micellar equilibrium, relaxation processes
for, 24:127
Micellar flooding, 18:628
Micellar-polymer (MP) chemical enhanced oil recovery systems, 23:531
Micellar-polymer enhanced oil recovery (EOR), 16:429
“Micellar” polymerization, 20:484
Micellar-polymer processes, 23:531–532
Micellar-polymer processes, 23:531–532
MgCl2, crystalline structure of, 26:515–516
MgCl2-supported catalysts, 26:507–509
MgCl2–TiCl4 catalyst systems, 26:505, 530, 531, 542, 544
Mibefradil, molecular formula and structure, 5:116, 122, 187
Mica, 2:344
asbestos substitute, 3:314t
in clays, 6:685
as filler, 11:312–313
hexadecylamine-modified, 20:307
in kaolinite, 6:659
in nacreous pigments, 19:412
pigment used in makeups, 7:836t
Mica-based materials, 12:636
Micaceous iron oxide (MIO) pigment, 19:402
Micardis, molecular formula and structure, 5:153t
Mice, Cre, 12:462. See also Gene-targeted mice; Knock-out mice; Transgenic mice
Micellar gelation mechanism, 20:1–15
Micellar equilibrium, relaxation processes
for, 24:127
Micellar flooding, 18:628
Micellar-polymer (MP) chemical enhanced oil recovery systems, 23:531
Micellar-polymer enhanced oil recovery (EOR), 16:429
“Micellar” polymerization, 20:484
Micellar-polymer processes, 23:531–532
Micelle formation, as an entropy driven process, 24:132–133
Micelle geometry, characterizing, 24:124
Micelles, 15:99, 100; 24:120. See also
Spherical micelles
in amphiphilic molecules, 15:100–101
dendrimer encapsulation into, 26:798–799
in emulsion polymerization, 11:202
surfactants in, 22:725
as microscopic liquid hydrocarbon droplets, 24:123
molecular recognition in, 16:800–801
in soap–water system, 22:726
surface active agent properties and, 24:123
various shapes of, 24:124–125
Micellization
drug efficacy and, 24:159
enthalpy and entropy of, 24:131–132
equilibrium aspects of, 24:127–128
phase separation model of, 24:128–129
of surface active agents, 24:119
thermodynamics of, 24:127–133
Micellization-dissolution process, 24:127
Micellar gelation mechanism, 20:1–15
Michael addition(s), 16:290
amino acids, 2:572
fatty amines, 2:523
ionic liquids in, 26:892
Michael addition chemistry, quinone, 21:248–249, 250, 252
Michaelis-Arbusov reaction, 19:29, 53, 54
Michaelis constant, 10:255; 14:626–627
Michaelis-Menten equation, in kinetic studies, 14:625–627
Michaelis-Menten kinetics, 10:254–255
Michael reaction, 14:570
Michaels addition, of PVA, 25:602
Michelson interferometer, 14:221, 225
Micrinite, molecular formula and structure, 7:836t
Microaerophiles, in nitrogen fixation, 17:301
Microamorphous silica, 22:380, 383
applications of, 16:389–393
basic components of, 16:381
commercially available, 16:390, 391t
fabrication of, 16:382–389
future of, 16:393
global market for, 16:389
history of, 16:381–382
Microbial pesticides, 18:525
Microbial poly saccharides, 20:573–578
    major, 20:574t
    purification of, 20:574–575
Microbial reductions, 16:401–402
Microbial resistance, origin and spread of, 15:303–304
Microbial resistance problem, 18:265–266
Microbial stability, of liquid enzyme formulations, 10:269–270
Microbial transformations, 16:395–419.

See also Biotransformations; Microbial oxidations; Microbial reductions
applications of, 16:396–399
biocatalyst selection in, 16:404–409
biocatalysts in, 16:409–414
for drug metabolite production, 16:398–399
further advances in, 16:414
in hydrolysis, 16:400–401
multiphase reactions in, 16:412–414
scale-up of, 16:414
systematic studies of, 16:398
technique overview for, 16:403–414
timing of substrate additions in,
    16:411–412
uses for, 16:400–403
Microbial waxes, 26:203
Microbiocides, triorganotins as, 24:817
Microbiological culture media, agar in,
    13:68
Microbiological fouling, in industrial water treatment, 26:146–149
Microbiologically influenced corrosion
(MIC), in industrial water treatment,
    26:128–129
Microbiology
    spa/hot tub, 26:197
    wine studies and, 26:298–299
Microbolometer photodetector, 19:166
Microbond NP, composition of alloy for
crowns and bridges, 8:311t
Microbond NP2, composition of alloy for
crowns and bridges, 8:311t
Microbore liquid chromatography, 4:620
Micro-Brownian motions, 14:474
Microcapsules
    for carbonless paper, 16:452
defined, 16:438
    injectable, 16:453
Microcarrier perfusion cell culture systems
    batch, 5:350, 352–354
    continuous, 5:351t, 354–355
    pros and cons of, 5:351t
Microchannels
fluid flow in, 26:963
mixing fluids in, 26:966
Microchip industry, 9:732
Microcontact printing, 15:192–193
Microcrystalline cane sugar, 23:438–439
Microcrystalline cellulose (MCC), 4:716–717; 5:381–382; 12:54
Microcrystalline diamonds, 8:522
Microcrystalline tests, 12:98–99
Microcrystalline wax, 26:215, 216
in mascara, 7:862
Microcutting procedures, 14:691
Microdenier fibers, 11:186; 19:761–762
Microdenier products, 11:215
Microdielectrometry, 10:14–15
Microdiffraction, 26:432
Microelectromechanical systems (MEMS), 15:202; 17:64
advanced coatings for, 1:715–716
advanced thin films for, 1:726
application in combinatorial chemistry, 7:383, 401, 422
lotus effect in, 22:123
silicon-based semiconductors and, 22:257, 259–260
SMA applications for, 22:353
Microelectronic engineering, supercritical fluids in, 24:22–23
Microelectronic processing,
photoimageable polyimides in, 20:278
Microelectronics, 5:598
patterned electrodeposition for, 9:811–832
sensor sensitivity and, 22:269
Microemulsifiable concentrates, 16:435
Microemulsion design, scaling theory and, 16:432
Microemulsion polymerization, acrylamide polymers, 1:322–323
Microemulsion publications, growth in, 16:420t
Microemulsions, 7:284; 10:113; 16:419–437;
24:10, 133
applications of, 16:429–431
components of, 16:429
derived, 16:419–420
economic aspects of, 16:434–435
enzyme immobilization via, 10:271
formation of, 16:421
perturbing variable scans and, 16:424–429
phase diagrams and, 16:420–424
physical description of, 16:431–432
stability of, 10:125
surfactants in, 24:157–158
versus emulsions, 16:420
versus macroemulsions, 16:433–434
Microemulsion systems, scaling theory of, 16:432
Microemulsion technology, in fiber finishing, 22:593
Microencapsulated phase-change-material (PCM) slurry, 13:276
Microencapsulation, 16:438–463. See also
Encapsulation processes
controlled release pesticide applications, 7:561–566
applications of, 16:451–460
biomedical and biological applications of, 16:454
of consumer and industrial products, 16:459–460
of food/food ingredients, 16:454–459
food product development and, 16:457–458
in imaging, 16:451–452
of live cells and organisms, 16:454
in pharmaceuticals, 16:452–453
processes in, 16:438–451
Microencapsulation treatment, of textiles, 24:623
Microencapsulation technique, 13:276–277
Microetching techniques, 19:167
Microextraction, solid-phase, 11:518
Microfermenters, 11:14
Microfibers, 11:186, 240; 24:613
Microfibrils, 10:283; 11:171
Microfilaments, liquid crystal properties in, 15:111–112
Microfilm images, 19:218, 219
Microfiltration, 15:723–725, 824–825; 16:27
in hazardous waste management, 25:817, 818
hollow-fiber membranes in, 16:24–26
hollow fibers in, 16:7
industrial success of, 16:25
membrane technology in, 15:797, 827
pore size in, 16:25
in wastewater treatment, 25:889–890
Microfluidic chips, in microfluidic assays, 26:970
Microfluidic devices, 26:959
  effect of scale on, 26:960
  fabrication of, 26:963–966
Microfluidics, 26:959–980
  applications of, 26:966–975
  basic features of, 26:959–966
  future directions for, 26:976–977
  history of, 26:959
  industrial impact of, 26:976
Microfluidic structures
  fabrication of, 26:963–966
MicroFluidic Systems, 26:976
Micro-gas chromatography (micro-GC), 6:434–437
Microgel particles
  deformable nature of, 13:745–746
  as drug delivery systems, 13:747
  osmotic de-swelling behavior of, 13:746
  in the surface coating industry, 13:746
Microgels, 13:743–747
  properties of, 13:744–746
  reactive, 13:746–747
  synthesis methods for, 13:744
Microhardness
  of deposits, 9:712–713
  measurements of, 19:582
Micro-heat exchangers, 13:269
Microhydrogen generators, 13:783
Microinjection, of transgenes, 12:454–456
Microlite, 24:316
Microlithographic resists, phenolic polymers for, 15:176
Microlithography, resists for, 15:161–181
Micromachines, application in
  combinatorial chemistry, 7:401, 422
Micromachining, of sensors, 22:266
  “Micromachining” processes, microfluidic devices via, 26:964
Micromechanical models, 12:16
Micromirrors, in MEMS, 22:260
Micromixers, 26:966–967
  for immunoassays, 26:968–969
Micromixing, 16:683
Micromorph solar cells, 22:140
Micromosaic immunoassay, 26:968–969
Micrones, 26:976
Micronized master blend (MIMAS) process, 25:425
Micronutrient complexing agents,
  lignosulfonates as, 15:18
Micronutrients, 25:781
Microorganism control, for spas/hot tubs, 26:195
Microorganisms
  in activated sludge, 25:827, 829, 830
  in biodegradation, 25:835–836, 838
  care of fermentation, 11:42
  in composting, 25:873
  engineered, 18:552
  food-enzyme, 10:309
  in industrial water treatment, 26:146–147
  lotus effect repellancy against, 22:122
  storing and propagating, 10:267
Microparticles, in paper manufacture, 18:117–118
Microparticulate silica, 22:383
Microphones, 11:130
Microphotoelectron X-ray microscope, 16:505
Micropipes, silicon carbide, 22:532
Micropipette solution deposition
  fabrication method for inorganic materials, 7:415t
Micropore diffusion, 1:596, 597–599
Microporous catalysts, in bisphenol A manufacture, 14:420
Microporous metal membranes, 15:813t
Microporous particles, apparent effective diffusivity and, 15:729–730
Microporous range, pore diameters within, 16:812
Microporous resins, 14:393, 397
Microporous symmetrical membranes, 15:801–804
Microporous thin films, 14:98–99
Microprocessor-based measurement devices, 20:679
Microreactor technology, application in
  combinatorial chemistry, 7:401, 422
Micro RNAs (miRNA), 17:620–621
Micro-routing, in waste collection, 25:869
Microsampling methods, in infrared spectroscopy, 14:232–233
Microscale microbial cultures, shaken, 16:406
Microscale sensors, high throughput experimentation application, 7:424
Microscopes. See also Microscopy
  comparison of, 16:465t
  components and functions in, 16:469–471
designs for; invention of; ongoing improvements in; optional components for; uses for; Microscope stages; Microscopic mass balance; Microscopic mass transfer equation; Microscopic models, used in kinetic studies; Microscopic pathology, in toxicology studies; Microscopic techniques; Microscopists, role of; Microscopy; Microscopy – ftir technique; Microscopy technologies, polymer analysis using; Micro-Sect formulation; Microsilica, world demand for; Microspectrometers; Microscopy, infrared; Microspectroscopy; Microspheres, of VDC copolymers; Microstructure; Microstructure alloys; Microstructure. See also Microstructures; Microthermal analysis, recent developments in; Microwave-accelerated reactions, miscellaneous; Microwave-assisted synthesis, of heterocyclic compounds; Microwave devices, high throughput experimentation; Microwave dryers; Microwave drying, ceramics processing; Microwave energy, exposure hazards of; Microwave equipment, conveyor-type; Microwave hardware; Microwave ovens; Microwave technology; Microwave heating, in synthetic organic chemistry; Microwave hydrothermal processing; Microwave inks; Microwave irradiation, effects of; Microwave magnetic fields
Microwave ovens
  advances in technology of, 16:528
  cooker magnetron for, 16:519
Microwave plasmas, 16:530–531
Microwave power, 16:510
  application to gaseous plasmas, 16:516–517
  frequency allocations for, 16:510–512
  monitoring, 16:521
  sources of, 16:519
Microwave power applications, 16:510–517
  materials processing in, 16:512–517
Microwave power system, elements of, 16:520
Microwaves (MWs)
  in alkene functionalization, 16:545
  in alkene synthesis, 16:545
  in alkylation reactions, 16:546
  in aromatic substitution reactions, 16:542
  in carbohydrate chemistry, 16:547–548
  in catalytic hydrogenation, 16:544
  in combinatorial chemistry, 16:548–552
  in condensation reactions, 16:563–566
  in cyclization and cycloaddition reactions, 16:540–542
  in decarboxylation reactions, 16:546
  environmental remediation using, 16:555
  features of, 16:538
  in isomerization and rearrangement reactions, 16:566–567
  miscellaneous reactions using, 16:552–555
  in organometallic chemistry, 16:552
  in oxidation reactions, 16:544–545, 567–572
  in parallel synthesis, 16:549–552
  in pericyclic reactions, 16:542–544
  in protection–deprotection (cleavage) reactions, 16:557–563
  in racemization reactions, 16:552–553
  in reduction reactions, 16:572–574
  in stereoselective additions, 16:553–554
  in synthesis of isotopically labeled compounds, 16:553
Microwave sintering, ceramics processing, 5:663
Microwave spectroscopy, 23:129, 135–136
Microwave susceptor, 16:528
Microwave techniques, applications in chemical technology, 16:539
Microwave technology—chemical synthesis applications, 16:538–594
  microwave-accelerated solvent-free organic reactions, 16:555–584
  microwave-assisted organic reactions in the liquid phase, 16:540–555
Microwave technology, 16:509–537. See also Microwave power; Microwave technology— chemical synthesis applications
  in biological, medical, and agricultural applications, 16:529–530
  in ceramics processing, 16:531
  chemical applications of, 16:530
  economic aspects of, 16:524–525
  in food processing, 16:526–529
  health and safety factors related to, 16:525–526
  instrumentation in, 16:517–524
  uses for, 16:526–531
  in waste treatment, 16:530
Microwave voltage breakdown, 16:525
Micro X-ray fluorescence (MXRF) analysis, 26:437–439
Mictrol, molecular formula and structure, 5:120t
Micturin, molecular formula and structure, 5:120t
Micturol, molecular formula and structure, 5:120t
Midamor, 5:168
  molecular formula and structure, 5:165t
Mid-cut detergent alcohols, 2:2
Middle distillates, Portland cement industry consumption, 5:497t
Middle East
  chemical production in, 24:265
  hybrid desalination systems in, 26:95
  water desalination in, 26:54
Middle East petroleum reserves, 18:596
Middle molecular solutes, in hemodialysis, 26:821
Middle molecule removal, in hemodialysis, 26:832–833
Middle soap phase, 22:726
Middlings, 16:603
Mid-ir lasers, 22:180
Mid-ir region, 14:234–236
MIDREX process, 14:513, 514
Midwest Research Institute, on PVC waste incineration, 25:681
Mie scattering, 7:308; 11:133; 23:127
dispersions, 8:715
MIG impeller, 16:672–673
Migration effect, 9:613
Migration exhaust dyeing, 9:177
Mikropul Acucut classifier, 22:289, 290
Mildness additives, for bar soap,
22:745–746
Mild steel cast iron, in galvanic series,
7:805t
Mild steel electrodes, 25:20
Mileage, polypropylene, 20:526–528
Military applications
of calcium hydride, 13:611
of high performance fibers, 13:397–398
of polycarbonates, 19:820
of titanium, 24:861–862, 863, 864, 867
Military chemicals, bioremediation, 3:779–780
Military Oriented Protective Posture (MOPP), 5:834–835
Military specifications, for hydrazines, 13:586
Military spending, after 9/11 attacks, and advanced materials research, 1:706
Milk
as blood substitute, 4:109–110
as colloid, 7:272t, 273t
dry whole in formulation for milk chocolates, 6:362t
estimated maximum oxygen tolerance, 3:381t
improving in transgenic farm animals, 12:465
pasteurization, 8:636–637
Milk and egg products, in pet foods, 10:853
Milk chocolate, 6:361–366
amino acid content, 6:368t
composition, 6:369t
minerals content, 6:371t
theobromine and caffeine content, 6:367t
tocopherols, 6:370t
typical formulation, 6:362t
vitamin content various samples, 6:370t
Milfish
aquacultural chemical needs, 3:209
common and scientific names, 3:187t
nutrition and feeding, 3:201
reproduction and genetics, 3:205–206
world aquaculture production in 1996, 3:186t
Milk of lime, 15:28, 55
production from hydrated lime, 15:56
production of, 15:57
in sodium carbonate recovery, 22:792
ultrafine, 15:56, 57
Milk protein, proteolytic modification of,
10:298
Milk sugar, 23:487–488
Milled bar process, in bar soap manufacture, 22:750–751
Milled translucent soaps, 22:747
Millets, in ruminant feeds, 10:864
Mill hardened copper alloys, 7:723t
Milling
of asbestos minerals, 3:308–309
in bar soap manufacture, 22:748, 750–752
in beer making, 3:574–578
of corn, 26:287–288
in dye manufacture, 9:292
in ink manufacture, 14:322, 324
of wheat, 26:279–282
Milling acid dyes, 26:395–396
Milling by-products, in ruminant feeds, 10:866
Milling equipment, pilot plant, 18:732
Milling techniques, in large-scale pharmaceutical synthesis, 18:729
Millipedes, alkaloids in, 2:75
Millisecond catalytic cracking (MSCC) process, 11:685
Mill products, titanium, 24:858. 859
Mills, grinding, 16:613–615
Mill scale, raw material for cement, 5:475t
Mill shipments, titanium, 24:839
Mill tailings as nuclear waste, 17:598
uranium recovery from, 17:527
Milrinone, 5:186
molecular formula and structure, 5:181t
Milstein, Cesar, 11:12
Mine drainage, bioremediation, 3:785–786
Mineral acid catalysts, 10:477
Mineral acids, cation exchanger regeneration using, 14:411
Mineral beneficiation, 16:135
anthropogenic silicas and silicates in,
22:471–472
Mineral classifiers, types of, 16:619–622
Mineral commodities, world and U.S. production of, 16:599–600t
Mineral constituents analysis, of water, 26:40–42
Mineral deposits, in iodine manufacture, 14:360
Mineral dissolution, 26:6–7
in stream water, 26:25
Mineral dissolution reactions
in stream water, 26:25
Mineral dressing, 16:128
Mineral feedstocks, titanium dioxide, 25:31–33
Mineral fibers, 24:613
Mineral-filled composites, 10:452
Mineral fillers, 11:311–313
Mineralization, defined, 3:757t
Mineralizers, 14:83; 19:403, 405
organic, 14:101–102
Mineralogical information gathering, 16:602–603
Mineralogical properties
of boehmite, 2:423t
of diaspore, 2:423t
of gibbsite, 2:423t
Mineralogy, 16:601–603
Mineral oil
carrier for dental cements, 8:287
cosmetically useful lipid, 7:832, 833t
in cosmetic molded sticks, 7:840t
Mineral oil (MWP paraffin), surface tension, 8:244t
Mineral pigments, in paper coatings, 18:124
Mineral processing
dispersant applications, 8:691–692
polyacrylamide polymers for, 1:324–325
Mineral products, valuation of, 16:608
Mineral reinforced rubber, silylation and, 22:703
Mineral reinforcements, in polyamide plastic manufacture, 19:786
Mineral resources, uranium, 17:518–521
Minerals. See also Ores
containing sodium sulfates, 22:863t
in coal, 6:718
content in cocoa and chocolate products, 6:371t
crushing, 16:611–613
defined, 16:128
dissolved, 17:694–695
grinding, 16:613–615
high magnetic susceptibility, 16:636
in wine fining, 26:317
iron-bearing, 14:494
liberation of, 16:603
lithium-bearing, 15:122
magnetic induction required to extract, 15:435t
major industries using, 16:597t
manganese, 15:540t
occurrence of, 16:595
platinum-group-containing, 19:603
rare-earth-containing, 14:631
as rubber fillers, 21:776–778
in ruminant feeds, 10:866–867
selenium occurrence in, 22:78
siliceous, 22:365–366
silver, 22:638
sodium silicate, 22:455
tin-bearing, 24:783–784
titanium-bearing, 24:840
Mineral sands, deposits of, 17:688
Mineral scale, salt versus, 22:817
Minerals concentration, 16:622–624
Minerals concentration operations, costs of, 16:607–608
Mineral separations, 15:442
Minerals industry, size of, 16:598
Mineral sludge dewatering efficiency, poly(ethylene oxide) in, 10:688
Mineral solids, hybrid materials based on, 13:541
Mineral sources, lanthanide and yttrium distribution in, 14:637t
Mineral spirits, solvent for cosmetics, 7:832
Minerals processing, history of, 16:596t.
See also Minerals recovery/processing
Minerals recovery/processing, 16:595–668.
See also Minerals concentration;
Minerals processing
classification in, 16:618–622
economic aspects of, 16:606–609
environmental aspects of, 16:609–610
flow sheets in, 16:603–605
materials handling in, 16:660–663
from ocean waters, 17:695–697
ores, 16:598–603
process control in, 16:663–665
size reduction (comminution) in, 16:610–615
size separation in, 16:615–622
solid–liquid separation in, 16:655–660
Mineral surfaces, alkyl silylating agents and, 22:697
Mineral technology, sulfur dioxide in, 23:668
Mineral waxes, 26:203, 213–218
Mineral wool, asbestos substitute, 3:314t
Miniature alkaline primary cells, 3:449–459
cutaway view, 3:449
divalent zinc–silver oxide batteries, 3:454–455
zinc–air batteries, 3:455–459
zinc–manganese dioxide batteries, 3:455
zinc–mercuric oxide batteries, 3:450–451
zinc–silver oxide batteries, 3:451–454
Miniaturization, microfluidics and, 26:959
Mini-emulsion processes, 25:570
Miniemulsions, 10:113; 14:713
Minimal repair, in reliability modeling, 26:989
Minimal Risk Level (MRL), 25:239
Minimum allowable continuous stable flow (MCSF) limits, for pumps, 21:83
Minimum bactericidal concentrations (MBCs), 18:262
Minimum boiling azotropes, 8:802–807
Minimum film-forming temperature (MFPT), 16:291; 20:378–379
Minimum film thickness equation, 15:211
Minimum fluidization velocity, 11:793, 797–798
effects of temperature and pressure on, 11:804–805
Minimum outlet temperature, 13:253–254
Minimum oxygen concentration (MOC), 21:840
Minimum required suction pressure, 21:73
Minimum temperature approach, 13:191
Minimum total annual cost, of heat recovery, 13:196–197
Minimum work required, for a change of state involving mixtures, 24:690–692
Mining. See also Mining and extraction of gold, 16:37–38, 134
hydrogen peroxide in, 14:67
of lanthanides, 14:636–638
of mercury, 16:37
of phosphorus, 19:5–7
of salt, 22:799, 800, 802–806
of silver, 22:641, 649t
of sulfur, 23:570
of tin, 24:783–784
of titanium oxides, 25:12–13
of titanium–nitrogen compounds, 25:11–12
of tungsten, 25:357–358, 361
of zirconium, 26:622–624
Mining and extraction. See also Extraction entries
activated carbon application, 4:753–754
alkanolamines from olefin oxides and ammonia, 2:138
asbestos, 3:308–309
bioremediation for drainage, 3:785–786
bromine for gold extraction, 4:314–315
plasticizer alcohols for, 2:23
Mining industry, electroless deposition in, 9:700
Mining operations
hafnium, 13:80–81
use of aqueous hydrochloric acid in, 13:834
zirconium, 13:80–81
Minipress, molecular formula and structure, 5:156t
Minitab 13, features compared to other software, 8:398t
Minizide, molecular formula and structure, 5:156t, 163t
Mink oil, cosmetically useful lipid, 7:833t
Minnesota, mercury legislation in, 16:46
Minnows, aquaculture, 3:183
Minocycline, 24:592, 604, 605
bacterial resistance mechanisms, 3:32t
Minority-carrier device, 22:248
Minority-carrier distribution, 22:244
Minor metals, 14:191
Minor use pesticides, 18:539–540
Minoxidil, 5:169; 2:816–817
molecular formula and structure, 5:166t
MINSOOP (Minimizing Number of Single Objective Optimization Problems) algorithm, 26:1033, 1034–1035
Mints, 23:168
Minty odor, 3:229t
“Minus-blue” speed, 19:238, 239
Miokamycin, 15:298, 304
Mirabilite, 5:785t; 22:863
Miracle fruit, 24:246
Miraculin, 24:246
MIRD database, 21:314
Mirrors, silver on, 22:661, 686. See also Reflectivity
Mischmetal, 5:677–678, 681
Miscibility diagrams, 22:302
Miscible flooding, 12:23
Miscible liquids, blending of, 16:687–691, 705, 712–713
Miscible polymer blends, 20:318
barrier polymers, 3:398–399
Mishandling failure, 26:982
Mist
  as colloid, 7:272t
  occurrences of, 7:273t
Mist combustion, 7:436
Mist control, ethylene oxide polymers in, 10:689
Mist eliminators, in sulfuric acid manufacture, 23:781
Misuse failure, 26:982
Mites, 8:9
Mitochondrial electron transport chain (ETC), 26:449
Mitochondrial enzymes, antibiotics as inhibitors of, 20:119
Mitochondrial respiration, insecticides and acaricides acting on, 14:348–349
Mitosis, in plants, 13:302
Mitotic entry inhibitors, 13:302–303
Mitotic sequence, disruption of, 13:302
Mitral valve repair, 3:717
Mitsubishi Gas Chemical Company process, for methyl methacrylate manufacture, 16:245, 248–250
Mitsubishi Kasei one-step MIBK process, 16:339
Mitsubishi Rayon methylamine process, 19:386
Mixed-alkali effect (MAE), 12:586–587
Mixed bauxites, 2:347
Mixed-bed columns, 14:405, 407
  in ion exchange, 14:404
Mixed-bed resins, 14:412
Mixed chalcogenides, 12:359
Mixed formulation fertilizers, 11:123
Mixed-integer linear programming (MILP), 20:748; 26:1023
Mixed-integer nonlinear programming (MINLP), 26:1023
  in computer-aided molecular design, 26:1037
  in process synthesis, 26:1039, 1040
Mixed-layer clays, 6:671
Mixed ligand complexes, synthesis of, 26:932
Mixed liquor suspended solids (MLSS), 26:157
  in biological waste treatment, 25:829–830
Mixed liquor volatile suspended solids (MLVSS), in biological waste treatment, 25:829–830
Mixed-metal alkoxides, titanium–vanadium, 25:100
Mixed-metal carbonyl clusters, synthesis of, 16:70–71
Mixed-metal oxide (MMO) pigments, 19:386
Mixed-metal oxides
  in hydrogen fluoride manufacture, 14:10
  organic titanium compounds as precursors to, 25:130–132
Mixed-metal systems, zirconium, 26:655–656
Mixed monocyclic aromatics, 18:678
Mixed municipal solid waste, 21:367–368
Mixed office waste (MOW), 18:128
  pulp, 18:96
Mixed-oxide (MOX) fuel, 19:700; 25:400
Mixed-phase ethylene hydration process, 10:538–539
Mixed phosphate ester–titanium complexes, 25:92
Mixed plastics, reprocessing of, 20:362
Mixed potential, 9:690
Mixed soap crystals
  in non-super fatted formulation, 22:729–730
  in super-fatted formulation, 22:730
Mixed spinels, 11:60, 61
Mixed uranium–plutonium nitrides, 25:427
Mixed uranium–plutonium oxide (MOX) fuel, 25:424
Mixed uranium–plutonium oxide system, 25:420
Mixed vesicles, molecular recognition between, 16:800
Mixer power, under gassed conditions, 16:703
Mixers, 22:44. See also Micromixers; Mixing and blending
  batch, 16:721
  change-can, 16:721
  continuous, 16:722
  convection, 16:719
Mixing applications, classes of, 16:670t
Mixing methods, for kinetic measurements, 14:611–614
Mixing-Roughness-Information Depth (MRI) model, 24:100
Mixing systems, 16:669
Mixing tanks, distribution of solids in, 16:694
Mixture design type, 8:399
commercial experimental design
software compared, 8:398t
Mixture effects, catalytic oxidation, 10:86–87
Mixture phase equilibrium calculations, types of, 24:680–681
Mixture-process design type, 8:399
commercial experimental design
software compared, 8:398t
Mixtures. See also Multicomponent mixtures; Nonideal liquid mixtures
acetylene containing, 1:186
adsorption, 1:593–594
adsorption isotherm models, 1:628–629
identification of, 23:140
solvent behavior in, 23:109
balance equations for, 24:669–671
estimating the properties of, 24:675
maximum work obtainable (or minimum work required) for a change of state involving, 24:690–692
noble gas, 17:355–357
partial molar properties of, 24:667–668
pseudobinary, 1:44–45
state properties of, 24:671–672
thermodynamics of, 24:667–668
MKSA (meter, kilogram, second, ampere) units system, 1:xi; 2–26:ix
MMB, low temperature solution polymerization of, 23:730
MMH (mixed metal hydroxide), 9:12
MMS (mixed metal silicate), 9:12
Mobil-Badger vapor-phase ethylbenzene process, 23:331, 332
Mobil Crystalline Materials (MCMs), 13:549
Mobile ions, 10:2
Mobile phase, 6:374–375
affinity chromatography, 6:392–393
capillary chromatography, 4:603
gas chromatography, 6:379–380, 408, 422–423
liquid chromatography, 4:621; 6:384, 440
supercritical fluid chromatography, 4:630
Mobile source emissions, control of, 26:717–721
Mobility control, issues in, 18:626
Mobility control agents
polyacrylamides as, 18:625
in polymer flooding, 18:622
Mobility control surfactants, in enhanced oil recovery, 18:625–628
Mobilizable vectors, for genetic manipulation, 12:471
Mobilization, of ascorbic acid, 25:771
Modacrylic fibers, 9:192; 11:188, 189, 190
dye site content of, 11:195
flame resistance of, 11:214
flammability of, 11:194
pigmented, 11:213
U.S. production of, 11:220t
“Mode conversion” phenomenon, 17:422
Model agreements, 24:373–374
Model-based methods, for reliability, 26:1044
Model building, sampling techniques for, 26:1038–1939
Model colloids, 20:388
Model dental plasters, 8:290–291
compressive strength, 8:289t
Model dyes, 9:368–369
Modeling (modelling). See also Model building
of air pollution dispersion, 26:725
in biochemical engineering, 11:41
of melamine resin hardening, 15:783
of organic separations, 21:660–661
pilot plant, 19:459
in protein structure prediction, 20:837–839
for reliability, 26:981, 986-990
software systems for, 16:758t
steam balance, 10:164
stochastic, 26:1019–1023, 1025–1026, 1026–1028
of supercritical phase behavior, 24:10–11
of the nanofiltration process, 21:652
Model investments, 8:294
Modeller computer package, 10:335–337
Mode locked lasers, 14:677–678
Modellocking technique, 14:677
Model predictive control (MPC), 20:701–702
Models, for process control, 20:687–691
Model selection, in chemometrics, 6:50–52
Model silicone networks, 22:20
Mode of a distribution, 18:135
Moderately toxic substances, 23:113
Moderately volatile materials, distribution ratios of, 23:213
Moderate molecular weight polyisobutylene, 4:434
Moderator, nuclear reactor, 17:569
Modern Plastics Encyclopedia, 19:543
Modern Plastics World Encyclopedia, 21:599
Modern reactive dyes, 9:470–492
acid fixing, 9:478–481
covalent dye fixation, 9:489–491
fiber pretreatment, 9:481–486
for wool fibers, 9:491–492
neutral fixing reactive dyes, 9:477–478
polyfunctional, 9:471–477
reactive fibers, 9:486–489
Modified alkyds, 2:148, 158–160
Modified brass, UNS designation, 7:721t
Modified carbon fibers, 13:383–385
Modified cellulotic membranes, in hemodialysis, 26:825, 826–828t
Modified chemical vapor deposition (MCVD), in fiber optic fabrication, 11:136–137, 138, 139
Modified-Claus sulfur recovery process, 23:601, 602
Modified coherence length, 23:806
Modified copper–zinc, nominal composition and UNS designation, 7:722t
Modified oligonucleotides, 17:626–637
applications of, 17:626–628
Modified phosphodiester backbones, 17:628–629
“Modified random network” glass structure, 12:572
Modified Reverse Micelle (MRM) process, 6:850
Modified solution diffusion (MSD) model, 21:660
Modified stainless steels, 13:511
Modified starches, 12:52
Modified sugars, oligonucleotides with, 17:631–632
Modified wood, 26:354–356
Modifiers, 19:404
categories of, 16:650
chemistry of, 16:652
in froth flotation, 16:645
role in separations, 16:650–652
use of latex in, 14:712

Modular architecture, with fiber-optic smart structures, 11:156, 157
Modular construction, plant site selection and, 19:525–527

Modular dendrimers, 26:802

Modulation doped FETs (MODFETs), 22:164. See also Field effect transistors (FETs)

Modulation transfer function (MTF) analyses, 19:222, 264–265

Module factor investment cost estimates, 9:530

Modulus misfit strengthening, 13:498
Modulus of elasticity (MOE), 12:590; 21:498, 719
of sealants, 22:29, 31
Modulus of rigidity, 11:768
Modulus–temperature curves, 16:274; 21:722

Moduretic, molecular formula and structure, 5:165t

Moen, Nolan, and Provost experimental design text; versus other texts, 8:395t

Moexipril HCl, molecular formula and structure, 5:150t

MoFe protein
P-cluster pairs in, 17:307–308
structure of, 17:307–310
Mo–Fe–S clusters, 17:315
Mohavite, 4:133t
Mohs' hardness scale, 1:3–4
selected materials, 1:3t

Moire interferometry
equations in, 17:426–428
experimental setup for, 17:428–429
in nondestructive evaluation, 17:426–429
theory behind, 17:426

Moissan, Henri, 22:524
Moissanite, 22:524

Moist activated carbon, phosgene decomposition with, 18:807

Moisture, 9:97
biofiltration system, 10:76
determination in sugar, 23:477
effect on weighing, 26:241
Moisture absorption, of polyamide plastics, 19:777
Moisture content
of ion-exchange resins, 14:398
of soap, determining, 22:754
in soap making, 22:736

Moisture-curing silicones, 22:32–34

Moisture gradient, 9:97
Moisture levels, in sugar, 23:472
Moisture permeability, 10:2
Moisture permeability, of higher olefin polymers, 20:423–424
Moisture properties, of polyamide fibers, 19:744–745
Moisture-reactive cross-linkers, silicone, 22:33

Moisture regain
of acrylic fibers, 11:191–193
of regenerated cellulose fibers, 11:274
Moisture-releasing silicones, 22:34–35
Moisture separator reheater (MSR), 23:235
Moisture sorption, of fibers, 11:169

Moisture vapor control, dessicant applications, 8:356t

Moisture vapor transmission rate (MVTR), for VDC copolymers, 25:709–710

Molality, 15:751
Molar absorptivity, 14:237
Molar flux, 15:678
Molar Gibbs energy, 24:660, 662
Molarity, 15:751
Molar mass distribution (MMD), 16:85
Molar volumes, 15:672
partial, 13:409, 410
of a solvent, 23:103

Molasses, 23:436, 449
in ruminant feeds, 10:864
sugar recovery from, 1:677, 678
secondary, 23:466
uses for, 23:483

MOLCAD method, 10:334–335
MOL data files, in SMILES, 6:3–6
Mold design, in plastics processing, 19:551–552

Molded flexible foam products, 25:470
Molded materials, ionomers in, 14:482–483
Molded phenolic parts, applications for, 18:786t
Molded resin parts, effects of fabrication on physical properties of, 18:302–303
Molecular oxygen, 17:734–755
computer graphics in, 16:730–734
defined, 16:728–730
historical perspective on, 16:727–728
literature of, 16:727
Web resources related to, 16:759–761
Molecular modeling experiments, on MF resins, 15:787–788
Molecular nanotechnology (MNT), 10:342–343; 17:62
Molecular nitrogen, 17:271. See also
Dinitrogen entries
physical properties of, 17:272t
Molecular nitrogen lasers, 14:688–691
Molecular orbital (MO) calculations, for
boron hydrides, heteroboranes, and
their metalla derivatives, 4:183–184
Molecular orbital laser examiner (MOLE), 16:485
Molecular orbitals, in organic
semiconductors, 22:211
Molecular orbital theory, 16:737
Molecular orientation, in linear low density
polyethylene, 20:188–189
Molecular oxygen, 17:746. See also Oxygen (O)
Molecular ozone, 17:778. See also Ozone (O₃)
Molecular properties, classification of, 16:729
Molecular receptors, structural types of,
16:774–775
Molecular recognition, 16:768–811; 24:31
at the air–water interface, 16:799–800
artificial receptors for substrate
recognition, 16:792–794
charge attraction dominated, 16:779–781
chiral recognition, 16:789–791
hydrogen bond dominated, 16:781–782
at interfaces and surface monolayers,
16:796–801
lipophilic interaction dominated,
16:783–786
multiple and multisite, coreceptor- and
coupled- system substrate recognition,
16:786–789
π-stacking and charge-transfer
dominated, 16:782–783
in polymers and solids, 16:794–796
receptor design principles, 16:769–775
receptor-substrate-/host-guest-
chemistry, 16:768–769
reorganization and preorganization in,
16:770–774
self-recognition, 16:801–804
simple modes of, 16:775–786
size/shape-dominated substrate
recognition, 16:775–779
types of interactions in, 16:770t
using hollow organic crystals, 16:796
Molecular recognition effects, amplification
of, 16:771–772
Molecular rotors, 17:59–61
Molecular self-organization chemistry, 17:57
Molecular separation, hydrogels in,
13:747–748
Molecular sieve dryers, 10:613
Molecular-sieve effects, 16:821
Molecular sieve membranes, 15:813t
Molecular sieve products
commercial, 16:838–839t
manufacturing processes for, 16:831
Molecular sieves, 16:811–853. See also
Carbon molecular sieves; Zeolite entries
acid sites in, 16:825
adsorption kinetics in, 16:824
analytical procedures for, 16:836
catalytic properties of, 16:824–825
dessicant, 8:359, 370–371
economic aspects of, 16:835–836
framework modification in, 16:828–829
health and safety factors related to,
16:836–837
high throughput experimentation, 7:414t
macroporous, 16:849
manufacture of, 16:829–835
mesoporous, 16:847–849
new trends in, 16:847
phosphate-containing, 16:819–820
properties of, 16:821–828
selectivity, 1:584
structure modification in, 16:820
structure of, 16:814–820
target of crystal engineering, 8:86t
uses for, 16:847
Molecular sieve technology, 14:82
Molecular sieve zeolites, 14:98. See also
Zeolite entries
processes for, 16:832t
Molecular simulations
complexity of, 16:747–748
sampling techniques for,
26:1035–1036
Molecular solutions, 8:697
Molecular speciation/quantification, infrared spectroscopy in, 23:140
Molecular spectroscopy, 10:508
Molecular structure. See also Chemical structures; Molecular formulas of linear low density polyethylene, 20:182–184
of liquid-crystal polymers, 20:80–81
of organic semiconductors, 22:210–212
of poly(fluorosilicones), 20:240
of silicones, 22:598
of wool proteins, 26:378–379
Molecular switch, in shape-memory polymers, 22:358
Molecular tectonics, 24:31
Molecular traps, target of crystal engineering, 8:867
Molecular uv–vis absorption spectroscopy, 23:143–145
applications of, 23:144–145
Molecular vibrations, 14:224–225
Molecular weight(s) (MW)
of aromatic polyamides, 19:717–718
characterization of, 20:396
between cross-links, 10:415
effect on high speed melt-spun nylon properties, 19:753
effects of fabrication on, 18:302–303
of ethylene–tetrafluoroethylene copolymers, 18:318–319
of lignin, 15:12–13
of LLDPE, 20:186–188, 204–205
of LLDPE resins, 20:181–182
of methacrylic ester polymers, 16:274
in olefin fiber spinning, 11:232–234
of polyamic acid, 20:270
of polycarbonates, 19:801–802
in polyesterification, 20:100–102
of poly(ethylene oxide) resins, 10:684–685
of polyimides, 20:270, 283
of polypropylene, 20:530–531
of PVA, 25:592, 600
in PVC fusion/gelation, 25:663–664
in PVC polymerization, 25:667–668
of PVDC, 25:699
of silicones, 22:600
of VDC copolymers, 25:706
in vinyl acetate polymerizations, 25:572–573
Molecular weight cutoff, 15:829
Molecular weight determination, for polysaccharides, 20:551
Molecular weight distribution (MWD), 20:530–531
of aromatic polyamides, 19:718
flow rate ratio and, 20:227
Molecular weight effects, of ethylene oxide polymers, 10:675–676
Molecule dipole moments, 24:115
Molecules
critical packing parameter of, 24:158
explosive, 10:741–742
kinetic measurements on, 14:622
number of functional groups in, 14:238
standard state for, 24:687–688
vibration of, 23:130
vibrational modes of, 24:72
vibrational spectroscopy of, 24:109
Molecule threading, 24:51
Mole fractions, 24:689
Moles of substitution (MS) values, 13:72
Molex process, 1:664, 676, 676t
Mollier charts, 23:204, 205, 232
Mollier diagram, 24:658
Molluscs
aquacultural chemical needs, 3:209
aquaculture, 3:182
common and scientific names, 3:188t
Molluscum contagiosum, 3:136
MolMod, 6:11
MOLSKEYS, 6:7, 8
Molten carbonate fuel cells (MCFCs), 12:204, 205, 219–223; 13:860
carbon dioxide supply for, 12:220
fueling, 12:220–222
Molten globule protein state, 20:828
Molten lead, silicon and, 22:489
Molten polymer blends, rheological properties of, 20:356–357
Molten salt breeder reactors (MSBRs), 24:751
Molten salt distillation, of hafnium, 13:84
Molten salt extraction (MSE) process, 19:677
Molten salt oxychlorination process, 16:323
Molten salt pyrolysis, 21:466–467
Molten salts, 26:836–837
electrolysis of, 16:161–163
Molten selenium fluxing, selenium and tellurium purification via, 22:85
Molybdenum (Mo)

Molten sodium silicates, viscosity and liquidus curves for, 22:462
Molten sulfur, handling, 23:771
Molten tin, 24:786
silicon and, 22:489
Molting accelerating compounds (MACs), 14:345

Molybdate, 17:9
as an ATP sulfurylase inhibitor, 17:32
Molybdate catalysts, 21:48
Molybdate ion, 17:21
reaction with organic ligands, 17:22
Molybdate orange, 6:523, 554, 555t
U.S. imports for consumption, 6:545t

Molybdenite, 17:2, 8
rhenium content of, 21:684, 685t, 693

Molybdenum (Mo)
chemical vapor deposition precursor, 5:805t
effect on cobalt alloys, 7:220
effect on stainless steel corrosion resistance, 7:809
in coal, 6:718

Molybdenum (Mo), 16:129, 17:1–19. See also FeMo-cofactors; Mo entries;
Nickel–chromium–molybdenum (tungsten) alloys; Nickel–molybdenum alloys; Nickel–molybdenum catalysts;
Pb Mo₆S₈
as an alloying element, 17:15–17
analytical methods for, 17:11
aqueous chemistry of, 17:31
chemical properties of, 17:3–7
deleterious effects of, 17:33–34
ductility of, 17:11
economic aspects of, 17:11
electrical, magnetic, and optical properties of, 17:8t
environmental and health aspects of, 17:12
as an essential trace element, 17:31–32
halides of, 17:31
inertia-welding of, 17:11
joints, 17:10
in low alloy steels, 13:509–510
maching, 17:10
manufacturing processes for, 17:9–11
market demand for, 17:2
melting temperature of, 17:3
molten metals that attack, 17:5
oxidation of, 17:5–6
physical properties of, 17:2–3, 6t
processing ores of, 17:8–9
recycling, 17:13
resistance of, 17:7
roles of, 17:19–20
as a soil nutrient, 17:39–40
sources and supply of, 17:1–2
in stainless steel, 23:306
statistics related to, 17:5t
thermal properties of, 17:7t
in titanium alloys, 24:856
U.S. imports for consumption of, 17:4t
uses for, 17:13–14
welding, 17:10–11
world mine production of, 17:2t

Molybdenum(II), dichloride of, 17:28
Molybdenum-99, 17:40
Molybdenum-alloyed steels, 17:15–16
Molybdenum base alloys, 17:14–15
Molybdenum-based metathesis catalysts, versus ruthenium-based metathesis catalysts, 26:936–937
Molybdenum blues, 17:22
Molybdenum bronzes, 17:22
Molybdenum carbide, 4:649t, 685, 691
cemented, 4:655–656
as industrial hard carbide, 4:674
physical properties of, 4:684t
solid solutions with other carbbides, 4:687–689
stoichiometry, 4:651
thermodynamic properties of, 4:651t
Molybdenum carbide (2:1), 4:649t
cemented carbides, 4:656
as industrial hard carbide, 4:674
Molybdenum carbide (23:6), 4:649t
Molybdenum carbonyl–phenol system, 26:949–950
Molybdenum-catalyzed asymmetric allylic alkylation, 16:552
Molybdenum co-factor (Moco), 17:33
Molybdenum complexes, 26:927–929, 949
Molybdenum(III) complexes, 17:26–27
Molybdenum compounds, 17:19–43
in advanced structural and heating materials, 17:38–39
in anticorrosion agents, 17:39
biological aspects of, 17:31–34
biological uses for, 17:39–40
biomedical uses for, 17:40
 catalytic applications of, 17:38
chemistry of, 17:29–31
in coatings, paints, and pigments, 17:39
economic aspects of, 17:34
in hydrodesulfurization and
hydroreforming catalysis, 17:37–38
industrial uses for, 17:39
in lubrication, 17:34–37
metal–metal bonding in, 17:29–31
in oxidation catalysis, 17:38
uses for, 17:34–40
Molybdenum(0) compounds, 17:28–29
Molybdenum(II) compounds, 17:27–28
Molybdenum(IV) compounds, 17:25–26
Molybdenum(V) compounds, 17:23–25
Molybdenum(VI) compounds, 17:20–23
Molybdenum concentrate price, annual
Molybdenum(V) dinuclear complexes, 17:23–25
Molybdenum dioxide, 17:25
Molybdenum disilicide, 3:664
Molybdenum disulfide, 15:246; 17:25–26
as a catalyst, 17:38
Molybdenum disulfide electrodes, sloping
discharge curve, 3:414
Molybdenum ditelluride, 17:26
Molybdenum enzymes, 17:32t
Molybdenum hexacarbonyl, 7:594;
17:28–29
Molybdenum hexafluoride, 17:31
Molybdenum materials, U.S. consumption
of, 17:35–36t
Molybdenum metalworking, 17:10–11
Molybdenum mill products, 17:9–10
Molybdenum–nickel alloys, 17:102
Molybdenum ore, U.S. exports of, 17:3t
Molybdenum oxidation states, 17:20
Molybdenum oxides, 17:38
Molybdenum pentachloride, 17:23
Molybdenum–rhenium alloys, 17:15
Molybdenum sulfide, poisons in
representative reactions, 5:258t
Molybdenum–sulfur complexes, molecular, 17:37
Molybdenum supplements, 17:40
Molybdenum trihalides, 17:26
Molybdenum trioxide, 17:9, 20
Molybdenum wire, manufacture of, 17:9
Molybdenic oxide, 17:9
Molybdothiol systems, in nitrogen fixation, 17:314
Molybdenum, 14:639
Moment of inertia, exponents of dimensions
in absolute, gravitational, and
engineering systems, 8:584t
Momentum balance equation, 21:347–348
Momentum equation, 11:738, 739–743
Momentum flowmeters, 11:671
Monactin, chelating agent, 5:710
Monazite, 5:671; 14:636; 24:756–757
digestion of, 14:638
processing, 5:673
Monel, 14:14
Monel alloy, 9:595
Monel alloy 400, 17:100
Monel cathodes, 11:837
Monensin, 20:132, 133, 135, 136, 137, 139
Monensin A, 20:120
Monetary system, bimetallic, 22:647–648
Money flows, annual, 9:537–540
Monitored retrievable storage (MRS)
facility, for spent radioactive fuel,
25:855
Monitoring and targeting (M&T)
technique, 10:166
Monitoring frequency, 10:72
Monitoring wells, 12:838, 843
location and placement of, 12:846
Mo-nitrogenase, 17:302–303
catalysis, 17:305
MONJU fast-breeder reactor, 17:588
Monkeypox, 3:136
Monkshood, 2:103
Mono(2-aminoethyl) isocyanurate, 8:202
2,3-Monoacetone-L-sorbose (MAS)
in ascorbic acid manufacture, 25:757
Monoacid chlorides, of maleic anhydride,
15:484–486
Monoacylglycerols, 10:802, 804, 822
Monoalkanolamine titanates, 25:95
Monoalkoxytriacyl titanates, 25:129
Monoalkylamines, 13:105
Monoalkylboranes, 103
Monoalkylhydrazines, 13:571
Monoalkylphosphates, 19:839
Monoalkyl phosphate extractants,
25:404
Monoalkylphosphates, 19:51
Monoalkylsulfosuccinates, 23:526
Monoalkyltin derivatives, as PVC
stabilizers, 24:825
Monoallyl derivatives, 2:242–247
health and safety factors, 2:247–248
Monoaluminum phosphate, 23:422
Monoamine oxidase, copper containing, 7:776
Monoammonium phosphate (MAP), 11:120–121; 12:67; 18:835
manufacture of, 18:854
Monoatomic oxygen, 10:642
Minoazo dyes, 9:245, 395
Minoazo Orange, colorant for plastics, 7:374t
Monoazo pigments, 19:430, 431–432
Minoazo Red, colorant for plastics, 7:374t
Minoazo Yellow, colorant for plastics, 7:374t
Minoazo Yellow Calcium Salt, pigment for plastics, 7:366t
Minoazo yellow salts, 19:433–434
Monoaromatic acids, alkyds from, 2:152–153
Monoaromatic lead sulfate, 14:790
Monoaromatic photographic processing, 19:212
Monobromanine, 4:318–319; 13:101, 103
Monobromoborane, 13:636
Monobutyltin oxide, chemical properties of, 24:824
Monocalcium phosphate (MCP), 11:120; 18:837, 838
manufacture of, 18:855–856
Monocarboxylates, 24:768
Monochloroamine, 13:101, 102, 115
Monochlorination, of ethane, 10:587
Monochloroacetates, reactions with PVA, 25:602
Monochloroacetic acid, 1:137
Monochlorobenzene
Antoine constants, 6:215t
chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
toxicity, 6:218t
uses, 6:222–223
Monochloroborane, 13:636
n-Monochlorobutanoic acid (MBA), 20:742–744
Monochlorodifluoromethane (HCFC-22), 6:279, 288
Monochloro-monoamino-s-triazine dyes, 9:467
Monochlorsulfamic acid, 4:54
Monochlorotoluenes, 6:338–343
physical properties, 6:339t
Monochlorotriazine groups, 9:320
Monochromaticity, 14:656
Monochromatic lasers, 23:138
Monochromatized X rays, 24:102
Monochromators, 23:133
uv–vis, 23:143
Monoclinal crystal system, 8:114t
Monoclinal parallelepiped lattice, 8:114t
Monoclinal sulfur, 23:565
Monoclinal symmetry, 8:114t
Monoclonal antibodies, 3:847; 12:150, 475
cell culture technologies used for, 5:351t
cell culture technology products, 5:345, 346
for medical defense against chemical warfare agents, 5:837
versus polyclonal antibodies, 14:152–153
m-Monochlorotoluene, physical properties, 6:339t
p-Monochlorotoluene, physical properties, 6:339t
Monocryl sutures, 24:222
Monocyclic monoterpenoid alcohols, 24:509–527
Monocyclic monoterpenoid hydrocarbons, 24:491–494
Monocycloalkanes, biodegradability of, 25:826
Monocyclopentadienyl compounds, 25:116
Monodentate chelants, 5:709
Monodentate ligands, 9:396
Monodisperse model networks, with silicone, 22:570
Monod kinetic relationship, 25:898
Monoethanolamine (MEA)
physical properties of, 2:123t
specifications, 2:132t
Monoethanolamine carbonate, 4:812
Monoethanolamine lauryl sulfate, effect of coconut diethanolamide on foaming, 2:453t
Monofilament fiber extrusion, 19:790
VDC copolymers in, 25:725, 727–728
Monofilament sutures, 24:218
Monofilament suture threads, 24:207
Monofunctional glycylidyl ethers, 10:376–377
Monoglycerides, 12:55
melting points of, 10:821
Monohaloalkylations, 12:167
Monohalogenoboranes, 13:636
Monohydrate bauxites, 2:347
Monohydrate crystals, in sodium carbonate recovery, 22:789
Monohydrate process, sodium carbonate recovery via, 22:788–789
Monoisopinocamphylborane, 13:635
Monoisopropanolamine (MIPA) physical properties of, 2:123t
specifications, 2:132t
Monoket, molecular formula and structure, 5:110t
Monolayer blown-film extrusion, VDC copolymers in, 25:725, 728–729
Monolayers, self-assembled, 17:57
Monomer addition, in PVC polymerization, 25:665–666
Monomer emulsion preparation, 16:286
Monomeric formaldehyde, properties of, 12:108t
Monomer–polymer syrups, 16:282
Monomer production, for poly(fluorosilicones), 20:241–242
Monomer quality, polypropylene, 20:532
Monomer reactivity, initiators and, 14:245t
Monomer recovery systems, 11:201
Monomers for aromatic polyamide manufacture, 19:714–715
aromatic radical anion reaction with, 14:247
of higher olefin polymers, 20:413–415
in initiating systems, 14:266
for latex acrylic polymers, 22:41–42
methacrylate, 16:241–242, 277–279
for microgel synthesis, 13:745t
organophosphorus, 11:496
polyimide, 20:277
polymer colloid, 20:378–379
silanol polycondensation of, 22:557
in synthetic latex manufacture, 14:716
used for hydrogel synthesis, 13:730
of VDC polymers, 25:692–694
Monomer units, head-to-head or tail-to-tail enchainments of, 26:512
Monomethine dyes, 9:505, 511
Monomethylamine (MMA) reactions, 16:357–358
Monomethylarsonic acid (MMA), 3:274
present in water and food, 3:276t
Monomethyl ether of hydroquinone (MEHQ) skin irritation from, 25:694
in VDC manufacture, 25:692
Monomethylhydrazine (MMH), 13:579, 584, 585, 588, 596
toxicity of, 13:590
Monomethyltin tris(iso-octylmercaptoacetate), as PVC stabilizer, 24:825–826
Monomethylurea, 2:638
Mono-N₂Ti complexes, 17:312
Mononitrobenzene, 17:161. See also Mononitrotoluene (MNT)
Mononitrochlorobenzenes, 17:259–262
economic aspects of, 17:261
manufacturing and processing, 17:260–261
physical properties of, 17:260t
uses for, 17:261–262
Mononitrotoluene (MNT), 17:160
Mononitrotoluenes, 17:262–267; 25:193
economic aspects of, 17:266–267
health and safety factors related to, 17:267
manufacture and processing of, 17:265–266
properties of, 17:262–265
specifications and test methods for, 17:267
Mononuclear carbonyls, structure of, 16:61–62
Mononuclear molybdenum(V) compounds, 17:23. See also Molybdenum(V) dinuclear complexes
Monoorganotin halides, in monoorganotin preparation, 24:825
Monoorganotins, 24:824–826
chemical properties of, 24:824
manufacture of, 24:825
physical properties of, 24:824
preparation of, 24:825
toxicity of, 24:829–830
uses of, 24:825–826
Monoxygenases, 3:674–675
bioconversions using, 12:481
Monoperoxyxycarbonates, as free-radical initiators, 14:286
Monoperoxyphthalic acid, magnesium salt, 4:62
Monophosphates, 19:59
Monopin, molecular formula and structure, 5:124t
Monopnictides, plutonium, 19:691
Monopolar electrodes, 9:621
Mono/poly soluble dyes, 7:373t
Monopotassium phosphate (MKP), 18:834
Monoperoxyphthalic acid, magnesium, 303–304
Monoperoxycarbonates, as free-radical initiators, 14:286
Monoperoxycarbonates as free-radical initiators, 14:286
Montmorillonite(s) (MMT), 2:686, 696; 5:175, 176
Monte Carlo calculations, networks and, 26:1045
Monte Carlo calculations and, 26:1045
Monte Carlo (MC) simulations, 14:440–441
Monsanto acetic acid process, 19:646
Monsanto adiponitrile process, 17:236
Monsanto aluminum chloride-based Alkylation process, 23:333
Monsanto Prism separator, 16:21
Monsanto process (Lummus-UOP Classic process), 16:74; 23:339, 341
Monsanto–Washington University collaboration, 24:390, 400–401
Montan acid physical properties, 5:30t
Montan wax, 9:677; 26:203
in defoamer formulations, 8:238
Monte Carlo (MC) simulations, 14:440–441
applied to chemical problems, 16:749
molecular dynamics and, 16:745–750
properties of, 16:750
Monte Carlo calculations, networks and, 22:570, 572
Monte Carlo molecular simulations, 26:1035–1036
Monte Carlo sampling, 26:999, 1001–1004
in control systems, 26:1046
future trends in, 26:1047–1048
HSGA algorithm and, 26:1032
in process scheduling, 26:1042–1043
in process synthesis and design, 26:1041
quasi-Monte Carlo sampling and, 26:1011–1016
for risk analysis, 26:1045
in supply chain management, 26:1043–1044
variance reduction techniques to increase efficiency of, 26:1004–1016
Monte Carlo simulation absorption, 1:30–36
gas adsorption dynamics, 1:629
Monteponite, 4:472t
Montgomery experimental design text; versus other texts, 8:395t
Montmorillonite(s) (MMT), 2:345t; 6:664, 686, 696; 11:313–314; 20:306–311; 23:82
in detergent formulations, 8:417

Monopropylene glycol, 12:4
Monosaccharides, 26:4
Monorail scales, 10:9
Monopropellants, 10:9
Monopril, molecular formula and structure, 5:150t
Monopropyl, molecular formula and structure, 5:150t
Monopropellants, 10:727
Monopropylene glycol, 12:661
Monorail scales, 26:244
Monosaccharides, 4:696; 23:435
acyclic form, 4:700
joining together, 4:697
most are D sugars, 4:697
surfactants derived from, 24:151–152
synthesis, 4:704
uses of, 4:714
Monosaturates, 10:813
Mono-sec-butanolamine, physical properties of, 2:123t
Monosilicic acid, 22:385, 389
Monosodium aspartate, taste profile, 2:605
Monosodium dihydrogen phosphate, 18:831
Monosodium fluorophosphate, function as ingredient in cosmetics, 7:829t
Monosodium glutamate (MSG), 2:605;
11:523, 565; 13:32
taste profile, 2:605
Monosodium L-glutamate (MSG), 12:49
Monosodium phosphate (MSP), 18:833
manufacture of, 18:853, 857–858
thermal dehydration of, 18:846
Monostatic optical arrangement, 23:139
Monosubstituted boranes, 13:635–636
Monoterpenoid alcohols, 24:500–528
bicyclic, 24:527–528
monocyclic, 24:509–527
Monoterpenoid aldehydes, 24:529–536
Monoterpenoid ethers, 24:528–529
Monoterpenoid hydrocarbons, 24:484–499
bicyclic, 24:494–499
monocyclic, 24:491–494
Monoterpenoid ketones, 24:536–541
Monoterpenoids, 24:468, 470, 472, 484–541
Monothiocarboxylic acids, 23:739
Monotropic phase transitions, 15:101
Monounsaturated fatty acids, 10:830
Monounsaturated olefins, hydrogenation of, 26:879–880
Monovinylacetylene, 1:230
Monsanto acetic acid process, 19:646
Monsanto adiponitrile process, 17:236
Monsanto aluminum chloride-based Alkylation process, 23:333
Monsanto Prism separator, 16:21
Monsanto process (Lummus-UOP Classic process), 16:74; 23:339, 341
Monsanto–Washington University collaboration, 24:390, 400–401
Montonic acid physical properties, 5:30t
Montan wax, 9:677; 26:203
in defoamer formulations, 8:238
Monte Carlo (MC) simulations, 14:440–441
applied to chemical problems, 16:749
molecular dynamics and, 16:745–750
properties of, 16:750
Monte Carlo calculations, networks and, 22:570, 572
Monte Carlo molecular simulations, 26:1035–1036
Monte Carlo sampling, 26:999, 1001–1004
in control systems, 26:1046
future trends in, 26:1047–1048
HSGA algorithm and, 26:1032
in process scheduling, 26:1042–1043
in process synthesis and design, 26:1041
quasi-Monte Carlo sampling and, 26:1011–1016
for risk analysis, 26:1045
in supply chain management, 26:1043–1044
variance reduction techniques to increase efficiency of, 26:1004–1016
Monte Carlo simulation absorption, 1:30–36
gas adsorption dynamics, 1:629
Monteponite, 4:472t
Montgomery experimental design text; versus other texts, 8:395t
Montmorillonite(s) (MMT), 2:345t; 6:664, 686, 696; 11:313–314; 20:306–311; 23:82
in detergent formulations, 8:417
Motor Vehicle Safety Standard (MVSS), 11:457

Mountkeithite, 6:471t

Mousse de chene, in perfumes, 18:369

Mouth protectors, 8:326

Mouthwash, 7:851

Movable surface aerators, 26:159

Movement capability, of sealants, 22:28–29

Moving-bed centrifuges, 11:391–392

Moving bed gas adsorption, 1:651

Moving bed gasifier, 6:828

Moving bed reactor, 17:212

Moving beds, in carbon adsorption units, 25:812. See also Fluidized bed entries

Moving belt polymerization, acrylamide polymers, 1:322

Moving body viscometers, 21:737–739

Moving-hearth incinerators, 13:177

MOX fuel, 19:686

Moxifloxacin, 21:224, 228, 231

Moxifloxacin, 3:25, 29

Mozley multigravity separators (MGS), 16:632

MP35N multiphase alloy, composition of

wear-resistant alloy, 7:221t

MPD-1 fibers, 13:372, 373

MPDI fibers. See also Poly(m-phenylene isophthalamide) (MPDI)

structure of, 19:727

uses for, 19:733–734

m-phenylenediamine (MPD), 19:714

MQ resins, 22:586–588

applications of, 22:588

manufacture of, 22:587–588

molecular structure of, 22:587

viscoelastic properties of, 22:588

MRI agents, dendrimer-based, 26:795–796

Mrigal, common and scientific names, 3:187t

MRI scanners, 23:858. See also Magnetic resonance imaging (mri, MRI)

mRNA synthesis, termination of, 17:621.

See also Messenger RNAs (mRNA)

MSA-requiring separation methods, general heuristics for, 22:317t, 321–322. See also Mass separating agent (MSA)

MSI-78 magainin derivative, 18:261–262

MSMA, 13:298, 325

mtDNA, in yeast, 26:449–451

MTG (methanol-to-gasoline) process, 6:77, 776, 828, 8658

mt-PA, 3:821

MTP inhibitors, 5:144t

MTP technology, 18:568

M-type ferrites, 11:57–58

advantages and disadvantages of, 11:86

common properties of, 11:59

as magnets, 11:85–87

physical properties of, 11:66–71

processing of, 11:74–75

properties of commercial, 11:84t

uses for, 11:83–87

Mucic acid, 4:708

Muclages

in cocoa shell from roasted beans, 6:357t

seed, 20:454

Mucoadhesives, ethylene oxide polymers in, 10:687

Mucopolysaccharides, 20:455–457

Mucopolysaccharides, 4:706

Mud (hydrothermal drilling fluid), 12:526

Mud, common and scientific names, 3:187t

Mud chamber, 12:731

Mud lubricants, 9:24–25

Muds

as drilling fluids, 9:1, 2, 3–6

shale-protective, 9:21–22

Mud systems, new, 9:33

Mud thinners, 9:15–19

Muehlenbergia macroura, 11:298

Muffle furnaces, 21:395

Muguel, 24:490

Mulch, allelopathic, 13:352

Mulliken, Robert S., 11:352

Mullis, Kerry, 11:11

Mullite(s)

carbon monoxide compatibility with

converted, 5:4t

carbon monoxide compatibility with

synthetic, 5:4t

ceramic insulator, 5:593

fiber reinforcement for ceramic–matrix composite, 5:558t

phase equilibria in the C–A–S system, 5:468

as refractory raw materials, 21:488–489

zirconia toughened mullite (ZTM), 5:571

Mullite fibers, 23:80

Mullite glass-ceramics, 12:640

Mullite refractories, ASTM classifications and specifications for, 21:508–509

Mullite whisker reinforcement, 5:574t
Multiannular nozzle design, 16:8, 9
MultiBatchDS software, 26:1040
Multibladed disk turbines, 15:692–693
Multiblock copolymers, applications of, 24:715–716
MULTICASE, 6:19
Multichamber PECVD reaction chamber apparatus, 22:129
Multichannel analyzer (MCA), 26:434
Multichannel detection, in concentric hemispherical analyzers, 24:106
Multiclient studies, 15:635–636
Multicollector-ICP-MS (MC-ICP-MS), archaeological materials, 5:743–745
Multicompartment drum filters, 11:357
Multicomponent copolymerization, 7:619–620
Multicomponent diffusion, 1:43–46
Multicomponent mixtures, phase and chemical equilibrium criteria in, 24:675–678
Multicomponent reactions, using microwave irradiation, 16:579–580
Multicomponent sol–gel fibers, 23:80
Multicrystalline silicon material, cast, 23:40
Multidentate N-heterocyclic ligands, thorium and, 24:767
Multidimensional gas chromatography, 4:617–618; 6:433–434
Multidrug resistant bacteria, 18:252
Multi-effect distillation (ME), 26:65–67
Multi-effect vapor-compression submerged-tube desalination plant, 26:70
Multielevation piperacks, 19:515
Multifeed fractionation, 10:616
Multifilamentary superconductor, 23:846
Multifilament sutures, 24:218
threads for, 24:207
Multifilament yarns, 11:177–178
Multifile patent searches, 18:244
Multifunctional aliphatic epoxies, 10:376
Multifunctional coatings, 1:714–716
Multifunctional epoxy resins, 10:367–373, 418, 454
Multifunctional fibers, 13:391
Multifunctional initiators, 24:706
Multifunctional processes, in life cycle assessment, 14:813–814
Multifunctional teams, in the development process, 24:348
Multigrade batch processing, 20:703
Multigrade oils, 15:225
“Multigrain model,” of polymer growth, 26:528
Multihydroxy surfactants, 24:148
Multijunction (MJ) stack arrays, 22:137–138, 139–140
Multilayer adsorption, 1:591
Multilayer barrier film, properties of, 25:732t
Multilayer blown-film extrusion, VDC copolymers in, 25:725, 729–733
Multilayer bottles, 20:52–53
Multilayer capacitors (MLCs), 11:101–103
Multilayer cast-film extrusion, VDC copolymers in, 25:725, 729–733
Multilayer ceramic capacitors (MLCC), platinum- group metals in, 19:630–631
Multilayered metal–matrix composites, 16:173
Multilayer injection stretch blow molding, 18:51
Multilayer-metal tandem solar absorbing surface, 23:11
Multilayer sheet extrusion, VDC copolymers in, 25:725, 734
Multilayer soft lithography, for lab-on-a-chip valves, 26:975
Multilayer structures, in sheet extrusion, 19:547
Multileaf spiral-wound modules, 15:819
Multilevel 157-nm resist systems, 15:188–189
Multilevel heat transfer, 13:223
Multimetal waste separation, hydrometallurgical process for, 21:400
Multimode cavity microwave applicator, 16:522
Multimode graded index optical fiber, 11:131, 132
Multimode optical fibers, 11:131, 132
intermodal dispersion in, 11:134
Multimode stepped index optical fiber, 11:131, 132
Multinational patent databases, 18:216
Multinuclear compounds, palladium, 19:652
Multiobjective optimization (MOP), 26:1033–1035, 1040
Multiphase continuum theory, of cake filtration, 11:336
Multiphase copolymers, Ziegler-Natta catalysts for, 26:535, 537–540
Multiphase laminar flow patterning, in microfluidics, 26:961
Multiphase reactions, in microbial transformations, 16:412–414
Multi-phase reactors, 21:333–335
Multiphoton effects, in photochemical technology, 19:109
Multipinned phase (MPP) charge-coupled device, 19:152
Multiple-arc melting, 25:522–523
Multiple-bonded functional groups, generation by flash vacuum pyrolysis, 21:150
Multiple bond functionalities, in lignin, 15:6
Multiple chemical sensitivity, 1:817
Multiple consortia technology transfer partnership model, 24:390
Multiple controllers, 20:698
Multiple downcomer plate, 8:764–765
Multiple-effect crystallizers, sodium carbonate recovery via, 22:789
Multiple-effect evaporators, 23:238
sodium chloride solution mining, 22:803
Multiple-emulsion coating, in photography, 19:199
Multiple equilibrium model, 24:131
Multiple extraction procedure (MEP), 25:869
Multiple-former paperboard machines, 18:121
Multiple hearth furnaces, in thermal waste treatment, 25:833
Multiple light scattering techniques, 12:14–15
Multiple linear regression (MLR) analysis, 10:329
Multiple linear regression methods, 16:753
Multiple-lined landfills, 25:877
Multiple liquid-path plates, 8:764
Multiple quantum well structure (MQW), 14:844
Multiple reactor processes, 20:170
Multiple screw pumps, 21:73
Multiple spinnerette per bank process, 17:473
Multiplet–cluster model, 14:466
“Multiplet plasticizer,” 14:480
Multiple wavelength photodetectors, 22:182
Multiplexing, in fiber-optic smart structure systems, 11:147
Multiplicative scatter correction (MSC), 6:64–66
Multipoint attachment theory, 24:247
Multi-point fuel injection system, 10:51
Multiproduct batch processes, 20:723
Multipurpose batch pilot plants, 19:459
Multipurpose canister (MPC), radioactive waste transport in, 25:855
Multipurpose/multiproduct batch plants, 26:1000
Multipurpose pilot plants, 19:458
Multipurpose plants. See also Multiuse entries
design of, 11:427–433
for fine chemical manufacture, 11:427
state-of-the-art, 11:437–439
Multiquantum well (MQW) structures, for LEDs, 22:173–174
Multireflection gas cell, 14:230
Multiresistant integrons, 3:31
Multistage contacting, in liquid–liquid extraction, 10:756
Multistage electrochemical deposition technique, 23:842
Multistage flash (MSF) processes, 21:650
Multistage flash desalination, 26:59
Multistage flash evaporation, 26:61–65, 97
energy required by, 26:86
in hybrid desalination systems, 26:95–96
schematic flow and temperature diagram of, 26:62
Multistage flash evaporation plant, 26:63, 65
Multistage induced-roll separators, 15:453–454
Multistage pumps, 21:67–68
Multistage refrigeration systems, 21:545–547
Multistage sampling, 26:1018–1019
Multistage vibrating disk column (MVDC), 10:780
Multitubular falling film continuous SO3 sulfonation units, 23:547
Multitubular reactors, 23:544
Multiunit pilot plants, 19:459
Multiuse facility design, 11:47
Multiuse operation, for fermentation, 11:47
Multivariable control, 20:701
Multivariable smart transmitters, 20:664
Multivariate Adaptive Regression Splines (MARS), 6:53
Multivariate curve resolution, 6:54–56
Multivariate linear regression, 6:32–35
Multivariate optical elements (MOE), 6:68
Multiwalled carbon nanotubes (MWCNTs), 17:48, 49; 22:720; 26:737. See also Carbon nanotubes (CNTs); Multiwall nanotubes (MWNTs) synthesis of, 26:806
Multiwall fullerenes, 12:231
Multiwall nanotubes (MWNTs), 12:232
Multiwall paper bags, 18:11
Multiway analysis, 6:57–63
Multiyear profitability analysis, 9:535–537
Mummification, 5:749
Mumps vaccine, 25:490–491
Mumps virus, 3:137
Municipal biosolids, as biomass, 3:684
Municipal distribution, potential for saline water use in, 26:55–56
Municipal effluents, disposal of, 26:54
Municipal landfill leachate, chemicals found in, 25:876
Municipal waste sludge, as biomass, 3:684
Municipal water, for aquaculture, 3:198
Municipal water softening methods, 26:115–120
MUTAGENIC EFFECTS, OF ETHYLENE OXIDE

PCR based, 12:472
studies of, 17:309
by synthetic DNA, 12:518
as a toxic effect, 25:206
Mutagenic effects, of ethylene oxide, 10:659–660
Mutagenicity
of hydrazine, 13:591
of trichloromethanesulfenyl chloride, 23:628
Mutagenicity list, 23:114
Mutagenicity test battery, 25:221
Mutagenicity testing, pesticide-related, 18:548–549
Mutagenic PCR, 12:518
Mutagenic solvents, 23:113
Mutations, 11:22–23
and antibiotic resistance, 3:30
introducing into genes, 12:472
Mutual diffusion coefficient, 23:102
MXD-6 polyamide, 20:52–53
MX Sorbex process, 1:676t
Mycarose, 15:292
Mycelial fermentation, aeration
biotechnology applications, 1:743
Mycinamicin complex, 15:294–296, 301
Mycobacterium, antibiotic resistant, 3:36
Mycobacterium tuberculosis, ultraviolet germicidal irradiation in inactivating airborne microorganisms, 8:654
Mycoherbicides, 13:332
Mycoplasma, in fermentation, 11:46
Mycostats, in pet foods, 10:855
Myers and Montgomery experimental design text; versus other texts, 8:395t
Mykrox, 5:168
molecular formula and structure, 5:162t
Mylotarg, cell culture technology product, 5:346t
Myocardial infarction, 3:710–711
and blood coagulation, 4:81
Myocardial pacemaker cells, 5:81
Myocardium, 5:79–80
Myoglobin, properties of standard, 3:836t
Myosin, role in heart excitation and contraction coupling, 5:81
Myrac aldehyde, 1:278; 24:485
Myrascone, 24:571
Myrcene sulphone, 24:486
Myrcenol, 3:232
Myristamide MIPA, cosmetic surfactant, 7:834t
Myristamine oxide, cosmetic surfactant, 7:834t
Myristaminopropionic acid, cosmetic surfactant, 7:833t
Myristoleic acid, physical properties, 5:31t
Myristyl betaine, skin conditioner/moisturizer, 7:843t
Myristyl chloroformate, molecular formula, 6:291t
Myristyl myristate, cosmetically useful lipid, 7:833t
Myroxacin, registered for use in aquaculture in Japan, 3:221t
N\(^1\)-acylsulfanilamides, 23:508
N\(^1\)-heterocyclic derivatives, 23:508
N\(^1\)-heterocyclic-N\(^4\)-acylsulfanilamides, 23:508
N\(^1\)-heterocyclic sulfanilamides, 23:507–508
N-(2-aminoethyl)-1,3-propylenediamine physical properties, 8:486t
N-(2-amino-phenyl)-piperazine (AEP), 8:485
N\(_2\) oxidation, Birkeland-Eyde process of, 17:291–292, 316. See also Dinitrogen entries; Nitrogen entries
N\(^3\)‘–P5’ phosphoramidates, 17:630–631
Na+, detection in blood, 24:54. See also Sodium entries
Nabarro–Herring creep, 5:626
Nacol 18, chain length and linearity, 2:10t
Nacreous pigments, 7:836–837; 19:412
Nacrite, 6:659
structure and composition, 6:668
NaDBC, 2:550t
NADH. See also Nicotinamide adenine dinucleotide (NADH) biosensors for, 3:797
requirement as cofactor, 3:672–673
Nadic group, in creating polyimide thermosetting resins, 20:275
Nadolol, 5:102
molecular formula and structure, 5:93t
NADPH, requirement as cofactor, 3:672–673. See also Nicotinamide adenine dinucleotide phosphate (NADPH)
Na–EMAA ionomers, 14:473, 474, 482. See also EMAA ionomers; Sodium entries
Nafion, 7:525; 13:861; 14:475, 482
resins, 23:535
solutions, 19:628
Nahcolite, 5:785t
sodium carbonate from, 22:787
NaI crystals, 26:420–421. See also Sodium iodide
Nail care products, 7:852–854
Nairoviruses, 3:137
Nalidixic acid, 29; 21:123, 215
in paper manufacture, 26:786
“Naked license,” 25:265
N-aldehydes, platinum-group metal catalysts and, 19:621
Naled, 4:358t
Nalidixic acid, 3:29; 21:104, 123, 215
year of disclosure or market introduction, 3:6t
N-alkylation reactions
of aniline, 2:785–786
microwaves in, 16:557–558
Naltrexone drug delivery, 9:65–66
“Nameplate” capacities, 23:547–548
Nameplate, 21:739
NAND arrays, 22:258
Nanoaluminum composites, 10:19, 20
Nanoassemblies, shell and core cross-linked, 20:489–490
“Nanocar,” 24:62
Nanocarbon materials, 1:718–722
Nanoceramics, 1:705–708
Nanoclays, 11:313–314
smectites application, 6:697t, 699
Nanocluster synthesis, by ion implantation, 14:449
Nanocomposites, 1:716–718; 11:313. See also Hybrid nanocomposite materials
epoxy, 10:350, 434
exfoliated, 13:541–542
ordered intercalated-and-flocculated, 20:308
phenolic resins in, 18:794
polylactide-based, 20:306–311
in polyamide plastic manufacture, 19:786
U.S. market trends, 1:722t
Nanocrystalline dye cells, 23:15
Nanocrystal synthesis, supercritical fluids in, 24:15
Nanodevices, development of, 17:64
Nanodrugs, dendrimers as, 26:798–800
Nanoelectromechanical systems (NEMS), 17:64
Nanoembossing, 15:193
Nano-engineered materials, 22:719
Nano-fabricated materials, 22:719
Nanofibers, 1:722–723; 24:613, 624
U.S. market trends, 1:723t
Nanofiltration, 21:632, 651–656; 24:14
applications of, 21:652–654
in hazardous waste management, 25:817, 818
modeling, 21:652
Nanofiltration membranes, 15:825
acid resistant, 21:635t
in nonaqueous media, 21:654–656
organic rejections by, 21:656–657
Nanofiltration reverse osmosis systems, 26:80–83
Nanofiltration system, “hybrid technology,” 26:73
Nanofiltration systems design, 21:667
Nanofiltration technology, advancements in, 21:667–673
Nanofiltration water desalination, energy consumption in, 26:87
Nanogold technology, 12:701
Nanoimprinting, optical, 15:193–195
Nano Indentor, 21:743
Nanoinhibitor design, 10:343
Nanomachines, 24:61–62
Nanomaterials, for sensors, 22:266
NanoMatrix, Inc., collagen nanofiber research, 1:723
Nanomedicine, 10:343
molecular level nanostructures in, 26:786
Nanometric clay particles, combining using nylon or polyimide, 23:82
Nano–microstructures, 22:720
Nanoparticles, 22:720
charge interactions between, 21:671
chemical reactions of, 21:671
in fillers, 11:303
in paper manufacture, 18:118
Nanoparticle TiO$_2$, organic titanium compounds as precursors to, 25:130–132
Nanoporosity, target of crystal engineering, 8:86t
Nanopowders, 1:716–718
U.S. market trends, 1:722t
Nanoscale additives, in enhanced separations, 21:670–673
Nanoscale fabrication, bottom-up, 24:61
Nanoscale lithographic resists, 15:181–191
Nanoscale lithographic resolution, approaches to, 15:186–189
Nanoscale materials preparing, 24:61
properties of, 17:45
Nanoscale modules, production of, 26:786–787
Nanoscale oxides, as fillers, 11:316
Nanosecond excitation pulses, 14:619
Nanosensors, 17:64
Nanostrip, 18:406
Nanostructures, in lotus effect surfaces, 22:117–120
Nanotechnologies, 17:44–70
antimicrobial nanoemulsion technology, 8:630–631
carbon nanostructures, 17:46–58
colloids and, 7:298
evolution of, 21:635
manganese materials in, 15:621
molecular, 10:342–343; 17:58–62
oligonucleotides and, 17:637–639
outlook for, 17:64
properties at nanoscale, 17:45
reductive versus synthetic approaches to, 17:45
silicon in, 22:499
smart materials in, 22:708t, 719–720, 721t
tools of, 17:62–63
Nano-Tex, 1:722
Nanotribology, 15:213
Nanotubes. See also Carbon nanotubes (CNTs)
Nanotubes, 12:232; 17:46
alkylated, 17:54
carbon, 17:47–48, 48–50, 52, 54, 57, 58; 26:737
functionalization of, 17:52–53
Nanowires, 22:720
Nantokite, 7:768
Naphtha(s), 13:778; 18:593; 25:167
acetylene manufacture from, 1:194–200, 195t, 198t
in aromatics production, 18:565
in catalytic reforming, 18:657–658
from crude oil distillation, 18:665
history of, 18:642
initial boiling point of, 18:579
liquid-phase oxidation to acetic acid, 1:125–126
petroleum, 18:667
steam cracking product distribution for light, 4:379t
steam reforming of, 16:303–304
Naphtha feed, effect of, 10:605–606
Naphtha feedstocks, 18:556, 557, 560, 561t
for ethylene production, 24:267
Naphthalene, 9:268; 17:70–87. See also
Alkynaphthalenes
addition products of, 17:75–77
alkylation of, 17:74–75
aroma chemicals derived from, 3:235
biodegradation, 3:762, 763t
chemical and physical properties of, 17:71t
chlorination of, 17:74, 77
chloromethylation of, 17:75
diffusion coefficient in air at 0°C, 1:70t
dye intermediates derived from, 9:286
economic aspects of, 17:80–81
halogenation of, 17:74
health and safety factors related to, 17:82–83
hydrogenation of, 17:75–77
manufacture of, 17:77–80
nitration of, 9:273–274; 17:74
oxidation of, 17:77
properties of, 17:70–72
purifying, 17:79–80, 81
reactions of, 17:73–77
solubility data for, 17:73t; 24:5
specifications and test methods for, 17:81–82
substitution products of, 17:73
sulfonated, 17:73–74; 23:525
uses for, 17:83–84
vapor pressure- and viscosity-temperature relationships for, 17:72t
Naphthalene-2,6-dicarboxylic acid (NDA), 20:33–34
industrial synthesis of, 20:35–36
Naphthaleneacetamide, 13:44t, 55–56
Naphthaleneacetic acid, 13:44t, 55–56
2,6-Naphthalenedicarboxylic acid, 2:195
1,5-Naphthalene diisocyanate (NDI), 25:462
1,6-Naphthalenediol, intermediate used in oxidation hair dyes, 7:858t
Naphthalene sodium, 22:764 preparation of, 22:778
Naphthalene sulfonates, 17:83–84; 24:146
Naphthalene vapors, inhalation of, 17:82–83
1-Naphthalenal methylcarbanate, 13:56–57
Naphthalimide soluble dyes, 7:373t
Naphtha reforming bifunctional catalysis, 5:246–248 to manufacture carbon monoxide, 5:12–13
Naphtha-reforming catalysts, 16:304
Naphthenes, 18:592 alkylated, 18:586 in petroleum vacuum residua, 18:590 as VGO saturates, 18:586–587
Naphthenic acids, 14:642
Naphthenic base stocks, 15:214, 217
Naphthofuran, 24:573, 574
1-Naphthol, 9:356, 357
National Center for Biotechnology Information (NCIB) databases, 12:473–474
National Center for Toxicological Research (NCTR), 21:572
National Coal Board (NCB; UK), 22:65, 66
coal classification system, 6:712
National Conference on Standards Laboratories (NCSL), 15:768
National Conference on Weights and Measures, 15:768
National Council on Radiation Protection and Measurement (NCRP), 21:279
National Defense Stockpile, chromium in, 6:470, 483–484
National Electrical Code (NEC), 21:847
National Electrical Manufacturers Association (NEMA), 17:843
specifications, 10:453–454
National Environmental Policy Act (NEPA), 10:228; 21:590
National Fire Protection Association (NFPA), 15:767; 24:284
National Formulary, 18:701
National Highway Traffic Safety Administration (NHTSA), 25:337
National Ignition Facility (NIF) laser glass, 12:616
National Institute for Occupational Safety and Health (NIOSH), 21:593. See also NIOSH Recommended Exposure Limit (REL)
lead guidelines of, 14:764
National Institute of Allergy and Infectious Diseases (NIAID), 25:500
National Institute of Standards and Technology (NIST), 15:762–763, 767; 19:588; 24:436. See also NIST Advanced Technology Program
buffer solution standards, 14:25, 26
Crystal Data File, 26:424
standards, 15:742
National Lubricating Grease Institute (NLGI), 15:242
National Motor Freight Classification, 18:2
National patent application filings, 18:189–191
National Pesticide Monitoring program, 13:146
National Petrochemical and Refiners Association (NPRA), 15:256
National Physical Laboratory (NPL), 24:436
National Pollutant Discharger Elimination System (NPDES), 9:794; 25:917
permit program, 21:582
standards, 6:828
National Primary Drinking Water Regulations (NPDWTR), 26:105
for vinyl chloride, 25:649
National Reactor Testing Station, boiling water reactor tests at, 17:579
National Residue Program (NRP), 13:17
National standards, 15:757–759
National Stream Quality Accounting Network (NASQAN), water chemistry program, 26:33
National Swimming Pool Foundation, 26:172
National Technical Information Service (NTIS), 15:763
National Television System Committee (NTSC), 525- line television standard, 19:146–147
National Toxicology Program (NTP), 16:377
investigations by, 25:221
on vinyl chloride, 25:651
Native silver, 22:637
Native sulfur deposits, 23:570
Native zone electrophoresis, 9:745
Natta, Giulio, 20:523
Natural aging, aluminum alloys, 2:332–333
Natural antioxidants, 12:60–61
Natural attenuation, defined, 3:759t
Natural boric acid, 4:133t
Natural cements, 5:502
“Natural” colors, 12:51
Natural color system (NCS), 7:309
Natural convection, 13:245
Natural defenses, against silver, 22:655, 681
Natural diamond, 8:519–528
applications, 8:527–528
microcrystals, 8:522
occurrence and exploration, 8:520–522
NATURAL POLYMER HOLLOW FIBERS

properties, 8:523–527  
recovery, 8:522–523
Natural gas liquids (NGL), 12:375–376  
recovery of, 13:794
Natural gas, 3:683; 8:40; 12:365–386. See also Methane  
acetylene manufacture from, 1:187, 192, 196
carbon dioxide associated with, 4:810–815
commercial gas absorption process, 1:26t
composition of, 12:370t; 13:691t
consumption of, 12:380–381
dehydration of, 12:374–375
delivery of, 12:368
dessicant applications, 8:356t
economic aspects of, 12:380–382
emissions control for, 10:59
first uses of, 12:366
as fuel, 12:382–383
furnaces for firing, 7:467
gas purification, 1:618t
helium recovery from, 17:357–358
history of, 12:365–366
imports of, 12:372, 373t; 13:686
indirect coal liquefaction starting from, 6:865
liquefaction of, 13:692–693
as a petrochemical feedstock, 18:566–567
Portland cement industry consumption, 5:497t
prices of, 18:567
processing of, 12:372–378
properties of, 12:369–370
research and development programs related to, 12:368
specifications for, 12:378–379
steam methane reforming of, 13:841
steam reforming of, 16:302–303
supplies of, 12:384t
techniques and diagnostic tools related to, 12:368
terms associated with, 12:365t
transmission and storage of, 12:379–380
usage for energy in U.S., 6:744t
uses of, 12:369, 382–385
Natural gas reservoirs, 12:366–369
estimate of undiscovered, 12:368
Natural gas reservoirs, 12:372
Natural gas recovery, 8:40; 12:375–376
recovery of, 13:794
Natural gas reservoirs, 12:366–369
estimate of undiscovered, 12:368
Natural graphite, 12:771–789
analytical and test methods for, 12:786–790
chemical properties of, 12:776–778
consumption of, 12:796–797
crystallographic properties of, 12:772–774
economic aspects of, 12:785–786
electrical uses for, 12:795
forms of, 12:771
as a graphite filler material, 12:724
manufacture and processing of, 12:781–785
occurrence of, 12:778–781
outlook for, 12:796–797
physical properties of, 12:774–776
properties of, 12:790
specifications and standards for, 12:786
steel-related uses for, 12:790–793
U.S. consumption of, 12:791–792t
U.S. imports of, 12:787–788t
U.S. suppliers of, 12:785t
world production of, 12:772, 779t
uses for, 12:790–796
Natural graphite refractories, 12:793–794
Natural hydraulic limes (NHL), 15:53–54, 55
with additional material, 15:55
Natural hydrocolloids, 12:52–54
Natural hydrothermal systems, 14:84–85
Natural iron oxides, 19:397–398
Naturally derived materials, in perfumes, 18:366–372
Naturally occurring silica, 22:402–403
applications of, 22:402–403
formation of, 22:402
Natural nuclear reactors, 17:589; 25:397
Natural organic polymers, manufactured fibers produced from, 24:616
Natural photocatalytic processes, in the environment, 19:100–101
Natural plant growth regulators, 13:22–28
Natural polymer hollow fibers, 16:23
Natural polymers, hydrogels based on, 13:732
Natural processes, unidirectional nature of, 24:649
Natural product derivatives, as plant growth regulators, 13:37–39
Natural products
caustic soda reactions with, 22:832
as flocculating agents, 11:627–628
as herbicides, 13:329–331
in perfumes, 18:365–366, 380–381
supercritical fluid extraction for, 24:13
Natural refrigerants, 21:531
Natural RNAs, 17:614
Natural rubber (NR), 1:22
carbon monoxide compatibility with, 5:4t
categories of visually inspected, 21:763t
effects of nonblack fillers on properties of, 21:782t
formulation for reclaiming, 21:476t
nitrogen diffusion coefficients in, 4:447
in rubber compounding, 21:760–7638
synthesis of synthetic butyl rubbers after disruption of supply in WW II, 4:433
Natural rubber scrap, reclaiming, 21:475
Natural sodium nitrate, processing of, 22:845–848
Natural sweeteners, 12:38
Natural waters, foams in, 12:24
Natural wines, 26:301
Nature, obtaining enzymes from, 10:262–264
Nature-identical flavoring substances, 12:47
Naturetin, 5:168
molecular formula and structure, 5:161t
Nautamix, 16:720
Naval brass, 7:754
antimony addition to, 3:53
arsenic addition to, 3:272
in galvanic series, 7:805t
Naval reactors, 17:590–591
Naval stores industry, wood in, 26:357–358
Navier-Stokes (N-S) equations, 11:741–742, 744–745, 750, 761–762; 22:52; 26:960. See also Reynolds-averaged Navier-Stokes (RANS); Stokes’ entries
Navilox, molecular formula and structure, 5:111t
Nb-based superconductors, 23:859–860. See also Niobium (Nb)
NBitr, air pollutant, 1:796–797
Nb-Ti alloy, data on, 23:830. See also Niobium (Nb)
NbTi multifilament wire, 23:859–860
Nb–Ti conductors, 23:829–831
N-containing compounds, kinetics of the evolution of, 19:93
Nd:YAG laser, 14:673. See also Neodymium entries
Nd:YAG Q-switched laser, in fine art examination/ conservation, 11:413
N-donating ligands, complexation with uranium, 25:434–436
Near-edge X-ray absorption fine structure (NEXAFS), 24:72
Near-equilibrium reactant conversions, 25:315
Near-field scanning optical microscope (NSOM), 16:501–503
Near-infrared absorbing dyes, 9:341
Near-infrared spectroscopy (nir), 23:141–142
in sugar analysis, 23:477
Near-ir LEDs, 22:175, 176
Near-ir region, 14:234–236
Near-ir VCSELs, 22:180
Near-zero sulfur fuel, 18:667
Neat soap phase, 22:726
in continuous saponification, 22:737–738
in kettle soap making, 22:736–737
NEAT sulfur dioxide process, 23:661
“NECAR 1” fuel cell vehicle, 13:800
Necic acids, 2:80
Necrosis, as a toxic effect, 25:205
NEDOL process, 6:844, 847, 849
Needle-bonding, 17:475
Needle coke, properties of, 12:723t
Needlelooms, 17:505–506
Needle petroleum coke, 12:722
Needle-punching process, 17:475
Needle-punching web-consolidation method, 17:505–507
Needles, surgical, 24:206–207
Needs
in chemical product design, 5:759, 760–766
identification, 5:761–762
interpretation, 5:762–763
quantification, 5:763–766
Negative-acting resist compositions, 15:156–157
Negative dye-scale image, 19:201
Negative free energy of micellization, 24:132
Negative gauge pressure, 20:646
Negative ions, production of, 15:653
Negatively charged polymers, as flocculating agents, 11:635
Negatively charged surfaces, cationic surfactant adsorption at, 24:147–148
Negative photochromism, 6:588
Negative photoresists, 20:280
Negative photosensitive polyimides, 20:280
Negative piezosolvatochromism, 6:611
Negative–positive system, in color photography, 19:242, 243
Negative structure, Polacolor, 19:298
Negative surface energy, 23:808–809, 813
Negative temperature coefficient (NTC), 17:108
Negative thermosolvatochromism, 6:626
Negative-tone photoresists, 15:172, 188–189
acid-catalyzed chemistry in, 15:170–172
Negative-working dye processes, 19:284
Negative-working dye-release processes, 19:288–289
Neglect of diatomic differential overlap (NDDO) technique, 16:737
Negligible failure, 26:982
Negotiations, in technology transfer, 24:363–366
Neiderriter sequence, in quasi-Monte Carlo sampling, 26:1011
NEKTON software package, 7:25
Nelson–Farrar Refinery Construction Index, 9:526, 527
Nematic liquid crystal molecules, alignment of, 15:90
Nematic liquid-crystal phase, 13:370
Nematic liquid crystals, 15:86–92; 20:79
technologically important, 15:106t
Nematic PPA solution, 13:379
Nenitzescu reaction, 12:184
Neocembrene-A, 24:473
Neodecanoic acid, 5:65–67
physical properties, 5:35t
Neodol 45, chain length and linearity, 2:10t
Neodol alcohols, 2:8t
Neodymium (Nd), 14:631t, 634t
electronic configuration, 1:474t
Neodymium carboxylates, 14:649
Neodymium–iron–boron, 4:136
Neodymium–iron–boron magnets, 14:651
Neodymium lasers, 14:698; 20:514, 515.
See also Nd:YAG entries
Neodymium oxide, for oxidizing iron in glass, 7:343
Neoflon, 7:641
Neoflon AP, 7:641
Neoglaziovia variegata, 11:296
Neohesperidin dihydrochalcones (DHC), 12:42; 24:240–241
Neohexene, synthesis of, 26:939–941
Neoisomenthol, 15:272
Neomycin, bacterial resistance mechanisms, 3:32t
Neon (Ne), 17:344. See also Helium–neon (HeNe) lasers
commercial, 17:368t
thermophysical properties, 8:41t
Neon atoms, 14:659–660
Neon column, 17:361
Neon–helium, separation and purification of, 17:360–361
Neon–helium continuous lasers, 17:372
Neonicotinoid insecticides, 14:346
Neopentanal trifluoroborane, 4:144t
Neopentanoic acid, 5:60–65
physical properties, 5:60t
production from butylenes, 4:427
Neopentyl glycol, 12:670–672
butyraldehyde derivative, 4:461, 467
Neoplasia, as a toxic effect, 25:205
Neoprene, 9:561, 562; 19:828. See also
Polychloroprene
carbon monoxide compatibility with, 5:4t
nitrogen diffusion coefficients in, 4:447
Neoprene–phenolic contact adhesives, 18:784
Neostigmine bromide, 4:360t
Neotame, 12:42; 24:231–232, 247
NEP1 gene, 13:351
Nepetalactone, 2:101; 24:473
Nepheline, 2:345t
Nephelometric turbidity analysis method, 26:36
Nephila clavipes, silk from, 22:627, 628t, 632t, 633
Nephrotoxicity solvent-related, 23:119
as a toxic effect, 25:207
Neptal, molecular formula and structure, 5:94t
Neptunium (Np), 1:463–491, 464t
electronic configuration, 1:474t
ion type and color, 1:477t
metal properties of, 1:482t
Neral, 24:530
Nernst–Einstein equation, 5:587
Nernst equation, 9:571; 12:206; 19:206
Nernst–Planck equation, 9:612–613
Nerol, 3:233; 24:479, 501, 503–506
grades of, 24:505
hydrogenation of, 24:506
price of, 24:505
Neroliol, 24:546–547
Neroliol acetate, 24:501, 503–506
Nerolidol, 24:546–547
Neroliodyl acetate, 24:505
Nerve agents, 5:815, 818–821
Neryl, 24:479
Neryl esters, 24:505
Nesmeyanov reaction, 3:75
Nested fullerenes, 12:231
Nested situations, amount of coverage in experimental design texts compared, 8:395t
Net diffusional flux, 25:308
Netherlands, coal grades in, 6:713t
Net–pen aquaculture, 3:194–195
Netpoints, in shape-memory polymers, 22:356
Net polymers, fullerene, 12:250, 251
Net positive suction head (NPSH), 21:60, 62
Net present value (NPV), 9:536–537, 546
Net return rate (NRR), 9:537, 544
Net weight, 26:246
Network copolymers, 7:610t
Networked programmable logic controllers, 20:670–671
Network formation, in silicones, 22:562–572. See also Biodegradable polymer networks; Filled silicone networks; Interpenetrating networks (IPNs); Model silicone networks; Monodisperse model networks; Silicone networks
Network hybrid preparation method, 13:539
Network polymerization, in silicate and phosphate glasses, 12:574
Neuberg, Carl, 11:8
Neupogen, 3:817
Neural networks, 7:507
Neurine, 1:254
Neurobehavioral effects, due to toxicity, 25:207–208
Neurodegenerative disease, yeast as a model for, 26:496
Neurodevelopmental effects, of PCBs, 13:142
Neuro-fuzzy controllers, 20:699
Neurological toxicology studies, 25:219
Neuronal norepinephrine depleting agents, antihypertensive, 5:156t, 159–160
Neuropathy, diabetic, 2:812
Neuropeptide Y, target of antiobesity drugs, 3:97
Neurotoxicity
quinolone, 21:231
as a toxic effect, 25:207
Neurotoxic solvents, 23:119
Neurotransmitters, amino acids, 2:603
Neutral agarose, classification by structure, 4:723t
Neutral catalysts, in phenolic resin polymerization, 18:761–762
Neutral extractants, of rare-earth elements, 14:642
Neutral fixing reactive dyes, 9:477–478
Neutralization, in hazardous waste management, 25:818
Neutralization step, in fatty acid neutralization, 22:739, 740–741
Neutralizer, 14:444
on soap making, 22:741
Neutralizing amines, in industrial water treatment, 26:136
Neutralizing value, 15:28
Neutral molecules
binding, 24:47–49
using weak forces to bind, 24:48
Neutral nucleophiles, addition to fullerenes, 12:246–247
Neutral sulfite pulping, 21:22
Neutramycin, 15:296
Neutrinos, 21:297–298
Neutron activation, 25:851
Neutron activation analysis (NAA) determining trace mercury using, 16:45
in thorium analysis, 24:774, 775
Neutron activation autoradiography (NAA), in fine art examination/conservation, 11:402
Neutron cycle, 17:563
Neutron decay, delayed, 21:303–304
Neutron irradiation
of silicon, 22:487
of vitreous silica, 22:435
Neutron moderators, deuterium
application, 8:460
Neutron production, plutonium, 17:585
Neutron radiation, high pressure, 13:431
Neutron-radiography (N-radiography),
17:418
Neutron-rich lanthanide isotopes, 14:635
Neutrons, 21:290
Nevirapine, 18:722
FDA approval of, 18:744–745
preparation of, 18:727
Nevirapine synthesis, 18:737–744
chemical development and pilot plant
scale-up for, 18:738–740
commercial production and process
optimization in, 18:743–744
medicinal chemistry synthetic route to,
18:737–738
process development and pilot plant
scale-up for, 18:740–743
New Animal Drug Amendments, 21:579
New Animal Drug Application (NADA),
21:579
Newborn jaundice, photochemical
treatment of, 19:120
New chemicals, pricing of, 15:641–642
New Chemicals Program (EPA), 9:456
New Drug Application (NDA), 21:574
New drug approval (NDA) process,
18:698–701
drug classifications in, 18:700–701
for nevirapine, 18:743
New energy sources, 24:166–167
New fibers, 11:185–186
New Jersey, mercury legislation in,
16:45–46
New Jersey Toxic Catastrophe Prevention
Act (NJTCPA), 21:830
New Jersey Zinc Company, 26:564–565
New product development programs,
15:638
New product introductions, 24:343
New raw materials, evaluation of, 24:343
New source performance air pollution
standards (NSPS), 21:584–585; 23:774;
26:670–672
Newspaper inks, 14:313
Newspaper printing, 14:320
Newsprint paper, 18:128

“New Substance Notification” (NSN)
regulations, 18:542
News vendor problem, 26:1026–1028
Newton Black films, 12:5
Newtonian behavior
of silicone fluids, 22:575, 576, 577
versus non-Newtonian behavior,
15:208–209
Newtonian flow model, 21:704
Newtonian fluids, 11:741–742
determining the viscosity of, 21:733–734
Newtonian liquids, 16:687–689
settling in, 22:53
Newtonian materials, 10:10
Newtonian mechanics, 16:734
Newtonian polymer melts, 11:306–307
Newtonian viscosity, 15:688
Newton–Raphson iteration, 7:501
Newton’s cooling law of heat convection,
13:245
Newton’s equations of motion, 16:747
Newton’s laws, 21:702–703
of gravitation, 26:239
of viscosity, 15:206
Newton’s second law, 11:739
New York Sugar Trade Laboratory
(NYSTL), 23:471
New Zealand hemp/flax, 11:296–297
Nextel312, fiber reinforcement for
ceramic–matrix composite, 5:558t
Nextel440, fiber reinforcement for
ceramic–matrix composite, 5:558t
Nextel480, fiber reinforcement for
ceramic–matrix composite, 5:558t
Next Generation Melter, 12:607
Neydium, composition of alloy for crowns
and bridges, 8:311t
NFPA National Electrical Code,
21:841–842
NH₃. See Ammonia entries
N-heterocycles, 9:283
N-heterocyclic ligands, thorium and,
24:767
Niacin, 5:146; 25:781
in beer, 3:582t
in cocoa beans and chocolate products,
6:370t
in coffee, 7:255
dietary sources of, 25:798
metabolic function of, 25:797
molecular formula and structure, 5:141t
physiological effects of, 25:784
Niacinamide, 25:797–798
Niacin deficiency, 26:291
Niacor, 5:146
molecular formula and structure, 5:141t
Niaspan, 5:146
molecular formula and structure, 5:141t
Ni-base alloys, 13:511–515. See also Ni-base superalloys; Ni-Fe-base alloys
applications for, 13:512–513
commercial, 13:515–525
corrosion resistance to hydrochloric acid, 13:826
corrosion resistant, 13:513–515
precipitation hardened, 13:520
solid solution strengthening in, 13:514
weldability of, 13:521
alloy compositions of, 13:523
hot corrosion and, 13:507
oxidation resistance of, 13:506
precipitation hardened, 13:503, 522–525
Nicalon fiber
manufacture of, 22:533
reinforcement for ceramic–matrix composite, 5:558t, 559
Nicant, molecular formula and structure, 5:128t
Nicarbazin, 20:135
Nicardipine, 5:133
molecular formula and structure, 5:128t
Niccolite, 3:263
Nicergoline, 4:360t
Nichromite, 6:471t
Nickel (Ni), 17:88–105. See also Chrome–nickel stainless steels; Fe-Ni-Co alloys; Ni entries; Nickel alloys; Nickel compounds; Nickel metal
chemical vapor deposition precursor, 5:805t
in coatings, 24:794
coke formation on, 5:264–265, 266
colloidal suspensions, 7:275
commercial forms of, 17:93
corrosion resistance of, 17:95–99
economic aspects of, 17:93–94
effect on copper resistivity, 7:676t
effect on stainless steel corrosion resistance, 7:809
electrochemical machining of, 9:593
electroplating of, 9:817–821
electrorefining of, 16:164
extraction and refining of, 17:91–93
FCC catalysts and, 11:681–682
in ferrites, 11:60–61, 72, 77, 78–81t
health and safety factors related to, 17:94
hydrometallurgical treatment of, 16:156
occurrence of, 17:88–89
poisons in representative reactions, 5:258t
as the preferred alloying system, 13:471
properties of, 17:90
solubility limits and electrical conductivity effects on copper, 7:750t
solution color of ions in glass, 7:343t
standard electrode potential, 7:799t
thermal degradation of catalysts, 5:272
U.S. consumption of, 17:118t
U.S. economic statistics related to, 17:94t
uses for, 17:95
vapometallurgical refining of, 16:149
water exchange rates and activation parameters of hexaaqua complexes, 7:589t
Nickel(II), concentration formation constant of chelates, 5:717t
Nickel 200, in galvanic series, 7:805t
Nickel acetate tetrahydrate, 17:117
Nickel acetylacetonate, 17:117
Nickel alloying process, 17:99–100
Nickel alloy plating, 9:821–822
development of, 17:98
low-alloy, 13:518
nominal chemical composition of, 17:96t
properties of, 17:95, 97t
selenium and metallurgy of, 22:98
Nickel aluminide, 17:124
intermetallics, 17:104
Nickel–aluminum bronze
effect of alloying on mechanical properties, 7:677
in galvanic series, 7:805t
mechanical properties, 7:678t
Nickel–aluminum catalyst, 17:121
Nickel amine complexes, 17:113
Nickel ammonium nitrate, 17:109
Nickel antimony titanium yellow rutile, formula and DCMA number, 7:347t
Nickel Antimony Titanate Yellow, pigment for plastics, 7:370t
Nickel arsenate, 17:112
Nickel Barium Titanate Yellow, pigment for plastics, 7:370t
Nickel barium titanium primrose priderite, formula and DCMA number, 7:347t
Nickel-based alloys, properties of, 17:848t
Nickel-base superalloys, 17:103
Nickel battery technology, 17:111
Nickel–beryllium alloys, 3:656–659
Nickel–boron deposition, 9:693–695, 708
Nickel brass, corrosion, 7:812
Nickel bromide, 17:110
  physical properties of, 4:329
  solubility in water, 4:322t
  applications, 3:490–491
  cadmium production from recycled, 4:474t, 487–488
  cell assembly, 3:485–490
  cell chemistry, 3:476–479
  charger technology, 3:491
  electrodes, 3:475–476
  fabrication, 3:480–485
  pocket cells, 3:480–482
  sealed, 3:479–480
  sintered cells, 3:482–485
  tubular cells, 3:482
  world market estimated, 3:410t
Nickel carbide, 4:649t, 690–692
Nickel carbide (3:1), 4:649t, 691
Nickel carbonate, 17:110–111
Nickel carbonyl, 16:66, 71; 17:106, 113–114
  gas, 17:123
  inhalation of, 17:119–120
  physical properties of, 17:114t
  uses for, 17:122–123
Nickel carbonyl complexes, substituted, 17:114
Nickel catalysts, 17:94, 99, 109
  precipitated, 17:121–122
Nickel-catalyzed dinitrotoluene hydrogenation, 25:194
Nickel chelates, 17:117
Nickel chloride hexahydrate, 17:109, 110
Nickel chromate, molecular formula, properties, and uses, 6:562t
Nickel–chromium alloy 600, in galvanic series, 7:805t
Nickel–chromium alloys, 17:100–101
  dental applications, 8:308, 310
Nickel–chromium–iron alloys, 13:519, 522
Nickel–chromium–molybdenum alloy C, in galvanic series, 7:805t
Nickel citrate, molecular formula, 6:638t
Nickel-coated powder products, 17:123
Nickel–cobalt plating, 9:821
Nickel compounds, 17:106–132
  in agricultural chemicals, 17:125
  analytical methods for, 17:117–119
  as catalysts, 17:121–123
  chronic toxicity of, 17:120
  economic aspects of, 17:118t
  in electroplating, 17:123
  environmental concerns related to, 17:121
  eye and skin contact with, 17:119
  health and safety factors related to, 17:119–120
  inhalation of, 17:119–120
  inorganic, 17:106–113
  organic, 17:113–117
  as plastics additives, 17:124
  in specialty ceramics, 17:123–124, 125
  uses for, 17:121–125
Nickel(0) compounds, 17:116
Nickel–copper alloy 400, in galvanic series, 7:805t
Nickel–copper alloy K-500, in galvanic series, 7:805t
Nickel–copper alloys, 13:518; 17:100
Nickel cyanide, 17:112
Nickel dialkyldithiocarbamates, 17:124
Nickel dicycloalkyldithiophosphinates, 17:124
Nickel dioxide, 17:107
Nickel double salts, 17:113
Nickel electrodes, 3:430; 12:216
Nickel electroplating solutions, 9:818t
Nickel extraction, 10:791
Nickel ferrite brown spinel, formula and DCMA number, 7:348t
Nickel fibers, 17:108
Nickel fluoride complexes, 17:111
Nickel fluoride tetrahydrate, 17:109–110
Nickel fluoroborate, 17:111
Nickel fluoroborate hexahydrate, 4:157t, 158, 159
Nickel formate dihydrate, 17:117
Nickel halides, 17:109–110
Nickel-hydride battery modules, 17:95
Nickel–hydrogen cells, 3:505–512
gaseous hydrogen systems, 3:505–509
metal hydride systems, 3:509–512
speciality for military and medical use, 3:430t
Nickel hydroxides, 17:111
Nickel–iron alloys, 17:101
Nickel–iron–aluminum catalyst, 17:121
Nickel–iron cells, 3:491–493
Nickel–iron–chromium alloy 825
in galvanic series, 7:805t
Nickel–iron–chromium alloys, 17:102–103
Nickel–iron plating, 9:821
“Nickel itch,” 12:691, 701
Nickel–matrix composites, 17:104
Nickel metal, forms of, 17:95–99
Nickel metal hydride cells, 3:431, 471, 509–512
world market estimated, 3:410t
Nickel mine production, world, 17:89t
Nickel–molybdenum alloys, 13:519; 17:102
Nickel–molybdenum catalysts, 17:122
Nickel monoxide, semiconducting ceramic, 5:599–600
Nickel niobium, 17:123–124
Nickel Niobium Titanate Yellow, pigment for plastics, 7:370t
Nickel niobium titanium yellow rutile, formula and DCMA number, 7:347t
Nickel nitrate, 17:109
Nickelocene, 17:114
derivatives of, 17:114–115
Nickel ores, 17:89
Nickel organometallic compound catalysts, 17:122
Nickel-oxide alumina, catalytic aerogels, 1:763t
Nickel oxide electrodes, 3:408
Nickel oxides, 17:106–108
carrier mobility at room temperature, 5:597t
manufacture of, 17:107
uses for, 17:107–108, 123
Nickel-oxide–silica–alumina, catalytic aerogels, 1:763t
Nickel oxide sinter, 17:107
Nickel phosphate, 17:112–113
complexes, 17:125
Nickel phosphorus (Ni-P) alloy deposition, 9:691–693. See also Ni-P entries
Nickel phosphorus compounds, 17:124
Nickel phosphorus deposits, 9:702–708
corrosion protection, 9:709
Nickel–phosphorus plating, 9:821–822
Nickel plating, 9:764; 17:99, 108
baths, 9:821
Nickel recycling, economic aspects of, 21:405
Nickel salts, 17:106, 112–113, 117, 125
coordination compounds with ligands, 17:116
Nickel selenide, 22:87
Nickel–selenium, 22:73t
Nickel sensitization, 17:119
Nickel silicate, 17:89
Nickel silicate green olivine, formula and DCMA number, 7:347t
Nickel silicides, 17:121
uses for, 17:123
Nickel–silver, 7:759
in galvanic series, 7:805t
nominal composition and UNS designation, 7:722t
Nickel silvers, 17:100
UNS designation, 7:721t
Nickel steel, 23:308–309
Nickel strike solutions, 9:819; 17:108
Nickel sulfamate, 17:112
Nickel sulfate, 17:108–109, 125
Nickel sulfides, 17:89, 112
Nickel tetracarbonyl, 16:66
effective atomic number of noble gas, 7:590t
Nickel–tin–aluminum catalyst, 24:794
Nickel titanate, 25:47
Nickel–titanium (NiTi) alloy (Nitinol), 22:341, 712
applications of, 22:345–352
Nickel–titanium alloys, dental applications, 8:313–314
Nickel–tungsten plating, 9:822
Nickel Tungsten Titanate Yellow, pigment for plastics, 7:370t
Nickel–zinc cells, 3:474, 502–505
Nickel–zinc ferrites, 5:602–603
Niclosamide (Bayluscide), 3:224
piscicide for aquaculture in U.S., 3:216t
Nicodel, molecular formula and structure, 5:128t
Nicorandil, 5:115
molecular formula and structure, 5:111t
Nicotinamide, 21:103–103; 25:797
Nicotinamide adenine dinucleotide (NADH), 14:348. See also NADH
Nicotinamide adenine dinucleotide phosphate (NADPH), 13:286. See also NADPH
production of, 13:288
Nicotine, concentration in plants, 2:76. See also Nornicotine
S(-)-Nicotine, 2:83
Nicotine adenine dinucleotide phosphate (NADP+), 14:147
Nicotinic acid, 9:477–478; 26:291
alcaloid precursor, 2:78
Ni-Cr alloys, 13:499. See also Nickel–chromium entries
NiCrAlY coatings, 13:508
nido designation
boranes, 4:184–186
boron hydrides, 4:170, 172–176
Nidrel, molecular formula and structure, 5:129t
NiF3A proteins, 17:310–311
Ni-Fe-base alloys, precipitation hardened, 13:520
Nifedicon, molecular formula and structure, 5:128t
Nifedipine, 5:133–134
molecular formula and structure, 5:128t
nif genes, 17:311
organization of, 17:304
transferring, 17:317
Nifurstylenic acid, registered for use in aquaculture in Japan, 3:221t
Nigeran, classification by structure, 4:723t
Nigericin, 20:132, 133, 135
Nightgowns, number produced from one bale of cotton, 8:133t
Night soil decomposition, 14:110
Nighttime oxidation chemistry, 17:792–793
See also Nickel entries
Nigre soap phase, 22:726
in kettle soap making, 22:737
Nile tilapia, common and scientific names, 3:187t
Nilvadipine, 5:134
molecular formula and structure, 5:128t
NiMH batter, 14:652
NIMH Technology Transfer Office, 24:358
Nimicor, molecular formula and structure, 5:128t
Nimodipine, 5:134
molecular formula and structure, 5:129t
Nimotop, molecular formula and structure, 5:129t
1994 National Water and Wastewater Rate Survey, 26:96
1995 Dietary Guidelines for Americans, 26:327
Ninhydrin, 12:101
Ninhydrin–color reaction
amino acids, 2:570
Niobates, 17:152–153; 24:315
Niobia–phosphate catalytic aerogels, 1:763t
Niobic acid, 17:152
Niobic salts, 17:152–153
Niobium (Nb), 17:132–157; 24:313, 315. See also Nb–Ti entries; Niobium compounds; Niobium metal
analytical methods for, 17:142–144
dissolution methods for, 17:142
economic aspects of, 17:140–142
effect on stainless steel corrosion resistance, 7:809
extraction, refining, and metallurgy of, 17:135–140
health and safety factors related to, 17:144
major use of, 23:829
occurrence of, 17:133–135
oxidation state of, 17:133
in perovskites, 11:97
properties of, 17:132–146
purifying, 17:138
recovery from ferroniobium, 17:138–139
reduction to metallic form, 17:139
separation from tantalum and/or impurities, 17:137–138
in stainless steel, 23:306
in superconducting devices, 23:828–829
in titanium alloys, 24:856
uses for, 17:144–146
volatile chlorides of, 17:137
world reserves of, 17:141t
Niobium alloys, 17:136–137
Niobium-bearing ore reserves, 17:140
Niobium boride, 17:146–147
Niobium carbide, 4:647, 649t, 683; 17:146, 147
cemented, 4:655–656
as industrial hard carbide, 4:674
lattice, 4:652
physical properties of, 4:679t
preparation, 4:675
quality control methods, 4:692–693
solid solution for steel machining, 4:663
solid solutions with other carbides, 4:686–689
stoichiometry, 4:651
Niobium carbide (2:1), 4:649t
Niobium compounds, 17:146–153
properties of, 17:148–149t
Niobium dioxide, 17:151
Niobium dioxide fluoride, 17:150
Niobium halides, 17:147–150
Niobium hydride, 13:627, 17:150
Niobium metal, corrosion of, 17:135t
Niobium monoxide, 17:151
Niobium nitrides, 17:150–151
Niobium oxides, 17:151
electrochromic materials, 6:579, 580, 580t
superconductivity in, 5:603
Niobium oxide tribromide, 17:150
Niobium oxide trichloride, 17:150
Niobium oxyhalides, 17:147–150
Niobium pentaboromide, 17:150
Niobium pentachloride, 17:139–140, 150
Niobium pentfluoride, 17:147
Niobium pentaiodide, 17:150
Niobium pentoxide reduction, 17:139
Niobium–tin ribbon, 24:798
NIOSH Recommended Exposure Limit (REL), for sulfuric acid, 23:795. See also National Institute for Occupational Safety and Health (NIOSH)
Ni-P adhesion, 9:705. See also Nickel phosphorus entries
Ni-P alloys, solderability, 9:707, 708
NIPAm hydrogels, 13:738
Ni-P density, 9:705
Ni-P electrical resistivity, 9:706
Ni-P ferromagnetic properties, 9:706
Nipkow disk, 16:484
Ni-P mechanical properties, 9:706
Niranium N/N, base-metal dental alloy, 8:309t
Nirvanol, 24:536
Nisin, 12:59
Nisoldipine, 5:134–135
molecular formula and structure, 5:129t
NIST Advanced Technology Program, 7:388. See also National Institute of Standards and Technology (NIST)
Niter, 5:785t
Nitostat, molecular formula and structure, 5:110t
Nitramine production, 17:164
Nitrate analysis, of water, 26:38
Nitratated products, as explosives, 17:162
Nitrate ore bed, 22:844
Nitrate-reducing conditions, defined, 3:757t
Nitrate removal
in municipal water treatments, 26:124
from water, 14:417
Nitrates, 12:59
in bioremediation design considerations, 25:840
iron, 14:541
mechanism of action in muscle cells, 5:109, 112–113
predicted deviations from Raoult’s law based on hydrogen-bonding interactions, 8:814t
side effects, 5:115–116
thallium, 24:633
as vasodilators, 5:109–116, 110–111t
zirconium, 26:648
Nitrating feedstock, 17:158
Nitrating, 12:182–183; 17:157–169. See also Nitration process; Nitration reactions
aliphatic, 12:187
benzene, 3:602
free-radical nitration of paraffins, 17:165–168
health and safety factors related to, 17:168
of m-hydroxybenzoic acid, 22:21
industrial applications of, 17:162–164
ionic liquids in, 26:896–897n
ionic nitration reactions, 17:158–165
of naphthalene, 17:74
reaction with aniline, 2:788–789
single-phase, 17:256
using N₂O₅, 17:164–165
Nitrating-grade toluene, specifications for, 25:178t
Nitrating plants
changes in, 17:162
energy requirements in, 17:163
Nitrination process, 9:269–270
dye intermediates obtained by, 9:271t
Nitrination reactions, 21:845
quinoline, 21:183–184
Nitrendipine, 5:135
molecular formula and structure, 5:129t
Nitric absorption columns, design of, 17:182–183
Nitric acid, 17:170–195
in acid deposition, 1:805
acidic properties of, 17:173
analytical and test methods for, 17:190–191
chemical properties of, 17:171–174
Department of Transportation categories for, 17:188
economic aspects of, 17:188
health and safety factors related to, 17:191–192
inhalation symptoms of, 17:192
manufacture and processing of, 17:174–186
in nitration, 17:157
organic reactions of, 17:174
oxidizing properties of, 17:173–174
in photochemical smog, 1:789, 797
physical properties of, 17:171
process developments for, 17:170
production of, 11:115
reaction with metals, 17:174
salicylic acid and, 22:5, 6
selenium reactions with, 22:76
silicon solubility in, 22:491
silver reaction with, 22:650–651, 672
in silver qualitative analysis, 22:676
solubility of boron halides in, 4:140t
solvent for cotton, 8:21
specifications and standards for, 17:188–190
in synthetic sodium nitrate processing, 22:848–849
thermodynamic properties of, 17:173t
U.S. producers of, 17:189t
use in selenium analysis, 22:94
uses for, 17:192
weak acid process for, 17:175–184
world production of, 17:188
Nitric acid concentration (NAC) processes, 17:175, 185–186
Nitric acid plants
materials of construction for, 17:186–188
source performance standards for, 17:183
Nitric acid processes. See also Nitric acid concentration (NAC) processes
alternative, 17:186
compression and expansion in, 17:178–179
Nitric acid purification, magnesium nitrate in, 15:410
Nitric acid solutions, physical properties of, 17:172t
Nitric acid synthesis, platinum-group metal catalysts in, 19:621
Nitric acid wet spinning process, 11:189
Nitric oxide (NO), 13:791–792. See also Nitrogen oxides (NO_x)
afinity for ruthenium, 19:638–639
air pollutant, 1:789, 796
cardioprotection role, 5:188
catalyst poison, 5:257t
chemistry of, 13:443–444
catalyst for, 26:691–692
effect on ozone depletion, 17:785
mechanism of action in muscle cells, 5:109, 112–113
oxidation of, 17:181
in photochemical smog, 1:789, 790
reduction with catalytic aerogels, 1:763t, 764
role in hemostatic system, 4:85
role in stratospheric ozone depletion, 1:808–811
sodium nitrite and, 22:855
in VDC polymer degradation, 25:713
Nitric phosphates, 11:121
Nitridation, direct metal, 17:211–213
Nitride coatings, 17:209–210, 218
Nitride-containing layers, 17:208–209
Nitride glasses, 12:583
Nitrides, 17:195–227
as abrasives, 17:220
alphabetical list of, 17:197–198t
alternative preparation methods for, 17:207–208
aluminum, 17:210–213
analytical methods for, 17:216–217
carbon, 17:214–215
catalytic applications of, 17:221
chemical vapor deposition precursor, 5:805t
in coatings and lubrication, 17:220–221
economic aspects of, 17:215–216
electronic and optoelectronic applications for, 17:221
gallium, 17:213–214
health and safety factors related to, 17:217
high strength and hardness of, 17:217–219
manufacture and processing of, 17:209–215
metallic, 17:199–201
niobium, 17:150–151
nonmetallic (diamond-like), 17:201–206
nuclear applications for, 17:219
precipitation from the gas phase, 17:207
preparation of, 17:206–209
properties of, 17:198–206
in the refractories industry, 17:219–220
salt-like, 17:198–199
silicon, 17:210
as solid electrolytes, 17:219
tungsten, 25:385–386
uranium, 25:426–427
uses for, 17:217–224
volatile, 17:206
zirconium, 26:640
Nitriding, of steel, 23:291
Nitriding temperature/time, 16:205–207
Nitrification
as advanced wastewater treatment, 25:906–907
defined, 3:757t
Nitrilamine, 21:48
Nitrile barrier polymers
compositions of commercial, 3:386t
permeability to selected permanent gases, 3:381t
water-vapor transmission rate (WVTR), 3:387t
Nitrile butadiene rubber (NBR), 4:375, 384t; 9:560–561
nitrogen diffusion coefficients in, 4:447
Nitrile rubbers, in rubber compounding, 21:769–771
Nitriles, 10:485–486, 504; 17:227–249
acetonitrile, 17:231–233
adiponitrile, 17:233–237
α-aminonitriles, 17:237–239
α- and β-chiral, 13:669
aroma chemicals, 3:258
azobisnitriles, 17:239–242
benzonitrile, 17:242–244
chemistry and uses of, 17:228–229
commercially available, 17:230t
cyanoacetic acid and esters, 17:244–245
enzymatic transformation of, 12:481
fatty acid, 17:246–247
Friedel–Crafts acylation using, 12:179
inhalation of, 17:230–231
isophthalonitrile, 17:245
2-methylglutaronitrile, 17:245–246
microwave-accelerated transformation of arylaldehydes to, 16:580–581
pentenenitriles, 17:246
predicted deviations from Raoult’s law based on hydrogen-bonding interactions, 8:814t
preparations for and chemical properties of, 17:227–228
reduction in manufacture of lower aliphatic amines, 2:546–547
synthesis of, 12:179–180
Nitrolotriacetic acid (NTA), 2:129
for calcium sulfate scale removal, 4:594–595
concentration formation constants for metal chelates, 5:717t
molecular formula, 5:712t
regulation, 5:731
solubilization with calcium salts, 5:729t
trisodium salt, 8:417
U.S. production, 5:730t
Nitrolotriacetonitrile, 8:174
Nitrolotrimethylene phosphonic acid, molecular formula, 5:713t
3,3′,3″-Nitrolotrispropionamide, 1:291, 295
Nitrite analysis, of water, 26:38
Nitrite-cured meats, packaging, 18:32
Nitrite ion acrylamide stabilizer, 1:289
Nitrites, 12:59
in beets, 23:463
mechanism of action in muscle cells, 5:109, 112–113
predicted deviations from Raoult’s law based on hydrogen-bonding interactions, 8:814t
as vasodilators, 5:109
Nitro alcohols, alkanolamines from, 2:113–122
Nitroalkanes, reaction with acrylamide, 1:289
Nitroalkene synthesis, microwaves in, 16:565
Nitroaminopyridines, 21:103
o-Nitroaniline (ONA), derivative of nitrochlorobenzenes, 6:223t
p-Nitroaniline (PNA), derivative of nitrochlorobenzenes, 6:223t
o-Nitroanisole (ONAS), derivative of nitrochlorobenzenes, 6:223t
1-Nitroanthraquinone, 9:307
1-Nitroanthraquinone-2-carboxylic acid, 9:317
Nitroarenes, 25:192
Nitroaromatics, aroma chemicals, 3:258–259
Nitrobacter, use in recirculating aquaculture biofiltration, 3:196
Nitrobenzene(s), 3:602, 620; 17:250–270, 24:275
chemical properties of, 17:250–251
derivatives of, 17:259–262
double-distilled, 17:258t
economic aspects of, 17:257–259
health and safety factors related to, 17:258–259
manufacturing and processing, 17:252–257
physical properties of, 17:250, 251t
reduction products of, 17:252t
specifications and test methods for, 17:257–258
U.S. production, sales, and prices of, 17:258t
uses for, 17:259
Nitrobenzotrichloride, 6:327
m-Nitrobenzotrichloride, 6:327
p-Nitrobenezyl chloroformate, molecular formula, 6:291t
o-Nitrobenzyl intramolecular rearrangement, 15:167, 169
z-Nitro carboxylic acid, reduction, 2:572
Nitrocarburizing
austenitic, 16:211
ferritic, 16:210–211
plasma, 16:211
Nitrocellulose, 10:725, 731
m-Nitrochlorobenzene, 17:260
o-Nitrochlorobenzene, 17:259–260, 261
p-Nitrochlorobenzene, 17:260, 261–262
Nitro compounds, 17:157–158
catalytic hydrogenation of, 25:192
condensation of, 9:359–360
reducing, 13:570
Nitrodiazobenzenes, 9:411
4-Nitro diphenylamine (4 NDPA), derivative of nitrochlorobenzenes, 6:223t
Nitrodiphenylamine dyes, 9:263
Nitro dyes, 9:263
Nitrofurans
antibacterials, 3:8
development of, 3:3
preparation and manufacture, 3:13
therapeutic utility, 3:18
world market for, 3:16t
Nitrofurantoin, year of disclosure or market introduction, 3:6t
Nitrogard, molecular formula and structure, 5:110t
Nitrogen (N), 17:270–289. See also N₂
oxidation; N-donating ligands;
Nitrogen compounds; Nitrogen fixation; Titanium–nitrogen compounds
in an air-separation plant, 17:359
in ammonia synthesis, 2:688; 11:114
availability of, 17:290
binary compounds of, 17:195, 196
in biological wastewater treatment, 25:896
in bioremediation design considerations, 25:841
in BOP steels, 23:296
catalyst poison, 5:257t
in the chemical process industry, 17:284
chemical properties of, 17:271–274
chromatographic adsorption on carbon molecular sieve, 1:610
in chromium ferroalloys, 6:501t
in coal gasification, converted to ammonia, 6:772, 775
in cocoa shell from roasted beans, 6:357t
in crude oils, 18:589
cryogenic shipping, 8:40
diffusion coefficient for dilute gas in water at 20 °C, 1:67t
diffusion coefficient in air at 0 °C, 1:70t
diffusion coefficients in rubbers, 4:447
economic aspects of, 17:282
in electronics manufacturing, 17:286–287
electrostatic properties of, 1:621t
in food, 12:62
in the food industry, 17:285–286
gas bulk separation, 1:618t
gas purification, 1:618t
health and safety factors related to, 17:283–284
high purity, 13:457–459
introduction into terpenoid skeleton to produce alkaloids, 2:100–105
liquefaction, 8:40
liquid from air separation, 8:48–49
manufacture and processing of, 17:274–280
in natural gases, 12:378
in oil and natural gas production, 17:287
oxidation of, 17:271
permeabilities in selected barrier polymers, 3:381t
in petroleum vacuum residua, 18:590
physical properties of, 17:271, 272t
physical properties of compressed gas propellant, 1:779t
in primary metallurgy and heat treatment, 17:286
in pyridines, 21:98
rejection in air separation, 8:56–57
replacement of boron by, 13:649
shipment of, 17:280–282
sodium reactions with, 22:765
soil chemistry of, 11:111–112
solubility in acetaldehyde, 1:101t
solubility of, 17:273
specifications, standards, and quality control for, 17:282–283
in storing sodium, 22:776
substituents in pyridines, 21:103–104
temperature elevation and, 17:273
thermophysical properties, 8:41t
uptake curves for carbon molecular sieves, 1:601
uses for, 17:284–288
in vinyl chloride manufacture by oxychlorination, 25:641
xenon bonded to, 17:330–331
Nitrogenase(s), 17:32–33, 298
in nitrogen fixation, 17:302–311
requirements for catalysis and substrate reduction, 17:304–306
synthesis and activity of, 17:310
Nitrogenase-based biophotolysis system, 13:849
Nitrogenase structural models, in nitrogen fixation, 17:315
Nitrogenated hydrocarbons, 10:86
Nitrogen bromide, 4:299
Nitrogen circulation, in the hydrologic cycle, 26:32
Nitrogen compounds
bioremediation, 3:781
complex, 10:638
nomenclature for, 17:390
reactions with succinic acid, 23:421–422
reaction with ozone, 17:776, 779–780
Nitrogen-containing molecules, total mineralization of, 19:90. See also N-containing compounds
Nitrogen-containing polymers, 10:204–218
aromatic polyamides, 10:210–212
butadiene–acrylonitrile–styrene polymer, 10:205–207
in hollow fiber membranes, 16:22–23
polyamideimides, 10:214–216
polyamide resins (aliphatic), 10:207–210
polyetherimide, 10:217–218
polyimides, 10:213–214
polyphthalamides, 10:216–217
styrene–acrylonitrile copolymer, 10:204–205
styrene–maleic anhydride copolymer, 10:207
Nitrogen derivative herbicides, heterocyclic, 13:323–324
Nitrogen dioxide (NO₂). See also Nitrogen oxides (NOₓ)
abatement technology in adipic acid production, 1:573t
air pollutant, 1:796–797
criteria pollutant, 26:691–692
formation of, 17:181
in mega-cities, 1:788t
role in stratospheric ozone depletion, 1:808–811
SIP requirements, 1:812, 814
sodium nitrite and, 22:855
thermochromic material, 6:614
Nitrogen donor ligands, thorium and, 24:766–768
improving, 17:316
global production of, 11:114t
materials in, 11:115–117
Nitrogen fixation, 17:290–323
aerobes and microaerophiles in, 17:301
anaerobes in, 17:301
aqueous systems in, 17:314–315
biological, 17:316
biological systems for, 17:295–311
chemical, 17:311–315, 316
dinitrogen-reducing systems in, 17:311
energy demand of, 17:306
facultative anaerobes in, 17:302
free-living microorganisms in, 17:301
genetic manipulation of, 17:316–317
industrial processes for, 17:291–295
nitrogenases in, 17:302–311
nonaqueous systems for, 17:311–315
outlook for, 17:315–317
photosynthetic bacteria and cyanobacteria in, 17:302
plant–bacterial associations in, 17:296–301
regulation of, 17:310–311
Nitrogen-fixation genes, 17:304
Nitrogen generation, via inert gas generators, 17:280
Nitrogen heterocyclic compounds, microwave-assisted synthesis of, 16:576
Nitrogen ligands, iridium complexes containing, 19:649
Nitrogen membrane systems, 17:278–280
Nitrogen molecule, energy levels of, 14:689–690. See also AlGaInN compounds
Nitrogen mustards, 5:816, 817
Nitrogen oxide (NO) emissions. See also NO$_x$ reduction technology
  catalyst additives and, 11:719
  from FCC unit regenerators, 11:718–720
  lime industry, 15:76
  reducing, 11:692–694
Nitrogen oxide (NO$_x$) exhaust control, 10:96–102
Nitrogen oxides (NO$_x$), 17:789, 796–797; 13:180; 17:270. See also Nitric oxide (NO); Nitrogen dioxide (NO$_2$); Nitrogen pentoxide; Nitrogen peroxide; Nitrogen tetroxide; Nitrous oxide (N$_2$O); NO$_x$ entries
  absorption of, 17:182–183
  as air pollutants, 26:668
  from combustion, 7:470–472
  in food, 12:62
  gas purification, 1:618t
  indoor air pollution, 1:804
  in photochemical smog, 1:789, 790, 793
  role in stratospheric ozone depletion, 1:808–811
  silicone degradation and, 22:604
  SIP requirements, 1:812, 814
  suppression during ozone preparation, 17:796
  trends in emissions, 1:797
Nitrogen pentoxide, sodium reactions with, 22:766
Nitrogen perchlorates, 18:278
Nitrogen peroxide, 17:173
Nitrogen–phosphorus detector (NPD), gas chromatography, 6:381, 431–432
Nitrogen pressure swing adsorption systems, 17:278
Nitrogen selenide, 22:87
Nitrogen separation, cryogenic, 17:275–278
Nitrogen sources, for fermentation, 11:25
Nitrogen tetroxide, thermochromic material, 6:614
Nitrogen-transfer reactions, osmium, 19:643
Nitrogen triiodide, 4:319
Nitrogen trifluoride, 11:830
  production of, 11:845
Nitroglycerin[ε] (NG), 9:47, 48; 10:730
  molecular formula and structure, 5:110t
  pharmacokinetics, 5:115
  processes, 17:164
  production of, 17:174
Nitro group, 17:157–158
Nitroguanidine, 10:734
Nitrol, molecular formula and structure, 5:110t
Nitrolyne, molecular formula and structure, 5:110t
Nitrometer method, 17:191
Nitromethane production, 17:168
Nitronium perchlorate, 18:279
Nitronium tetrafluoroborate, 25:632
Nitroparaffins, 17:166–167
  HNO$_3$ conversions to, 17:166–167
p-Nitrophenetole (PNPt), derivative of nitrochlorobenzenes, 6:223t
p-Nitrophenol (ONP), derivative of nitrochlorobenzenes, 6:223t
  derivative of nitrochlorobenzenes, 6:223t
  predicted deviations from Raoult’s law based on hydrogen-bonding interactions, 8:814t
  p-Nitrophenol (PNP), derivative of nitrochlorobenzenes, 6:223t
Nitrophenols
reduction to aminophenols, 2:658
soluble dyes, 7:373t
p-Nitrophenyl chloroformate, molecular
formula, 6:291t
Nitropress, 5:170
molecular formula and structure, 5:166t
Nitropusside, 5:170
molecular formula and structure, 5:166t
4-Nitropyridine oxide, 2:469
Nitropyridines, uses for, 21:125
Nitroquinolines, 21:183–184
5-Nitrosalicylic acid, 22:5
Nitrosamine formation, ascorbic acid and,
25:767, 769–770
Nitrosamines, 2:449–451
N-Nitrosamines, 15:531
Nitrosobenzene, Diels–Alder adduct from
cyclopentadiene, 8:222t
N-Nitroso compounds, ascorbic acid and,
25:770
N-Nitrosodietanolamine, 2:449, 450
Nitroso dyes, 9:263–264
Nitro soluble dyes, 7:373t
Nitroso soluble dyes, 7:373t
Nitrosonomas, use in recirculating
aquaculture biofiltration, 3:196
β-Nitrostyrenes, preparation by nitration of
styrenes, 16:581
Nitrosyl chloride, 20:634
Nitrosyl complexes, osmium, 19:642
Nitrosyl perchlorate, 18:279
Nitrosyl tetrafluoroborate, 4:144t
m-Nitrotoluene, 17:263
physical properties of, 17:264t
o-Nitrotoluene, 17:262–263, 266
p-Nitrotoluene, 17:263–265
Nitrotoluenes, 17:262–268
dinitrotoluenes, 17:267–268
health and safety factors related to,
17:267
mononitrotoluenes, 17:262–267
Nitrotetramine, soluble dyes, 7:373t
Nitrous acid
reaction with aniline, 2:787–788
quantitative analysis of, 17:191
sodium nitrite and, 22:855
Nitrous oxide (N₂O)
air pollutant, 1:789
diffusion coefficient for dilute gas in
water at 20° C, 1:67t
electrostatic properties of, 1:621t
as greenhouse gas, 1:806, 807t
in photochemical smog, 1:789, 790
physical properties of compressed gas
propellant, 1:779t
Nitroxide mediated polymerization,
7:621–622
Nitroxide-mediated styrene
polymerizations, 23:388–389
Nitroxyl-mediated polymerizations,
14:298
Nitroxy radicals, stable, 14:298
Nitroxy-mediated polymerization (NMP),
14:297–298
Nivadil, molecular formula and structure,
5:128t
N-nitration, 17:157
157-nm lithography, 15:187–189
157-nm resist systems, multilevel,
15:188–189
193-nm liquid immersion lithography,
15:186–187
193-nm resists
crylic polymers for, 15:178–179
COMA copolymers for, 15:180–181
cyclic olefin polymers for, 15:179–180
design strategies For, 15:177
polymers for, 15:176–181
One minus dimensionless molar density,
25:314
1:1 metal complex dyes, 9:186
1-2 insertion, 16:98–99
1:2 metal complex dyes, 9:186–187
1-3 insertion, 16:99
N-Nitrosamines, 15:531
No. 1 busheling scrap, 21:408–409
No. 1 heavy melting steel, 21:409
No. 1 industrial scrap, 21:409
No. 2 bundles scrap, 21:409
No. 2 heavy melting steel, 21:409
Nobelium (No), 1:463–491, 464t
electronic configuration, 1:474t
Nobil Ceram, composition of alloy for
crowns and bridges, 8:311t
N,O-bis(trimethylsilyl)-trifluoracetamide,
chiral derivatizing agent, 6:96t
Noble-gas compounds, 17:323–343
krypton compounds, 17:333–343
of the lighter noble gases, 17:335
preparation of binary fluorides,
17:335–336
radon compounds, 17:334–335
uses for, 17:336–337
xenon bonding to polyatomic groups, 17:330–333
xenon compounds, 17:323–330
Noble gases, 17:323, 343–383. See also
   Helium- group elements; Inert gases
   in the aerospace industry, 17:376
   in an air-separation plant, 17:358–360
   analytical methods for, 17:367–368
   commercial distribution of, 17:362–364
   comparative prices of, 17:366t
   in cryogenics, 17:373–375
   economic aspects of, 17:364–366
   in the electronics industry, 17:372–373
   fluorine reactivity with, 11:830
   furnace applications for, 17:370
   laboratory and scientific uses for, 17:370–371
   in light sources, 17:371–372
   as medical and breathing gases, 17:376–378
   metallurgical uses for, 17:368–370
   mixtures of, 17:355–357
   in nuclear reactors, 17:375–376
   occurrence of, 17:344–347
   physical properties of, 17:347–357
   production of, 17:357–362
   quantum mechanical effects of, 17:350
   resources and conservation of, 17:346–347
   separation from the atmosphere, 17:358
   solid phases of, 17:350–352
   specifications and standards for, 17:366–367
   uses for, 17:368–378
   in window insulation, 17:378
   Noble gas fluorides, properties of, 17:324t
   Noble gas halides, uses for, 17:337
   Noble metal anodes, platinum-group metal
   in, 19:622
   Noble metal catalysts, 10:81, 106
   Noble metal deposit, in photocatalysis, 19:94
   Noble metal films, 15:251
   Noble metal nanoparticles, 26:805
   Noble metal recovery, in photocatalytic
   water decontamination, 19:87–89
   N–O bond polymerization inhibitors, 23:382
   Noddack, Walter, 21:681–682
   Nod factors, 17:297

Nodulated nonleguminous angiosperms, in
   nitrogen fixation, 17:298–299
Nodulating process, 19:7–8
No-effect-level (NOEL), 18:541
Noise
   bolometer, 19:144
   centrifuge, 5:524–525
   in industrial hygiene, 14:221
   photodetector, 19:132–133
   from quarrying, 15:75
   silicon-based semiconductors and, 22:237
Noise abatement, in plant layout, 19:521–522
Noise correlation function, 22:113
Noise equivalent power (NEP), 19:133
Noise spectral density, 19:134–135
Nomarski, Georges, 16:480
Nomarski-modified Wollaston prism, 16:481
Nomenclature, 17:384–413
   basic scheme of, 17:384–385
   biochemical, 17:401–402
   computerized approaches to, 17:400–401
   elastomer, 21:761t
   enzyme, 10:258–260
   for ionic liquids, 26:840–841
   glossaries related to, 17:404
   inorganic, 17:387–394
   macromolecular (polymers), 17:403–404
   organic, 17:394–401
   polymer, 20:390–395
   pump, 21:88
   quinone, 21:236–237
   reactor technology, 21:358
   related to mass transfer, 15:731–737
   reverse osmosis, 21:674–676
   Society of Rheology, 21:704
   spray-related, 23:199t
   systematic, 17:394
   thermodynamics-related, 24:692–694t
   of vitamins, 25:787, 788t
Nomenclature Committee of the
   International Union of Biochemistry
   and Microbiology, 17:402
Nomenclature of Inorganic Chemistry
   (IUPAC), 17:392–393, 399
Nomex, 10:211, 212
Nomex aramid, 13:372
Nomex fiber, 13:373
   “Nominal mass,” 15:649, 650
Nonaquaneodymium(III), 7:578t
Nonaborane(15), 4:186
Nonabsorbable suture materials, 24:207
Nonactin, chelating agent, 5:710
Nonadecanoic acid, physical properties, 5:29t
Nonadecyclic acid, physical properties, 5:29t
Nonafluoro-4-trifluoromethylpent-3-one, 13:726t
Nonaheteroglycan, classification by structure, 4:723t
Nonahydridorhenate(VII), effective atomic number of noble gas, 7:590t
Nonalkaline scales, in seawater distillation, 26:72
Nonanal, 2:59
physical properties of, 2:61t
Nonane, spontaneous ignition temperature, 7:438t
Nonane (9-BBN), 4:187, 229
Nonanoic acid, physical properties of, 5:29t
Nonanol, chain length and linearity, 2:12t
1-Nonanol, physical properties of, 2:3t
Nonanoyloxybenzene sulfonate (NOBS), 4:60, 70
Nonaqueous phase liquids (NAPLs), 12:846
Nonaqueous dispersion (NAD) polymerization, 20:82
of methacrylic ester polymers, 16:289
Nonaqueous media, separations in, 21:654–656
Nonaqueous phase liquids (NAPLs), 3:766
in soil and ground water treatment, 25:834
Nonaqueous polymers, inversion of, 14:722–723
Nonaqueous solutions, sodium nitrite in, 22:854t
Nonaqueous solvents, 14:32
Nonaqueous systems
ion exchange in, 14:397
in nitrogen fixation, 17:311–315
Nonaromatic cyclic structures, conversion of aromatic rings to, 15:5
Nonaromatics, 23:329, 330
Non-azeotropes, methyl isobutyl ketone, 16:331t
Nonazeotropic mixtures
heuristic distillation sequencing for, 22:298–301
as refrigerants, 21:525, 531
Nonbanded coals, 6:703, 706

“Non-benzenoid” aromatic compounds, flash vacuum pyrolysis for, 21:148
Non-benzenoid quinones, 21:238
Nonbenzidine-based dyes, 9:448
Nonblack fillers, 21:781
effects on natural rubber properties, 21:782t
effects on styrene–butadiene rubber properties, 21:783t
Non-Boltzmann biasing techniques, 26:1036
Nonbonded (NB) truncation methods, 16:748
Nonbulking sludge, 25:899
Nonbulk packages, of hazardous materials, 25:338, 342–343
None catalytic cracking, 18:648
Noncatalytic gas–solid reactions, 21:331
Noncatalytic solid–fluid reactions, 21:343–344
categories of, 21:344
Non-cellulosic “synthetic” membranes, in hemodialysis, 26:825–828
Noncentrosymmetry point group crystals, 11:93–94
Noncertified colors, 12:51
Noncertified pigments, performance criteria in cosmetic use, 7:860t
Non-cGMP products, 11:427, 433
Non-chemical stabilization methods, in PTG systems, 19:366
Nonchlorinated pesticides and herbicides bioremediation, 3:776–779
Nonchlorine oxidizers, in swimming pools, 26:189–190
Noncircular tubes, Reynolds number in, 13:246
Nonclogging applications, pumps for, 21:78–79
Noncompetitive enzyme inhibition, 10:256, 321
Noncondensable gas mix, resolution processes, 17:361
Nonconjugated drying oils, 9:144–147, 150–151
Noncontact mode atomic force microscopy, 3:325–326; 17:63
Noncontact printing, in microarray fabrication, 16:386
Noncoordinating anions, 16:95
Noncovalent carbon nanotube functionalization, 17:53
Noncovalent fluorescence labeling, 20:519
Noncovalent interactions, 24:38
Noncryogenic air separation, 17:753
Noncrystalline domains, in fibers, 11:172, 175
Noncrystalline (glassy) polymer materials, 16:24
Noncrystalline polymers, 9:554
Noncyanide baths, 9:804–805
Noncyclic maleyl chloride, 15:485–486
Noncyclopentadienyl compounds, covalent, 25:105–109
Nondestructive analysis, in fine art examination/conservation, 11:399–400
Nondestructive evaluation (NDE), 17:414–442. See also Nondestructive evaluation techniques
future of, 17:437–438
history of, 17:415
principles of, 17:415–416
recent developments in, 17:429–437
smart structures for, 11:155
standards for, 15:747–748
Nondestructive evaluation techniques, 17:415, 416–429
acoustic emission, 17:425
acoustic microscopy, 17:434–437
acousto-ultrasonics, 17:425–426
cylindrical guided wave technique for pipe inspection, 17:433–434
eddy current technique, 17:420
equipment for, 17:437, 438
Lamb wave technique for plate inspection, 17:429–433
liquid penetrant testing, 17:417
magnetic flux leakage, 17:418–420
magnetic resonance testing, 17:418
moire interferometry, 17:426–429
optical holography, 17:421
radiography, 17:417–418
thermal, 17:420–421
ultrasonic, 17:421–425
visual inspection, 17:416–417
Nondestructive hydropyroprocesses, 18:654–655
Nondestructive testing (NDT), 15:747, 748 active, 17:415–416
passive, 17:416, 425
on plastics, 19:588–589
Nonelectrolytes, critical micelle concentration and, 24:122–123
Nonemulsion paints, organic titanium compounds in, 25:121–122
Nonene, 17:725
2-Nonenoic acid, physical properties, 5:31t
Nonequilibrium heat transfer device, 13:236
Nonerodible systems, 9:58
Nonessential amino acids, 2:600
Nonessential bioactive substances, efficacy of, 17:648
Nonessential nutrients, 17:645
Noneutectoid steels, 23:278
Nonferrous alloys, vanadium in, 25:525
Nonferrous metallics, eddy-current separation of, 15:455–457
Nonferrous metallurgy niobium in, 17:145
oxygen in, 17:762
slaked lime in, 15:63
Nonferrous metal production, sulfuric acid use in, 23:590–591
Nonferrous metals electrowinning of, 16:161
recycling, 21:385–407
reduction smelting of, 16:143–144
Nonferrous shape-memory alloys, 22:342t
applications of, 22:345–352
Nonferrous systems, fatigue strengths of, 13:486
Nonflammable materials, 7:436
Non-fluoroquinolones, 21:227
Nonfree-radical polymerization, 19:835–836
Nonfuel minerals, role in the U.S. economy, 16:607
Nonglass pH electrodes, 14:24
Nonhalogenated resin systems, 20:115
Nonhalogenated solvents, 19:800
Nonhazardous waste, defined, 25:862
Nonheterocyclic compounds, pyridine ring syntheses from, 21:108–110
Nonhomologous extension modeling, in protein structure prediction, 20:837–839
Nonideal liquid mixtures, separations process synthesis for, 22:301–329, 330
Nonideal packed catalytic tubular reactors, 25:279–281
isothermal design of, 25:287–289
maximum conversion in, 25:292–293
Nonideal reactors, 25:284
Nonideal tubular reactors, homogeneous chemical reactions in, 25:280
Nonideal tubular reactor models, inclusion of interpellet axial dispersion in, 25:283–285
Noninsertion/extraction electrochromic materials, 6:573–577
Nonintegrated Two-Stage Liquefaction (NTSL), 6:841
Nonintentional food additives, 12:29
Noninteracting solvents, 23:99
Nonionic emulsifiers, in VDC emulsion polymerization, 25:722–723
Nonionic functional groups, in polymer colloids, 20:384
Nonionic latexes (latices), 19:855
Nonionic photoacid generators, 15:167–168
Nonionic polymers
introduction of ionic groups to, 14:460–461
introduction of ionic interactions to, 14:476
Nonionic surface-active agents, 10:665
Nonionic surfactant adsorption, 24:137
critical micelle concentration of, 24:122, 149
liquid dispersions made from, 19:830
product design, 5:761–762
as soap bar additives, 22:745
solubility–temperature relationship for, 24:126
types of, 24:142
Nonionic water-soluble polymers, 20:460–464
Nonisothermal gas absorption
in bubble tray absorbers, 1:86–87
in packed column absorbers, 1:58–61
in packed column absorbers with reaction, 1:76–80
Nonisothermal tubular reactor performance, 25:314–316
Nonkeratinous proteins, in wool, 26:378
Nonlaboratory environments, standards for, 15:760
Nonlauric oils/fats, in soap making, 22:732–734, 735
Nonlinear (harmonic) light generation, 14:678–680
Nonlinear chemometrics methods, 6:53–54
Nonlinear dielectrics, 11:91–92
Nonlinear fracture mechanics, 20:350
Nonlinear interaction, 14:680
Nonlinear ion traps, 15:662
Nonlinear materials, 14:680
Nonlinear optical materials, 17:442–460
advantage of, 17:448
classification of, 17:443–444
economic aspects of, 17:457–458
photorefractive materials, 17:457
second-order, 17:444–453
third-order, 17:453–457
Nonlinear optical phenomena, 17:443
Nonlinear optics
polymer methine dyes in, 20:515–516
target of crystal engineering, 8:86t
Nonlinear-PLS (NPLS), 6:53
Nonlinear refraction phenomena, 17:454
Non-Markovnikov addition, in silicone network preparation, 22:563
Nonmechanical valves, in circulating fluidized beds, 11:819
Nonmetallic centrifugal pumps, 21:76
Nonmetallic hard materials, 4:654
Nonmetallic inclusions, in magnesium, 15:342–343
Nonmetallic inorganic compounds, extraction of, 10:791
Nonmetallic (diamond-like) nitrides, 17:201–206
properties of, 17:202t
Nonmetallic oxidants, 16:570
Nonmetallics, in manganese, 15:544–545
Nonmetalloenesogens, 15:97
Nonmetals
corrosion resistance to HCl, 13:832t
fluorine reactivity with, 11:829
reactions with halogen fluorides, 13:125–126
Nonmetals analysis, of water, 26:40–41
Nonmetals, selenium and, 22:76
Nonmethane hydrocarbons (NMHC), 1:796
Nonmethylated carbonyl groups, in flax fiber, 11:598
Nonmineralized metal-grade alumina, 2:403–404
Nonnegative least squares (NNLS), 6:63
Non-Newtonian behavior
of filled networks, 22:572
of silicone fluids, 22:575
versus Newtonian behavior, 15:208–209
behavior of, 11:768
categories of, 16:690
electrorheological, 22:715
heat exchangers using, 13:268–269
measurements of, 21:725
settling in, 22:53
viscosities of, 21:734
Non-Newtonian materials, 10:10
Non-Newtonian shear thinning liquids, 16:689–690
Nonnutrient additives, in pet foods, 10:854–855
Nonnutritive sweeteners, 12:32, 38; 24:225, 226–242
acesulfame-K, 24:233–234
alitame, 24:232
aspartame, 22:266–231
blending of, 24:225–226
cyclamate, 24:236
glycyrrhizin, 24:240
neohesperidin dihydrochalcone, 24:240–241
neotame, 24:231–232
saccharin, 24:234–236
stevioside, 24:239–240
sucralose, 24:236–238
thaumatin, 24:241–242
Nonobviousness, as a patentability requirement, 18:175–176
Nonoccupational lead exposure, 14:763–764
Nonoriented steels, 23:309
Nonoxynol-9, cosmetic surfactant, 7:834t
Nonoxynol-12, cosmetic surfactant, 7:834t
Nonpetroleum-based transportation fuels, 10:59
Nonplant cost, 9:527
Nonpoint contamination source, 13:310
Nonpolar adsorbents, 1:674
for gas adsorption, 1:632
Nonpolar solvents, VDC polymer degradation in, 25:717–718
Nonporous dense membranes, 15:799
Nonporous silicone tubing, flow through, 15:722, 723
Nonprobability sampling, 26:1001
Nonproduct contact utilities, 11:45–46
Nonprotein amino acids, 2:554
Nonprotein nitrogen (NPN), 10:865
Nonquenching photoluminescence properties, 26:804–805
Nonradiative recombination, 14:837
Nonreactive additive flame retardants, 11:497
Nonreactive compatibilization, of polymer blends, 20:324–325
Nonreactive diluents, 10:429–430
Nonreactive silicones, in fiber finishing, 22:593
Nonregenerative caustic treatment, 18:661
Nonregenerative processing, of adsorbents, 1:649–650
Nonreinforcing fillers, for silicone networks, 22:570
Nonrepairable components, in reliability modeling, 26:989
Nonruminant feeds, 10:836–847
additives to, 10:846
ingredients of, 10:837–838
swine and poultry nutrient requirements, 10:838–845
Nonselective catalytic reduction (NSCR), 10:101–102; 17:184; 19:626
Nonselective herbicides, 13:313
Nonselective poisoning, 5:258
Nonself-aligned (NSA) HBT fabrication, 22:167
Nonself-aligned (NSA) FET fabrication, 22:162–163. See also Field effect transistors (FETs)
Non-SI (unacceptable and obsolete) units, 1:xxiv–xxv; 2–26:xxii–xxiii
Nonsilicate crystals, glass-ceramics based on, 12:641–642
Non solvent bath oleum sulfonation process, 23:542
Non solvent bath, polymer precipitation by immersion in, 15:808–811
Nonspecific elution, in affinity chromatography, 6:398, 399
Nonstationary Poisson process, in reliability modeling, 26:989
Non-steady-state conduction, 9:105
Nonsteroidal antiinflammatory agents/drugs (NSAIDs); 21:231
for Alzheimer’s disease, 2:820
for cancer prevention, 2:826
Nonsulfide collectors, 16:649
Nonsulfide flotation, 16:649–650
Nonsulfide mineral flotation collectors used in, 16:648–649t
modifiers used in, 16:650, 651t
Nonsulfide ores, 16:598, 624
Non-sulfur burning plants, 23:778
Nonthermoplastic linear polymers, 20:400
Non-toxic chlorofluorocarbons, 24:188
Nontronite (iron smectite), 6:664, 696
structure and composition, 6:669
Nonuniqueness, 24:446
Non-vessel operating common carriers (NVOCC), 25:328
Nonvolatile compounds, as taste substances, 11:566
Nonvolatile food components, 11:522–523
Nonvolatile memory (NVM), silicon-based semiconductors in, 22:257–258
Nonvolatile methylene chloride extract (NVMCE), 23:158
Non-Watson-Crick base pairs, 17:614, 616
Nonwood fibers, 21:16–20
characteristics and chemical composition of, 21:18–20
dimensions of, 21:19t
major sources of, 21:17–18
Nonwoods, hemicelluloses in, 21:10
Nonwoven abrasives, 1:2, 16–17
Nonwoven binders, vinyl acetate polymers in, 25:585
Nonwoven cards, 17:499–500
Nonwoven fabrics, See also Nonwoven materials; Nonwovens; Nonwoven textile materials
global demand for, 17:483t
spunbonded, 17:460–494
staple-fiber, 17:495–518
Nonwoven finishing processes, 17:512
Nonwoven manufacturing, cotton, 8:18
Nonwoven materials, 24:620. See also Nonwoven fabrics
Nonwoven processes, 17:496–497
Nonwovens. See also Nonwoven fabrics
air-laid, 17:503
defined, 17:495–496
foam-bonded, 17:510
needled, 17:506, 507
thermal-bonded, 17:511–512
Nonwoven textile materials, 11:178–180
4-Nonylphenol (PNP), 2:225–226
health and safety data, 2:220t
physical properties of, 2:205t
Nonyl phenol, 10:429
8-Nonynoic acid, 5:34t
No observable adverse effect level (NOAEL), 25:228, 235–236
values at, 23:113
No observed effect level (NOEL), 18:548
of aquatic toxicity, 25:887
Noodle washing, 19:184–185
Nootkatone, 24:549
Nopol, 24:497
2-Nor-2-formylpyridoxal 5'-phosphate, hemoglobin modifier, 4:118–119
Noranda magnesium manufacturing process, 15:338
Noranda submerged tuyere process, 16:146
Noranda sulfur recovery process, 23:575
NOR arrays, 22:258
Norbornene, copolymerization with benzvalene, 7:515
Norbornene derivatives, polymerization of, 26:945
Norbornene–ethene copolymer, 16:113
Norbornene–ethylene copolymers, 20:433
physical properties of, 20:420–422
Norbornenodiazetine derivatives, 13:306
Nordel IP (metallocene), 7:637
Nordihydroguaiaretic acid, antioxidant useful in cosmetics, 7:830t
Nordstrandite, 2:421, 425
activation, 2:394
classification, 2:422
decomposition sequence, 2:392
from gelatinous boehmite, 2:427
structural properties of, 2:423t
NO-reduction reactions, TWC catalyst, 10:49
Norepinephrine, 3:87
Norfloxacain, 21:223
bacterial resistance mechanisms, 3:32t
year of disclosure or market introduction, 3:6t
Norflurazon, 13:322
Nori (laver), common and scientific names, 3:188t
Norit, 4:741
Norlaudanosoline, 2:87
Normal coarse grade Bayer alumina hydrate, 2:428
properties of commercial, 2:429t
Normal coordination compounds, 7:573
Normal distribution, 26:1020, 1021
Normal ferroelectrics, properties of, 11:105t
Normal headers, 13:271
Normal hydrogen, 13:761
Normal hydrogen electrode (NHE), 9:571
Normalization, in impact assessment, 14:820–821
Normalized frequency, 11:132
Normalized mechanical properties, of fibers, 11:182
Normalizing, of steel, 23:287–288
Normal mapping, 10:341
Normal paraffins, catalytic dehydrogenation of, 17:723–724
Normal phase liquid chromatography, 4:624
Normal quicklime hydration process, 15:54–55
Normal quicklime slaking process, 15:55–56
Normal spinels, 11:60
Normal stress (Weissenberg effect), 21:724
Normiflo, 4:95t
Normodyne, molecular formula and structure, 5:182
Nornicotine, 2:83. See also Nicotine
Norvaline, 4:95t
Nornicotine, 2:83. See also Nicotine
Norvos, molecular formula and structure, 5:124t, 129t
Norway
aquaculture production, 3:189t
natural graphite in, 12:780
Noryl, 11:486
Noryl GTX, 10:194
Noryl resins/blends, 10:193–194
Noscapine, 2:71, 73, 89
“No-slip” boundary condition, in microfluidics, 26:963
Notation systems, 17:386
Notched Izod pendulum impact test, 19:580–581, 810
Notch sensitivity, 13:487
Notice of Allowance, for patents, 18:182
Notice of Errors, for patents, 18:183–184
Not Invented Here (N.I.H.) syndrome, 24:372
Novafil suture, 24:215
Novamyl, 10:255
Novel functionalized polythiophene, 23:708
Novel nonnucleoside reverse transcriptase (NNRT) inhibitor, 18:722
Novel reactor systems, design of, 20:742–744
Novelty, as a patentability requirement, 18:172–175
Novelty patent information searches, 18:231–233
Novobiozin
bacterial resistance mechanisms, 3:32t
registered for use in aquaculture in Japan, 3:221t
Novocamid, molecular formula and structure, 5:90t
Novolac cure, 18:771–772
DSC and DMA scans of, 18:778
Novolac epoxy resins, 10:349
Novolac resins, 15:163. See also Novolacs
in coatings, 18:782
in fiber bonding, 18:792
from phenolic resin polymerization, 18:760–761
phenolic resins in, 18:785–786
production of, 18:767
properties of, 18:761t
Novolacs, 10:6. See also Novolac resins
decomposition of, 18:772–773
high ortho, 18:761–762, 767–768
production of, 10:406
Novolak. See Novolac entries
Novoloid fibers, 18:797, 798
NO\(_x\), 10:58. See also Nitrogen oxides (NO\(_x\))
NO\(_x\) abatement, in nitric acid production, 17:183–184
NO\(_x\) control, diesel engine, 10:61. See also Nitrogen oxide (NO\(_x\)) exhaust control
NO\(_x\) emissions, 10:32, 35, 36, 46, 137
NO\(_x\) production, 13:855, 856–857
NO\(_x\) reduction catalysts, 12:430
NO\(_x\) reduction technology, post regenerator, 11:719–720
NOXSO process, 22:779
Nozzle disk centrifuge
materials of construction, 5:524
power, 5:521–522
theory of performance, 5:516
Nozzle pressure differential, 11:660
Nozzles
critical, 11:660–661
flow, 11:660
multiple, 23:197–198
selecting, 23:195
specialized, 23:197
Nozzle-to-nozzle pipe runs, 19:517
n–p diodes, in HBTs, 22:168
n-p-n bipolar junction transistors, 22:246–249
NRC safety goal, 17:540–541. See also U.S. Nuclear Regulatory Commission (NRC)
n-region, 23:36–37
NRRL 3382, 20:136
NRTL model, 8:745
N-substituted-1-amino-4-hydroxyanthraquinones, 9:327
N-substituted phenothiazine reactions, 13:444
N-sulfonylimine synthesis, microwaves in, 16:565
NTC-thermistors, 24:450
N-tert-butoxycarbonyl (Nboc) group cleavage, microwaves in, 16:559
NTO, 10:737
n-type dopants
in ion implantation, 22:185, 187–188
for MOCVD, 22:150t, 157–158
in silicon, 22:485, 486, 487
n-type doping
in HBTs, 22:168–169
in photocatalysis, 19:83
n-type emitters, in HBTs, 22:166
n-type FET devices, 22:164. See also Field effect transistors (FETs)
n-type high temperature superconductors, 23:838
n-type MOSFET (NFET, NMOSFET). See also Field effect transistors (FETs)
in CMOS logic circuits, 22:251–253
long-channel behavior of, 22:249–251
scaling to deep submicron dimensions, 22:255–256
n-type regions, in photovoltaic devices, 22:220
n-type semiconductors, 22:236–237
antimony-doped, 3:53–54
n-type (negative) silicon, 23:35
n-type silicon carbide semiconductors, 22:530
Nucleants, in polyamide plastic manufacture, 19:784
Nuclear accident scenarios, direct contact heat transfer in, 13:268
Nuclear age, 25:391
Nuclear applications
hafnium, 13:89
nitrides in, 17:219
Nuclear/atomic processes, 21:306–309
Nuclear capacities, regional, 17:567t
Nuclear chain reaction, modeling, 17:563
Nuclear collisions, energy loss from, 14:430–431
Nuclear criticality, preventing, 17:547
Nuclear cycle, water treatment issues in, 23:235–236
Nuclear decay, 21:290–291
exotic modes of, 21:305–306
modes of, 21:295–306
Nuclear energy, uranium as a source of, 25:420
Nuclear energy for propulsion of aircraft (NEPA) program, 17:589–590
Nuclear Energy Institute (NEI), 17:598
Nuclear Energy Research Initiative (NERI), 13:847
636 NOVOLACS
Nuclear power facilities, reactor types in, 24:758–759
Nuclear fuel applications, thorium in, 24:756
Nuclear fuel cycle, 17:545–547
  safety principles and, 17:546–547
Nuclear fuel reprocessing, 10:789–790
Nuclear fuel reserves, 17:518–530
  alternative sources of, 17:527
  economic aspects of, 17:526–527
  toxicology of uranium, 17:528–529
  uranium mineral resources, 17:518–521, 522–525
  uranium production, 17:525–526
  uranium reserves, 17:521–522
Nuclear generating units, licensed, 17:566
Nuclear graphites, properties of, 12:744t
Nuclear hazards, protection against, 19:702
Nuclear industry, hydrogen fluoride in, 14:19
Nuclear ion stopping, 14:433
Nuclear localization signal (NLS), 26:451
Nuclear magnetic resonance (nmr) spectroscopy
  for melamine resin analysis, 15:788–789
  polymer analyses using, 11:196;
  19:565–566
  silica surface chemistry and, 22:372–373
  of silicate solutions, 22:457–458
  of silicones, 22:599t
  in wax analysis, 26:225
Nuclear magnetic resonance detectors, liquid chromatography, 6:450
Nuclear magnetic resonance spectroscopy
  high pressure, 13:430, 431–435
  in hydrogen determination, 13:791
  polysaccharide analysis using, 20:550
  in protein structure determination, 20:836
Nuclear magnetic resonance systems, electromagnets for, 23:857–861
Nuclear metallurgy, 16:127
Nuclear Nonproliferation Act of 1978, 17:550
Nuclear particle detectors, hydrogenated amorphous silicon in, 22:135
Nuclear power, 6:813
  hydrogen production using, 13:847–849
  usage for energy in U.S., 6:744t
Nuclear power facilities, reactor types in, 17:542–545. See also Nuclear power facility safety; Nuclear reactors
Nuclear power facility safety, 17:531–561
  assessment of, 17:538–542
  basic principles of, 17:533–536
  characteristics of, 17:542–551
  design of, 17:536–542
  first barrier in, 17:536–537
  fourth barrier in, 17:538
  future of, 17:554–557
  operational, 17:538
  radiation exposure and health standards, 17:551–554
  second barrier in, 17:537
  third barrier in, 17:537–538
Nuclear power plants
  krypton and xenon from, 17:362
  physical barriers and levels of protection in, 17:534–536
  treatment of radioactive waste from, 25:853
Nuclear power units, worldwide, 17:532t
Nuclear properties, of rare earths, 14:652
Nuclear radiation effects, lubrication and, 15:254–255
Nuclear reactor applications, artificial graphite in, 12:741–744
Nuclear reactor control rods, indium in, 14:195
Nuclear reactor fuel, 25:851. See also Spent radioactive fuel
  uranium isotopes suitable for, 25:420
Nuclear reactors, 17:561–602
  advanced, 13:848; 17:594–595
  aircraft, 17:589–590
  behavior analysis of, 17:563–564
  boiling water, 17:578–582
  classification of, 17:567–568
  components of, 17:568–569
  design of, 17:562–566
  development of, 17:561–562, 562–563
  environmental aspects of, 17:598–599
  evolutionary designs of, 17:554–557
  fast-breeder, 17:585–588
  first, 17:570
  graphite use in, 12:741–744; 17:569–573
  homogeneous aqueous reactors, 17:589
  maritime, 17:591
  minimum ingredients of, 17:562
  natural, 17:589; 25:397
  naval, 17:590–591
  noble gases in, 17:375–376
  package power, 17:591
  power generation by, 17:566–567
pressurized water, 17:573–578
research and training, 17:593–594
safety of, 17:596–597
silicon carbide in, 22:541
space, 17:591–592
Nuclear Regulatory Commission (NRC) regulations, 21:279. See also U.S. Nuclear Regulatory Commission (NRC)
Nuclear rocket, solid-core, 17:592
Nuclear standards, 15:767
Nuclear states, theoretical wave functions for, 21:299
Nuclear steam cycles, 23:234–236
Nuclear steam generators, 23:217
Nuclear transfer, embryo cloning by, 12:451–452
Nuclear turbines, 23:229
erosion-corrosion in, 23:244
Nuclear waste disposal, glasses for, 12:616
on radioactive waste storage, 25:855
Nuclear weapons, cost of building, 19:686
Nuclear weighing, 26:236
Nucleases, 17:628
Nucleation, 8:95
glass, 12:627–628
kinetics, 8:103–107
Nucleation sites, in ferrosilicon, 22:516
Nucleation track membranes, 15:802
Nucleic acid bases, recognition of, 16:794
Nucleic Acid Database (NDB), 17:606
Nucleic acid probe assays, 16:380. See also DNA analysis
Nucleic acid probes, 14:153
Nucleic acids, 17:602–643; 20:444–447. See also Deoxyribonucleic acid (DNA); Ribonucleic acid (RNA)
DNA structure, 17:603–613
future of, 17:639
modified oligonucleotides, 17:626–637
in molecular device design, 17:638–639
oligonucleotides and nanotechnology, 17:637–639
oligonucleotide synthesis/applications, 17:621–626
peptide, 17:631–634
RNA structure and function, 17:613–621
synthesis of, 20:447
in yeast, 26:474
Nucleic acid transfer, 9:755–756
Nucleophiles, VDC polymer degradation and, 25:718. See also Nucleophilic agents
Nucleophilic addition to maleic anhydride, 15:493–494
with methacrylic acid/derivatives, 16:236–237
Nucleophilic agents, in VDC polymer stabilization, 25:720
Nucleophilic aromatic substitution, 9:268–269
Nucleophilic aromatic substitution, 26:897
Nucleophilic attack, at carbon or hydrogen, 21:98–100
Nucleophilic catalysts, 10:420
Nucleophilic reagents, 10:389
Nucleophilic substitution in benzene, 3:601
in 1,2-dichloroethane, 6:255
in fullerences, 12:248
of quinones, 21:261–262
during pulp bleaching, 21:35–38
Nucleosomes, 17:611–612, 613
Nucleotide biosynthesis inhibitors, 13:300–302
Nucleotides, from fine chemical industry, 11:444
Nucleotide sequence, 12:509
Nucleus, 21:289–290
Nuclides, reaction with monomers, 14:248
NuDat database, 21:314
Nukiyama-Tanasawa function, 23:185
Null-background techniques, in infrared spectroscopy, 23:139–140
Number-average molecular weight, 20:101
of polymers, 11:195, 196
Number density, of droplets, 23:187
Number of gas-phase transfer units (N_G), packed column absorbers, 1:51
Number of overall gas-phase transfer units (N_OG), packed column absorbers, 1:52
Number of transfer units (N_T, NTU), 10:761
packed column absorbers, 1:53
Numerical analysis, 7:491–500
Numerical aperture (NA), 11:131
Numerical simulations, of foam structure, 12:11
Nusselt number, 11:746, 809; 13:246; 25:290
Nutating disk meters, 11:655
Nutmeg, 23:155, 168
Nutraceutical activities, classification of, 17:647
Nutraceuticals, 12:61; 17:643–683
efficacy of, 17:647–649
future trends in, 17:674
health benefits of, 17:645–649
identification of, 17:646–647
market for, 17:673–674
product classes of, 17:649–673
safety of, 17:647
vitamins as, 17:649–655
NutraSweet, 24:226, 229
Nutrient feeding, for fermentation, 11:39
Nutrient Profiles (AAFCO), 10:857, 858–859t
Nutrients
in bioremediation design considerations, 25:841
as food additives, 12:67–70
nonessential, 17:645
in yeasts, 26:455
Nutrient supplement, 12:32
Nutrition
amino acid requirements, 2:600–601
and chromium(III) compounds, 6:548–550
mammalian cells in cell culture, 5:347–348
past and current trends in, 17:644–645
role of zinc in, 26:616
salt in, 22:815–817
selenium in, 22:101–102
Nutritional value of cereal grains, 26:289–290
Nutrition and Labeling Act (NLEA), 23:470
Nutrition labeling, 25:784, 786t
Nutritive ingredients, in pet foods, 10:851–854
Nutritive sweeteners, 24:224
Nutritive sweeteners, 12:32, 38
Nutsche filter, 11:350–351, 352
Nutshells, as biomass, 3:684
Nutter ring, 8:770
N-vinylpyrrolidinone (NVP) monomer, 20:464
Nylon. See also Nylons
advanced material, 1:693
applications for, 19:765–766
dyeability of, 19:758–760
dyeing, 9:188–189, 190–191
effect of clay filler on properties, 6:694t
elastic properties, 5:614t
microdenier, 19:762
notch sensitivity of, 19:780
polymerization of, 19:782
reactive dyes for, 9:469–470
solvolysis and reactivity of, 19:746
Nylon-3, 1:292
Nylon-4, 19:764
Nylon-4,6, 19:764
Nylon-6, 1:558; 19:739; 20:391
electrical properties of, 19:745
good barrier-to-permanent gases, 3:384, 385–386
manufacture of, 19:748–749
permeability to selected permanent gases, 3:381t
photolytic properties of, 19:746–747
powder coatings, 7:39
preparation of, 19:747–748
properties of, 19:740–747
temperature properties of, 19:744
thermal properties of, 19:776–777
water-vapor transmission rate, 3:387t
Nylon-6,6, 19:739
base-dyeable, 19:759
effect of additives on, 19:779t
from adipic acid, 1:553, 574
good barrier-to-permanent gases, 3:384, 385–386
manufacture of, 19:748–749
photolytic properties of, 19:746–747
polymerization of, 19:782
powder coatings, 7:39
preparation of, 19:748
properties of, 19:740–747
solid-state polymerization of, 19:783
temperature properties of, 19:744–745
water-vapor transmission rate, 3:387t
Nylon-6,6 fibers, 1:574
modified, 19:760–764
Nylon-6,6 resins, 1:574
Nylon-6,12, 19:764
Nylon-6 fibers, modified, 19:760–764
Nylon-11
powder coatings, 7:39
water-vapor transmission rate, 3:387t
Nylon-12
effect of additives on, 19:779t
powder coatings, 7:39
water-vapor transmission rate, 3:387t
Oatmeal, function as ingredient in

Oatmoss, in perfumes,

Oak Ridge Laboratory, bioengineering

Oak Ridge electromagnetic separation

O3.

Nylons,

Nylon-MXD6

good barrier-to-permanent gases, 3:384, 386
permeability to selected permanent
gases, 3:381t

Nylons, 19:739, 764. See also Nylon

blow molding of, 19:790–791
electrical properties of, 19:777–778
manufacture of, 19:783–787
mechanical properties of, 19:779–781
polycondensation to form, 20:390
processing of, 19:787–791
properties of, 19:773–774t
semicrystalline, 19:775
time-dependent properties of, 19:781

Nylon stabilization, 14:370

Nylon staple, 19:747

Nylon yarn, melt spin-draw processes for,

19:752

O2 carry-over, in Claus converters,

23:610–611. See also Oxygen entries

O2 sensor, OBD-II, 10:58

O2 tension, nitrogen fixation regulation
and, 17:310. See also Oxygen entries

O3. See Ozone entries

O-acylation, 9:282

Oakmoss, in perfumes, 18:369

Oak Ridge electromagnetic separation

plant, 25:415–416

Oak Ridge Laboratory, bioengineering

research program, 1:702

O-alkylation, 9:279–280

Oatmeal, function as ingredient in

cosmetics, 7:829t

Obesity, 3:88t. See also Antiobesity drugs

medical and economic aspects, 3:87–89
role of sugar in, 23:478

Objective lens, 16:470

Oblique flow headers, 13:271

Obscurants, 5:814, 828

Observations, in toxicology studies, 25:216

Obsidian, chemical analysis of

archaeological materials, 5:744–745

Obsolete products, recycling, 21:361

Obsolete scrap, 21:413

Occasional loads, piping system design for,

19:482–484

Oclusive agents, cosmetically useful lipids,

7:833t

Occupational argyria, 22:682

Occupational exposure

to hydrazine, 13:591
to lead, 14:764
to lindane, 13:146–147
to PCBs, 13:141

pesticide registration requirements for,

18:549–550

variability of, 14:214

Occupational exposure indicators, for

solvents, 23:114–115

Occupational exposure standards (UK),

15:74

Occupational health hazards, steel-related,

23:311–313

Occupational radiation exposure, at

nuclear power facilities, 17:552–553

Occupational Safety and Health

Administration (OSHA), 21:568.

See also OSHA entries

anthropogenic silicas and silicates and,

22:467

hazardous chemical regulations, 13:154

permissible levels for cadmium

compounds, 19:413

Occupational Safety and Health Act

(OSHA), 21:568, 592–593, 828–829

ink regulation under, 14:332

Occupational solvent neuro-toxicity (OSN),

23:119

Ocean basins

consolidated deposits in, 17:693–694

unconsolidated deposits in, 17:689–691

Ocean bill of lading, 25:330

Oceanic residence times, 26:20

Oceanic systems, role of weathering in

geochemical processes in, 26:7. See also

Marine entries
Oceanic zooplankton species, wax esters in, 26:204–205
Ocean ranching, 3:198
Ocean raw materials, 17:684–699
consolidated deposits of, 17:691–694
economic aspects of, 17:697
fluid deposits of, 17:694–695
minerals recovery from, 17:695–697
unconsolidated deposits of, 17:686–691
Ocean resources, global, 17:684–686
Oceans, selenium content of,
Ocean thermal energy conversion (OTEC)
power plants, 13:267, 268; 26:92–93
Ocean transportation, 25:328
Ochratoxin A, 7:267–268
Ochre (mineral hematite)
color, 7:333
pigment used in makeups, 7:836
Ochterlony double diffusion test, 12:103
Ocimeses, 24:490–491, 495
β-Octaalkylporphyrins, 14:552
Octabromo-1-phenyl-1,3,3,-trimethylindan,
11:467
Octabromodiphenyl ether, physical properties of, 4.355t
Octabromodiphenyl oxide, 11:455
Octachlorocyclotetraphosphazene, 19:55
Octacosanoic acid, physical properties, 5:30t
Octacyanide ion, 17:26
Octacyanotungstate(IV), 7:578t
5,6-Octadecadienoic acid, physical properties, 5:33t
cis-9,cis-12-Octadecadienoic acid, physical properties, 5:33t
trans-9,trans-12-Octadecadienoic acid, physical properties, 5:33t
Octadecanoic acid, physical properties, 5:29t
1-Octadecanol, physical properties of, 2:3t
n-Octadecanol
thermal, flammable, and critical properties of, 2:4t
toxicological properties of, 2:7t
4,8,12,15-Octadecatetraenoic acid, physical properties, 5:33t
cis-9,trans-11,trans-13,cis-15-Octadecatetraenoic acid, physical properties, 5:33t
trans-9,trans-11,trans-13,trans-15-Octadecatetraenoic acid, physical properties, 5:33t
cis-9,cis-11,trans-13-Octadecatrienoic acid, physical properties, 5:33t
cis-9,cis-12,cis-15-Octadecatrienoic acid, physical properties, 5:33t
cis-9,trans-11,trans-13-Octadecatrienoic acid, physical properties, 5:33t
trans-9,trans-11,trans-13-Octadecatrienoic acid, physical properties, 5:33t
trans-9,trans-12,trans-15-Octadecatrienoic acid, physical properties, 5:33t
9-Octadecen-1-ol, physical properties of, 2:3t
1-Octadecen-9-ylamine. See Oleylamine
17-Octadecene-9, 11-dionaioic acid (isanic, erythrogenic), 5:34t
trans-11-Octadecene-9-ynoic acid (ximenynic), 5:34t
cis-6-Octadecenoic acid, physical properties, 5:31t
cis-9-Octadecenoic acid, physical properties, 5:31t
cis-11-Octadecenoic acid, physical properties, 5:31t
trans-6-Octadecenoic acid, physical properties, 5:31t
trans-9-Octadecenoic acid, physical properties, 5:31t
trans-11-Octadecenoic acid, physical properties, 5:31t
cis-9-Octadecenol. See Oleyl alcohol
1-Octadecylamine. See also Stearamine
Octadecyl chloroformate, molecular formula, 6:291t
6-Octadecynoic acid (tariric), 5:34t
9-Octadecynoic acid (stearolc), 5:34t
Octahalodirhenates, piezochromic materials, 6:610–611
Octahedral geometry, for metal coordination numbers, 7:574, 575t
Octahedral structure, of ferroelectric crystals, 11:94–96, 98
Octaheteroglycan, classification by structure, 4.723t
Octahydrotriborate(1–), 4:185
Octamolybdate, 17:21
Octanal, physical properties of, 2:61t
Octane, 12:390
spontaneous ignition temperature, 7:438t
blending behavior of, 12:412–413
measuring, 12:392–395
Ocean raw materials, 17:684–699
consolidated deposits of, 17:691–694
economic aspects of, 17:697
fluid deposits of, 17:694–695
minerals recovery from, 17:695–697
unconsolidated deposits of, 17:686–691
Octane, 12:390
spontaneous ignition temperature, 7:438t
blending behavior of, 12:412–413
measuring, 12:392–395
n-OCTANE, DIFFUSION COEFFICIENT IN AIR AT 0°C

optimum level of, 12:395
of refinery blends, 12:411–412

n-Octane, diffusion coefficient in air at 0°C, 1:70t
Octane blending debit/bonus, 12:411
Octane number, 18:665
Octane number requirement (ONR), 12:392, 393–394
Octane requirement increase (ORI), 12:395
Octanitrocubane (ONC), 10:742
Octanoic acid, physical properties, 5:29t
Octanol, properties of commercial, 2:12t
1-Octanol, physical properties of, 2:3t
n-Octanol
 list pricing, 2:9t
 thermal, flammable, and critical properties of, 2:4t
Octanol-water partition coefficient, 13:310; 17:83
predicted by molecular simulations, 26:1036
3-Octanone, permeation in selected barrier polymers, 3:389t
Octavite, 4:507
Octenar aromatic recovery process, 25:169
2-Octenoic acid, physical properties, 5:31t
Octcrylene, cosmetic uv absorber, 7:846t
Octogen, 10:735–736
Octopolar materials, 17:453
Octyl bromide, physical properties of, 4:351t
2-Octyl chloroformate, molecular formula, 6:291t
Octyl dimethyl PABA, cosmetic uv absorber, 7:846t
Octyl dodecanol, in cosmetic molded sticks, 7:840t
Octylhexaoxyethylene glycol, monoether micellization of, 24:131t
Octyl methoxycinnamate cosmetic uv absorber, 7:846t
function as ingredient in cosmetics, 7:829t
4-tert-Octylphenol (PTOP), 2:226–228
health and safety data, 2:220t
physical properties of, 2:205t
Octyl salicylate, cosmetic uv absorber, 7:846t
Octyl stearate, function as ingredient in cosmetics, 7:829t
Octyl thiocyanate synthesis/isomerization, microwaves in, 16:566
Octyltriethoxysilane, as silylating agent, 22:697
Octyltrimethoxysilane, as silylating agent, 22:697
7-Octynoic acid, 5:34t
Ocular drug delivery, 9:50
Ocular infections, sulfonamides for, 23:499
ODA/PPTA fibers, uses for, 19:734–735
Oddy test, in fine art examination/conservation, 11:409
O-dealkylation, 9:441
Odometric titration method, 14:59
Odontalag, molecular formula and structure, 5:91t
Odor from landfills, 25:880
molecular structure and, 11:567
physiology of, 11:566–569
variations in, 11:567
Odor activity value (OAV), 11:519
Odor analysis, of water, 26:36
Odor control, 26:721–725
methods for, 26:724–725
in municipal water treatments, 26:123–124
ozone use in, 17:809
Odor detection-threshold values, 11:567–569
Odor evaluation, in perfumes, 18:379
Odor impacts, air pollution dispersion modeling for, 26:725
Odorous compounds controlling, 10:75
in wastewater, 26:723t
Odor panels, 26:724
Odor pollution, 26:669
Odor removal, adsorbents for, 1:611
Odors
 adaptation to, 18:355–356
“concentration” of, 26:722–724
detection thresholds for, 26:722
dynamic dilution methods for, 26:724
gas purification, 1:618t
indoor air pollution, 1:817
measurement of, 26:722–724
recognition threshold for, 26:722
static dilution methods for, 26:724
terms used to describe, 3:227–229t
OECD chemicals program, 24:186
Off-gases, blast furnace, 14:507–508
Oil drilling, 11:250
Oil-field chemicals, microencapsulated, 16:460
Oilfield drilling fluids, organic titanium compounds in, 25:133
Oilfield emulsions, colloid, 7:274t
Oilfield hydraulic fracturing fluids, organic titanium compounds in, 25:133
Oil fields, lithium in, 15:124
Oil-field waters, lithium-bearing, 15:128
Oil filters, phenolic resins in, 18:790
Oil-furnace blacks, 4:762
manufacture, 4:780–785
Oil gas, 6:787
Oil gels, blends with styrenic block copolymers, 24:715
Oil in water dispersions, 22:725
Oil-in-water (O/W) emulsions, 11:551; 24:155
Oil of benzaldehyde, 3:594
Oil paint, degradation of, 11:415
Oil pipeline, costs vs. size for, 19:473t
Oil Pollution Act (OPA) of 1990, 21:583
Oil prices, increase in, 18:612
Oil production nitrogen in, 17:287
patterns, 24:255–258
Oil reclaiming, 21:420. See also Oil recovery; Oil recycling technology for, 21:424–425
Oil recovery. See Petroleum recovery anthropogenic silicas and silicates in, 22:472
chemical surfactant tertiary, 23:530
defoamer applications, 8:248
dispersant applications, 8:689
emulsion use in, 10:131
fluid injection rate and, 18:614
foams in, 12:22–23
mechanisms of, 18:613–630
organic titanium compounds in, 25:133–134
Oil recyclers, categories of, 21:421
Oil recycling, 21:419–430
characteristics of used oils, 21:421–423
definitions related to, 21:420
regulations and specifications for, 21:427
technology in, 21:423–425
Oil refinery, schematic diagram of, 20:761
Oil refinery feedstocks, petroleum sulfonates from, 23:531
Oil refining, 24:254
- hydrogen integration in, 20:74S–746
- sulfur dioxide in, 23:668

Oil refining states, major, 24:255
- Oil reprocessing, 21:420
  - technology for, 21:423–424
- Oil-refining, 21:420
  - technologies for, 21:425

Oil reserves, international, 18:597t

Oil reservoirs, 18:612–613
- primary production in, 18:613
- waterflooding of, 18:613

Oil resources, estimated, 18:606t

Oils, See also Crude oil(s); Fats and fatty oils; Liquid oils
- activated carbon application, 4:753
- alkyds from, 2:161–164
- bleaching, 4:73; 10:808–809
- citric acid in, 6:646
- classification by body part and use, 7:842t
- corn, 26:289
  - in cosmetic molded sticks, 7:840t
- cyclic ketones in, 14:592
- degumming and dewaxing of, 10:807
- enzymatic modification of, 10:306
- estimated maximum oxygen tolerance, 3:381t
- ethoxylated, 24:150
- fatty acid manufacture from, 5:46–53
  - as feedstock, 24:254–255
- furnaces for firing, 7:467
- higher alcohol manufacture from, 2:12–19
- hydrogenation of, 13:798
  - in insect control, 14:341
- interesterification of, 10:811–813
- lubricating, 15:226–240
- mechanical pressing of, 10:817–818
- in microfluidics, 26:968
- miscellaneous uses of, 10:831–832
- packaging, 18:34
  - in pet foods, 10:853
- phospholipid content of, 10:804
- physical fractionation of, 10:813–814
- production of, 10:818
- quaternary ammonium compounds from, 2:741
- radiation tolerance limits of, 15:255t
- rancidity of, 10:825
- refining, 10:807–808
- removal of odors from, 10:814
  - renewable, 12:812
  - saponification of, 22:736–741
  - in soap making, 22:732–734, 735–736
  - specifications for, 10:825
  - surfactants and, 22:724–725
  - typical composition of selected, 5:56t
- Oilseed meals, 10:852
- Oil separators, in refrigeration systems, 21:539
- Oil-soluble azo dyes, 9:420–421
- Oil soluble sulfonates, 23:530
  - recent developments in, 23:534
- Oil–water separation, 22:68
  - in hazardous waste management, 25:818–819
- Oil-well acidizing, use of aqueous hydrochloric acid in, 13:834
- Oil well cement retarders, lignosulfonates
  - as, 15:18
- Oil-well cements, 5:493, 500t, 502
  - U.S. shipments, 5:498t
- Oil wells, cyclic steam stimulation of, 18:619
- Oil-wet reservoirs, 18:614
- Oily-soil detergency, 8:433–437
- Ointments, ophthalmic, 18:617
- Okra gum, classification by structure, 4:723t
- OKT-3, cell culture technology product, 5:345, 346t
- Olation, of Ti–OH groups, 25:130
- Old corrugated containers (OCCs)
  - products from, 18:130
    - pulp from, 18:96
  - Old high bloomery furnace, 14:491
- Old magazine paper (OMP), 18:128
- Old newspaper (ONP), 18:128
  - pulp from, 18:95–96
- Oldshue-Rushton column, 10:778
- Oleandomycin, 15:279, 305
  - derivatives of, 15:282–285t
  - ester derivatives of, 15:281
    - registered for use in aquaculture in Japan, 3:221t
- Olefination reactions, microwaves in, 16:564
- Olefin complexes
  - palladium, 19:652
  - platinum, 19:656
Olefin conversion technology (OCT), 26:937–939
Olefin dimerization, carbometalation in, 25:118
Olefin disproportionation reactions, 26:938–939
Olefin feedsates, 18:563–564
Olefin feedstocks, 18:558–565
prices of, 18:562
Olefin fiber production, economic aspects of, 11:242–243
Olefin fibers, 11:224–246
applications of, 11:243–244
creep, stress relaxation, and elastic recovery in, 11:227–228
extrusion of, 11:231–234
hard-elastic, 11:242
high-strength, 11:241–242
manufacture and processing of, 11:231–242
properties of, 11:225–230
pulp-like, 11:241
thermal properties of, 11:229t
Olefin hydration, catalysts for, 10:539
\( \alpha \)-Olefin insertion
regioselectivity in, 16:98–99
stereoselectivity in, 16:99–102
Olefin isomerization, 25:109
Olefin metathesis, 5:217; 26:920–921, 937, 950–951
important milestones in, 26:925t
mechanism of, 26:924–926
rate of, 26:927
Olefin metathesis technology, in polymer synthesis, 26:944–948
Olefin oligomerization, 16:111
Olefin oxides, alkanolamines from (with ammonia), 2:122–140
Olefin polymerization, organic titanium compounds in, 25:122
Olefin(ic) polymers, 17:699–709
ethylene–propylene elastomers, 17:705–707
higher olefin polymers and cycloolefin polymers, 17:707–708
in spunbonded nonwoven fabrics, 17:483
Olefins. See also \( \alpha \)-Olefin entriess; Higher olefins; Light olefins
addition of hydrogen chloride to, 13:821
addition reaction with, 11:863
amination, 2:547
branched, 17:724
carbometalation of, 25:117
carboxylated, 12:187
conversion into esters, 10:486
disproportionation for butylenes manufacture, 4:416–417
electron-donating, 18:446
epoxidation of, 10:349
feedstocks for higher aliphatic alcohols, 2:27–31t, 36
fluorinated, 11:866
hydroboration of, 13:645
hydroisilylation of, 22:553, 554
industrial use of, 24:254
liquid–liquid extration selectivity, 1:672, 673
living cationic homo- and copolymerization of, 14:271–272
oxidation to acetic acid, 1:126
palladium-catalyzed oxidations of, 19:653
in the petrochemical industry, 18:556–557
polarity relative selected molecules, 8:813t
polymerization and copolymerization of, 16:112–113
polymerization of, 12:188; 24:170
predicted deviations from Raoult’s law based on hydrogen-bonding interactions, 8:814t
production of, 18:559t; 26:937–944
PVC copolymerization with, 25:670, 671t
quaternary ammonium compounds from, 2:741, 771–772
reactions with carbon monoxide, 5:10
reaction with tert-butyl hydroperoxide, 18:445
recovery of light by cryogenic technology, 8:54–56
rhodium-catalyzed hydrosilation of, 19:647–648
separation from hydrocarbon-derived acetylene, 1:203
silver(I) complexes with, 22:675
sulfurized, 23:642
syntheses of, 13:571
tertiary, 10:575
\( \alpha \)-Olefins, 17:709–710
copolymerization with ethylene, 7:631
in detergents, 17:725–726
epoxidation of, 10:380
feedstocks for higher aliphatic alcohols, 2:29t, 30t
handling, 17:727
homopolymerization of, 16:110
manufacture of, 17:713–724
metathesis of, 26:923
polymerization of, 20:424
production of, 10:598
Olefins complexes, 18:557
Olefin separation, molecular sieves in, 16:841
Olefins plant separation train, 20:776
Olefins reduction, in gasoline, 11:689
α-Olefin sulfonate (AOS), 17:725–726; 23:526–527
α-Olefin sulfonates, 24:146
use in cosmetics, 7:849
Olefins Ultra, 11:695
α-Olefin waxes, polymerized, 26:221
Oleflex process, 4:417–418; 20:779; 24:272
Oleic acid, 22:728
boiling point, 5:53t
percentage in selected fats and oils, 2:519t; 5:47t
physical properties, 5:31t, 37t
in toilet soap making, 22:733t
Oleoochemistry, metathesis in, 26:943–944
Oleoressin, extraction of, 23:156
Oleoresinous phenolic varnishes, 18:783
Oleth-44, cosmetic surfactant, 7:834t
Oleum(s)
density of, 23:765
equipment and piping for, 23:782
explosive reactions of, 23:793
heat capacity of, 23:768
heats of formation of, 23:766, 767t
manufacture of, 23:778
melting points of, 23:766
properties of, 23:764–767
sulfur dioxide concentrations in, 23:792
sulfur dioxide production from, 23:661, 662
vapor pressure of, 23:766
viscosity of, 23:766
Oleum plants, 23:770
Oleum storage tanks, 23:783
Olex process, 1:673, 676t
Oleyl alcohol, 2:2
in cosmetic molded sticks, 7:840t
properties of commercial, 2:11t
Oleylamine, 2:519
melting point, 2:521t
Oleyl oleate, cosmetically useful lipid, 7:833t
Olfaction, research in, 18:383–384
Olfactory membrane, 11:567
Olfactory perceptions, 11:510–511
Olfactory receptors, 18:383–384
Olfactory response, 11:566–567
Oligo(2-propenylxyloxy)methylxyrirane, sulfonation of, 23:720
Oligocyclic lattice host inclusion compounds, 14:177–179
Oligocyclic lattice hosts, 14:177
Oligo(γ-caprolactone)dimethylacrylate, in shape-memory polymer networks, 22:364
Oligo(γ-caprolactone)diol, in shape-memory polymer networks, 22:364
Oligomer formation, 10:358–359
Oligomeric 2-chloroethyl phosphate, 11:492
Oligomeric cyclic phosphonates, 11:492
Oligomeric esters, 11:491–492
Oligomeric ethyl ethylene phosphate, 11:489
Oligomeric flame retardants, 11:470–474
Oligomeric peroxides, 18:480
Oligomeric phenolic poly-(mainly tetra-)sulfides, 23:644
Oligomeric phosphate–phosphonate, 11:497
Oligomeric products, obtaining, 16:106
Oligomeric titanates, pyrolysis of, 25:121
Oligomerization, 23:329
acetylene, 1:181
butadiene, 4:373–374
in higher olefins, 17:712
ionic liquids in, 26:885–887
olefin, 16:111
Oligomer production, in styrene polymerization, 23:379
Oligomers
brominated carbonate, 11:470
brominated epoxy, 11:470
Oligonucleotide conjugates, therapeutic uses for, 17:636
Oligonucleotide library, 12:515
Oligonucleotides, 12:513
bioconjugated, 17:634
cellular uptake of, 17:634–635
conjugated to reactive molecules, 17:636–637
crystallographic analyses of, 17:606–607
in situ synthesis of, 16:390
market for, 17:621–623
microfluidic assays of, 26:969–970
modified, 17:626–637
with modified bases, 17:633–634
with modified phosphodiester backbones, 17:628–629
with modified sugars, 17:631–632
nanotechnology and, 17:637–639
in sequencing experiments, 12:510
structure of, 17:606–607
Oligonucleotide synthesis, 17:621–626
antisense pharmaceuticals and, 17:622
Oligoribonucleotide synthesis, 17:626
Oligosaccharides, 4:697, 700–704
methanalysis of, 16:547
synthesis, 4:704
uses of, 4:714–715
Oligosilicates, 22:453t
Oligosiloxanediol, in silanol
polycondensation, 22:558
Oligotrophic conditions, defined, 3:757t
Olin Raschig process, 15:322
Olivine, 2:98
Olive oil, cosmetically useful lipid, 7:833t
Olive oil, used in silica network preparation, 22:440
Olive wax, 228
Oligomer synthesis, 17:626
Olives, 7:833
Olive press, 17:665
Olmesartan, 5:181
molecular formula and structure, 5:153t
Ol-one, 1:558
Olympus Camedia C-211 digital photo
printing camera, 19:321
Olympus Camedia P-200 Printer, 19:321
Omapatrilat, 5:159
molecular formula and structure, 5:154t
OMD leaf filter, 11:372
Omega-3 fatty acids, 2:823; 17:665–666
Omega-3 oils, 10:829
Omega-6 fatty acids, 17:665, 666
Omnidirectional DBR structures, 14:858
Omnidirectional reflectors (ODRs), 14:857–860, 861
On-board diagnostic (OBD) function, 10:38
On-board diagnostic system (OBD-II), 10:57–58
On-through boilers, water treatment in, 23:225
Once-through steam generators, 23:217
On-column injection, gas chromatography, 6:420–421
One-bath, one-stage dyeing process, 9:198
One-component system, phase equilibrium
in, 24:661–665
One-dimensional (1D) SDS capillary gel
electrophoresis (CGE), in microfluidic
assays, 26:971
One-dimensional polymers, conduction in,
22:208
One-dimensional solubility parameter,
23:89–90
One-electron oxidation reactions,
9:377–380
1/f noise, silicon-based semiconductors and,
22:237
One-part clear acrylic latex sealant
formulation, 22:42t
One-part manganese dioxide-cured
polysulfide formulation, 22:41t
One-part pigmented siliconized acrylic
latex sealant, 22:42t
One-part RTV silicones, 22:596
One-part silicone cross-linkers, 22:33t
One-part silicone sealant formulation,
22:34t
One-part solvent-releasing butyl sealant
formulation, 22:43t
One-part urethane sealants, 22:36–37
One-pass clarifier, 22:61
One-photon absorption, 17:455
One-pot oxidation polymerization, 23:713
One-stage separation plants, 15:840
One-step cameras/processors, 19:276–278
One-step Ziegler process, 17:715–718
One-way memory, of shape-memory alloys,
22:341, 345–346
One-way shape-memory alloys (SMAs),
22:712
One-way SMA devices, 22:345–346
Onion diagram, 20:734, 735
Onions, dehydrated, 23:169
O-nitration, 17:157
Onium growth retardants, 13:306
Onium salt cationic photoinitiators, 14:270
Oninium salts, 15:183
as photoinitiators, 15:165–166
in silicone network preparation, 22:568
On-line coating technologies, 12:609
On-line database patent searching,
18:239–243
subject-based retrieval parameters for,
18:240–242
On-line green chemistry materials, 12:815
On-line infringement searches, 18:234
On-line ion chromatography, 23:228
On-line novelty searches, 18:233
On-line pervaporation, 18:518
On-line probes, for fermentation, 11:39
On-line vapor permeation, 18:518
On/off feedback controllers, 20:691
Onstream analyzers, 20:682
On-tank leak detection systems, 24:311
Onyx thermal printing process, 19:321
Oocytes, retroviral infection of, 12:457
Oolitic limestone, 15:28
Opacification, colorants for ceramics, 7:344–345
Opacifiers, 19:410–411
as soap bar additives, 22:744
Opacity, 7:316. See also Opaque vitreous silica
of conductors, 22:234
of inorganic pigments, 19:380
of organic pigments, 19:429
of vitreous silica, 22:408, 411
Opal, 22:40
as colloid, 7:272t, 273t
in clays, 6:6852
Opal thermal printing process, 19:321
Opaque encapsulants, 10:3
Opaque metals, and object mode perceptions, 7:306t
Opaque nonmetals, and object mode perceptions, 7:306t
Opaque vitreous silica
density of, 22:422
viscosity of, 22:424t
OPB-9195, antiaging agent, 2:812
Open-arc furnaces, 12:298–300, 753
applications for, 12:315
electrodes in, 12:301
voltage for, 12:301–302
Open-cast quarrying, 15:33–35
Open-channel electrochromatography, in microfluidic assays, 26:970
Open-cycle air conditioning, adsorbents for, 1:612
Opened fullerenes, 12:232
Open-end spinning, cotton yarn, 8:17
Open-head drums, 18:8
Open-hearth furnace, 12:320; 21:408
Open-hearth steelmaking process,
16:150–151
Open hollow fiber membranes, 16:2, 3
Open-loop control systems, 9:56–57
Open-loop dynamics, 20:694
Open manometers, 20:646–647
Open-mold process, for unsaturated polyesters, 20:116–117
Open-mold processing, 19:558
Open-pit zinc mining, 26:557
Open reading frames (ORFs), 26:480, 481
with yeasts, 26:491–492
Open system
energy balance in, 24:646–648
rate of change of entropy in, 24:649
Open system maintenance, 14:209
Open tubular capillary liquid chromatography (OTLC), 4:620
Open-type (Karr) RPC plate, 10:779–780
Operating costs
heat exchanger, 13:259
in fine chemical production, 11:436–437
pilot-plant, 19:465–466
Operating line
bubble tray absorbers, 1:83–86
packed column absorbers, 1:48–50
Operating pressure
in ethylene oxidation, 10:650–651
PAFC, 12:218–219
SOFC, 12:226–227
Operating temperature, MCFC, 12:223
Operational data
for ammonia plant, 26:997
reliability and, 26:994
Operational modes, for ammonia plant, 26:995t
Operational performance, primary measurements of, 20:731
Operational qualification (OQ), in fine chemical production, 11:433
Operational systems, for sustainable development, 24:190
Operational testing, piping system, 19:487
Operation controls, in leak and spill prevention, 24:310
Operations, as a cause of tank spills and leaks, 24:306. See also Process operation
Operations improvement, waste minimization via, 25:884t
Ophthalmic drug delivery systems, 18:711
Ophthalmic drug dosage forms, 18:716
Ophthalmic solutions, ethylene oxide polymers in, 10:687
Opiates, economic aspects, 2:108
Opium, 2:89–90
Oposim, molecular formula and structure, 5:93t
Oppenauer oxidation, 24:506
Opponent theory, of color, 7:304
Opportunistic systematic generation strategy, 22:300
for binary systems, 22:324t
flowsheet construction and, 22:307
rules for selecting, 22:313t, 315
Opportunity fuels, defined, 6:828
Opposition patent information searches, 18:235
Optical absorption, of hydrogenated and hydrogen-free films, 17:206
Optical amplifiers, 11:145–146
Optical applications
U.S. patents in, 12:614t
of vitreous silica, 22:440–441
Optical cavities, 14:849
Optical cells, for high pressure measurements, 13:417–419
Optical coatings, cerium application, 5:685
Optical computation, 6:67–68
Optical configuration, amino acids, 2:564–565
Optical crystals, magnesium fluoride, 15:397
Optical data storage, high throughput experimentation, 7:414t
Optical density measurements, 19:221
Optical detectors, gas chromatography, 4:614–615
Optical elements, liquid crystalline materials in, 15:116–117
Optical emission spectra, 14:833–837
plutonium, 19:671–673
Optical emission spectroscopy (OES), archaeological materials, 5:742
Optical fiber(s), 13:391–392; 24:618
defects in, 11:145
drawing of, 11:141–145
fabrication of, 11:135–141
health care applications for, 13:397
overcladding of, 11:144
remote measurements using, 14:234
in sensors, 22:270–271
sol–gel processing of, 11:144–145
strength of, 11:141–145
vitreous silica in, 22:444
Optical fiber sensors, 12:614–616
Optical germanium, 12:556
transmission characteristics of, 12:559
Optical holography, in nondestructive evaluation, 17:421
Optical imaging techniques, spray-related, 23:194
Optical immunosensors, 3:803, 813
Optical industry, indium in, 14:195
Optical information storage markets, polycarbonate grades for, 19:809–810
Optical isomers, 6:72–73
Optical lens systems, in photography, 19:199
Optical lithography, in compound semiconductor processing, 22:193
Optically active citronellol, 24:506
Optically transparent porous gel–silica, 23:75, 76
Optical materials
nonlinear, 17:442–460
second-order nonlinear, 17:444–453
third-order nonlinear, 17:453–457
Optical memory, photochromic material application, 6:602
Optical microscopy, 16:467–487
history of, 16:467–469
in kinetic studies, 14:622
liquid immersion, 15:186
Optical mode density, 14:849, 850–852
Optical multichannel analyzers (OMAs), 23:143
Optical nanoimprinting, 15:193–195
Optical nonimaging techniques, spray-related, 23:193–194
Optical nonlinearity, in crystals, 11:94
Optical parametric amplifiers (OPAs), 17:452
Optical parametric oscillators (OPOs), 17:452
Optical particle counters, 18:150
Optical properties, See also Light properties
of amorphous semiconductors, 22:128–129
of compound semiconductors, 22:148, 150t
effect of crystallinity on, 20:402
energy bands and, 22:234
of filled polymers, 11:310
of germanium, 12:551t
of glass, 12:581–584
of glass-ceramics, 12:630, 642
of gold, 12:689t
of inorganic pigments, 19:379–382
of linear low density polyethylene, 20:185
of methacrylic ester polymers, 16:275–276
of organic semiconductors, 22:208–209
of poly(4-methyl-1-pentene), 20:419–420
of polyanide fibers, 19:745
of polycarbonates, 19:802, 809–810
of rare earths, 14:650–651
of regenerated cellulose fibers, 11:275
of selenium, 22:99
of silicon, 22:487–489
of silicon carbide, 22:530–531
of silk, 22:631
of silver, 22:636
of solar energy materials, 23:1–2
of Teflon PFA film, 18:335
of vitreous silica, 22:408, 430–433
Optical properties testing, on plastics, 19:585–586
Optical pumping, 14:658. See also Pumping
Optical recording, polymethylene dyes in, 20:516
Optical resolution, in microscopy, 16:471–474
Optical sorters, 16:625
Optical spectroscopy, 23:125, 128
OPTI Critical Care Analyzer, 24:55
Optics
laser-pumped dye laser, 14:704
methacrylic ester polymers in, 16:294
nonlinear, 20:515–516
selenium uses in, 22:99–101
Optimal control, sampling techniques for, 26:1046–1047
Optimal designs, 8:397–398
commercial experimental design software compared, 8:398t
Optimality gap method (OGM), optimization via, 26:1028–1029
Optim fine manufacturing process, 26:389
Optimised structure, 20:727–728
Optimization
discrete, 26:1023–1025
high throughput experimentation, 7:382t
multiobjective, 26:1033–1035, 1041
oil refinery, 20:761–762
of Pinch design, 13:201–203
of process synthesis and design, 26:1039–1041
sampling accuracy and, 26:1029
under uncertainty, 26:1025–1032
Optimization algorithms
for sampling techniques, 26:1023–1035
Optimization loop, 26:1025
Optim max manufacturing process, 26:389
OPTIM™ textile fiber, 26:388–389
Optoelectronic applications
glass in, 12:613
nitrides in, 17:221
tellurides in, 24:428
Optoelectronic imaging devices (OIDs), 23:143
Optoelectronics, 9:733; 17:442
Oral care, silica in, 22:376
Oral cleaning products, 7:851
Oral drug delivery, 9:44–46
repeat and delayed, 18:712
Oral drug release, ethylene oxide polymers in, 10:687
Oral heparin, 4:97–98
Orally administered drug dosage forms, 18:708–712
Oral pharmaceutical tablets, osmotic pressure controlled, 18:710–711
Oral presentations, 15:637
Oral toxicity
of diorganotins, 24:829, 830t
of triorganotins, 24:828–829
Orange (color)
and blackbody color, 7:327
CIE chromaticity diagram, 7:313, 315
Orange flower, in perfumes, 18:369–370
Orange lepidocrocite, 19:397
Orange peeling, 7:896
Orange pigments, 14:317
typical applications in plastics, 7:368t
typical applications of inorganic in plastics, 7:372t
typical soluble dye applications, 7:376t
Orange-red titanium acetylacetonate chelates, 25:90
Oranges, citric acid in, 6:632t
ORB1T PRINT SELECT software, 18:243
Orbitrap, 15:662–663
Orb web, structure of, 22:630
Ordered intermetallic alloys, 13:530
Order, in amorphous semiconductor structure, 22:128–129
Ordering, in ternary semiconductor alloy preparation, 22:158–159
Order of addition, in large-scale pharmaceutical synthesis, 18:728–729
Order-of-magnitude analysis, 11:745
Order-of-magnitude estimates, 9:529
Order parameters, of liquid crystalline materials, 15:82–85
Ordinary differential equation (ODE), 25:281
Ore(s), 16:128–129
dating, 21:314
defined, 16:128
dressing, 16:135
manganese, 15:540–542
mineralogy of, 16:601–603
mining costs for, 16:606–607
mining of, 16:598–600
preparation of, 16:134–136
processing of, 16:596–597
tantalum, 24:316
thorium recovery from, 24:756
tin, 24:783, 784, 791, 800
titanium, 24:845, 846t, 848t
Ore-concentrate refining, of titanium, 24:849
Ore concentration, wet magnetic drums for, 15:445–447
Ore deposits, 16:598–600
economic importance of, 16:608–609
Ore dressing, in tantalum processing, 24:317
Ore flotation, sodium sulfite in, 23:672
Oregano
Mediterranean, 23:169
Mexican, 23:169
Ore grade, 16:128
for economic processing, 16:129t
Ore leach liquors
copper recovery from, 10:790
uranium extraction from, 10:789–790
Ore minerals, 16:135
Ore minerals/deposits, lithium in, 15:122–123
Ore reserves, marine, 17:685
Ore roasting, sulfur recovery from, 23:772
Ore sorting machine, 16:625
Ore sorting methods, 16:624–626
Oretic, 5:168
molecular formula and structure, 5:161t
Orexins, target of antiobesity drugs, 3:97
Organic accelerators, in polychloroprene
curing, 19:848
Organic acids, 12:58–59; 17:394
in beer, 3:582t
conversion to alcohols, 14:116
ethylene oxide reaction with, 10:637–638
as fermentation products, 11:2–3
polarity relative selected molecules, 8:813t
Organic aerogels, 1:750–752
Organically modified layered silicate (OMLS), 20:306, 307, 308
Organic archaeological materials, 5:748–752
Organic-based drilling fluids, 9:35
Organic bases, poisons in representative reactions, 5:258t
Organic bromamines, 13:104–112
Organic bromine compounds, 4:340–362
aliphatic, 4:345–349
chemical reactions, 4:341–343
dyes and indicators, 4:361–362t, 362
flame retardants, 4:349, 354, 355–358t
industrial chemical intermediates, 4:350–353t
pesticides, 4:354, 358–359t
pharmaceuticals, 4:359–360t, 362
preparation and production, 4:343–345
Organic carbon
in hydrogen fluoride manufacture, 14:11
in industrial wastewater, 25:887t
Organic carbon analysis, of water, 26:42
Organic cations, in supramolecular chemistry, 24:43
Organic cellulose esters, 5:412–439
analysis, 5:430–434
economic aspects, 5:427–430
health and safety factors, 5:434–435
liquid crystalline, 5:418
manufacture and processing, 5:418–427
physical properties, 5:415–418, 416t, 417t
uses of, 5:435–439
Organic charge transfer complexes, 22:223
Organic chemical facilities, 24:261
Organic chemical industry economic patterns, U.S. and international, 24:263–265
Organic chemical manufacture, 24:259
conversion processes in, 24:257–258
Organic chemicals. See also Organic compounds; Organics; Organo- entries
first, 24:253
regulatory control of, 24:262–263
Organic chemistry
mechanistic, 13:439–440
of selenium and its compounds, 22:101
waste studies and, 26:299
Organic chemistry reactions
pressure and, 13:403, 412–416
rapid, 13:419–431
relaxation methods for, 13:424–429
slow, 13:416–419
Organic chloramines, 13:104–112
Organic chloride, in ethylene oxidation, 10:652
Organic-clad bentonites, 6:680
Organic coagulants, 11:642
Organic coatings for corrosion control, 7:167–189
evaluation and testing, 7:186–189
protection by intact coatings, 7:168–174
protection by nonintact coatings, 7:174–179
types, 7:179–186
Organic color pigments, for inks, 14:317
Organic compound control, in municipal water treatment, 26:125
Organic compound extraction, ionic liquids in, 26:873–875
Organic compound–hydrogen chloride systems, 13:818
Organic compound removal, with ion-exchange resins, 14:423
Organic compounds. See also Organic fluorine compounds; Organics;
organometallic compounds
addition to reaction mixtures, 16:409–411
causes of color, 7:326t, 331–332
fluorine reactivity with, 11:830–831
hydrogen chloride reaction with, 13:821
identification of, 14:239
iodination of, 21:274
nomenclature of, 17:384
odor detection thresholds of, 11:568
oxidation of, 14:65; 24:16–17
oxygen-containing, 25:436
in photographic crystal growth, 19:179
reaction of hydrochloric acid with, 13:822
reactions with halogen fluorides, 13:127
relative biodegradability of, 25:895t
of selenium, 22:76t, 77, 89–90, 94
silylation of, 22:691–692
sodium reactions with, 22:767
spectra of, 23:141
Organic contaminaants, oxidation of, 17:805–806
Organic corrosion inhibitors, 7:815–816
Organic costabilizers, for PVC polymers, 25:672
Organic crop production, 18:551
Organic cyanides. See Nitriles
Organic dissolved matter (ODM), reverse osmosis removal of, 25:890
Organic dye lasers, optically pumped, 23:144
Organic dyes/pigments, nickel compounds in, 17:124–125
Organic electrochemical processing, 9:652–685. See also Inorganic electrochemical processing
cell design, 9:653–666
commercially available cells, 9:666–670
commercial processes, 9:674–681
economic aspects, 9:671–674
product recovery, 9:670–671
Organic electrochromic materials, 6:573–577
Organic esters, 10:497–526. See also Esters
analysis, specifications, and standards for, 10:508
chemical properties of, 10:502–507
flammability of, 10:509, 510–511t
formation of, 10:530–531
health and safety factors related to, 10:509–513
as herbicides and pesticides, 10:520
as lubricating oil base stocks, 15:217–218
in medicinals, 10:519
names of, 10:497–498
occurrence and preparation of, 10:499
in perfumes, flavors, cosmetics, and soap, 10:518–519
physical properties of, 10:500–501
as plasticizers, 10:514
of PVA, 25:601
regulation of and waste from, 10:513–514
in resins, plastics, and coatings, 10:514–518
as solvents, 10:514
stability and storage of, 10:509
substitution, alkylation, and rearrangement of, 10:507
toxicity of, 10:509–513
uses of, 10:514–522
Organic extractants, 10:746
Organic fibers, synthetic, 24:614
Organic fillers, 11:302t
Organic film
  in continuous SO$_3$ single-pass
  sulfonation processes, 23:549
  “predominantly laminar,” 23:555
Organic finish removers, 18:79–84
environmental impact of, 18:84
health and safety aspects of, 18:83–84
Organic flocculants, 11:627–631
analysis of, 11:640
Organic fluorine compound production,
economic aspects of, 11:868–872
Organic fluorine compounds, 11:858–876
chemical properties and applications of,
11:866–868
health and safety factors related to,
11:872–873
history of, 11:858–859
physical properties of, 11:859–866
Organic germanium, 12:560
Organic glasses, 12:576
Organic halides
  cross-coupling of organoboranes with,
  13:651
  reactions with tin, 24:821
Organic host lattices, designed, 14:179–182
Organic-in-CO$_2$ dispersions, 24:10
Organic/inorganic coatings, 9:153
Organic–inorganic compounds, 13:533–534
Organic–inorganic hybrid supported
  catalysts, 5:337
Organic–inorganic hybrids
  prepared from polystyrene and silica-
  derived TEOS, 23:81
  sol–gel technology in, 23:80–82
  using polymers coupled with TEOS,
  23:82
  using poly(vinyl acetate), 23:81
Organic–inorganic materials, 13:535, 536,
  539, 540, 541, 542, 543, 544
Organic–inorganic polyelectrolytes, 13:543
Organic iodine compounds, 14:375–377
Organic light-emitting diodes (OLEDs),
  22:214–220
conducting polymer applications,
  7:540–541
efficiency of, 22:215, 219
emission from, 22:215, 218–219
high throughput experimentation application, 7:412
outlook for, 22:219–220
performance of, 22:214–215
stability of, 22:219
structure and operation of, 22:215–218
Organic liquid streams, in vinyl chloride
  manufacture by-product disposal,
  25:644
Organic lithium compounds, 15:121
Organic loading, in biological waste
treatment, 25:829
Organic mass spectrometry, 15:647,
  668–669
Organic material (kerogen), types of,
  18:572
Organic materials analysis, of water,
  26:42–44
Organic nickel compounds, 17:113–117
Organic nomenclature, 17:394–401
  historical account of, 17:399
Organic–organic hybrids, 13:546
Organic–organic separations, tailored
  polymeric membranes for, 18:511
Organic paint pigments, 18:57
Organic peroxide initiators
  production of, 14:281
  worldwide producers of, 14:303
Organic peroxides, 18:425–506
  acyl peroxides, 18:467–478
  alkyl peroxyesters, 18:478–487
  α-oxygen-substituted hydroperoxides
    and dialkyl peroxides, 18:448–460
  analytical and test methods for,
  18:488–489
carcinogenicity of, 18:489–490
  classes of, 14:282t
decomposition hazards of, 18:490–492
dialkyl peroxides, 18:436–448
economic aspects of, 18:488
  as free-radical initiators, 14:279–292
  handling and storage of, 18:491
  hazard classification system for, 18:492
  hazard tests for, 18:491–492
  health and safety factors related to,
  18:489–492
  hydroperoxides, 18:427–436
  manufacture and processing of,
  18:487–488
mutagenicity of, 18:490
  ozonides and ozonization, 18:460–462
  peroxyacids, 18:462–466
shipping, 18:492
10-h HLTs of, 18:493–494t
thermal activity of, 18:426
additional working properties of, 19:429–430
aminoanthraquinone pigments, 19:444–445
azo condensation pigments, 19:438
azo pigments, 19:430–431
azo reds and maroons, 19:435–437
benzimidazolone, 19:432–433
bleeding properties of, 19:428
brightness of, 19:427
color and constitution of, 19:424–425
colored, 19:417
in continuous-filament yarns, 19:757–758
copper phthalocyanines, 19:438–441
diaryl yellows, 19:433
diaryl pyrrolopyrroles, 19:441–443
Dinitraniline Orange, 19:434
dioxazines, 19:445–446
dispersibility of, 19:428–429
ecological effects of, 19:453
fastness of, 19:427–428
global demand for, 19:449t
global production of, 19:448–449
health and safety factors related to, 19:452–453
hiding power and transparency of, 19:429
innovation in, 19:454
isoindolinones and isoindolines, 19:446–447
lake pigments, 19:438
monoazo pigments, 19:431–432
monoazo yellow salts, 19:433–434
naphthol reds and maroons, 19:437–438
production and economic aspects of, 19:448–450
properties of, 19:426–430
Pyrazolone Orange, 19:435
quinacridones, 19:441
quinophthalones, 19:447
strength of, 19:426–427
synthetic, 19:418–422t
testing and standardization for, 19:450–452
types of, 19:430–447
U.S. imports of, 19:451t
uses for, 19:453–454
vat dye pigments, 19:443–444
Organic pollutants
photocatalytic removal of, 19:92–94
in photocatalytic water decontamination, 19:89–94
total mineralization of, 19:90
Organic polymer coagulants, producers of, 11:643–644t
Organic polymeric flocculating agents, mechanisms of, 11:632–633
Organic polymeric thin films, quasi phase matching in, 17:451
Organic polymers combining with TEOS, 23:82
hybrid materials based on, 13:541–544
manufactured fibers produced from, 24:616–618
self-lubricating, 15:248
toxicity of, 11:641
Organic processes, solvent extraction in, 10:787–788
Organic PV cells, 23:44
Organic pyrophosphates, 19:42
Organic reactions, microwave-accelerated solvent-free, 16:555–584
Organic reactions, sulfur in, 23:568
Organic reactions, use of thallium in, 24:635–636
Organic reagents, amine oxides, 2:473
Organic semiconductor, 22:201–229
defined, 22:201
donor and acceptor molecules in, 22:203–204, 205–206t
health and safety factors related to, 22:214
molecular structure of, 22:210–212
properties of, 22:204–210
synthesis and manufacture of, 22:212–214
theory of conduction in, 22:201–204
uses of, 22:214–225
Organic separations from aqueous streams, 21:656–661
modeling, 21:660–661
Organics. See also Organic compounds; 
Organics removal 
hydrothermal decomposition of, 
14:108–109 
market trends for, 24:264t
Organic silver complexes, 22:675
Organic solvents, 24:170 
in biotransformations, 16:412–414 
diazotizations in, 9:352 
effect of pressure on, 13:404 
exposure to, 23:119 
in fine art examination/conservation, 
11:412–413 
release into the environment, 23:109 
replacing with supercritical carbon 
dioxide, 24:15 
solubility of silicone fluids in, 22:578 
tail gas treatment in, 23:618
Organics removal 
adsorbents, 1:587t 
from wastewater, 18:521
Organic sulfur compounds, in VDC 
polymer stabilization, 25:720
Organic surfaces, detersive systems for, 
8:413t
Organic surface treatments, on titanium 
dioxide pigments, 25:26
Organic surface treatments, on titanium 
dioxide pigments, 25:26
Organic syntheses, 13:412–413 
acid and base catalysts for, 24:182 
advantages of fermentation over, 11:6 
enzymes as catalysts for, 10:307 
high pressure in, 13:438–439 
ozone use in, 17:810–811 
silylation in, 22:695–696
Organic tellurium compounds, 24:414–415, 
422 
isolated, 24:423t
Organic thermochromic materials, 6:619– 
626
Organic titanate catalysts, 25:124
Organic titanates 
associations of, 25:74 
in industrial applications, 25:120 
production and economic aspects of, 
25:82–83
Organic titanium compounds, 25:71–158 
See also Titanium compounds 
in adhesives, 25:122 
alkoxides, 25:72–86 
as catalysts, 25:122 
as coupling agents for polymer 
composites, 25:129–130 
in esterification, 25:122–126 
in glass-surface coating, 25:121 
health and safety factors related to, 
25:120 
in nonemulsion paints, 25:121–122 
organometallics, 25:105–120 
in polyestereification, 25:124–125 
as precursors to ultrafine and 
nanoparticle TiO2 and mixed-metal 
oxides, 25:130–132 
in printing inks, 25:127–128 
properties and reactions of, 25:74 
in thixotropic paints, 25:127 
titanium(IV) complexes with other 
ligands, 25:97–101 
titanium silicates, 25:102 
uses for, 25:120–135 
in vulcanizable silicone rubber, 25:129 
in water repellents, 25:122 
Organic vapor condensation, 10:151–152 
Organic (epoxy) zinc-rich primers, 10:443 
Organisation Internationale de la Vigne et 
du Vin (OIV), 26:324 
Organisation Internationale de Métrologie 
Légale (OIML), 26:238 
Organizational competitiveness, 
21:623–625 
Organizational competency, in technology 
transfer, 24:361–362 
Organizational decisions, strategic, 21:628 
Organizational sustainable development 
initiatives, 24:190–194 
Organization for Economic Cooperation 
and Development (OECD), 18:540; 
21:610 
Organization for Standardization (ISO) 
14000 standards, 9:456–457. See also 
ISO entries 
Organization of Petroleum Exporting 
Countries (OPEC), 12:386 
Organizations 
future domain of, 21:627 
impact of R&D on, 21:617–618 
Organized media effects, inclusion 
compounds in, 14:184 
Organoaluminum compounds, 2:285, 358 
Organoantimony compounds, 3:67–80 
Organoarsenic compounds, 13:298 
Organobarium compounds, as initiators, 
14:257 
Organobismuth compounds, 4:26–36 
Organoborane reactions, 13:647–664
Organoboranes. See also Chiral organoboranes
\( \alpha \)-bromination transfer in, 13:658–659
concerted reactions of, 13:661–663
cross-coupling with organic halides and triflates, 13:651
hydroboration-obtained, 13:667
oxidation reactions of, 13:648
oxidation with molecular oxygen, 13:664
reactions with acyl carbanion equivalents, 13:657–658
thermal isomerization of, 13:661
Organoborate rearrangements, 13:651–654
Organoboron polymers, 13:663–664
Organobromine compounds, 4:340–365
Organocadmium compounds, 4:516–518
Organocadmium soaps, 4:518
Organocations, 16:817
Organochlorine insecticides, 14:341–342
Organochlorines, PVC and, 25:679
Organochromium compounds, 20:153
Organoclays
quaternary ammonium compounds, 2:752
smectites application, 6:693, 697t, 698–699
Organoferric compounds, 20:115
Organofunctional silylating agents, 22:698–703
Organogallium compounds, 12:361
Organogermanium compounds, 12:554
Organogold compounds, 12:707–708
Organohalogen compounds (AOX), 26:398
Organohalogenes, in Grignard reactions, 12:824
Organolithium compounds, 15:143–148
Organolithium initiators, 14:257
Organolithium reagents, in tetraorganotin preparation, 24:812
Organomagnesium compounds, as initiators, 14:256–257
Organometallic chemical vapor deposition (OMCVD), 9:734, 735–736
Organometallic chemistry, microwaves in, 16:552. See also Organometallic reactions
Organometallic complexes
thorium, 24:770–774
uranium, 25:439–442
Organometallic compositions, use of anhydrous magnesium chloride in producing, 15:396
Organometallic compounds, 14:550–551; 25:71. See also Organometallics carbides contrasted, 4:648 as initiators, 14:256–257
iridium, 19:649–650
molybdenum(III), 17:27
osmium, 19:642–643
palladium, 19:652
platinum, 19:656–657
reaction with carbonyl groups, 10:505–506
rhodium, 19:645–646
ruthenium, 19:639
sodium in manufacture of, 22:777
titanium(IV), 25:105–120
Organometallic fullerene derivatives, 12:249–250
Organometallic ligands, attachment to titanium, 25:119
Organometallic methacrylate monomers, 16:242
Organometallic reactions, microwave-assisted, 16:581–582. See also Organometallic chemistry
Organometallic reagents, 12:829t
Organometallics, 18:447. See also Organometallic compounds in pyridine chemistry, 21:107–108
thallium, 24:633–635
Organometallic U(V) complexes, 25:441
Organometallic vapor-phase epitaxy (OMVPE), 22:152. See also Metal organic chemical vapor deposition (MOCVD)
Organometallic zirconium compounds, 26:652–657
Organometalloids, 18:447
Organomineral hydroperoxides, 18:433, 434
Organomineral peroxyxulfonic acids, 18:436, 444, 446, 448
Organomineral peroxides, 18:436, 444, 446, 448
properties of, 18:440t
Organonickel complexes, 17:115–117
Organonitriles, reactivity of, 17:228
Organophosphous acid, 18:462, 466
Organophilic clay, 9:13
Organophilic membranes, 18:510, 511
Organophosphate insecticides, 19:68–69
Organophosphate oil additives, 19:69
Organophosphate pesticides, 18:533
Organophosphates, uses of, 19:68
Organophosphate surfactants, 19:51
Organophosphinates, 19:65
Organophosphines, 19:60–66
  reactions of, 19:64–66
Organophosphorus compounds,
  11:496–497; 20:115
  in textile finishing, 11:498
  uses of, 19:68
Organophosphorus derivatives, with P–C
  bonds, 19:23–24
Organophosphorus extractants,
  14:641–642
Organophosphorus insecticides, 19:47
Organophosphorus monomers, 11:496
Organophosphorus pesticide analysis
  of water, 26:44
Organophosphorous pesticides, 19:90
Organopolyisocyanates, 25:134
Organopolysiloxane waterproofing
  compositions, 25:128
Organopotassium compounds, as initiators,
  14:255–256
Organoreactive silicons, in fiber finishing,
  22:593
Organoselenium compounds, 22:76t,
  89–90, 94
  in medicine, 22:102
Organosilane coupling agents, 21:781
Organosilanes, 13:622
Organosilane wetting agents, 11:305
Organosilicates, 11:313–314
Organosilicon, 22:547. See also Silicones
Organosilicone coating products,
  properties and applications of,
  22:590–591
Organosilicone films, plasma-polymerized,
  22:561
Organosilicones, 24:152–153
  environmental occurrences of, 22:601,
  602t
Organosiloxane oligomers, in silicone
  polymerization, 22:555–556
Organosiloxane polymers, silicone resins
  as, 22:586–590
Organosiloxanes, via hydrosilylation,
  22:552–554
Organosodium compounds, 767
  as initiators, 14:255–256
Organosodium reagents, in tetraorganotin
  preparation, 24:812
Organosolv pulping, 21:29–31
  lignins, 15:20–21
Organostannanes, 13:613
Organosulfonyl peroxides, melting points
  of, 18:472t
Organosulfur compounds, 22:89
Organotellurium compounds, 22:89
Organothallium compounds, 24:633
Organotin compounds, 24:808–831
  commercial, 24:809
  diorganotins, 24:819–824
  history of, 24:808–809
  monoorganotins, 24:824–826
  properties of, 24:809–810
  salts, 24:826–827
  tetraorganotins, 24:810–813
  with tin–tin bonds, 24:826
  toxicology of, 24:827–831
  triorganotins, 24:813–818
Organotin hydrides, 24:813
Organotin–lithium reagents, in
tetraorganotin preparation, 24:813
Organotin–magnesium reagents, in
tetraorganotin preparation, 24:813
Organotin silanolate, in silanol
  condensation, 22:566
Organotin–sodium reagents, in
tetraorganotin preparation, 24:813
Organotin stabilizers, for PVC polymers,
  25:671
Organotin trichlorides, 24:811
Organotin trihalides, physical properties
  of, 24:824t
Organotitanium(IV) biscyclopentadlenyls,
  25:113–115t
Organotitanium(IV) cyclopentadienyls,
  25:111–112t
Organotitanium compounds, of lower
  valence, 25:103t
Organo transitional metal compounds,
  20:155
Organ repair, porous hydrogels for,
  13:751
Organ systems, antiaging agents,
  2:815–825
Organ weight determinations, in toxicology
  studies, 25:216
Orgaran, 5:174
  molecular formula and structure, 5:172t
ORGSYN, 6:20
Oriental fragrances/perfumes, 18:358, 361
Orientaline, 2:89
Orientational distribution function, of liquid crystalline materials, 15:82–85
Orientation distribution function (ODF), 26:430, 431
Orientation image microscopy (OIM), 24:77
Oriented polypropylene film (OPP) food packaging, 18:42
Oriented polystyrene film, 23:408–409
Orifice mixing columns, 16:712
Orifice plates, 11:657–659; 20:680
Orifice viscometers, 21:729–730
ORIGEN code, 19:673
Orimulsion, 3:769
Orkla sulfur recovery process, 23:575
Orlistat, 3:95–96
Orlon, 11:188
Orobanche, molecular formula and structure, 5:96t
Ormentoprim registered for use in aquaculture in Canada, 3:218t
registered for use in aquaculture in Japan, 3:221t
therapeutant for aquaculture in U.S., 3:212t
Ornamentals, GA3 use in, 13:35
Ornid, molecular formula and structure, 5:96t
Ornithine, alkaloids derived from, 2:78, 79–80
Orowan bowing mechanisms, 13:502
Orphan Drug Act, 18:686
Orpiment, 3:263t
Orris, in perfumes, 18:369
Orr-Sherby-Dorn parameter, 13:478
Ortacrole, molecular formula and structure, 5:95t
Ortho alkylation, of toluenediamine, 25:191
Orthoarsenic acid, 3:264–265
Orthoboric acid, 4:242t, 249–255
Orthoclase, hardness in various scales, 1:3t
Orthocortex, in wool fibers, 11:173
Orthodontics, superelastic and pseudoelastic SMA devices in, 22:350–351
Orthoesters, 10:498
Orthoferrites, 11:56t, 57
Orthogonal matrices, 6:27
ortho-hydrogen, 13:759, 760–761
Orthokinetic flocculation, 11:631; 22:56
Orthokinetic flocculator, 22:59
Orthomyxoviruses, 3:136–137
Orthopedic devices, 3:721–735
joint replacement, 3:727–735
Orthopedic marrow needles, 3:743–744
Orthophosphoric acid, 18:815, 817–826
Orthophosphate (PO₄), in soil, 11:112
Orthophosphates, 18:830–841; 20:637
magnesium, 18:839
manufacture of, 18:853–855
Orthophosphate salts, 18:836
Orthophosphoric acid, 18:815, 817–826
condensation of, 18:826
properties of, 18:817–819
solubility of boron halides in, 4:140t
ortho-phthalic resins, 20:101, 113
formulation of, 20:102
Orthorhombic crystal system, 8:114t
Orthorhombic phosphorus pentoxide, 19:49
Orthorhombic structure, of ferroelectric crystals, 11:95, 96
Orthorhombic symmetry, 8:114t
Orthosilicate monomers, in silicate glasses, 22:453
Orthosilicic acid, 22:385
Orthosis, 3:726
Orthotelluric acid, 24:421
Orthotitanates, 25:43
ortho-Xylene, 24:275
ortho-Koksowy coal grade (Poland), 6:713t
Oryzalin, 13:319
Oscillating unbridged catalysts, 16:109
Oscillatory flowmeters, 11:667–669
Oscillatory insulin delivery, 9:71
Oscillatory temperature changes, 14:616–617
OSHA lead standard, 14:764. See also Occupational Safety and Health Administration (OSHA)
OSHA ozone exposure limits, 17:815
OSHA Permissible Exposure Level (PEL), for sulfuric acid, 23:795
OSHA regulations, for vinyl chloride, 25:650, 651
OSHA TLV toxicity standard, for organotin compounds, 24:831
Oslo crystalizer, 8:139
OSME method, 11:520–521
Osmitrol, 5:169
molecular formula and structure, 5:164t
Osmium (Os), 19:598, 601
catalytic applications of, 19:643–644
separation of, 19:608, 611, 637
supported catalyst complexes, 5:341
Osmium compounds, 19:641–644
synthesis of, 19:643
Osmium plating, 9:823
Osmium tetroxide, 19:623
Osmolarity, range for mammalian cell culture, 5:347t
Osmosis, in hazardous waste management, 25:817, 818
Osmotic diuretics, 5:169
Osmotic drug delivery systems, 9:79
Osmotic pressure controlled oral pharmaceutical tablets, 18:710–711
Osoniazid, year of disclosure or market introduction, 3:6t
Osram process, 22:413
Osteocalcin, vitamin K and, 25:795
Osteolathyrism, 17:229–230
Osteomalacia, as vitamin D deficiency disease, 25:792
Osteoporosis biomarkers, 17:649
Ostromislensky, Ivan, 25:628
Ostwald color system, 7:309
Ostwald glass capillary viscometer, 21:728
Ostwald ripening, 10:124
as an aging mechanism, 23:65
of amorphous silica, 22:390
surfactants and, 24:157
Ostwald ripening crystallization process, 19:183
Osuloses, 4:711
Osyril, 24:489
Otavite, 4:472t
Ouchterlony double immunodiffusion, 14:141
Ouchterlony technique, 9:754
Ouricour wax, 26:210–211
Ourecury, in mascara, 7:862
Outer approximations (OA), discrete optimization via, 26:1024
Outer–Helmholtz plane (OHP), 3:419
Outer-sphere (OS) mechanism, 13:446–447, 448
Outgassing, 13:463
Outlet temperature, 13:253–254
Outlet terminal filtration, for fermentation, 11:45
Outlier detection, in chemometrics, 6:56–57
Outokumpu flash smelting, 16:146
Outokumpu lead smelting process, 14:745
Outokumpu Oy process, selenium recovery via, 22:83
Outokumpu sulfur recovery process, 23:575–576
Outside battery limit (OSBL), 19:494
for equipment spacing, 19:519
Outside processes, in fiber optic fabrication, 11:140–141
Outside vapor deposition (OVD), in fiber optic fabrication, 11:140, 141
Outsourcing, of maintenance, 15:478
Ovalbumin, properties of standard, 3:836t
Overaged precipitation, 13:502
Overall gas-phase height of a transfer unit (HOG), packed column absorbers, 1:52
Overall heat-transfer coefficient, 13:244
Overall return rate (ORR), 9:545
Overbasing, 15:423
Overcladding, in optical fiber manufacturing, 11:144
Overcoat layers, in photography, 19:199
Overcuring, in tire compounding, 21:810
Overfeed/underfeed drums, 15:439–440
Overflow of carriers, 14:845
in hydrocyclones, 22:285, 286
in wet classifiers, 22:284
“Overflow” dyeing machines, 9:210
Overhung impeller pumps, 21:63–67
Overlap concentration, 20:440
Overpotential reactions, 9:772
Overpotentials, 9:571, 614
Overprinting, 9:218–219
Override control, 20:698
Overstress failure mechanisms, 26:983
Over-the-counter (OTC) drugs/medications, 18:718; 21:575
Over-the-Counter Drug Review, 18:685
Over/under scales, 26:252
Overvoltage, 12:206–207, 214
mass transport (concentration), 12:207–209
Overweight, 3:88t
Ovine somatotropin (oST), effects on growth and gain in lambs, 13:11t
Ovis aries, wool from, 11:173
Oxacarbocyanine sensitizers, 9:510
Oxacillin, 3:25
Oxacrown ethers, 24:44
Oxadiazine insecticides, 14:347
Oxadiazole (OXZ) dendrimers, 26:803
Oxafullerenes, 12:242, 243
Oxahomofullerenes, 12:243
Oxahomofullerenes 659
Oxalate oxidase (OXO), in biosensor, 3:798

Oxalates
iron, 14:547–548
plutonium, 19:691
thorium, 24:768–769

Oxalation, of Ti–OH groups, 25:130

Oxalic acid
l-ascorbic acid and, 25:751
as chelating agent, 5:731
in cocoa shell from roasted beans, 6:357t

Oxalic-acid-catalyzed novolacs, in molding compounds, 18:786

Oxalic acid esterification, 12:652

Oxaloacetic acid, in citric acid cycle, 6:633

Oxalosuccinic acid, in citric acid cycle, 6:633

Oxalyl bis(benzylidene)hydrazide, 3:115

Oxamide, 8:174

2,2'-Oxamidobis-ethyl(3,5-di-tert-butyl-4-hydroxyhydrocinnamate), 3:115

Oxane bonds, silylation and, 22:702–703

Oxazine soluble dyes, 7:373t

Oxaziridines, 9:372–373

2-Oxazolines, microwave-assisted synthesis of, 16:576

Oxazoles, 21:151

oxa compounds in roasted coffee, 7:256t

Oxazolidinone families, synthesis of, 17:741

Oxazolidinone libraries, preparation of, 17:742

Oxazolidinones, 3:26; 13:111–112; 17:730–732. See also Antibacterial oxazolidinones

antibacterials, 3:8
binding sites in, 17:736
optically pure, 17:740
preparation and manufacture, 3:13–14
therapeutic utility, 3:18
world market for, 3:16t

Oxazolidione products, 10:410

Oxichromic developers, dye images from, 19:287–288

Oxidant consumption methods, in residual lignin analysis, 15:8

Oxidants
nonmetallic, 16:570
oxidation potentials of, 14:39t
peroxodisulfate, 18:409
reaction with synthetic ion exchangers, 14:400

sodium peroxoborate, 18:399
used as detergent bleaches, 9:369–370

See also Oxidization devices; Oxidation processes; Oxidation reactions of aldehydes, 2:63
of alkanolamines from olefin oxides and ammonia, 2:129
of allyl alcohol, 2:238–239
of aluminum, 2:283–284
of ammonia, 2:683–684
of amyl alcohols, 2:768–769
of aniline, 2:788
of l-ascorbic acid, 25:751
in ascorbic acid manufacture, 25:757
of benzene, 3:601
of bromine, 4:299–300
of butadiene, 4:370–372
of carbohydrate carbonyl groups, 4:707–708
of carbohydrate hydroxyl groups, 4:710–711
catalysts for, 10:40
catalytic direct, 24:172–174
of cellulose, 5:383
of chlorocarbons, 6:235
of chloroform, 6:281
of citric acid, 6:636
of cyclopentadiene and dicyclopentadiene, 8:225
damage from, 13:505–506
of 1,2-dichloroethane, 6:255
electrochromics and, 22:224
electrode consumption and, 12:301
of ethanol to acetaldehyde, 10:554
of ethylene, 10:596
of ethylene oxide polymer, 10:682–683
in fat-based products, 10:827–828
of fatty amines, 2:523
of fullerenes, 12:235
of gallium, 12:344
of germanium metal, 12:549
of gold, 12:690
of graphite, 12:720
in hazardous waste management, 25:824
of higher aliphatic alcohols, 2:5–6
in higher olefins, 17:713
of hydrocarbons, with silver, 22:685
of hydrogen peroxide, 14:41
of isoquinoline, 21:200–201
of ketone, 14:570
Oxidation chemistry

17: Oxidation inhibitors, for lubricating oil and
17: Oxidation ditch process, in biological waste
with detergent bleaches,

17: advanced,

17: Of saligenin,

22: Selenium recovery via,

16: Of lactic acid,

21: Of polyamide plastics,

21: Of naphthalene,

21: of polychloroprene polymers,

19: Lead re

16: Oxidation reactions

14: Of organic semiconductors,

16: Oxidation rate, 17:750

Oxidation reactions

with claycop-hydrogen peroxide, 16:569
with copper sulfate or OXone®-alumina,

16:569–570

influence of oxygen pressure in, 19:82
ionic liquids in, 26:894–896
microwaves in, 16:544–545, 567–572
of organoboranes, 13:648
photocatalytic, 19:85–87
potassium permanganate, 15:606–610
of toluene, 25:162

21: TWC catalyst, 10:48

Oxidation/reduction (redox) reactions, in

hazardous waste management,

25:819–820

Oxidation resistance, 13:505

13: of steels, 13:508

Oxidation/selective catalytic reduction,

poisons, 5:258t

Oxidation states

multiple, 17:389–390

13: of phosphorus compounds, 19:20–25

Oxidation system, selecting, 10:79

Oxidative addition, in monoorganotin

preparation, 24:825

Oxidative attack, 14:401

Oxidative bleaching, 21:440

Oxidative capacity, silver, 22:639

Oxidative carboxylation, 5:10–11

Oxidative coupling, of methane,

10:620–621

Oxidative damage, role of ascorbic acid in

preventing, 25:769

Oxidative degradation, 10:682

gasoline, 12:399–400

Oxidative dehydrogenation, 23:342–343

Oxidative pyrolysis, 21:466

Oxidative stability, of olefin fibers, 11:229

Oxidative stability test, 12:400

Oxide crystal glass-ceramics, 12:641

17:103–104

Oxide dispersion-strengthened alloys,

Oxide fluorides, properties of noble-gas,

17:324t

Oxide glasses, 12:569

Oxide powderyntoed, 12:587

Oxide-powder-in-tube (OPTT) method, 16:171
Oxide ratio, 18:815
Oxides, 16:598
acidic, 12:190–191
bond strengths and coordination
numbers of, 12:570t
diorganotin, 24:819
glass electrodes and, 14:28
gold, 12:707
iron, 14:541–542
lead, 14:786–788
manganese, 15:581–592
nickel, 17:106–108
niobium, 17:151
plutonium, 19:688–689
in perovskite-type electronic ceramics, 14:102
predicted deviations from Raoult’s law
based on hydrogen-bonding interactions, 8:814t
properties of noble-gas, 17:324t
refractory properties of, 21:699
rhenium, 21:644
rhodium, 19:644
selenium, 22:88
thallium, 24:632–633
thorium, 24:761–762
tin, 24:804–806, 808
triorganotin, 24:815
tungsten, 25:380
uranium, 25:421–426
vanadium, 25:534
xenon, 17:325–326
zirconium, 26:641–643
Oxide scales, 13:528–529
Oxide superconductors, 23:826, 837
Oxide thickness, aluminum particle, 10:22–23
Oxide-water interfaces, in silica polymer–metal ion solutions, 22:460–461
Oxidimetric method, 15:145
Oxidization devices, 10:77–96
catalytic oxidation, 10:78–96
thermal oxidation, 10:77–78
Oxidized mercury, 13:181
Oxidized polyacrylonitrile fiber (OPF), 13:384
Oxidized starches, 4:724t
Oxidized wines, 26:316
Oxidizers
as a hazard class, 25:340
in hazardous waste management, 25:819
nonchlorine, 26:189–190
for swimming pool/spa water treatment, 26:196
Oxidizing acids, effect on wood, 26:352
Oxidizing agents
hydrogen chloride reaction with, 13:820
sodium nitrate as, 22:852
sodium nitrite as, 22:855
Oxidizing antimicrobials, in industrial
water treatment, 26:147–148, 150
Oxidizing chemistry, in steam-generating systems, 23:226–227
Oxidizing reactions, in steelmaking, 23:258
Oxidizing/reducing agent, 12:33
Oxidizing solutions, in leaching chemistry, 16:152–153
Oxidoreductases, in the textile industry, 10:303–304
Oximes
achiral derivatizing agents, 6:96t
chelating agents, 5:712t
Oxine, 8-hydroxyquinoline, molecular formula, 5:712t
Oxinesulfonic acid, molecular formula, 5:712t
Oxirane functionalization, silicone network
preparation via, 22:568
Oxirane processes, 4:416; 23:342; 24:172
4-Oxo-9,11,13-octadecatrienoic (licanic) acid
physical properties, 5:35t
Oxoantimony, 3:43
(μ-Oxo)bis(μ-carboxylato) diiron complexes, 14:556
Oxochromium(V) cation, 6:535
Oxo ion salts
thorium, 24:764–766
for uranium separation and reprocessing, 25:428–429
α-Oxoketenes, 21:149
Oxolinic acid
registered for use in aquaculture in
Chile, 3:222t
registered for use in aquaculture in
Japan, 3:221t
Oxone®–alumina, oxidations with, 16:569–570
Oxonol dyes, 9:503
Oxonols, 20:505
12-Oxooctadecanoic acid, physical
properties, 5:35t
Oxy processes, 13:768; 17:725
for amyl alcohols, 2:770–771
described, 2:36–41
major producers using, 2:29–31t
for producing odd-numbered higher alcohols, 2:1, 10; 5:215–217
Oxy reaction, in higher olefins, 17:712
Oxosuccinic acid, 23:419
Oxprenolol, molecular formula and structure, 5:156t
Ox-Tran instruments, 3:402
Oxyacids
hydrogen chloride reaction with, 13:820–821
of phosphorus, 19:20, 21t, 22t
selenium, 22:88–89
Oxalkoxides, composite, 25:99–100
Oxyanionic polymerization (OAP), 20:443
2,2-{Oxybis(methylene)}-bis(2-ethyl)-1,3-propanediol. See Dtrimethylolpropane
2,2-{Oxybis(methylene)}-bis[2-hydroxymethyl]-1,3-propanediol. See Dipentaerythritol
Oxysulfurides, titanous, 25:54
Oxysulfurization, 6:232–233; 10:597
alternatives to, 25:646–647
in vinyl chloride manufacture, 25:634, 635, 636, 638–641, 642, 645–646, 647
Oxydehydrogenation, 10:620
Oxyfluorfen, peroxidation by, 13:298
Oxy-fuel burners, 23:252
Oxyfuel firing, 12:598–599, 600
Oxygen (O), 17:746–767. See also Argon–oxygen decarburization (AOD) process;
O₂ carry-over; Ozone (O₃)
adsoption on silicalite, 1:634
analysis of, 17:758–760
in animal metabolism, 17:750
L-ascorbic acid and, 25:751
binary selenides and, 22:87
in biological waste treatment, 25:829, 830
in bioremediation design considerations, 25:838–839, 840–841
catalyst poison, 5:257t
in chemical processing, 17:763
chemical properties of, 17:748–750
chromatographic absorption on carbon molecular sieve, 1:610
class shipments for, 17:756t
coal and, 6:780
in coal gasification, 6:771, 772, 774
copolymers of, 18:447
critical oxygen concentration for selected organisms, 1:731t
cryogenic shipping, 8:40
demands of biological species, 1:730t
diffusion coefficient for dilute gas in water at 20°C, 1:67t
diffusion coefficient in air at 0°C, 1:70t
direct combination with hydrogen, 14:53–54
discovery of, 17:746–747
in earth’s crust, 26:23
economic aspects of, 17:755
effect of calcium carbonate fillers on permeability in LDPE, 3:398t
effect of orientation of barrier polymers on permeability, 3:393t
effect on copper resistivity, 7:676t
effect on rubber aging, 21:785
electrolytic reduction of, 9:637
electrostatic properties of, 1:621t
estimated maximum oxygen tolerance of selected foods, 3:381t
explosion hazard with VDC, 25:694
in ferrite processing, 11:73–74
furnace temperature applications for, 17:762–763
gas bulk separation, 1:618t
grades of, 17:756–758
health and safety factors related to, 17:760–761
high purity, 13:459–460
in hydrogel irradiation, 13:732
hydrogen selenide and, 22:86
industrial benefits of, 17:761–762
inert gases in, 17:764
isotopic species of, 17:747
in life-support applications, 17:765
liquefaction, 8:40
liquid from air separation, 8:48–49
for mammalian cells in cell culture, 5:348
manufacture of, 17:750–753
mass transfer in aeration biotechnology, 1:732–737
in medical applications, 17:764
mixtures with acetylene, 1:186
in M-type ferrites, 11:67
myocardial demand and heart rate, 5:108
in nonferrous metallurgy, 17:762
odor of, 17:759
Oxygen analysis, of water, 26:39–40

Oxygenases, 3:674–675

Oxygenated carotenoids, 24:560–561
Oxygenated chemicals, lactic acid and, 14:126
Oxygenated hydrocarbons, 10:86
Oxygenates
diesel fuel, 12:428–429
in styrene manufacture, 23:342
Oxygeneration
in biological waste treatment, 25:829, 830
bubble-free, 15:716
Oxygen-atom transfer reactions, 9:370–376
Oxygenators
blood, 3:720
for cardiovascular devices, 3:717
Oxygen-barrier properties, of PVA, 25:598–599
Oxygen-based ethylene oxidation, 10:646–648
Oxygen binding, in proteins, 20:830
Oxygen blowing, 14:753
Oxygen bottom metallurgy (OBM), 23:259
Oxygen commodity specifications, 17:757t
Oxygen compounds, 17:747
nomenclature system for, 17:390
reaction with ozone, 17:776, 780–781
Oxygen concentrations, maximum permissible, 17:285t
Oxygen-containing polymers, 10:183–201
Oxygen containment systems, 17:748–749
Oxygen contamination, of aluminum nitride, 17:212–213
Oxygen control, in industrial water treatment, 26:131–132
Oxygen degradation, of high density polyethylene, 20:166–167
Oxygen delignification process, 21:45
Oxygen demand, in industrial wastewater, 25:887t
Oxygen donor ligands, thorium and, 24:768–770
Oxygen donors, for uranium complexation, 25:436–437
Oxygen electrodes, 3:408
standard potential, 3:413t
Oxygen-enriched atmospheres, silver in safety of, 22:661
Oxygen-enriched sulfuric acid processes, 23:787
Oxygen fluorides, 11:830
Oxygen-free copper wrought alloy, mechanical properties, 7:678t
Oxygen heterocyclics, 10:567
Oxygen–hydrogen mixtures, 13:770–771
Oxygen impurities, in argon separation, 17:360
Oxygen ligand complexes, ruthenium, 19:639
Oxygen ligands
  iridium complexes containing, 19:649
  palladium coordination with, 19:651
  platinum, 19:655–656
  rhodium complexes with, 19:645
Oxygen–oxygen bonds, 14:279
Oxygen permeability, of VDC copolymers, 25:710
Oxygen pipelines, 17:754
Oxygen plasma etching, of lotus effect surfaces, 22:117, 119
Oxygen pressure, in oxidation reactions, 19:82
Oxygen production, 17:753–754
  process improvements for, 17:751–752
Oxygen profiles, axial dissolved, 15:707–708
Oxygen purity, in ethylene oxidation, 10:651–652
Oxygen radicals, 9:371
Oxygen reactive ion etch (RIE) conditions, 15:188
Oxygen salts, nomenclature for, 17:391
Oxygen scavengers, 12:61
Oxygen scavenging, in industrial water treatment, 26:137
Oxygen Scav-Ox solutions, 13:596t
Oxygen sensors, 10:55–57; 22:271
Oxygen separation, molecular sieves in, 16:841
Oxygen solubility, in aeration water treatment, 26:153–154
Oxygen sources, for fermentation, 11:25
Oxygen steelmaking, quicklime requirements for, 15:68
Oxygen steelmaking processes, 23:255–260
Oxygen transfer, 26:153
  in fermentation scale-up, 11:43
  volumetric rates of, 15:690–691
  in wastewater treatment processes, 15:713–714
Oxygen transfer coefficient, 26:157
Oxygen transport, silver and, 22:657
Oxygen vectors, 15:716–717
Oxyhalides, 23:647–651
  niobium, 17:147–150
  plutonium, 19:689–690
  selenium, 22:87, 88
  thorium, 24:762–763
  tungsten, 25:377–384
  vanadium, 25:534–535, 539
Oxymercuration, butylenes, 4:408
Oxynitrilases, 3:675
Oxyphenoxypropionic acids, 13:296–297
Oxy radicals, 14:277
Oxytetracycline, 24:592, 600
  registered for use in aquaculture in Canada, 3:218t
  registered for use in aquaculture in Chile, 3:222t
  registered for use in aquaculture in Europe, 3:220t
  registered for use in aquaculture in Japan, 3:221t
  therapeutant for aquaculture in U.S., 3:205t, 211t
  water treatment compound for aquaculture in U.S., 3:213t
Oxytetracycline genes, 24:601
Oxythallation, 24:634
  reactions, 24:635–636
Oysters
  aquaculture, 3:183, 189
  culture systems, 3:190, 191
  world aquaculture production in 1996, 3:186t
  shells, 15:28
    raw material for cement, 5:467, 475t
Ozokerite
  cosmetically useful lipid, 7:833t
  in cosmetic molded sticks, 7:840t
Ozokerite wax, 26:214
Ozonation, 9:446
  as advanced wastewater treatment, 25:909–910
  benefits of, 17:803
  in hazardous waste management, 25:819–820
  hydrazine, 13:588
  for lignin characterization, 15:10
  promising aquaculture uses, 3:224
  recirculating aquaculture systems, 3:196
Ozonators, for swimming pool/spa water treatment, 26:196
  See also Ambient ozone; Background ozone; Ozone generators
absorption in pure water, 17:769
adducts, 17:783–784
adsorptivity of, 17:769
as air pollutant, 26:669
analytical and test methods for, 17:811–812
analyzers, 17:812
applications of, 17:768
aqueous phase of, 17:771–773, 774
catalytic decomposition of, 17:795
chemistry of, 17:774–784
centration of, 17:785, 795
criteria pollutant, 1:813t
der for disinfection, 8:619–621
in drinking water treatment, 17:802–807
effect on rubber aging, 21:785–786
flammability and explosivity of, 17:769
in food, 12:62
formation and destruction of, 17:768, 784–785, 794–795
gas phase of, 17:770–771, 773–774
gas–liquid–solid phases of, 17:768–770
as greenhouse gas (tropospheric), 1:807t
in hazardous waste management, 25:819–820
health and safety factors related to, 17:812–815
in high purity water systems, 17:807–808
human exposure to, 17:815
in industrial wastewater pollution control, 17:808–809
in industrial water treatment, 26:148
in mega-cities, 1:788t
miscellaneous uses for, 17:811
in odor control, 17:809
organic reactions of, 17:778–784
in organic synthesis, 17:810–811
photochemical decomposition of, 17:773–774
in photochemical smog, 1:789–795
properties and characteristics compared to other disinfectants, 8:608t
properties of, 17:768–770
in pulp bleaching, 17:810
solubility of, 17:769
spectral data for, 17:769
stratospheric, 17:784–790
structure of, 17:770
thermal–chemical decomposition of, 17:770–773
thermodynamic values for, 17:770
toxicity of, 17:815
transfer into water, 17:801–802
in treatment of process water, 17:809
tropospheric, 17:790–793
uses for, 17:802–811
vinyl chloride reactions with, 25:631
in wastewater disinfection, 17:809
water decolorization using, 17:805
Ozone-based advanced oxidation processes, 17:773
Ozone bleaching technology, 21:46
for recycled pulps, 21:51–52
Ozone contactors/dispersion devices, 17:801–802
Ozone decomposition
in acidic solution, 17:773
hydroxyl ion initiated, 17:771–772
Ozone deficit problem, 17:785
Ozone delignification technology, 21:46
Ozone-depleting substances, in release agents, 21:598
See also Chlorine reservoirs
dehleting potential for various compounds, 1:809t
effect of halogen radicals on, 17:786–790
effect of hydroxyl radicals on, 17:786
effect of nitric oxide on, 17:785
laboratory studies related to, 17:813
Ozone depletion potential (ODP), 11:884; 17:813; 21:528–529
Ozone depletion substances (ODSs), 21:527
Ozone disinfection by-products, 17:815
Ozone dosage, 17:802
Ozone exposure limits, OSHA, 17:815
Ozone formation, 10:96
Ozone generation. See also Ozone generators
from air, 17:795–796
alternative methods of, 17:800–801
by electric discharge, 17:793–800
from oxygen, 17:794–795
production costs and capital requirements for, 17:800
Ozone generators
design of, 17:798
electrical characteristics of, 17:797
feed gas preparation for, 17:796
output of, 17:797–798
as pool sanitizers, 26:177
types of, 17:799–800
Ozone hole, 17:813
Ozone layer, 21:526
solvents in, 23:111
Ozone layer depletion, stratospheric, 21:525–529
Ozone level, reduction in, 21:528
Ozone molecules, vibrationally excited, 17:774
Ozone rate constants, 17:771
Ozone reactions
  activation of, 17:779
kinetics and mechanism of, 17:778–779
Ozone resistance, of ethylene–propylene polymers, 10:704, 717
Ozone synthesis, energy requirements for, 17:798
Ozone-transfer efficiencies, 17:802
  formation of, 17:776
Ozonization, 18:460–462
Ozonization effluent treatment, 9:435
Ozonolysis, in polychloroprene, 19:848–849

P(3HB), 20:256
P(3HB-co-3HV), 20:249, 250
P₂O₅ adjustment method, 13:378
P2 Recognition Project (EPA), 9:456
P450 enzyme, resonance Raman scattering from, 21:327
PA6, 10:208, 209, 210. See also Aliphatic polyamides (PA)
PA6,6, 10:208–209, 210
PA11, 10:209, 210
PA12, 10:209, 210
P. A. 3679, thermal resistance characteristics, 8:634t
PAAm microgels, 13:746
PABA (para-aminobenzoic acid), antagonism to sulfanilamide, 23:501
Pacemakers, 3:713, 716–717, 721; 5:107
PACER, 7:479
Pacerone, molecular formula and structure, 5:95t
Pachnolite, 2:364t
Pacific halibut, aquaculture, 3:189
Pacific oyster, common and scientific names, 3:188t
Pacific Rim/India, aliphatic fluorocarbon production in, 11:871
Pacific salmon
  aquacultural chemical needs, 3:209
  nutrition and feeding, 3:202
world aquaculture production in 1996, 3:186t
Pacific white shrimp, common and scientific names, 3:188t
Package certification, 18:2
Packaged food, classification of, 18:31–35
Package dyeing, 9:206
Package icing, 21:561
Package power reactors, 17:591
Package preparation, in food processing, 12:81
Packaging. See also Food packaging;
  Industrial materials packaging
    aluminum for, 2:339–340
    aseptic, 18:32–33
    child-resistant, 18:28
    coffee, 7:259–260
    consumer awareness of, 18:29
    converting, 18:15–23
    corrugated cardboard boxes, 18:16–20
    cosmetics and pharmaceuticals, 18:24–30
    effectiveness of, 18:28
    electronic materials, 17:823–851
    fiber drums and cans, 18:22
    folding cartons, 18:21–22
    food, 12:77
    for industrial materials, 18:1–14
    instant coffee, 7:262
    LDPE, 20:231–232
    of pharmaceuticals, 18:718–719
    oxygen-permeable flexible, 18:31
    paper and paperboard materials, 18:16
    paper bags, 18:21
    polycarbonates in, 19:820–821
    polystyrene, 21:452–453; 23:348
    polystyrene foam, 23:404
    requirements for hazardous materials, 25:338–339
    semibulk, 18:5–6
    in sensor technology, 22:266
    solid fiber paperboard boxes, 18:20–21
Packaging applications. See also Electronic materials
    membrane technology in, 15:796
    for spunbonded fabrics, 17:492
Packaging design, for cosmetics and pharmaceuticals, 18:24–25
Packaging materials, environmental impact of, 18:1
Packaging memory, of sutures, 24:215
Pack carburizing, case hardening by, 16:209–210
Packed absorption towers, 15:695–696
Packed bed adsorption columns, 1:601–609
Packed bed of spheres, flow through, 15:721t
Packed-bed reactors, 21:333, 352, 354
Packed beds, 15:718
Packed catalytic tubular reactor design
with external mass transfer resistance, 25:293–298
nonideal, 25:295
Packed catalytic tubular reactors
isothermal design of ideal and nonideal, 25:287–289
plug-flow mass and thermal energy balances in, 25:270–271
steady-state analysis of, 25:279–281
zeroth-order chemical kinetics in, 25:281–283
Packed column absorbers, 1:27–28
capacity limitations, 1:80–83
design, 1:48–71
Packed columns, 10:769–772, 773
band broadening, 6:412
for distillation, 8:768–776
gas chromatography, 6:377, 379
instrumentation, 6:423–424
Packed column supercritical fluid chromatography (pSFC), 19:567
Packed fiber-bed mist eliminators, 23:781
Packed towers, 25:810, 811
Packing(s)
characteristics of types, 8:774t
for distillation columns, 8:769–770
for pumps, 21:80–81
structured, 10:153
sugar, 23:453
Packing factor, 1:83
Packing Groups (PG), for hazardous materials, 25:341
Paclitaxel, 24:553–554
Paclobutrazol, 13:44t, 56–57
PACM-12, 19:764
PACT system, in biological waste treatment, 25:829
Pacu, common and scientific names, 3:187t
Pad-bake process, 8:25
Pad-batch dyeing, cold, 9:177–178
Padding, 9:165
Padding and printing processes, 9:470
Paddle dryers, 9:132
Paddle dyeing machines, 9:210–211
Paddle type mixers, 16:720
Paddle wheel clusters, 8:82–84
Pad-steam dyeing, 9:194
Pails, as industrial materials packaging, 18:6–7
Paint(s), 18:54–76. See also Coatings
adhesion properties of, 18:73
analysis and testing of, 18:68–73
application and appearance properties of, 18:60–63
architectural coatings, 7:137–145
chemical and physical properties of, 18:55–60
chlorinated paraffins applications, 6:128
cobalt applications, 7:244–245
as colloid, 7:272t, 273t
color and hiding ability of, 18:70–71
controlling polymer applications, 7:538
degradation of, 11:414–415, 417
detergent systems for, 8:413t
dispersant applications, 8:690–691
dry time of, 18:69–70
economic aspects of, 18:73–74
exterior wood, 18:67
graphites in, 12:795–796
health, safety, and environmental factors related to, 18:74–75
hiding power and tinting strength of, 19:381
in-store tinting of, 18:66
interior, 18:67
kaolin application, 6:688t, 693
manufacturing of, 18:63–66
masonry, 18:68
mercury in, 16:53
molybdenum compounds in, 17:39
organic titanium compounds in, 25:127
package stability of, 18:70
palygorskite/sepiolite application, 6:700t
performance testing, 18:71–73
pigment absorbance properties of, 18:62
pigments in, 19:433, 453
pumping and transfers of, 18:65–66
reflection, refraction, and diffraction of, 18:62–63
silica in, 22:375
silicon carbide in, 22:541
smectites application, 6:697t
spectrally selective, 23:13
sulfur use in, 23:591
surface tension of, 18:73
titanium dioxide in, 25:23
types and end uses of, 18:66–68
vinyl acetate polymers in, 25:583–584
zinc oxide in, 26:615
Paint additives, 18:60
Paint adhesion, testing, 16:217–218
Paint applications, titanates in, 25:121–122
Paint/coatings industry, 9:153
Paint color, 18:62
Paint dryers, cerium application, 5:688
Paint formulations, 18:60, 61t
Painting industrial hygiene and, 14:210
of magnesium, 15:375
Paintings degradation of, 11:414–415
varnishes and protective coatings for, 11:410–411
Paint Remover Manufacturer’s Association, 18:77
Paint removers, manufacturers of, 18:87t.
See also Finish removers
Paint solvents, 18:59–60
Paint stripping, methylene chloride in, 16:378
Paint technologies, 18:54–55, 56
Paint viscosity, measuring, 18:69
Paired comparison test, 11:512
Paired synthesis, of phthalide and 4-t-butylbenzaldehyde, 9:680–681
PAI resins, properties of, 10:215t
Pair production process, 21:313
Palatinit, 12:44
Palatinit, sucrose as fermentation feedstock for, 23:481
Paleodiet, 5:753
Palin analytical method, 13:114
Palladium (Pd), 19:600. See also Pd(0) catalysts
as an autocatalyst, 19:624–625
with gold in dental applications, 8:305, 307t
demand for, 19:617
in dental alloys, 19:629
dental applications, 8:308
effect on copper resistivity, 7:676t
electronic applications of, 19:630–631
poisons in representative reactions, 5:258t
in solder for dental applications, 8:316
in the solvent extraction process, 19:610
supply and demand for, 19:614–615t
supported catalyst complexes, 5:339–341
thermal degradation of catalysts, 5:272
Palladium alloy membranes, 15:813–814
Palladium alloys, dental applications, 8:308
Palladium–alumina, catalytic aerogels, 1:763t
Palladium bromide, physical properties of, 4:329
Palladium catalysts, 10:42; 14:49; 16:250
Palladium-catalyzed carbonylation, 13:656
Palladium chloride/copper chloride, supported catalyst, 5:329
Palladium compounds, 19:650–654
synthesis of, 19:652
uses for, 19:653–654
Palladium films, 19:654
Palladium membranes, 15:813
Palladium monoxide, 19:651
Palladium oxide, 19:601
air/fuel conditions and, 10:50
Palladium/palladium alloy plating, 9:823
Palladium recovery, 14:51–52
Palladium–silica–alumina, catalytic aerogels, 1:763t
Palladium–silver alloy membranes, 15:813–814
Pall rings, 1:28; 8:770
characteristics of metal and polypropylene, 1:82t
packing parameters, 1:69, 868
characteristics of metal and plastic, 8:774t
Palma istle, 11:296
Palm fibers, processing of, 11:298
Palmitic acid, 22:756
boiling point, 5:53t
percentage in selected fats and oils, 2:519t, 5:47t
physical properties, 5:29t
in toilet soap making, 22:733t
Palmitoleic acid, percent in important fats and oils, 5:47t
cis-9-Palmitoleic acid, physical properties, 5:31t
trans-9-Palmitoleic acid, physical properties, 5:31t
Palmitylamine, 2:519
Palm kernel oil
fatty acid composition, 2:519t
in soap making, 22:732, 735, 742
Palm oil
fatty acid composition, 2:519t; 5:56t
feedstock for higher aliphatic alcohols, 2:28t
in soap making, 22:732, 735, 742
Palpation sensor, for detecting prostate
cancer and hypertrophy, 3:748–749
Palygorskite (attapulgite), 6:686
attapulgite discouraged as mineral
name, 6:666
estimated total production, 6:683
mining, 6:681
occurrence and geology of major deposits,
6:666–667
properties relating to applications, 6:686t
structure and composition, 6:670–671, 674
uses, 6:692–693, 699–701, 700t
Pamabrom, 4:360t
PAMAM dendrimers, 26:791–792, 800–801,
805
anionic, 26:798. See also Polyacrylamide
(PAM)
in cell targeting, 26:797–798
in drug delivery, 26:793–795
as imaging agents, 26:795–796
cosmetic UV absorber, 7:846t
p-aminophenylacetic acid (PAH), 9:58
Panacryl, 24:219
PAN-based carbon fiber processing flow
chart, 26:731. See also
Polyacrylonitrile (PAN)
PAN-based carbon fibers, 26:730–733;
26:758–759
as asbestos substitute, 3:314t
compressive strength versus tensile
modulus for, 26:742–743
stabilization of, 26:733
Pancake fluxons, 23:827
Pancuronium bromide, 4:360t
Pandermite, 4:133t
Pandora risk class, 24:188
Pangamic acid, 25:807
PAni/V2O5, 13:540, 541
PAni/V2O5 hybrid materials, 13:547–548
PAN/nanotube composite fibers, 26:747
Panox, 11:194
Panqueque, 22:844
Panthenolic acid, 25:799
content in cocoa beans and chocolate
products, 6:370t
Pantothenyl, 25:799
Pan type mixers, 16:720
Papain, therapeutic for aquaculture in
U.S., 3:211t
Papaveraceae, alkaloids in, 2:75
Papaverine, 2:87–88
from vanillin, 25:554
Paper, 18:89–132. See also Papermaking
analysis of moisture and fluid resistance
for, 18:101
appearance analysis for, 18:101–102
barrier coatings and lamination for,
18:125–126
biodeterioration of, 11:409
charge control additives to, 18:116–117
chemical additives to, 18:98–99, 107–118
chemical and material composition of,
18:90–99
chlorate application, 6:116
citrin acid application, 6:648
CMC applications, 5:452t
colorants for, 18:113–114
converting operations for, 18:126
defoamer applications, 8:248–249
defoamers in, 18:118
degradation of, 11:415
detergent systems used in scouring of
raw de-inking paper, 8:413t
dimensional stability of, 18:97
directionality of, 18:100
dry-strength additives to, 18:114–115
drying, 18:121–122
economic impact of, 18:89–90
end use of chlorine, 6:134t
fiber composition and physical attributes
of, 18:94–95
fiber identification in, 18:97
fillers in, 11:306
in food packaging, 18:35–37
global consumption of, 21:17
grades of, 18:128–130
HEC applications, 5:454t
history of, 18:89
information sources for, 15:765
internal sizing in, 18:109–113
kaolin application, 6:688t, 689–693
manufacturing of, 18:102–106
mass per unit area (basis weight) of,
18:100
microparticles in, 18:117–118
mineral content of, 18:99
MPDI fibers in, 19:734
nonfiber ingredients of, 18:97
nonfibrous components of, 18:98–99
palygorskite/sepiolite application, 6:700,
700t, 701
Paperboard
18:
Paperboard packaging, converting, 18:123–125
recycling of, 25:871
retention aids in, 18:117
sheet forming, pressing, and drying, 18:118–122
smectites application, 6:697t
strength analyses of, 18:100–101
surface sizing, 18:122–123
tensile failure analysis of, 18:100
thickness (caliper) of, 18:100
titanium dioxide in, 25:26–27
titanium dioxide in, 25:27
types of recovered, 21:430
vinyl acetate polymers in, 25:584–585
wet-strength additives to, 18:115–116
world production of, 18:90
Paper adhesives, 25:580
Paper and pulp industry, recycling in, 15:77
Paper applications, 11:219
Paper artworks, treatment of, 11:414
Paper bag packaging, converting, 18:21
Paper bags, 18:129
multiwall, 18:11
Paper bleaching, sodium dithionite in, 23:676
Paperboard
grades of, 18:130–131
sulfur-impregnated, 23:593–594
Paperboard boxes
corrugated, 18:16–20
solid fiber, 18:20–21
Paperboard food containers, 18:36–37
Paperboard machines, multiple-former, 18:121
Paperboard packaging, converting, 18:16
Paper chromatography, 9:233–234, 751
Paper chromatography, 6:384
Paper coating, mercury in, 16:52
Paper coatings
PVA as, 25:618–619
silica in, 22:376–377
titanium dioxide in, 25:27–28
VDC lacquer resins for, 25:735
Paper coloring, 9:222–224
Paper electrophoresis, 9:750–751
Paper fibers
chemical composition of, 18:91–93
properties of, 18:109t
Paper forming machines, 18:118–121
Paper industry, 12:328
fibers in, 11:163–164
floculating agents in, 11:625
phytosterols from, 17:671
sodium sulfate standards for, 22:867
water use in, 26:56
Paper laminates, TiO₂ pigments in, 25:28
Papermaking, 11:179, 287–288. See also
Paper manufacture
additives in, 18:98
amino resin applications, 2:644–648
asbestos applications, 3:311
calcium carbonate applications, 4:554–555
calcium chloride application, 4:567t
chemical pulps for, 18:94
effect of pulping methods in, 18:93–95
environmental impacts of, 18:126–128
mechanical pulps for, 18:93–94
non-cellulosic fibers in, 18:96–97
nonwood fibers for, 21:17, 19
reclaimed fiber in, 18:95–96
sludge handling and disposal in, 18:127–128
sodium aluminate applications, 2:276–277
water quality assessment in, 18:128
Papermaking fibers, chemical differences among, 18:94–95
Papermaking pulps, beating and refining, 18:102–105
Papermaking technology, 17:496, 497
Paper manufacture. See also Papermaking
crystalline ester polymers for, 1:390
dispersed acrylic polymers for, 1:390
polyacrylamide polymers for, 1:324–325
polyacrylamide polymers for, 1:390
Polyacrylamide polymers for, 1:324–325
Paper materials standards, 15:742
Paper mills, use of tire-derived fuel in, 21:464
Paper packaging, converting, 18:16
Paper photography supports, 19:197–198
Paper processing, magnesium sulfate in, 15:420
Paper production
enzymes, 10:304–305
fiber dimensions in, 21:18
Paper products
sulfur dioxide use in, 23:591
water content of, 18:97–98
Paper pulping
consistency of, 21:434
in paper recycling, 21:432–436
Paper recycling, 21:430–446
agglomeration in, 21:440
bleaching in, 21:440–441
contaminants in, 21:431–432, 433t
dispersion and kneading processes in, 21:439–440
economic aspects of, 21:442–443
flotation process in, 21:437–438
global growth of, 21:443
high density cleaning and screening in, 21:436
mechanical cleaning in, 21:439
refining and fractionation in, 21:441
rejects and sludge handling in, 21:442
washing process in, 21:436–437
water clarification in, 21:441–442

Paper recycling mills, 21:430–431
process designs of, 21:433

Paper release coatings, properties and applications of, 22:591–592

Paper resins, ethyleneamines application, 8:500t, 502–503
Paper sizing, organic titanium compounds in, 25:132
Paper sizing agents, requirements for, 18:110

Paper stock
approach flow, screening, cleaning, and deaerating of, 18:106
blending and metering of, 18:105–106
preparing, 18:102

Papovaviruses, 3:136
Paprika, 23:164, 165
adulterated, 23:163
defatted, 23:162

Paptac Bleaching Protocol, 21:43

Papirus, 11:287; 18:89
Para-alkylphenols, 2:204
Parabens, 10:270; 12:58; 22:22
p-hydroxybenzoic acid in manufacture of, 22:23

Parabutyraldehyde, butyraldehyde derivative, 4:461
Para-carboxylated polystyrene ionomer, 14:480
Parachlorobenzotrifluoride, 6:134t
Paracortex, in wool fibers, 11:173

Para-crystalline lattice model, 14:464
Paracyclophane synthesis, 24:38
PARAFAC (PARAllel FACtor analysis), 6:57–59

PARAFAC/CANDECOMP, 6:59–62
Paraffin(s), 13:684; 18:592. See also Normal paraffins
alkylation, 2:170–177
chlorination and chlorination–dehydrochlorination of, 17:723
cosmetically useful lipid, 7:833t
dehydrogenation of, 10:620
in dental waxes, 8:296
free-radical nitrations of, 17:165–168
gas bulk separation, 1:618t
liquid–liquid extraction selectivity, 1:672, 673
oxidation process for higher alcohols, 2:27t, 29t, 40, 43
polarity relative selected molecules, 8:813t
sulfonation and sulfochlorination of, 23:527–528

Paraffinic base stocks, 15:214, 217
Paraffinic distillate oils, 15:242
Paraffinic oils, 10:713
Paraffin isomerization, molecular sieves in, 16:844
Paraffin nitrations, processes for, 17:167–168
Paraffin separation, molecular sieves in, 16:841
Paraffin sulfonates, 24:146
Paraffin wax(es), 18:671; 26:214–215
separation from crude oil, 26:216
as barrier coating, 18:125
in lubricating oil base stocks, 15:216–217
Paraffin wax vapor barriers, in finish removers, 18:80

Paraformaldehyde, 2:623; 12:123
Paraformaldehyde solids, 12:119
para-hydrogen, 13:759, 760–761, 764
vapor pressure of, 13:764
Parainfluenza vaccine, 25:498
Paraldehyde, 1:103
Parallax errors, in liquid-in-glass thermometers, 24:465
Parallel-counterflow exchanger, heat-exchanger effectiveness for, 13:255
Parallel flow heat exchangers
heat-exchanger effectiveness for, 13:254
heat-transfer equation for, 13:250
Parallel flow manifolds, 13:271
numerical results related to, 13:273
Parallel-flow regenerative kiln, 15:50
Parallel plates, flow between, 15:720t
Parallel plate viscometers, 21:735–736
Parallel-pore model, 25:306
Parallel pores, 25:301
Parallel synthesis, microwaves in, 16:549–552
“Parallel track” drug policy, 18:689
Paramagnetic defects, in vitreous silica, 22:410
Paramagnetic supercurrents, 23:802–803
Paramagnetism, sodium, 22:761
Paramelaconite, 7:771
Parameter estimation, sampling techniques for, 26:1038–1939
Parameter optimization, 20:711
Paramyxoviruses, 3:137
Para-oriented polymers, 19:715
Paraquat, 13:315, 349; 21:100, 120, 127
Para reds, 19:435
Parasites aquatic animals susceptible to, 3:206
vaccines against, 25:501
Parasiticides promising chemicals for aquaculture, 3:223
registered for aquaculture in U.S., 3:217
Parasitic pressure drops, 15:823t, 824
Para- substituents, 9:371, 372
Paratungstates, 25:383
demand for, 24:276
Parcel charter, 25:330
Parenteral drug dosage forms, 18:713–716
Parenteral drug injections, prolonged action, 18:715–716
Parenteral formulations, microencapsulation in, 16:453
Parenteral products, 18:715
Pareto chart, 21:174, 177–178
Pareto optimal solutions, in process synthesis and design, 26:1041
Pareto set, in multiobjective optimization, 26:1033–1034
Parex process, 1:649, 676t, 686
Paricalcitol, 25:793
α-Parinaric acid, physical properties, 5:33t
β-Parinaric acid, physical properties, 5:33t
Paris Convention for the Protection of Industrial Property, 18:179, 187, 198, 201, 206
Pariser–Pople–Parr (PPP) method, 16:736–737
“Parison swell,” 20:172
Paritane, molecular formula and structure, 5:156t
Parity, 21:290–291
conservation of, 21:299
Parkerizing process, 16:214
Parkes crust recovery of metals from, 14:752
treatment of, 14:752
Parkes process, 14:751
Parkes refining process, 16:150
Parr bomb method, 10:386
Parshall flume, 11:664, 665
Parsley, 23:169
Partial block copolymerization, 20:327
Partial denture investments, compressive strength, 8:289t
Partial enzyme inhibition, 10:318, 320
Partial glycerides, 10:802–804
“Partial immersion” thermometers, 24:464–465
Partial least-squares regression analysis, 16:753, 754, 755–756
Partially alkoxylated chlorotitanates, 25:72
Partially hydrogenated fats, 10:829
Partially hydrogenated oils, 10:813
Partially hydrolyzed trimethylaluminum (PHT), 16:88
Partially oriented yarns (POYs), 17:470; 19:752; 20:14, 23
Partially processed food products, packaging, 18:32–33
Partially promoted catalyst system, 11:712
Partial molar availability, 24:692
Partial molar entropy, of an ideal gas mixture, 24:673–674
Partial molar Gibbs energy, 24:672, 678
Partial molar properties, of mixtures, 24:667–668
Partial oxidation (POX), 13:844
catalytic aerogels for, 1:763t
economic process of, 13:781–783
of hydrocarbons, 13:780–783
Partial oxidation facility, 13:792–793
Partial oxidation plants, 13:775–776
Partial oxidation units, 13:782
Partial zero emission vehicle standard (PZEV), 10:57
Participation methods, EIA, 10:242–243t
Particle, defined, 18:132. See also Particles
Particle accelerators, superconducting magnets in, 23:861–862
Particle aggregation, surfactants and, 24:157
Particle attrition, in distributor jets, 11:812–813
Particle-based mass transfer Peclet number, 25:294. See also Peclet numbers (Pe)
Particle beam ionization, liquid chromatography, 4:625
Particle board bonding, phenolic resins in, 18:790
Particle boundary location, 18:148
Particle capture mechanisms, in depth filtration theory, 11:339–340
Particle changes, in solid–fluid reactions, 21:344
Particle contamination, in ion implantation, 14:445–446
Particle counters, 13:466; 18:139
Particle counting
methods of, 18:146–151
optical counters for, 18:150
resistazone counters for, 18:149–150
time-of-flight instrumentation for, 18:150–151
Particle emission control, diesel engine, 10:61–62
Particle encapsulation, 9:698
Particle entrainment, in rotary kilns, 13:182
Particle formation from gas saturated solutions (PGSS), 24:17, 18
Particle formation, supercritical fluids in, 24:17–19
Particle generation methods, categories of, 24:17
Particle image velocimetry (PIV), 11:784–785
Particle-induced X-ray emission (PIXE), archaeological materials, 5:742
Particle interferometry, phase Doppler, 23:193
Particle morphology, of fillers, 11:303–304
Particle nucleation, in emulsion polymerization, 14:713–714
Particle–particle collisions, in flocculation, 22:56
Particle population
average diameter of, 18:134
mode of, 18:135–136
Particle properties, 11:794–801
Particle regimes, 11:798–800
Particle reinforcement
brittle, 5:569–570
ductile, 5:570–572
performance in ceramic–matrix composites, 5:568–572
Particles. See also Particle as emulsion stabilizers, 10:116
filtration and shapes and sizes of, 11:326–328
graphite, 12:761
gravity settling of, 22:51–53
properties of, 21:291
terminal settling velocities of, 26:695
Particle settling, in sedimentation, 22:50
Particle size, 11:795
effects in chemical reactors, 25:296–297
in water treatment, 26:105
of inorganic pigments, 19:378–379
in polymer colloids, 20:380–381
Particle size distributions (PSDs), 19:378; 22:275
atmospheric particulates, 1:800
centrifugal separation and, 5:519
carbon, 6:725
in colloidal silica and silica sols, 22:391, 393–394
colloid rheology and, 7:281
colloids, 7:277–278
determining, 26:696
flake, 20:528
of latex, 14:710–711
in precipitated silica, 22:397
sedimentation and, 22:51
in silica gel preparation, 22:395–396
silicone chemistry and, 22:550–551
in soap bar processing, 22:731
superground submicrometer alumina, 2:409
of vanillin, 25:548
Particle size measurement, 18:132–156
data representation in, 18:133–138
distribution averages in, 18:134–136
ensemble methods for, 18:151–154
Particulate matter (PM), 1
field-flow fractionation, 18:144–146
hydrodynamic chromatography in, 18:146
laser diffraction equipment in, 18:153–154
methods of, 18:139–140
photon correlation spectroscopy in,
18:151–152
sampling in, 18:138–139
sedimentation in, 18:142–144
tabular, 18:136–137
ultrasonic spectroscopy in, 18:152–153
Particle-size specifications, for sugar,
23:478
Particle sizing, 10:127–128
Particle-track detectors, noble gases in,
17:375
Particulate composites, 26:754–755
ceramics processing, 5:653–654
extensional modulus of, 26:777
fabrication of, 26:766
Particulate emission limits, 13:183
Particulate emissions, reducing, 11:689
Particulate fillers, 11:302t, 303
for rubber, 21:772, 773
Particulate fluidized-bed regime, 11:801
Particulate impurities
in gases, 13:464
in high purity gases, 13:466
Particulate matter (PM), 1:798–801;
26:667–668, 672
control of, 26:677
criteria pollutant, 1:813t
filtration of indoor air, 1:832–833
hazards of, 21:837
in photochemical smog, 1:789, 795–796
removing in water for aquaculture, 3:199
spatial distribution of emissions, 1:799
Particulate matter emissions, control of,
26:694–717
Particulate matter pollutants, sampling of,
26:674–675
Particulate matter removal, in industrial
treatment, 26:140–141
Particulate metal–matrix composites,
16:179
applications for, 16:191–192
spray-forming of, 16:175
Particulate regulations, 11:714
Particulate systems, size distribution of
particles in, 18:132–133
Partition coefficient, 9:53
Partitioning, in chromatography, 6:374
Partnership for a New Generation of
Vehicles, 2:294
Partnerships, barriers to collaboration in,
24:366–372
Part qualification testing, for reliability,
26:991
Parvoviruses, 3:137
Parylene coatings, properties of, 17:846t
Pascal (Pa), 20:644, 645
Passenger DNA, 12:506
artificial chromosomes for insertion of,
12:507–508
joining with vector DNA, 12:501–503
Passivating (anodic) corrosion inhibitors,
26:144
Passivating primers, 7:174–177
Passivators, 15:221
Passive bulk applications, electromagnetic
applications for, 23:865–866
Passive components, 10:15
Passive composting, 25:874
Passive cooling, in nuclear power facilities,
17:555–556
Passive dielectric polymers, 22:718
Passive electroanalytical techniques,
9:581–586
Passive heat-transfer enhancement
techniques, retrofitted, 13:267
Passive mixers, in microfluidics, 26:966, 967
Passive noise detectors, 11:673
Passive nondestructive tests, 17:416, 425
Passive reactors, 17:555
Passive smart textiles, 24:625
Passive solar collection, silica aerogel
application, 1:761–762
Pasta products, 26:278
Paste-extrusion process, 18:301–302
Paste forming, ceramics, 5:651
Paste inks, 14:315–316
manufacture of, 14:321–322
Paster adhesives, for solid fiber paperboard
boxes, 18:20–21
Pastes
aerosols, 1:775
mixing of, 16:720–723
Paste-type alkaline finish removers, 18:85
Pasteurized dairy products, 18:32
Pasteurized process cheese, citric acid in,
6:646
Pasteur, Louis, 11:7
Patch coating, 7:24
Patchouli oil, 24:542
in perfumes, 18:370
Patcote, commercial defoamer, 8:241t
Patentability, prerequisites for, 18:172–177
Patentability searches, 18:207
Patentable subject matter, 18:165
Patent abstracts, pharmaceutical-related, 18:235–236
Patent agent/attorney, 18:177
Patent Analyzer system, 18:250
Patent applications, 18:159
drafting, 18:177–179
examination by the Patent Cooperation Treaty process, 18:188t
examination of, 18:200
filing and examination of, 18:179–182
“provisional,” 18:179
regional and national, 18:189–191
Patent claims, 18:165, 205
drafting, 18:178
Patent classification codes, 18:241
Patent classification systems, 18:208
hybrid, 18:209
by country, 18:248–249
country coverage of, 18:216–222
full-text, 18:234, 247–248
Patent depository libraries, 18:249
Patent disclosures, 18:205–206
Patent documentation, advances in, 18:212–231
Patent documents, 18:158, 203–206
on CD-ROMs, 18:249
for patent families, 18:207
reviewing, 18:160–165
Patentee, 18:160
Patent enforcement, 24:377
Patent examination, in foreign countries, 18:190
Patent examiners, 18:159, 164
foreign, 18:189, 190
Patent families, 18:206–207
information related to, 18:229
Patent information
computer aids to processing, 18:226
from scientific and technical societies, 18:211
secondary sources of, 18:210–212
Patent information services, 18:211–212.
See also Derwent Information Ltd.
Patent information searches, types of, 18:231–239. See also Infringement patent information searches; Patent searches
Patent infringement, 18:186. See also Infringement patent information searches
Patenting procedures, 18:201–203
Patenting, technology transfer and, 24:356–357
Patent interference, 18:185–186
Patent issuance, 18:159
Patent law(s), 18:199–201
harmonization with international conventions, 18:158
Patent literature, 18:197–252. See also World Patent entries
archiving and document delivery, 18:249
changes in, 18:198–199
cross-file and multife file searching of, 18:243–244
manual codes for searching, 18:223–225
milestones in the development of, 18:199t
on-line database searching of, 18:239–243
publishing, 18:198
searches of, 18:231–239
technological initiatives related to, 18:249–250
Patent medicine industry, 18:683
Patent office gazettes, printed, 18:210–211
Patent portfolio
auditing, 18:185
compiling, 18:157
Patent protection, foreign, 18:191
Patent research, in fine chemical research and development, 11:425–426
Patents, 5:766; 18:157–197. See also
Foreign patents; Invention;
Patentability; Trade secrets
article of manufacture category in, 18:166
composition of matter category in, 18:165–166
correction of errors in, 18:183–185
design category in, 18:166
determining invention scope, 18:172–177
developing the record of invention, 18:168–172

676 PATCH COATING
elements of, 18:161–163
expiration date of, 18:201
foreign, 18:173
hollow-fiber-related, 16:28
issuance of, 18:182
legal actions based on, 18:186
legal position of, 24:365
maintenance fees for, 18:185
methods/processes category in, 18:166
origin of patent rights, 18:158–159
overcoming rejections of, 18:181–182
in oxazolidinone preparation,
17:742–743
plants category in, 18:166
post-issuance concerns related to,
18:183–186
previously filed, 18:173
reading, 18:160–165
reissue and reexamination of,
18:184–185
research related to, 18:167–168
review after issuance, 18:183
subject matter class in, 18:166–167
technical subject matter of, 18:165–167
term of, 18:159, 200–201
“utility,” 18:176
versus trademarks and copyrights,
25:254
Patents Citation Index, 18:227, 238
Patent searches, 18:207–210. See also Patentability searches; Patent information searches
Patent specifications, searching of, 18:234
Patents Preview, 18:226, 236
PATFULL files, 18:247–248
pat gene, 13:360, 361t
Pathogenic yeasts, 26:475–476
Patient package inserts (PPIs), 18:718
PATOLIS database, 18:248–249
Patternation, 23:194
of sprays, 23:187–188
Patternators, 23:188, 194
Pattern dental waxes, 8:296
Patterned electrodeposition, 9:811–832
Patterned impressions, in blood, 12:102
Pattern recognition examinations,
12:100–101
Pattinson’s lead white, 14:785
Pauli exclusion principle, silicon-based semiconductors and, 22:235
Pauling, Linus, 25:747–748
Pauling’s rules, 22:453
Paul traps, 15:662
Pauson-Khand reaction, 16:72
Pavements, insulated, 23:405
Paving, 19:494
epoxy, 10:453
Payback time (PT), 9:546
Paylean, 13:2
PB film, properties of, 20:420t. See also Poly(1- butene) (PB)
PBI fibers, 13:380–381
spinning process for, 13:381
Pb Mo6S8, in low temperature superconductors, 23:835–836. See also Lead (Pb); Molybdenum (Mo); Sulfur (S)
PBO polymers, 13:377. See also Poly(p-phenylene benzobisoxazole) (PBO)
applications of, 13:379
degradation of, 13:379
early syntheses of, 13:378
PB resin, properties of, 20:419t
PbSe photoconductors, 19:157
PbS photoconductors, 19:157
PBT molding resins, 20:62–64. See also Poly(butylenterephthalate) (PBT)
PBT polymer
manufacture of, 20:40–41
processing, 20:66–67
PBT resin grades, current prices for, 20:68t
PBT resin, injection-molding machine settings for, 20:66t
PBZ polymers, 13:377
PbZrO3–PbTiO3-based (PZT) materials, 11:96–98, 100
PBZT polymers, 13:377
degradation of, 13:379
early syntheses of, 13:378
PC-based stress analysis, 19:482
PCB congeners, toxic, 13:139
PCB laminates, base resin systems used in, 10:456t
P–C bonds, organophosphorus derivatives with, 19:23–24t. See also Phosphorus–carbon bond
PCGC-2 software package, 7:448
PC resins, properties of, 10:196t
PCR reaction, 12:514
PC–SAFT equation of state, 24:11
PCT Gazette, 18:236
PCT molding resins, 20:60–61. See also Poly(cyclohexanediethylene-terephthalate) (PCT)
PCTPAT file, 18:230
Pd(0) catalysts, 26:805. See also Palladium (Pd)

PDF filter, 11:378
PdM checklist, 15:467

N,N-Dimethylformamide
solubility of chlorine in, 6:133t
solvent for chiral separations, 6:78

N,N-Disubstituted p-phenylenediamine (PPD), 19:245

Peakshaving, LNG plants, 8:49

PEA-Na ionomers, 14:479

Peanut butter, estimated maximum oxygen tolerance, 3:381t

Peanut oil in defoamer formulations, 8:237–238
surface tension, 8:244t
Pearl, as colloid, 7:272t, 273t

Pearlescent pigments, 19:412

Pearlrite, 23:273
coarse, 23:288–290
constituent properties of, 23:280
formation of, 23:278, 279

Pearson IV model, of ion implantation, 22:186

Pears soap, 22:747
cast-mature process for, 22:749

Peas, citric acid in, 6:632t

Peat, 6:704
composition, 6:720t
conversion to bituminous coal, 6:705

Peat waxes, 26:214

Pebax, commercial block copolymer, 7:648t

Pebble quicklime, 15:28

Peclet numbers (Pe), 1:63; 10:763; 11:746;
15:686t, 687t; 25:279. See also Mass transfer Peclet number (PeMT)
axial dispersion in bubble tray absorbers, 1:89
axial dispersion in packed absorbers, 1:62, 63, 64
Sherwood–Holloway constants, 1:66t

Pectates, classification by structure, 4:723t

Pectinases, 10:300
Pectinase treatment, 10:305
Pectinic acids, 20:454

Pedant hybrid preparation method, 13:539

Pedersen, 24:Charles J., 37, 39, 40

Pedersen, Charles J., 22:764

Pedestal-shaped die, 14:847

PEEK, 10:197–198. See also Polyetheretherketone (PEEK) fibers
electrical properties of, 23:718
properties of, 10:199t
sulfonation of, 23:717

PEEK-based composites, 26:764

Peel-apart color films, 19:286

Peel-apart film(s), 19:274, 281, 282, 299, 314

Peel-apart pack films, Fuji, 19:312

Peeler centrifuge, 5:544; 11:390–391

Peeling reaction, of polysaccharides, 21:27–28

Peel number (Np), 22:116

Peel tests, 1:514

Peen plating, 9:829

PEG-2 stearamonium chloride, 7:854

PEG-8 oleate, cosmetic surfactant, 7:834t
PEG-20 dilaurate, cosmetic surfactant, 7:834t

PEG-40 stearate, cosmetic surfactant, 7:834t

PEG-50 stearate, cosmetic surfactant, 7:834t

PEG-50 stearate, cosmetic surfactant, 7:834t

PEG-BSA hydrogels, 13:737

Pegmatites, mining of, 24:316
rubidium-bearing, 21:818

PEG-NADH, 3:673

Peierls distortion, 22:203, 208

PEI resin, properties of, 10:218

Pelargonaldehyde. See Nonanal

Pelargonic acid, 13:356
physical properties, 5:29t

Pelagrina, 26:291
niacin and, 25:797

Pelleted catalyst, 10:82

Pelleted feeds, 10:838

Pelletierine, 2:81–82

Pelleting (differential centrifugation), 5:531

Pelletization process, LDPE, 20:217–218

in cocoa shell from roasted beans, 6:357t
in flax fiber, 11:598

in cocoa shell from roasted beans, 6:357t
in flax fiber, 11:598
Pelletizing, in pyrometallurgy, 16:140
Pelouze reaction, 17:227
Peltier effect, 21:555; 24:428
Pelton wheel turbine, 26:85
Pemanent Red 2B, Strontium Salt, pigment for plastics, 7:366t
PEN fuel cell (PEMFC), 12:202–203
PEN, 10:222. See also Poly(ethylene 2,6-naphthalenedicarboxylate) (PEN)
Penaeid shrimp, aquacultural chemical needs, 3:209
PEN blow-molded bottles, 20:50–51
Pencil leads, kaolin application, 6:688t, 696
Pencils, graphite in, 12:795
PEN copolymer bottles, 20:52
Pendant cationic azo dye, 9:423
“Pendant chain” polymers, fullerene, 12:251
Pendant chains, in silicone networks, 22:570
Pendant reactive groups, dyes containing, 9:463–465
Pendimethalin, 13:319
Pendulum impact tests, 19:580
Penetrating particle size, in depth filtration theory, 11:340–341
Penetrating radiation, protection against, 19:701
Penetration depth, superconductor, 23:806–807
Penetration tests, 21:743
Penetration theory, in absorption, 1:46
Peng–Robinson equation of state, 24:656, 665, 685
Penicillin(s), 3:25, 27–28
bacterial resistance mechanisms, 3:32t
fermentation and, 11:9
Penicillin Amendment, 18:684
Penicillin-binding proteins, 3:33–34
Penicillin G, 3:31–32; 11:5
Penicillium chrysogenum, 1:731
critical oxygen concentration for selected organisms, 1:731t
mycelial fermentation, 1:743
Penn cap M
formulation, 7:564t
toxicity, 7:564t
Penniman-Zoph process, 19:400
Penning cold-cathode ionization gauges, 20:662
Penn State Sample Bank program (coal), 6:744
Pennsylvania State University,
administrative support offices of, 24:382–383
PEN polymers, 20:38, 44. See also Poly(ethylene 2,6-naphthalenedicarboxylate) (PEN)
properties of, 20:70
Penta-4-tolylantimony, 3:78
Pentaammine complexes, aquation of, 13:442
Pentaborane(9), 4:185
physical properties of, 4:184t
Pentaborane(11), physical properties of, 4:184t
Pentabromobenzylacrylate, physical properties of, 4:357t
Pentabromobenzyl bromide, physical properties of, 4:357t
Pentabromotoluene, physical properties of, 4:355t
Pentacarbocyanine dyes, 19:194
Pentacarbonylmanganate(I), 7:578t
Pentachlorobenzene
physical properties, 6:213t
toxicity, 6:218t
3,3',4,4',5-Pentachlorobiphenyl, 13:140
Pentachloroethane, in integrated manufacturing process, 6:237t
Pentachlorophenol, bioremediation substrate, 3:772–776
Pentachlorotoluene, physical properties, 6:344t
Pentachlorotoluene, 6:345
Pentacyano complexes, 14:536
Pentacyclopentadiene, 8:224t
Pentadecanoic acid, physical properties, 5:29t
Pentadecanoic acid, physical properties, 5:31t
Pentadecyclic acid, physical properties, 5:29t
2,4-Pentadienoic acid, physical properties, 5:33t
Pentaerythritol (PE), 2:46, 47; 12:110
economic aspects, 2:52
manufacture, 2:50–51
physical properties of, 2:48t
production from acetaldehyde, 1:104
uses of, 2:53–54
Pentaerythritol acrylic esters, 2:54
Pentaerythritol ester of rosin, 22:43
Pentaerythritol phosphates, 2:49; 11:492
Pentaerythritol tetrallyl ether, 2:50
Pentaerythritol tetranitrate (PETN), 2:49; 5:114. See also PETN molecular formula and structure, 5:110t
Pentaerythrose, production from acetaldehyde, 1:104
Pentaethylenehexamines, physical properties, 8:486t
1R-3-Pentafluorobenzoylcamphorate, 6:98
1,1,1,2,2-Pentafluoroethane, 13:721–722
Pentagonal bipyramidal geometry, for metal coordination numbers, 7:574
Pentaheteroglycans, classification by structure, 4:723t
Pentalene ligand, 24:772–773
Pentamethine dyes, 9:505
Pentamethylantimony, 3:77
Pentamethylcyclopentadiene, 25:116
Pentamethylcyclopentasiloxane, monodisperse model networks and, 22:570
Pentanal, physical properties of, 2:60t
Pentane azoetrop with hexane, 8:812
diffusion coefficient in air at 0° C, 1:70t
solubility in polyethylene, Gibbs ensemble simulation, 1:35
spontaneous ignition temperature, 7:438t
n-Pentane, reactivity as VOC, 1:792t
polystyrene foaming and, 23:406
Pentane blown foams, 25:472
n-Pentane conversion, 10:600
2,4-Pentanediene, 14:596–598
Pentanes, 13:684, 700–703
health and safety factors related to, 13:702
occurrence and recovery of, 13:702
properties of, 13:701t
uses for, 13:703
Pentanoic acid dissociation constant, 5:40t
physical properties, 5:29t
1-Pentanol physical properties of, 2:764t
specifications of commercial, 2:774t
2-Pentanol, physical properties of, 2:764t
3-Pentanol, physical properties of, 2:764t
Pentanuclear carbonyls clusters of, 16:64
structure of, 16:62–64
Pentaoxosmium carbonyl clusters, 16:64
Pentaphenylantimony, 3:78
Pentaphenylbismuth, 4:35–36
Pentarerythritol tetrastearate, cosmetically useful lipid, 7:833t
Pentasaccharides, 4:697
Pentasodium diethylenetriaminepentaacetic acid (DTPA), as soap bar additive, 22:744
Pentasodium triphosphate, 8:415
Pentatracontanoic acid, physical properties, 5:30t
Pentafluorobenzoylcamphorate, 6:98
1R-3-Pentafluoroethane, 13:721–722
Pentafluorobenzoylcamphorate, 6:98
1R-3-Pentafluoroethane, 13:721–722
Pentavalent antimony compounds, 20:56
Pentavalent plutonium cations, 19:692
Pentavalent tungsten, 25:386
Pentavalent vanadium aqueous, 25:533
solvent extraction of, 25:537–538
Pentavinylantimony, 3:78
Pentenenedinitriles, 17:246
2-Pentenoic acid, physical properties, 5:31t, 37t
3-Pentenoic acid, physical properties, 5:31t, 37t
4-Pentenoic acid, physical properties, 5:31t, 37t
β-Pentenoic acid, physical properties, 5:31t
Penthienate bromide, 4:360t
Pentanol, physical properties of, 2:764t
specifications of commercial, 2:774t
2-Pentanol, physical properties of, 2:764t
3-Pentanol, physical properties of, 2:764t
Pepper, piperine levels in, 23:159
Peptide antibiotics, 18:252–253. See also Antimicrobial peptides
Peptide backbone hydrogen bonds, in proteins, 20:826
Peptide mapping, 3:840–841
Peptide nucleic acids, 17:631–634
Peptides
controlled release of, 9:81–82
display on phages, 12:474–475
from fine chemical industry, 11:444
microfluidic assays of, 26:969–970
reversed-phase process chromatography, 3:842
selenium-containing, 22:90
Peptide synthesis, 2:570, 601
Peptide vaccines, 23:503–504, 506
Peptidoglycans, 20:
Peptide synthesis, 4:
Peptization, of aluminum alkoxide sols, 23:77
Peptizers, in tire compounding, 21:810
Pepto-Bismol, 4:36
Peptone, killing rate of e. coli, 8:641t
Peracetic acid, 21:46–47
disinfection via, 8:630
production from acetaldehyde, 1:102, 111
bleaching agents, 4:57–63
bleaching mechanism, 4:47
ozone use in, 17:810
reaction of dye with, 9:375
Feralkylated cyclodextrins, 14:185
Perborates, bleaching agents, 4:44, 57
Perbromic acid, 4:335
Percarbonates, bleaching agents, 4:44, 57
Percent crystallinity determination, diffractometers in, 26:430
% E (exhaustion factor), 9:471, 472
% owf (on weight of fiber), 9:163
% S (substantivity factor), 9:471, 472
Percent saturation, 9:97
% T (total fixation factor), 9:471, 472
Perceptual abilities, in flavor characterization, 11:515–516
Perchlorates, 9:627–628, 632–633;
18:274–287
alkali metal, 18:277
alkaline-earth, 18:278
analytical methods for, 18:283–284
economic aspects of, 18:283
Group 3 (IIIB), 18:278
Group 4 (IVB), 18:278
Group 5 (VB), 18:279
Group 6 (VIB), 18:279
Group 11 (IB), 18:277–278
Group 12 (IIB), 18:278
Group 13 (IIIA), 18:278
Group 14 (IVA), 18:278
Group 15 (VA), 18:278–279
Group 16 (VIA), 18:279
Group 17 (VIIA), 18:279–280
heath and safety factors related to, 18:284
inner transition-metal, 18:278
iron, 14:543–544
manufacture of, 18:281–282
properties of, 18:275–280
shipping and handling, 18:282–283
transition element, 18:280
uses for, 18:284
in VDC emulsion polymerization, 25:723
Perchloric acid(s), 18:274–287
economic aspects of, 18:283
health and safety factors related to, 18:284
hydrates, 18:275
manufacture of, 18:280–281
oxidation state and stability, 8:545t
properties of, 18:275–276
shipping and handling, 18:282–283
use in selenium analysis, 22:94
uses for, 18:284
Perchloric acid formation, electrochemical, 18:276
chlorofluorination of, 13:720
chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
consumption, 6:245t
production from acetylene, 1:219–220, 229
Perchlorotoluene, 6:327
Perchlorylation, 12:183
Perchloryl fluoride, 18:279
Percolation leaching, 16:153
Percolation processes
of filled polymers, 11:303
for wood, 26:358–359
Percolation theory, 20:345; 23:63
Percolation transition, 10:16
Percutaneous transluminal coronary angioplasty (PTCA), 3:712
-per- designation, 7:609t
PE resins, applications of, 20:206t. See also Polyethylene (PE)
Perfan, molecular formula and structure, 5:181t
Perfane, molecular formula and structure, 5:181t
Perferrites, 17:389
Perfluorinated carbons (PFCs), 13:715
Perfluorinated ethylene–propylene (FEP) copolymers, 18:306–316. See also FEP entries
Perfluorinated ethylene–propylene resin, 18:306–307
Perfluorinated fluids/liquids. See also Perfluorinated inert fluids
 electrical properties of, 11:879
 solubility parameters of, 11:881
 uses for, 11:885
Perfluorinated inert fluids, health and safety factors related to, 11:884
Perfluorinated organic compounds, 9:678–679
Perfluorinated polymers, 18:288–353. See also Perfluorinated ethylene–propylene (FEP) copolymers
 polytetrafluoroethylene, 18:288–306
tetrafluoroethylene–ethylene copolymers, 18:316–329
tetrafluoroethylene–perfluorodioxole copolymers, 18:339–342
tetrafluoroethylene–perfluorovinyl ether, 18:329–339
Perfluorinated quaternary ammonium compounds, 2:752
Perfluoroacylbenzene sulfonates, 12:174
Perfluoroacyl fluorides, 11:865
 alkylation of, 11:883
Perfluoroalkanesulfonic acids, 12:191
Perfluoroalkoxy (PFA) fluorocarbon resins, 18:329
Perfluoroalkoxy polymer (PFA) materials, acid resistance of, 23:785. See also PFA
Perfluoroalkyl dispersant moieties, 8:706t
Perfluoroalkylsulfonyl fluorides, 11:865
Perfluorocarbons, 15:716–717
 as blood substitutes, 4:112–113
Perfluorocarboxylate ionomers, 14:475
Perfluoroethers, thermal stabilities of, 11:879
Perfluoroisobutylene, 18:289
Perfluoro polyether peroxides, 11:882–883
Perfluoropolyethers
 polymerization of, 11:882–883
 uses for, 11:885
Perfluoropropyl vinyl ether (PPVE), properties of, 18:330
Perfluorosulfonate ionomers, 14:475
Perfluorotertiary amines, 11:880
3-(Perfluoro)-thiophenes, synthesis of, 23:708
Perfluorotributylamine, as blood substitute, 4:112–113
Perfluorovinyl ethers, preparation of, 18:329–330
Perforate basket centrifuges, 16:660
 operation, 5:529, 543–545
Perforated bowl centrifuge, theory of performance, 5:515
Perforated-drum dryers, 9:120
Perforated-plate columns, 10:772–774
Perforated plates, 11:810
Performance. See also Filter performance of BJT s, 22:248–249
 of FETs, 22:165
 of flame retardants, 11:448–453
 of HBTs, 22:168–169
 of HEMTs, 22:165–166
 of LEDs, 22:173–174
 of M-type ferrite manufacturing, 11:75
 of M-type ferrites, 11:70
 of photon detectors, 22:181
 of photovoltaic devices, 22:221–222
 of rheological measurements and, 21:748
 Performance assessment, in radioactive waste disposal, 25:856, 857
 of SETs, 22:171–172
 Performance criteria, selective catalytic reduction, 10:97
 Performance enhancement, in heat exchangers, 13:276–278
 Performance-failure (P-F) curve, 15:462
 Performance orientated packaging (POP), 18:2
 Performance qualification (PQ), in fine chemical production, 11:433
 Performance testing of emulsion, 10:128
 of paint, 18:71–73
 Perfume industry, safety, regulatory, and environmental aspects of, 18:388–389
 Perfumery
 ionones in, 24:562
 salicylic acid esters in, 22:12, 16
 Perfumery descriptions, 18:356t
 Perfumes, 18:353–391. See also Fragrance entries
 aroma chemicals in, 18:379
 compounded, 18:354
creation of, 18:354–356
economic aspects of, 18:387–388
evaluating, 18:355–356
fine fragrances, 18:356–361
historical background of, 18:353–354
ingredients in, 18:355, 365–379
manufacture and quality control of, 18:379–380
in mixed crystalline soap, 22:730
ozone use in, 17:810
research related to, 18:380–387
shampoo, 18:364
as soap bar additives, 22:743–744
talc and powder, 18:364
vanillin in, 25:553–554
worldwide sales of, 18:387–388
Perhalogenated aromatic acids, as chemical stabilizers, 19:363
Perhydrates, 18:411
Perhydrotriphenylene, 14:177
Perhydroxyl anion, 21:49
Periclase
colorants for ceramics, 7:347t
hydration, 5:478
phase in Portland cement clinker, 5:472t
physical properties of, 15:411t
Pericyclic reactions, microwaves in, 16:542–544
Perikinetic flocculation, 22:55
Perindopril, molecular formula and structure, 5:151t
Perinone Orange
pigment for plastics, 7:367t, 374t
Perinone pigments, 19:443–444
Perinone Red
colorant for plastics, 7:374t
Perinones, typical soluble dye applications, 7:376t
Periodic copolymers
classification in terms of monomer sequence distribution, 7:608t
IUPAC source-based classification, 7:609t
Periodic Table, 21:287
Peripheral vascular diseases, antianginal agents for, 5:111t
Periplum, molecular formula and structure, 5:129t
Perkin reaction, 2:64
Perkins, William H., 19:423
Perlite, asbestos substitute, 3:314t
Perelman, David, 11:50
Perlon U, 25:455
Permanent dye setting, 9:493–494
Permanent gases
barrier polymers with good barrier-to-permanent gases, 3:383–388
liquefaction of, 8:40
permeation in barrier polymers, 3:380–383
Permanent magnets, ferrites as, 11:58
Permanent mold castings, aluminum alloys, 2:326t
Permanent Red 2B, Barium Salt, pigment for plastics, 7:366t
Permanent Red 2B, Calcium Salt, pigment for plastics, 7:366t
Permanent set, of fibers, 11:184
Permanent setting, in wool processing, 26:387–388
Permanent shape, of shape-memory polymer, 22:355–356, 357
Permanent wet drum separators, 15:443
Permanent wet-strength resins, in paper manufacture, 18:115–116
Permanent Yellow FGL, pigment for plastics, 7:366t
Permanganate production, 9:635–636
Permanganate salts, 15:609
Permanganic acid, 15:596
Permanganyl fluoride, 15:597
Permanox, 15:587–588
Permeability, 3:375–380
colloids, 7:276–277
of common materials, 11:332t
dimensions of, 3:378–380
Ergun equation for, 11:332–333
exponents of dimensions, 8:585t
of filled polymers, 11:303, 310–311
moisture, 10:2
physical factors affecting in barrier polymers, 3:390–393
polytetrafluoroethylene, 18:298
prediction for barrier polymers, 3:399–401
selected polymers, 3:381t
of silicone elastomers, 22:582t
units with conversion factors, 3:379t
of VDC copolymers, 25:707, 708t
of wood, 26:340–341
Permeable diaphragms, 9:656
Permea process, 15:838–839
Permeate condensation, 18:508
Permeate side partial vapor pressure, reducing, 18:508
Permeation, in barrier polymers, 3:376–380
  large molecule permeation, 3:388–390
  permanent gases, 3:380–383
  small molecules, 3:380–388
Permeators, hollow-fiber, 16:22
PermeOx, 18:395
Permethyl-derivatized cyclodextrin, 6:98
Permethylhydroxypropyl-derivatized cyclodextrin, 6:98
Permissible air concentration, of hydrogen fluoride, 14:18
Permissible exposure limits (PEL), 10:509; 12:281; 21:837. See also Personal exposure limit (PEL)
  for anthropogenic silicas and silicates, 22:467
  for inorganic fluorine compounds, 11:856
  for lead, 14:764, 799
  for magnesium carbonate, 15:428
  for methylene chloride, 18:80
  for nickel carbonyl, 17:119
  for tellurium, 24:417
  for thallium, 24:638
  for tungsten, 25:372–375
Permitting, environmental, 19:531
Permittivity
  dielectric, 16:512–513
  exponents of dimensions, 8:585t
  of plastics, 19:587
Permselective diaphragms, 9:98
Perovskite ferrites, 11:55, 56t, 57
Perovskite material, mercury-base superconducting, 23:801
Perovskite structures, 5:598
Perovskite-type layered superconductors, 23:852
Peroxidase systems, 10:284
Peroxide bleaching, 21:49
  of recycled pulp, 21:51
Peroxide cure, silicone network preparation via, 22:562–563
Peroxide-cured dipolymers, 10:697–698
Peroxide-cured EPDM, 21:804t. See also Ethylene–propylene–diene monomer (EPDM) rubber
Peroxide cure systems, in rubber compounding, 21:793–794
Peroxide decomposers, 3:111–114
Peroxide decomposition, 14:279–280
Peroxide formation, by VDC, 25:694. See also Hydrogen peroxide
Peroxide initiators, 23:379–380
  worldwide producers of, 14:303
Peroxide–ketazine process, 13:582–583
  flow sheet for, 13:582
  versus Raschig process, 13:583
Peroxide linkages, in VDC polymer degradation, 25:713
Peroxides. See also Inorganic peroxides;
  Organic peroxides
    acid hydrolysis of, 18:459
    diacyl, 14:282–284
    explosive, 10:569–573
    formation of, 10:577
    as free-radical initiators, 14:279–293
    organomercury-containing, 18:445
    potassium salts of, 18:478
    silylation and, 22:703
    stereoisomers of, 18:459
    as vulcanizing agents, 21:795;
      22:579–580
Peroxide titanate complexes, 25:98
Peroxide value, 10:827
  in soap making, 22:736
Peroxidic compounds, 25:42
Peroxoborates, names, CAS numbers, and IUPAC names of, 18:398t
Peroxcarbonates, 18:401
Peroxo compounds, 18:392–393, 397
Peroxodisulfate ion, 18:408
Peroxodisulfates, 18:392, 408–410
Peroxodisulfate salts, 18:418
  uses for, 18:408–409
Peroxodisulfuric acid, 18:407–408
Peroxohydrate(s), 14:40; 18:411–415
  of melamine, 18:415
  stabilization of, 18:413
Peroxomolybdate complexes, 17:22
Peroxomonophosphate ion, 18:403
Peroxomonophosphoric acid, 18:403
Peroxomonosulfates, 18:406–407
Peroxomonomosulfuric acid, 18:404–405
Peroxonitrite ion, 18:402
Peroxonitrous acid/salts, 18:402
Peroxophosphoric acids/salts, 18:402–404
Peroxopolyoxometallates, 18:415–416
Peroxosilicates, 18:402
Peroxosulfuric acids/salts, 18:402–405
Peroxotin compounds, 18:402
Peroxyacetic acid, 18:402
Peroxyacids, 18:462–466
chemical properties of, 18:464–465
physical properties of, 18:462–464
as pulp bleaching agents, 21:46–47
synthesis of, 18:465–466
Peroxyacrylic acids, 14:50; 18:462, 476
bleaching activity of, 18:464
as oxidizing agents, 18:465
thermal decompositions of, 18:464
Peroxy compounds, melting points of, 18:49t
Peroxydicarbonates, 14:281
Peroxydisulfate production, 9:636–637
Peroxyesters, 14:284–286; 18:478
decomposition of, 18:485–487
Peroxygen bleaching agents, 4:55–63
Peroxy compounds, 14:40
α-Peroxy lactones, 18:484
β-Peroxy lactones, 18:484
Peroxymonosulfonic acid, 4:57
Peroxymonomosulfuric acid, 23:669
Peroxypolymers, 18:447
Peroxysulfate, in VDC emulsion polymerization, 25:723
Perrhenic acid, 21:689, 690, 699
rhenium content of, 21:695
specifications for, 21:694t
Persantine, 4:104, 104t
Persistent, Bioaccumulative, Toxics (PBT)
Rule of 1999, 16:46
“Persistent current,” 23:865
Persistent organic pollutants (POPs), 24:188
Persistent toxic effects, 25:203
Personal care
poly(ﬂuorosilicones) in, 20:245
silica in, 22:376
Personal care products
alkanolamines from olein oxides and ammonia, 2:136–137
detergent alcohols for, 2:20–21
emulsion use in, 10:129
enzymes in, 10:306
ethylene oxide polymers in, 10:689
fatty acid amides, 2:455–457
fatty amines, 2:533
surfactants in, 24:158–159
Personal computers, as operator stations, 20:670
Personal exposure limit (PEL), for nickel compounds, 17:120. See also Permissible exposure limits (PEL)
Personal hazard protection, 21:838
Personnel. See also People
commitment of, 15:474
health and safety of, 21:826–827
selection and training of, 21:857
training requirements for, 24:345–347
Persulfate redox initiation, in aqueous dispersion polymerization, 11:197–198, 199
Persulfates, 18:408; 26:189–190
Persulfate salts, 18:409
Persulfuric acid, 18:407–408
Perturbation
of external thermodynamic variables, 14:614–617
by flash photolysis and pulse radiolysis, 14:617–620
pressure changes and, 14:616–617
Perturbation analysis, in life cycle assessment, 14:823
Perturbation-based measurement strategies, 14:614–621
Perturbing variable scans, 16:424–429
Pertussis vaccine, 25:488–490
Peru balsam, benzoic acid in, 3:625
Peruvial, 24:546
applications of, 18:513–522
benefits of, 18:515
in continuous drying of reaction feed streams, 18:522
in distillation debottlenecking, 18:521
in hydrocarbon separation, 18:522
membranes, 18:506, 510–511
membrane technology in, 15:842–844
methanol and ethanol removal using, 18:520
modules, 18:511–512
off-line, 18:517–518
on-line, 18:518
in organics removal from wastewater, 18:521
processes, 18:507–509
in solvent dehydration, 18:513–515
in water removal from condensation reactions, 18:516–520
Pervaporation assisted esterification, 14:118, 122
Pervaporation systems, 15:798
Perxenates, 17:326
Perylene Green (Yellow), colorant for plastics, 7:374t
Perylene pigments, 19:443
commercial, 19:444t
Perylene Red pigment for plastics, 7:366t, 367t
Perylene soluble dyes, 7:373t
Perylene Violet, pigment for plastics, 7:367t
cyanide applications, 8:183
cyclopentadiene and dicyclopentadiene applications, 8:232
degradation pathways of, 19:90–92
dietary risks of, 18:538–539
discovery of, 18:527
early, 18:527t
economic aspects of, 18:531–536
environmental concentrations of, 18:546–547
ethylene oxide, 10:664
export of, 18:532
formulation, packaging, and distribution of, 18:529–531
health and environmental hazards of, 18:536
history of, 18:524–526
hydrazine in, 13:593–595
inert ingredients in, 18:530
legislation related to, 18:537–539
liquid chromatography applications, 6:465
manufacturing, 18:527–528
microencapsulation of, 16:458
minor use, 18:539–540
organic esters as, 10:520
phosphorus-containing, 19:68–69
predicting environmental behavior of, 18:547
registration of, 13:285
regulatory policy for, 18:536–550
risk characterization for, 18:549
sodium nitrite in syntheses of, 22:860
sugar beet, 23:454–455
technology related to, 18:527–531
PETN, 10:544, 550
uses for, 18:526
Pesticide usage, reductions in, 13:327
Pest management
integrated, 14:339, 349–351
systems, 14:341
integrated, 18:551–552
Pest management practices, integrated, 13:327
Pest management strategy, 13:359
Pests, sugarcane, 23:445–446
PET, 10:222. See also Poly(ethylene terephthalate) (PET)
Petalite, 15:122–123
PET bottle chip, uses for, 20:55
PET bottle resin process, 20:48–50
PET bottle resin, world market for, 20:53
PET bottles
multilayer, 20:53
recycling, 20:54–56
stretch blow-molded, 20:46
PET containers, gross recycling rate for, 20:55
PET fiber manufacturers, worldwide, 20:21t
PET fibers
health and safety factors related to, 20:22
stress-strain curves for, 20:7
Pet food production, economic aspects of, 10:857–860
Pet foods, 10:848–861
formulation of, 10:850–857
types of, 10:848–850
PET/HDPE blends, 21:452. See also High density polyethylene (HDPE); Poly(ethylene terephthalate) (PET)
Petite yeasts, 26:451
Petitgrain oils, in perfumes, 18:370
PET molding resins, 20:56–57
current prices for, 20:59t
properties of, 20:59t
uses for, 20:57
PETN, 10:734–735. See also Pentaerythritol tetranitrate (PETN)
PET/PEN copolymers, 20:50–51
PET POY spun yarn, 20:14
PET/PTN blend bottles, 20:53
PET resins, 20:33
handling, 20:59–60
Petri, Julius Richard, 11:8
Petri dish, invention of, 11:8
Petrochemical feedstocks, 18:556–570, 674
alternative, 18:568–569
aromatics, 18:565–566
events affecting, 18:556
flexibility in using, 18:558–559
methane, 18:566–567
olefin, 18:558–565
relative cost of, 18:561–563
selecting, 18:561–563
Petrochemical industries, location of, 19:528–529. See also Petroleum industry
Petrochemical(s) industry
environmental trends in, 24:261–262
hydrogen in, 13:797–798
regulatory requirements for, 24:262
sectors in, 18:556
U.S., 24:254
Petrochemical plant(s), 24:261. See also Petroleum plant
fractionating towers in, 19:501–504
layout of, 19:496–497
process flow diagram for, 19:497, 498
Petrochemical processes, in liquid–liquid extraction, 10:781–786
Petrochemicals, 10:625; 18:664, 674–680
catalysts and, 24:260–261
expansion of, 24:260
mass production of, 24:259
rise of, 24:259–260
defoamer applications, 8:248
dessicant applications, 8:356t
aliphatics, 18:674–678
cycloaliphatics and aromatics, 18:678
inorganic, 18:678–680
Petrochemicals market, ethylene in, 24:269
Petrol. See Gasoline
Petrolatum
cosmetically useful lipid, 7:832, 833t
function as ingredient in cosmetics, 7:829t
Petroleum, 3:683; 18:570–611. See also Crude oil(s); Enhanced oil recovery (EOR); Oil entries; Petroleum resources
aromatic structures in, 18:588–589
biogenic origin for, 18:571
citric acid application, 6:647
classification of, 18:578–579
composition of, 18:574, 575–591
distillation fractions of, 18:640
distillation of, 18:579, 641
effect of political and economic developments on, 18:601–606
elemental composition of, 18:577–579
as feedstock for advanced materials, 1:692
formation of, 18:571
as a fuel source, 24:257
hydrodesulfurization of, 17:37
international supply and consumption summary for, 18:602–605
kaolin application, 6:688
laboratory generation of, 18:572–573
liquid chromatography applications, 6:465
migration of, 18:574
molecular composition of, 18:576–577
naphthalene from, 17:77–78
nomenclature related to, 18:591–595
origin of, 18:570–575
palygorskite/sepilolite application, 6:701
physical properties of, 18:592
refining, 18:575–576
in reservoir rocks and source rocks, 18:573
usage for energy in U.S., 6:744
world reserves of, 18:596
Petroleum alkylate, demand for, 23:788
Petroleum alkylation, hydrogen fluoride in, 14:19–20
Petroleum and oxygenate finish removers, 18:81–82
environmental impact of, 18:82
Petroleum coke
as a graphite filler material, 12:721–723
partial oxidation to ammonia, 2:701
Portland cement industry consumption, 5:497
selection of, 12:722–723
Petroleum distillate, 18:594. See also Petroleum mid-distillates
Petroleum ether, solubility of higher alcohols in, 2:3t
Petroleum feedstock evaluation, 18:642–644
Petroleum feedstocks, sulfonation of, 23:530–531
Petroleum fields, 18:591
Petroleum gas, liquefied, 18:664–665
Petroleum industry. See also Petrochemical(s) industry
alkanolamines from olefin oxides and ammonia, 2:138
electroless deposition in, 9:699–700
emulsion use in, 10:131
platinum-group metal catalysts in, 19:623
radioactive tracers in, 21:282
Petroleum mid-distillates compounds in, 18:584–586
naphthenes and naphthalenes in, 18:586
S-heterocyclics in, 18:586
Petroleum naphtha(s), 18:667
aromatics in, 18:583
compounds found in, 18:582–584
sour, 18:584
sulfur in, 18:583–584
Petroleum oils silicone oil versus, 22:575t, 576
in tire compounding, 21:809–810
used, 21:421–423
Petroleum pitch, 12:724–725, 726
Petroleum plant, piperack, piping, and equipment relationships in, 19:517–519
Petroleum plasticizers, 21:790
Petroleum processing. See also Petroleum refining entries
conversion in, 24:257–258
separation stage in, 24:257
upgrading in, 24:258
Petroleum production ethyleneamines application, 8:500t, 505–506
xanthan in, 13:70
Petroleum production facilities, corrosion potential in, 9:711
Petroleum production technologies, 18:607
Petroleum products, 18:663–674
asphalt, 18:671–673
coke, 18:673–674
fuel oil, 18:669
gasoline, 18:665–667
information sources for, 15:765
kerosene, 18:667–669
liquefied petroleum gas, 18:664–665
lubricating oil, 18:669–670
solvents, 18:667
Petroleum recovery scavenging by alkanolamines from nitro alcohols, 2:120
sodium aluminate application, 2:277
use of steam in, 23:240
Petroleum refineries, as sources of hydrogen, 13:788
Petroleum refinery operations, general, 18:643
Petroleum refinery processes, 18:639–682
acid treatment, 18:661
alkali treatment, 18:660–661
alkylation, 18:659
catalytic cracking, 18:651–654
catalytic reforming, 18:657–658
clay treatment, 18:661
coking, 18:649–651
desalting and dewatering, 18:644–645
distillation, 18:645–647
feedstock evaluation, 18:642–644
gas processing, 18:663
history of, 18:641–642
hydroprocessing, 18:654–657
isomerization, 18:658–659
polymerization, 18:659–660
solvent treatment, 18:661–663
thermal cracking, 18:647–651
treating, 18:660–663
Petroleum refining, 24:254
hydrogen production and, 13:842
sulfur use in, 23:590
Petroleum-refining industry, 24:256–257
development of, 18:642
Petroleum-refining plant, 24:258–259
Petroleum reserves, 18:595
Petroleum residua (resid), 18:641. See also Petroleum vacuum residua; Vacuum residua
as feedstocks, 18:647–648
partial oxidation to ammonia, 2:701
separating petrolatum from, 18:671
Petroleum resources, 18:595–607
estimated, 18:606t
outlook for, 18:601–607
unconventional, 18:606–607
volume of, 18:607
Petroleum sulfonates, in oil recovery, 23:531–533
Petroleum supply, world, 18:601
Petroleum system, 18:575
Petroleum technology, sulfur dioxide in, 23:668
See also Petroleum residua (resid)
nitrogen and oxygen in, 18:590
Petroleum waxes, 18:670–671; 26:214–218
applications for, 26:218
production of, 26:216
properties of, 26:216t
refining of, 26:217
Petroselaidic acid, physical properties, 5:31t
Petroselinic acid, physical properties, 5:31t
Petrothene, 7:636, 637
PETROX selective hydrocarbon separation system, 15:502
PET scanning, 21:280–281. See also Positron emission tomography (PET) cameras
PET spinning, 20:12, 13
PET staple, 20:23
Peukert equation, 3:429
Pewter, 24:798
composition, 3:52t Phell
Pexiganan, 18:261–262
as an antimicrobial agent, 18:263
PFA, 10:220. See also Perfluoroalkoxy polymer (PFA) materials
Pfam Protein Families database, 10:261
Pätzinger reaction, of quinoline, 21:190
pFOX (partial Fatty Acid Oxidation) inhibitors, 5:189
PGE1, 5:28
PGM concentrate, 19:607. See also Platinum-group metals (PGMs)
PGM sulfide pulp, 19:607
pH, 15:751. See also pH Measurement entries; pH-sensitive entries
acid deposition, 1:806
in acid dyeing, 9:184–185
of amorphous silica, 22:386
biofiltration system, 10:76–77
in bioremediation design considerations, 25:842
boiler water, 23:220–221
of bread doughs, 26:462
chelation and, 5:719–724
of colloidal silica and silica sols and, 22:391–392
dependence of gelation time on, 23:62–63
determination of, 14:24–27
in dyeing processes, 9:160
effect on anion binding, 24:43
effect on enzymes, 10:257, 269
of fermentation medium, 11:38
in fiber finishing, 22:593
of limestone, 15:33
measuring, 26:185
in metal complex dyes, 9:187
in neutralization hazardous waste management, 25:818
in paper pulping, 21:434–435
precipitation and, 25:821
of PVA, 25:613
range for mammalian cell culture, 5:347t
of silica polymer–metal ion solutions, 22:460
of silicate solutions, 22:461
of slaked lime, 15:45
in sol–gel chemistry, 1:749
of sugar, 23:442
PHA depolymerases, 20:253, 256
pH adjusting agents, 12:61–62
Phage cloning, DNA isolation for, 12:506
Phages, display of peptides and proteins on, 12:474–475
Phagocytosis, 18:253
PHA_MCL biosynthetic genes, 20:258. See also Medium-chain-length PHA (PHA_MCL)
pH analysis, of water, 26:36
Pharmaceutical applications
of ethylene oxide polymers, 10:686–688
of lactic acid, 14:125
of sucrose, 23:442
Pharmaceutical capsules, 18:708
Pharmaceutical drugs, standardized generic names for, 17:402. See also Pharmaceuticals
Pharmaceutical industry. See also Drug entries
electroless deposition in, 9:700
methylene chloride in, 16:378
ozone use in, 17:808
safety and ethical considerations related to, 24:174–175
supercritical fluid extraction in, 24:13
Pharmaceutical ingredients, solid-state properties of, 18:729
Pharmaceutical packaging, 18:24–30
design of, 18:24–25
FDA role in, 18:26–27
product tampering and, 18:25–26
tamper-evident features of, 18:27–28
Pharmaceutical patents, information related to, 18:212
Pharmaceutical processes
in liquid–liquid extraction, 10:786–787
solvent extraction in, 10:787
Pharmaceutical products. See also Pharmaceuticals
development of, 20:714–715
vanill in, 25:554
Pharmaceutical research, 15:666–667
Pharmaceutical Research and Manufacturers of America (PhMRA), 18:720
Pharmaceuticals, 18:682–721. See also
Food and Drug Administration (FDA);
Large-scale pharmaceutical synthesis;
Pharmaceutical products
accelerated development/review for, 18:697
activated carbon application, 4:753
amine oxides, 2:473
aminopyridines in, 21:121–123
bismuth compound applications, 4:1, 11, 36–37
bromine applications, 4:314
bromine-containing organic compounds, 4:359–360t, 362
carbohydrate applications, 4:713
carbonate applications, 6:314
from carbon disulfide, 4:837
chemical development of, 18:723–724
chemical production of, 18:724
chiral separations, 6:73–74
chlorate application, 6:116
chloroform application, 6:288
chloroformate application, 6:303
chlorotoluene application, 6:345
citric acid application, 6:646
classifications of, 21:575
CMC applications, 5:452t
detergent alcohols for, 2:20–21s
development and approval time frame for, 18:696–698
dosage forms of, 18:702–718
economic aspects of, 18:719–720
emulsion use in, 10:130
from fermentation, 11:16–21
furan derivatives in, 12:280
gelatin in, 12:442–443
HEC applications, 5:454t
HPC applications, 5:463t
hydrazine based in, 13:598–599
iodine in, 14:372
ion exchange in producing, 14:419–420
kaolin application, 6:688t, 696
labeling, 18:718–719
liquid chromatography applications, 6:457–458
magnesium carbonate in, 15:390
magnesium hydroxide in, 15:407
manufacturing, 18:702–718
markets for, 11:444–445, 446
mercury in, 16:52
methylcellulose applications, 5:459t
microencapsulation in, 16:452–453
organic esters in, 10:519
use in, 17:811
packaging, 18:718–719
pygorskite/sepiolite application, 6:700t
process development for, 18:724
produced by transgenic farm animals, 12:465t
quality control and quality assurance for, 18:719
quality standards for, 21:168
selenium and its compounds in, 22:101
smectites application, 6:697t
sodium borohydride in, 13:619–620
sodium nitrite in syntheses of, 22:729
surfactants in, 24:159–161
U.S. citric acid/citrate distribution, 6:643t
U.S. Pharmacopeia and FDA, 18:701
uses of succinic acid and succinic anhydride in, 23:428t
Pharmaceutical separation
economic aspects of liquid-phase adsorption, 1:685–686
liquid phase adsorption, 1:677–680
Pharmacodynamics, 9:54
Pharmacogenomics, microarrays in, 16:392
Pharmacokinetic–pharmacodynamic (PK-PD) profile, 9:54
Pharmacokinetics, 9:53–54
of macrolide antibiotics, 15:304–305
Pharmacokinetic studies, 25:220
Pharmacological doses of ascorbic acid, 25:771
Pharmacology, of macrolide antibiotics, 15:304–305
Pharmacology information, in Investigational New Drug Applications, 18:692–693
Pharma companies, 11:16
Pharmacophores, 10:326, 327
boranes as, 4:227–228
chemical centers in, 10:382
enzyme–inhibitor models based on, 10:333
generation and validation, 6:11–12
identification system for, 10:331–333
models of, 10:338
perception data on, 10:331
Pharmacopoeia Internationalis, in fine chemical production, 11:435
PHARMSEARCH file, 18:230
Phase analysis, in fine art examination/conservation, 11:407
Phase behavior
of ionic liquids, 26:848–851
of soap, 22:725–728, 728–731
of soaps with low water content, 22:729
of supercritical fluids, 24:4–7
Phase Boundary Potential Model, 9:584
Phase-change materials (PCMs), 13:276
microencapsulated, 16:459–460
Phase changes, high throughput experimentation, 7:410, 414t
Phase-change slurry, laminar flow simulation using, 13:277
Phase compositions, 22:330–331
“Phase condition” equation, 23:803
Phase conjugation, 17:456
Phase contrast technique, 16:480
Phase diagrams, 11:803–804
for liquid–liquid extraction, 10:747, 748
microemulsions and, 16:420–424
in separating nonide liquid mixtures, 22:305
Phase dispersion, 10:779
Phase Doppler interferometry (PDI), 23:188, 193
Phase Doppler particle analyzers (PDPA), 23:188
Phase Doppler particle interferometry, 23:193
Phase equilibria (equilibrium)
in a one-component system, 24:661–665
in refractory systems, 21:493
Phase equilibrium calculations, in the chemical industry, 24:682
Phase equilibrium criteria, in multicomponent mixtures, 24:675–678
Phase inversion, 15:804–811; 16:700
in polymer blends, 20:327–329
in styrene manufacture, 23:395, 396
Phase inversion temperature (PIT), 10:125, 126
Phase matched crystal, 14:680

Phase matching, in crystalline materials, 17:451
Phaseolotoxin, 13:300
Phase-separated glass, 12:578–579
Phase-separated systems, 24:701
Phase separation, 10:765
in ternary semiconductor alloy preparation, 22:158
Phase separation model, of micellization, 24:128–129
Phase structure(s)
effect of compatibilizer on fineness of, 20:335
Phase structure development/evolution in binary polymer blends, 20:334
of polymer blends, 20:327–330
Phase-transfer catalysis, 5:220; 10:357–359
Phase-transfer catalysts (PTCs), 16:545, 546; 19:813
quaternary ammonium compounds, 2:752
Phenacite, colorants for ceramics, 7:347t
Phenalkamines, 10:400
Phenanthrene, biodegradation, 3:762, 763t
Phenanthrene compounds, 18:587–588
o-Phenanthroline, molecular formula, 5:712t
Phenanthrolines, 24:50
Phenazine methosulfate, cofactor regeneration using, 3:673
Phenazocine, 4:359t
Phendimetrazine (Bontril), 3:91
Phenethanolamines, 13:14
Phenethyl alcohol, antimicrobial used in cosmetics, 7:831t
Phenformin, antiaging agent, 2:813
Phenhydan, molecular formula and structure, 5:91t
Phenol, 18:747–756, 757. See also Phenols
alkylation, 2:196–197
analytical methods for, 18:753–754
antimicrobial used in cosmetics, 7:831t
from benzene, 3:620
from benzoic acid oxidation, 3:631
binary azeotrope with benzaldehyde, 3:591t
bioremediation substrate, 3:780
chemical properties of, 18:747–748
from cumene hydroperoxide cleavage, 1:165–166, 169; 8:155
demand for, 24:275
direct carbonylation of, 19:815–816
derivatives of, 18:755
formaldehyde condensation polymers, 10:409
formaldehyde resole cured epoxies, 10:445
Phenol–acetone cumene manufacture process, 23:355
Phenol analogues, as PSII inhibitors, 13:293
Phenolase, 7:776
Phenol-blocked methylene diisocyanate, 25:463
Phenol couplers, 19:252–253
in chromogenic chemistry, 19:251
Phenol–formaldehyde condensation polymers, 10:409
Phenol–formaldehyde resole cured epoxies, 10:445

692 PHASE MATCHING, IN CRYSTALLINE MATERIALS
Phenolic resins, 10:408–409
Phenol–formaldehyde reactions, 18:760
Phenolic acetates, 20:45
Phenolic adhesives, 1:543–544
Phenolic antioxidants, 10:806
in VDC polymer stabilization, 25:719–720
Phenolic baking coatings, 18:782
Phenolic-based CA resists, 15:190
Phenolic-based resins, 14:380
Phenolic–carbon-fiber composites, strength properties of, 18:794t
Phenolic dispersions, production of, 18:768–769
Phenolic effluents, production of, 17:808
Phenolic ethers, 10:574
Phenolic friction materials, 18:788–789
Phenolic herbicides, 13:293
Phenolic host inclusion compounds, 14:172–174
Phenolic host inclusion chemistry, 14:173
Phenolic hydroxyl group, effect on lignin, 15:11
Phenolic novolacs, 18:760–761
Phenolic resin adhesives, 18:783–784
Phenolic resin can coatings, 18:38
Phenolic resin composites, 18:792–794
Phenolic resin drying-oil varnishes, 18:783
Phenolic resin fibers, 18:797–798
mechanical properties of, 18:798
Phenolic resin foam, 18:795–796
Phenolic resin manufacturers, U.S., 18:774
Phenolic resin polymerization, 18:760–765
alkaline catalysts in, 18:762–765
neutral catalysts in, 18:761–762
strong-acid catalysts in, 18:760–761
Phenolic resin prepregs, 18:793
Phenolic resin production unit, 18:766
in abrasive materials, 18:786–787
in air and oil filters, 18:790
additional reactants in, 18:759
analytical methods for, 18:774–779
applications of, 18:781–798
batch processes for, 18:766
from biomass and biochemical processes, 18:769–770
for bonded abrasives, 1:13–14, 18–19
in carbonless copy paper, 18:784–785
in coatings, 18:781–783
controlled decomposition of, 18:773
cured laminates of, 18:793
curing, 18:770–773
decomposition of, 18:772–773
in dispersions, 18:783
economic aspects of, 18:773–774
in fiber bonding, 18:791–792
formaldehyde in, 12:121
health and safety factors related to, 18:779–780
in honeycomb structures, 18:796
inorganic pigment applications, 7:372t
in laminate manufacture, 18:789–790
in liquid-injection molding, 18:794–795
long-term use of, 18:773t
manufacture of, 18:765–770
materials of construction for, 18:766–767
in molding compounds, 18:785–786
monomers, 18:757–759
in nanocomposites, 18:794
organic pigment applications, 7:368t
preparation of, 18:756
recycling, 18:780–781
resole-type, 18:762–765
as spherical fillers, 18:796–797
substituted phenols used for, 18:758t
typical soluble dye applications, 7:376t
in wood bonding, 18:790–791
Phenolic sheet-molding compound, 18:793
Phenolic-terminated curing agents, 10:406
Phenol monomers, 10:193
Phenol plant, 18:749
Phenols. See also Phenol; Phenolic entries
achiral derivatizing agents, 6:96t
alkylation, 2:196–197, 212–214
aroma chemicals, 3:243–246
aroma compounds in roasted coffee, 7:256ts
chelating agents, 5:712t
chemiluminescence reagents for determination, 5:851–853
dimethylol-substituted, 18:763
ethylene oxide reaction with, 10:639
ortho-hydroxyalkylation of, 12:165
hydroxylation of, 14:66
oxidation of, 15:608–609
reaction of chloroform with, 6:282
reactions with acetaldehyde, 1:104–105
reactions with acetylene, 1:181
reactions with carbonates, 6:307
reactions with chloroformates, 6:294
substituted, 18:757–758
in wine, 26:303–304
Phenox process, 10:787
Phenoxyacetic acid herbicides, 13:314
Phenoxyacetic acids, 13:50, 304
Phenoxyalkanoic acids, 13:284
Phenoxyalkanoic herbicides, 13:314–315
Phenoxy anions, formation in lignin, 15:13–14
Phenoxyethanol, antimicrobial used in cosmetics, 7:831t
2-Phenoxyethyl chloroformate molecular formula, 6:291t
Phenoxy herbicides, 10:520
Phenoxypropionic acid herbicides, 13:314
Phenoxy resins, 10:6, 364–365
Phentermine, 3:91
5-Phenyl-3,6-dihydro-1,3,4-oxadiazin-2-one, 13:593
1-Phenyl-5-mercaptotetrazole (HSPT), 21:247
Phenylacetaldehyde annual consumption by region, 2:67t
physical properties of, 2:61t
Phenyl acetate trifluoroborane, 4:144t
Phenylacetylene, 23:335
hydrosilylation of, 22:553, 554
Phenylalanine alkaloids derived from, 2:78, 83–92
content in cocoa and chocolate products, 6:368t
systematic name, formula, and molecular weight, 2:557t
taste profile, 2:605
d-Phenylalanine, systematic name, formula, and molecular weight, 2:557t
dL-Phenylalanine, systematic name, formula, and molecular weight, 2:557t
I-Phenylalanine in aspartame synthesis, 24:229–231
systematic name, formula, and molecular weight, 2:557t
Phenyl allyl carbonate, molecular formula, 6:305t
3-(N-Phenylamino)phenol, 2:668, physical properties of, 2:666t
Phenylantimony dihydroxide oxide, 3:72
5-Phenylazosalicylic acid, 22:6
2-Phenylbenzimidazole-5-sulfonic acid, cosmetic uv absorber, 7:846t
Phenyl benzoate, 3:635
Phenylbis(trimethylsilyl)stibine, 3:68
Phenylcarbamate herbicides, 13:320
N-Phenylcarbamate herbicides, 13:303
Phenyl chloroformate DOT regulations for shipment, 6:301t
molecular formula, 6:291t
toxicity, 6:302t
Phenylchlorosilane(s), 22:551
in TD resin preparation, 22:588
Phenyldiazonium chloride, 21:250
Phenyldichlorostibine, 3:68
Phenylglycinonitrile, 8:174
Phenylglycinonitrile, 8:174
Phenylglycine, 1:138; 9:279
Phenylglycinonitrile, 8:174
Phenyldihalobismuthines, 4:29
Phenyliodostibine, 3:68
m-Phenylenediamine (MPD). See meta-Phenylatediamine (MPD)
meta-Phenylenediamine (MPD), 10:396; 19:714
intermediate used in oxidation hair dyes, 7:858t
p-Phenylatediamine (PPD), 19:245, 248, 715, 849
function as ingredient in cosmetics, 7:829t
intermediate used in oxidation hair dyes, 7:858t
Phenylatediamines, alkylation, 2:197
p-Phenylenediisocyanate (PPDI), 25:462
p-Phenylene ladder oligomers, sulfonio-bridged, 23:709, 716
1-Phenylethanol, 20:805
Phenylethanolamine, physical properties of, 2:124t
2-Phenylethyl alcohol, 25:181
1-Phenylethylamine, chiral derivatizing reagent, 6:76t
Phenylethanolamine, physical properties of, 2:124t
Phenylethynyl-terminated imide (PETI) series, 20:276, 284
p-Phenylatediamine (PPD), 19:245, 248, 715, 849
Phenyl formate, physical properties, 6:292t
Phenyl glycidyl ether (PGE), 10:376
N-Phenylglycine, 1:138; 9:279
N-Phenylglycinonitrile, 8:174
Phenylhydrazine synthesis, 13:573
Phenylhydrazine cleavage, microwaves in, 16:562
2-Phenyl imidazoline, 10:410
Phenyllithium, 3:603; 14:249; 15:147–148
Phenylmagnesium chloride, 3:604
Phenylmercaptotetrazoles, 19:196
Phenylmercuric acetate, 3:603
  antimicrobial used in cosmetics, 7:831t
Phenylmercuric benzoate, antimicrobial
  used in cosmetics, 7:831t
Phenylmercuric borate, antimicrobial used
  in cosmetics, 7:831t
Phenyl metaborate, salicyl alcohol and,
  22:24
Phenyl metallation, 16:91
N-Phenyl-N’-(1,3-dimethylbutyl)-p-
  phenylenediamine, 3:107
N-(Phenylmethyl)-9-(tetrahydro-2H-pyran-
  2-yl)-9H- purin-6-amine, 13:26t
  as a plant growth regulator, 13:37–38
4-Phenylol anchoring groups, 8:683t
4-Phenylphenol, chemiluminescence
  reagent enhancer, 5:845
o-Phenylphenol, antimicrobial used in
  cosmetics, 7:831t
Phenylphosphonic dichloride, 19:30
N-Phenyl-p-phenylenediamine,
  intermediate used in oxidation hair
dyes, 7:858t
2-Phenylpropane, 8:147
Phenylpropanolamine, 3:90–91
Phenylpropanolamine hydrochloride, 3:90t
Phenylpyridazinones, 19:28
Phenylsiloxane, 22:575
Phenylethylsiloxane, 22:575
Phenylstibine, 3:68
Phenyl-substituted silicones, 22:576
z-Phenyl-tert-butyl nitrate, 2:814
N-Phenylthalamic acid, 13:45t, 56
Phenylthalic trifluoroacetate, 3:603
Phenyllithium trialkoxide, 25:106
Phenyltrimethylammonium tribromide,
  bromination reagent, 4:344
Phenytoin, 5:100
  folic acid and, 25:803
  molecular formula and structure, 5:91t
Pheromones, for controlling insect
  populations, 26:942
Philippines, aquaculture production,
  3:189t
Phillips catalysts, 17:702; 20:151–152
  active chromium species on, 20:156
Phillips chromium catalyst, 20:152
Phillips Petroleum loop slurry process,
  20:168
Phosphatation, in cane sugar refining,
  695
Phospham, 12:231
Phosphafullerenes, 12:231
Phosphafullerenes, 12:231
Phosgene waste disposal, 18:810
Phosgene process control equipment,
  quality and design of, 18:809
Phosgene dose-indicator badges, 18:808
Phosgene process control equipment,
  quality and design of, 18:809
Phosgenation, 18:802–814, 19:65
  analytical and test methods for,
    18:807–808
  carbon monoxide in production of, 5:7
  as a chlorinating agent, 18:804
  chlorine in manufacture of, 6:204
  diffusion coefficient in air at 0°C, 1:70t
  health and safety factors related to,
    18:809–810
  inhalation of, 18:809
  manufacture of, 18:806–807
  in polycarbonate preparation,
    19:811–812
  production from acetaldehyde, 1:105
  properties of, 18:803–806
  reactions of, 18:804–806
  reaction with amino acids, 2:567
  storage and handling of, 18:808–809
  uses for, 18:810–811
Phosgene dose-indicator badges, 18:808
Phosgene process control equipment,
  quality and design of, 18:809
Phosgene waste disposal, 18:810
Phosphafullerenes, 12:231
Phospham, 19:57
Phosphatation, in cane sugar refining,
  23:452
Phosphate, See also Phosphates
  buffer for ion-exchange chromatography, 3:830t
  colorants for ceramics, 7:347t
Phosphate analysis, of water, 26:39
Phosphate anions, classification of, 18:816t
Phosphate-bonded investments, 8:294
  compressive strength, 8:289t
Phosphate coatings, 16:215, 217, 218
Phosphate containing anionic surfactants, 24:146
Phosphate-containing molecular sieves, 16:819–820
Phosphate conversion coatings, 18:829
Phosphated flour, 26:283
Phosphate drilling mud thinners, 9:16t
Phosphate ester additives, 11:500
Phosphate esters, manufacture of, 19:51
Phosphate fertilizers, 11:111, 117–122, 125, 127; 23:590
  agronomic effectiveness of, 11:121–122
  biological fixation of, 11:122
  materials in, 11:118–121
Phosphate glasses, 12:573–575, 616
  durability of, 12:585
  electrical conductivity of, 12:587t
Phosphate industry, 18:814
Phosphate ore, 19:5–7. See also Phosphate rock
Phosphate–phosphonate oligomers, 11:497
Phosphate–polymer control, in industrial water treatment, 26:132–133
Phosphate recognition, 16:794
Phosphate refractory dental dies, 
  compressive strength, 8:289t
Phosphate rock, 11:119, 120
  minerals in, 19:5, 14
  recovery of fluoride from, 14:12–13
  U.S. imports for consumption of, 19:15t
  U.S. production of, 19:17
Phosphates, 18:814–863; 19:19. See also Phosphate; Polyphosphates
  aluminum acid, 18:839
  ammonium, 11:487; 18:835–836
  analysis of, 18:851–852
  calcium, 18:836–839
  condensed, 18:841–852
  crystalline, 18:839
  dispersants, 8:710t
  economic aspects of, 18:859–860
  environmental considerations related to, 18:861
  glass-ceramics based on, 12:641–642
  halogenated alkyl, 11:489–496
  health and safety factors related to, 18:860
  iron, 18:839
  melamine and amine, 11:488
  oligomeric ethyl ethylene, 11:489
  orthophosphates, 18:830–841
  potassium, 18:834–835
  predicted deviations from Raoult’s law based on hydrogen-bonding interactions, 8:814t
  sodium, 18:831–834
  tertiary metal, 18:840
  titanium, 25:57
  trialkyl, 11:489
  two- or three-dimensional structures of, 18:840–841
  uranium, 25:432–434
  western, 19:5–7
  zirconium, 26:649–650
Phosphate salts, manufacture of, 18:852–859
Phosphate treatment, in industrial water treatment, 26:132
Phosphatic limestone, 15:28
Phosphating, metal surface, 16:214–218
Phosphazenes, 19:55–57
  physical properties of, 19:56t
Phosphides, 19:4
  alkaline earth, 19:28
  chemical vapor deposition precursor, 5:805t
  inorganic, 19:58–59
  titanium, 25:56–57
  zirconium, 26:641
Phosphinates, 11:493
Phosphine(s), 19:16, 20
  alkylolation of, 19:61–62
  coordination with Lewis acids, 19:62
  health and safety factors related to, 19:59–60, 66
  inorganic, 19:57–58
  physical properties of, 19:63t
  purified, 19:58
  reaction with acrylamide, 1:289
  separation from carbide-generated acetylene, 1:207
  in silicone network preparation, 22:565
  spontaneous ignition of, 19:35
  VDC polymer degradation and, 25:718
Phosphine complexes, osmium, 19:642
Phosphine coordination complexes, of uranium, 25:436
Phosphine derivatives, 19:28
Phosphine oxide(s), 11:495–496; 19:66
predicted deviations from Raoult’s law based on hydrogen-bonding interactions, 8:814t
in salicylic acid manufacture, 22:8
Phosphine oxide diols/triols, 11:501
Phosphine selenides, 22:90
Phosphinic acid, 19:20, 54–55
Phosphinic anhydride, 11:499
Phosphinothricin acetyltransferase (PAT) proteins, 13:360
Phosphite esters, 19:20
Phosphites, in VDC polymer stabilization, 25:720
Phosphate diesters, 19:37
Phosphobetaine monomers, 20:480
Phosphobetaines, 20:482
Phosphoboranes, 4:170, 204
Phosphocreatine, 17:671
Phosphodiesterase inhibitors, 5:181t, 186
Phosphodiester backbones, modified, 17:628–629
Phosphodiesters, 17:625
Phosphoethyl methacrylate, 16:242
Phosphogypsum, 4:593; 23:577
Phospholipids, 10:804, 822; 24:53
in cosmetics, 24:159
Phospholipid surfactants, 24:161
Phosphomolybdic acid (PMA), 19:438
Phosphomycin calcium, registered for use in aquaculture in Japan, 3:221t
Phosphonate esters, 19:37
Phosphonate finishes, 11:498
Phosphonates
halogenated, 11:489–496
oligomeric cyclic, 11:492
Phosphonic acid(s), 11:498; 19:36, 52–54, 68
chelating agents, 5:711, 713t
synthesis of, 19:64
trialkyl esters of, 19:54
Phosphonic acid dye, acid-fixable, 9:479
Phosphonium compounds, 10:363
Phosphonium perchlorate, 18:279
Phosphonium salts, 19:66–67
2-Phosphonobutane-1,2,4-tricarboxylic acid (PBTC), 19:29
Phosphonocarboxylic acid esters, 19:29
Phosphonomannans, 4:706
N-(Phosphonomethyl)-glycine, 13:26t; 19:53
monoisopropylamine salt, 2:549t
as a plant growth regulator, 13:38–39
Phosphonoxy-L-ascorbic acid magnesium salt, 25:762
Phosphonyl halides, 19:64
Phosphoramidite DNA synthesis method, 17:623–624
Phosphor bronzes, 24:796
mechanical properties of 1.25% E, 7:678t
mechanical properties of 5% A, 7:678t
mechanical properties of B2, 7:678t
nominal composition and UNS designation, 7:722t
UNS designation, 7:721t
Phosphor-containing epoxies, 10:455–456
Phosphorescent pigments, 19:411
Phosphoric acid(s), 11:127; 12:45; 18:814–863, 19:19, 38
analysis of, 18:820t
applications of, 18:814
as a catalyst, 11:484
catalytic applications of, 18:830
as cellulose solvent, 11:272–274
in cocoa shell from roasted beans, 6:357t
condensed, 18:826–830
economic aspects of, 18:859–860
environmental considerations related to, 18:861
extraction, 10:791
as food additives, 18:829–830
health and safety factors related to, 18:860
manufacture of, 18:819–826
in olefin hydration, 10:540
organic-phase extraction of, 18:825–826
orthophosphoric acid, 18:817–826
in pet foods, 10:856
physical properties of aqueous solutions of, 18:819t
in potassium phosphate production, 20:637
properties of, 18:817–819
solvent for cotton, 8:21
strong, 18:827t
thermal process, 18:820–823
in triple superphosphate production, 11:119–120
wet-process, 18:819–820, 824–826
Phosphoric acid-based systems, for cellulosics, 11:488
Phosphoric acid esters, 24:159
effects of carbon monoxide and sulfur in, 12:219
fuel and oxidant utilization in, 12:219
Phosphoric acid–nitric acid baths, 18:829
Phosphoric acid solutions, vapor pressure of, 18:819
Phosphorite deposits, 17:688, 691
Phosphorite uranium deposits, 17:520
Phosphorochloridate synthesis, 19:28
Phosphorodithioate DNA, 17:630
Phosphorodithioates, 17:630
Phosphorothioates, 17:629–630
synthesis of, 17:630
Phosphorous acid, 19:52
Phosphorous donor ligands, thorium and, 24:768
Phosphors
high throughput experimentation, 7:414t
rare-earth-based, 14:650–651
yttric, 14:646
Phosphorus (P), 19:1–19. See also GaAsP system; Gallium phosphide (GaP) semiconductor; InGaAsP alloy; Organophosphorus extractants; Phosphate fertilizers
atomized, 18:820
in biological wastewater treatment, 25:896
in bioremediation design considerations, 25:841
build-up of, 12:465–466
catalyst poison, 5:257t
chemical properties of, 19:4
in chromium ferroalloys, 6:501t
combustion of, 18:822, 823
content in cocoa and chocolate products, 6:371t
in cotton fiber, 8:20t
early production of, 19:2
economic aspects of, 19:14–15
effect on copper resistivity, 7:676t
 elemental, 18:823; 19:1–2, 4, 14
environmental concerns related to, 19:17
gallium compounds with, 12:360
health and safety factors related to, 19:16–17
hydroxybenzoic acids and, 22:3
lower oxides of, 19:34, 49
mining of, 19:5–7
oxyacids of, 19:21t
in pet foods, 10:851
physical properties of, 19:2–4
in ruminant feeds, 10:867
shipping and handling, 19:13–14
silicone chemistry and, 22:551
as silicon impurity, 22:507
soil chemistry of, 11:112
solubility limits and electrical conductivity effects on copper, 7:750t
solubility of, 19:2–3
tin compounds with, 24:807
uses for, 19:18
Phosphorus-31 nuclear magnetic resonance (nmr), 19:31
Phosphorus-33, 21:272
Phosphorus allotropes, 19:3
Phosphorus bonding, 19:28–30. See also P–C bonds
Phosphorus compounds, 19:19–73
bond properties of, 19:26
chemical properties of, 19:20–31
chiral-centered, 19:25–26
economic aspects of, 19:67–69
as flame retardants, 19:51
inorganic, 11:487–488
oxidation states, coordination numbers, and geometries of, 19:20–26
as oxyacid derivatives, 19:20
reactive organic, 11:496–497
titanium in, 25:56–57
triply connected, 19:25
U.S. prices of, 19:68t
U.S. production of, 19:67t
Phosphorus concentration, in catalytic oxidation, 10:95
Phosphorus-containing polyester fibers, 11:499
Phosphorus-containing polymers, 11:498–499
Phosphorus-containing diols/polyols, 11:496–497
Phosphorus deoxidized pitch copper wrought alloy, mechanical properties, 7:678t
Phosphorus deposition, 9:692–693. See also Nickel phosphorus (Ni-P) deposits
Phosphorus Emergency Response Team (PERT), 19:14

Phosphorus flame retardants, 11:484–510
additive organic, 11:488–489
commercial, 11:487–499
economic aspects of, 11:503
in epoxy resins, 11:499–501
health, safety, and environmental factors related to, 11:501–503
interaction with other flame retardants, 11:486
mechanisms of action, 11:484–486
Phosphorus furnaces, 19:8–11
operating characteristics of, 19:10t
Phosphorus halides, 19:31–44
phosphorus oxychloride, 19:37–42
phosphorus pentachloride, 19:42–44
phosphorus sulfochloride, 19:42
phosphorus trichloride, 19:33–37
physical properties of, 19:32t
Phosphorus–halogen bond, 19:30–31
Phosphorus–halogen interactions, 11:486
Phosphorus heptasulfide, 19:47
Phosphorus–hydrogen bond, 19:27–28
Phosphorus manufacture, 19:4–13
by-products of, 19:11–12
feed preparation in, 19:7–8
product quality and specifications in, 19:12–13
product recovery in, 19:11
Phosphorus–nitrogen compounds, 19:57
Phosphorus oxide, 19:51–52
Phosphorus oxides, 19:20, 49–55
Phosphorus(V) oxides, 19:49–51. See also Phosphorus pentoxide
Phosphorus oxyacid esters, 19:22t, 27
Phosphorus oxychloride, 19:37–42
end use of chlorine, 6:135t
health and safety factors related to, 19:40–41
hydrolysis of, 19:38
manufacture of, 19:38–40, 51
properties and reactions of, 19:37–38
sodium reactions with, 22:766
specifications for, 19:40
storage, shipping, and handling of, 19:40
uses for, 19:41–42
vapors of, 19:40
Phosphorus–oxygen bonds, 19:26–27
Phosphorus oxyhalide, physical properties of, 19:39t
Phosphorus pentabromide, physical properties of, 4:325
Phosphorus pentachloride, 19:40, 42–44
end use of chlorine, 6:135t
sodium reactions with, 22:766
Phosphorus pentachloride, 19:33
Phosphorus pentahalides, 19:31–33
Phosphorus pentoxide, 19:49, 69. See also Phosphorus(V) oxides
as cellulose solvent, 11:272
in hydrogen fluoride manufacture, 14:11
vapor of, 19:49
Phosphorus production technology, 19:5
Phosphorus production plants, 19:17
Phosphorus removal, as advanced wastewater treatment, 25:907
Phosphorus-rich phosphides, 19:59
Phosphorus selenides, 22:87
Phosphorus sesquisulfide, 19:47
Phosphorus–silver, UNS designation, 7:721t
Phosphorus stabilization, 11:695–697
Phosphorus sulfochlorides, 19:44–48
analyses and analytical test methods for, 19:47–48
health and safety factors related to, 19:48
hydrolysis of, 19:44, 46t
manufacture of, 19:47
properties and reactions of, 19:44–47
shipping and storage of, 19:48
structure of, 19:46
uses for, 19:48
Phosphorus(V) sulfide, 19:47
fire and explosion from, 19:48
uses for, 19:48
Phosphorus sulfochloride, 19:42
Phosphorus sulfohalides, physical properties of, 19:43t
Phosphorus–sulfur bonds, 19:26–27
Phosphorus tetroxide, 19:52
Phosphorus tribromide, physical properties of, 4:325
Phosphorus trichloride, sodium reactions with, 22:766
Phosphorus trichloride, 19:33–37, 54, 67, 68
end use of chlorine, 6:135t
health and safety factors related to, 19:36
hydrolysis of, 19:33–35
manufacture of, 19:35–36
oxidation of, 19:38–40
properties and reactions of, 19:33–35
specifications and analytical methods for, 19:36
storage, shipping, and handling of, 19:36
uses for, 19:36–37
vapors of, 19:36, 42
Phosphorus trifluoride, 19:31
Phosphorus trihalides, 19:31
Phosphorus trioxide. See Phosphorus(III) oxide
Phosphorus vapor, 19:4, 16
Phosphoryl chloride, solubility of chlorine in, 6:133t
Phosphotriester DNA synthesis method, 17:624
Phosphotungstic acid (PTA), 19:438
Phosphotungstomolybdic acid (PTMA), 19:438
Phossy jaw, 19:16
PhoStrip process, as advanced wastewater treatment, 25:907
Photoablation, 20:278
Photoacid generators (PAGs), 10:521; 15:165–168
ionic, 15:166–167
nonionic, 15:167–168
solubility properties of, 15:167
Photoacoustic detection and ranging (padar), 23:140
Photoacoustic spectroscopy (pas), 14:232; 23:140
Photobiological hydrogen production, 13:849–850
Photobleach mechanism, 19:203
Photobleach reversal grains, 19:201
Photocatalysis, 19:73–106. See also Photocatalysts; Photoreactors
aqueous pollutants eliminated and mineralized by, 19:89t
catalyst modifications in, 19:94–95
catalysts in, 19:75–76
challenges in, 19:101–102
fate of photo-holes in titania, 19:82–85
in fine chemistry applications, 19:102
influence of oxygen pressure in, 19:82
ion doping in, 19:94–95
mass of catalyst in, 19:77–78
noble metal deposit in, 19:94
parameters governing kinetics in, 19:77–82
photocatalytic (solar) photoreactors, 19:95–99
principles of, 19:74–75
radiant flux in, 19:80–81
reactant concentration/partial pressure in, 19:78
solar, 23:23–24
solar devices in, 19:80
temperature in, 19:78–80
in wastewater treatment, 25:910–911
in water treatment, 19:102
wavelength in, 19:78
Photocatalysts. See also Photocatalysis
most effective, 19:95
for photothermographic/thermographic imaging materials, 19:343–346
Photocatalytic processes, natural, 19:100–101
Photocatalytic quantum yield (quantum efficiency), 19:81–82
Photocatalytic reactions
parameters and characteristics of, 19:86t
types of, 19:85–87
Photocatalytic support-based composites, 14:105
Photocatalytic systems, standardized tests for, 19:102
Photocatalytic water decontamination, 19:87–94
inorganic pollutants in, 19:87–89
organic pollutants in, 19:89–94
pesticide degradation pathways in, 19:90–92
Photochemical decomposition, of ozone, 17:773–774
Photochemical degradation, of herbicides, 13:309
Photochemical iniferters, 14:297
Photochemical laws, 19:108
Photochemically initiated reactions, pressure treated, 13:416
Photochemical reactions
as a function of pressure, 13:429
quinones in, 21:244
Photochemical reduction, 19:172
Photochemical smog, 1:789–796
Photochemical smog, 17:790
Photochemical technology, 19:106–126
applications of, 19:115–122
electron-transfer dynamics in, 19:111–113
excited-state relaxation in, 19:109–111
light sources in, 19:107–108
multiphoton effects in, 19:109
polymer-based, 19:117–120
spectral sensitization in, 9:515–520
Photochemical therapies, 19:120–122
Photochemical vapor deposition (PCVD), 5:807; 19:115; 24:743, 745–746
Photochemistry, of vinyl chloride, 25:632–633
Photochromic dyes, 20:516
Photochromic glass
silver in, 22:658, 686
as a solar energy material, 23:5
Photochromic lenses, 6:588, 601–602
Photochromic materials, 6:587–606
inorganic, 6:589–592
organic, 6:592–601
polyoxometalates, 6:591–592
silver halide-containing glasses, 6:589–590
sol–gel systems, 6:592
uses, 6:601–603
Photochromic pigments, 6:588
Photochromic sunglasses, smart material in, 22:707
Photochromic systems, 6:588
Photochromism, 6:587–589; 22:708t, 716; 23:6
based on cycloaddition reactions
involving bimolecular mechanism, 6:601
based on dissociation processes,
6:595–596
based on electrolytic reactions,
6:597–600
based on geometric inversion, 6:593
based on redox reaction, 6:597
based on tautomerism or hydrogen
transfer, 6:593–595
based on triplet formation, 6:596
Photoconductive detector arrays,
19:161–163
Photoconductivity, 23:34
selenium, 22:99
Photoconductor noise, 19:133
Photoconductors, 19:138
doped germanium and silicon,
19:164–165
semiconductor-based, 22:180, 181
Photodegradable plastics, 20:231
Photodegradation
of polystyrene, 23:374–376
of wool keratin, 26:400
Photodetector noise, 19:132–133
blackbody emittance and, 19:131–132
bolometers, 19:143–144
cadmium sulfide photoconductor,
19:155–156
calibrating, 19:134
charge-coupled devices and imaging
arrays, 19:146–152
charge mode detectors, 19:140–143
CMOS image sensors, 19:154–155
cutoff wavelengths in, 19:130
detectivity in, 19:133–134
fabrication and performance of,
19:144–167
figures of merit related to, 19:132–137
GaAsP and InGaAs photodiodes,
19:156–157
health and safety factors related to,
19:167–168
ideal performance and cooling
requirements in, 19:134–137
InSb photodiode detectors and arrays,
19:158
mercury cadmium telluride, 19:158–164
modes of operation of, 19:137–144
operating temperature of, 19:134
PbS and PbSe photoconductors, 19:157
performance of, 19:130
photoconductors, 19:138
photodiodes, 19:138–140
platinum silicide Schottky barrier
arrays, 19:157–158
principles of, 19:127–132
responsivity of, 19:132
semiconductor, 19:128–129t
silicon photodiodes, 19:152–154
spectral sensitivities of, 19:145
Photodiode array detectors
liquid chromatography, 6:448–449
Photodiode arrays, 19:153
Photodiode detectors, 19:138–140
Photodiodes, 22:180–181. See also
Avalanche photodiodes (APDs)
Photodissociation, of vinyl chloride,
25:632–633
Photodynamic therapy (PDT), 9:517; 24:56;
26:798–799
sensitizers for, 19:122
sensitizer in, 9:503
Photoelectric effect, 24:84
Photoelectrochemical hydrogen production, 13:849
Photoelectrochemical (PEC) systems, 13:784
Photoelectrons, trapping site for, 19:187
Photoemission current, 20:661
Photoemissive devices, cesium applications, 5:702–703
Photoemulsions, sensitizing dyes added to, 20:514
Photoexcitation, 14:620; 19:109
Photoexcitation modes, 19:130
Photoextinction, 18:143
Photofading, 9:384–389
Photofinishing industry, 19:266
Photofragmentation, of fullerenes, 12:231
Photofrin, 19:122
Photographic crystals, 19:178–189
chemical sensitization of, 19:189–192
effect of dopants on, 19:184
emulsion washing and concentrating procedures for, 19:184–185
impurity incorporation in, 19:184
properties of, 19:185–189
tabular, 19:183–184
techniques for growing, 19:179–184
Photographic film, 19:173
Photographic gelatin, 12:440, 441–442, 443–444
Photographic goods, recovery of silver from, 22:653
Photographic grains
interactions among, 19:209–210
optimized, 19:202
Photographic materials, 19:173; 22:716. See also Photographic crystals
coating techniques for, 19:198
environmental impact of, 22:683
preparation of, 19:178–179
Photographic problems, spectral
sensitizing approaches to, 9:511
Photographic process, flow chart of, 19:174
Photographic processing, environmental aspects of, 19:217–218
Photographic response
exposure required for, 19:202
influences on, 19:201–202
Photographic sensitivity, 19:173
Photographic sensitization, polymethine dyes in, 20:513–514
Photographic spectral sensitizers, 9:505
Photographic speed
in color photography, 19:235
crystal size and, 19:238
standards for, 19:261–262
Photography, 19:172–230. See also Color photography; Instant photography;
Photographic crystals
classes of supports in, 19:197–198
coating structures in, 19:198–199
coordination compound applications, 7:596
development in, 19:204–212
economic aspects of, 19:216
emulsion additives in, 19:196–197
emulsion coating in, 19:197–199
exposure and latent-image formation in, 19:199–202
iodine in, 14:370
one-step, 19:273
polymethine dyes in, 20:514
reduction sensitization in, 19:191–192
response enhancement in, 19:189–196
silver halides in, 22:638–639
silver image in, 19:218–222
silver in, 22:649, 657–658
silver iodide in, 22:671
silver nitrate in, 22:672, 686
sodium bromide in, 22:824
sodium selenite in, 22:102
sodium sulfite in, 23:671
special exposure effects in, 19:202–204
spectral sensitization in, 19:192–196
stabilization in, 19:215–216
stop-bath treatment and fixation in, 19:212–214
sulfur sensitization in, 19:190
thiosalicylic acid in, 22:25
three-color, 19:233–235
washing in, 19:214–215
Photohalogenation, 19:113–114
Photo-holes
for bleaching prefogged emulsion grains, 19:203
reactions in reducing atmospheres, 19:84–85
reactions with water, 19:84
reaction with carboxylic acids, 19:84
reaction with oxygen, 19:84
in titania, 19:82–85
Photoimageable polyimides, 20:278–281
Photoimageable resists, 20:280. See also Photoresists
Photoimaging, 19:107; 20:279
Photoinduced effects, in hydrogenated amorphous silicon, 22:139
Photoinduced electron transfer, 19:111
Photoinitiated cationic curing, 10:414–415
Photoinitiated cross-linking, 15:157
Photoinitiated free-radical photopolymerization (PIP), 15:157–158
Photoinitiated radiation cure, silicone network preparation via, 22:567–569
Photoinitiation, 14:270
Photoinitiators, 14:134
hydrogen-abstracting, 14:301
photocleavage and, 14:302
suppliers of, 14:303
Photoionization detector (PID), gas chromatography, 4:614
Photoisomerization, dye-sensitized, 9:520
“Photo-Kolbe” reaction, 19:84
Photolithography, 15:159
excimer lasers in, 14:693
on-substrate synthesis using, 16:386–387
Photoluminescence, 8:255; 22:218
Photolysis, 25:118
effect of, 14:620
in hydrogen production, 13:784
of vinyl chloride, 25:633
Photolytic amplification, 19:211
Photolytic hydrogen production, 13:849–850
Photolytic properties, of polyamide fibers, 19:746–747
PhotoMax Digital Photo Printer, 19:321
Photomedicine, applications for, 19:121–122
Photometric sorters, 16:625
Photometry, of ascorbic acid, 25:760
Photomicrography, 19:322
Photomultipliers, 14:619
Photomultiplier tube (PMT), 16:389; 18:151; 21:277
Photon-absorption, 19:127–131
Photon collection efficiency, in charge-coupled devices, 19:151
Photon correlation spectroscopy (PCS), 20:381
in particle size measurement, 18:151–152
Photon detectors, 22:180–182
performance of, 22:181
Photon electron rejecting alpha liquid scintillation (PERALS), 24:774
Photon energy, 23:128
Photonic applications, glass in, 12:613–614
Photonic devices high throughput experimentation, 7:414
compound semiconductors in, 22:172–182
Photonics, 17:442
Photon–molecule interaction strength, 23:132
Photon momentum., 14:834
Photon “recycling,” 14:846
Photon scanning tunneling microscopy (PSTM), 16:503
Photons, Compton-scattered, 21:312
Photon spectrum, 21:296
Photon stimulated desorption (PSD), 24:74
Photooxidation, 9:385–386
dye-induced, 19:195
in industry, 9:518
reactions, 9:515–518
Photooxidative degradation of higher olefin polymers, 20:423
of linear low density polyethylene, 20:183–184
Photophone, 11:129
Photophysics, 19:108–113
Photopolymerization, spectral sensitization of, 9:518–519
Photopolymerization chemistry, in optical nanoimprinting, 15:194
Photoreactors, 19:76
polyphasic (solar), 19:95–99
Photoreceptors, 9:513
organic semiconductors used in, 22:223
selenium and organic, 22:91
Photoreductive pathways, 9:386–388
Photorefractive materials, 17:457
Photoresists early, 15:156–158
market for, 15:161
negative, 20:280
negative-tone, 15:170–172
organic esters as, 10:521
photosensitized reactions for, 9:518–519
positive, 20:280–281
positive-tone, 15:161–163, 169–170
stripping of, 24:22
Photoresponsive gels, 9:61
Photoresponsive materials, 22:708t, 715–716, 721t
Photo-sensitive glass, cerium applications, 5:684
Photosensitive materials, 22:708t, 715–716, 721t
Photosensitive polyimides (PSPIs), 20:280
Photosensitive reactions, chromium application, 6:560–561
Photosensitization, 9:385
of singlet oxygen, 26:804
Photosensitizers, 14:300; 23:374–375
diazonaphthoquinone, 15:161–163
Photostability
of N-halamines, 13:100–101
of organic semiconductors, 22:210
Photostimulated drug delivery systems, 9:61, 81
Photostrictive materials, 22:708t, 716
Photosulfochlorination, of paraffins, 23:528
Photosynthesis, 13:286; 17:747; 26:12
Photosynthetic bacteria, in nitrogen fixation, 17:302
Photosynthetic electron flow, 13:287
Photosystem I (PSI), 13:286. See also PSI transport processes
Photosystem I inhibitors, 13:286–288
Photosystem II (PSII), 13:286. See also PSII entries
Photosystem II inhibitors, 13:288–294
Photosystem inhibitors, electron transport between, 13:288
Phototendering, dye-induced, 9:388–389
Photothermal conversion, of solar energy, 23:10
Photothermal dye sensitization, 9:515
Photothermographic (PTG) imaging, 19:314–320
dry silver materials and processes in, 19:314–317
Fuji systems, 19:317–320
Photothermographic imaging systems, 19:335
Photothermographic materials, 19:211–212. See also Photothermographic/thermographic imaging materials
Photothermographic process
binder role in, 19:359–360
latent image formation in, 19:353–355
mechanism of, 19:353–360
thermal development and toner recycling in, 19:358–359
thermal generation of Ag+ intermediate complexes, 19:355
thermal migration of Ag+ intermediate complexes to latent image, 19:355–358
Photothermographic technology, 19:369
Photothermographic/thermographic imaging materials, 19:329–374. See also Photothermographic materials; PTG entries
color developers in, 19:347–349
constructions of, 19:335–337
developers for, 19:346–350
as high contrast image-setting films, 19:349–350
historical perspective on, 19:330–335
nature of metallic silver in, 19:366–369
photocatalysts for, 19:343–346
sensitization in, 19:360–366
silver sources for, 19:337–343
thermally controllable reactivity of, 19:339–340
toners for, 19:350–352
unique feature of, 19:330
Phototoxicity, of fluoroquinolones, 21:230–231
Photovoltage, 23:37
Photovoltaic (PV) cells, 23:32–53. See also Photovoltaic materials
commercial history of, 23:49–51
conducting polymer applications, 7:541
polymethine dyes in, 20:516–517
selenium, 22:100, 103
spectrum and band gap of, 23:37–39
structure of, 22:220–221
third generation, 23:44
workings of, 23:32–37
Photovoltaic detectors, 19:133, 138
Photovoltaic detectors/arrays/focal planes, 19:163–164
Photovoltaic devices, 23:45–46
organic semiconductors used in, 22:220–222
outlook for, 22:222
performance of, 23:37–38
semiconductor-based, 22:180, 181
Photovoltaic effect, 22:99
Photovoltaic industry, status of, 23:51–52
Photovoltaic market, important features of, 23:51
Photovoltaic materials, 23:39–45
Photovoltaic modules, 23:47–48
Photovoltaics, gallium use in, 12:352
Photovoltaic solar cells, 26:93
Photovoltaic system, component balance in, 23:48–49
Photovoltaic technologies, commercial, 23:44–45
Photoyellowing, of wool, 26:399–401
pH reduction, dye image stabilization by, 19:296
pH-responsive glass, 14:28
pH-sensitive hydrogels, 13:743
pH-sensitive materials, 22:716
pH-sensitive microgels, 13:746
pH-sensitive polymer insulin delivery, 9:68–70
pH sensors, 14:24–25
fouling of, 14:29
pH stability, in food systems, 12:62
pH-stat method, 10:258
pH-swing method, 9:191
Phthalate-based catalysts, 26:544
Phthalated gelatin, 12:444
Phthalate esters, 10:513
Phthalates, in Ziegler-Natta polymerization, 26:520
Phthalation, 10:550
Phthalazine toner, 19:333, 350, 351, 357, 358
Phthalalazineone, 19:332
o-Phthalaldehyde-2-mercaptoethanol, chiral derivatizing reagent, 6:76t
Phthalein dyes, 19:304–305
Phthalic acid, 19:332
aroma chemical derived from naphthalene, 3:235
Phthalic acid toner, 19:351, 357, 358
Phthalic anhydride (PA), 10:406, 407t, 489; 17:84; 20:102; 25:81
manufacture/production of, 17:77, 83
Phthalic compound herbicides, 13:315
Phthalic resins, 20:100, 102
ortho-Phthalic resins, 20:101, 113
formulation of, 20:102
Phthalide, 9:680–681
Phthalimide, 9:333
Phthalic esters, 10:513
Phthalocyanine (PC), 9:513, 515, 518; 14:547
adsorption energy to pigments or fillers, 8:683t
chelant applications, 5:733
dyes, 9:261–262
molecular formula, 5:712t
Phthalocyanine Blue, pigment for plastics, 7:367t, 374t
Phthalocyanine blues, 14:318
Phthalocyanine Green, pigment for plastics, 7:367t
Phthalocyanine green, 14:318
Phthaloyl chlorides, 19:715
pH values
accuracy and interpretation of, 14:26
in chromogenic chemistry, 19:251
Phyllosilicates, 22:453t
clay minerals as, 6:667
hydrothermal treatment of, 14:109
in nylon–clay nanocomposites, 11:313
Physical adsorption, 1:583–584. See also Adsorption
Physical aging, defined, 10:424
Physical analysis, of wine, 26:324
Physical bonding processes, 17:496
Physical–chemical waste treatment, 25:809–825, 843–845
air stripping, 25:809–821
carbon adsorption, 25:811–813
dissolved air flotation, 25:813
distillation, 25:813–815
ion exchange, 25:816–817
membrane filtration, 25:817–818
neutralization, 25:818
oil–water separation, 25:818–819
oxidation/reduction, 25:819–820
precipitation, 25:820–821
sedimentation–clarification, 25:821–822
solvent extraction, 25:822–823
stabilization–solidification, 25:823–824
steam stripping, 25:824
supercritical fluid extraction, 25:824
supercritical water oxidation, 25:825
wet air oxidation, 25:825
Physical chemistry, hydrothermal, 14:85–88
Physical effluent treatment, 9:432
Physical evidence
in forensic chemistry, 12:90–95
purposes of, 12:91–95
types of, 12:91
Physical fractionation, of oils, 10:813–814
Physical materials standards, 15:742
Physical metallurgy, 16:127
Physical models, for process control, 20:687
Physical netpoints, in shape-memory polymers, 22:356, 358
Physical oil refining, 10:807
Physical recycling technologies, in wastewater treatment, 25:888–892
Physical solvents, in hydrogen sulfide recovery, 23:600–601
Physical sputtering, 24:728–729
Physical stability, of ion-exchange resins, 14:402–403
Physical tests, of solid waste, 25:869
Physical vapor deposition, 5:803
Physical vapor deposition (PVD), 16:173; 24:721–724
system for, 24:721–722
Physicochemical properties of polypolyrene, 20:254t
of sulfonamides, 23:499–501

Physics
microfluidic applications in, 26:966–967
of fluid flow, 26:959–963
in sensor technology, 22:264–265
Physikalisch-Technische Bundesanstalt (PTB), 24:436
Physiological cooling agents, 24:525–526
Physiological effects, of hydrogen peroxide, 14:60–61
Physiological functions, of vitamins, 25:784
Physiology, of ascorbic acid, 25:766–773
Physiosorbed water, 23:71–72
Physoctimine, 2:817–818
Phytane, 18:592
in crude oils, 18:584–586
Phytase, 10:300–301
Phytates, 26:292
Phytic acid, 4:710
Phytochelatins, 3:784
Phytoene desaturase (PD) inhibitors, 13:294–295
Phytoextraction, 3:784–785
defined, 3:759t
Phytol, 18:592
defined, 3:759t
Phytol, 24:550
Phytonadione, 25:794–795
Phytoplankton, fertilizers and, 11:126
Phytophthora palmivora, 13:348
Phyto remediation, 3:784; 9:446
in bioremediation, 25:842
defined, 3:759t
hydrocarbons, 3:769
Phytostabilization, 3:785
defined, 3:759t
Phytosterols, 2:815–816; 17:669–671
biochemical effects of, 17:670
commercial sources of, 17:670–671
Phytotoxic allelochemicals, 13:354
Phytotoxin production genes, 13:351
Phytotoxins, 13:281, 330
autotoxic activities of, 13:356
PG99 Conference on Process Integration, conclusions of, 20:766
π, Monte Carlo procedure for estimating, 26:1003–1004
Piassava, 11:298
Pichia pastoris, 12:479
Pickle inhibitors, 16:222
Pickling, 16:222–223. See also Acid dips/pickles; Electropickling
environmental concerns of titanium, 24:865
of metals and alloys, 16:222–223
Pickling agent, 12:31
Pickrite, 5:785t
Picloram, 13:322
α-Picoline, 21:92, 101
synthesis of, 21:109
uses for, 21:119
β-Picoline, 21:110
from acrolein, 1:276
uses for, 21:120
3-Picoline N-oxide, 21:105
Picrolines
uses for, 21:119–120
vapor-phase synthesis of, 21:110
“Picopulses,” 14:620
Picornaviruses, 3:137
Picrochromite, in chromite, 6:474
Picromerite, 5:785t
Pictet-Gams method, 21:202
Pictet-Spengler synthesis, of isooquinoline, 21:202–203
Pictography 3000 system, 19:318
Pictography 4000 system, 19:318
Pictro Proof digital color proofer, 19:320
Pictrostat 300 (PS300) system, 19:318
Pictrostat Digital 400 system, 19:318, 319
π-cyclopentadienyl nickel complexes, 17:114–115
Pidgeon magnesium manufacturing process, 15:339–340; 16:147
Pidotimod, 2:824
Piece goods, detersive systems for, 8:413t
Piecewise Direct Standardization, 6:67
Pierce Disease, 26:309
Pigment Black 11, for plastics, 606-614; 22:708t
Piezochromic materials, 6: coordination compounds and metal cluster compounds, 6:610-611
organic molecules in crystals and polymer films, 6:607-610
organometallic complexes of Cu(II), 6:611-612
Piezochromism, 6:606-607, 612-613
negative piezosolvatochromism, 6:611
Piezoelectric actuation, for lab-on-a-chip valves, 26:975
Piezoelectric biomaterials, 3:748-750
Piezoelectric ceramics, 1:708-710
U.S. market trends, 1:710t
Piezoelectric coefficient tensor, 11:93, 94
Piezoelectric crystals, 17:423
in acoustic wave sensors, 22:270
Piezoelectric devices, applications of, 11:103-104
Piezoelectric effect. See also Piezoelectricity in silicon, 22:486
in smart materials, 22:708t, 709-711, 721t
Piezoelectric immunosensors, 3:803-805
Piezoelectricity, 11:95, 96, 100, 105, 106, 107
in perovskites, 11:95
Piezoelectric materials, 14:93
electrostrictive materials and, 22:713
magnetostrictive materials and, 22:715
properties of, 14:94, 96t
smart, 22:706, 707, 709-711, 721t
Piezoelectric polarization, in compound semiconductors, 22:152
Piezoelectric pressure sensor, 20:652, 653
Piezoelectric transducers, 17:425
Piezoelectric DNA-based biosensors, 3:806-807
Piezoresistive sensors, 20:655-656
Piezo technology, in commercial printing, 14:327
Pig, limiting amino acids of common feedstuffs for, 2:604t
Pig iron, 14:498; 16:143, 150; 23:250
economic aspects of, 14:523-524
world production of, 14:525t
silicon in, 22:515
Pigmentary titanium dioxide, 25:21-23
Pigmentation, of Teflon PFA, 18:338
Pigment Black 7, for plastics, 7:369t
Pigment Black 11, for plastics, 7:369t
Pigment Black 12, for plastics, 7:369t
Pigment Black 26, for plastics, 7:369t
Pigment Black 27, for plastics, 7:369t
Pigment Black 28, for plastics, 7:369t
Pigment Black 30, for plastics, 7:369t
Pigment Blue 15:1, for plastics, 7:367t
Pigment Blue 15:3, for plastics, 7:367t
Pigment Blue 15:4, for plastics, 7:367t
Pigment Blue 25, for plastics, 7:367t
Pigment Blue 27, for plastics, 7:370t
Pigment Blue 28, for plastics, 7:370t
Pigment Blue 29, for plastics, 7:370t
Pigment Blue 36, for plastics, 7:370t
Pigment Blue 36:1, for plastics, 7:370t
Pigment Blue 60, 19:445
for plastics, 7:367t
Pigment Blue 72, for plastics, 7:370t
Pigment Brown 6, for plastics, 7:369t
Pigment Brown 11, for plastics, 7:369t
Pigment Brown 24, for plastics, 7:369t
Pigment Brown 31, for plastics, 7:369t
Pigment Brown 33, for plastics, 7:369t
Pigment Brown 35, for plastics, 7:369t
Pigment Brown (Black) 35, for plastics, 7:369t
Pigment Brown 39, for plastics, 7:369t
Pigment Brown 40, for plastics, 7:370t
Pigment Brown 45, for plastics, 7:370t
Pigment coatings, for paper, 18:123-125
Pigment color, determinants of, 19:376
Pigment coloration, 9:199
Pigment dispersers
alkanolamines from nitro alcohols, 2:119
alkanolamines from olefin oxides and ammonia, 2:139
high speed, 18:63-64
Pigment dispersion, 14:324
Pigmented fibers, acrylic, 11:213
Pigmented HDPE, 21:451
Pigment finishing, 25:37-39
Pigment-grade TiO2, world production of, 24:860-861
Pigment Green 7, for plastics, 7:367t
Pigment Green 17, for plastics, 7:370t
Pigment Green 18, for plastics, 7:370t
Pigment Green 26, for plastics, 7:370t
Pigment Green 36, for plastics, 7:367t
Pigment Green 36 brominated phthalocyanine, 4:361t
Pigment Green 50, for plastics, 7:370t
Pigment industry, 19:448
Pigment Orange 5, 19:434
Pigment Red 272, pigment for plastics, 7:367t
Pigment replacements, environmentally safe, 9:45
Pigments, 9:155. See also Azo pigments;
Colorants; Inorganic pigments;
Organic pigments; Titanium dioxide absorbents, 10:808–809
anthraquinone dye, 9:301, 302
attributes of, 19:423
black, 19:408–470
cadmium applications, 4:499–500
carbon black applications, 4:797–799
carotenoid, 10:806
categories of, 19:423
carotenoid, 10:806
colorants, 7:345–354
cromium application, 6:523, 554–558
colored, 19:397–408; 25:39
commercial forms of, 19:423
coordination compounds, 7:595–596
coatings; 7:112–118
in cotton fiber, 8:19t
global consumption of, 19:454t
ink, 14:316
inorganic colorants for plastics, 7:359,
ink, 14:367, 369–370t, 372t, 378
iron oxide, 14:557–559
lead-based, 19:386
mercury in, 16:52
molybdenum compounds in, 17:39
nickel compounds in, 17:124–125
opacity of, 19:376, 380
organic colorants for plastics, 7:359, 365,
366–368t, 378
paint, 18:57–58; 19:377
performance characteristics of, 19:376
for PVC polymers, 25:675
rare earth, 14:646, 650
selenium in, 22:91, 97, 102
in silicone heat-cured rubber, 22:580
as soap bar additives, 22:744
tellurium in, 24:427
versus dyes, 19:417
Pigment technology, 19:375
Pigment Violet, for plastics, 7:370t
Pigment Violet 14, for plastics, 7:370t
Pigment Violet 15, for plastics, 7:370t
Pigment Violet 16, for plastics, 7:370t
Pigment Violet 19
for plastics, 7:367t
semipermanent hair dye, 7:857t
Pigment Violet 19, 19:441

Pigment Red 1, 19:435
Pigment Red 3, 19:435
Pigment Red 38, 19:437
Pigment Red 48:3, for plastics, 7:366t
Pigment Red 48:2, for plastics, 7:366t
Pigment Red 48:1, for plastics, 7:366t
Pigment Red 49:1, 19:435
Pigment Red 53, for plastics, 7:366t
Pigment Red 57:1, 19:436
Pigment Red 88, 19:444
Pigment Red 101, for plastics, 7:370t
Pigment Red 104, for plastics, 7:370t
Pigment Red 108, for plastics, 7:370t
Pigment Red 112, 19:437
Pigment Red 122, for plastics, 7:366t
Pigment Red 123, for plastics, 7:366t
Pigment Red 144, for plastics, 7:366t
Pigment Red 166, for plastics, 7:366t
Pigment Red 168, for plastics, 7:367t
Pigment Red 170, 19:438
Pigment Red 177, 19:444–445
for plastics, 7:367t
Pigment Red 179, for plastics, 7:367t
Pigment Red 188, 19:437
Pigment Red 190, for plastics, 7:367t
Pigment Red 202, for plastics, 7:367t
Pigment Red 216, tribromopyranthrene, 4:361t
Pigment Red 220, for plastics, 7:367t
Pigment Red 221, for plastics, 7:367t
Pigment Red 254, 19:443
for plastics, 7:367t
Pigment Red 255, for plastics, 7:367t
Pigment Red 259, for plastics, 7:370t
Pigment Red 264, 19:443
pigment for plastics, 7:367t

Pigment Red 259, for plastics, 7:370t
Pigment Red 255, for plastics, 7:367t
Pigment Red 254, 19:443
for plastics, 7:367t
Pigment Red 259, for plastics, 7:370t
Pigment Red 264, 19:443
pigment for plastics, 7:367t

Pigment Red 254, 19:443
for plastics, 7:367t
Pigment Red 259, for plastics, 7:370t
Pigment Red 264, 19:443
pigment for plastics, 7:367t

Pigments, 9:155. See also Azo pigments;
Colorants; Inorganic pigments;
Organic pigments; Titanium dioxide absorbents, 10:808–809
anthraquinone dye, 9:301, 302
attributes of, 19:423
black, 19:408–470
cadmium applications, 4:499–500
carbon black applications, 4:797–799
carotenoid, 10:806
categories of, 19:423
carotenoid, 10:806
colorants, 7:345–354
cromium application, 6:523, 554–558
colored, 19:397–408; 25:39
commercial forms of, 19:423
coordination compounds, 7:595–596
coatings; 7:112–118
in cotton fiber, 8:19t
global consumption of, 19:454t
ink, 14:316
inorganic colorants for plastics, 7:359,
ink, 14:367, 369–370t, 372t, 378
iron oxide, 14:557–559
lead-based, 19:386
mercury in, 16:52
molybdenum compounds in, 17:39
nickel compounds in, 17:124–125
opacity of, 19:376, 380
organic colorants for plastics, 7:359, 365,
ink, 14:367, 369–370t, 372t, 378
paint, 18:57–58; 19:377
performance characteristics of, 19:376
for PVC polymers, 25:675
rare earth, 14:646, 650
selenium in, 22:91, 97, 102
in silicone heat-cured rubber, 22:580
as soap bar additives, 22:744
tellurium in, 24:427
versus dyes, 19:417
Pigment technology, 19:375
Pigment Violet, for plastics, 7:370t
Pigment Violet 14, for plastics, 7:370t
Pigment Violet 15, for plastics, 7:370t
Pigment Violet 16, for plastics, 7:370t
Pigment Violet 19
for plastics, 7:367t
semipermanent hair dye, 7:857t
Pigment Violet 19, 19:441
Pigment Violet 23, 19:445–446
for plastics, 7:367t
Pigment Violet 29, for plastics, 7:367t
Pigment Violet 32, for plastics, 7:367t
Pigment-volume concentration (PVC), 18:58, 66, 67, 19:381
Pigment White 6, for plastics, 7:369t
Pigment Yellow 13
for plastics, 7:366t
semipermanent hair dye, 7:857t
Pigment Yellow 14, for plastics, 7:366t
Pigment Yellow 17, for plastics, 7:366t
Pigment Yellow 34, for plastics, 7:370t
Pigment Yellow 35, for plastics, 7:370t
Pigment Yellow 37, for plastics, 7:370t
Pigment Yellow 42, for plastics, 7:370t
Pigment Yellow 53, for plastics, 7:370t
Pigment Yellow 62:1, for plastics, 7:366t
Pigment Yellow 83, for plastics, 7:366t
Pigment Yellow 93, 19:438
for plastics, 7:366t
Pigment Yellow 95, for plastics, 7:366t
Pigment Yellow 97, for plastics, 7:366t
Pigment Yellow 110, 19:446
Pigment Yellow 119, for plastics, 7:370t
Pigment Yellow 138, 19:447
for plastics, 7:366t
Pigment Yellow 139, 19:447
for plastics, 7:366t
Pigment Yellow 147, 19:445
Pigment Yellow 150, for plastics, 7:366t
Pigment Yellow 154, 19:433
Pigment Yellow 155, for plastics, 7:366t
Pigment Yellow 157, for plastics, 7:370t
Pigment Yellow 161, for plastics, 7:370t
Pigment Yellow 162, for plastics, 7:370t
Pigment Yellow 163, for plastics, 7:370t
Pigment Yellow 164, for plastics, 7:370t
Pigment Yellow 168, 19:433
for plastics, 7:366t
Pigment Yellow 184, for plastics, 7:370t
Pigment Yellow 189, for plastics, 7:370t
Pigment Yellow 191, 19:434
for plastics, 7:366t
Pig tin, grades of, 24:790, 791t
Pikromycin, 15:279
Pillared interlayer clays (PILCs), 1:655
“Pill-box” cell, 13:417–419
Pilling, reduced, 11:211
Pillow cases, number produced from one bale of cotton, 8:133t
Pilot plant(s), 19:457–471
control requirements for, 19:462–463
demonstration, 19:459
design of, 19:458–459, 462
development scale (kilo-lab), 19:459
estimating construction costs for, 19:464–465
experimental program planning for, 19:467–468
feed, product, and effluent handling in, 19:466–467
financial justification for, 19:461
in fine chemical research and development, 11:426
fully integrated, 19:458
future trends in, 19:468–469
implicit role of, 19:461
lab-scale bench-top, 19:459
in large-scale pharmaceutical synthesis, 18:729–733
multipurpose, 19:458
multipurpose batch, 19:459
multiunit, 19:459
operating costs of, 19:465–466
process data related to, 19:463
project timeline for, 19:466
prototype, 19:459
purposes served by, 19:458t
risks associated with, 19:457
safety of, 18:732–733; 19:464
scale up in, 19:459–461
size and cost of, 19:459
space requirements for, 19:466
start up of, 19:468
types of, 19:457–458
Pilot plant drug syntheses
agitation in, 18:730–731
drying and solid handling in, 18:731–732
liquid-solid separations in, 18:731
Pilot-plant experimental studies, 19:461
Pilot-plant program, justification for, 19:461
Pilot plant scale-up, for nevirapine synthesis, 18:738–743
Pilot-scale testing, 10:768–769
preliminary to contactor design, 10:768
Pilot studies, VOC emission reduction, 10:90
Pima cotton, 8:2, 13
Pimagedine, 2:811
Pimelic acid, salicylic acid and, 22:6
Pinacol, production from acetone, 1:163
Pink salmon, common and scientific names, 3:187t
Pinning, intrinsic, 23:826
Pinning centers, 23:844–845
effective, 23:826
Pinning effect, 23:866
Pinning force, 23:825–827
Pinning force scaling, global, 23:828
Pinning mechanism, change in, 23:828
Pinpoint sludge, 25:898, 899
Pinsonite, 5:785t
Pinto furnace, 21:395
Pinwheel metallocarborane, 4:214
PIPĐ polymers, 13:377–378
Pipe
HDPE, 20:174
LLDPE, 20:208
PVC in, 25:683–684, 685
Pipe attachments
integral, 19:483
nonintegral, 19:482
Pipecuronium bromide, 4:360t
Pipe distributors, 11:811–813
Pipe extrusion, 19:543–544, 790
Pipe-grade PB resin, properties of, 20:419t
Pipe-grade poly(1-butene), 20:431
Pipe grid design, 11:726
Pipe inspection, cylindrical guided wave
technique for, 17:433–434
Pipeline and Hazardous Materials Safety
Administration (PHMSA), 25:338
Pipeline hydrogen delivery, 13:853
Pipelines, natural gas, 12:379–380
Pipeline specifications, natural gas, 12:378t
Pipeline transportation, 25:328
Pipe manufacture, from higher olefin
polymers, 20:427
Pipe materials, types of, 19:476–478
Pipenzolate bromide, 4:360t
Pipe provers, 11:652–653
PipeACK(s), 19:494
multielevation, 19:515
in plant layout, 19:515–519
PipeACK configurations, types of, 19:516
Piperazine, 8:485
physical properties, 8:486t
prices of commercial 68% aqueous
solution, 8:496t
Piperidines, 21:100, 115
uses for, 21:127–128
Piperine, 2:74
Piperitenone, hydrogenation of, 24:520

Pinacolborane, 13:639, 644
catalytic hydroboration with, 13:645
Pinacol–pinacolone rearrangement, microwaves in, 16:567
Pinacolyl methylphosphonofluoridate (GD), 5:819, 820
Pinane, 3:231; 24:487
cis-Pinane, 24:495
Pinanols, 24:477, 495
Pinch, making stream matches at, 13:199–200. See also Pinch point
Pinch analysis, 10:163; 20:735–737
applications of, 20:763
total site, 20:751
Pinch analysis, targets of, 13:217
Pinch design. See also Pinch Design Method
completing and optimizing, 13:201–203
eample of, 13:203–211
Pinch Design Method, 13:197–203. See also Heat exchanger network design
for heat-exchanger networks,
20:755–756
shortcomings of, 13:211–212
solution derived using, 13:210t
Pinched distillation, debottlenecking, 18:521
Pinched regions, strategic separation
schemes and, 22:308t
Pinch match heat loads, 13:207t
Pinch point, 13:192
packed column absorbers, 1:49–50
Pinch principle, 13:198–199
Pindolol, molecular formula and structure,
5:157t
α-Pinene, 3:230; 24:494–496
acid-catalyzed isomerization of, 24:495
epoxidation of, 24:496
as natural precursor for aroma
chemicals, 3:231
pyrolysis of, 24:495
terpenoids from, 24:477–478
β-Pinene, 3:230; 24:496–497
major products from, 24:478
l-menthol from, 24:522
as natural precursor for aroma
chemicals, 3:232
terpenoids from, 24:478–479
Pine oil, 24:510–511
p–i–n junctions, 22:136–139
Pink bollworm, 8:9
Pink pigments, 7:349–350
Piperitone, 24:540
l-Piperitone, l-menthol from, 24:522–523
Pipe still furnaces, 18:646
Pipe taps, 11:658–659
Piping
as a cause of tank spills and leaks, 24:306
for fermentation, 11:31–34
heat exchanger, 19:507, 508
opening, 21:854
in plant layout, 19:506
safety of, 21:850–851
Piping and instrumentation diagram
(P & I D), 20:731
Piping concept, in fine chemical production, 11:428–430
Piping direction, change in, 19:517
Piping engineering, key disciplines of, 19:472
Piping manifolds, in fine chemical production, 11:429
Piping materials, properties of, 19:479–480
Piping system operations, 19:487–492
Piping systems, 19:471–493. See also Piping system operations
change management in, 19:491–492
construction of, 19:484–487
design documents related to, 19:484
design for occasional loads, 19:482–484
design for sustained loads, 19:482
fitness-for-service assessment of, 19:491
inspection, testing, and turnover related to, 19:485–487
layout and design of, 19:480–484
maintenance of, 19:488–492
materials selection for, 19:476–480
pressure design in, 19:480–482
process and system design in, 19:471–476
shop fabrication and field erection for, 19:484–485
sizing, 19:471–474
thermo-hydraulic design in, 19:471–476
Piping system valves, selection and sizing of, 19:474–476
Pipobroman, 4:360t
Pirani gauge, 20:659–660
Pirbuterol, 5:185
Pirkle phases, 6:83–84
Piroximone, 5:186
Piscicides
promising chemicals for aquaculture, 3:224
registered for aquaculture in U.S., 3:218
π-stacking and charge-transfer dominated substrate recognition, 16:782–783
Piston bag type aerosol system, 1:784–785
Piston cylinder capillary viscometers, 21:730–731
Piston-cylinder high pressure apparatus, 13:413, 414
Piston meters, reciprocating, 11:655
Piston seals, in high pressure apparatus, 13:415
Piston type aerosol system, 1:784
PIT (powder-in-tube) conductors, critical current density in, 23:833–834. See also PIT technique
Pitch-based carbon fibers, 26:733–735
asbestos substitute, 3:314t
compressive strength versus tensile modulus for, 26:742–743
Pitch-based fibers, 26:760
Pitch binders, 12:724–726
Pitchblende, 25:396–397
Pitch control, 10:304
Pitched blade turbine (PBT), 16:672
Pitches
characteristics of, 12:725
use in producing graphite, 12:721
Pitch impregnation process, 12:736–737
Pitching, in beer making, 3:583
Pitch pyrolysis, 12:734
Piteira, 11:296
Pit furnace, 12:734
Pi theorem (Buckingham), 8:582; 11:744
Pitot tubes, 11:661–662
Pit sealants, 8:334–335
PIT technique, 23:845. See also PIT (powder-in-tube) conductors
Pitting corrosion
as failure mechanism, 26:984
in industrial water treatment, 26:126
Pitting resistance equivalent number (PREN), 7:810
Pittsburgh (HVB) coal
carbon structural distribution based on NMR, 6:715t
empirical composition, 6:730t
Pituitary gland, ascorbic acid and, 25:771
Pivalaldehyde. See 2,2-Dimethylpropanal
Pivalic acid, physical properties, 5:35t, 37t
Pivaloylacetonilide couplers, 19:253–254
p-jump (pressure jump), 14:616, 617
pK_a values
- azo dye, 9:366–367
- of sulfonamides, 23:500
PLA/Cloisite 25A nanocomposites, 20:311
Planter, common and scientific names, 3:187t
PLA/MMT nanocomposites, 20:311
Planar cameras, 21:277
Planar cavity surface-emitting laser (PCSEL) diodes, 22:178
Planar diodes, 19:163
Planarization, dielectrics for, 22:192
Planck’s blackbody radiation law, 14:662, 663; 24:452
Planck’s constant, 23:33
Planck spectrum, 23:2
Plan-Do-Check-Act (PDCA) model, 21:174
Plane-polarized light (PPL), 16:470, 476
Planetary rotation reactor, 22:154, 155
Planetary type mixers, 16:720
Plane wall, heat-transfer rate through, 13:243–244
Planned component replacement (PCR), 15:465, 470
Planning. See also Disaster planning;
- Process planning
  - maintenance and, 15:471–473
  - pilot-plant, 19:467–468
  - quality, 15:479
  - steps in, 15:472–473
- Planning package, 15:473
Plantation white sugar, 23:444, 450
Plant–bacterial associations, in nitrogen fixation, 17:296–301
Plant biotechnology, 12:486
Plant capacity, increasing, 20:724–725
Plant cell culture
  - aeration biotechnology applications, 1:744
  - airlifts bioreactors for, 1:740
Plant cells, oxygen demands, 1:730t
Plant cell wall, 21:2, 3–4
- cellulose in, 21:7
Plant construction, safe, 21:852
Plant control, in minerals recovery and processing, 16:665
Plant cost, 9:527
Plant-derived insecticides, 14:338–339
Plant-derived secondary compounds, 13:357
Plant design, in fine chemical production, 11:427–433
Plant extract gums, 13:63t
Plant extracts, as antioxidants, 12:61
- fireproofing, 21:841–842
Plant genetic engineering, 12:484–496
  - bioengineering of glyphosate tolerance, 12:487–490
Plant genome, modification of, 13:333
Plant growth inhibitors, 13:47, 53
Plant growth regulating compounds, 18:525
Plant growth regulators, 13:21–60, 284
carvone, 13:28
cytokinins, 13:28–30
n-decanol, 13:30
dikegulac, 13:30
ethylene, 13:30–32
gamma aminobutyric acid, 13:32
gibberellins, 13:32–35
indole 3-butyric acid, 13:35–36
lactic acid, 13:36
natural products, 13:22–28
paclobutrazol, 13:56–57
synthetic compounds, 13:39–56
triacontanol, 13:36–37
Plant growth regulator synthesis and function inhibitors, 13:304–307
Plant gums, 20:454
Plant hormones, 13:330
Plant hosts, 11:23
Plant layout, 19:493–523
- blast furnace, 14:505–508
- compressors in, 19:512
- computer-aided design models in, 19:519–521
- control room in, 19:514–515
- cooling towers in, 19:514
- cost-effective, 19:495
- definitions related to, 19:493–494
- design modifications in, 19:495
- equipment considerations related to, 19:501–515
- estimated dimensions of, 19:498
- fired heaters in, 19:511–512
- fractionating towers in, 19:501–504
- heat exchangers in, 19:507–511
- importance of, 19:494–495
- noise abatement in, 19:521–522
- piperack considerations in, 19:515–519
- piperack, piping, and equipment relationships in, 19:517–519
plot plan in, 19:495–501
preliminary, 19:495
pumps in, 19:513, 516–517
reactors in, 19:505–506
scale models of, 19:521
sketch of, 19:497–498
storage tankage in, 19:513–514
tower types in, 19:502
vessels and drums in, 19:504–505

Plant location, 19:523–536
accessibility to transportation and, 19:529
environmental and safety considerations in, 19:527–528
European siting considerations in, 19:530–531
labor availability and productivity and, 19:528
living conditions and, 19:528
power availability and, 19:530
property cost and, 19:529–530
raw material availability and, 19:528–529
requirements for, 19:532
site purchase and, 19:531–532
siting factors in, 19:523–527
taxes and, 19:530
Plant maintenance/repair costs, 9:533
Plant monoesters, 26:204
Plant nutrient sulfur, 23:589
Plant operation
in fine chemical production, 11:433–437
safe, 21:853–854
Plant pathogenesis, 12:476
Plant pathogens
biocontrol of weeds with, 13:346–352
genetic alterations to, 13:350–351
indigenous, 13:347
as weed control agents, 13:331–332
Plant polysaccharides, 20:555–565
derivatization of, 20:556
supramolecular structure of, 20:556–557
Plant products, in pet foods, 10:853–854
Plant proteins, in pet foods, 10:852
Plants. See also Phytoremediation
ascorbic acid biosynthesis in, 25:762, 763–764, 765, 766
carotenoid content in, 17:656t
herbicide fates in, 13:307
selenium occurrence in, 22:78
shelf life of, 12:486
toxicity of seleniferous, 22:96
types of, 9:528
water repellancy of, 22:108–109, 112
Plant safety systems, 20:671–672
Plant-scale trials, 24:343
Plants category, in patents, 18:166
Plant security, 18:
Plant siting checklist, 19:532–535t
Plant starch content, bioengineering of, 12:490–494
Plant uptake, of herbicides, 13:310
Plant viruses, 3:135
Plant waxes. See Vegetal waxes
Plant-wide optimization, 20:675
PlantWise software, 19:520–521
Plaque, 3:710–711
cardiac device solutions, 3:712
PLASDOC service, 18:245
Plasma(s)
bacterial contamination of, 12:142–143
collection of, 12:142
microwave, 16:530–531
processing of, 12:142–143
in semiconductor dry etching, 22:184
Plasma-applied coatings, 15:250
Plasma-arc devices, 17:369
Plasma-arc furnace, 12:303
Plasma-based ion plating, 24:736–738
Plasma carburizing, case hardening by, 16:210
Plasma chemical synthesis, 1:717
Plasma chemical vapor deposition (PCVD), in fiber optic fabrication, 11:139–140
Plasma coatings, 5:665
Plasma deposition, in vitreous silica manufacture, 22:414, 415
Plasma derivatives, 12:129t
distribution and sales of, 12:148t, 149t
freeze-drying, 12:138–139
viruses transmitted by, 12:140
Plasma diagnostic techniques, in growing amorphous silicon, 22:130
Plasma etching, of silicon, 22:492
Plasma FPDs, 22:259
Plasma fractionation, 12:128–159
economic aspects of, 12:147–150
health, safety, and environmental factors related to, 12:153

history of, 12:128–131
inactivation and removal of viruses, 12:139–141
manufacturing and processing in, 12:131
membrane separations, 12:137–138
organization of, 12:133
process rationale for, 12:141–142
protein adsorption, 12:136–137
protein precipitation in, 12:131–136
regulation and control of, 12:150
solid–liquid protein separation, 12:136
specifications and analytical methods related to, 12:150–152
typical operation for, 12:134t
unit operations in, 12:131, 132t
Plasma fractionation industry, sectors in, 12:131
Plasma fractionation plants, capacity of, 12:147
Plasma fractionators, 12:130t
Plasma immersion ion implantation (PIII) system, 14:427–428
Plasma Impulse Coating Vapor Deposition (PICVD) process, 20:53
Plasma nitriding, 16:205; 17:208
Plasma nitrocarburizing, case hardening by, 16:211
Plasmapheresis, 12:142
Plasma polymerization, 15:813t;
24:746–747
of siloxanes, 22:561–562
Plasma potential, 24:731
Plasma products
demand for, 12:149–150
description of, 12:150–151
requirement for, 12:148–149
Plasma protein fraction (PPF), 12:146
properties of, 12:151t
Plasma protein retention, in hemodialysis, 26:821
Plasma reactors, for CVD, 5:807–808
Plasma sintering, ceramics processing, 5:663
Plasma spraying, 21:483
Plasma spray MCrAlY coatings, 13:507
Plasma sputtering, 24:730
Plasma tube, 14:655
Plasmid cloning experiments, passenger sequence in, 12:503–504
Plasmid DNAs, introduction into cells, 12:500–501
Plasmids. See also Plasmid vectors
expression, 12:474
mobilizable, 12:471
in salicylic acid manufacture, 22:8
Plasmid vectors, for passenger DNA introduction and recombinant selection, 12:501
Plasmin, 5:175
Plasminogen activator inhibitor-1 (PAI-1), 4:85, 89
Plasmons, 21:327
Plaster, 5:467, 500t
citric acid application, 6:648
kaolin application, 6:688t
Plaster of Paris, 4:583, 599
Plastic bags, 18:11–12
Plastic (Bingham) body flow model, 21:704
Plastic bottles, recycling classifications of, 21:447
Plastic cans, 10:447
Plastic cements, 5:500t
Plastic deformation
ceramics, 5:624
heated coals, 6:733–736
of steel, 23:271
of uranium metal, 25:410–411
Plastic drums, as industrial materials packaging, 18:7–8
Plastic electronics, conducting polymer applications, 7:541
Plastic encapsulant materials (PEMs), in electronic materials packaging, 17:838–840
Plastic film photography supports, 19:197
Plastic films, properties of, 17:835t
Plastic flow, 8:727
Plastic food packaging, 18:40–51
retortable, 18:49
Plastic forming, ceramics processing, 5:649–651
Plastic grinding, nitrogen in, 17:287
Plasticity
doF ceramics, 5:623–626
of fibers, 11:184–185
of filled networks, 22:571
Plasticized polymer electrolytes, 3:418
Plasticized PVC, 661–662
colorations applications, 6:127–128
morphology of, 25:664–665

Plasticized white phosphorus (PWP), screening smoke, 5:829

Plasticizer manufacture, organic titanium compounds in, 25:123

Plasticizer range alcohols
chain length and linearity, 2:12t
defined, 2:1–2
economic aspects, 2:8–9
list pricing, 2:9t
physical properties of, 2:4
properties of commercial, 2:12t
specifications and standards, 2:12
uses of, 2:22t, 22–24

Plasticizers, 10:713
amphiphilic, 14:480
attributes of, 19:850t
butyl rubber applications, 4:449
for cement, 5:485
ceramics processing, 5:646–647
energetic, 10:740t
in hollow fiber post-treatment, 16:13
in melt spinning, 16:9
plasticizer alcohols for, 2:22
in polyamide plastic manufacture, 19:785
in polychloroprene, 19:847–848, 849
for PVC polymers, 25:673–675
for RTV silicones, 22:596
silicone polymer, 22:32–33
in tire compounding, 21:809–810
VDC polymer permeability and, 25:709

Plastic laminated sheets, 26:752

Plastic packaging materials, properties of, 18:41t

Plastic pellets, threat from, 20:231

Plastic pumps, for corrosive liquids, 21:76
Plastic refractories, 21:482

Plastics. See also Styrene plastics
adhesion of coatings to, 7:91–92
advanced materials, 1:693
cellulose ester applications, 5:404
chemical exposure tests on, 19:583
acidic acid application, 6:648
colloidal suspensions, 7:273t
colorants for, 7:358–380
development of, 10:168

electrical properties testing on, 19:586–587
environmentally friendly, 25:682
fiber-reinforced, 21:456
high throughput experimentation, 7:382t
hydrocarbon use in, 13:689–690
p-hydroxybenzoic acid in, 22:22–23
information sources for, 15:766
inks for, 14:321
kaolin application, 6:688t, 693–695
as parenteral packaging, 18:715
pigments in, 19:377, 427–428, 453
preparing for electroless deposition, 9:718–719
recycling of, 23:374; 25:871
reinforced, 26:750–751
release agent use with, 21:606
resistance to hydrochloric acid, 13:827
solvent exposure tests on, 19:583
sulfur use in, 23:591
sustainable development and, 24:169–170
U.S. consumption of cellulose acetate flake for, 5:428t
weathering effects tests on, 19:583–585

Plastics additives, nickel compounds as, 17:124

Plastics Compounding Redbook, 19:543
Plastics fabrication; 20:222–223
microwave technology in, 16:530
Plastic sheet specifications, 16:291
Plastic sheet thermoforming, 23:399
Plastics industry, titanium dioxide in, 25:25–26

Plastics processing, 19:536–563
extrusion, 19:539–549
molding, 19:549–556
thermoplastic resins, 19:536, 537–539
thermosetting resins, 19:556–559

Plastics recycling, 21:372, 446–461
economics of, 21:457–459
impurity separation in, 21:448
materials separation in, 21:447–448
recent developments in, 21:456–457
types of plastics in, 21:449–457

Plastics recycling industry, U.S., 21:458–459

Plastics testing, 19:563–596
composition and structure analysis, 19:563–569
environmental effects tests, 19:582–585
flamability properties, 19:587–588
mechanical properties, 19:579–582
molecular weight determination, 19:569–570
nondestructive, 19:588–589
optical properties, 19:585–586
polymer processing properties, 19:578–579
thermal analysis, 19:570–579
Plastic strain ratio, copper wrought alloys.
Plastic tile detersive systems for.
Plastic (POP) applications.
Plastic working, of steel.
Plastisols, PVC.
Plasto-ferrites.
Plastoquinol:plastocyanin oxidoreductase.
Plastoquinones.
Plate-and-frame filter presses.
Plate-and-frame heat exchangers.
Plate-and-frame membrane modules.
Plateau Border network, drainage in.
Plateau borders, 12:8
liquid distribution between, 12:9, 10
Plate-coil heat exchangers.
Plate coolers.
Plate copper, 7:693
Plate defects, Lamb waves in detecting.
Plate design, in a reciprocating-plate column.
Plate diffusers.
Plate-fin heat exchangers.
Plate-frame heat exchangers.
Plate glass, elastic properties.
Plate heat exchangers.
Plate inspection, Lamb wave technique for.
Platelet activating factor.
Platelet activation.
Platelet aggregation.
Platelet reinforcement.
dental applications, 8:305, 307, 308
in electronic applications, 19:631–632
in foam rubber preparation, 22:585
in galvanic series, 7:805t
global demand for, 19:617
with gold in dental applications, 8:305
high temperature applications for, 19:602
nanowires, 22:720
O₂ adsorption and, 10:49
poisons in representative reactions, 5:258t
in pressure-sensitive adhesive preparation, 22:591
in silicone network preparation, 22:564, 565–566, 568–569
in solder for dental applications, 8:316
thermal degradation of catalysts, 5:272
use in FCC unit circulating catalyst inventories, 11:711
uses of, 19:597
world supply of, 19:613t
Platinum alloys, dental applications, 8:308
Platinum aluminide, 19:630
Platinum-based catalysts, 17:179
Platinum-based electrocatalysts, 19:627
Platinum bromide, physical properties of, 4:329
Platinum catalysts, 10:100
Platinum complexes, in silicone network preparation, 22:563
Platinum compounds, 19:654–658. See also
  Platinum-group metal compounds
  synthesis of, 19:657
  uses for, 19:657
  Platinum deposition techniques, 19:157
  Platinum dichloride, 19:655
  Platinum–divinyltetramethyldisiloxane complex, in silicone network preparation, 22:563
Platinum films, 19:658
Platinum gauze catalyst, 17:180–181
Platinum-group metal compounds, 19:635–667
  analysis of, 19:637
  economic aspects of, 19:635–636
  health and safety factors related to, 19:658
  iridium compounds, 19:648–650
  nomenclature related to, 19:659
  osmium compounds, 19:641–644
  palladium compounds, 19:650–654
platinum compounds, 19:654–658
rhodium compounds, 19:644–648
ruthenium compounds, 19:637–641
Platinum-group metals (PGMs), 19:596–635. See also PGM entries; Platinum-group metal compounds
  analysis of, 19:617–618
  as autocatalysts, 19:623–625
CAS numbers and abundances of stable isotopes of, 19:598t
catalytic applications for, 19:619–628
catalytic properties of, 19:602–603
chemical properties and corrosion resistance of, 19:600, 601t
chloro complexes of, 19:609
concentration of, 19:605–607
conventional refining of, 19:607–609
economic aspects of, 19:612–617
electronic applications for, 19:630–632
as emission catalysts, 19:625–626
environmental concerns related to, 19:618
estimated reserves of, 19:603t
health and safety factors related to, 19:618–619
high-temperature applications for, 19:629–630
high-temperature properties of, 19:600–602
for jewelry and investment, 19:632–633
medical and dental applications of, 19:628–629
new applications for, 19:623
physical and mechanical properties of, 19:597–600
properties of, 19:597–603
recovery and refining techniques for, 19:605–612
refining, 19:636–637
for secondary refining, 19:611–612
sources and production of, 19:603–605
suppliers of, 19:612–613
supply and demand for, 19:613–617
in temperature measurement, 19:632
total demand and prices of, 19:636t
use of solvent extraction technology for, 19:609–611
uses for, 19:619–633
Platinum-group minerals, classes of, 19:603
Platinum halides, 19:657
Platinum–iridium alloy electrodes, medical applications for, 19:629
Plug(s)
- of activated sludge, 25:828
  in microfluidics, 26:968, 970
- Plug flow, 11:772
  of foams, 12:16
- Plug-flow activated sludge process, 25:900, 904
- Plug flow electrochemical reactor (PFER), 9:660, 662
- Plug-flow mass balance, 25:280, 286
  integration of, 25:271
- Plug flow reactor (PFR), 9:660; 21:348–349
- Plug-flow tubular reactors (PFRs), 25:285
- Plug-in-orifice nozzle design, 16:8, 9
- Plug valve, 19:474
- Plumbing codes, 19:481
- Plumbing tube, 7:694
- Plumbous acetate, 14:792–793
- Plume behavior, 11:757, 759
- Plume containment, in soil and ground water treatment, 25:835

“Pluripotent” embryonic stem cells, 12:458
- Pluronic, commercial defoamer, 8:241t
- Pluronic P68, 1:744
- Pluronic L62, surface tension, 8:244t
- Pluronics, 1:241, 153
- Plutonium (Pu), 1:463–491, 464t; 19:667–712. See also Plutonium compounds; Plutonium metal
- analytical chemistry of 699, 19:700
- aqueous solution chemistry of, 19:692–698
- atomic properties of, 19:671–673
- cost and value of, 19:686
- criticality precautions for, 19:703
- crystal structure data for, 19:680t
- economic aspects of, 19:686
- electronic configuration, 1:474t
- in the environment, 19:700
- health and safety factors related to, 19:700–703
- ionization potential of, 19:673
- ion type and color, 1:477t
- irradiation by, 19:701–702
- metal properties of, 1:482t
- military need for, 19:668
- optical emission spectra of, 19:671–673
- production rate of, 19:673
- reactor-grade, 17:550
- safe handling of, 19:702
- separation and purification from irradiated uranium, 19:674–675
- sources of, 19:673
- spectral properties of, 19:671
- storage, usage, and disposal of, 19:700
- uses of, 19:686
- Plutonium(IV), hydrolysis of, 19:698
- Plutonium-231, 19:670
- Plutonium-238, 19:668, 669, 675
  special precautions for, 19:703
- Plutonium-239, 19:669
- Plutonium aqua ions, thermodynamic values for, 19:693t
- Plutonium carbide, 4:649t
  stoichiometry, 4:651
- Plutonium carbide (2:3), 4:649t
- Plutonium carbides, 19:690–691
- Plutonium cations, 19:692
- Plutonium chalcogenides, 19:691
- Plutonium complexes
  bonding in, 19:694–695
  formation constants for, 19:697t
Plutonium compounds, 19:687–691
  protection against, 19:702
Plutonium dioxide, 19:688–689
Plutonium fuel fabrication facilities, 17:547
Plutonium–gallium alloys, 19:683–684
Plutonium halides, 19:689–690
Plutonium hexafluoride, 19:689
Plutonium hydrides, 19:690
Plutonium ions
  electronic absorption spectra of, 19:693–694, 695
  hydrolysis constants for, 19:699
  hydrolytic behavior of, 19:696–698
  optical absorption bands of, 19:696
Plutonium isotopes, 19:670
  natural, 19:673
  radioactive decay properties of, 19:671
Plutonium metal, 19:676–685
  aging and self-irradiation damage in, 19:684–685
  alloys and phase transformations of, 19:682–684
  chemical properties of, 19:685
  magnetic and electrical behavior of, 19:681
  physical properties of, 19:679–682
  preparation of, 19:676–678
  pyrophoricity of, 19:702
  storage and handling of, 19:685
  thermal expansion of, 19:679
  thermodynamic properties of, 681, 682
  transition temperatures for, 19:682
Plutonium monocarbide, 19:691
Plutonium neutron production, 17:585
Plutonium(IV) nitrate pentahydrate, 19:691
Plutonium nitride, 19:691
Plutonium oxalates, 19:691
Plutonium(IV) oxide, 19:669
Plutonium oxides, 19:688–689
Plutonium oxyhalides, 19:689–690
Plutonium pnictides, 19:691
Plutonium-producing reactors, storage of radioactive waste from, 25:855
Plutonium radioisotopes, 21:319
Plutonium refractory compounds, 19:687
Plutonium reprocessing plants, 19:686
Plutonium silicides, 19:690–691
Plutonium solutions, self-radiolysis of, 19:694
Plutonium species, thermodynamic parameters for, 19:687

Plutonium tetrafluoride, 19:689
Plutonium tribromide, 19:690
Plutonium trichloride, 19:690
Plutonium triiodide, 19:690
Plutonium, Uranium, Reduction,
  See also PUREX flow sheet
Plutonyl nitrate hexahydrate, 19:691
Plywood, 26:752
  salicylic acid and, 22:11
  PM$_{10}$, 1.798–801
  and NAAQS, 1.813
  PM$_{2.5}$, 1.798–801
  and NAAQS, 1.813
PMMA, 13:734. See also Poly(methacrylic acid) (PMAA)
PMDA, 20:266. See also Polymeric methylenedianiline (PMDA)
PMDA-ODA, gel casting of, 20:271–272
PMDA-ODA structures, 10:214
PMDI polymeric isocyanate, 25:456, 457, 462. See also Polymeric methylene diisocyanate resins (PMDI)
  rigid polyurethanes from, 25:471–472
PMF/PMUF resins, 15:779
PMF resins, hardening of, 15:781
PMMA ionomer, 4DA and, 14:479
PM optimization (PMO), 15:466
P$_M$ process, 21:50
Pneumatic classification, 22:288
  health and safety factors related to, 22:293–294
Pneumatic conveying dryer, in hazardous waste management, 25:816
Pneumatic-conveyor flash dryers, 9:107
Pneumatic conveyors, 9:124–126
Pneumatic flotation machines, 16:653
Pneumatic fluidized-bed separation, 16:635–636
Pneumatic system, in basket centrifuges, 11:389–390
Pneumococcal polysaccharide vaccine, 25:495
Pneumococcus vaccine, 25:492
Pneumocystis carinii pneumonia (PCP), 26:494
Pneumonia, effect on heart, 5:107
p-n homojunction, 14:844
Pnictides
plutonium, 19:691
thorium, 24:761
PNIPAm hydrogel, 13:738, 743, 744
p–n junctions, 14:837–838, 840; 23:34
band diagram of, 23:37
in photovoltaic devices, 22:220
physics of, 22:241–245
simplified band gap of, 23:36
PNU 255889, 17:735
Pocahontas (LVB) coal
carbon structural distribution based on
NMR, 6:715t
empirical composition, 6:730t
Pockels’ effect, 14:676; 17:444–445
Pocket films, 19:307–308
“POCKET immunoassay,” 26:969
Podands, 16:772, 773, 775, 776; 24:45
tren-derived, Schiff base, 24:47
Podates, 14:161
Podbielniak extractor, 10:780–781
Pods, photographic-reagent-containing, 19:275
Point bonding, 17:474, 476. See also
Thermal point bonding
Point-contact transistor, 9:730–731
“Point of departure,” 25:244
Point of incipient precipitation,
16:217
Point-of-use gas purification, 13:462
Point of zero charge, 8:708
Point source of contamination, 13:310
Point-to-point (bistatic) optical
arrangement, 23:139
Poiseuille flow
macropore diffusion, 1:596–597
Poiseuille number (Ps), 15:687t
Poiseuille’s law, 16:6
Poison(s). See also Toxic- entries
catalyst, 10:93
as a hazard class, 25:340
systemic, 21:836
Poisoning. See also Catalyst poisoning
PCB, 13:141
polychlorinated naphthalene, 13:145
Poison Inhalation Hazard (PIH),
23:643
Poison Prevention Packaging Act of 1970,
18:28
Poisson’s ratio, 5:614; 26:777–778
of vitreous silica, 22:428
Pol, 23:473
PolarBlue, 19:295
Polachrome 35-mm transparency film,
processing of, 19:241, 309–311. See also
Polaroid 35-mm transparency
films; 35-mm transparency films
Polacolor 2 film, 19:301
Polacolor ER film, 19:301
Polacolor film, 19:284, 296, 298–302
image formation and stabilization using,
19:300–301
Polacolor images, stability of, 19:298
Polacolor Pro film, 19:301–302
Polacolor Pro peel-apart film, 19:299
Polacolor receiving sheet, 19:299–300
Polacolor system, 19:241–242
Polado, 13:38–39
Poland
carbon grades, 6:713t
nanoceramics research, 1:706
sulfur deposits in, 23:570
Polanyi adsorption potential, 1:627
Polar adsorbents, 1:674
for gas adsorption, 1:632
Polar-functional monomers, for latex
acrylic polymers, 22:41–42
Polarimetry, in sugar analysis, 23:473
Polariton scattering, 7:339
Polarity
effect on ionic liquid reactions,
26:855–856
of ionic liquids, 26:853–856
of PVDC, 25:704
solvent, 20:517; 23:86
Polarity reversal process, 15:837
Polarizability, 1:620–621
selected molecules, 1:621t3
Polarizability per volume, 24:4
Polarization
batteries, 3:425–426
by electric fields, 11:91–92
in ferroelectrics, 11:93, 94
nonlinear, 14:679
in perovskites, 11:95, 96
in solvent–solute interactions, 23:92
Polarization fields, in compound
semiconductors, 22:152
Polarization forces, in adhesion,
21:602–604
Polarization mechanisms, 10:21
Polarized ir radiation, 14:234
p-Polarized light, 24:115
s-Polarized light, 24:115
Polarized light microscopy, 16:474–478
Polarmet, 16:470
Polarization analyzer, 14:675
Polarization, 9:340
Polar monomers, polymerization of,
16:113–114
Polarography, 9:569, 578
in peroxide analysis, 18:488–489
Polaroid 35-mm transparency films,
19:282. See also Polachrome 35-mm transparency film
Polaroid additive color films, 19:308–311
Polaroid BadgeCam, 19:323
Polaroid camera, 19:277
Polaroid ColorShot Digital Photo Printer,
19:321
Polaroid Copy&Fax Film, 19:307
Polaroid Identifilm, 19:323
Polaroid integral films, 19:302–308
Polaroid one-step film, 19:281
Polaroid P-500 Digital Photo Printer,
19:321
Polaroid pack/sheet films, 19:282
Polaroid Pocket ID camera, 19:323
Polaroid SPd360 Studio Express system,
19:321
Polarons, 22:208
Polar plasticizers, effects on ionomer properties, 14:479
Polar solvents, 10:205, 207, 409
in supramolecular chemistry, 24:34–35
Polar stratospheric clouds, effect on ozone depletion,
17:788–790
Polavision film, 19:309
Policon tubes, 26:165
Policy analysis, sampling techniques for,
26:1045
Poling kettle, in tin refining, 24:788
Polyconophalomalacia, 10:867
Polyiomyelitis vaccine, 5:345t, 25:488
Polio virus, 11:10, 11
Polished metals, and object mode perceptions, 7:306t
Polishes, colloids, 7:273t
Polishing, of staple-fiber nonwoven fabrics,
17:515
Polishing agents, as food additives, 12:57
Polishing antifouling coatings, 7:158
Polishing compounds
kaolin application, 6:688t, 696
palygorskite/sepiolite application, 6:700t
Political pattern, 24:196
Political sustainable development initiatives, 24:190–194
Polkoksowy coal grade (Poland), 6:713t
Pollucite, 5:694–695
processing, 5:695–697
Pollutant formation, by fossil-fuel-fired furnaces, 12:333
Pollutants
atmospheric, 10:30; 26:8
considerations for controlling, 26:676
diffusion to active catalyst sites,
10:47–48
effect of air/fuel ratio on, 26:718–719
gaseous, 26:674
particulate matter, 26:674–675
solar photocatalytic degradation of,
19:97–99
in wastewater treatment, 25:883
Pollutant waste intermediates, 9:454
Pollution
from hydrothermal resources,
12:534–535
waste minimization techniques and,
25:883–885
of water sources, 26:53
Pollution control
methodology for, 10:67
hydrogen-peroxide, 14:64, 65
in phosphorus production, 19:17
Pollution determination, inorganic mass spectrometry in,
15:666
Pollution monitoring, using mass spectrometry, 15:668
Pollution preventing ink, product design, 5:759
Pollution prevention, 9:442–456;
10:742–743; 12:800, 806; 24:164–165
aromatic amines, 9:451–452
dye manufacturing, 9:447–450
dyeing medium, 9:455–456
heavy metals, 9:443–446
hierarchy in, 12:803
metal complexed dyes, 9:446–447
pigment replacements, 9:450
programs for, 25:876
real-time analysis for, 12:80
recovery and reuse, 9:452–455
salt, 9:454–455
Pollution Prevention Act of 1990 (PPA),
18:77; 21:589
Poloxamer 407, cosmetic surfactant, 7:834t
Poly(2-acrylamido-2-methylpropanesulfonic acid)
electrochromic material, 6:574–575
Poly(3-alkoxythiophenes), conducting polymers, 7:519
Poly[3,4-(alkylene dioxy)thiophene)s (PXDOTs) electrochromic materials, 6:575–576
Poly(3-alkylsulfonate thiophene)s, 23:717
Poly(3-alkylthiophenes) (P3ATs) conducting, 7:519
stability, 7:536
Poly(3-alkylthiothiophenes), conducting, 7:519
Poly(1,4-benzamide) (PBA), 13:371
Poly(1-butene) (PB), 4:429. See also Blown PB film; Isotactic PB resins; Isotactic poly(1-butene) (PB); PB entries;
Pipe-grade PB resin; Syndiotactic poly(1-butene) (PB)
mechanical properties of, 20:418
polymerization processes for, 20:424–425
uses of, 20:430–431
commercial manufacture of, 20:429
Poly-1-olefins, regioregular, 26:513
Poly(1,4-butylene terephthalate) (PBT), 10:188
Poly(1,4-butyleneterephthalate) (PBT), 20:32–33. See also Poly(butyleneterephthalate) (PBT)
Poly(2,6-dibromophenylene oxide), 11:474
Poly(2,3-dihexylthieno[3,4-b]pyrazine), conducting, 7:519
Poly(2,6-dimethyl-1,4-phenylene ether) (PPO), 10:193
Poly[2-(dimethylamino)ethyl methacrylate] (PDMAEMA), 20:469
Poly(2,6-dimethyl-1,4-phenylene oxide) (PPO), 16:9
Poly(2,6-dimethyl-1,4-phenylene oxide)/ high impact polystyrene (PPO/HIPS), 20:360
Poly[3,4-(ethylenedioxy)thiophene] (PEDOT) electrochromic material, 6:575
coupling, 7:520
room temperature conductivity, 7:532
Poly(3-fluorooalkyloxythiophenes), conducting, 7:519
Poly(3-hexylfuran), optical band gap, 7:529t
Poly(3-hexythiophene) conducting, 7:517
electroluminescent properties, 7:540
Poly(3-hydroxalkanoate), 23:742
Poly(3-hydroxybutyrate-3-hydroxyvalerate), 10:518
Poly(2-hydroxy ethyl methacrylate) (PHEMA) hydrogels, 13:733–734, 749, 750
Poly[2,2′-(m-phenylene)-5,5′-bisbenzimidazole] (PBI), 13:380–381
Poly(3-methyl thiophene) (PMET) optical band gap, 7:529t
room temperature conductivity, 7:532
Poly(4-methyl-1-pentene) (PMP), 20:413, 417 crystalline, 20:415
film, 20:432
mechanical properties of, 20:418
optical properties of, 20:419–420
polymerization processes for, 20:424–425
uses of, 20:431–432
Poly(1,4-naphthalenevinylene), conducting, 7:521
Poly(2,3,4,5,6-pentabromobenzyl acrylate), 11:474
Poly(2,5-pyridinediyl), conducting, 7:519
Poly(2,5-pyridinediyl), conducting, 7:522
Poly(3-thiopheneacetic acid), conducting, 7:519
Poly(3-thiophene-bethanesulfonate), conducting, 7:519
Poly(2-vinyldibenzothiophene), 23:715
Poly(N-acetyl-neuraminic, classified by structure, 4:723t
Poly(4-phenoxybenzoyl-1,4-phenylene) (PPBP), sulfonated, 23:718
Polyacetal, antioxidant applications, 3:121
Polyacetaldehyde, 1:103
Polyacetal fiber, 13:392
Polyacetylene, 7:514–515, 26:953
coupling in, 7:527; 22:208
molecular structure of, 22:211
optical band gap, 7:529t
Peierls distortion in, 22:203, 208
room temperature conductivity, 7:532
synthesis of, 22:213
trans-Polyacetylene, 22:207t
Polyacids, 20:577
Poly(acrylamide/maleic acid) [P(AM–MA)], 13:732
Polyacrylamide (PAM), 1:304–305; 13:732; 20:460–461. See also Acrylamide polymers
high molecular weight, i:311
suggested $R_g$–$M_w$ correlations, i:309t
suppliers, i:331–332t
uses of, i:300–301
Poly(acrylamide$_{70}$co-AETC$_{30}$)
Mark–Houwink–Sakurada correlations, 1:310t
suggested $R_g$–$M_w$ correlations, 1:309t
Poly(acrylamide)$_b$-based hydrogels, 13:737–738
Polyacrylamides
electrophoresis of, 9:749–750
high molecular weight, 9:15
as mobility control agents, 18:625
Polyacrylate (PAC), 12:812
mechanical properties of, 16:275t
Polyacrylates, 21:795
dispersants, 8:710t
silicon-modified, 22:40
Poly(acrylic/methacrylic acid) hydrogels, 13:734
Poly(N-acetyl-neuraminic acid), classification by structure, 4:723t
Poly(acrylic acid) (PAA), 13:732
colloidal suspensions, 7:275
in dental cements, 8:281, 283
reactions with PVA, 25:601
ionization of, 20:465
preparation of, 20:461–462
Polyacrylic fibers, 23:722
Polyacrylonitrile (PAN), VDC
polymerization and, 25:696
Polyacrylonitrile (PAN), 13:383, 384; 26:730. See also PAN-based carbon fibers
asbestos substitute, 3:315
fibers, 9:285; 24:624
food packaging, 18:44
hollow fibers, 16:15, 23
oxygen permeability at 25°C, 3:400
synthesis of, 11:188
Polyaddition reaction, 25:457
Polyalcohols, 10:269
Polyalkenoic adhesive cements, 8:337–338
Polyalkylated fullerenes, 12:247
Polyalkylations, 12:162
Polyalkylbenzenes, 23:328
Polykylene glycol (PAG) base stocks, 15:218
Polyalkylsuccinimides, emulsifiers, detergents, and dispersants, 8:710t
Poly(alkylthiophenenes), electroluminescent properties, 7:540
Poly alloys, 9:698
Poly($\alpha$-methylstyrene), 23:373–373
Polyalphaolefin base stocks, 15:217
Polyalphaolefin oligomer (PAO), 17:726
Poly-$\alpha$-olefins (PAO), 20:432
Polyaluminum chloride (PAC), as a flocculating agent, 2:380, 385; 11:626
Polyaluminum–silicate–sulfate (PASS), as a flocculating agent, 11:626
Polyamic acid
classic molecular weight of, 20:270
polyimide formation via, 20:269–272
Polyamic acid formation, polyimide synthesis via, 20:265–269
Polyamic acid synthesis, rate constants for, 20:266t
Polyamide/epoxy curing agents, ethyleneamines application, 8:500t, 502
Polyamide/rubber blends, 20:361
Polyamide block copolymers, 24:704, 708
Polyamide composite membranes, 21:633
Polyamide–elastomer block copolymers, 24:698
Polyamide fibers, 19:739–772. See also Synthetic polyamides
applications for, 19:765–766
chemical properties of, 19:745–747
cross-section shape of, 19:756
dyeability of, 19:758–760
early reactive dyes for, 9:468–470
electrical properties of, 19:745
manufacture of, 19:748–749
modified nylon-6 and nylon-6,6, 19:760–764
optical properties of, 19:745
photolytic properties of, 19:746–747
preparation of, 19:747–748
properties of, 19:740–747
spinning continuous-filament yarns from, 19:749–758
staple properties of, 19:747
Polyamide hollow fibers, 19:744–745

tensile properties of, 19:742–744
thermochemical properties of, 19:746
Polyamide hollow fibers, 16:21–22
Polyamideimides (PAI), 10:214–216
Polyamide plastics, 19:772–797

applications for, 19:794–795
assembly techniques for, 19:791
blow molding of, 19:790–791
chemical properties of, 19:781–783
crystallinity of, 19:775–776
economic aspects of, 19:791–793
effect of chemicals and solvents on, 19:783
electrical properties of, 19:791
extrusion of, 19:789–790
flammmability of, 19:778
injection molding of, 19:788–789
manufacture of, 19:783–787
manufacturers of, 19:792t
mechanical properties of, 19:779–781
moisture absorption of, 19:777
physical properties of, 19:775–778
powder coating of, 19:791
processing, 19:787–791
properties of, 19:773–774t
reaction injection molding of, 19:791
recycling, 19:793–794
rotomolding of, 19:791
specifications, standards, and quality control for, 19:793
thermal properties of, 19:776–777
ultraviolet aging of, 19:783
Polyamide resins (aliphatic), 10:207–210
Polyamides, 10:176, 399–400. See also

Aromatic polyamides
aliphatic, 10:207–210
antioxidant applications, 3:120
applications of, 15:110–111
aromatic, 10:210–212
bonding strength and, 10:459
coatings, 7:39–40
commercial block copolymers, 7:648t
disadvantages of, 10:400
glass transition and melting temperature for soft/hard segments, 7:649t
injection-molding temperatures for, 19:788t
inorganic pigment applications, 7:372t
polycondensation to form, 20:390
polycondensation to form, 20:390
polymer and coatings properties, 7:38
typical soluble dye applications, 7:376t
unmodified, 10:394
Polyamide solutions, 15:110
Polyamide suture materials, 24:207
Polyamine-based quaternary ammonium compounds, 2:752
Polyamine methacrylates, aqueous solution characteristics of, 20:469–471
Polyamines
as chelating agents, 5:712t
cyclized, 24:42
as flocculating agents, 11:630
in microporous weak base resin synthesis, 14:389
Polyammonium-containing ligands, 24:44
Polyammonium macropolycycles, 16:780
Polyampholytes, 20:475–479
solution properties of, 20:479
synthesis of, 20:477–478
Poly(anhydrides), bioresorbable polymers, 3:740
See also PAni/V₂O₅ entries
applications, 7:538
room temperature conductivity, 7:532
conducting, 7:521–522
electrochromic material, 6:572t, 581t
synthesis of, 22:213–214
Polyanionic cellulose (PAC), 9:13, 18
Polyanionic substances, 23:723
Polyaramid fiber, 13:372
Polyarylates (PAR), 10:189–191
processing techniques and applications for, 10:190–191
properties of, 10:191t
Polyarylene sulfide)s, 23:704–706
Polyarylenesulfonium salt)s, 23:715–716
Polyarylenevinylenes), conducting, 7:520–521
Polyarylether ketone)s, sulfonation reaction of, 23:717–718
Poly(di-n-alkylsilanes), thermochromic materials, 6:619
Polyatomic groups, xenon bonding to, 17:330–333
Polyazacryptands, metal-containing, 24:46
Polyazo compounds, 9:361

organic pigment applications, 7:368t
**Polybenzamide**, 15:109–110

**Poly(butadiene-co-acrylonitrile-co-acrylate)** elastomers, 14:481

**Poly(butadiene-co-acrylonitrile-co-acrylate)**

elastomers, 14:481

**Poly(butadiene-graft-poly(styrene-stat-acrylonitrile)**, 7:608t

**Poly(butadiene thin films)**, in lotus effect surfaces, 22:120

**Polybutadienes**, 14:257

**Polybutadiene thin films, in lotus effect surfaces**, 22:120

**Polybutadiene sulfone**, 23:658

**Polybutylenes**, 4:409

**Poly(butyl methacrylate)-block-poly(methyl methacrylate)**, 7:646

**Poly(butyl methacrylate)-block-poly(methyl methacrylate)**, 7:646

**Polycarbonate**

antioxidant applications, 3:121

oxygen permeability at 25°C, 3:400

water-vapor transmission rate (WVTR), 3:387t

**Polycarbonate–ABS blends**, 19:824–825

**Polycarbonate blends**, 20:361–362

**Polycarbonate–polyester blends**, 19:824, 825

**Polycarbonate resin(s)**

organic titanium compounds, 25:125–126

stress–strain curve for, 19:810

**Polycarbonates (PCs)**, 10:194–196; 19:797–828

analytical methods for, 19:819

applications of, 10:196

aromatic, 19:806–808

BPA, 19:800–801

carbon monoxide in production of, 5:8–9

carbon monoxide in production of, 5:8–9

carbon monoxide in production of, 5:8–9

conducting, 7:525

commercial production of, 19:798, 799

copolymers and blends of, 19:821–825

economic aspects of, 19:818–819

electrical, electronic, and technical applications of, 19:821

glass-reinforced, 19:811

glass-transition temperature and melt behavior of, 19:805

health and safety factors related to, 19:819–820

**Poly(n-butyl acrylate)-block-poly(acrylic acid)**, 7:646

**Poly(tert-butoxyxycarbonylstyrene)** (PTBOCST), 15:165

**Poly(butylene terephthalate) (PBT)**, 20:31.

**See also** PBT entries; **Poly(1,4-butylene terephthalate) (PBT)**

chemical properties of, 20:65

crystal parameters for, 20:64t

economic aspects of, 20:67–68

flame retardant, 20:64–65

mechanical properties of, 20:65–66

physical properties of, 20:64–65

principal world manufacturers of, 20:67t

uses for, 20:63–64

**Poly(butyl methacrylate)-block-poly(methyl methacrylate)**, 7:646

**Polycapillary lens**, 26:438

**Polycaprolactone**

bioresorbable polymer, 3:739

solubility plots, 8:685t

**Polycaprolactone diols**, 25:468

**Polycaprolactones**, 24:703

**Polycarbonate**

antioxidant applications, 3:121

oxygen permeability at 25°C, 3:400

water-vapor transmission rate (WVTR), 3:387t

**Polycarbonate–ABS blends**, 19:824–825

**Polycarbonate blends**, 20:361–362

**Polycarbonate–polyester blends**, 19:824, 825

**Polycarbonate resin(s)**

organic titanium compounds, 25:125–126

stress–strain curve for, 19:810

**Polycarbonates (PCs)**, 10:194–196; 19:797–828

analytical methods for, 19:819

applications of, 10:196

aromatic, 19:806–808

BPA, 19:800–801

carbon monoxide in production of, 5:8–9

carbon monoxide in production of, 5:8–9

carbon monoxide in production of, 5:8–9

conducting, 7:525

commercial production of, 19:798, 799

copolymers and blends of, 19:821–825

economic aspects of, 19:818–819

electrical, electronic, and technical applications of, 19:821

glass-reinforced, 19:811

glass-transition temperature and melt behavior of, 19:805

health and safety factors related to, 19:819–820

**Poly(butyl methacrylate)-block-poly(methyl methacrylate)**, 7:646

**Polycapillary lens**, 26:438

**Polycaprolactone**

bioresorbable polymer, 3:739

solubility plots, 8:685t

**Polycaprolactone diols**, 25:468

**Polycaprolactones**, 24:703

**Polycarbonate**

antioxidant applications, 3:121

oxygen permeability at 25°C, 3:400

water-vapor transmission rate (WVTR), 3:387t

**Polycarbonate–ABS blends**, 19:824–825

**Polycarbonate blends**, 20:361–362

**Polycarbonate–polyester blends**, 19:824, 825

**Polycarbonate resin(s)**

organic titanium compounds, 25:125–126

stress–strain curve for, 19:810

**Polycarbonates (PCs)**, 10:194–196; 19:797–828

analytical methods for, 19:819

applications of, 10:196

aromatic, 19:806–808

BPA, 19:800–801

carbon monoxide in production of, 5:8–9

carbon monoxide in production of, 5:8–9

carbon monoxide in production of, 5:8–9

conducting, 7:525

commercial production of, 19:798, 799

copolymers and blends of, 19:821–825

economic aspects of, 19:818–819

electrical, electronic, and technical applications of, 19:821

glass-reinforced, 19:811

glass-transition temperature and melt behavior of, 19:805

health and safety factors related to, 19:819–820

**Poly(n-butyl acrylate)-block-poly(acrylic acid)**, 7:646

**Poly(tert-butoxyxycarbonylstyrene)** (PTBOCST), 15:165

**Poly(butylene terephthalate) (PBT)**, 20:31.

**See also** PBT entries; **Poly(1,4-butylene terephthalate) (PBT)**

chemical properties of, 20:65

crystal parameters for, 20:64t

economic aspects of, 20:67–68

flame retardant, 20:64–65

mechanical properties of, 20:65–66

physical properties of, 20:64–65

principal world manufacturers of, 20:67t

uses for, 20:63–64

**Poly(butyl methacrylate)-block-poly(methyl methacrylate)**, 7:646

**Polycapillary lens**, 26:438

**Polycaprolactone**

bioresorbable polymer, 3:739

solubility plots, 8:685t

**Polycaprolactone diols**, 25:468

**Polycaprolactones**, 24:703

**Polycarbonate**

antioxidant applications, 3:121

oxygen permeability at 25°C, 3:400

water-vapor transmission rate (WVTR), 3:387t
Polychlorinated biphenyls (PCBs), 19:798–799
injection blow molding of, 19:818
inorganic pigment applications, 7:372t
isolation methods for, 19:814
mechanical–optical properties of, 19:802
mechanical properties of, 19:801–802, 810–811
molecular weight and viscosity of, 19:801–802
optical properties of, 19:809–810
organic pigment applications, 7:368t
preparation, 19:811–818
processing, 19:818
producers of, 19:819
production of, 19:798
properties of, 19:799–811, 820
solubility and solvent resistance of, 19:799–801
structure and crystallinity of, 19:802–805
thermal, flame-retardant, and hydrolytic behavior of, 19:805–809
thermal-oxidative reactions of, 19:815
transesterification process for, 19:814–818
typical soluble dye applications, 7:376t
uses for, 19:820–821
viscosity of, 19:805
Polycarboxylates, water-soluble, 24:768–769
Polycarboxylic-acid-containing dyes, 9:480–481
Polycatenanes, 17:60
Polys in shape-memory polymers, 22:357
Poly(γ-caprolactone)/OMLS nanocomposite, 20:311
Poly(γ-caprolactone) switching segment, in shape-memory polymers, 22:362–363
Polychlorinated biphenyls (PCBs), 13:135–142; 21:591. See also Hydroxylated PCBs; PCB congeners bioremediation substrate, 3:773, 774–775
chemistry and environmental impact of, 13:135–137
coplanar, 13:136t
human health effects of, 13:140–142
production and disposition of, 13:136t
recycling of, 25:871
sensitive detector, 3:812
structure-function relationships related to, 13:138–140
toxic and biochemical effects of, 13:137–138
toxic equivalence factors for, 13:140
in used and waste oils, 21:422
Polychlorinated dibenzo-p-dioxins (PCDDs), 13:135, 137, 179
Polychlorinated dibenzofurans (PCDFs), 13:135, 137, 179
Polychlorinated naphthalenes (PCNs), 13:144–145
Polychloroprene (Neoprene), 19:828–866
from butadiene, 4:384t
calendering and extrusion of, 19:851
commercial conversion of, 19:846–851
compared with EPDM and natural rubber, 19:846t
compounding and processing of, 19:847–851
copolymerization of, 19:832–835
curing, 19:848
dimerization of, 19:828–829
economic aspects of, 19:861
free radical polymerization of, 19:829–832
global grades of, 19:852
health and safety factors related to, 19:861–862
microstructure of, 19:845t
mixing, 19:849–851
molding, 19:851
polymerization of, 19:828–836
polymer structure of, 19:836–840
quality management for, 19:861
standard grades of, 19:853t
Polychloroprene elastomers, 21:767
Polychloroprene interpenetrating polymer networks, 19:834
Polychloroprene latex adhesives, 1:533–534
Polychloroprene latexes, 19:854–861
applications for, 19:857, 859–861
compounding, 19:857–859
global product line of, 19:855
stabilization of, 19:855–857
Polychloroprene polymers
branching parameters of, 19:839
commercial, 19:851–852
crystallization of, 19:843–844
cure site for, 19:837
heat aging and degradation of, 19:844–846
manufacture of, 19:840–843
properties of, 19:843–846

Polychlorostyrene beads, foaming-in-place, 23:406t

Polychromator, 23:144

Polyclonal antibodies
DAS-conjugate, 14:145
versus monoclonal antibodies, 14:152–153

Polycondensation, 10:189–190, 191
as an aging mechanism, 23:64
of polyamide plastics, 19:781–782
polyester formation by, 20:390–391
silicone polymerization via, 22:556–558
in the sol–gel process, 23:61–62

Polycrystalline alloys, 13:523

Polycrystalline diamond films, deposition of, 24:744–745

Polycrystalline diamond compact (PDC) bits, 9:25

Polycrystalline glass–ceramics, 8:277–278

Polycrystalline silicon, 9:732

Poly(cyanopropylmethyl(14%)-dimethyl(86%))siloxane, gas chromatography stationary phase, 4:617t

Polycyclic aromatic carbonyl dyes, 9:255–256

Polycyclic aromatic hydrocarbons (PAHs), 12:430; 18:593
skeletal rearrangements of, 21:147–148

Polycyclic aromatic systems, synthesis of, 21:146

Polycyclic hydrocarbons, synthesis of, 21:245–246

Polycyclic pigments, 9:450; 19:449

Polycycloalkanes, biodegradability of, 25:826

Polycycloalkenes, 16:112
Polycyclopentene, 16:112
PolyDADMAC, 20:472. See also Polydiallyldimethylammonium chloride (DADMAC)
Polydextrose, 4:702, 724t; 12:43
Polydiallyldimethylammonium cationics, 20:472
Polydiallyldimethylammonium chloride (DADMAC), in paper manufacture, 18:117

Poly(dibromophenylene oxide), physical properties of, 4:356t

Poly(dibromostyrene), physical properties of, 4:356t

Poly(dichlorophosphazene), 19:56

Poly(dicyclopentadiene), manufacture of, 20:430
properties of, 20:422t

Poly(dicyclopentadiene), 26:946–947

Polydimethylsilane (PDMS). See also Polydimethylsiloxane entries
biodegradability of, 22:604–605
lotus effect in, 22:123
pressure-sensitive adhesives and, 22:590
shear rate versus viscosity of, 22:577
in silicon carbide manufacture and processing, 22:533
silicone fluids and, 22:573, 575, 576
solubility of gases in, 22:578

biodegradability of, 22:604–605
in foul release antifoulings, 7:163–165
gas chromatography stationary phase, 4:617t
for lab-on-a-chip valves, 26:975
in microfluidic assays, 26:970–971, 972
in microfluidic cell patterning, 26:972–973
in microfluidic fabrication, 26:964–966
monodisperse model networks and, 22:570
in MQ resins, 22:588
in silanol condensation, 22:567
silicone LIM rubber and, 22:584
Polydimethylsiloxane, mol wt 3900, surface tension, 8:244t

Polydimethylsiloxane-co-BPA polycarbonates, 19:823–824
Polydimethylsiloxane fluids, in fiber finishing, 22:593
Polydimethylsiloxane oils, properties and applications of, 22:573–575, 576
Polydimethylsiloxane diol, in silanol condensation, 22:566
Polydimethylsiloxanes, 10:3
Polydioxanone, bioresorbable polymer, 3:737–738
Poly[diphenyl(5%)-dimethyl(95%)]siloxane, gas chromatography stationary phase, 4:617t
Poly[diphenyl(50%)-dimethyl(50%)]siloxane, gas chromatography stationary phase, 4:617t
Polydispersity index (PI), 20:299, 395, 410, 531
Polydispersity, of lignin, 15:12–13
Poly(disulfide)s, 23:711–714
as electroactive materials, 23:713–714
oxidation processes leading to, 23:713
Poly(dithiocarbonate)s, 23:727
POLYDMAP resin, 21:123
Polyelectrochromic materials, 6:572
Polyelectrolytes, 23:716
Polyelectrolyte block copolymers, 23:717
Polyelectrolytes, 14:460; 20:464–472
anionic, 20:465–469
cationic, 20:469–472
organic, 26:112t
Polyenes, metathesis of, 26:923
Polyester (PE), 11:247. See also Polyesters
  global production of, 11:176
  applications for, 19:765
  microdenier, 19:762
  azo disperse dyes for, 9:417–418
dyeing, 9:194–197
fibers, 9:321
Polyester1-block-polyester2, 7:646
Poly(ester amides), bioresorbable polymers, 3:739–740
Polyester-based urethane sealants, 22:36
Polyester block copolymers, commercial, 24:707–708
Polyester-block-polycarbonate, 7:646
Polyester bottles, recycling, 20:54–56
Polyester can coatings, 18:39
Polyester carbonates, 19:822
Polyester–carboxyl powder coatings
  1998 production, 7:49
Polyester composites, cross-linked, 20:114
Polyester composition, determining, 20:21
Polyester diols, 25:476
Polyester–elastomer block copolymers, 24:698, 704
Polyester elastomers, 20:70–71, 74
Polyesterether elastomers
  chemical resistance of, 20:75t
  manufacture of, 20:75–76
  market for, 20:77–78
  models for two-phase structure in, 20:72–73
  molding conditions for, 20:77t
  processing of, 20:76
  stress–strain curves for, 20:74–75
Polyester fabrics
  flame-retardant, 11:485
  phosphorus-containing, 11:499
Polyester fiber blends, dyeing, 9:203
Polyester fibers, 17:466; 20:1–31
alkali resistance of, 20:8
analytical test methods for, 20:20–22
applications of, 20:23
bicomponent, 20:5
chemical properties of, 20:7–8
commercial production of, 20:10–12
defined, 20:2
developing and improving, 20:2
drawing and stabilization of, 20:15–16
economic aspects of, 20:19–20
filament processes for, 20:18
fine structural properties of, 20:5
health and safety factors related to, 20:22
manufacturing and processing, 20:10–19
mechanical properties of, 20:6–7
properties for end-uses of, 20:3–4
properties of, 20:2–9
raw materials in manufacturing and processing, 20:10
staple processes for, 20:16–17
structure of, 20:21
surface modification of, 20:5
texturing processes for, 20:18–19
thermal properties of, 20:8–9
Polyester fiber staple, applications of, 20:23
Polyester filament, applications of, 20:23
Polyester foil, 23:6
Polyester food packaging, 18:43
Polyester homopolymers, 20:2
crystallographic data for, 20:6t
Polyester–hydroxylalkylamide powder coatings, 7:50–51
1998 production, 7:49
Polyesterification, 20:98–99  
equipment for, 20:97–98  
organic titanium compounds in,  
25:124–125  
Polyester manufacture, organic titanium  
compounds in, 25:123  
Polyester materials, recycling, 20:22  
Polyester/polyether/poly carbonate,  
commercial block copolymers, 7:648t  
Polyester polymers, rheological properties  
of, 20:4  
Polyester polyols, 25:464–468  
Polyester resin(s), 11:302  
coating resins, 7:104–106  
cyclopentadiene and dicyclopentadiene  
applications, 8:230  
flammability of, 20:115–116  
properties in powder coating, 7:43t  
standard test methods for, 20:111t  
unreinforced, 10:187t  
weathering of, 20:116  
Polyester resin-based powder coatings,  
organic titanium compounds in, 25:125  
Polyester resin composites, 26:762–763  
Polyester resin formulations  
ingredients of, 20:96t  
unsaturated, 15:511–512  
See also Thermoplastic polyesters;  
Unsaturated polyesters  
acid resistance of, 20:7–8  
antioxidant applications, 3:121  
aromatic ionic, 23:722  
based on 1,4-cyclohexanedi methanol,  
12:674–675  
by-products in manufacture of, 20:11–12  
commercial block copolymers, 7:648t  
containing sulfur linkages, 23:738–742  
derived from trimethylpentanediol,  
12:673  
effect of orientation on oxygen  
permeability, 3:393t  
as embedding materials, 10:7  
glass transition and melting  
temperature for soft/hard segments,  
7:649t  
glass transition temperature for, 20:9  
historical survey of, 20:32–34  
hydrolysis of, 20:7, 50  
impermeable, 20:53  
inorganic pigment applications, 7:372t  
liquid-crystal, 10:191–192  
made from hydroxypivalyl  
hydroxypivalate, 12:676  
manufacture of, 12:662; 20:34–45  
organic pigment applications, 7:368t  
oxgen permeability of, 20:52  
polymerization process conditions for,  
20:11t  
polymerization processes for, 20:39–45  
in powder coatings, 10:401–402  
producers and trademarks of, 10:186t  
ring-opening polymerization of, 20:298  
typical soluble dye applications, 7:376t  
in waxes, 26:204–205  
Polyester spinning processes, classification  
of, 20:14t  
Polyester–sulfur compositions (PSC),  
23:739  
from thiopolyester, 23:740–741  
Polyester–TGIC powder coatings, 7:48–50;  
10:441  
gloss retention in outdoor exposure, 7:49  
physical and coating properties, 7:42t  
Poly(ester-thiocarbonate)s, synthesis of,  
23:726  
Polyetheramines, 10:395  
Polyether antibiotics, 20:119–148  
analysis of, 20:132  
anticoccidial activity of, 20:135–136  
antimalarial activity of, 20:135  
antimicrobial activity of, 20:134t  
antiviral activity of, 20:133–135  
biological activities of, 20:133–136  
biosynthesis of, 20:136–137  
economic aspects of, 20:139–140  
features of, 20:119  
feed efficiency enhancement by, 20:133,  
136  
ionophoretic properties of, 20:135–136  
by number of skeletal carbons,  
20:121–128t  
properties of, 20:120–131  
purification and production of,  
20:131–132  
structure determination and synthesis  
of, 20:137–139  
Polyether–block-poly ether, 7:646  
Polyether diols, 14:271; 20:76; 25:476  
Polyether ketone (PEEK) fibers,  
13:393  
Polyether–polyester polyol hybrids, 25:472  
Polyetherimide–polysiloxane block  
copolymers, 24:698, 704, 708
Polyetherimide–polysiloxane multiblock copolymers, 24:716
Polyetherimides (PEI), 10:217–218
Polyether impression materials, 8:332–333
Poly(ether ketones) (PEK), 10:197–199
Polyether polyls, 25:455–456, 464, 468t, 470
propylene oxide polymerization to, 20:793–794, 812
Polyethers, 12:663
commercial block copolymers, 7:648t
glass transition and melting temperature for soft/hard segments, 7:649t
silyl-terminated, 22:23–39
for urethane sealants, 22:36
Polyethersulfone (PES) tape material, 17:836
Poly(ethyl acrylate), chain-transfer constants to common solvents, 1:381t
Poly(ethyl acrylate-co-acrylate) (PEA) ionomer system, 14:470
Polyethylbenzenes (PEB), 12:162; 23:328
Polyethylene (PE), 10:179. See also High density polyethylene (HDPE); Linear low density polyethylene (LLDPE); Olefin fibers; PE resins
advanced material, 1:693
catalytic aerogels for preparation, 1:763t
chlorinated, 21:768
chlorosulfonated, 21:768–769
coatings, 7:40
conducting, 7:524
for copper wire, 7:691
decomposition of, 14:109
in defoamer formulations, 8:238
glass transition and melting temperature for soft/hard segments, 7:649t
as “heat shrinkable” polymer, 22:364
history of, 20:149–152
influence of crystallinity on properties of, 20:401t
market for, 24:269
in olefin fibers, 11:224
oxygen permeability at 25°C, 3:400
permeability of household films, 3:387t
physical and coating properties, 7:38
reaction systems for producing, 10:594–595
recycling, 21:451–452
solubility of pentane in, Gibbs ensemble simulation, 1:35

trans-Polyethylene, Peierls distortion in, 22:203
Poly(ethylene 2,6-naphthalenedicarboxylate) (PEN), 10:187–188; 20:33. See also Poly(ethylene-2,6-dicarboxylate) (PEN)
Poly(ethylene amine) (PEI), 20:474
Poly(ethylene amines), dispersants, 8:710t
Polyethylene bags, woven, 18:12
Poly(ethylene carbonate), bioresorbable polymers, 3:738–739
Poly(ethylene-chlorotrifluorethylene) (ECTFE), 23:785
Poly(ethylene-co-1,4-cyclohexylenedimethylene terephthalate) (PETG), 10:189
Polyethylene-co-butylene, 24:703, 706–707
Polyethylene-co-propylene, 24:703
Polyethylene fabrics, flashspun high density, 17:466
Polyethylene fibers, 26:761
high performance, 13:382
Polyethylene film, properties of, 25:732t
Polyethylene food packaging, 18:40–42
Poly(ethylene glycol) (PEG), 12:658
gas chromatography stationary phase, 4:617t
PEG-hemoglobin, 4:114, 123–124
solvent for cosmetics, 7:832
in wood, 26:355
Poly(ethylene glycol) hydrogels, 13:736–737
Polyethylene glycols, 10:637, 665
in cosmetic molded sticks, 7:840t
Polyethylene hollow fiber membranes, 16:21
Polyethylenimine (PEI), 16:14, 15
molecular formula, 5:713t
Polyethylene ionomers, properties of, 14:473–475
Polyethylene market, pricing in, 20:226
Poly(ethylene-naphthalene-2,6-dicarboxylate) (PEN), 20:31. See also Poly(ethylene-2,6-naphthalenedicarboxylate) (PEN)
advantages of, 20:50–51
Poly(glycidyl methacrylate), 23:728
Polyglycolic acid, bioresorbable polymer, 3:736–737
Poly(glycolide-co-trimethylene carbonate), bioresorbable polymers, 3:738
Polyglycols, 12:644–645, 663
Polygodial, 24:550
Polygraph test, 12:90
Polyhalite, 5:785t
Polyhedral boron hydrides, 4:169
economic aspects, 4:229
metallaboranes, 4:208–210
metallocarbonanes, 4:215–216
polyhedral expansion, 4:187–188
Polyhedral bubbles, in foams, 12:8–10
Polyhedral oligomeric silsesquioxanes (POSS), 13:538–540, 549
PolyHEMA-block-poly-MMA-block-polyHEMA, 7:464
Poly(hexamethylenebiguanide) (PHMB)
pool sanitizer, 26:177
Poly(hexamethylene sulfoxide), 23:734
Polyhydrazide, 13:574
Polyhydric alcohol esters, 10:498
Polyhydric alcohol mercaptoalkanoate esters, 2:48
Polyhydric alcohols, 2:46–55
analysis, 2:52–53
chemical reactions, 2:46–50
economic aspects, 2:52
health and safety factors, 2:53
manufacture, 2:50–52
physical properties of, 2:48t
uses of, 2:53–54
Polyhydroxyalkanoates (PHA), 20:249–264. See also PHA entries
applications of, 20:256–257
biodegradation of, 20:253, 255–256
biosynthesis of, 20:249–252
chemical and physical properties of, 20:253–255
fed-batch culture productivities of, 20:260t
future outlook for, 20:261
industrial production of, 20:257–261
in vitro biosynthesis of, 20:262
polymer blends with, 20:256
production cost for, 20:261
production in transgenic plants, 20:262
recovery and purification of, 20:259–261
Polyhydroxy amino ether (PHAE), 10:365
Polyhydroxy ester ether (PHEE), 10:365
Polyhydroxyfullerenes, 12:251
Poly(hydroxystearic acid), solubility plots, 8:685t
Polyidene, 3:383
Polyimide(s) (PI), 10:171, 213–214; 20:264–296
applications for, 20:281–285
chemical groups used for functionalizing, 20:274t
conducting, 7:524
direct formed, 20:284
electrical properties of, 20:277–278
electronic interactions of, 20:276–277
enviromental resistance of, 20:277
mechanical properties of, 20:278
melt processable, 20:283–284
in membranes, tubes, fibers, and foams, 20:282–283
molecular weight of, 20:270, 283
one step formation of, 20:272
photoimageable, 20:278–281
photosensitive, 20:273–274
properties of, 10:214t
structural features of, 20:277
structure-property relationships in, 20:276–278
thermal stability of, 20:277
as thermoplastic molding resins, 20:283–284
thermosetting, 20:284
Polyimide coated wire, 20:282
Polyimide film, 20:281–282
Polyimide formation, via polyamic acid, 20:269–272
Polyimide laminates, 20:285
Polyimide matrix composites/adhesives, 20:284
Polyimide matrix materials, 26:763–764
Polyimide powders, 20:284
Polyimide synthesis, 20:264–276
using imide-containing monomers, 20:272
via addition reactions, 20:273–276
via aromatic nucleophilic displacement, 20:273
via imide ring formation, 20:265
via polyamic acid formation, 20:265–269
via polymer conversion, 20:276
Polyimide thermosetting resins, nadic group in creating, 20:275
Polyinternal olefin base stocks, 15:217
Polyisobutylene, 22:43, 44
Polyketide synthases (PKSs), 13
Polylactide hydrogel, 20
Polylactides (PLAs), 433–454
Polylactic acid (PLA), 15:12
Polysaccharide binders, organic titanium compounds in, 25:134–135
Polysaccharide manufacture, phosgene in, 18:510
Polyisoprene, 9:559; 14:256; 24:703
Polyisoprenoid, 24:474
Polyisoprenyltin reagents, 21:253
Poly(isothianaphthene) electrochromic material, 6:581
optical band gap, 7:529
Polyketide synthases (PKSs), 15:302; 20:137
Polyketones, carbon monoxide in production of, 5:9
Polylactic acid (PLA), 18:569
bioresorbable polymer, 3:735–736
Poly(lactic acid)s, 14:116
Poly(lactic-co-glycolide), bioresorbable polymer, 3:737
Poly(lactide (PLA), 14:11
from corn by-products, 1:702–7037
Poly(lactide-based materials, future of, 20:311–312
Poly(lactide-based nanocomposites, 20:306–311
Poly(lactic-co-glycolide) (PLGA), 13:741
Poly(lactide nanocomposites, improved, 20:308
Poly(lactide hydrogel, 13:741
Polylactides (PLAs), 20:297–318. See also Poly(lactic acid) (PLA) entries breakthroughs in synthesis of, 20:297–298
as building blocks for materials, 20:302–303
enantiopure, 20:302–303
Polylinear internal olefins (PIO), 17:724
Poly(lactic acid)/OMLS nanocomposites, intercalated, 20:307–308
Poly(lactic acid). See also Polylactides (PLA) blends, 20:307
mechanical properties of, 20:303
Poly(lysine) dendrimers, 20:799
Poly(maleic acid), 15:494
Polymer additives, analysis of, 19:566–567
Polymer analysis, 19:563. See also Plastics testing of acrylic fibers, 11:195–196
Polymer antioxidants, 3:102–132
applications, 3:111–124
autoxidation, 3:102–104
commonly used by class, 3:127–131
economic aspects, 3:132
health and safety factors, 3:126, 132
metal deactivators, 3:115
peroxide decomposers, 3:111–114
physical properties of, 3:125–126
radical scavengers, 3:104–111
temperature effect, 3:115–117
test methods, 3:124–125
Polymer architectures, 20:436
Polymerase chain reaction (PCR), 11:11;
12:103, 104
applications of, 12:513
automated cycles in, 12:471–472
mutagenic, 12:518
sequence amplification by, 12:513
Polymerases, 20:831
Polymer-based photochemical technologies, 19:117–120
Polymer-based structural materials, 26:755
Polymer blends, 20:318–372
binary, 20:330–334
categories of, 20:343
commercially important, 20:358–362
compatibilization of, 20:323–326
compressibility of, 20:319–320
containing a compatibilizer, 20:334–338
effect of compatibilizer on microstructure of, 20:334–335
equilibrium phase behavior of, 20:318–323
ethylene oxide, 10:680–681
heterogeneous, 20:343
high throughput experimentation, 7:382
molten, 20:356–357
morphology of, 20:329–330
permeability to gases and vapors, 20:357–358
phase structure development in, 20:327–330
physical properties of, 20:342–358
in polyamide plastic manufacture, 19:786
with polyhydroxyalkanoates, 20:256
predictive formats for physical properties of, 20:343–344, 349–350
preparation and phase-structure development of, 20:326–330
preparation methods for, 20:326–327
reactive compatibilization of, 20:325–326
shear yielding in, 20:351
structure determination of, 20:339–342
studies on, 19:575
temperature dependence of interaction parameters in, 20:320
toughness of, 20:350–356
Polymer bonded explosives (PBXs), 10:735, 739
Polymer casting solution, 15:801
Polymer chain length control, 20:529–530
Polymer chains
micro-Brownian motion of, 14:474
reduced mobility of, 14:466–467
termination by β-scission of polymer radicals, 20:221–222
termination by chain transfer with chain-transfer agents or solvents, 20:221
termination by chain transfer with ethylene, 20:221
termination by coupling, 20:221
Polymer chain stiffening effect, 23:358
Polymer characterization, infrared spectroscopy and, 14:239
Polymer chips, crystallized, 20:41, 44
Polymer colloids, 20:372–389
applications of, 20:373
electrokinetic measurements for, 20:383–384
emulsion polymerization of, 20:374–376
functional monomers of, 20:379–380
industrial-scale production of, 20:373–374
leading suppliers of, 20:373
major monomers of, 20:378–379
manufacturing processes for, 20:376–378
morphology of, 20:386–388
particle size and size distribution in, 20:380–381
polymerization rate of, 20:386
properties of, 20:380–386
rate of polymerization in, 20:381
rheological properties of, 20:384–386
serum composition of, 20:386
surface layer dissociation behavior of, 20:381–383
synthesis of, 20:374–380
use with filler particles, 20:380
viscosity of, 20:384–386
Polymer–complex insulin delivery, 9:66
Polymer composites, coupling agents for, 25:129–130
Polymer connectors, 17:846
Polymer conversion polyimide synthesis via, 20:276
in silicon carbide manufacture and processing, 22:533
Polymer cross-linking, 14:275
Polymer crystallization, 24:9
high throughput experimentation application, 7:411–412
Polymer degradation, 14:275
Polymer design, aspects of, 20:379t
Polymer diffraction, 26:432
Polymer dispersed liquid crystal (PDLC) display, 15:116
Polymer fabrication, 9:73–75
Polymer families, 10:169
Polymer ferroelectrics, 11:106–107
Polymer–filler interactions, in filled networks, 22:571, 572
Polymer films, lamination of, 23:398
Polymer films/rods, 9:73
Polymer flooding, in enhanced oil recovery, 18:622–625
Polymer formation, biosynthesis process of, 15:1–2
Polymer fume fever, 18:304
Polymer gasoline, 4:423
propane in, 20:782–783
Polymer gels, smart, 22:718
Polymer-grade ethylene, specification for, 10:624t
Polymer-grade propylene, product specifications for, 20:777t
Polymer grades, data concerning, 10:221
Polymer growth, models of, 26:528–529
Polymeric Z-alkene-alkenyl substituted peroxides, 18:459–460
Polymeric acyl titanate esters, 25:79
Polymeric adsorbents, properties and applications, 1:587t
Polymeric chain branching, 25:567–568
Polymeric composites, 13:369
Polymeric couplers, in chromogenic chemistry, 19:252
Polymeric diacyl peroxides, preparation of, 18:476
Polymeric drug delivery systems, for cancer treatment, 9:82
Polymeric embedding, in microarray fabrication, 16:387
Polymeric fibers, 11:171
  water interactions with, 11:168
Polymeric flocculants, 11:624
  high molecular weight, 11:636–637
Polymeric fluids, carrier for dental cements, 8:287
Polymeric gem-peroxides, 18:460
Polymeric light-emitting diodes (LED), 26:803
Polymeric materials
  blends with styrenic block copolymers, 24:714–715
  in carbon fiber production, 26:729
  derivatization of, 23:535
  particles in, 26:754
  used in explosive compositions, 10:738–739
Polymeric methylene diisocyanate resins (PMDI), 24:189
Polymeric methylenedianiline (PMDA), 2:793–794
  physical properties of, 2:794t
Polymeric nanocomposites, 13:549
Polymeric N-halamines, 13:116
Polymeric nuclear-track detector, diallyl carbonate cast plastics, 2:257
Polymeric/oligomeric flame retardants, 11:470–474
Polymeric peroxides, 18:442, 480
Polymeric prodrugs, 9:80
Polymeric resins
  in hazardous waste management, 25:813
  molding, 10:11
Polymeric surfactants, 24:153, 154, 159
Polymeric system, “smart,” 13:742
Polymeric titanate esters, 25:79
Polymer industry, organic peroxides in, 18:495
Polymer in situ gels, 9:75
Polymerization, 12:188. See also Bulk continuous polymerization; Polymers; Radical polymerization
  ABS, 1:419–423
  acetaldehyde, 1:103
  acetylene, 1:181
  acrolein, 1:279
  acrylamide, 1:311
  acrylic ester monomers, 1:375–386
  acrylic esters, 1:342
  of acrylonitrile, 11:197–204
  of amorphous silica, 22:389–390
  anionic, 14:244; 22:559–560
  atom transfer radical, 22:40
  bulk, 11:201–202
  butadiene, 4:375–377
  of butylenes, 4:409
  of carboxylic acids, 5:45
  catalytic aerogels for, 1:763
  cationic, 14:265
  chain-growth, 20:406–410
  chlorocarbons, 6:235–236
  of cyclic olefins, 16:112–113
  of cyclopentadiene and dicyclopentadiene, 8:223
  emulsion, 11:202; 14:713–715
  ethene, 16:102–103
  ethylene, 10:593–596
  ethylene oxide, 10:657
  free radicals in, 14:297
  of furan, 12:275
  of furfural, 12:264–265
  in the gas phase, 17:703, 704
  group-transfer, 16:240; 22:696
  in growing amorphous silicon, 22:129–131
  in hazardous waste management, 25:824
  heterogeneous catalytic, 10:683
  in higher olefins, 17:712
  HPC applications, 5:463t
  ionic liquids in, 26:885–887
  of liquid sulfur trioxide, 23:778
  low temperature, 19:719
  maleic anhydride, 15:494–495
  mean field theory of, 23:63
  of methacrylic acid/derivatives, 16:239–240
  in microencapsulation, 16:445–446
  multistage, 17:704
  nonradical, 19:835–836
  organoboron, 13:663–664
  ozone use in, 17:810
  of perfluoropolyethers, 11:882–883
  in petroleum refining, 18:659–660
  of β-pinene, 24:496–497
  PMMA, 10:200
  of poly(fluorosilicones), 20:242
  of printing inks, 14:314
  ring-opening, 14:271; 22:558–559, 573
  in silicate solutions, 22:458–459
  of silicones, 22:555–562, 598

POLYMERIZATION 735
Polymerization reactions, 21:845
Polymerization catalysts, magnesium alkyls as, 15:385
Polymerization inhibitors
miscellaneous, 23:383
in styrene manufacture, 23:338
Polymerization initiators
alkyllithiums as, 14:251
cerium application, 5:687
peroxydicarbonates as, 14:290
Polymerization kinetics, in PVC polymerization, 25:666–667
Polymerization mechanism, for low density polyethylene, 20:218
Polymerization methods, choice of, 20:482
Polymerization modes, polychloroprene, 19:835–836
Polymerization of Monomeric Reactants (PMR)
materials, 20:275
Polymerization processes
for linear low density polyethylene, 20:194–199
novel, 19:816
Polymerization reactor, product grades produced in, 23:380
Polymerization reactions, 21:845
in HDPE production, 20:153
of propylene, 20:774
with Ziegler-Natta catalysts, 20:424
Polymerization variables, 10:705
Polymerized α-olefin waxes, 26:221
Polymerized rosin, accelerator for dental cements, 8:285
Polymer latex dispersions, production of, 24:156–157
Polymer liquid crystals, 15:107–111
Polymer matrices, 26:761–765
Polymer–matrix composites, 13:502;
26:751, 755–756
fabrication of, 26:765
chain fluctuations in, 21:714
Polymer metal composites, smart, 22:718
Polymer microspheres, 9:73–75
Polymer microstructure, polychloroprene, 19:836–838
Polymer miscibility, enhancing, 14:476
Polymer modification, supercritical fluid impregnation in, 24:20
Polymer networks, interpenetrating, 19:834; 20:327
Polymer nomenclature, 17:403–404
Polymer Nomenclature Committee
(American Chemical Society), 17:403
Polymer-only treatment, in industrial water treatment, 26:133
Polymer organic light-emitting diodes (PLEDs), 7:540
Polymer parameters, catalysts and, 26:534
Polymer particle growth
technological implications of, 26:532–533
over Ziegler-Natta catalysts, 26:526–533
Polymer particles
with decreasing monomer concentration, 14:715
monomer-saturated, 14:714–715
Polymer plasticizers, silicone, 22:32–33
Polymer poly(butene-1-sulfone) (PBS) resist, 15:160
Polymer–polymer incompatibility
encapsulation processes, 16:441–442
Polymer polyls, 25:464
Polymer precipitation, 15:804
by cooling, 15:805–806
by imbibition of water vapor, 15:807–808
by immersion in nonsolvent bath, 15:808–811
Polymer pyrolysis, in silicon carbide, 15:806
Polymer properties, testing of, 19:578–579
Polymer production, metathesis in, 26:944–948
Polymer properties
  of ethylene–acrylic elastomers, 10:697–701
  of ethylene–propylene polymers, 10:704–707
  of high density polyethylene, 20:162–167
  modification of, 14:461
Polymer pyrolysis, in silicon carbide fiber manufacture, 22:534
Polymer radicals, polymer chain
  termination by β-scission of, 20:221–222
Polymer recirculation rate, in Spherizone technology, 20:543
Polymers, 20:389–412. See also Ethylene–propylene polymers; Filled polymers; Higher olefin polymers; Polymerization; Polysaccharides; Shape-memory polymers (SMPs); SiO₂ polymer; Special polymers; Sulfur-containing polymers; Thermosetting reactive polymers; Water-soluble polymers
  “aging” of, 20:167
  amorphous phase and glass-transition temperature in, 20:400
  barrier, 18:125
  in batteries, 22:223–224
  with bisphenol A moieties, 23:727
  burning behavior of, 10:175–176
  from butadiene, 4:375–377, 384t
  from butylenes, 4:409, 429
  chelating agents, 5:711, 713t
  chiral synthetic polymer phases, 6:92–93
  classes of, 9:554
  classification and nomenclature of, 20:390–395
  classification by properties and processing, 24:696t
  combinatorial chemistry applications, 7:405–413
  competition among, 10:220–225
  conducting, 22:717, 718–719
  conducting organic, 13:544–546
  containing flame retardants, 23:366
in controlled drug release formulations, 9:71–73
  conventional and conducting, 13:541
  corrosion attack on, 20:114–115
  crystallinity in, 20:397–399
  defoamer applications, 8:248
  degradation characteristics, 9:79t
  for dense symmetrical membranes, 15:801
  dilute solution viscosity testing of, 19:578–579
  dimethylsilicone, 22:577–578
  doping, 13:543–544
  in drilling fluids, 9:13–14
  dyesite content of, 11:195
  dynamic mechanical analysis of, 19:574–575
  effect of temperature on, 9:552–554
  effects of crystallinity on properties of, 20:400–403
  electroactive, 22:708t, 717–719, 721t
  in electrochemical cell design, 9:653
  electrochromic materials, 6:572t, 574–576
  in electrochromic systems, 22:225
  as emulsion stabilizers, 10:116
  energetic, 10:739t
  ethylene, 17:700–703
  for expanded-film membranes, 15:803–804
  fatigue testing of, 19:581
  in fibers, 11:165–166, 172
  fillers used in commercial, 11:302t, 303
  fluorine reactivity with, 11:831–832
  fluorine-containing, 10:218–220
  fracture mechanics of, 20:351–352
  freeze roll isolation of, 19:842
  fullerene, 12:250–252
  gelled, 19:833
  gelling, 20:570–571
  from genetically engineered microbes, 12:482
  “heat shrinkable,” 22:364
  higher olefin, 17:724–725
  high-fluorine, 15:188
  high molecular weight, 23:730
  high throughput experimentation, 7:382t
  for 193-nm resists, 15:176–181
  for 248-nm chemically amplified resists, 15:175–176
  hybrid materials based on, 13:541–544
hydrazine-based, 13:599
hydrocarbon use in, 13:689–690
of p-hydroxybenzoic acid, 22:22–23
lactic acid, 14:125–126
latex acrylic, 22:41–43
liquid chromatography applications, 6:465
liquid-crystal, 20:34
low molecular weight components of, 19:567
in manufactured fibers, 11:174–175
measurements of, 19:577
mechanical strength of, 20:165
in melt spinning, 15:816, 818
mercaptan-terminated, 22:40–41
metallocene, 16:82
metallocene-catalyzed, 16:85
molecular recognition in, 16:794–796
molecular structure of semiconductor, 22:211–212
molecular weights of, 20:395–396
optical properties of semiconductor, 22:208–209
as organic semiconductors, 22:207–208
in organic semiconductor transistors, 22:222–223
oxygen-containing, 10:183–201
in paper release coatings, 22:591
partially crystalline, 23:703
passive dielectric, 22:718
performance criteria in cosmetic use, 7:860t
phosphorus-containing, 11:498–499
photochromic materials, 6:591–592
photosensitized reactions for, 9:518–519
in photovoltaic devices, 22:222
piezochromic materials, 6:607–610
polythioether, 22:40–41
pressure-sensitive adhesives and, 22:591
principal categories of, 20:391, 394
for protecting art, 11:410–411
quinolines in, 21:195
as reactive hot melt silicone sealants, 22:35
recycling, 20:362
recycling costs for, 21:457t
in regenerayed and derivative fibers, 11:247
release agent use with, 21:606
rigid-rod, 13:370–382
in RTV silicone preparation, 22:595
secondary bonding in, 20:396–397
selenium-containing, 22:89–90
semicrystalline, 20:351
shale-stabilizing, 9:21–22
silicon-modified polyacrylates from, 22:40
silicone latex, 22:34–35
silicone resins as, 22:586–590
silyl-terminated polyethers from, 22:38–39
silyl-terminated polyisobutylene from, 22:39
silyl-terminated polyurethanes from, 22:39–40
in single layer OLEDs, 22:215–216
as smart materials, 22:710, 711
sodium bromide and, 22:824
as solar energy materials, 23:5–6
solid-state testing and melt-state testing of, 19:575
solubility of, 20:403–405
solvent absorption by, 23:97–99
spunbonded nonwoven fabrics made from, 17:465
stereoisomerism in, 20:397
structure and properties of, 20:395–405
styrene derivative, 23:367–368
sulfonated, 23:534–536
sulfur-containing, 10:201–204
supercritical fluid extraction for, 24:13–14
supercritical fluids and, 24:8–9
supercritical impregnation of, 24:19–20
sustainable development and, 24:169–170
in switches and sensors, 22:225
synthesis and manufacture of semiconductor, 22:213–214
synthesis of, 20:405–411
synthesized from phosgene and dithiols, 23:727
thermochromic materials, 6:619–626
toughening of, 20:352
T resin, 22:590
for urethane sealants, 22:36
use in controlling stability behavior of suspensions, 24:138
uses of succinic acid and succinic anhydride in, 23:429t
vinyl chloride, 25:657–691
vinyl-containing, 22:579
vinylidene chloride, 25:691–745
viscoelasticity of, 19:580
Poly(methyl methacrylate) 739

- Polymethine chromophore, 20:504
- Polymethine chains (PCs), 20:504
- substituent effects in, 20:510–511
- Polymethine chromophore, 20:504
- Polymethine dyes (PDs), 9:257, 503, 504, 511, 512, 513; 20:504–522
- absorption bands of, 20:509
- absorption maxima of, 20:518
- absorption spectra of, 20:506–512
- applications of, 20:513–521
- color theory and, 20:521
- in electronic photography, 20:516
- in fluorescence labeling, 20:519–521
- fluorescence spectra of, 20:512–513
- in ion recognition, 20:517–519
- in laser technology, 20:514–515
- medical applications of, 20:521
- in optical recording, 20:516
- in photographic sensitization, 20:513–514
- in photovoltaic and solar cells, 20:516–517
- in solvent polarity/hydrophobicity probing, 20:517
- unsymmetrical, 20:508–509
- Polymethine Orange, colorant for plastics, 7:374t
- Polymethines, typical soluble dye applications, 7:376t
- “Polymethylene,” 20:149
- Polymethylene wax, 26:220
- Poly(methyl methacrylate) hollow fiber membranes, 16:21
- Poly(methyl methacrylate) sheet, properties of, 16:292t
- chemical properties of, 16:277
- conducting, 7:524
- electrical properties of, 16:276t
- glazing sheets, 20:407
- in microfluidic fabrication, 26:966
- monomer recovery from, 16:257
- optical properties of, 16:275–276
- outdoor stability of, 16:277t
- oxygen permeability at 25°C, 3:400
- phosphorus flame retardants in, 11:484
- precipitate, 20:117
- properties of, 10:200, 201t
- sheet production of, 16:282
- viscosity of, 23:100
- 4-star-Poly(methyl methacrylate), 7:610t
- Poly(methyl methacrylate)-block-poly(butyl methacrylate)-block-poly(methyl methacrylate), 7:646

In wastewater treatment, 25:911
- water-soluble, 23:720
- in wet spinning, 15:816, 817–818
- widely used support materials, 5:324t

Polymer solutions, 15:109–110
- superposition and master curves for, 21:747
- viscosities of, 21:710–712
- diffusivity in, 15:672–673

Polymer–solvent interaction, 23:100
- Polymer stabilized cholesteric texture (PSCT) display, 15:116

Polymer stabilizers, in polychloroprene latex compounding, 19:858

Polymer structure
- mechanical properties related to, 16:275
- relation to plasma etch resistance, 15:177

Polymer–supercritical fluid systems, phase behavior of, 24:11
- Polymer surfaces, preparation of, 11:846
- Polymer suspensions, poly(ethylene oxide) resin, 10:683
- Polymer synthesis, advances in, 20:442
- Polymer tacticity, 20:533
- Polymer tubing, aeration through, 15:718–723
- Polymer utility, role of water in, 20:439
- Polymetallic sulfides (PMS), 17:693–694
- Polymetallocarbossilanes, 25:101
- Poly(metanilic acid), conducting, 7:522
- Poly(metaphosphoric acid), 20:459
- Polymetatelluric acid, 24:421
- Poly(meth)acrylamido cationics, 20:471
- Poly(methacrylate)–poly(acrylate), colloidal suspensions, 7:275

Poly(methacrylates)
- amine-containing, 20:469
- high molecular weight, 23:728
- Poly(methacrylic acid) (PMAA), 16:257–258
- preparation of, 20:466–467
- reactions with PVA, 25:601

Poly(methacrylic cationics), 20:469–471
- Poly(methacrylonitrile, oxygen permeability at 25°C, 3:400
- Polymethacryloylacetone, molecular formula, 5:713t

Poly(methacrylate) hollow fiber membranes, 16:21
Poly(methyl methacrylate) encapsulants, 14:865

Poly(methyl methacrylate) molding powder, 16:283

Poly(methyl methacrylate-stat-butyl acrylate), 7:608t

Poly(methyl siloxane)-comb-polystyrene, 7:610t

Polymethylsiloxane polymers, manufacture of, 22:555–556

Poly(methyl vinyl ether) (PMVE), 13:732; 20:463

Polymolybdate ion, 17:22

Poly(monoperoxycarbonates), 14:286

Poly(monosulfide ketone)s, 23:709–711

Poly(monosulfide)s, 23:702–711
  aliphatic, 23:702–704
  aromatic, 23:706
  conjugated polymers, 23:709
  macrocyclic polythioethers, 23:707
  poly(arylene sulfide)es, 23:704–706
  poly(monosulfide)ketone)s, 23:709–711
  polythiophenes, 23:708
  tetrathiafulvalene polymers, 23:708–709

Poly(monothiobis)acetals, 23:726

Polymorphism
  and crystal engineering, 8:68–70
  in liquid crystalline materials, 15:101–102

Poly(m-phenylene isophthalamide) (MPDI), 10:210, 211, 212; 19:713, 714. See also MPDI fibers
  commercial process for, 19:721
  crystal lattice parameters of, 19:728t
  dry spinning of, 19:724
  interfacial polymerization process for, 19:722
  laboratory synthesis of, 19:719
  low temperature solution polymerization process for, 19:722
  wet spinning of, 19:724

Poly(m-xylylene adipamide), 10:210

Poly(Na acrylate30-co-acrylamide70)
  Mark–Houwink–Sakurada correlations, 1:310t
  suggested $R_g$–$M_w$ correlations, 1:309t

Poly(Na acrylate20-co-acrylamide80)
  Mark–Houwink–Sakurada correlations, 1:310t
  suggested $R_g$–$M_w$ correlations, 1:309t

Poly(NIPAm) microgels, 13:746

Polynitrofluorene, 17:164

Poly(norbornene), 22:363–364; 26:944–945
  high molecular weight, 20:432
  manufacture of, 20:430

Polynucleic rayons, 11:260–261

Polynuclear aromatic hydrocarbons (PAHs), 18:587–589

Polynuclear aromatics
  indoor air pollution, 1:804
  production by alkylation, 2:195

Polynuclear phenol glycidyl ether derived resins, 10:371–372

Polynucleotide chains, 17:604

Polynucleotides, 20:444–447

Polyoctenamer(s), 20:425; 26:945–946
  manufacture of, 20:430
  properties of, 20:426t

Polyoctenamer elastomers, 20:432

Polyol cross-linking, organic titanium compounds in, 25:132

Polyolefin-based block copolymers, 24:703

Polyolefin block copolymers, 24:698, 704, 716

Polyolefin containers, fluorine surface treatment of, 11:846

Polyolefin dust, 20:230

Polyolefin fibers, 11:224; 24:614. See also Olefin fibers

Polyolefin industry, catalysts in, 26:503

Polyolefin (PO) resins, 17:699–700
  technologies and uses for, 17:707–708

Polyolefin products, Ziegler-Natta catalysts for, 26:533–544

Polyolefins, 10:518
  antioxidant applications, 3:118–120
  improvements with metallocene catalysts, 16:85–86
  metallocene, 16:82
  properties of, 20:416t
  worldwide usage of, 20:150t

Polyolefin thermoplastic elastomers, 24:708

Polyol esters, 9:150; 10:518

Polyol polytitanates, 25:88

  See also Alcohols, polyhydric
  alkyds from, 2:147, 153–154
  benzoylation of, 16:548
  as fermentation products, 11:2–3
  formaldehyde in, 12:122
  phosphorus-containing, 11:496–497
Poly(paraphenylene) (PPP), 18:815
Polyphosphates, 18:815
  chelating agents, 5:711, 712t
  colloidal properties of, 18:851
  dispersants, 8:710t
  emulsifiers, detergents, and dispersants, 8:710t
  hydrolysis rates of, 18:848
  long-chain, 18:846–848, 850
Polyphosphazenes, 19:57
Polyphosphoric acid, 18:826
  catalysts, 18:830
Polyphthalamides (PPA), 10:216–217
  ASTM standards for, 19:793
Poly(p-phenylene) (PPP), 22:207t; 23:717
  conducting, 7:523, 527
  molecular structure of, 22:211
  optical band gap, 7:529t
  room temperature conductivity, 7:532
  water-soluble, electroactive, self-doped
  sulfonatoalkoxy-substituted, 23:720
Poly(p-phenylene benzobisoxazole) (PBO), 19:714
Poly(p-phenylene benzobisthiazole) (PBT), 19:714
Poly(p-phenyleneethynylene) (PPE) derivatives, 26:951
Poly(p-phenylene sulfide ketone), 23:709
Poly(p-phenylene terephthalamide), 10:210, 211
Poly(p-phenylene terephthalate) (PPT), 13:371, 372
  crystal structure of, 13:376
  high molecular weight, 13:374–375
  liquid-crystalline behavior of, 13:375
Poly(p-phenylene terephthalamide) (PPTA), 19:713, 714. See also Copoly
  (p-phenylene/3,4'-diphenyl ether
terephthalamide) (ODA/PPTA); PPTA
  entries
  commercial process for, 19:721
  crystal lattice parameters of, 19:728t
  film casting of, 19:726
  laboratory synthesis of, 19:720
  low temperature solution polymerization
  process
  for, 19:723
  resin and fibril forms of, 19:735
  spinning of, 19:724–725
Poly(p-phenylene vinylene) (PPV), 22:207t
  conducting, 7:520, 524
  optical band gap, 7:529t
room temperature conductivity, 7:532
Polypropylene, isotactic, 16:86
Polypropylene microstructure, control of, 16:86–87
Polypropionate synthesis, 20:138
Polypropylene (PP), 20.523–548; 24:272.
See also Olefin fibers; Propylene polymer entries; Spherizone technology; Spheripol technology; advanced material, 1:693
asbestos substitute, 3:314t, 315
can coatings, 18:39
catalyst systems for, 20:525–528
catalyst yield for, 20:531–532
coatings, 7:40
conducting, 7:525
diffusion of oxygen and carbon dioxide in, 3:382t
economic aspects of, 20:545–546
effect of orientation on oxygen permeability, 3:393t
fabrication processes for, 20:548t
fibers, 17:465–466
food packaging, 18:42
heterophasic copolymers of, 20:533–534
inorganic pigment applications, 7:372t
isotactic, 11:225
mileage of, 20:526–528
molecular weight of, 20:530–531
monomer quality of, 20:532
in olefin fibers, 11:224
organic pigment applications, 7:368t
permeability to selected permanent gases, 3:381t
physical and coating properties, 7:38
physicochemical properties of, 20:254t
process chemistry and thermodynamics of, 20:524–532
processing of, 14:275
production and consumption of, 11:276–277
properties of, 20:524
propylene in the production of, 20:783
random copolymers of, 20:532–533
recycling, 21:452
recycling of, 14:758
replication factor for, 20:528–529
safety and environmental considerations related to, 20:546–547
spunbonded, 17:483–484
stereoregulation and isotacticity in, 20:529
typical soluble dye applications, 7:376t
uses for, 20:547
water-vapor transmission rate, 3:387t
Polypropylene-based multiphase copolymers, 26:537–538
Polypropylene capacity, U.S., 24:273t
Poly(propylene-co-α-olefin), 7:631
Polypropylene-derived branched alkylbenzene (BAB), batch sulfonation of, 23:541–542
Polypropylene fiber, 13:394
Polypropylene fire-retardant, 14:785
Poly(propylene glycol) (PPG), 25:474
Poly(propylene glycol)s, 20:812
Polypropylene homopolymers, 20:524–532
properties of, 20:525t
Poly(propylene imine) (PPI) dendrimers, 26:789, 790
Polypropylene manufacturing, 20:536–545
commercialization of, 20:525
Poly(propylene oxide)
commercial block copolymers, 7:648t
dispersant moieties, 8:706t
Polypropylene products, Ziegler-Natta catalysts for, 26:534, 535–536
Polypropylene/rubber blend, 20:360–361
Polypyrindine, conducting, 7:522
Polypyrindyl ligands, 14:548–550
Polypyrrole(s)
conducting, 7:516–517; 7:523, 527
electrochromic material, 6:572t, 575, 581t
optical band gap, 7:529t
room temperature conductivity, 7:532
Poly(pyrrylene vinylenes), stability, 7:38
Poly(pyrrole tosylate), stability, 7:77
Polypyrole(s)
conducting, 7:516–517; 7:523, 527
electrochromic material, 6:572t, 575, 581t
optical band gap, 7:529t
room temperature conductivity, 7:532
Polypropylene capacity, U.S., 24:273t
Polypropylene-based multiphase copolymers, 26:537–538
Polypropylene-Derived Branched Alkylbenzene (BAB), Batch Sulfonation Of, 23:541–542
Polypropylene Fiber, 13:394
Polypropylene Fire-Retardant, 14:785
Poly(propylene glycol) (PPG), 25:474
Poly(propylene glycol)s, 20:812
Polypropylene Homopolymers, 20:524–532
Properties of, 20:525t
Poly(propylene imine) (PPI) Dendrimers, 26:789, 790
Polypropylene Manufacturing, 20:536–545
Commercialization of, 20:525
Poly(propylene oxide)
Commercial Block Copolymers, 7:648t
Dispersant Moieties, 8:706t
Polypropylene Products, Ziegler-Natta Catalysts For, 26:534, 535–536
Polypropylene/Rubber Blend, 20:360–361
Polypyrindine, Conducting, 7:522
Polypyrindyl Ligands, 14:548–550
Polypyrrole(s)
Conducting, 7:516–517; 7:523, 527
Electrochromic Material, 6:572t, 575, 581t
Optical Band Gap, 7:529t
Room Temperature Conductivity, 7:532
Poly(pyrrylene vinylenes), Stability, 7:38
Poly(pyrrole tosylate), Stability, 7:77
Polypyrole(s)
Conducting, 7:516–517; 7:523, 527
Electrochromic Material, 6:572t, 575, 581t
Optical Band Gap, 7:529t
Room Temperature Conductivity, 7:532
Polypropylene capacity, U.S., 24:273t
Polypropylene-based multiphase copolymers, 26:537–538
Polypropylene-Derived Branched Alkylbenzene (BAB), Batch Sulfonation Of, 23:541–542
Polypropylene Fiber, 13:394
Polypropylene Fire-Retardant, 14:785
Poly(propylene glycol) (PPG), 25:474
Poly(propylene glycol)s, 20:812
Polypropylene Homopolymers, 20:524–532
Properties of, 20:525t
Poly(propylene imine) (PPI) Dendrimers, 26:789, 790
Polypropylene Manufacturing, 20:536–545
Commercialization of, 20:525
Poly(propylene oxide)
Commercial Block Copolymers, 7:648t
Dispersant Moieties, 8:706t
Polypropylene Products, Ziegler-Natta Catalysts For, 26:534, 535–536
Polypropylene/Rubber Blend, 20:360–361
Polypyrindine, Conducting, 7:522
Polypyrindyl Ligands, 14:548–550
Polypyrrole(s)
Conducting, 7:516–517; 7:523, 527
Electrochromic Material, 6:572t, 575, 581t
Optical Band Gap, 7:529t
Room Temperature Conductivity, 7:532
Poly(pyrrylene vinylenes), Stability, 7:38
Poly(pyrrole tosylate), Stability, 7:77
Polypyrole(s)
Conducting, 7:516–517; 7:523, 527
Electrochromic Material, 6:572t, 575, 581t
Optical Band Gap, 7:529t
Room Temperature Conductivity, 7:532
Polyrotaxane Structures, 23:733
Polysaccharide Extraction, 10:307
Polysaccharide gels, 4:724
algal, 20:453–454
animal, 20:565–568
aqueous solution properties of, 20:451
bacterial and fungal, 20:455
classification and structure of,
20:549–555
characterization and structure of,
20:549–555
classification of commercial by source,
4:724
degradation of, 10:300
depolymerizing, 13:64
determining the composition of,
20:550–551
dynamic measurements of, 20:555
extracellular, 20:454–455
hydrolysis of, 21:29
microbial, 20:573–578
molecular weight determination and viscosity for, 20:551–553
nmr spectroscopy analysis of, 20:550
peeling and stopping reactions of,
21:27–28
plant, 20:555–565
rheology of, 20:554–555
seaweed, 20:568–573
storage, 20:452–453
structures of, 13:62
sulfated, 23:725
surfactants derived from, 24:151–152
synthesis, 4:704
synthetically modified, 20:457–459
uses of, 4:714–731
viscosity of, 20:554
Polysaccharidic gums, 13:61, 62
solutions of, 13:64
Polyselenides, 22:87
Polysilicates, 22:453t
Polysilicic acid, 22:383, 385
Polysilicon, in MEMS, 22:260
Polysilicon gate, in field-effect transistors, 22:249–250
Polysiloxane(s)
dispersant moieties, 8:706t
glass-transition temperatures of, 13:538t
stationary phase, 4:631
Polysiloxane resin coatings
organic titanium compounds in, 25:128
Polysiloxanes, 13:538
Polysiloxanes, bridged, 1:753
Polysiloxane resin coatings
organic titanium compounds in, 25:128
Polysiloxane(s)
uses of, 25:696–697
molecular weight of, 24:702
Polystyrene-block-polybutadiene-block-polystyrene, 7:608t
Polystyrene-block-polybutadiene-block-polymethylmethacrylate copolymers, 7:645
Polystyrene-block-poly(ethylene-butylene)-block-polystyrene, 7:647
Polystyrene-block-poly(n-butyl acrylate), 7:646
Polystyrene-co-butylacrylate, 7:608t
Poly(styrene-co-divinylbenzene), 13:113
Poly(styrene-co-vinylpyridinium methyl iodide) ionomer system, 14:480
Poly(styrenedivinylbenzene) (PSDVB) liquid chromatography stationary phase, 4:623
Polystyrene film
characteristics of, 23:409
oriented, 23:408–409
Polystyrene flame retardants, 23:407–408
Polystyrene foam(s)
blowing agents for, 23:376
characteristic properties of, 23:404t
as colloid, 7:272t, 273t
granulated, 21:453
uses of, 23:403–408
Polystyrene foamed sheet, 23:408
Polystyrene ionomers, 23:364–365
Polystyrene molding, expandable, 19:554–555
Poly(styrene)—poly(acrylate)
colloidal suspensions, 7:275
Polystyrene/poly(methyl methacrylate) commercial block copolymers, 7:648t
Polystyrenes. See also Polystyrene (PS) commercial, 23:364
general-purpose, 23:364
specialty, 23:364–366
stabilized, 23:366
tactic, 23:365
Polystyrene stereostructures, 10:180–183
Poly(styrenesulfonic acid) (PSSA); 23:720
preparation of, 20:467–468
synthesis of, 23:535
Polystyrene Wang resin, coupling of aromatic carboxylic acids to, 16:549
Polystyryl radical coupling, 23:380
Polystyryl radicals, 23:388
Polysubstitution, 12:162
Polysulfates, 23:725
Polysulfide impression materials, 8:329–332
as embedding materials, 10:7–8
Polysulfide salts, 23:640
Polysulfide sealants, 22:404–41, 48t
Polysulfides, weatherability of, 22:31
Polysulfido-bis-silane, as silylating agent, 22:703
Poly(sulfanyl acrylate)s, 23:733
Polysulfonates, 23:723–725
antibacterial activities of, 23:724
prepared by interfacial condensation of, 23:723–724
with reactive pendent chloromethyl groups, 23:724
Polysulfone/PVP/DMF dope composition, 16:11
Polysulfone hollow-fiber dialyzer, 26:815–816
Polysulfone hollow-fiber membranes, 16:20–21
Polysulfone hollow fibers, composite, 16:17
Polysulfone membranes, 15:811
Polysulfones, 10:202–204
properties of, 10:204t
Polysulfone ultrafiltration hollow-fiber membrane, 16:4
Poly(sulfonic acid)s, 23:717–725
biomedical applications of, 23:722–723
uses for, 23:717
Polysulfonium salts, 23:714, 715
as photochemical polymeric materials, 23:715–716
Polysulfoxides, 23:733–735
optically active, 23:735
Polysulfoximines, 23:745–746
Poly(sulfur nitride), as organic semiconductor, 22:212
Polytellurides, 24:408
Poly-Tergent, commercial defoamer, 8:241t
Polytetrafluoroethylene (PTFE) Teflon, 9:697, 763
Polytetrafluoroethylene (PTFE), 12:211, 217–218; 14:228; 18:288, 329. See also PTFE entries; Teflon entries
absorption, permeation, and interactions of, 18:297–298
applications of, 18:305–306
asbestos substitute, 3:314t
chemical properties of, 18:296–299
for copper wire, 7:691
economic aspects of, 18:303
for electrical insulation, 11:837
electrical properties of, 18:298–299
estimated relative molecular weight of, 18:293
fabrication of, 18:299–303
granular, 18:291–292
health and safety factors related to, 18:304
homopolymers, 18:303
in lotus effect surfaces, 22:117
manufacture of, 18:290–292
mechanical properties of, 18:292–299
melting and recrystallization behavior of, 18:293–294
monomer of, 18:288–290
powders, 18:290–291
pressure-sensitive adhesives and, 22:590
properties of, 18:292–299
radiation effects on, 18:296–297
testing and standards for, 18:303
transitions in, 18:294
use in fluorine production, 11:839, 841
Polytetrafluoroethylene diaphragms, 21:74
Polytetrafluoroethylene ionomers, properties of, 14:475–476
Poly(tetrafluoroethylene-co-hexafluoropropylene) films, 23:720
Polytetrafluoroethylene linings, 14:14
Poly(tetrahydrofuran) [poly(THF)]
switching segment, in shape-memory polymers, 22:363
Poly(tetramethylene ether glycol) (PTMEG), 10:578, 582
Polytetramethylene ether glycol terephthalate (PTMEG-T), 20:70, 71
Poly(tetramethylene glycol) (PTMG), 25:464
Poly(tetramethylene oxide) (PTMO), 23:82, 744
Polytetramethylene oxide diol (PTMEG), 20:76
Polythiazide, molecular formula and structure, 5:163t
Polythiazyl, 23:654
Poly(thiénylene vinylene), conducting, 7:521
Polythioacetal, 23:732–733
Polythiocarbamates, 23:735–738
Polythiocarbonates, 23:626, 725–729
thermal stability of, 23:726–727
Polythioester, 23:729–732
preparation of, 23:730–731
Polythioether-based urethane sealants, 22:36
Poly(thioether ketone)s, 23:710
Poly(thioether-monothiocarbonate)s, 23:729
Polythioether polymer, 22:40–41
Polythioethers, 23:704
Polythionic acids, 23:641
Polythiophene(s), conducting, 7:517–520; 7:523, 527
electrochromic material, 6:572t, 575, 581t
in electrochromic systems, 22:225
optical band gap, 7:529t
room temperature conductivity, 7:532
synthesis of, 22:214
Polythiourethanes, 23:735–738
containing units bearing thiol groups, 23:737–738
preparation of, 23:736–737
Polytitanaoxane, 25:90. See also Polytitanaoxanes
Polytitanosiloxane (PTS) polymers, 25:101
Polytitanoxanes, 25:79–80. See also Polytitanaoxane
Poly(trimethylene terephthalate) (PTT), 10:188–189; 20:31, 36–37
mechanical properties of, 20:69–70
physical properties of, 20:68–69
polymerization of, 20:43
structure of, 20:68t
Poly(triphenylstibine oxide), 3:74
Polytungstates, 25:382–384
Polytype formation, in silicon carbide, 22:527
Polyunsaturated fatty acids (PUFAs), 5:33t; 10:830; 17:663–666
health effects of, 17:665–666
Polyunsaturates, 10:814
Polyurea, colloidal suspensions, 7:275
Polyurea greases, 15:243
Polyurethane (PU). See also Polyurethanes (PUs)
conducting, 7:525
formation of, 25:457–459
melt temperature of, 25:460
Polyurethane adhesives, 25:475
uses for, 25:482
Polyurethane applications, organic
titanium compounds in, 25:134–135
Polyurethane-based thermoplastics, as
shape-memory
polymers, 22:713
Polyurethane block copolymers, 24:707
Polyurethane elastomers, 23:743; 25:475–476
high performance, 10:7
uses for, 25:482
Polyurethane engineering thermoplastics,
25:476
Polyurethane fibers, 24:614
segmented elastomeric, 25:476–477
Polyurethane foam(s), 25:183
commercial production of, 25:455
1,4-cyclohexanedimethanol use in,
12:675
for electronic system embedding, 10:7
organic titanium compounds in, 25:135
physical properties of, 13:716t
rigid, 25:460–461
Polyurethane foam catalysts, diorganotins
as, 24:823
Polyurethane foam processing, 19:559
Polyurethane hydrogels, 13:739
Polyurethane industry, neopentyl glycol in,
12:672
Polyurethane ionomers, 25:460
Polyurethane-modified isocyanurate
(PUR) foams, 25:455, 456
Polyurethanes (PUs), 9:564. See also
Polyurethane (PU)
antioxidant applications, 3:121–122
cardiovascular device applications, 3:720
CASE, 25:474–477
commercial block copolymers, 7:648t
containing sulfur linkages, 23:742–745
dyeing, 9:204
as embedding materials, 10:6–7
glass transition and melting
temperature for soft/hard segments,
7:649t
health and safety factors related to,
25:480–481
inorganic pigment applications, 7:372t
organic pigment applications, 7:368t
physical properties of, 25:459
processing, 24:717–718
reactive hot melt, 22:37–38
segmented, 23:722
as shape-memory polymers, 22:362–363
silyl-terminated, 22:39–40
stress relaxation of, 19:564
thermoplastic, 25:459–460
thermoset, 25:460–461
typical soluble dye applications, 7:376t
Polyurethane sealants
formulations for, 25:475
uses for, 25:482
Poly(vinyl acetate) (PVAc), 13:735; 25:557
adhesives, 25:578–583
applications of, 10:514–517
chemical properties of, 25:565
colloidal suspensions, 7:275
commercial manufacture of, 25:606–608
as a concrete additive, 25:585–586
conversion to poly(vinyl alcohol),
25:608–610
copolymer emulsions, 25:565
emulsion adhesives, 1:533
emulsion films, 25:566
emulsion specifications for, 25:576t
hydrolysis of, 25:591, 592–593
in emulsion polymerization, 25:617
North American producers of, 25:560t
organic–inorganic hybrids using, 23:81
physical constants for, 25:563–564t
plasticizers and fillers in, 25:565–566
precipitate, 20:117
production of, 25:605–606
for protecting art, 11:411
resin, 25:562
softening points and molecular weights
of, 25:564t
toxicity of, 25:566
Poly(vinyl alcohol) (PVA), 10:492;
13:731, 734. See also Vinyl alcohol
polymers
acetalization of, 25:602–603
in adhesives, 25:617
asbestos substitute, 3:314t
biodegradation of, 25:604–605
in building products, 25:619
commercial grades of, 25:612
conducting, 7:524
copolymers of, 25:611
cross-linking in, 25:603, 604
crystallization and melting point of, 25:592–594
drying and solids separation of, 25:610
in emulsion polymerization, 25:617
esterification of, 25:601
etherification of, 25:602
ethyl propionate permeability in barrier layer, 3:404–405
extrusion of, 25:615
FDA regulations for, 25:612–613
fibers of, 25:619
gas-barrier properties of, 25:598–599
glass-transition temperatures of, 25:594
in high-performance concrete, 13:542
history, uses, and properties of, 25:591
hydrogels, 13:734–736
inhalation of, 25:614
intrinsic viscosity of, 25:600
manufacture of, 20:462–463
miscellaneous applications of, 25:619
miscellaneous reactions of, 25:603
molecular weight of, 25:592, 600
as nonhazardous material, 25:613–614
organic titanium compounds and,
25:132–133
as paper coating, 25:618–619
pH of, 25:613
physical properties of, 25:593t
price of, 25:611–612
production of, 25:608–610
residual sodium acetate in, 25:613
solubility of, 25:594–595
solution preparation and handling of,
25:614–615
solution viscosity of, 25:595–597
solvent recovery from, 25:610
solvent resistance of, 25:598
surface tension of, 25:599–600
thermal decomposition of, 25:603–604
in textile and warp sizing, 25:615–617
toxicity of, 25:614
uses for, 20:463
world capacity of, 25:611
Poly(N-vinyl-2-pyrrolidone) (PVP), 13:731
hydrogels, 13:739
photochromic material, 6:597
Poly(N-vinylacetamide) (PVNA), 20:475
Poly(N-vinylcarbazole), 22:223
Poly(N-vinylformamide) (PNVF), 20:475
Poly(N-vinylpyrrolidione), 20:464
Poly(p-vinylbenzyliminodiacetic acid),
molecular formula, 5:713t
Poly(p-xylylene) polymer, in
microencapsulation, 16:444–445
Poly(vinyl alkane sulfonate)s, 25:601
Polyvinylamine (PVAm), 20:474–475
Polyvinyl-block-poly(-caprolactone), 7:646
Polyvinyl-block-poly(cycloaliphatic amine), 7:646
Polyvinyl butyral (PVB), 19:343; 25:602
butyraldehyde derivative, 4:462, 467
as a photothermographic material,
19:331
Poly(vinyl butyrate), 10:492–493
Polyvinylcarbazole (PVK), 22:207t
Poly(vinyl carbonates), 25:601
Poly(vinyl chloride) (PVC), 23:407; 24:170;
25:657–691. See also PVC entries;
Vinyl chloride polymers
antioxidant applications, 3:123
asbestos substitute, 3:315
cadmium stabilizers with, 4:501
coatings, 7:39
colloidal suspensions, 7:275
as a contaminant in recycled polymers,
21:453
for copper wire, 7:691
in defoamer formulations, 8:238
diffusion of oxygen and carbon dioxide
in, 3:382t
economic aspects of, 25:647
end groups and branching in, 25:666
environmental friendliness of,
25:681–682
food packaging, 18:42–43
good barrier-to-permanent gases, 3:384, 385
gross energy requirements for, 24:180
impact modifiers for, 23:371
inorganic pigment applications, 7:372t
molecular structure of, 25:665–666
monomer addition in, 25:665–666
organic pigment applications, 7:368t
oxygen permeability at 25°C, 3:400
permeability of plasticized household
films, 3:387t
permeability to selected permanent
gases, 3:381t
as a PET impurity, 21:449
photochlorination of, 19:114
physical parameters of, 25:665t
stereoregularity in, 25:666
typical soluble dye applications, 7:376t
VDC polymerization and, 25:696
water-vapor transmission rate, 3:387t
Poly(vinyl chloride) cable, 17:848
Poly(vinyl chloride-co-vinyl acetate), 7:524
Poly(vinyl chloride) polymers, lead
phosphite in, 14:791
Poly(vinyl chloride)/rubber blend, 20:361
Poly(vinyl chloride) stabilizers
commercially significant, 24:822t
diorganotins as, 24:821–822
monoorganotins as, 24:825, 830
Poly(vinyl fluoride) (PVF), 20:586–597.
See also Vinyl fluoride (VF)
application to substrates, 20:590
conformational characteristics of, 20:589
economic aspects of, 20:592
exposure to radiation, 20:589
fabrication and processing of, 20:589–592
health and environmental factors related
to, 20:592
properties of, 20:588–589
solubility of, 20:588–589
thermal stability of, 20:589
transitions below melting temperature,
20:588
uses for, 20:593
Poly(vinyl fluoride) film, properties of,
20:590–591t
Poly(vinyl fluoride) monomer, 20:586
Poly(vinylidene chloride) carbon,
adsorption/ desorption isotherms for
water vapor on, 1:634
Poly(vinylidene chloride) (PVDC), 11:106;
15:248, 25:691
food packaging, 18:43
lattices, 25:735–736
preparation of, 25:694–697
solution properties of, 25:703–706
structure and properties of, 25:699–709
coatings, 7:40
physical and coating properties, 7:38
as smart material, 22:710
Poly(vinyl nitrate), 25:601
Polyvinylpyridines, 20:472–473
aqueous solution characteristics of, 20:473
Polyvinylpyrrolidinone(s) (PVP), 16:410
conducting, 7:525
hair conditioner ingredient, 7:855t
Poly(vinyl pyrrolidinone)-iodine complex,
14:372
Poly(vinylsulfonic acid) (PVSA),
preparation of, 20:467
Polywood, 24:576
Poly(p-xylylene)/polymer, in
microencapsulation, 16:444–445
Poly(2,4-dimethoxyphenyl)-acrylate),
thermochromic material, 6:619
Polyzonimine, 2:73
Polyzwitterions, 20:475–482
applications of, 20:482
Pomeranz-Fritsch synthesis, of
isoquinoline, 21:203–204
Ponalrestat, 4:360t
Pondimin, 3:93
Ponds
aquaculture systems, 3:191
bioremediation of halogenated
compounds, 3:776
bioremediation of nonchlorinated
pesticides and herbicides, 3:778
Pontiac fever, 1:805
Pontoon roofs, 24:291, 292
Pool area, 22:63
of thickeners, 22:64
Poole-Frenkel mechanism, 24:328
Pool reactors, 17:593–594
Pools, radioactive waste storage in,
25:854–855. See also Lagoons;
Swimming pools
Pool/spa sanitizers
chlorine-based, 26:173–176
economic aspects of, 26:196
safe storage and handling of,
26:198–199
Popcorn polymerization, 19:835
Popping, coating film defect, 7:123–124
Poppy seed, 23:170
Population balances, 8:120–121
Population inversion, 14:658
Porcelain, 5:582
as corrosion protective coating, 7:817
dental application, 8:335–336
Porcine insulin, 3:817
Porcine somatotropin (pST), effects on
growth performance, 13:9–10
Porcupine dryer, 9:132
Pore models, 21:638–639
Pore size distribution
adsorbents, 1:586–590
aerogel preparation effects, 1:765
of silica, 22:371, 374t
Pore sizes
in filtration membranes, 15:825, 837, 838
influence on drying, 23:66
Pore-structure modeling, of cake filtration, 11:336–337
Pore volume, of silica, 22:371
Porosity
of adsorbents, 1:585–586
of aerogels, 1:758–760
of colloids, 7:276–277
of dispersed particles, 8:719
of ion-exchange resins, 14:393
of limestone, 15:31
of pyrogenic silica, 22:400
of quicklime, 15:41
of silica gel, 22:394–395, 396–397
Porosity test, for electroplating, 9:792
Porous catalysts, exothermic reaction within, 25:270
Porous catalytic pellets, 25:271–272
Porous electrodes, 3:428–429
Porous glass, 22:394
Porous graphite, 12:747
Porous hydrogels, for tissue engineering, 13:750–751
Porous layer open tubular (PLOT) columns, 4:615; 6:379
Porous pipes, cross-flow filtration in, 11:387–388
Porphyrin, 7:576
Porphyry, 7:672
Portable EDXRF instruments, 26:442
Portable scales, 26:244
Porter equation, 15:724
Portimicin, 20:137
Portland cement, 4:583
applications of special, 5:500t
applications using U.S. standards, 5:499t
chemical composition, compounds, and fineness, 5:476t
components, 5:467
as corrosion protective coating, 7:817
economic aspects, 5:495
hydration, 5:475–482, 477t
industry energy consumption in U.S., 5:497t
kaolin application, 6:696
manufacture, 5:485–492
phase equilibria, 5:468–470
phases formed in, 5:471, 472t
setting and hardening, 5:480
specifications and types, 5:498–500
top world producers, 5:496t
U.S. consumption, 5:494t
U.S. industry energy consumption, 5:497t
U.S. shipments by type, 5:498t
Portland cement clinker, 5:468
mixture with blast furnace slag, 5:493, 498t
properties of more common phases, 5:473t
structure, 5:472–474
Portland cement industry consumption, 5:497t
Portlandite, 5:479t
Portlandite, 5:479t
Port-type red dessert wines, 26:316
Posicor, molecular formula and structure, 5:119t
Position sensitive detectors (PSD), 26:430–431
Position-sensitive photodiode (PSPD), 24:83
Positive crankcase ventilation (PCV) valve, 10:59
Positive displacement compressors, 21:535
Positive-displacement flowmeters, 11:654–656
Positive displacement pumps, 21:54–56
cavitation damage to, 21:86
types of, 21:70–74
Positive image dye-release system, 19:290–292
Positive imaging techniques, 19:201
Positive ion spectroscopy, 24:107
Positive photochromism, 6:588
Positive photoresists, 20:280–281
Positive photosensitive polyimides, 20:280–281
Positive temperature coefficient (PTC) resistors, 25:46
Positive-tone photoresists, 15:161–163
acid-catalyzed chemistry in, 15:169–170
Positive-working dye processes, 19:284
Potash salt mining, 20:613–614

Potassium (K), 20:597–608. See also NaK entries; KBr disks; Organopotassium compounds
Potassium hydroxide, 751

role in excitation and contraction coupling, 5:81–82
Potassium chemicals, hazardous, 20:640t
Potassium chloride
economic aspects, 6:113–114
health and safety factors, 6:114–116
manufacture, 6:107–113
physical properties, 6:106t, 106–107
uses, 6:116
Potassium chloride, 11:122; 12:67; 20:611–625. See also KCl-langbeinite ore chemical grades of, 20:621t
compaction of, 20:621–625
corrosive effect on iron, 7:806
electrolysis of, 20:633
encapsulated, 16:453
froth flotation of, 20:615–616
mining, 20:613–615
refining, 20:615–621
as salt substitute, 22:819–820
separation from sodium chloride, 20:622
therapeutant for aquaculture in U.S., 3:211t
transference number of cations, anions, and electrons or holes, 5:586t
Potassium chloride collectors, 20:618
Potassium chloride products, 20:620–621
Potassium chlorochromate(VI), physical properties, 6:528t
Potassium chromate, manufacture, 6:542
Potassium chromate(VI), physical properties, 6:528t
Potassium chromium(III) sulfate dodecahydrate, physical properties, 6:528t
Potassium citrate, molecular formula, 6:638t
Potassium citrate hydrate, molecular formula, 6:638t
Potassium citrate monohydrate, solubility in water, 6:649t
Potassium cocoyl hydrolyzed collagen, hair cleanser ingredient, 7:850t
Potassium compounds, 20:608–644
analytical methods for, 20:639
aqueous solubility of, 20:613t
economic aspects of, 20:637–639
health and safety factors related to, 20:640–641
occurrence of, 20:611
properties of, 20:611, 612t
recovery from brine, 5:798–799
Potassium cyanide, 8:191–192
manufacture, 8:193
properties, 8:192t, 192–193
uses, 8:193
Potassium dibismuthide, alloy-like superconducting compound, 4:18t
Potassium dichromate, 6:538; 14:559
manufacture, 6:541
for purifying carbon dioxide streams, 4:815
silicon carbide reaction with, 22:531
U.S. exports, 6:544t
U.S. imports for consumption, 6:545t
Potassium dichromate(VI), physical properties, 6:528t
Potassium dodecylbenzenesulfonate, cosmetic surfactant, 7:834t
Potassium ethyl xanthate, molecular formula, 5:713t
Potassium-exchanged zeolite A, 16:824
Potassium ferric hexacyanoferrate(II), 24:639
Potassium fertilizers, 11:111, 122–123, 125–126, 127
Potassium fluoride, 11:861–862; 13:128
Potassium fluoride–hydrogen fluoride system, 11:833
Potassium fluoroborate
manufacture, 4:155
physical properties of, 4:152
thermodynamic properties of, 4:154t
uses of, 4:156
Potassium fluorotitanate, 25:48–49
Potassium formate, 20:632–633
solution, 9:34
Potassium graphite, 20:605
Potassium heptafluorotantalate,
24:321–322, 334
chemical reduction of, 24:322–324
Potassium hexabromoplatinate, 4:310
Potassium hexafluoroaluminate, 2:361, 371
Potassium hexafluorochromate(III), 6:535
Potassium hexafluorochromate(IV), 6:535
Potassium hexafluorozirconate, 26:643–644
Potassium hexahydroxoantimonate(V), 3:59
Potassium hexamethyldisilazane, 20:605
Potassium hydride, 13:613; 20:605
Potassium hydroxide, 3:471; 20:602, 633–634. See also KOH plants activated carbon manufacture using, 4:747
chlorine from, 6:172
dessicant, 8:360–361e
in fatty acid neutralization, 22:740
reactions with PVA, 25:603
resistivity of battery electrolyte, 3:417
sodium reactions with, 22:766
solution, 12:215
Potassium iodate, 14:375, 370, 373, 374; 20:634
Potassium iodide, 20:634
Potassium ions, 20:597, 598, 641
in soap–water system, 22:727
Potassium isotopes, 20:598
Potassium magnesium sulfate, 20:626
Potassium manganate(V), 15:592
Potassium manganate(VI), 15:594–596
Potassium metal, 20:604
production of, 20:600
reducing power of, 20:599
Potassium muds, 9:4
Potassium niobate, 17:152–153
Potassium nitrate, 20:609, 634–636
solubility of, 20:636t
uses of, 20:636
Potassium oleate, cosmetic surfactant, 7:834t
Potassium orthophosphates, 18:834t; 20:637
Potassium oxide
in cement, 5:468
in dental ceramics, 8:275
Potassium ozonide, 18:417, 418
Potassium pentaborate tetrahydrate, 4:242t, 276
Potassium pentfluoroaluminate monohydrate, 2:371
Potassium perbromate, 4:335
Potassium perchlorate, 18:277
Potassium permanganate, 9:635–636
crystallographic studies on, 15:601
as a detoxicant, 15:621
decomposition of, 15:597
as an ignitable waste, 15:615
industrial-scale production of, 15:606
manufacture of, 15:601–606
for purifying carbon dioxide streams, 4:815
assay, 15:612
crystals, 15:605–606
oxidation reactions, 15:606–610
solution, in sodium nitrite analysis, 22:857
solubility of, 15:600–601
for taste and odor control, 15:618–619
water treatment compound for aquaculture in U.S., 3:213t
Potassium permanganate–alumina, 16:571
Potassium permonosulfate, 4:57
Potassium peroxomonosulfate triple salt, 18:407
Potassium peroxomonosulfate, 14:67
Potassium peroxydisulfate, 14:292
Potassium peroxymonomosulfate, 26:189
Potassium persulfate, 7:856
Potassium phosphates, 18:834–835; 20:637
manufacture of, 18:854
Potassium polymetaphosphate, 18:848
Potassium products, 20:599t
Potassium pyrophosphates, 18:843
Potassium residues, 20:603
Potassium salts, 20:609
in p-hydroxybenzoic acid manufacture, 22:22
Potassium selenocyanate, 22:73t
Potassium silicate, 22:573
Potassium silicates, 22:451–452
in adhesives and binders, 22:472
manufacture of, 22:464–465
properties of commercial, 22:466t, 468t
Potassium–sodium (NaK) alloys, 20:600, 601. See also NaK entries
uses for, 20:603–604
Potassium sparing diuretics, antihypertensive agents, 5:165t, 166
Potassium stannate, 24:806
Potassium sulfate, 11:122–123; 20:625–629
phase in Portland cement clinker, 5:472t
U.S. producers of, 20:626t
Potassium sulfate production, processes for, 20:626–627
Potassium superoxide, 18:416–417; 20:606
Potassium tetrafluoroborate, 4:144t
Potassium tetrahydroborate, physical properties of, 4:194t
Potassium tetraperoxochromate(V), 6:536
Potassium tetrahthiotungstate, 25:385
Potassium thiobismuthate(III), 4:24
Potassium thiocyanate, 10:640; 23:680
Potassium titanates, 25:43–44
Potassium toluenesulfonate, cosmetic surfactant, 7:834t
Potassium transport, 20:641
Potassium tri-sec-butylborohydride, 20:605
Potassium tripolyphosphate, 18:846; 20:637
Potassium trisiamylborohydride, 20:605
Potassium winchite, 3:289
Potassium-zirconium carbonate, 26:637
Potato branching enzyme, 12:493
Potatoes, citric acid in, 6:632t
Potato fungicide, 13:57
Potato starch, 4:724t
Potential energy diagrams, 10:118–119
Potential gun test, 12:400
Potentiated toxic effects, 25:214
Potentiometric measurements, 14:612
Potentiometric titrations, 9:585–58; 12:82
of plutonium, 19:69968
Potentiometry, 10:258
direct, 9:582–585
Pot life, fillers and, 10:430
Pottery, chemical analysis of archaeological materials, 5:744–745
Pottery kilns, 12:319
Potting, 10:11–12
centrifugal, 16:18
epoxy resins in, 10:457
of ethylene–tetrafluoroethylene copolymers, 18:327
of hollow-fiber bundles, 16:16–18 materials, 10:10
Potting agents, 16:16–17
epoxy resin, 16:17
Poulin process, 13:385–386
Poultry
occidiostats for, 20:139
packaging, 18:31–32
Poultry industry, feed ingredient usage by, 10:837t
Poultry meal, 10:852
Poultry production, 10:836
Fourbaix diagram, 7:800–801
Four depressants, 15:225
Povidone–iodine compounds
disinfectant for aquaculture in U.S., 3:205t, 213t
registered for use in aquaculture in Europe, 3:220t
registered for use in aquaculture in Japan, 3:221t
Powder(s). See also Amorphous silicate powders; Group A powders
classification by body part and use, 7:842t
graphite, 12:761
magnesium hydroxide, 15:404–405
properties of, 11:796t
sampling of, 18:138
SiC-ceramic, 22:535
silicon carbide, 22:532–533
silicon in, 22:509
silver, 22:646
sodium, 22:762
Tospearl, 22:589–590
vitreous silica in, 22:444
zinc, 26:598–600
zirconium, 26:636
Powder can coatings, 18:38
Powder ceramics
dispersing in liquids, 5:645
granulation, 5:645–646
preparation of, 11:98–99
synthesis, 5:640–642
Powder coating(s), 7:135–137; 10:401
for corrosion protection, 7:201
epoxies-based, 10:350
of polyamide plastics, 19:791
Powder coating processes, 7:34–68
analysis, 7:61
application methods, 7:55–59
economic aspects, 7:59–60
environmental concerns, 7:61–62
health and safety factors, 7:62–63
manufacture, 7:53–55
thermosetting coating powders, 7:39–41
thermosetting coating powders, 7:41–53
Powder coating technologies, 10:401–402
Powder coating, Teflon PFA, 18:338
Powder compounds, in PVC siding
manufacture, 25:684–685
Powder diffraction, instruments for,
26:426–430
Powder diffraction patterns, 19:377, 378
Powder diffractometers, applications for,
26:427–430
Powder dyes, dusting properties, 9:231–232
Powdered activated carbons (PACs), 4:747n
in advanced wastewater treatment, 25:909
in hazardous waste management, 25:812
Powdered activated carbon treatment (PACT) effluent treatment, 9:436
Powdered carbon treatment, in sugarcane processing, 23:450–451
Powdered iron phosphates, 16:215
Powdered sugar, 23:482
Powdered surfaces, diffuse reflectance of radiation from, 24:110
Powder glass-ceramic processing, 12:628–629
Powder injection molding (PIM) ceramics processing, 5:651–629
Powder metallurgy (P/M), 16:127 corn, 7:698
ethylene oxide polymers in, 10:688–689
natural graphite in, 12:796
Powder metallurgy alloys, 13:525
Powder metallurgy processing, 13:513; 17:9–10
Powder metallurgy techniques, wick formation by, 13:232
Powder pattern, 26:429
Powder pattern structure determination diffractometers in, 26:428
Powder perfumes, 18:364
Powder processing hydrothermal technique for, 14:100
of metal–matrix composites, 16:171
Powder resins, 18:292
fabrication of, 18:301–302
Powder samplers, types of, 18:139
Powder-sintered glass-ceramics, 12:640
Powder steelmaking techniques, 23:255
Powder X-ray diffraction, 13:547–548
Powdery hydrogels, 13:738
Powdery odor, 3:229t
Power, exponents of dimensions in absolute, gravitational, and engineering systems, 8:584t
Power availability, plant location and, 19:530
Power conversion, ferrites in, 11:77–82
Power costs, 9:671–672
Power cycles, turbine throttle pressures of, 23:228
Power draw, during fermentation, 11:39–40
Power efficiency, 14:843
Power Electronic Building Block (PEBB) program, 24:390, 398–399
Power electronic circuits, silicon carbide in, 22:539–540
Power generation coal, 6:756–758
coal gasification applications, 6:821–822
by nuclear reactors, 17:566–567
Power generation systems, combined-cycle, 12:369
Power/heat ratio, 10:141
Power law flow model, 21:705
Power-law type fluids, 11:769, 770
Power plant off-gases, elemental sulfur recovery from, 23:588
Power plants, 13:267
Power production, use of steam in, 23:228–237
Power recovery, 10:139–143
Power recovery expander, 11:731
Power recovery systems process flow in, 11:730–731
types of, 11:729–730
PowerSearch software, 18:244, 250
Power semiconductors silicon-based, 22:260–261
silicon carbide in, 22:539–540
Power station design, 20:757
Power supplies induction furnace, 12:308
plating, 9:778–779
Power transference, in heat pipes, 13:228–229
Power tubes, microwave, 16:520
Power washing, of metal surfaces, 16:213
Poxviruses, 3:136
Poynting correction, 8:746; 24:666
Pozzolanic materials, in hazardous waste management, 25:823
Pozzolans, 5:478–479, 493
U.S. shipments, 5:498t
PPA resins, properties of, 10:216t
PPE-PS blends, 10:193
PPG-10 cetyl ether
 cosmically useful lipid, 7:833t
PPG coatings, 10:439
PPG SunClean Glass, 12:609
PPO blends, 10:194
p-polarized light, 24:115
PPS resins, properties of, 10:202
PPTA fibers
structure of, 19:727
uses for, 19:734–735
PPTA films, 19:735
PPy–HCF hybrids, 13:545
PR-10 integral color print film, 19:311–312
Pralidoxime chloride (2-PAM), for medical defense against chemical warfare agents, 5:836–837
Pralidoxime iodide, 21:126
Prandiol, molecular formula and structure, 5:181
Prandtl mixing length hypothesis, 11:779
Prandtl number, 11:746, 809; 13:246–247
Praseodymium (Pr), 14:631, 634
electronic configuration, 1:474
Praseodymium bromide, physical properties of, 4:329
Prater equation, 25:270, 299
Prater number, 25:299, 300–301, 303
effect on maximum dimensionless intrapellet temperature, 25:304, 309
effect on maximum intrapellet temperature, 25:306
Prato reaction, 12:244
Pratsinis aluminum nitride, 17:212
Pravachol, 5:143
molecular formula and structure, 5:139
Pravastatin, 2:821–822
Pravastatin sodium, 5:143
molecular formula and structure, 5:139
Praziquantel
registered for use in aquaculture in Europe, 3:220
registered for use in aquaculture in Japan, 3:221
Prazosin HCl, 5:160
molecular formula and structure, 5:156
PRD-49, 13:373
Prebaked carbon electrodes, 12:752, 755
Prebaked cathode blocks, 12:765–766
Prebaked electrodes, 12:758
Precautionary Principle (PP), 10:245–246, 24:188
Precious metal catalyst, 10:42
Precious-metal oxidation catalyst, 10:102
Precious metals
as catalytic materials, 10:47
collectors for the flotation separation of, 16:647
selenium recovery and, 22:79, 85
Precipitation inhibitors, 7:816
Precipitants, sodium sulfides as, 22:871
Precipitated azo pigments, 19:431
Precipitated calcium carbonate (PCC), 4:553; 15:28, 65
as a rubber filler, 21:779
slaked lime in, 15:65
in synthetic fillers, 11:314
Precipitated nickel catalysts, 17:121–122
Precipitated silica, 22:368–369, 374, 385, 397–400, 473–474
applications of, 22:399–400
manufacture of, 22:399
modification of, 22:398–399
preparation of, 22:397–398
properties of, 22:397
in synthetic fillers, 11:315
worldwide production of, 22:399
Precipitate formation, oil recovery and, 18:614–615
Precipitates, over-aged, 13:502
Precipitating (cathodic) corrosion inhibitors, 26:144, 145
Precipitation
bauxite, 2:352–353
chelant applications, 5:734–735
in hazardous waste management, 25:820–821
in hydrometallurgical recycling, 21:396–399
in hydrometallurgy, 16:151
in metal refining, 16:149–150
metal recovery via, 16:154
in perchlorate analysis, 18:283
of printing inks, 14:313
recovery of silver via, 22:654
sample prep for liquid chromatography, 6:444
of silver on glass, 22:686
in wastewater treatment, 25:889, 892–893
Precipitation colors, 7:343–344
Precipitation fouling, 4:593
Precipitation hardened alloys, Ni-base and Ni-Fe-base, 13:520
Precipitation hardened superalloys, Ni-base, 13:522–525
Precipitation hardening, 13:474, 480, 500–502
aluminum alloys, 2:331–333
effect of aging temperature on, 13:496
Precipitation hardening alloys
copper, 7:723t, 729–730
wrought copper, 7:759–760
Precipitation hardening stainless steels, compositional and property linkage, 7:809
Precipitation heat treatment, aluminum alloys, 2:331–333
Precipitation inhibitors, dispersants contrasted, 8:686
Precipitation leachate procedure, synthetic, 25:868–869
Precipitation reactions, for niobium and tantalum determination, 17:142–143
Precipitation reagents, protein, 12:133
Precipitation with compressed antisolvent (PCA) process, 24:17, 18
Precipitator dust, in phosphorus manufacture, 19:12
Precipitators, electrostatic, 13:180
Precision agriculture, 13:328; 26:269–270
Precision measurement techniques, noble gases in, 17:370
Precision scales, 26:245
Preconcentration, of uranium ores, 25:401
“Pre-crosslinked” polychloroprene grades, 19:852
Precursor atmosphere (PA) process, 11:578
Precursors
in chemical vapor deposition, 22:153
in vitreous silica manufacture, 22:414
Predemethanization, 10:616
Predesign investment cost estimates, 9:529–530
Predicted No-Effect Concentration (PNEC), 14:818
Prediction of size separation, 22:294–295
Predective maintenance (PdM), 15:464–467. See also PdM entries introducing and managing, 15:467–470
Preencapsulation, in VDC film extrusion, 25:732
Preference-based methods, in multiobjective optimization, 26:1033
Preferential salivation, 23:109
Preferential sputtering, 24:100
Precirning, of ferrites, 11:72
Prefixes, 17:398, 399
Preformed silver halide grains, as photocatalysts, 19:345–346
Pregelatinized starches, 4:722
p-region, 23:36–37
Pregnancy, exposure to organic solvents during, 23:119
Preheater rotary kiln, 15:53
Preheat trains, 13:221–223
Preinstalled piping system, in fine chemical production, 11:428–429
Prekallikrein, 4:86–87
Prekallikrein activator (PKA), 12:145, 146
Pre-liming, in beet juice purification, 23:459
Preload-venous pressure, 5:108
Premanufacture notices (PMNs), 18:542
Premarket Approval Application (PMA), 14:140
for medical devices, 21:577
Premarking notification (PMN), 18:388
Premature atrial contractions, 5:108
Premature supraventricular contractions, 5:88
Premature ventricular complexes, 5:88–89
Premature ventricular contractions, 5:108
Premium wines, 26:300
Premixed flames
laminar, 7:443–445
turbulent, 7:445–446
Premixes, silica in, 22:375
Premixing process, for fumed silica, 22:581
Prenal, 24:482
esters of, 24:483
Prent, molecular formula and structure, 5:94t
Prenylamine, 5:122
molecular formula and structure, 5:120t
Preobese, 3:88t
Preorganization principle, 16:772
Preorganization/reorganization, in molecular recognition, 16:770–774
Preparation centrifuge, operation, 5:529–530
Preparative chromatography, 6:374, 385
Preparative high performance liquid chromatography, 6:441
Prephenic acid, 2:83–84
Prepolymers, 24:705
polyurethane, 22:38
for urethane sealants, 22:36
Prepreg, 10:454
Preprocessing, for composting, 25:874
Presical, molecular formula and structure, 5:1266
Prescription Drug Marketing Act, 18:686
Prescription drugs, 21:575
Prescription Drug User Fee Act, 18:686
Presedimentation reservoir, in water treatment, 26:103
Preservation, sodium metabisulfite in, 23:673
Preservation studies, in fine art examination/conservation, 11:407–409
Preservative(s)
antibacterial agents contrasted, 3:1
ascorbic acid as, 25:761
in cosmetics, 7:828
food, 12:57–63, 78
in photographic development formulations, 19:206
natural alternatives to, 12:59
Preserves, citric acid in, 6:645
Preshaves, 7:851
“Pre-Side Dress Nitrate Test” (PSNT), 11:125
Presidential Green Chemistry Challenge Awards, 24:168, 171
Presinter thermal processing, ceramics, 5:656–657
Press cocoa butter, 6:359
properties and composition, 6:360t
Presses
  cylindrical, 11:372–373
  membrane plate, 11:370–372
  molding, 12:732
  screw, 11:381
Pressing, of paper, 18:118–122
Pressing operations, in wool processing, 26:388
Press ready inks, 14:320
Press technology vessels, 13:410
Pressure, 24:285–287
  equilibrium constant as a function of, 13:409–410
  exponents of dimensions in absolute, gravitational, and engineering systems, 8:584t
  food preservation by, 12:86–87
MCFC, 12:223
SOFC, 12:226–227
  temperature-jump method and, 13:426
  units and magnitude of, 13:403–404
Pressure atomizers, 23:175
Pressure balance
  in circulating fluidized beds, 11:817
  in foams, 12:9–10
Pressure belt filters, flocculants for, 11:639
Pressure cells, 13:430
Pressure cycle, change related to, 13:402
Pressure cycle data, 13:410–411
Pressure-dependent regioselectivity, 13:439–440
Pressure design, piping system, 19:480–482
Pressure-driven filtration, 21:665
Pressure-driven flow, in microfluidics, 26:962, 963
Pressure driven membrane process, 18:507
Pressure-driven membranes, in water treatment, 26:111
Pressure drop, 11:804
  from area change, 13:261–262
  in cake filtration, 11:330–332, 333–335
  flow maldistribution and, 13:270
  from flow turning, 13:262
  frictional, 13:260–261
  in gas adsorption, 1:657–658
  in hyperbar vacuum filtration, 11:377
  shellside tube bundle, 13:262–263
  in vacuum filtration, 11:349–350
Pressure drop calculations, in heat exchanger design, 13:259–260
Pressure drop information, for resins, 14:399
Pressure drop optimization, 10:155
Pressure effects
  on melt viscosity, 21:714
  on minimum fluidization velocity, 11:804–805
  theoretical framework relating to, 13:406
  on viscosity, 15:208
Pressure element, inverted bell-type, 20:647
Pressure filters, 16:658–659
  horizontal belt, 11:379
  thickening, 11:382–388
Pressure gauge, 20:645
Pressure gradients, flow caused by, 9:110
Pressure infiltration, of metal–matrix composites, 16:167–169
Pressure injection, moldings, 10:11
Pressure-jump method, 13:427–428
Pressure leaching, 16:153
Pressureless sintering, of SiC-ceramic, 22:535–536
Pressure loss coefficient, 13:261
Pressure measurement, 11:783; 20:644–665. See also Vacuum measurement electronic sensors, 20:651–657
mechanical gauges, 20:646–651
smart pressure transmitters, 20:663–665
terms related to, 20:644–646
Pressure measurement devices. See also
Pressure meters; Pressure sensors
location of, 20:682
types of, 20:681–682
Pressure rated valves, 13:414
Pressure relief devices, fugitive emissions from, 10:71
Pressure-sensitive adhesives (PSAs), 1:528–530
organosilicone, 22:590–591
Pressure-sensitive adhesive release liner market, 21:607
Pressure-sensitive dyes, 22:10
Pressure sensors, 22:267–268
for a capacitance manometer, 20:658
for a thermal conductivity gauge, 20:659
Pressure-sintered products, 18:300
Pressure sintering, 5:661–662
Pressure standards, 15:749
Pressure swing adsorption (PSA) technology, 13:794–795
Pressure swing adsorption (PSA), 1:642–647; 17:753
carbon dioxide recovery from natural gas, 4:814–815
design of systems, 1:615, 656
factors governing choice of method, 1:614
nitrogen generation system, 17:277
processes, 17:358
regeneration, 1:657
systems, 17:278
Pressure-swing distillation, 8:817–819
general separation heuristics for, 22:318
Pressure swirl atomizers, 23:180
spray dynamics associated with, 23:188
Pressure testing, piping system, 19:487
Pressure treated inorganic chemistry reactions, 13:416–431
Pressure-treated lumber, arsenic addition to, 3:270
Pressure treated organic chemistry reactions, 13:412–416
Pressure tubes, 11:784
Pressure units, 20:644
conversion to SI Units, 20:645t
Pressure-volume-temperature relationships, for propylene, 20:769
Pressure-volume-temperature (PVT) tests, 19:579
Pressurized commodities, transportation of, 18:5
Pressurized filters, 11:324
Pressurized heavy water reactors (PHWRs), 24:758
Pressurized water reactors (PWRs), 17:543–544, 554, 562, 566, 573–578; 19:673; 23:217
Pressurizing devices, 13:405
Presumptive bloodstain tests, 12:102
Pretreatment in solid–liquid separation, 11:342–343
of vegetable fibers, 11:291–292
Prevalite, molecular formula and structure, 5:141t
Prevention of Significant Deterioration (PSD) regulations, 21:584
Preventive maintenance (PM), 15:463, 464–467. See also PM entries for reliability, 26:991, 992
Preventive maintenance inspection, results of, 15:465
Preventive maintenance program, in commercial-scale pharmaceutical operations, 18:735
Preventive maintenance systems, components of, 15:466–467
Preventive medicine, through vaccination, 25:487
Preventol A5S, biocide for antifouling coatings, 7:156
Prevetol A4, biocide for antifouling coatings, 7:156
Prewetting, 22:279
Priceite (pandermite), 4:133t
Prices/pricing. See also Cost entries; Economics
barley and malt, 15:534
for epoxy resins, 10:352, 353t
for ethylene and propylene, 10:625t
for M-type ferrites, 11:85, 86
hydrogen, 13:788–789
hydrogen peroxide, 14:57
indium, 14:199–201
of chemicals, 15:641–642
of silicon, 22:510–511
Pricing model, of technology transfer, 24:364
Pricing policy, 9:534
Pride, in maintenance workers, 15:479
Priderite, colorants for ceramics, 7:347t
Prilling, 15:334, 410
Prilling technique, 10:273
PrimaCel, 5:363–364
Primacor, molecular formula and structure, 5:181t
Primary alcohols
dispersant moieties, 8:706t
synthetic processes for, 2:27t
Primary amines, 10:392–393
predicted deviations from Raoult's law based on hydrogen-bonding interactions, 8:814t
Primary ammonium ion, recognition of, 16:778–779
Primary amyl alcohol mixed isomers, 2:774t
physical properties of, 2:766t
Primary amyl alcohols, production from butylenes, 4:426
Primary amyloidosis of lung, effect on heart, 5:107
Primary batteries, 3:434–469. See also Alkaline primary cells; Batteries; Carbon–zinc cells; Lithium primary cells; Secondary batteries defined, 3:409
economic aspects, 3:468–469
reserve batteries, 3:467–468
World market 2000 estimated, 3:410t
Primary combustors, 13:174
Primary creep, 13:472
Primary electron beam, demagnification of, 24:78
Primary energy, 24:196
Primary explosives, 10:722, 723–724
Primary ferrous scrap, grades of, 21:408–410
Primary intermediates, 9:265–266
Primary intrinsic magnetic properties, of M-type ferrites, 11:67–68
Primary ions, backscattered, 24:106
Primary irritancy toxicity studies, 25:218
Primary knock-on atoms (PKA), 14:435, 436
Primary measurements, of operational performance, 20:731
Primary metabolites as fermentation products, 11:2–3, 21
isolation after fermentation, 11:43
Primary metal, 16:134
Primary petrochemicals, 18:674
Primary phosphines, 19:60, 64
Primary production, of mercury, 16:37
Primary radicals, 14:713
Primary recycling, 21:378, 449
Primary reference fuels (PRFs), 12:392–393
Primary smelting, of tin, 24:787–788
Primary timber products, 26:361–363
Primary uranium minerals, 25:396
Primary vulcanization accelerators, 21:797
Primary wastewater treatment, 25:888
Primers, 18:67
for baked coatings, 7:179–180
coatings for corrosion protection, 7:174–179
masonry, 18:68
for metal coatings, 7:125–127
organic (epoxy) zinc-rich, 10:443
Primary-surfacer coating, automobile, 10:441
Primex process, 16:167
Priming, 1:513
bubble tray absorption columns, 1:90
Primrose chrome yellow, 6:554, 555t
Principal characteristic group concept, 17:398
Principal component analysis (PCA), 10:330
Principal component analysis-regression (PCA-PCR), 6:41–47
Principal component regression (PCR), 6:41–47
Principal organic hazardous constituents (POHCs), 13:184
Principal Register, 25:258–259
registration of a mark on, 25:263
Principles of Good Laboratory Practice (OECD), 18:540
Prins reaction, 12:111; 24:486, 499
of vinyl chloride, 25:632
Print bonding, 17:509–510
Print-coater films, 19:281
Printed circuit board (PCB) laminates, 10:455
Printed circuit board materials, 17:843
Printed circuit board manufacture, permanganate solution in, 15:619–621
Printed materials, as a technical service function, 24:344
Printed wiring board (PWB) industry, 10:453, 455
Printing catalytic oxidation in, 10:105
with dyes, 9:165
EC and HEEC applications, 5:461t
electrographic, 14:329
on food packaging, 18:45–46
ink jet, 14:327
microcontact, 15:192–193
silica in, 22:376–377
steel-plate, 14:329
sublimation thermal-transfer, 9:338
textile, 9:213–222; 24:621–622
of wool, 26:397–399
Printing alloys, 14:771, 772t
Printing industry, electroless deposition in, 9:701–702
Printing ink market, 14:330
Printing inks, 9:153; 14:312–318
organic titanium compounds in,
25:127–128
titanium dioxide in, 25:29–30
classes of, 14:312
rheology of, 14:315–316
Print molecules, 16:794
Prinvil, molecular formula and structure, 5:150t
Prinzide, molecular formula and structure, 5:150t
Prion agents, removal from plasma derivatives, 12:140–141
Prion disease yeast as a model for, 26:496
Prion protein gene, 12:466
Prior art, 18:173–174
Prior art references, standard for, 18:232
Prior distribution, in Bayesian inference, 26:1017
Prior Informed Consent (PIC) program, 18:541
Priority-based Assessment of Food Additives (PAFA) program, 23:667
Priority pollutants, 9:443
Prior sanctioned substances, 12:34
Pristane, 18:592
in crude oils, 18:584–586
Pritor, molecular formula and structure, 5:153t
Private carriage, 25:326
Private Fuel Storage, LLC, radioactive waste storage by, 25:855
Private materials standards, 15:743
Private wastewater disposal systems, 25:915–916
Privies, 25:915
ProAlcohol program, 10:533–534
Pro-allelochemicals, 13:356
Probabilistic approach, in control systems, 26:1045–1047
Probabilistic fatigue behavior, 13:494
Probabilistic performance assessment, 17:548
Probabilistic risk assessments (PRAs), 17:533, 540
Probabilistic safety assessment (PSA), 17:597
Probability, 13:166–170
Probability distributions
in process synthesis and design, 26:1040–1041
in risk assessment, 26:1001, 1045
in stochastic modeling, 26:1019–1020, 1020–1021, 1022–1023
Probability-of-passing equation, in evaluating size separation, 22:276–278
Probability sampling, 26:1001. See also Monte Carlo sampling
Probability screens, 22:282–283
Probe DNA, 12:473
Probetrite (kramerite), 4:133t
Probes groundwater, 12:844
high pressure, 13:433, 434, 435
in nondestructive evaluation, 17:416
oligonucleotide, 17:634, 635
Problem decomposition
in heat exchanger network design,
13:212–217
progressive, 13:214
Procainamide, 5:99
molecular formula and structure, 5:90t
Procamide, molecular formula and structure, 5:90t
Procanbid, molecular formula and structure, 5:90t
Procapan, molecular formula and structure, 5:90t
Processability, of shape-memory alloys, 22:345
Process aids, for filled networks, 22:571
Process analysis, Raman scattering in, 21:328
Process and Instrumentation Diagrams (P&IDs), 19:471
Process annealing, 23:290
Process chemistry, manganese alloy, 15:546–547
Process colors, 9:167
Process control, 20:666–709
advanced techniques for, 20:695–702
batch and sequence, 20:702–707
in biological waste treatment, 25:829
changes in, 20:668
computers, 20:668
economic aspects of, 20:707–708
feedback control systems in, 20:691–695
hardware and software for, 20:668–676
instrumentation for, 20:677–687
levels of, 20:674–676
mathematical software for, 20:694–695
in minerals recovery and processing, 16:663–665
objective of, 20:666–667
on-line measurement options for, 20:678t
process dynamics and mathematical models for, 20:687–691
role in plant safety, 20:671
software, 20:672–673
Process control documents (PCDs), 26:745
Process control languages (PCL), 20:672
Process control system, 20:730–731
Process cut-offs, in life cycle assessment, 14:813
Process design, 20:710–733. See also Chemical process design; Process simulation
for chemical plants, 26:999–1001
chemical product design and, 5:759
for continuous and batch processes, 20:722–724
design problem formulation, 20:715–717
EIA, 10:237–238
future trends in, 26:1048
hierarchy of, 20:734
new plant design and retrofit, 20:724–725
objectives of, 20:711–715
onion model of, 20:721
sampling in, 26:999–1000, 1036–1038, 1039–1041
targeting before, 20:765
Process development
in fine chemical research and development, 11:426
in nevirapine synthesis, 18:740–743
for pharmaceuticals, 18:724
Processed food products, packaging, 18:32–35
Processed foods
cereal grains in, 26:262
vitamins added to, 12:69
Process equipment
opening, 21:854
operation and maintenance of, 10:162
utility system, 10:152–158
Processes
assessment of environmental impacts of, 24:176–190
in life cycle assessment, 14:813–814
out-of-control, 20:700
Process facilities
in plant layout, 19:495–496
operating objectives for, 20:702
Process flavorings, 12:48
Process flexibility, 26:1041
Process flow diagrams (PFDs), 18:733; 23:550
petrochemical plant, 19:497, 498
Process flowsheet, heating and cooling requirements from, 20:736
Process furnaces, energy consumption by, 10:156–157
Process hardware, failure rate data for, 13:168t
Process hazard heuristic, for simple distillation, 22:299
Process hazard reviews, in pilot plant safety, 18:733

Process hazards
- analysis of, 21:861
- control of, 21:861–863
- preventing, 21:832–846

Process industries, weighing in, 26:248

Processing
- of titanium–nitrogen compounds, 25:11–12
- of titanium oxides, 25:12–13
- of VDC, 25:721–725

Processing agents
- preparing, 21:791
- in rubber compounding, 21:790–791
- uses for, 21:792

Processing aids
- butyl rubber applications, 4:449
- as food additives, 12:63–67
- for PVC polymers, 25:672
- in tire compounding, 21:810

Processing equipment requirements, in commercial- scale pharmaceutical operations, 18:733–734

Processing methods, for silicone rubber, 22:580

Processing temperatures, heat exchanger network, 13:222

Process integration
- background to, 20:734–735
- schools developed for, 20:735
- systematic procedures for, 20:734

Process integration research consortium, 20:763

Process integration software, 20:765

Process integration technology, 20:733–768
- efficient use of raw materials in, 20:741–748
- energy efficiency of, 20:748–760
- heat integration, 20:735–738
- mass integration, 20:738–741
- new developments in, 20:741–763
- range of applications of, 20:765
- transfer and application of, 20:763–764

Process management, sampling techniques for, 26:1042–1043

Process monitoring
- biosensors for, 3:811
- mass spectrometry in, 15:669

Process operation, sampling techniques for, 26:1041–1047

Process operations, 20:760–763
- in hazard recognition, 14:205–207

Process optimization
- for commodity chemicals, 20:760–761
- in nevirapine synthesis, 18:743–744
- textile industry, 9:443

Processors, high pressure, 13:411–412

Process Piping, 19:480

Process planning, sampling techniques for, 26:1042–1043

Process plant, hazardous reactions in, 21:844

Process research, in fine chemical research and development, 11:426

Process reviews, 10:163

Process risk analysis, in large-scale pharmaceutical synthesis, 18:726

Process safety, 20:731–732

Process safety management, 21:826
- standards for, 21:592

Process Safety Management (PSM) of Highly Hazardous Chemicals standard, 21:829

Process scheduling, sampling techniques for, 26:1042–1043

Process simulation, 20:710, 728–730

Process specific piping system, in fine chemical production, 11:429–430

Process-stream purification, 13:620

Process synthesis, 13:218; 26:999
- sampling techniques for, 26:1039–1041

Process systems engineering, sampling techniques for, 26:998–1052

Process technology, in vaccine production, 25:505–506

Process temperatures, measuring, 20:679–680

Process validation, in commercial-scale pharmaceutical operations, 18:735

Process water
- ozone treatment of, 17:809
- recycling of, 10:543

Process water streams, in vinyl chloride manufacture by-product disposal, 25:645

Process-zone shielding, ceramic–matrix composites, 5:566–567
Prochem Maxflo T agitator, 1:739
Prochiral alkenes, hydroboration of, 13:665–666
Prochiral ketones, enantioselective asymmetric hydrogenation of, 19:647
Procinyl dyes, 9:469–470
Procion dyes, 9:467, 488
Procion Red HE-3B, for dye–ligand affinity chromatography, 6:402
Procion Resin process, 9:479
Procion Rubine MX-B, for dye–ligand affinity chromatography, 6:402
Procion T dyes, 9:479, 480
Procion Yellow H-A, for dye–ligand affinity chromatography, 6:402
Procorum, molecular formula and structure, 5:119t
Prodrugs, 10:519
Produce cold storage of, 21:564
controlled atmosphere storage of, 21:564–565
cooling of, 21:558–559
packaging, 18:32
precooling of, 21:559–560
Produced-water softening, ion exchange in, 14:417
Producer-dyed fiber (PDF), acrylic, 11:212–213
Product chemistry, pesticide registration requirements for, 18:544
Product contact utilities, 11:44–45
Product cost, 9:531–534
Product design chemicals, 5:758–782
sampling techniques for, 26:1035–1036
Product design stage, 20:715
Product development, 18:159–160
Product discovery, sampling techniques for, 26:1035–1036
Product examinations/investigations, law enforcement authority for, 18:27
Product flammability tests, 11:458–459
Product handling in pilot plants, 19:466–467
safe, 21:854–857
Product inquiries, technical service and, 24:341
Product-integrated environmental protection, 24:163
Production of fine chemicals, 11:427–440
of regenerated cellulose fibers, 11:275, 276–278
Production campaign, in fine chemical production, 11:428
Production capacities, of EPM/EPDM rubber, 10:712
Production cultivation growth, 11:28
Production hazards, preventing, 21:832–846
Production methods, of magnesium analysis, 15:348
Production operations, piping system, 19:487–488
Production planning, for fine chemicals, 11:436
Production process changes, waste minimization via, 25:884t
Product ion scan spectrum, 15:665
Production systems, improvement of, 24:190–191
Productivity improvement and, 21:171
plant location and, 19:528
Product labels, 12:35, 37
Product license application (PLA), 21:576
Product life cycle management, 24:167
Product materials standards, 15:742–743
Product performance, technical information on, 24:344
Product price, 9:534
Product quality from fermentation, 11:46–47
in continuous SO3 single-pass sulfonation processes, 23:549
Product recovery, in phosphorus manufacture, 19:11
Products assessment of environmental impacts of, 24:176–190
of incomplete combustion emission limits, 13:183
life-cycle assessments of, 24:182–183
pressure treatment of, 13:436–438
Product Safety Data Sheet (PSDS), sodium nitrite in, 22:858
Product safety regulations, 21:590–592
Product selectivity, in reactor technology, 21:338
Products packaging, heavy metals in, 19:413–414
Product specification, 5:779–780
Product Sustainability Toolbox, 14:828
Product systems
alternative, 14:809
environmental impacts of, 14:805
Product tampering, 18:27
packaging and, 18:25–26
Product-to-feed heat interchange, 10:144
Product toxicology, of phosphorus flame retardants, 11:501–502
Product yield, in reactor technology, 21:338
Produits Chimiques Ugine Kuhlmann (PCUK) process, 13:576, 582–583
Proeutectoid cementite, 23:275
Proeutectoid ferrite, 23:275
Profenofos, 4:358t
Professional organizations, technical service personnel participation in, 24:347
Professional Safety, 15:769
Profile extrusion, 19:544, 790
Profiles, PVC in, 25:685
Profilometer, 3:319
Profitability analysis, 9:535–537, 545, 546.
See also Economic evaluation
Profitability criteria, 9:544–546
Profitability diagram, 9:544
Profitability spreadsheet, 9:543
Progestasert, 18:711
Progestosterone, 13:3
Progil process, 18:823
Proglycem, 5:169
molecular formula and structure, 5:166t
Programmable logic controllers (PLCs), 19:463, 20:670–671
Programmatic comparative risk assessment (PCRA), 24:177
Programmed temperature vaporizers, 6:383
Programmed temperature vaporization (PVT), gas chromatography, 4:612–613; 6:421–422, 423
Programmer consoles, 20:669
Programming, of shape-memory polymer, 22:355–356
Programming languages, 7:485–491
Progressive cavity pumps, 21:73–74
Progress, management systems to sustain, 10:166
Prohesion testing, 18:72
Prohexadione–calcium, 13:45t, 56
Prohibition, 26:328
Projection FPDs, 22:259
Projection Pursuit (PP), nonlinear method, 6:53
Project leading, in R&D, 21:619
Prokaryotes, defined, 3:757t
Prolene suture, 24:215
Proline
content in cocoa and chocolate products, 6:368t
systematic name, formula, and molecular weight, 2:557t
taste profile, 2:605
d-Proline, systematic name, formula, and molecular weight, 2:557t
dL-Proline, systematic name, formula, and molecular weight, 2:557t
L-Proline, systematic name, formula, and molecular weight, 2:557t
Prolonged action/controlled release drug dosage forms, 18:708–712
Prolonged action drug products, 18:711–712
Prolonged action parenterals injections, 18:715–716
Promethium (Pm), 14:634t
electronic configuration, 1:474t
Promoted CO combustion, 11:710–713
benefits of, 11:711
Promoters, 12:453–454
heterogeneous catalysts, 5:229
in plants, 12:485–486
Prompt industrial scrap, 21:408, 413
Pronamide, 13:320
Pronestyl, molecular formula and structure, 5:93t
Proron, molecular formula and structure, 5:93t
Prontosil, 23:493
Pronuclear injection gene transfer method, 12:458–459
Proof casting, of dies and molds
bismuth alloy applications, 4:14
Propadiene, 16:250–251
Propafenone, 5:101, 105
molecular formula and structure, 5:93t
Propagation, polymer autoxidation, 3:102, 103–104
Propagation constants, 20:219
Propagation plant, brewer’s yeasts, 3:581
Propagation rate constants (k_p), in VDC polymer degradation, 25:715–716, 717t
Propagation reactions, 14:274
Propanal, 2:59
Propanal route, to methyl methacrylate, 16:253–254
acetylene manufacture from, 1:195t, 198, 201
as an alternative refrigerant, 21:532–533
deasphalting of, 18:662
dehydrogenation of, 24:272
diffusion coefficient in air at 0 °C, 1:70t
effect on catalyst mileage, 20:526
feedstock, 18:558
health and safety factors related to, 13:694
manufacturing and processing of, 13:691–692
physical properties as propellant, 1:776t
production and shipment of, 13:692–693
production from acetylene, 1:163
reactivity as VOC, 1:792t
solvent for supercritical hydrogenolysis
for higher alcohol manufacture, 2:18–19
spontaneous ignition temperature, 7:438t
steam cracking product distribution, 4:379t
typical commercial gas absorption
process, 1:26t
uses of, 13:695
Propane-1,3-diol (PDO), 20:37
Propane concentration, impact of,
20:531–532
Propane dehydrogenation, 20:778
1,3-Propanediol (PDO), 18:569
from acrolein, 1:271, 276
Propane nitration, 17:167
1,2,3-Propanetricarboxylic acid, 6:636
1,2,3-Propanetriol trinitrate, 10:730
Propanoic acid, physical properties,
5:29t
Propanol, 7:257t
2-Propanol
azeotrope with acetone and water,
8:795–796
azeotrope with benzene, 3:598t
use in reversed-phase chromatography,
3:840
n-Propanol, solubility of boric acid in,
4:253t
n-Propanol dehydration, 18:515
2-Propanone. See Acetone
Propantheline bromide, 4:360t
Propargyl alcohol
health and safety factors, 1:234–235
manufacture, 1:234
physical properties of, 1:233t
production from acetylene, 1:220, 231,
232–235
reactions, 1:232–234
shipping, storage, and price, 1:234
specifications and analysis, 1:234
uses of, 1:235
Propargylboration, 13:659–660
Propargylic acid, 5:34t
Propellant, 12:33
Propellant 11, 1:775, 780
as greenhouse gas, 1:807t
ozone depleting potential, 1:809t
physical properties of, 1:776t
and stratospheric ozone depletion, 1:811
Propellant 12, 1:775, 780
as greenhouse gas, 1:807t
ozone depleting potential, 1:809t
physical properties of, 1:776t
and stratospheric ozone depletion, 1:811
Propellant 13, ozone depleting potential,
1:809t
Propellant 114, 1:775, 780
ozone depleting potential, 1:809t
physical properties of, 1:776t
Propellant 115, ozone depleting potential,
1:809t
Propellant 123, ozone depleting potential,
1:809t
Propellant 124, ozone depleting potential,
1:809t
Propellant 134a, 1:780
Propellant 141b, ozone depleting potential,
1:809t
Propellant 142b, 1:777, 780
ozone depleting potential, 1:809t
physical properties of, 1:776t
Propellant 152a, 1:777, 780
physical properties of, 1:778t
Propellant 225ca, ozone depleting potential,
1:809t
Propellant 225cb, ozone depleting potential,
1:809t
Propellant 227, 1:780
Propellant A-108, physical properties of, 1:776t
Propellant A-17, physical properties of, 1:776t
Propellant A-31, physical properties of, 1:776t
Propellant applications, anhydrous hydrazine for, 13:584
Propellant hydrazine grades, specifications for, 13:585t
Propellant R227, 1:780
Propellants. See also Explosives and propellants hydrazine in, 13:584–597
Propylene(s), 10:707–708; 20:768–790; 24:254
advanced cracking techniques for, 20:778–779
Alfrey–Price parameters, 7:617t
alkoxycarbonylation of, 16:252
alkylation of, 2:176, 182, 188; 20:782
ammoniation to acrylonitrile, 1:400–404

Proportional feedback controllers, 20:691–692
Proportional hazard models, in reliability modeling, 26:990
Proportionality constant (k), in high pressure chemistry, 13:406
Proportional-only controller, 20:693
Proportional plus integral feedback controllers, 20:692
Proportional plus integral plus derivative (PID) feedback controllers, 20:692–693. See also Digital PID controllers
Proportioning, 26:226
batch, 26:249–251
Proportioning operations, 26:248–251
Prooxylation, fatty amines, 2:523
Propranolol HCl, molecular formula and structure, 5:93t
Proprietary (private) carriage, 25:326
Proprietary solvents, 10:553
Proprietary weathering steels, 23:299
Proprietary wines, 26:302
PROP taster groups, 11:513, 515
Propulsion principle, 23:865
n-Propyl acetate, diffusion coefficient in air at 0 °C, 1:70t
n-Propyl alcohol, diffusion coefficient in air at 0 °C, 1:70t
Propyl alcohols, batch condensation reactions of, 18:516–518
n-Propylamine, 2:537t
physical and chemical properties of, 2:540t
specifications and economic data, 2:551t
Propynyl bromide, physical properties of, 4:351t
Propyl butyrate, permeation in selected barrier polymers, 3:389t
n-Propyl chloroformate
DOT regulations for shipment, 6:301t
molecular formula, 6:291t
toxicity, 6:302t
Propylene(s), 10:707–708; 20:768–790; 24:254
advanced cracking techniques for, 20:778–779
Alfrey–Price parameters, 7:617t
alkoxycarbonylation of, 16:252
alkylation of, 2:176, 182, 188; 20:782
ammoniation to acrylonitrile, 1:400–404
amoxidation by mixed metal oxides, 5:244–245
chemical properties of, 20:773–775
chemical uses for, 20:783–786
chlorohydrination of, 20:784
compressed liquid, 20:770
consumption patterns for, 24:272
double bond in, 20:773
economic aspects of, 20:779–781
electrophile addition reactions of, 20:774
epoxidation of, 20:808; 24:173
feedstock for higher aliphatic alcohols, 2:27t, 30t, 31t, 40
gas-phase oxidation of, 20:807
global supply and demand for, 24:272–273
health and safety factors related to, 20:781
in integrated manufacturing process, 6:237t
manufacture of, 20:775–779
noncatalytic oxidation of, 20:807
oligomers of, 20:783
oxidation to acrolein, 1:265–268, 270, 350–355
particle growth, 26:528–529, 530
physical properties of, 20:769–770
polymerization, 26:524
prices for, 10:625t; 18:565
process direct oxidation of, 24:173
production of, 24:271–272
reaction with peroxides, 20:784
reaction with sulfur to produce carbon disulfide, 4:830
reactivity as VOC, 1:792t
refinery gas streams as a source of, 18:564
refinery production of, 20:776–778
refinery uses for, 20:782–783
regional markets for, 24:273
as a source of petrochemicals, 18:677
storage and handling of, 20:781
substitution reactions of, 20:775
thermal properties of, 20:770, 771t
transport properties of, 20:772t
uses for, 20:782–787
U.S. producers of, 20:780t
in vinyl chloride manufacture by pyrolysis, 25:643
world consumption of, 20:780–781

Propylene–ammonia reaction, 10:135
Propylene–based routes, to methyl methacrylate, 16:251–252
Propylene carbonate, in lithium cells, 3:459
Propylene chlorohydrin, end use of chlorine, 6:134t
Propylene copolymers, heterophase, 26:539t
1,2-Propylenediamine, 8:485
physical properties, 8:486t
pK values, 8:487t
prices of commercial, 8:496t
typical specifications, 8:496t
Propylene disproportionation process, 10:621–622
Propylene fractionator, 10:615
Propylene glycol (PG), 20:96, 794
in cosmetic molded sticks, 7:840t
function as ingredient in cosmetics, 7:829t
solubility of boric acid in, 4:253t
solvent for cosmetics, 7:832
monoesters of, 20:794–795
production of, 20:812
Propylene glycol alginate (PGA), 12:21
Propylene glycol alginates, properties of, 13:74t
Propylene glycol dicaprylate, cosmetically useful lipid, 7:833t
Propylene glycol dipelargonate, cosmetically useful lipid, 7:833t
Propylene glycol distearate, in mascara, 7:862
Propylene glycols, 12:660–670
economic aspects of, 12:666
environmental considerations related to, 12:667–668
health and safety factors related to, 12:666–667
manufacturing, 12:664–666
properties of, 12:661–664
as solvents, 12:668
stereochemical and structural isomers of, 12:664, 665t
U.S. producers of, 12:666t
uses for, 12:668–670
Propylene–hydrogen fluoride technology, 16:251
Propylene maximizing catalysts (PMC), 11:695
Propylene nitrile. See Acrylonitrile (AN)

- base- and acid-catalyzed reactions of, 20:793
- chemical properties of, 20:791–796
- copolymerization of, 20:793–794
- developmental processes for, 20:806–808
- direct oxidation of propylene to, 20:806–807
- economic aspects of, 20:808
- electrocatalytic synthesis of, 20:807
- Friedel–Crafts reactions of, 20:795–796
- global production capacities for, 20:797t
- health and safety factors related to, 20:810–811
- isomerization and hydrogenolysis of, 20:796
- manufacture of, 20:796–806
- physical properties of, 20:790–791
- physiological effects of, 20:811
- polymerization to polyether polyols, 20:793–794
- production of, 20:784–785
- purification of, 20:800
- reactions of, 20:794–796
- reaction with ammonia, 2:122
- reaction with carbon dioxide and carbon disulfide, 20:795
- reaction with carbonyl compounds, 20:796
- reaction with fatty amines, 2:523
- reaction with Grignard reagents, 20:796
- reaction with hydrogen halides, 20:796
- reaction with hydrogen sulfide, 20:795
- ring opening in, 20:791–793
- solvents for purification of, 20:803t
- specifications and analysis for, 20:810
- storage and materials of construction for, 20:808–809
- in styrene manufacture, 23:334
- transportation of, 20:809–810
- treatment of spices with, 23:157
- uses for, 20:812
- Propylene oxide selectivity, 20:806–807
- Propylene oxide vapors, 20:811
- Propylene oxide–styrene (PO–SM) coproduction, in styrene manufacture, 23:334, 342
- Propylene polymerization, 20:523, 524, 774
- aluminum alkyl in, 20:529

Propylene polymer manufacture, catalysts and technologies of, 17:704

Propylene polymers, 17:700. See also
- Polypropylene
  - history of, 17:704
  - properties of, 17:704–705
  - types of, 17:703–704
  - uses of, 17:705
- Propylene polymers/copolymers, 17:703–705
- Propylene production, 24:259
- Propylene urea resins, 2:639
- n-Propyl formate, physical properties, 6:292t
- Propyl gallate, antioxidant useful in cosmetics, 7:830t
- Propylparaben, antimicrobial used in cosmetics, 7:831t
- function as ingredient in cosmetics, 7:829t
- 2-Propyn-1-ol. See Propargyl alcohol
- Propynal, 21:149
- Propyne, methyl methacrylate from, 16:250–251
- Propynoic (propionic, propargylic) acid, 5:34t
- Proshear, 13:37–38
- ProSimPlus, 1:652
- PROSIM software package, 1:76
- Prosopite, 2:364t
- Prostacyclin, 5:112
- Prostaglandin, 4:84
- Prostaglandin, acetylsalicylic acid and, 22:20
- Prostaglandins, 5:28
- Prostanoid acid, 5:28
- Prostate cancers, 17:662
- antiaging agents for, 2:811, 826
- Prosthetic group label immunoassay (PGLIA), 14:148
- Prosthetics, 10:253
- Prosthetics, 3:707
- silk in, 22:634
- Protactinium (Pa), 1:463–491, 464t
  - electronic configuration, 1:474t
  - ion type and color, 1:477t
  - metal properties of, 1:482t
- Protease activity, minimizing, 10:269
- Protease performance, 10:277, 278, 279
- as bleaching agents, 4:64
cotton modification, 8:30
in the dairy industry, 10:296–297
in leather processing, 10:306
in personal care products, 10:306
protein-engineered, 10:279
protein modification using, 10:297–299
Protection–deprotection (cleavage) reactions, microwaves in, 16:557–563
Protective-atmosphere furnaces, 12:291
Protective clothing, high performance fibers in, 13:395–396, 397
Protective coatings flame retardants as, 11:456
in fine art examination/conservation, 11:410–412
Protective layer, in landfill design, 25:879
Protective overcoat layers, in photography, 19:199
Protegrin derivatives, 18:260
Protegrins, 18:260–261
properties of, 18:261
Protein. See also Proteins extraction of, 26:474
in cereal grains, 26:275–276
Proteinaceous materials, as membrane foulants, 21:664
Protein adsorption, 12:136–137
Protein affinity libraries, 12:516–517
Protein-based chiral phases, 6:89–90
Protein-based microarrays, 16:382
Protein biosynthesis, 20:450
as target of antibiotics, 3:24, 29–30
Protein bound uremic toxins, 26:821
Protein C, 4:88
Protein composition of wool, 26:376–379
Protein computers, 20:840
Protein Databank (PDB), 26:426
Protein–DNA interactions, 17:608
Protein-folding investigations, high pressure, 13:431
Protein isolation, by conjugating, 13:748
Protein kinases, 20:832
Protein metabolism, anabolic steroids and, 13:5–6
Protein modification, using proteases, 10:297–299
Protein pharmaceutical products, genetic engineering procedures for, 12:518–520
Protein precipitates, 12:143–147
albumin, 12:146
Factor IX, 12:144–145
Factor VIII, 12:143–144
immunoglobulin, 12:145
Protein precipitation, in plasma fractionation, 12:131–136
Protein products high value, 26:484–486
Protein products, isolation after fermentation, 11:43
analysis in roasted, brewed, and instant coffee, 7:255t
in beer, 3:582t
biosynthesis, 2:570, 601
biosynthesis of, 20:824–825
cell-adhesion, 26:972
chemical analysis of archaeological materials, 5:749–750
chromatography, 3:826–847
content in cocoa beans and their products, 6:369t
controlled release of, 9:81–82
in cotton fiber, 8:19t
display on phages, 12:474–475
DNA-binding, 20:831–832
in drug development, 20:839
energy of, 20:836
engineering, 10:264
enzymatic degradation of, 10:298
from fermentation, 11:12
in fibers, 11:165
folding/misfolding of, 20:828–829
functions of, 20:829–832, 834
globular, 15:829, 830
homology of, 20:833–834
ligand binding in, 20:829–830
liquid separation adsorption, 1:678
microfluidic assays of, 26:969–970
nutritional value of amino acids, 2:600–601
optimization, 10:264
oxygen binding in, 20:830
in pet foods, 10:851–853
post-translational modifications of, 20:825
practical applications for, 20:839–840
predicting secondary structure of, 20:837
properties of, 20:823–824
purification of, 20:823–824
recombinant, 11:23–24
in ruminant feeds, 10:865–866
secondary structure in, 20:827
selenium in, 22:102
sequencing, 20:824
signal transduction, 20:832
in silk, 11:174; 22:628, 629, 631
simplified models for, 20:839
single-cell, 11:3–4
single-cell, 13:688
small molecule binding to, 13:448
solubilities of, 20:449–450
suspensions, 7:273t
uses for, 20:823
Protein secretion
by yeasts, 26:483
Protein separation
by ion-exchange adsorption, 12:136–137
solid–liquid, 12:136
Protein separation, 9:746–747
hydrogels in, 13:748
Protein structure, 20:449
determination of, 20:834–836
prediction of, 20:836–839
principles of, 20:825–829
Protein synthesis, transfer RNAs in, 17:618
Protein threading problem, 20:838
Protein tyrosine phosphatase
target of antiobesity drugs, 3:98
Proteoglycans
purification, 3:845
Proteoglycans, 4:706
Proteolytic enzymes, commercial, 10:298t
Proteome, 20:824
Proteomics, 16:382; 20:450, 824
microarrays in, 16:390, 392
Prothrombin, 25:795
Prothrombin, 4:87, 89
Prothrombinase, 4:87
Protic acids, 12:190
Protic acids, in cationic polymerization of
cyclic siloxanes, 22:560
PROTO (−)-Protoemetine, 2:84, 85
Protonated ozone, 17:774–775
Protonated pyridines, 21:100–101
Protonation, 15:653–654
Protonation, in silanol polycondensation, 22:557
Proton decay, delayed, 21:303–304
Proton-exchange membranes, 23:720
electrolyzer, 13:843
Proton exchange membrane process, 13:783
Proton exchange membrane fuel cells
(PEMFC), 12:201, 211–213;
13:861–862
operating pressure of, 12:213
technology for, 13:801
water management in, 12:212–213
Proton exchange membrane fuel cells
(PEMFC), 19:626–627
Protonic conduction, in glass, 12:586
Proton-induced gamma emission
spectroscopy (PIGE), in fine art
examination/conservation, 11:404
Proton-induced X-ray emission
spectroscopy (PIXE), in fine art
examination/conservation, 11:404
Protonolysis, 13:647
Proton-rich nuclides, decay of, 21:304
Proton-transfer processes, 13:426
Proton traps, 14:269
Protoporphyrinogen oxidase (protox), crop
resistance to, 13:361–362
Prototype pilot plants, 19:459
Prototaxine A, 2:105
Prourokinase, 5:71, 178
molecular formula and structure, 5:172t
Proustite, natural occurrence of, 22:668
Proved crude oil reserves, in the United
States, 18:596, 598–600t
Proved petroleum reserves, 18:595
Provenance, 5:740
Provers
liquid displacement gas meter, 11:652
pipe, 11:652–653
Provisional low temperature scale of 2000
(PLTS-2000), 24:436, 437, 438
Pro-vitamins, 17:649
Proximity-mode X-ray lithography, 15:159
“Proxmire Amendments,” 18:685
Prussian Blue, 14:534, 536–537; 19:407;
22:810
color, 7:332
Prussian blue systems
electrochromic materials, 6:572t,
579–580, 580t
Prussian brown
electrochromic materials, 6:572t
Prussian white
electrochromic materials, 6:572t, 580
Prussic acid, 8:171
Pruteen, 11:3
Pruteen process, 1:744
PS/EPR polymer blends, 20:338
Pseudobinary alloys, as compound semiconductors, 22:148
Pseudo-binary isotopic mixtures
thermal diffusion inversion in, 25:308
Pseudobinary mixtures, 1:44–45
thermal diffusion in, 25:305–309
Pseudoboehmite, 2:397
classification, 2:422
Pseudoelastic devices, 22:350–352
Pseudoelastic effect, 22:339, 340
Pseudoelasticity, smart materials exhibiting, 22:711–712
Pseudoephedrine
chemoenzymatic synthesis, 3:668
Pseudo-first-order irreversible chemical kinetics
numerical analysis of, 25:312–316
Pseudo-first-order rate constant, 14:611
Pseudo-first-order situation, 14:611
Pseudogap, 23:839–840
Pseudo-homogeneous catalysts, 26:504
Pseudo-homogeneous diffusion, 25:277, 278
“Pseudo-interfacial” polymerization,
20:269
Pseudometaphosphates, 18:815
Pseudomonad plasmids, in salicylic acid manufacture, 22:8
Pseudomonas aeruginosa
antibiotic resistant, 3:33, 34, 37
use in bioremediation, 3:756
Pseudomonas, as a host system for gene expression, 12:476
Pseudomonas denitrificans
critical oxygen concentration for selected organisms, 1:731t
Pseudomonas fluorescens, 1:732; 11:4
Pseudomonas putida, 11:4
Pseudomonas testosteroni alcohol dehydrogenase, 3:672
Pseudopelletierine, 2:81–82
Pseudoplastic flow, 7:280t
Pseudoplastic fluids, 11:768
Pseudoplasticity, 10:679
Pseudoplastic with yield stress flow, 7:280t
Pseudopolymorphism, 8:69
Pseudo random binary signals (PRBS),
20:690
Pseudorandom numbers, 26:1002–1003,
1024
Pseudorandom vectors, 26:1002
Pseudo steady-state approximation, 10:599
Pseudovitamins, 17:651, 25:807
Pseudo-volumetric chemical reaction,
25:278
Pseudo-volumetric reaction rates, 25:277,
280
Pseudowollastonite, 19:12
PSI Ψ-ionones, 24:562–563
PSII complex, 13:288–292
plastoquinones in, 13:293
PSII reaction center, 13:292–293
PSI transport processes, 13:288
PSMAA ionomers, 14:465
PSMALi ionomer, 14:477
PSMANa ionomers, 14:466, 468, 470–473
diethylbenzene in, 14:479
Psoralens, 17:636, 637
Psoriasis
vitamin A treatments for, 25:789–790
vitamin D treatments for, 25:792
PSR theory, 12:333
PSSA homopolymer, 20:468
Psychoneurological electrochemistry, 9:576
Psychrometry, 9:98–102
Psyllium
physical properties, 5:30t
Psyllium
classification by structure, 4:723t
Psyllium seed gum, 4:724t
classification by structure, 4:723t
PT1 (oil–metal incendiary mixture), 5:827
See also Teflon
PTFE-based ionomers, 14:481
PTFE dispersion, 18:288. See also Polytetrafluoroethylene (PTFE)
PTFE films, 18:334
PTFE micropowders, 18:306
PTG black and white developers,
19:346–347
PTG formulation, non-silver carboxylate, 19:362
PTG imaging material, robustness of,
19:355
PTG systems. See also Photothermographic entries
aqueous solubility in, 19:361
PTT MOLDING RESINS

chemical sensitization in, 19:362
nonchemical stabilization methods in, 19:366
stabilization of, 19:362
stabilizing compounds in, 19:362–366
tribromomethyl compounds in, 19:363–365

PTT molding resins, 20:68. See also Poly(trimethyleneterephthalate) (PTT)
PTV (oil–metal incendiary mixture), 5:827

p-type (positive) silicon, 23:35

p-type dopants
in ion implantation, 22:185, 187–188
for MOCVD, 22:150t, 157–158
in silicon, 22:485, 486, 487

p-type FET devices, 22:164. See also Field effect transistors (FETs)

p-type high temperature superconductors, 23:838

p-type MOSFET (PFET, PMOSFET). See also Field effect transistors (FETs)
in CMOS logic circuits, 22:251–253
long-channel behavior of, 22:251
scaling to deep submicron dimensions, 22:255–256

p-type regions, in photovoltaic devices, 22:220

p-type semiconductors
boron applications, 4:137
p-type silicon carbide semiconductors, 22:530

Publication delays, 24:376
Public Health Service Act, 3:826
Public Health Service Drinking Water Standards, 22:680

Publicly owned treatment works (POTWs), 21:582

Public materials standards, 15:743
Public, protection of, 21:827–828
Public sanitation, soap and, 22:755, 756
Public sector aquaculture, 3:182–183
Public Utilities Commission, 6:828
Public Utilities Regulatory Policies Act (PURPA), 12:533–534
PUC19 plasmid vector, 12:501, 502
Puccinia chondrillina, 13:347
Puffer fish poison, 5:822
Puffing, 12:722, 740

Pu-Ga phase diagram, 19:684. See also Plutonium–gallium alloys
PULC d-Pulegone, l-menthol from, 24:523
Pulegone, 24:540
Pulleys, magnetic, 15:452
Pullulan, 4:724t
classification by structure, 4:723t

Pulmonary damage
as a toxic effect, 25:208
Pulmonary drug delivery, 9:49–50
Pulmonary embolism
and blood coagulation, 4:81
Pulmonary mercury toxicity, 16:50

Pulmozyme
cell culture technology product, 5:346t

Pulp. See also Dry pulps; Pulps; Wet pulps
clorate application, 6:116
defoamer applications, 8:248
end use of chlorine, 6:134t
future of, 11:281
plant fibers and, 11:287
for regenerated cellulose fibers, 11:251–252

Pulps, 21:1–42
kappa number of, 21:21
mechanical, 21:48–49
nonwood fibers in, 21:16–20
pretreatments of lignocellulosics, 21:20
wood and fibers, 21:1–16

Pulp and paper industry
water use in, 26:56

Pulp bleaching, 4:45; 21:31–38, 43–54
bleaching of recycled pulps, 21:51–52
chemical, 21:43–48
initial reacting species in, 21:32–33
lignin reactions during, 21:33–38
main chemicals used in, 21:31t
mechanical, 14:63–64; 21:48–51
ozone use in, 17:810
sodium dithionite in, 23:676

Pulp bleaching agents, 21:44–48
Pulp bleaching chemistry, 21:32–38
Pulp, dry-laid, 17:504
Pulp fibers, in paper, 11:164
Pulping, 5:367; 21:1, 20–31
chemical, 21:21–31
mechanical, 21:20–21
organosolv, 21:29–31
steam explosion, 21:21
thermomechanical, 15:13

Pulp-like olefin fibers, 11:241
Pulp manufacture, sodium sulfite in, 23:671
Pulp mills, use of tire-derived fuel in, 21:464
Pulp pressing technology, improvements in, 23:458
Pulp production enzymes, 10:304–305
Pulp stabilization, sulfur dioxide in, 23:667
Pulpstone grinding wheels, 1:19
Pulp, sugar beet, 23:458
Pulwood species, 21:2t
properties of, 21:3t
Pulsatile drug delivery systems, 9:57–61
Pulsating heat pipes (PHP), 13:235–236
Pulse combustion heat sources, 9:104–105
Pulse cycles, 9:778
Pulsed baffle reactors, 15:709–710
Pulsed discharge detector (PDD) gas chromatography, 4:614
Pulsed dye lasers, 23:144
Pulsed electrochemical machining (PECM), 9:604–605
Pulsed field gel electrophoresis, 9:746
Pulsed flashlamps, 14:619
Pulsed laser deposition chamber, 24:739
Pulsed laser deposition (PLD), 24:738–743 advancement of, 24:739
as an alternative deposition technique, 24:742–743
fabrication method for inorganic materials, 7:415t
modification of, 24:743
thin films, 1:724
uses for, 24:739
Pulsed magnetization, 23:869
Pulsed-packed columns, 10:777
Pulsed periodic reversal plating, 24:749
Pulsed-plate columns, 10:776–777
Pulsed solid-state lasers, 14:673
Pulse-jet baghouses, 26:712, 713
Pulse magnetic fields, 23:854
Pulse plating, 24:749
Pulse radiolysis, 9:376–377; 13:429
perturbation by, 14:617–620
Pulse separation method, 23:466
Pulse testing, 20:690
Pulse tube refrigeration, 8:43
Pultrusion, 19:558; 26:770–771, 766–767
in polyamide plastic manufacture, 19:786–787
Pulverized coal (PC) plants, 6:828
Pulverized-coal firing solid fuel combustion, 7:463–465
furnaces for, 7:467–469
Pumice
dental abrasive, 8:339
Pumice stone
as colloid, 7:272t, 273t
Pump and treat
defined, 3:759t
groundwater hydrocarbon contamination, 3:766
metals, 3:782
Pump and treat hazardous waste management, 25:845
Pump-around streams, 13:223
Pump calculation worksheet, 21:56
Pump energy level, 14:695
Pump head, total developed, 21:57–58
Pumping, 14:658–659
in four-level lasers, 14:668
Pumping dye lasers, 14:691
Pumping number \(N_q\), impeller, 16:676–677
Pumping systems, evaluation of, 21:56
Pump manufacturers, U.S., 21:87t
Pump metallurgy, upgrading, 21:86
Pumps, 21:54–91
adjustable speed, 20:686–687
affinity laws related to, 21:63
application guidelines for, 21:82–86
applications for, 21:74–79
capacity of, 21:57
cavitation in, 21:62, 84–86
classification of, 21:54–56
for corrosive and toxic applications, 21:76–78
coupling alignment of, 21:80
couplings and seals for, 21:79–82
economic aspects of, 21:87
efficiency of, 21:59
energy use for, 10:155–156
fugitive emissions from, 10:70
impeller-diffusor gaps in, 21:84
inlet piping configurations for, 21:82–83
kinetic, 21:63–70
for leakage prevention, 21:76
localized pressure reductions in, 21:62
low flow operation of, 21:83–84
nomenclature associated with, 21:88
for nonclogging applications, 21:78–79
operating conditions for, 21:56–63
in plant layout, 19:513, 516–517
plastic, 21:76
positive displacement, 21:70–74
power delivered to, 21:58–59
in propylene oxide transfer, 20:808–809
reliability of, 21:86
for slurries, 21:78
special coupling types for, 21:80
specific speed of, 21:59–60
suction and suction specific speed of, 21:60–63
types of, 21:63–74
Pump vibration measurements, 21:86
Punching
- ceramics processing, 5:655
Puncture test, for spunbonded nonwoven fabrics, 17:480–481
Punicic acid
- physical properties, 5:33t
Purasiv HR process, 1:667
Purchasing
- guide, for selecting SLS equipment, 11:347–348
- profile report, 15:644
Purchase
- patterns of, 15:644–645
Pure compounds, octane numbers of, 12:394t
Pure counter-flow, 13:194
Pure cultures, in microbial transformations, 16:404–405
Pure culture yeasts, 26:468
Pure ethanol, 10:554
Pure fluids
- solvent strength of, 24:3–4
- thermodynamics of, 24:643–644
Pure Food and Drug Act, 11:581
Pure hydrogen, in IC engines, 13:799–800
Pure ionic liquids
- structural studies of, 26:866–868
Pure oxygen
- in bioremediation design considerations, 25:840
Pure substance, phase behavior of, 24:663
Pure supercritical fluids, physical properties of, 24:4
Pure terephthalic acid (PTA) production, exhaust from, 10:105–106
Pure water, in silicon semiconductor technology, 22:232
PUREX flow sheet, 19:676
Purex process, 10:789
Pure zirconium
- uses for, 26:639
- Purge, adsorption processes, 1:613, 614
- Purge-and-trap methods
capillary chromatography sample preparation, 4:609
Purge reactors, 10:655
Purge reactor system, 10:645
Purge swing adsorption, 1:647–648
regeneration, 1:655
Purification. See also Impurities; Refining;
- Wastewater treatment; Water purification
adsorbents for, 1:612
adsorption processes for, 1:612–613
aminophenols, 2:660–661
benzoic acid, 3:627–628
of carbide-generated acetylene, 1:207–208
ceramics processing, 5:644
function of crystallization, 8:95
of hydrocarbon-derived acetylene, 1:203–204
in hydrometallurgy, 16:151
in methanol synthesis, 16:310
molecular-sieve, 16:837
of silicon, 22:492–497
of silicon carbide, 22:532
of silver, 22:647, 653
in soap making, 22:735–736
sodium in, 22:779
Purification treatment, plating bath, 9:799
Purine
alkaloids derived from, 2:105–106
Purine nucleotides, 2:554
Purisol process
carbon dioxide recovery from natural gas, 4:814
Purity
- in fused quartz manufacture, 22:413
- of silicon-based semiconductors, 22:231–232
- of silver, 22:649–650
- of sodium chloride, 22:811, 812t
- in sugar analysis, 23:474
- of vitreous silica, 22:407
Purity requirements, in ethylene oxidation, 10:651–652
Purkinje system, 5:80, 81, 88
Puronic polyols, 13:741–742
Purple
- CIE chromaticity diagram, 7:313, 315
- Purple acid phosphatases, 14:556
<table>
<thead>
<tr>
<th>Term</th>
<th>Page/Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purple permanganate ion, 15:597</td>
<td></td>
</tr>
<tr>
<td>Purple pigments, 7:349–350</td>
<td></td>
</tr>
<tr>
<td>for inks, 14:318</td>
<td></td>
</tr>
<tr>
<td>Pusher centrifuges, 11:392</td>
<td></td>
</tr>
<tr>
<td>Pusher furnaces, 12:289–290</td>
<td></td>
</tr>
<tr>
<td>Push–pull coupler device, 13:422</td>
<td></td>
</tr>
<tr>
<td>“Push–pull” rods/barrels, 24:59</td>
<td></td>
</tr>
<tr>
<td>Putrescine, 2:79</td>
<td></td>
</tr>
<tr>
<td>Putty powder, stannic oxide in, 24:805</td>
<td></td>
</tr>
<tr>
<td>PVA fibers, 25:619. See also Poly(vinyl alcohol) (PVA)</td>
<td></td>
</tr>
<tr>
<td>PVA membranes, 15:843</td>
<td></td>
</tr>
<tr>
<td>PVB binders, 19:359–360</td>
<td></td>
</tr>
<tr>
<td>PVC crystallites, 25:663, 664–665. See also Poly(vinyl chloride) (PVC)</td>
<td></td>
</tr>
<tr>
<td>PVC decomposition products as health hazard, 25:677</td>
<td></td>
</tr>
<tr>
<td>PVC fusion/gelation, 25:663–664</td>
<td></td>
</tr>
<tr>
<td>PVC–nitrile rubber blends, 24:717. See also Poly(vinyl chloride) (PVC)</td>
<td></td>
</tr>
<tr>
<td>PVC particles</td>
<td></td>
</tr>
<tr>
<td>electron microscopy of, 25:658–659</td>
<td></td>
</tr>
<tr>
<td>X-ray scattering of, 25:659, 660</td>
<td></td>
</tr>
<tr>
<td>PVC powder, 25:662–663</td>
<td></td>
</tr>
<tr>
<td>as explosion hazard, 25:678</td>
<td></td>
</tr>
<tr>
<td>PVC processing, 25:661–663</td>
<td></td>
</tr>
<tr>
<td>PVC resin manufacturing processes, 25:669–670</td>
<td></td>
</tr>
<tr>
<td>PVC stabilizers</td>
<td></td>
</tr>
<tr>
<td>in VDC polymer stabilization, 25:720</td>
<td></td>
</tr>
<tr>
<td>PVC waste</td>
<td></td>
</tr>
<tr>
<td>incineration of, 25:680–683</td>
<td></td>
</tr>
<tr>
<td>PVDC copolymer films properties of, 25:730–731t. See also Poly(vinylidene chloride) (PVDC)</td>
<td></td>
</tr>
<tr>
<td>P-wave, 17:422–423</td>
<td></td>
</tr>
<tr>
<td>pYEX-BX yeast expression vector, 26:484</td>
<td></td>
</tr>
<tr>
<td>Pymetrozine, 14:346</td>
<td></td>
</tr>
<tr>
<td>Pyoreol</td>
<td></td>
</tr>
<tr>
<td>molecular formula and structure, 5:91t</td>
<td></td>
</tr>
<tr>
<td>Pyramidal</td>
<td></td>
</tr>
<tr>
<td>geometry for metal coordination numbers, 7:575t</td>
<td></td>
</tr>
<tr>
<td>β-L-Pyranoses, 4:699</td>
<td></td>
</tr>
<tr>
<td>Pyranose oxidase</td>
<td></td>
</tr>
<tr>
<td>regioselective oxidation by, 3:674</td>
<td></td>
</tr>
<tr>
<td>Pyranose ring, 4:698–699, 700</td>
<td></td>
</tr>
<tr>
<td>two forms of, 4:699</td>
<td></td>
</tr>
<tr>
<td>Pyranthrone dyes, 9:336</td>
<td></td>
</tr>
<tr>
<td>Pyragyríte, natural occurrence of, 22:668</td>
<td></td>
</tr>
<tr>
<td>2-Pyrazinyl anchoring groups, 8:683t</td>
<td></td>
</tr>
<tr>
<td>Pyrazinamide</td>
<td></td>
</tr>
<tr>
<td>year of disclosure or market introduction, 3:6t</td>
<td></td>
</tr>
<tr>
<td>Pyrazines</td>
<td></td>
</tr>
<tr>
<td>aroma chemicals, 3:261</td>
<td></td>
</tr>
<tr>
<td>aroma compounds in roasted coffee, 7:256t</td>
<td></td>
</tr>
<tr>
<td>Pyrazoles, 13:599</td>
<td></td>
</tr>
<tr>
<td>Pyrazolinone couplers, 19:254–255</td>
<td></td>
</tr>
<tr>
<td>Pyrazolo-(3,2-c)-5-triazole couplers, 19:256</td>
<td></td>
</tr>
<tr>
<td>Pyrazolobenzimidazole couplers, 19:256</td>
<td></td>
</tr>
<tr>
<td>Pyrazolone dyes, 19:285</td>
<td></td>
</tr>
<tr>
<td>Pyrazolone Orange, 19:435</td>
<td></td>
</tr>
<tr>
<td>pigment for plastics, 7:367t</td>
<td></td>
</tr>
<tr>
<td>Pyrazolone reds, 19:437</td>
<td></td>
</tr>
<tr>
<td>Pyrazolones, 9:283; 13:599</td>
<td></td>
</tr>
<tr>
<td>typical soluble dye applications, 7:376t</td>
<td></td>
</tr>
<tr>
<td>Pyrazolone soluble dyes, 7:373t</td>
<td></td>
</tr>
<tr>
<td>Pyrazolone Yellow, colorant for plastics, 7:374t</td>
<td></td>
</tr>
<tr>
<td>Pyrazon, 13:322</td>
<td></td>
</tr>
<tr>
<td>Pyrethrin</td>
<td></td>
</tr>
<tr>
<td>in microcapsule formulations, 7:564t</td>
<td></td>
</tr>
<tr>
<td>Pyrethroids, 10:520; 14:342; 26:403–404</td>
<td></td>
</tr>
<tr>
<td>synthetic, 18:533; 19:69</td>
<td></td>
</tr>
<tr>
<td>Pyrex</td>
<td></td>
</tr>
<tr>
<td>matrix for ceramic–matrix composites, 5:553t</td>
<td></td>
</tr>
<tr>
<td>thermal shock resistance parameters, 5:633t</td>
<td></td>
</tr>
<tr>
<td>Pyrex glass</td>
<td></td>
</tr>
<tr>
<td>in microfluidic fabrication, 26:964, 965</td>
<td></td>
</tr>
<tr>
<td>2-Pyridocyanines, 20:505</td>
<td></td>
</tr>
<tr>
<td>2-Pyridones, 21:125, 228</td>
<td></td>
</tr>
<tr>
<td>2-Pyridyl anchoring groups, 8:683t</td>
<td></td>
</tr>
<tr>
<td>2-Pyridylcarbinol, 21:125</td>
<td></td>
</tr>
<tr>
<td>3,4-Pyridyne, 21:107</td>
<td></td>
</tr>
<tr>
<td>4-Pyridocyanines, 20:505</td>
<td></td>
</tr>
<tr>
<td>4-Pyridyl anchoring groups, 8:683t</td>
<td></td>
</tr>
<tr>
<td>Pyridazinone, herbicidal activity of, 13:296</td>
<td></td>
</tr>
<tr>
<td>Pyridazinone herbicides, 13:322</td>
<td></td>
</tr>
<tr>
<td>Pyridine, 12:113. See also Pyridines</td>
<td></td>
</tr>
<tr>
<td>from acrolein, 1:276</td>
<td></td>
</tr>
<tr>
<td>acrylamide solubility in, 1:290t</td>
<td></td>
</tr>
<tr>
<td>alklylation, 2:197–198, 198</td>
<td></td>
</tr>
<tr>
<td>production from acetaldehyde, 1:104, 111</td>
<td></td>
</tr>
<tr>
<td>solubility of boric acid in, 4:253t</td>
<td></td>
</tr>
<tr>
<td>VDC polymer degradation and, 25:718</td>
<td></td>
</tr>
<tr>
<td>Pyridine-based ionic liquids, 21:121</td>
<td></td>
</tr>
<tr>
<td>Pyridine bases, 21:95</td>
<td></td>
</tr>
<tr>
<td>commercial manufacture of, 21:113–114</td>
<td></td>
</tr>
<tr>
<td>production of, 21:116</td>
<td></td>
</tr>
</tbody>
</table>
Pyridinecarbaldehydes, uses for, 21:126
Pyridinecarbonitriles, uses for, 21:123–124
Pyridinecarboxamides, 21:123–124
Pyridinecarboxylic acids, 21:123–124
Pyridine chemicals, 12:124
Pyridine–chromic acid adduct
molecular formula, properties, and uses, 6:562t
Pyridine compounds, 21:91–92, 116
prices of, 21:116
Pyridine derivatives, 21:91, 112
acute toxicology of, 21:118
formation of, 21:109, 111
Pyridine dichromate
molecular formula, properties, and uses, 6:562t
Pyridine herbicides, 13:322
Pyridine N-oxides, 21:98, 99, 105
uses for, 21:121
Pyridine quaternary salts, uses for, 21:121
Pyridine ring syntheses, 21:108–112
from nonheterocyclic compounds, 21:108–110
from other ring systems, 21:111–112
Pyridines, 21:91–133. See also Substituted pyridines
acute toxicology of, 21:117
2- and 4-alkylation of, 21:100
analytical and test methods and storage for, 21:117
applications of, 21:91
aroma chemicals, 3:260
aroma compounds in roasted coffee, 7:256t
by-products of, 21:114–115
carbon substituents in, 21:101–103
chemical properties of, 21:95–108
chemistry of, 21:92
chronic toxicology of, 21:118
commercial manufacture of, 21:113
cross-coupling reactions in, 21:108
economic aspects of, 21:116
electrophilic attack at carbon in, 21:98
electrophilic attack at nitrogen in, 21:98
free-radical attack at carbon in, 21:100–101
halogen substituents of, 21:106–107
handling of and exposure to, 21:118–119
health and safety factors related to, 21:117–119
hindered, 14:269
history of, 21:113
manufacture and processing of, 21:112–115
nitrogen substituents in, 21:103–104
nucleophilic attack at carbon or hydrogen in, 21:98–100
oxygen substituents in, 21:104–105
physical properties of, 21:92–95
production and shipment of, 21:115
quantitative structure-property relationships of, 21:95
raw material and energy aspects to, 21:114–115
reactions at ring atoms in, 21:98–101
specifications, standards, and quality control for, 21:116–117
sulfur substituents in, 21:105–106
uses for, 21:119–128
vapor-phase synthesis of, 21:110
Pyridinethiones
acetylation and alkylation of, 21:105–106
oxidation of, 21:106
Pyridine, vapor-phase processes for, 21:113. See also Pyridines
Pyridinium hydrobromide perbromide, as a chemical stabilizer, 19:365
Pyridinium salts, 21:100, 120
Pyridinium tribromide
bromination reagent, 4:344
Pyridocyanines, formation of, 20:520
Pyridones
typical soluble dye applications, 7:376t
Pyridones, 9:283–288
Pyridone Yellow
colorant for plastics, 7:375t
Pyridostigmine bromide, 4:360t
Pyridostigmine bromide for medical defense against chemical warfare agents, 5:837
Pyridoxal 5'-phosphate (PLP)
hemoglobin modifier, 4:113, 117–118
Pyridoxal phosphate, 2:812, 25:798
Pyridoxamine, 25:798
Pyridoxine, 21:112
Pyridoxine, 25:798–799
Pyridyl disulfide method, for covalent ligand immobilization, 6:396t
Pyridylpyridinium salts, 21:99
Pyrimethamine
year of disclosure or market introduction, 3:6t
Pyrimidine nucleotides, 2:554
Pyrimidines, 13:306
combinatorial, 13:30
Pyriproxyfen, 14:344
Pyrite, 14:494; 23:575. See also Pyrites
color, 7:334
in coal, 6:718
Pyrite burners, 23:659
Pyrite plants, 23:768
Pyrites, burning, 23:660–661
Pyrithione, 21:107
Pyrocatechol
intermediate used in oxidation hair dyes,
7:858t
Pyrocerams, 21:381
Pyro-Chek 68PB, 11:470–474
Pyrochemical processes, in plutonium
metal preparation, 19:676
Pyrochlore, 17:133–134, 140, 141
colorants for ceramics, 7:347t
Pyroelectricity, 11:95, 100, 106, 107
Pyroelectric materials, smart, 22:708t, 709
Pyroform process, 25:171
Pyrogallol
chemiluminescence reagent, 5:858
intermediate used in oxidation hair dyes,
7:858t
Pyrogenic silica, 22:367, 383, 400–401. See
also Fumed silica
applications of, 22:401
preparation of, 22:400–401
properties of, 22:400
worldwide production of, 22:401
Pyrolusite, 15:540, 582
Pyrolysis, 10:506, 601
benzene, 3:604
carboxylic acids, 5:42–43
catalytic, 10:619
coal, 6:736–738, 787, 789, 828
in direct coal liquefaction, 6:851–856
of light hydrocarbons, 25:170
of organic titanium compounds, 25:118
scrap tire, 21:466–467
in silicon carbide fiber manufacture,
22:534
of silicones, 22:598
in thermal waste treatment, 25:832
of vinyl chloride, 25:633
in vinyl chloride manufacture, 25:634,
635, 641–642, 642–645
Pyrolysis furnace, yield of propylene
produced in, 20:776
Pyrolysis gas, 10:613
Pyrolysis–gas chromatography
(pyrolysis–gc), 19:563
studies of, 19:566
Pyrolysis gasoline, 18:558
benzene separation from, 3:608
as a source of aromatics feedstock,
18:566
toluene content of, 25:170t
toluene recovery from, 25:170
Pyrolysis heater, characteristics of, 10:603t
Pyrolysis–ir technique, 19:564, 565
Pyrolysis techniques, for thermally
degrading polymers, 19:566
Pyrolytic carbon, 4:735
Pyrolytic coating technologies, 12:609
Pyrolytic graphite, 4:737–738
Pyrolytic methods, 21:134
Pyrolytic vapor deposition, 19:115
Pyrolyzed wood, 26:356–357
Pyrometallurgical lead refining methods,
14:747
Pyrometallurgical operations, preparatory,
16:138–141
Pyrometallurgical processes, 17:91, 92
zinc, 26:574–577
Pyrometallurgical recycling, 21:390–396
Pyrometallurgical upgrading process,
24:318–319
Pyrometallurgy, 16:128, 133, 136–151
chlorination in, 16:140
drying and calcination in, 16:138
equipment used in, 16:140–141
sintering and pelletizing in, 16:140
sulfide roasting in, 16:138–139
Pyrometers, 20:680
Pyrometric cone equivalent (PCE) test,
21:502, 511–512
Pyrophoricity, of organolithium
compounds, 14:260
Pyrophosphates, 18:815, 841–844
organic, 19:42
uranium, 25:433
Pyrophosphoric acid, 18:828
Pyrophyllite, 5:640
Pyroprocessing, of Portland cement raw
material, 5:488–489
Pyroreduction process, 19:678
Pyrosulfuryl chloride, 23:641, 645, 647, 649
Pyrosultones, decomposition of, 23:527
Pyrotechnics
boron applications, 4:137
molybdenum compounds in, 17:39
Pyrotorm process flow diagram, 25:174
Pyrovatex CP, 11:498
2-Pyrrolidinone
acrlylene-derived, 1:231, 249
2-Pyrrolidinone-5-carboxylic acid (PCA)
skin conditioner/moisturizer, 7:843t
Pyrroles, 21:112
aroma chemicals, 3:260
aroma compounds in roasted coffee, 7:256t
Pyrrolidines, amino-substituted, 21:223
Pyrrolidinofullerenes, 12:244, 245
Pyrrolidinone carboxylic acid (PCA)
function as ingredient in cosmetics, 7:829t
Pyrrolizin-3-ones, 21:151
Pyrrolizin-3-ones, 21:151
Pyrolyoppyrole pigments, 19:424
PYRUV 5-enol-Pyruvylshikimate synthase
inhibitors, 13:300
Pyruvic acid
in citric acid cycle, 6:633
PYRYL 2-Pyrylocyanines, 20:505
Pyrylium dyes, 9:503
PZT ceramics, 14:100–102. See also PbZrO3–PbTiO3- based (PZT)
materials
PZT system, 14:86, 87
Quantitative structure–property
relationships, 7:385, 386
Qaiyarah heavy oil, 18:618
QC laboratory, purpose of, 21:160. See also Quality control (QC)
QEKRIRVLSA antimicrobial peptide, 26:799–800
Qianna, 19:764
QikProp, 6:18
Qinghai Lake, 5:784
Q parameter, impeller, 16:676
QSAR analysis, 10:327t, 328–329. See also Quantitative structure–activity
relationship (QSAR) studies; 3D QSAR models
QSAR studies, 13:307
QSAR techniques, 13:294
QSAR with CoMFA analysis, 10:327t, 330
QSL furnace, 14:741
QSL lead smelting process, 14:740–742
QSL process, 16:146
Q-switched laser, 14:616
Q-switches, in YAG lasers, 14:698
Q-switching technique, 14:618, 673–678
Quadrature technique, in sampling, 26:1010–1011
Quadropole mass analyzers, 24:109
Quadropole moment, 1:620–621
selected molecules, 1:621t3
Quadropoles, 15:661–662
Qualimet
composition of alloy for crowns and bridges, 8:311t
Qualitative analysis
of dyes, 9:233–234
of nitric acid, 17:190
for reliability, 26:984
of silicones, 22:598
of silver compounds, 22:676–677
Qualitative spot test, hydrazine, 13:589
Qualitative synergy, 24:226
Quality, 21:159–181
economic aspects of, 21:178–179
Quality assurance (QA)
customer complaints and, 21:168
employee training and, 21:165
method transfer in, 21:167
procedures, 10:109
test methods and, 21:166–167
Quality assurance unit, 21:159
responsibilities of, 21:164–168
Quality audit, 21:167–168
Quality Circles, 21:172
Quality control (QC). See also QC laboratory; Statistical quality control
(QSC) analysis replication in, 21:162
calibration in, 21:161
in the chemical industry, 21:159–164
of ethanol, 10:550
in fine chemical production, 11:434–435
in finish remover production, 18:86
of gold, 12:698
of higher olefin polymers, 20:428–429
of hydrogen peroxide, 14:59
of inks, 14:331
of inorganic pigments, 19:384
laboratory information management
system and, 21:163–164
of linear low density polyethylene, 20:203
of magnesium, 15:347–348
of maintenance, 15:479
measurement of, 15:479
of mercury, 16:43
of nitrogen, 17:282–283
of perfumes, 18:379–380
of pharmaceuticals, 18:719
planning for, 15:479
of polyamide plastics, 19:793
principal role of, 21:160
of pyridines, 21:116–117
sampling plan in, 21:161
of silver, 22:650
of sodium carbonate, 22:793, 794t
of sodium nitrite, 22:856–858
of sodium sulfates, 22:867
of titanium, 24:862–864
of toluene, 25:175
of wine, 26:324–326
Quality control testing, of silicones, 22:601
Quality control unit, 21:159
Quality cost, 21:178
Quality factor, of filtration, 11:330
Quality Function Deployment (QFD), 21:172–173
Quality improvement, 21:171–178
history of, 21:171
impact of, 21:179
Quality, in maintenance, 15:479
Quality management, 21:173–178
Quality manual, 21:165
Quality-of-life indicators, 24:176
Quality, of solid enzyme formulations, 10:273
Quality operating procedures (QOP), 21:165
Quality parameters
in fermentation, 11:48–49
for spices, 23:157–159
Quality standards, for gelatin, 12:441
Quality system documentation, 21:165–166
Quality systems, 21:168–171
Quality system standard, selecting, 21:170–171
Quality techniques, 21:172–173
Quality testing, of methyl chloride, 16:325
Quality tests, of phenol, 18:753
Quantitative affinity chromatography, 6:404–405
Quantitative analysis
of alkyllithium initiator solutions, 14:251–252
of dyes, 9:232–233
of nitric acid, 17:190–191
of silicon, 22:498
of silicones, 22:598
silver in, 22:683–684
of silver compounds, 22:677
in spectral analysis, 14:237–239
Quantitative Auger electron spectroscopy, 24:98
Quantitative declaration of ingredients (QUID), 12:37
Quantitative efficiency, in size separation, 22:279
Quantitative ir spectroscopy, 14:239
Quantitative phase analysis diffractometers in, 26:428
Quantitative Structure–Activity Relationships (QSARs), 16:753–755; 18:527; 21:95; 24:175. See also QSAR entries
studies, 10:341
Quantitative Structure–Property (Toxicology) Relationships [QSP (T) R], 16:753
Quantitative XPS, 24:92–94
Quantum and molecular mechanical simulations, combined, 16:750–751
“Quantum condition” equation, 23:803
Quantum cellular automata (QCA), 22:169
Quantum computers, 17:61
Quantum dot materials, 22:142
Quantum dot PV cells, 23:44
Quantum dots
dendrimer-stabilized, 26:804–805
Quantum effect devices (QEDs), 22:169
compound semiconductors in, 22:160
Quantum efficiency, 19:81–82, 112–113
in CMOS image sensors, 19:155
of InSb photodiode detectors, 19:158
Quantum mechanical calculations, goal of, 16:737
Quantum mechanical effects, of noble gases, 17:350
Quantum mechanical forces, in adhesion, 21:602
Quantum mechanics (QM), 16:734–740, 741
of p–i–n junctions, 22:136–139
theory, 21:290
Quantum superconducting devices (SQUIDs), 17:370
Quantum well arrays, GaAs–AlGaAs, 19:166

Quantum well infrared photodetector (QWIP), 19:137

Quantum well infrared photodetectors (QWIPs), 22:181–182

Quantum well lasers, 22:180

Quantum wells, 14:844

Quantum yield, 8:256; 19:75. See also Photocatalytic quantum yield (quantum efficiency)

Quarrying, noise and vibration from, 15:75

Quartz, 1:1; 5:650; 22:402, 490. See also Silicon dioxide

accelerator for dental cements, 8:285
in clays, 6:685
in coal, 6:718
in dental ceramics, 8:275
in ferrosilicon production, 22:512
hardness in various scales, 1:3t
as health hazard, 22:521
isoelectric point, 8:674t
in silica/silicate manufacture, 22:461–462
α-Quartz, growth of, 14:93
β-Quartz solid solution, 12:637–638

Quartz crystal growth, hydrothermal, 14:92–97

Quartz crystal microbalances (QCMs), in acoustic wave sensors, 22:270
sensors, 23:708
Quartz crystals, growth of, 14:93, 94
Quartz-pebble conglomerate uranium deposits, 17:520
Quartz powder, sources of, 22:413
Quartz sand, 22:380, 382

Quasielastic light scattering (QELS), 8:715–716
in particle size measurement, 18:151–152

Quasi-Fermi levels, 9:728–729, 730

Quasifullerenes, 12:232–233

Quasi-isotropic laminates, 26:754; 26:782

Quasi-Monte Carlo sampling methods, 26:1005, 1011–1015, 1024
parallelization with Monte Carlo sampling, 26:1016
in supply chain management, 26:1044
Quasiparticles, 23:819, 840
in the superconducting state, 23:805

-Quartz, growth of, 14:93

-Quartz solid solution, 12:637–638

Quartz crystal growth, hydrothermal, 14:92–97

Quartz crystal microbalances (QCMs), in acoustic wave sensors, 22:270
sensors, 23:708

Quartz crystals, growth of, 14:93, 94
Quartz-pebble conglomerate uranium deposits, 17:520
Quartz powder, sources of, 22:413
Quartz sand, 22:380, 382

Quasielastic light scattering (QELS), 8:715–716
in particle size measurement, 18:151–152

Quasi-Fermi levels, 9:728–729, 730

Quasifullerenes, 12:232–233

Quasi-isotropic laminates, 26:754; 26:782

Quasi-Monte Carlo sampling methods, 26:1005, 1011–1015, 1024
parallelization with Monte Carlo sampling, 26:1016
in supply chain management, 26:1044
Quasiparticles, 23:819, 840
in the superconducting state, 23:805

tunneling of, 23:820

Quasi phase matching, 17:451

Quasirandom sequences
sampling via, 26:1016, 1036, 1048

Quasi-static sensing-strain, 11:152

Quaternary aluminum alloys, 2:323–329

Quaternary ammonium dispersant moieties, 8:706t
Quaterrnary ammonium bases
solvents for cotton, 8:21

Quatennary ammonium compounds, 2:711, 728–729; 24:147
analysis, 2:744–746
biodegradability of selected, 2:748t
chemical properties of, 2:737
disinfecting agent for aquaculture in U.S., 3:213t
economic aspects, 2:741–744
health and safety factors, 2:746–749
in industrial water treatment, 26:148–149
naturally occurring, 2:737–738
nomenclature, 2:729
physical properties of, 2:729
prices and suppliers of selected, 2:743t
selected compounds and their applications, 2:730–736t
synthesis and manufacture, 2:738–741
uses of, 2:749–752

Quatennary ammonium salt (QAS), 9:676
salicylic acid and, 22:11

Quaternary bismuth compounds, 4:33–34
Quatennary compounds, nomenclature for, 17:390–391

Quatennary phosphonium salts, 10:413

Quatennary plutonium oxides, 19:689

Quatennary salts
of quinoline, 21:185–186
uses for, 21:120–121

Quatennary semiconductor alloys,
heterostructures and superlattices in, 22:158–160

Quatennary structure, 20:449

Quaternium-14
antimicrobial used in cosmetics, 7:831t

Quaternium-15
antimicrobial used in cosmetics, 7:831t, 832

Quaternium 22
hair conditioner ingredient, 7:855t

Quaternium 79 hydrolyzed milk protein
Quaternization
fatty amines, 2:522–523
Quaternization reaction, 20:490
Quaternized esteramines, 2:741, 742
Queensland Metals magnesium manufacturing process, 15:338
Quelle basic-oxygen process (Q-BOP), 23:259
Quench converters
conversion of, 16:310
in methanol synthesis, 16:308–309
Quenched and tempered low carbon constructional alloy steels, 23:300
Quenched steel, toughness of, 23:286
Quenching
Martempering
aluminum alloys, 2:329–333
rapid, 10:617
of photographic development, 19:212
Quench oil, 18:649
Quench oil viscosity control, 10:616
Quench process, with olefin fibers, 11:234–236
Quench tower, 10:610
Quercetin antioxidant useful in cosmetics, 7:830t
Questran molecular formula and structure, 5:141t
Quick freezing, 21:561, 562t
Quicklime(s), 15:25. See also Screened quicklime
acid neutralization by, 15:44
calcination of, 15:51
economic aspects of, 15:60–61
high calcium, 15:60
hydration processes, 15:54–55
market overview of, 15:57–60
packaged, 15:56
particle size of, 15:65–66
physical and chemical properties of, 15:41–44
processing of, 15:53
production of, 15:46–54
reaction with carbon dioxide, 15:44
reactivity/degree of burning of, 15:29, 66
storage and transport of, 15:56
uses for, 15:61–62
Quicklime reactivity tests, 15:72–73
Quicklime slaking process, normal, 15:55–56
Quicksand, 7:273t
QUILL academic research centre, 26:901–902
Quinacidone Magenta pigment for plastics, 7:366t, 367t
Quinacidonequinone (QAQ), 19:441
Quinacridones, 19:441
commercial, 19:442t
Quinacridone Violet pigment for plastics, 7:367t
Quinaglute molecular formula and structure, 5:90t
Quinapril molecular formula and structure, 5:151t
Quinaoline, 5:99
molecular formula and structure, 5:90t
Quiniduran molecular formula and structure, 5:90t
Quinine, 2:74, 94, 97; 6:78
Quinizarin, 9:311–312
derivatives, 9:328–329
QUINO 1,2-Quinones, diene reactions of, 21:256
Quinoid-type chromophoric structures, reactions of, 21:36–37
Quinoline (QI), 12:723, 725–726
soluble dyes, 7:373t
Quinoline-4-carboxylic acids, 21:190
Quinoline derivatives, 21:196–214
Quinoline-derived drugs, 21:197–198t
Quinoline dyes, 21:196
Quinoline, formation of, 21:109. See also Quinolines
Quinoline N-oxide, 21:184, 185
Quinoline Orange colorant for plastics, 7:374t
Quinoline Red colorant for plastics, 7:375t
Quinolines, 21:182–214
alkyl- and aryl-substituted, 21:192
aroma chemicals, 3:260–261
chemical properties of, 21:183
commercially available, 21:194t
economic aspects of, 21:193
manufacture from coal tar, 21:187–193
microwave-assisted synthesis of, 16:579
physical properties of, 21:183
Quinolone, safety of, 21:183–187
reduction of, 21:187
syntheses of, 21:187–193
toxicity of, 21:193–194
typical soluble dye applications, 7:376t
uses for, 21:194–196
Quinolinethiols, 21:200
Quinoline Yellow
colorant for plastics, 7:374t
Quinonic acid, 21:182
synthesis of, 21:185
Quinolinium salts, 21:192
Quinolinols, 21:199
Quinolinones, microwave-assisted
synthesis of, 16:578
Quinolone, safety of, 21:230–231. See also Quinolones
Quinolone antibacterials, 21:215–235
economic aspects of, 21:231–232
mechanism of inhibition by, 21:216–221
modifying, 21:222–223.
structure–activity relationships in, 21:221–228
targets of, 21:216–217
Quinolone–enzyme–DNA complex, 21:221
Quinolone resistance determining region (QRDR), 21:219–220
Quinolones, 3:25
antibacterials, 3:8–9
bacterial resistance mechanisms, 3:32t
development of, 3:6–37
 gyrase inhibition by, 21:217–220
interaction with topoisomerase IV, 21:220
lethality of, 21:221
microwave-assisted synthesis of, 16:578
photochromic materials, 6:594
preparation and manufacture, 3:14–16, 21:228–230
ternary complex with DNA gyrase, 21:219
therapeutic utility, 3:18–19
world market for, 3:16t
Quinone chemistry, tandem reaction
sequence in, 21:250. See also Quinones
Quinone compounds, dye-releasing, 19:293–294
Quinone Diels–Alder chemistry,
regioselectivity in, 21:255
Quinonediimine (QDI), 19:249, 251
in chromogenic chemistry, 19:245–246
Quinone dyes, 9:503
Quinone ketals, anodic oxidation of
hydroquinone ethers to, 21:264
Quinone methides, 2:209–211
Quinone Michael addition chemistry,
21:248–249, 250, 252
Quinone monoacetals, 21:251
Quinone monoamine (QMI), 19:246
Quinone oximes, formation of, 21:260
Quinones, 21:236–270
addition of nucleophiles to, 21:246
benign syntheses of, 21:238
biochemical reactions of, 21:239–242
chemical properties of, 21:239
commercially available, 21:265t
conversion of keto nitriles to, 21:251
dehydrogenation by, 21:242–243
electrochemical relationship of, 21:237
electrophilic addition to, 21:249–250
formation of heterocycles derived from, 21:257
health and safety factors related to, 21:267
manufacture of, 21:265–266
nomenclature related to, 21:236–237
non-benzenoid, 21:238
novel synthetic approaches to the
synthesis of, 21:259
nucleophilic-addition chemistry of, 21:251
nucleophilic substitution reactions of,
21:261–262
as oxidants, 21:242, 243
oxidation of 4-bromophenols to, 21:264
photochromic materials, 6:595
physical properties of, 21:239–262
reactions with aluminum, 2:285
reactions with radicals, 21:252
ring addition of, 21:260
soluble dyes, 7:373t
spectral data and redox potentials for, 21:241t
syntheses of, 21:262–265
synthesis by oxidation, 21:236
with unsaturated side chains, 21:253
uses of, 21:266t
Quinone sesquiterpenes, 21:252–253
Quinone stabilizers, 20:105–106
Quinonoid compounds, 21:237
Quinonoid dienophiles, Diels–Alder
cycloaddition of, 21:254
Quinonoid structure, synthesis of natural products containing, 21:254
Quinonoid systems, oxygen addition to, 21:249
Quinophthalone dyes, 9:262
Quinophthalone pigments, 19:447
Quinophthalones
  typical soluble dye applications, 7:376t
Quinophthalone Yellow
  pigment for plastics, 7:366t
Quinora
  molecular formula and structure, 5:90t
Quinoxalines
  aroma chemicals, 3:261
QUINTUS pressure vessel, 13:410, 411
Quinuclium bromide, 4:359t
Quorn, 11:3–4
Quota sampling, 26:1018
Q value, 14:94
Q vesicant agent, 5:816
  physical properties, 5:817t
Qy process, 21:50
R-103757
  novel potential antihyperlipemic agent, 5:144t
R-11 refrigerant, 21:531
R-123 refrigerant, 21:531
R-134a refrigerant, 21:531
RA $^{226}$Ra, 25:392, 393
RA-4 paper process, in color photography, 19:265
Rabbitfish
  common and scientific names, 3:187t
Rabies vaccine, 5:345t
Rabies virus, 3:137
Rabinowitsch correction, 21:730
Racemic menthol, 24:512–513
Racemization reactions, microwaves in, 16:552–553
Raceway aquaculture systems, 3:193–194
Rack plating, 9:768
Ractopamine, 13:2, 14, 16
Radappertization, 8:655
Radar systems, vitreous silica in, 22:442
Radialene, 21:144
Radial flow impellers, 16:673, 684
  flooding with, 16:701
Radially split multistage pumps, 21:67–68
Radial patternators, 23:194
Radial thrust, 21:83–84
Radial velocity, in hydrocyclones, 22:285
Radiant coil decoking, 10:609
Radiant energy, absorption of, 23:107
Radiant flux, in photocatalysis, 19:80–81
Radiant-heat dryers, 9:136
Radiant heaters, vitreous silica in, 22:440
Radiation
  diffuse reflectance of, 24:110
  effects on silicon, 22:487
  effects on silicon carbide, 22:530
  effects on vitreous silica, 22:433–438
  electromagnetic, 23:125, 128
  in industrial hygiene, 14:221
  initiation through, 14:299–300
  synchrotron, 26:412
  uranium, 25:444
  VDC polymer degradation via, 25:713
Radiation-curable coatings, 10:442
  liquid, 10:438
Radiation-curable epoxy acrylates, 10:450
Radiation cures, silicone network preparation via, 22:567–569
Radiation curing coatings, 7:133–135
  of printing inks, 14:314
Radiation damage, ion implantation and, 14:435–436
Radiation drying coatings, 7:29–30
Radiation effects
  on FEP polymer, 18:310
  on polytetrafluoroethylene, 18:296–297
  on Teflon PFA film, 18:335
Radiation enhanced diffusion (RED), 14:436–437
Radiation exposure standards, at nuclear power facilities, 17:551–554
Radiation furnaces, 12:292–295
Radiation hazards, of niobium, 17:144
Radiation heating, in thermal bonding, 17:511
Radiation hydrogel preparation, 13:731–732
Radiation-induced polymerization
  of acrylic ester monomers, 1:386–387
  of siloxanes, 22:561
Radiation methods, high pressure, 13:429
Radiation monitors, 17:549
Radiation, protection against, 19:701–702
Radiation-resistant glass
  cerium applications, 5:684
Radiation sensitivity, of lithographic resists, 15:155
Radiation shielding
  bismuth alloy applications, 4:12–13
Radiation stability, of ion-exchange resins, 14:403
Radiation thermometers, 24:453
  calibration of, 24:454
  calibration source for, 24:458
Radiation thermometry, uncertainty of, 24:455
Radiative cooling, 23:13–14
Radiative heating/cooling, 23:25–26
Radical catalysts, 14:274
Radical cations, 12:249
Radical chain reactions, 14:274
Radical cyclization approach, 21:147
Radical decomposition reaction, 10:600
Radical generating systems, alternative, 14:299
Radical grafting, 10:206
Radical-induced decompositions, 14:280
  of dialkyl peroxydicarboxates, 14:289
Radical ozone reactions, 17:774
Radical polymerization, 22:40. See also Free-radical polymerization
  controlling, 14:297
  of methacrylic ester polymers, 16:279–290
Radical processes, choice of initiator for, 14:277–278
Radical reactions, 9:376–381
  mediated, 14:297–299
Radicals, 14:274
  reactions of, 14:274
  structure reactivity of, 14:276
Radical scavengers, 3:104–111
  in VDC polymer degradation, 25:716–717
Radical trapping studies, 14:277
Radication, 8:655
Radioactive decay, 21:287–288
  particles associated with, 21:291
Radioactive decay properties
  of uranium isotopes, 25:393
Radioactive emission, interaction with tracer molecules, 21:276
Radioactive iodine, protection from, 14:372–373
Radioactive ions, removal of, 14:423
Radioactive isotopes
  of iodine, 14:373
  labeling probe molecules with, 16:389
Radioactive materials
  as a hazard class, 25:340
Radioactive materials analysis
  of water, 26:45
Radioactive processing wastewater
  treatment, reverse osmosis in, 21:646
Radioactive release, protection of the environment from, 21:279
Radioactive rubidium, 21:823
Radioactive scrap, 21:417
Radioactive tracer manufacture,
  precursors for, 21:273
Radioactive tracers, 21:271–284
  detection and quantitation of,
  21:276–278
  health and safety factors related to,
  21:278–279
  in vitro applications for, 21:281
  product purification and, 21:275
  properties of, 21:272
  radionuclide decomposition and,
  21:275–276
  rate of excretion of, 21:279
  syntheses of, 21:273–275
  uses for, 21:279
Radioactive waste management,
  17:547–551; 25:850–862
  environmental concerns related to,
  25:859–860
  radiation sources and, 25:851–852
  waste disposal in, 25:856–859
  waste storage in, 25:854–855
  waste transport in, 25:855–856
  waste treatment in, 25:853–854
Radioactive wastes
  classification of, 25:851
Radioactivity, 21:285
Radio astronomy, 23:135
Radiochemical ozone generation, 17:801
Radiocontrast media, 14:375
Radio frequency dryers, 9:137–138
Radiofrequency shielding
  bismuth alloy applications, 4:13
Radiographic testing (RT) piping system,
  19:485–486
Radiography
  X-ray, 26:440–441
Radiography, in nondestructive evaluation,
  17:417–418
Radioimmunoassay (RIA), 12:97; 14:135,
  136, 139, 142–143; 21:281
Radioisotopes, 14:142–143; 21:271,
applications for, 21:314–319
decay of, 21:295–296, 313–314, 316t
history of, 21:284–288
naturally occurring, 21:289t
as radioactive waste source, 25:851
of thallium, 24:629
in the 232Th chain, 21:288t
in the 238U chain, 21:287t
Radioisotope separation/purification, molecular sieves in, 16:846
Radioisotope thermoelectric generators (RTGs), 19:669–670
Radiolabeled compounds, microwave-expedited synthesis of, 16:582–583
Radiolysis, of plutonium solutions, 19:694
Radiometric detection technology, 21:271
Radiometric ore sorting, 16:626
Radiometric techniques, for plutonium analysis, 19:699–700
Radiometry, 23:142–143
Radionuclide removal
in municipal water treatment, 26:124–125
Radionuclides, 25:851. See also Radioisotopes
Radioisotopes
activated carbon for adsorption, 4:755
bioremediation of groundwater, 3:785
decay data for, 21:314, 315t
health and safety factors related to, 21:278–279
Radiopharmaceuticals, 18:716–717
Radio wave spectroscopy, 23:129, 135–136
Radio-wave technology, 16:509
Radke–Prausnitz adsorption isotherm, 1:627
Radon (Rn), 1:787
complex salts of, 17:335
physical properties of, 17:350
separation of, 17:362
Radon-220, 17:344
Radon-222, 1:802–803; 17:344, 345
Radon compounds, 17:334–335
Radon fluoride, 17:334–335
RADTRAN code, 25:856
Radurization, 8:655
Radziszewski method, 21:204
Raffinate, 1:61
in hazardous waste management, 25:8223
Raffinose, 4:707
in beets, 23:463
Rail carriers, 25:344
Railroad car material
methods of weighing, 26:247–248
Railroad rails scrap, 21:409
Railroads
aluminum alloy applications, 2:341
Railroad-track scales, 26:244, 246
Railroad transport, 25:324–325
regulated, 25:333
Rainbow trout
aquacultural chemical needs, 3:209
common and scientific names, 3:187t
world aquaculture production in 1996, 3:186t
Rainwater, 22:818
Rakes, in wet classifiers, 22:284
Raloxifene, 2:825
Ralstonia eutropha, PHAsCL in, 20:257–258
Ralstonite, 2:364t
Ralston Purina extruders, 10:850
RAM (reliability, availability, maintainability) performance, 26:1044
Raman, C. V., 21:322
Raman effect, 23:127
Raman microprobe, 16:485–486
Raman optical activity (ROA), 21:328
instrumentation for, 21:325–326
intensity of, 21:323
specialized techniques in, 21:326–328
strengths and weaknesses of, 21:324–325
theory and method of, 21:322–324
uses for, 21:328–329
Raman shifts, 16:485
Raman spectra, 16:486
Raman spectrometer, 21:325–326
Raman spectroscopy, 21:322; 24:72
archaeological materials, 5:743–744
in fine art examination/conservation, 11:402–403
polymer analysis using, 19:565
of silicate solutions, 22:456–457
silver and, 22:640
in wax analysis, 26:225
Ram extrusion, of polytetrafluoroethylene, 18:301
Ramie, 11:287, 292, 294
strength, 5:360–361
supramolecular structure, 5:380
uses of, 11:299t
Ramipril
- molecular formula and structure, 5:151t
Rammelsbergite, 3:263t
Ramming mixes, 21:482, 506
Ramsdellite, 15:582
Ranales
- alkaloids in, 2:75
Rancidity
- in grain lipids, 26:274
- ran-designation, 7:609t
Random cards, 17:502
Random copolyamides, 19:482, 506
Random copolymerization, 20:400
Random copolymers, 18:308; 19:762–763
- classification in terms of monomer sequence distribution, 7:608t
- IUPAC source-based classification, 7:609t
- physical characteristics of, 20:533
- polypropylene, 20:527t, 532–533
Random factor, 20:532
Random free-radical copolymers, 7:638–640
Random gene insertion, 12:453
Randomization, 8:388–389; 10:811–813
- commercial experimental design software compared, 8:398t
Randomly oriented thin film model, 12:16
Random number generators, 26:1002–1003
Random packing
- characteristics, 8:774t
Random propylene copolymers
- Ziegler-Natta catalysts for, 26:536–540
Random scission initiation, 23:372
Random thermal motion, in silicon-based semiconductors, 22:237–238
Random walk process, 26:1022
Raney nickel catalyst, 14:48; 17:121
Raney-type catalysts, 25:195
Range of ambivalence, 16:700
Range quantities, methods for obtaining, 14:432
Range theory, ion implantation and, 14:431–434
Rankine cycle
- efficiency of, 23:232–233
- regenerative, 23:233–234
- thermodynamics of, 23:231–234
Rankine scale, 24:283
Ranking flavor characterization tests, 11:512–513
- Rank, of coal, 6:703, 829
- and aromaticity, 6:714
- and combustion, 6:726
- and geochemical stage of formation, 6:705
Ranunculaceae
- alkaloids in, 2:75
Ranvil
- molecular formula and structure, 5:128t
Raoult’s law, 8:742; 24:683
- predicted deviations based on hydrogen-bonding interactions, 8:814t
Rapeseed oil
- fatty acid composition, 5:56t
Rapid approximate design
- axial dispersion in packed absorbers, 1:62–65
- packed column absorbers, 1:54–55
Rapid expansion of supercritical solutions (RESS) process, 24:17
Rapid filtration
- in water treatment, 26:105
Rapid freezing, 12:82, 83
Rapid granular filters
- operating characteristics of, 26:114t
Rapid hardening hydraulic cement, 5:500t
Rapid mixing methods, 13:419–424
Rapid organic chemistry reactions, 13:419–431
Rapid scanning instruments, advantages of, 14:228
Rapid screening devices, immunosensors as, 14:155–156
Rapid stopping piston, 13:420
Rapid thermal annealing (RTA), in ion implantation, 22:187
Rapid Thermal Decomposition of Solutions (RTDS) process, 6:850
Rapid thermal processing sintering ceramics processing, 5:663
Rare-earth alloys, 23:262
- economic aspects of, 14:645
Rare earth aluminosilicate (REAS) glass microspheres, 12:612
Rare-earth application market, 14:644–645
Rare-earth catalysts, economic aspects of, 14:645
Rare-earth chlorides, 14:643
Rare-earth elements (REEs)
- liquid–liquid extraction of, 14:640–642
- in magnesium ferrosilicons, 22:518
Rare-earth fluorides, 14:643
RAR receptors, 13:627
Rare-earth industry, recycling and disposal in, 14:646–647
Rare-earth ion exchange, 11:680
Rare earth metal coordination compounds, 7:584
Rare-earth metals, 14:635
  economic aspects of, 14:645
  production of, 14:643
Rare-earth ores
  digestion of, 14:638–639
  world production of, 14:638t
Rare-earth oxide (REO), 14:631
Rare-earth products, prices of, 14:646
Rare earths, 14:630, 631t. See also
  Lanthanides; Scandium (Sc);
  Yttrium (Y)
  abundances of, 14:631
  consumption pattern of, 14:644–645
  electrical and nuclear properties of,
  14:652
  electronic structure of, 14:632
  future applications of, 14:652
  hydrogen storage properties of, 14:652
  magnetic properties of, 14:651–652
  in M-type ferrites, 11:83
  optical properties of, 14:650–651
  producers of, 14:646
  separation of, 14:640
  world reserves of, 14:632t
Rare-earth salts, 14:649–650
Rare-earth silicides, 22:519
Rare-earth–transition-metal alloys, 14:643,
  652
Rare-earth vapors, inhalation of, 14:647
Rare gas crudes, concentration of,
  17:358–360
Rare-metal thermocouples, 24:461
RAR receptors, 25:787–789
Raschig process, 13:571, 576, 577–579
  flow sheet for, 13:578
  versus hypochlorite–ketazine processes,
  13:581
  versus peroxide–ketazine process, 13:583
Raschig rings, 1:28; 8:770
  characteristics of ceramic, 1:82t; 8:774t
  characteristics of steel, 1:82t
  as flame arrestors in acetylene piping,
  1:185
  packing parameters, 1:69, 868
  Peclet numbers, 1:63
Sherwood–Holloway constants, 1:66t
Rasortie, 4:133t
Raspberries, citric acid in, 6:632t
Rate constants, 14:609
  azo dye, 9:373
  calculation, 9:372
  isoparaffin, 10:606
  pseudo-first-order, 14:611
Rate expression (rate law), 21:340
  in reactor technology, 21:341
Rate laws, 13:406; 14:609–610
  empirical, 14:624
  experimental verification of, 14:610–611
  flooding and pseudo-first-order
  conditions and, 14:610–611
Rate structures, utility company, 10:159
Rating calculation method, 13:248–249
“Rational protein engineering,” 10:264
Rational drug design, 20:839
Ratio thermometers, 24:457
Ratoon crops, 23:446
Rauzide
  molecular formula and structure, 5:161t
Raw color pigment, 7:359
Raw material availability, plant location
  and, 19:528–529
Raw materials. See also Ocean raw
  materials
  in blast furnaces, 14:508
  costs, 9:533
  in ferroelectric preparation, 11:98
  in polyester manufacture, 20:34–39
  for polyester manufacture, 20:34–39
  prices, 15:644
  in process integration technology,
  20:741–748
  purity, in ethylene oxidation, 10:651–652
  renewable, 24:167–169
  in soap making, 22:732–736
Raw steel, world production of, 23:309–310
Raw sugar, 23:449, 452
Raw water clarification, 11:624
Raw wool
  contaminants in, 26:384
Raxofelast, 2:819
Ray diagram, 23:210
Rayleigh breakup, 11:765
Rayleigh number (Ra), 11:747, 764, 15:687t
Rayleigh scattering, 7:30; 11:132, 133, 15;
  21:32; 23:12
  dispersions, 8:417–7153827
Rayleigh waves, 17:422, 437
Raynaud’s disease
antianginal agents for, 5:111t
Rayon, 4:716; 11:247. See also Regenerated cellulose fibers
alloy, 11:262–263
bleaching, 4:72
bulky, 11:261–262
cellulose II form, 5:376, 377
cuprammonium, 11:263–265
dyeing, 9:171
future of, 11:281
high wet modulus, 11:250
history of, 11:248
inflated–collapsed, 11:261, 262
inflation of, 11:262
polynosic, 11:260–261
production and consumption of, 11:276–277
properties of commercial, 11:270t
pulp purity and, 11:251–252
super inflated, 11:261
Rayon-based carbon fibers, 13:383–384
Rayon cake, 22:863
Rayon fibers, 24:614
RBMK reactor, 17:542–543
rBPI21 protein fragment, 18:257–258
R-curve behavior
ceramics, 5:620
RDX (Royal Demolition eXplosive; hexahydro-1,3,5- trinitro-1,2,3-triazine), 10:735
bioremediation substrate, 3:779–780
molecular structure of, 10:724
Reachable compositions, in separating nonideal liquid mixtures, 22:303–304
Reactant concentration/partial pressure, in photocatalysis, 19:78
Reactant conversion, 21:337–338
effect of residence time on, 25:316
Reactants
molar density of, 25:278, 292
Reactant solutions, mixing methods for, 13:419–424
Reactant transport processes, 9:612–615
Reaction activation parameters, 14:627
Reaction carrier, 14:43
Reaction control, 21:843–846. See also Chemical reactions
Reaction coordinate, 21:337
Reaction dynamics, in kinetic studies, 14:628–629
Reaction engineering, electrochemical, 9:660–663
Reaction feed streams, continuous drying of, 18:522
Reaction furnace
chemistry, 23:604
in hydrogen fluoride manufacture, 14:11–12
Reaction hazard prediction, 21:843
Reaction injection molding (RIM), 19:558–559; 25:456, 476; 26:946
of polyamide plastics, 19:791
Reaction intermediate enzyme inhibitors, 13:299
Reaction invariant composition space, 22:330–331
Reaction kinetics, high pressure cells for, 13:417
Reaction mechanisms, for MOCVD, 22:156–157
Reaction mixtures, addition of organic compounds to, 16:409–411
Reaction pathways, 21:336
Reaction profiles, sulfonation, 23:548–549
Reaction rate constants, pressure variation and, 13:406–407
of solvents, 10:107
Reaction rates, relative, 10:425
Reactions. See also Chemical reactions; Inorganic chemistry reactions; Organic chemistry reactions
hydrogen peroxide, 14:38–39
methods of initiating, 13:422
microfluidic control of, 26:967–968
Reaction schemes/mechanisms, in kinetic studies, 14:623–625
Reaction solvents, in large-scale pharmaceutical synthesis, 18:726–727
Reaction stoichiometry, in large-scale pharmaceutical synthesis, 18:728–729
Reaction system variables, in ethylene oxidation, 10:646
Reaction temperatures
ethylene oxide, 10:642
in large-scale pharmaceutical synthesis, 18:727–728
Reaction thermochemistry studies, before scale up, 19:460–461
Reaction time, in large-scale pharmaceutical synthesis, 18:728
Reaction volume, 13:409
Reaction yields, optimizing, 9:443
Reactive aluminas, 2:405, 408
Reactive azeotropes, 22:331–332
Reactive compatibilization of polymer blends, 20:325–326
Reactive crystallization, 8:135
Reactive deposition, 24:721
antisetting agents and, 9:493–498
development history, 9:463–470
Reactive distillation, 10:481; 20:744–745
heuristics of, 22:334t
for methyl acetate separations system, 22:335–337
antisetting agents and, 9:493–498
development history, 9:463–470
Reactive extrusion (REX), 10:364; 19:540
Reactive fibers, 9:486–489
Reactive flame retardants, 11:474–479
brominated, 11:475–477t
Reactive gases, 13:456
Reactive groups, types of, 9:178
Reactive hot melt butyl sealants, 22:44
Reactive hot melt polyurethanes, 22:37–38
Reactive hot melt silicones, 22:35
Reactive ion-beam etching (RIBE), 22:184
Reactive ion etching (RIE), 20:278; 22:183
of lotus effect surfaces, 22:120
Reactive lead alloys, 14:779
Reactive liquid metal infiltration process, 16:168
Reactive liquid-phase sintering, 5:661
Reactive molecules, oligonucleotides conjugated to, 17:636–637
Reactive organic phosphorus compounds, 11:496–497
in textile finishing, 11:498
Reactive oxygen species and Alzheimer’s disease, 2:818
and antiaging agents, 2:813–814
Reactive phosphate diol oligomer, 11:497
Reactive powder systems, 10:439
Reactive rectification, 24:176
Reactive saturated polyester resins, 12:670
Reactive scheduling, 20:705
Reactive separations, membrane-based, 15:848
Reactive sputtering, 24:733–734
Reactive surface treatment, 15:813t
Reactive systems, 20:741–742
flowsheet generation for, 22:329–337
Reactivity of coal, 6:779–780
of ethylene, 10:593
of fullerenes, 12:234
of polyamide fibers, 19:746
Reactivity ratio, 20:534
for selected toluene reactions, 25:164t
Reactivity tests, 10:425
Reactor configuration, selecting, 21:353–354
Reactor coolant, 17:569
Reactor coolant water as radioactive waste source, 25:852
Reactor design, 20:717–718, 721, 732, 734, 742–744
Reactor diameter
effect of, 25:297–298
Reactor gases commercial gas absorption process for formaldehyde manufacture, 1:26t
Reactor inlet
bulk conditions at, 25:310
Reactor length
effect of, 25:295–296
Reactor linings, materials used as, 14:90t
Reactor operating conditions, selecting, 21:354
Reactors, 14:89. See also Autoclaves airlift, 15:708–709, 713–714
boiling water, 17:578–582
bubble column, 15:708–709
“deep shaft,” 15:713, 714
draft-tube sparged concentric draft-tube airlift, 15:712–713
fast-breeder, 17:585–588
gas–liquid–solid fluidized bed, 15:710–711
performance of, 20:743–744
in plant layout, 19:505–506
pressurized water, 17:573–578
pulsed baffle, 15:709–710
silicon carbide in, 22:541
for spacecraft propulsion, 17:592
special-purpose designs for, 14:91–92
tubular loop, 15:710
types of MOCVD, 22:154–155
in vinyl chloride manufacture by oxychlorination, 25:639–640
Reactor—separator—recycle systems, design of, 20:744
Reactor systems, polyester resin, 20:98
Reactor technology, 21.330–360. See also
  Chemical reactors
classification of reactors, 21:332–335
common practices used in, 21:352–356
diagnostic methods in, 21:355–356
energy balance equation in, 21:347
global rate expression in, 21:345–346
industrial, 21:356, 357
momentum balance equation in,
  21:347–348
nomenclature related to, 21:358
operational considerations in, 21:354
phenomena and concepts related to,
  21:335–348
reactor design equations, 21:348–350
scale-up in, 21:355
species balance equation in, 21:346–347
stoichiometry in, 21:335–338
transport effects in, 21:341–345
Reagent Chemicals—ACS Specifications, in
  fine chemical production, 11:435
Reagent conditioning, in potassium
  chloride refining, 20:617–618
Reagent-grade chemicals
  chromium application, 6:565
Reagent grade sodium nitrite, 22:856, 857t
Reagents
  fluorescence immunoassay, 14:148
  instant photography, 19:274–275
  VDC polymer degradation via, 25:713
Real depth medium, in depth filtration
  theory, 11:338
Realgar, 3:263t
Real-time holography, 17:456
Real-time optimization (RTO), 10:152;
  20:702
Rearrangement reactions, microwaves in,
  16:566–567
Reasonable available control technology, 1:812, 814
Reasonably assured resources (RAR),
  17:519; 25:398
Rebaudioside A, 24:239
Reboilers, 10:153
  in distillation, 22:300–301
  in plant layout, 19:510
Recalciitation, 26:119
Recalcitrant bioremediation target
defined, 3:757t s
  Receiver coil, superconducting, 23:860–861
  Receivers, in refrigeration systems,
    21:539
  Receptor affinity chromatography, 3:847
  Receptor blockers, 5:158
  Receptor design, principles of, 16:769–775
  Receptor purity, in microarray fabrication,
    16:383
  Receptor–substrate binding, 16:774
  Receptor–substrate–host–guest-chemistry,
    16:768–769
RECEPTOR technique, 16:756–757
Receptor topology, 16:774–775
Receptor tyrosine kinases, 20:535
Receptor design, principles of,
  16:769–775
Receptor purity, in microarray fabrication,
  16:383
Recalcination, 26:119
Recalciitation, 26:119
Recognition site mapping, 10:326
Recombinant bovine somatotropin, 13:2
Recombinant CHO cell products
cell culture technologies used for, 5:351
Recombinant cosmid DNA, 12:507
Recombinant DNA, replication of, 12:517
Recombinant DNA techniques, gene
isolation by, 12:500–509
Recombinant DNA technology, 3:816;
12:496–497; 18:717; 20:447
advantages of yeast in, 26:479
Recombinant expression systems,
11:24–25
Recombinant hemoglobin, 4:124, 126
Recombinant hepatitis B vaccine, 25:502
Recombinant organisms
environmental release of, 26:479
Recombinant phage, screening of,
12:506–507
Recombinant plasmid, construction of,
12:501–503, 502
Recombinant proteins, 11:23–24
clinical use of, 12:520
production in transgenic farm animals,
12:464–465
stability and purification of,
12:517
Recombinant selection, 12:517
plasmid vectors for, 12:501
Recombinant technology, 11:11–14
Recombinant therapeutics
cell culture technology product,
5:345–346
Recommended Dietary Allowance (RDA),
17:652; 25:784–787
of ascorbic acid, 25:772
defined, 25:784
for vitamins, 25:785t
Recommended exposure level (REL),
ydrazine, 13:590
Recompression evaporators, in sodium
chloride solution mining, 22:803, 804
Reconfigured Integrated Two-Stage
Liquefaction (RITSI), 6:843
Recontamination prevention technologies,
13:463
Recording media, PPTA film in, 19:735
Record keeping, for market research,
15:635
Record of invention
accurate and complete, 18:171
checklist for, 18:171–172
developing, 18:168–172
elements of, 18:170–172
Records, material specification, 15:752
Recoverable strain, in shape-memory
alloys, 22:345
Recovered toluene
demand for, 25:172
Recovery and purification, in enzyme
production, 10:267–268
Recovery and reuse practices,
9:452–455
Recovery coke oven batteries, pollution
from, 14:524–525
Recovery efficiency, in size separation,
22:278
Recovery furnace, 12:328, 329
Recovery, of silver, 22:653–657
Recrystallization
of sodium chloride (salt), 22:808
of VDC copolymers, 25:702, 703
Rectal drug delivery, 9:46
Rectangular basin clarifier, 22:59, 60
Rectangular multichannels
in microfluidics, 26:961
Rectangular prism lattice, 8:114t
Rectification, in p-i-n junctions, 22:136
Rectification section, 8:750, 755
Rectifiers, 9:618; 22:241
selenium, 22:99–100
silicon carbide in, 22:539
Rectisol process
carbon dioxide recovery from natural
gas, 4:814
Recyclable items
in waste collection, 25:869–870
Recyclable materials, processing, 21:364–
371. See also Recyclables; Recycled
materials; Recycling
Recyclables
commingled, 21:368
separated, 21:368–369
Recycle blacks, 4:787–788
Recycle clarifier, 5:535
Recycle convergence unit, 20:730
Recycled content laws, 21:373t
Recycled glass, 12:596, 607
Recycled materials, world markets for,
21:374
Recycled PET. See also Poly(ethylene
terephthalate) (PET)
economics of, 21:454
food contact with, 21:451
Recycled petroleum products, evaluations of, 21:427
Recycled pulps, bleaching of, 21:51–52
Recycled rubber, 21:784–785
Recycled water, deionization of, 14:423
Recycle heuristics, in separation synthesis algorithm, 22:313, 314t, 316
Recycling, 21:360–376. See also Glass recycling; Metals recycling; Oil recycling; Paper recycling; Plastics recycling; Rubber recycling
of alkaline secondary cells, 3:520
of aluminum, 2:305
of antimony, 3:51
of barium, 3:347
of bismuth, 4:10
of cadmium, 4:487–488, 519
of cemented carbides, 4:657
of chromium, 6:518–519
of commercial asphalt materials, 23:592
of copper, 7:705–708
economic aspects of, 21:371
electronic, 21:364
of gallium, 12:345–346
of germanium, 12:559–560
of gold, 12:698–699
in hazardous waste management, 25:809
of hydrogen, 13:793–796
hydrometallurgical, 21:396–402
hydrothermal, 14:108–111
industrial, 21:361–362
of lead–acid batteries, 3:541
of lead–acid cells, 3:541
in life cycle assessment, 14:815
lime industry, 15:77
of magnesium, 15:349
mechanical and chemical, 21:370–371
of metal, 16:126
of molybdenum, 17:13
of NiCd batteries, 3:520
of phenolic resins, 18:780–781
of plastics, 23:374, 24:169
of polyamide plastics, 19:793–794
of polyester materials, 20:22
of polymers, 20:362
of process water, 10:543
PVC and, 25:679–680
rates of, 21:371–372
of rhenium, 21:695
of scrap, 23:261
of scrap titanium, 24:848, 857
of silver, 22:653–657
solid waste volume reduction via, 25:870–872
of titanium, 24:864–865
of tungsten, 25:370–371
of urethane polymers, 25:478
of vinyl, 25:681–682
waste minimization via, 25:884t
in wastewater treatment, 25:888–902
Recycling programs, economic analysis of, 21:372–374
Recycling regulations, 21:373–374
Red
and blackbody color, 7:327
Red 2B, 19:436
Red blood cells (RBC)
citric acid in, 6:632t
drug delivery via, 18:264
Red–blue–green (RBG) multicolor displays, LEDs in, 22:175
Red brass
in galvanic series, 7:805t
Red cell substitutes, 4:109
“Red Delicious” apples, 13:33, 39
Red drum
aquaculture, 3:183
common and scientific names, 3:187t
enhancement programs in Texas, 3:198
REDEX process, 3:606
Red-figures ceramic techniques, 5:745
Red fuming nitric acid, 17:188
Redingtonite, 6:471t
Red iron oxide(s), 19:397, 398–399
wet preparation of, 19:399
“Redistribution” technology, 19:816
Red Lake C
barium salt, 3:362
pigment for plastics, 7:366t
Red laser diodes, 22:179
Red lead, 14:788
prohibited pigment in anticorrosive coatings, 7:195t
Redledgeite, 6:471t
Redlich-Kwong equation, 13:814
Redox condensation, 16:70
Redox dye releasers, 19:290
chemistry of, 19:317, 318
Redox dye-release systems, 19:292
Redox enzymes, 10:284
Redox initiation, in aqueous dispersion polymerization, 11:197–198
“Redox neutral” atmosphere, 14:84
Redox potentials, of plutonium in acid, 19:693
Redox printing technique, 24:328–329
Redox process, 10:782–785
Redox reactions, 13:444–445
mechanisms of, 13:445–446
organic, 9:569
in sulfide mineral systems, 16:649
Redox titration, 9:585
Red peppers, 23:164, 165
adulteration of, 23:160
heat levels of, 23:159
Red petrolatum cosmetic uv absorber, 7:846t
Red phosphorus, 19:2, 3
health and safety factors related to, 19:16–17
manufacture of, 19:13
screening smoke, 5:829
Red pigments, 7:349
for inks, 14:317–318
Reds
typical applications of inorganic in plastics, 7:372t
typical applications of organic in plastics, 7:368t
typical soluble dye applications, 7:376t
Red seaweed extracts, 13:67, 68
Red selenium, 22:74
Red-sensitive cones, in eye, 7:304, 308
Red swamp crawfish aquaculture, 3:189
common and scientific names, 3:188t
Reduced energy concept, 14:433
Reduced quinolines, synthesis of, 21:193
Reduced SDS electrophoresis, 9:745–746
Reduced sulfur fuel, 18:667
Reducing agents, 9:687, 688–689
Reducing atmospheres, reaction of photoholes with, 19:84–85
Reducing bleaches, 4:63–64
bleaching mechanism, 4:47
Reducing chemistry, in water treatment, 23:222–226
Reducing sugars, determination of, 23:474–475
Reducing treatments, photographic, 19:220–221
Reductase gene
cloning for higher alcohol manufacture, 2:19
Reduction, 14:509–510. See also Redox entries
aldehydes, 2:62–63
aluminum, 2:284
amine oxides, 2:468
amino acids, 2:568
barium, 3:344
benzene, 3:601–602
carbohydrate carbonyl groups, 4:709–710
carbohydrate hydroxyl groups, 4:710–711
carbon dioxide, 4:806
carboxylic acids, 5:42
chloroform, 6:281
citric acid, 6:636–637
dye release by, 19:293–294
electrochromics and, 22:224
of fullerenes, 12:235, 245–246
hydrogen peroxide, 14:42
industrial hard carbides, 4:676–677
lactic acid, 14:116
lanthanide separation after, 14:639–640
maleic anhydride, 15:495–496
reaction with aniline, 2:788–789
in silicon purification, 22:493–494
waste minimization via, 25:884
in wastewater treatment, 25:892t
Reduction bomb reactor, 25:408
Reduction–oxidation (redox) reactions, with MEKP, 20:107
Reduction process, 9:270–273
arylamine dye intermediates obtained
by, 9:272t
pyrometallurgical, 16:136–138
in titanium manufacture, 24:851–854
in vat dyeing, 9:179–180
Reduction reactions
in ironmaking, 14:499–500
microwaves in, 16:572–574
Reduction, reuse, recycle (three R’s), in solid waste management, 25:862–863
Reactions
carbonyl, 13:569–570
diazene, 13:570
hydrazine, 13:569–571
microbial, 16:401–402
sodium borohydride, 13:616–619
Reduction sensitization, in photography, 19:191–192
Reduction smelting, of nonferrous metals, 16:143–144
Reductive alkylation
for lower aliphatic amine manufacture, 2:546
Reductive amination, of carbonyl compounds, 16:573
Reductive bleaching, 21:440
Reductive dechlorination
defined, 3:757t
Reductive dehalogenation
defined, 3:757t
Reductive precipitation, 21:397, 398
Reductive reactions, 9:381
Redundancy
for ammonia plant, 26:996
for reliability, 26:991
Red-violet quinacridone pigments, 19:424
Red wines
extended aging of, 26:320
fermentation of, 26:313, 467–468
phenol content of, 26:304
specific processes for, 26:312
Reed reaction, 23:658
Reeds, 11:287
Reentrant cardiac rhythms, 5:82, 86, 87–88
Reentrant nematic phase, 15:102
Referee methods, of magnesium analysis, 15:348
Reference buffer solutions, 14:25–26
Reference data, standard, 15:747
Reference dose (RfD), 25:238, 239
Reference electrodes, 9:571–574;
14:29–30
Reference electrode–salt bridge combination, 14:29
Reference flow, in life cycle assessment, 14:809
Reference spectra catalogs, 23:140
Reference states, for thermodynamic properties, 24:687–688
Re-fermented wines, 26:301
Refined brown sugars, 23:453
Refined cocoa butter, 6:359
properties and composition, 6:360t
Refined copper, 7:671, 680
Refined ferromanganese, 15:556–557
Refined germanium products, analysis of, 12:559
Refined lead, standard specifications for, 14:762t
Refined selenium, 22:92

Refiners
cane sugar, 23:451–454
hydrogen balance of, 20:745–746
optimization/debottlenecking of, 20:761–762
use of propylene in, 20:782–783
Refiner mechanical pulp (RMP), 18:93; 21:20
Refinery FCC off-gas, 23:330
Refinery gas cleanup, 18:663. See also Petroleum refinery processes
Refinery gases
commercial gas absorption process, 1:26t
Refinery gas streams, as a propylene source, 18:564
Refinery molasses, 23:483
Refinery production, of propylene, 20:776–778
Refinery pump, centerline-mounted, 21:65
Refining. See also Electrorefining;
Purification
glass, 12:596–597
gold, 12:690
hydrogen use in, 13:797–798
milk chocolate, 6:363
of papermaking pulps, 18:102–105
of platinum-group metals, 19:605–612, 636–637
of silicon, 22:492–493, 504–505, 506
in soap making, 22:735
solvent extraction in, 19:609–611
of tin, 24:788–789
Refining catalysts
high throughput experimentation, 7:394–395
Refining centers, location of, 19:528–529
Refining processes
in paper recycling, 21:441
platinum-group metal recovery from, 19:611–612
Refinery product (copper), 7:671
Reflectance, of ODRs, 14:858–859
Reflectance spectrophotometry, 9:232
Reflectance techniques, in infrared spectroscopy, 14:230–232
Reflectancy, 7:305
Reflected light differential interference contrast (DIC), 16:482
Reflection correction algorithms, 24:456
Reflection high-energy electron diffraction (RHEED), 24:74
Reflection indexing
diffraetrometers in, 26:428
Reflectivity. See also Mirrors
  of ODRs, 14:859–860
  of silver, 22:640, 661
  of vitreous silica, 22:431
Reflectometers, 7:325
RefLib database, 6:20
Refudan, 4:100t, 101
Reflux
  in distillation, 8:753–754
Reflux condenser, selenium recovery via, 22:85
Reflux ratio, 8:753–754
  maximum, 8:806
Reformate
catalytic, 25:168
Reformate-based technology, 24:274
Reformatsky reactions, 14:130; 20:605
Reformer feeds
  composition of, 25:168t
Reforming catalyst, 18:658
Reforming, in petroleum refining,
  18:657–658
Reforming technology, steam-activated, 20:779
Reforming units, 25:166
Reformulated gasoline (RFG), 13:773–774,
  18:666
  regulations, 12:417, 418
Reformulated gasoline Blendstock for
  Oxygenated Blending (RBOB), 12:405
  benzene in, 18:566
Refraction phenomena, nonlinear, 17:454
Refractive index (RI), 11:131; 15:187
  of compound semiconductors, 22:150t,
    151
  of fats and oils, 10:822
  of ionic liquids, 26:859, 860t
  of silicon, 22:488–489
  of silicon carbide, 22:526t, 541
  of silicones, 22:600
  in sugar analysis, 23:474
  of Teflon AF, 18:340
  thermoplastic, 10:176
  of vitreous silica, 22:432–433, 434–435
Refractive index contrast, in LEDs, 14:863
Refractive index detectors, liquid
  chromatography, 4:623; 6:387
Refractories, 21:481–522. See also
  Refractory entries
  aluminum industry, 12:765–766
  analytical and test methods for,
    21:511–513
  ASTM classifications and specifications
    for, 21:508–511
  ASTM test methods for, 21:512t
  calcined alumina applications, 2:413–414
  chrome, 21:518
  chromite, 6:491, 493, 495–496, 523
  citric acid application, 6:648
  crushing and grinding, 21:502–503
cupola, 12:765
curing, 21:505–506
  database, 12:602
dolomite, 21:518
drying, 21:505
economic aspects of, 21:506–508
effects of processing conditions on,
  21:514t
electric reduction furnace, 12:765
fireclay, 21:516
firing, 21:505–506
  forming, 21:504–505
  forsterite, 21:518
general properties of, 21:491–502
  health and safety factors related to,
    21:513
  high alumina, 21:518
  information sources for, 15:766
  initial processing of, 21:502
  magnesite, 21:518
  manufacture of, 21:502–506
  mechanical properties of, 21:498
  mixing, 21:503–504
  natural graphite, 12:793–794
  physical forms of, 21:481–483
  reaction temperatures of, 21:517t
  reactions between, 21:516
  reactions with gases, 21:516
  reactions with liquids, 21:515–516
  reheat change in, 21:498–499
  screening, 21:503
  selection and uses of, 21:513–519
  silica, 21:516
  silicon carbide, 21:518–519; 22:539
  special tests for, 21:513
  specialty, 21:506
  specific heat of, 21:500
  spinel, 21:518
  thermal conductivity of, 21:499
  thermal properties of, 21:498
  thermal spalling in, 21:500–502
  thermal strength and stability of,
    21:512–513
  zirconia, 21:519
Refractories industry, nitrides in, 17:219–220
Refractoriness (melting temperature), 21:502
abrasives, 1:4
determining, 21:511–512
Refractory brick/minerals, mean specific heats of, 21:501t
Refractory bricks, 21:481
composition of, 21:496t
physical properties of, 21:495t
Refractory ceramic fibers (RCF), 13:388
coalition, 21:513
Refractory coatings, 21:483
Refractory concrete, 5:467
Refractory furnace linings, 12:300–301
Refractory lime, 15:29
Refractory magnesia, 15:413
Refractory metal alloys, 13:508, 527–530
composition of, 13:528t
Refractory metals, 21:686
in high temperature applications, 13:528
joining, 13:530
Refractory organics, removal from drinking water, 17:806
Refractory products, phosphoric acids in, 18:830
Refractory raw materials, 21:483–491
composition of, 21:484–487t
Refractory sales, U.S., 21:507t
Refractory-wall furnaces, 12:328, 330
Refrigerant–absorbent combinations, 21:525
Refrigerant chemicals, 11:869
Refrigerants, 21:524–533
alternative, 21:530–533
classification of, 21:524–525
effect of lubricating oils on, 21:533
hydrofluorocarbons as, 13:719–723
secondary, 21:525
selecting, 21:533
Refrigerant superheating, 21:543–545
Refrigerated transport, 21:565–566
Refrigerating unit, commercial, 21:544
Refrigeration, 8:40; 21:523–567. See also Refrigerants
Refrigerants; Refrigeration systems
binary, 10:617
carbon dioxide applications, 4:818–819
food, 21:558–566
food preservation by, 12:77–78
methods of, 21:523
uses of, 21:523
Refrigeration industry, 21:559
needs of, 21:523
Refrigeration methods, 8:42–43
Refrigeration Piping, 19:480
Refrigeration systems, 10:151; 21:533–550
absorption, 21:550–552
air-standard, 21:552–554
cascade, 21:547–550
components of, 21:534–540
multistage, 21:545–547
steam jet ejector, 21:554–555
thermoacoustic, 21:556–558
thermoelectric, 21:555–556
vapor–compression, 21:541–545
Refrigeration technology, 21:559
Refrigerator-cooled electromagnet, 23:856
Refuse derived fuel (RDF), 3:689;
21:369–370
definitions of, 21:370t
Regenerated cellulose fibers, 11:246–285. See also Rayon;
Regenerated fibers
alternative solvent routes for, 11:272–274
applications for, 11:250–251
Courtaulds lyocell process for, 11:266–267, 267–269
cuprammonium rayon, 11:263–265
direct dissolution processes for, 11:265–269
economic aspects of, 11:275–278
environmental issues related to, 11:278–280
future of, 11:280–281
history of, 11:246–247, 248–250
lyocell applications, 11:269–272
mercerizing of, 11:253
modified viscose processes for, 11:259–263
production and consumption of, 11:275, 276–278
properties of, 11:274–275
steeping of, 11:252–253
viscose process for, 11:251–263
xanthation of, 11:253–254
Regenerated fibers, 11:164, 165, 174, 247;
24:614, 616. See also Manufactured fibers; Regenerated cellulose fibers
Regenerating chemicals, recycling, 14:412
Regeneration
of carbon adsorption units, 25:813
in ion exchange, 14:410–412
Regeneration temperature adsorbents, 1:590
Regenerative Rankine cycle, 23:233–234
Regenerative thermal oxidizer (RTO), 26:684–685
Regional economic development, role of universities in, 24:371
Regional patent application filings, 18:189–191
Regional wines, 26:301–302
Regioselectivity in \( \alpha \)-olefin insertion, 16:98–99
in hydroboration, 13:642–644
pressure-dependent, 13:439–440
in quinone Diels–Alder chemistry, 21:255
Registration, Evaluation, and Authorization of CHEmicals (REACH) system, 24:193
Registration rights, 25:258–259
Regnault, Victor, 25:628
Regression analysis commercial experimental design software compared, 8:398t
linear, 6:27
locally weighted, 6:53
multivariate linear, 6:32–35
principal component analysis-regression (PCA-PCR), 6:41–47
statistical background, 6:38–39
univariate regression, 6:28–31
Regular color carbon blacks, 4:798t
Regular crystal system, 8:114t
Regular density silica gel, 22:394–395
Regular ferrosilicon, 22:515–516
Regularity, of fiber polymers, 11:174
Regular solution theory, 20:403
Regulated-set cements, 5:492, 500t
Regulation. See also Governmental requirements; Regulations; Safety regulation; Statutes
of automotive emission, 10:31–35
of body salt, 22:812
of clinical use of silver, 22:678–679
of fermentation, 11:46–49
of genetic engineering procedures, 12:520
of Grignard reagents, 12:832
herbicide, 13:282
of high-level radioactive waste disposal, 25:857
of ink production, 14:331–335
of inorganic pigments, 19:413–415
of microorganisms and enzyme products, 10:308–310
of nonnutritive sweeteners, 24:225
pesticide, 13:307
of radioactive waste, 25:852, 853
of radioactive waste transport, 25:855
of transportation service, 25:323
of vinyl chloride, 25:649–650
of wastewater treatment, 25:917–918
of wine, 26:328–331
Regulation for the Management of Extremely Hazardous Substances Act (Delaware), 21:831
Regulations. See also Biotechnology regulation; Drug regulation;
Environmental regulations; Laws;
Legislation; Pesticide regulations;
Regulation; Safety regulations;
Tamper-resistant packaging regulations
electroless deposition, 9:720–721
environmental and health, 15:256–258
environmental impact assessment, 10:231–232
ester-related, 10:513–514
ferrous scrap, 21:415–417
flavoring-related, 11:581–582
food additive, 12:33–38
food processing, 12:75
fragrance-related, 18:388–389
hydrogen-related, 13:797
incinerator, 13:173, 182–185
on industrial ketones, 14:582t
ink industry, 14:332–334
interstate and intrastate transportation, 25:330–331
mercury-related, 16:45–47
methyl chloride, 16:326
methylamine, 16:363
methylene chloride, 16:377–378
minerals recovery/processing, 16:609
nitrobenzene processing, 17:256
packaging and shipping, 18:2–4
plasma fractionation, 12:150
recycled petroleum product, 21:427
recycling, 21:373–374, 379
scrap-tire, 21:462
solvent-related, 23:120–121
versus laws, 21:569–570
weighing-related, 26:237–238
Regulators, 20:667
Regulatory agencies, 21:568–597
chemical process industry, 21:580–590
U.S. Food and Drug Administration, 21:571–580
Regulatory guidelines
for combination vaccines, 25:505
Regulatory initiatives, emissions-related, 24:263
Regulatory materials standards, 15:742
Regulatory policy, pesticide-related, 18:536–543
Regulatory requirements
for nuclear power facilities,
personnel familiarity with, 24:346
for the petrochemicals industry, 24:262
Regulatory risk assessments, 25:236
Regulatory sector, ink industry and, 14:334–335
Regulatory systems, environmental impact assessment, 10:232–233
Rehalogenating bleaches, 19:261
“Reheat” blow-molding process, 20:47
Rehm-Weller equation, 19:112
Rehydration bonded alumina, 2:395, 396–397
Reichardt’s dye, 26:854
Reichert cone, 16:632
Reich process, 4:810
Reichstein-Grüssner synthesis, 16:401
of ascorbic acid, 25:752–753, 754, 755–758, 782
Reich test, 23:665
Reid vapor pressure (RVP), 12:396; 26:720
Reimer-Tiemann reaction, 6:236
of salicylic acid, 22:5
Reinforced composites
flax fiber in, 11:594
silylating agents and, 22:701–703
Reinforced plastics, 26:750–751
asbestos applications, 3:311
Reinforced polyester composites, 20:114
Reinforced reaction injection molding (RRIM), 25:456
Reinforcement
in polyamide plastic manufacture,
theories of, 26:775–783
Reinforcement materials
aramid fibers as, 26:760s
carbon fibers as, 26:758–760
glass fibers as, 26:757–758
Reinforcements
using composite materials,
26:756–761
Reinforcing agents, adding to polyamide plastics, 19:780–781
Reinforcing blacks, 21:775
Reinforcing fillers, for silicone networks, 22:570, 571
Reinforcing materials, 10:455t
Reissert compounds, 21:185, 186, 201
Reissert-Henze reaction, 21:99
Relationships, as an aspect of the technical service function, 24:348
“Relative abundance,” 15:648, 649–650
Relative atomic ratios, determination of, 24:93–94
Relative humidity (RH), 9:97. See also Humidity in fine art examination/conservation, 11:407–408
Relative motion, interacting surfaces in, 15:202–204
Relative resolution, 24:103
Relative temperature scale, 24:283
Relative velocity, between cores and electrons, 23:824
Relative viscosity, 21:710, 715–716
Relaxation fabric shrinkage, 26:390
Relaxation, in wet fiber spinning, 11:208–209
Relaxation methods, 14:614
high pressure, 13:424–429
Relaxation shrinkage tests, 26:390–391
Relaxed filtration oil muds, 9:5
Relaxor ferroelectrics, 11:105–106
properties of, 11:105t
Release agents, 21:598–609
classification of, 21:598, 600, 601t
economic aspects of, 21:604–605
in food, 12:66
health and safety concerns related to, 21:599, 605
mechanism of, 21:600–604
product types and requirements, 21:598–600
residue buildup from, 21:599
suppliers of, 21:599
uses for, 21:598, 605–608
Release prevention barriers (RPBs), 24:311–312
Release substrates, surface tensions of, 21:603t
Reliability, 26:980–998
   in ammonia plant example, 26:981, 994–997
   analysis for, 26:981, 984–986
   basic concepts, 26:981–983
   defined, 26:982
   engineering for, 26:981, 990–992
   management for, 26:981, 992–994
   modeling for, 26:981, 986–990
   need for, 26:980–981
   sampling techniques for, 26:1044–1045
   science of, 26:981, 983–984
   Reliability block diagram (RBD), 26:986
   for ammonia plant, 26:994
   Reliability centered maintenance (RCM), 15:466, 476–477; 26:992
   Reliability functions, 13:166
   Reliability index, 26:1044
   Reliability programs, 26:993
   Reliability science, 26:981, 983–984
   Reliability theory, 26:983
   Relief annealed copper alloys, 7:723t
   Relief devices, 21:850–851
   Relief valves, 19:476
   Remomycin, 15:290
   Reluctance, 20:653, 654
   Reluctive pressure transducers, 20:653–654
   Remalan dyes, 9:468
   Remalan Fast dyes, 9:464
   Remanence, of M-type ferrites, 11:69–70
   Remazol dyes, 9:467, 468, 472–473, 474, 475
   Remicade, 2:824
   cell culture technology product, 5:346t
   market, 5:356
   Remivox
   molecular formula and structure, 5:92t
   Remote atmospheric sensing, 23:136
   Remote Sensing Chemical Agent Alarm, 5:832
   Remsen–Fahlberg saccharin process, 24:235
   Rendering, of fats, 10:817
   Renese
   molecular formula and structure, 5:163t
   Renewable energy sources, 24:166–167
   Renewable feedstocks, 12:804–805
   Renewable freshwater
   human appropriation of, 26:3–4
   Renewable raw materials, 24:167–169
   Renewable resources, 9:153; 12:812
   Renin, 5:158
   Renin–angiotensin system, 5:148, 158
   Renin inhibitors, 5:158–159
   Rennets, 10:296
   Rennin, 12:64
   Reocorin
   molecular formula and structure, 5:120t
   ReoPro, 4:104t; 5:173
   cell culture technology product, 5:345, 346t
   molecular formula and structure, 5:171t
   Reorganization/preorganization, in
   molecular recognition, 16:770–774
   Reoviruses, 3:137
   Reoxidation reactions, 14:522
   Repairable components
   in reliability modeling, 26:989
   Repairs, short, 15:465
   Repeat action drug delivery systems, 18:712
   Repeat length, of fiber polymers, 11:175
   “Replication-defective” retroviral vectors, 12:457
   Replication factor, polypropylene, 20:528–529
   Repolarization, in cardiac
   electrophysiology, 5:81–82
   Reportable quantity (RQ), of propylene oxide, 20:809
   Reports
   oral and written, 15:637
   purchasing-research, 15:644
   in research partnerships, 24:390
   Repowering, 6:829
   Reppe chemicals, 13:694
   Reppe chemistry, 5:4
   Reppe polymerization of acetylene, 17:113
   Reppe process, 1:355–357; 16:73
   Repressor proteins, 20:832
   Reprocessing
   of lubricants, 15:259
   of spent nuclear fuel, 25:854
   of thermoplastic elastomers, 24:718
   Reprocessing plants, nuclear, 17:547
   Reproduction materials, organic
   semiconductors used in, 22:223
   Reproductive-hazard materials, 21:837
   Reproductively toxic solvents, 23:113
   Reproductive toxicity, 25:208
   lead-related, 14:765
   Reproductive toxicology tests, 25:219
   Repulsion barrier, flocculation and, 22:55
Repulsion, in solvent-solute interactions, 23:93–94
Repulsive interactions, in foams, 12:4
Request for Proposal (RFP) policy, 24:386
Required net positive suction head (NPSHR), 21:62, 85
Rerefining, of lubricants, 15:259
Research, See also Discovery research;
  Marketing research; Market research
  biomedical, 12:466–467
  in the fragrance industry, 18:380–387
  fuel cell, 19:627–628
  global competition in, 21:616
  herbicide developmental, 13:294
  invention-related, 18:167–168
  olfaction, 18:383–384
  polycarbonate, 19:798
  purchasing, 15:643–645
  rubidium use in, 21:823
  on supercritical fluids, 24:2
  in vanadium use, 25:526
  on Ziegler-Natta catalysts, 26:545
Research and development (R&D), 24:359
  of advanced materials, 1:694–696
  context, 21:610–614
  creativity in, 21:620–621
  critical roles in, 21:618–619
  expenditures for, 21:611–612
  geographically dispersed, 21:616
  global importance of, 21:609
  impact on organizations, 21:617–618
  impact on people, 21:617
  industrial, 24:363
  modern, 21:629
  related to fine chemicals, 11:425–426
  in sensor technology, 22:265–266
  turbulence and complexity of, 21:614–618
Research and development leaders
  challenges facing, 21:613–614
  hallmarks of, 21:621
  pressures on, 21:617
  technology strategy and, 21:622–623
Research and development management, 21:609–631
  critical nature of, 21:614
  organizational-level aspects of, 21:622–629
  people in, 21:618–622
Research and development programs/projects, 21:628–629
Research and development unit, 21:166–167
Research and Special Programs
  Administration (DOT), 18:2
  Research and training reactors, 17:593–594
Research collaborations
  benefits of, 24:359–360
  compensation in, 24:374–375
  confidentiality in, 24:375–376
Research deadlines, meeting, 24:384
Research electromagnets, 23:854–855
Research fields, liquid crystals in, 15:117
Research function, technical service and, 24:340
Research initiatives, competitive
  advantage from, 24:393
Research Institute for Fragrance Materials (RIFM), 18:388
Research management
  sampling techniques for, 26:1045
Research Octane Number (RON), 12:393, 394–395; 18:565, 665
Research partnerships
  accountability mechanisms of, 24:389–390
  managing, 24:387–389
  role of corporations in facilitating, 24:384–391
  university facilitation of, 24:380–384
Research partners, selecting, 24:386
Research reactor neutrons, uses for, 17:566
Reserpine, 2:94, 96
  antihypertensive agent, 5:159–160
  economic aspects, 2:107–108
  molecular formula and structure, 5:155t
Reserve batteries, 3:467–468
  defined, 3:409
Reservoir designs, heat pipe, 13:236
Reservoir drug delivery systems, 9:77
Reservoir insulin delivery systems, 9:69
Reservoirs
  aquaculture systems, 3:191
Residence time, 26:18
  in thermal waste treatment, 25:832
  oceanic, 26:20, 21
Residential exposure, pesticide registration
  requirements for, 18:549–550
Resident time distribution (RTD), in reactors, 21:355–356
Residual property, 24:659
Resin transfer molding (RTM) 801

Residual radiation, from nuclear power facilities, 17:553–554
Residual stress/strain measurement
diffraction in, 26:428–430
Residual thermal stresses
ceramics, 5:632–633
Residue chemistry, pesticide registration
requirements for, 18:544–545
Residue curve maps (RCM), 8:790–793;
22:302, 303
in separation synthesis algorithm,
22:312
in transformed coordinates, 22:332
Residue curves, 22:304
Residues, pesticide, 14:337
Resilience/resiliency
of cotton, 8:26–27
of fibers, 11:181, 183–184
of olefin fibers, 11:227–228
Resin(s)
fillers and aggregates in, 20:117
flame-retardant, 20:104
melt viscosity of, 20:199
ortho-phthalic, 20:102, 113
unsaturated polyester, 20:95
Resin additives, to paper packaging, 18:16
Resin applications, furan derivatives in,
12:280
Resin bed regeneration, in water softening,
22:819
Resin binders, 17:477
for abrasives, 1:13–14
Resin-bonded refractories, 21:503–504
Resin bonding, 17:508
Resin cements, 12:746
Resin components, 10:385
Resin composite restorative materials,
8:333–335
Resin density, 20:159
Resin dental cements, 8:287–288
classification and composition, 8:284t
Resin-hardener networks, 10:416
Resin-impregnated glass rovings, 20:117
Resin-impregnated wood, 26:355–356
Resin-in-pulp (RIP) systems, 14:407–408,
422
Resin-in-pulp process, 16:155
Resinite, 6:707t
Resin-modified glass–ionomer dental
cements, 8:283
classification and composition, 8:279t
Resinoid grinding wheels, 1:18–19, 21
Resinous adducts, 10:394
Resinous odor, 3:229t
Resins. See also Epoxy resins; Lacquer
resins; Novolac resins; Phenolic resins;
Resole resins; Thermoplastic resins
acidic cation-exchange, 12:191
advanced materials, 1:693
antilipemic agents, 5:141
aromatic glycidyl amine, 10:372–373
chromatographic, 14:383–384
for coatings, 7:95–107
derived from furfuryl alcohol, 12:271–272
dispersion, 18:302
embedding, 10:7
fiber bonding, 18:791–792
filled, 18:292, 296
fine powder, 18:292, 301–302
for flexo and gravure ink, 14:322
for flexographic and rotogravure ink
vehicles, 14:323t
from butadiene, 4:375–377, 384t
functional groups of, 14:384
furfural, 12:269
granular, 18:291–292
hydrocarbon use in, 13:689–690
ion-exchange, 14:381–384
juice softening with, 23:463
Lexan, 19:802
manufacture of, 14:384–391
melamine, 15:773–796
particle shape and size of, 14:391–393
permanent wet-strength, 18:115–116
phenoxy, 10:364–365
polynuclear phenol glycidyl ether
derived, 10:371–372
properties and applications of silicone,
22:586–590
for protecting art, 11:410
shrinking and swelling of, 14:402
simulated moving bed (SMB) liquid
ad sorption processes, 1:669, 674
styrenic, 24:714
thermosetting, 22:70
unsubstituted heat-reactive, 18:782
use in polymers, 14:711
widely used support materials, 5:324t
Resin solubilizers
alkanolamines from nitro alcohols,
2:119
Resin transfer molding (RTM), 19:559;
20:117; 26:767, 771
Resistance
exponents of dimensions, 8:585t
Resistance furnaces, 12:287–297
  batch furnaces, 12:288–289
  conduction furnaces, 12:295–296
  continuous furnaces, 12:289–290
  direct-heat electric-resistance furnaces, 12:296–297
  low-temperature convection furnaces, 12:291–292
  radiation furnaces, 12:292–295
Resistance–temperature characteristics, 24:448–450
Resistance temperature detectors (RTD), 11:783; 20:680, 24:447
for fermentation, 11:38
Resistance thermometry, accurate, 24:446–447
Resistance, to filtration, 11:333–335
Resistance welding
copper wrought alloys, 7:747–748
Resistazone counters, in particle counting, 18:149–150
Resist feature dimensions, 15:185
Resistive dc electromagnets, 23:854
Resistivity
  in electrostatic precipitators, 26:704–705
  of SiC-ceramic, 22:536
  of silicon, 22:485–487
  of silicon carbide, 22:528–530
Resistively and capacitively shunted junctions (RCSJ), 23:821
Resist limits of extendibility, 15:181–186
Resist line edge roughness (LER), random fluctuation in, 15:183–185
Resist materials
  for imaging with ionizing radiation, 15:158–160
  historical development of, 15:156–160
  organic semiconductors used in, 22:223
Resist optical properties, 15:163–165
Resist printing, 9:219–220
Resists
  deep-ultraviolet chemically amplified, 15:163–181
  epoxies used in, 10:449–450
  for microlithography, 15:161–161
Resist sensitivities, specified, 15:181
Resist surface, contamination of, 15:174
Resole dispersions, 18:769
Resole resins, 18:766. See also Resoles; Resole- type phenolic resins
curing, 18:771
in fiber bonding, 18:791
methylene group distribution in, 18:765t
physical properties of, 18:764–765
Resoles
  decomposition of, 18:772–773
  production of, 18:768
Resole-type phenolic resins, 18:762–765
Resolution, 23:131
  atomic force microscopy, 3:324–325
  chromatography, 4:606
  defined, 16:473
  inadequate, 23:132
  in microscopy, 16:471–474
  photographic, 19:222
  techniques for improving, 16:474–487
Resonance enhanced multiphoton ionization
  application in combinatorial chemistry, 7:404
Resonance Raman scattering, 21:326–327
Resonance stabilization of benzene, 3:599
Resonance theory, 20:774
Resonant cavity, 14:851
Resonant-cavity enhanced structures, 14:848–856
Resonant-cavity light-emitting diodes (RCLEDs), 14:832, 847, 849, 854, 856;
22:175–176. See also Light-emitting diodes (LEDs)
Resonant tunneling diodes (RTDs), 22:170–171
  compound semiconductors in, 22:160
  electron tunneling in, 22:169
Resorcinarenes, 24:50
Resorcinol
  in antiacne preparations, 7:844
  from benzene, 3:620
  intermediate used in oxidation hair dyes, 7:858t
  sol–gel polymerization with resorcinol, 1:751–752
Resorcinol acetate
  in antiacne preparations, 7:844
Resorcylic acid lactone, 13:5
anthropogenic silicas and silicates and, 22:467–468
chromium and, 6:515–516
coal gasification and, 6:812
environmental limits on silver in, 22:653
ink regulation under, 14:333
omnibus authority of, 13:184–185
Resources, 24:197
conservation and management of, 24:163, 164–167
efficient use of, 24:162
exploitation of, 24:188
Resource sharing, 10:165
Resource stewardship, 10:158
Resox process, 23:657
Respiration
in biodegradation, 25:836
Respiratory effects
of isocyanates, 25:479
from nickel compounds, 17:120
Respiratory function, oxygen in, 17:764
Respiratory infections
indoor air pollution can cause, 1:817
Respiratory metabolism
in yeasts, 26:454–455
Respiratory pathogens, resistance to sulfonamides, 23:504–505
Respiratory problems
from PVC, 25:676–677
Respiratory protection, 21:838
Respiratory syncitial virus (RSV), 3:137
inhibitors, 23:723, 725
vaccine, 25:498
Respiratory tract irritation
in spas/hot tubs, 26:197–198
Response surface designs, 8:396–397
amount of coverage in experimental design texts compared, 8:395t
Response variables, 8:391
multiple, 8:403
Responsible Care: A Public Commitment initiative, 21:831, 24:197
Responsible Care companies, 19:414
Responsible Care initiatives, 24:163, 25:337
Responsible Care program, 12:808; 14:204; 24:192
Responsive copolymers, 20:487–489
Restenosis, 9:82
Restoration
of vitamin C, 25:765
Restriction endonucleases, sequence specificities of, 12:498t
Restriction enzymes, sequence-dependent cleavage of DNA by, 12:497–498
Restriction fragment linked polymorphism (RFLP), 12:500
procedure, 12:103–104
Restriction sites, as genetic markers, 12:500
Retail scales, 26:243–245
“Retarding” ion, 14:640
Retardation factors (Rf values), 12:97
Retardation, inclusion compounds in, 14:183
Retarders
for cement, 5:485
vulcanization, 21:800
Retarding agents, 9:193
Retention aid polymers, 20:487–489
Retention aids, 11:624
in paper manufacture, 18:117
Retention factor, in chromatography, 4:603–604; 6:410
Retention time, in chromatography, 6:374–375, 409–410
(−)-Reticuline, 2:90
Retina, 7:307–308
Retinal, 25:787. See also Vitamin A carotenes and, 25:790
Retinitis pigmentosa, 17:659
Retinoic acid, 25:787–789, 790. See also Vitamin A receptors, 25:787–789
Retinoid-based drugs, 25:789–790
Retinol, 24:558; 25:787. See also Vitamin A trans-Retinoic acid
in skin aging products, 7:843
Retort bullion, cupellation of, 14:753
Retorts, mercury, 16:37
Retreat curve impeller, 16:672
Retro-cycloaddition reaction, 21:143
Retro-Diels–Alder reaction, 21:142–143
Retro-Diels–Alder strategy, 21:148
Retro-ene reactions, 21:150
Retrofit (revamp) design, 20:724
Retrofit (revamp) design, 20:724
Retrofitting, 6:829
Retrogradation, 20:452
Retrograde behavior, of supercritical fluids, 24:5–6
Retroreflectors, vitreous silica in, 22:444
Retroviral infection, of oocytes and embryos, 12:457
Retroviruses, 3:136
Retting, 5:367; 11:291
of flax fiber, 11:596–597, 602–610
improved, 11:618
Retting pits, 11:603–604
Return-on-investment (ROI), 9:546;
15:640–641
Return on sales (ROS), 15:640–641
Reusable drums, thickness requirements for, 18:8t
Reuse
of industrial by-products, 25:870,
874–875
waste minimization via, 25:884–885
Reutlingen Steam Explosion Treatment,
11:608
Revenue estimation, 9:534–535
Reverberatory furnace, 14:522, 759; 15:343;
16:144; 21:390–391
in tin refining, 24:788
Reversal films, 19:262–263
Reversal imaging, 19:201
Reverse-air bag filters, 26:709
Reverse cleaners, in paper recycling,
21:439
Reverse cleaning, 9:783
Reverse combustion, in enhanced oil recovery, 18:631
Reverse deionization, 14:405
Reversed-phase chromatography, 3:840–843
Reversed phase liquid chromatography, 4:624; 6:384, 453–454
antibody based columns with, 6:401
Reversed-phase process chromatography, 3:842–843
Reverse ester exchange reaction, 20:44
Reverse flow, cake dislodging by, 11:382
Reverse flow manifolds, 13:271
numerical results related to, 13:273
Reverse genetics, 26:481, 492
Reverse osmosis (RO), 15:824; 21:632–681; 26:59. See also Nanofiltration
applications of, 21:643–651; 26:79–80
for arsenic removal, 3:280t
composite fibers in, 16:14
concentration polarization and, 21:641–642
costs associated with, 21:666–667
in desalination, 21:648–650
design and economic considerations related to, 21:665–673
dispersant applications, 8:689
drinking water treatment using, 21:647
electroplating and metal-finishing
process wastewater treatment using, 21:645–646
in food and beverage processing,
21:650–651
in hazardous waste management,
25:817–818
hollow-fiber membrane modules for, 15:823
leachate treatment using, 21:646–647
measurable process parameters in,
21:637–638
membrane cleaning methods in, 21:665t
membrane fouling and, 21:662–665
membrane technology in, 15:834–836
in municipal wastewater treatment,
21:647–648
nomenclature associated with,
21:674–676
organic separations from aqueous streams, 21:656–661
in radioactive processing wastewater
treatment, 21:646
theoretical aspects of, 21:636–641
for ultrapure water, 21:650
versus membrane filtration, 26:113t
in wastewater treatment, 21:645;
25:899t, 890–891
in water treatment, 26:114
Reverse osmosis effluent treatment, 9:432
Reverse osmosis elements
nominal performance and test conditions of, 26:76t
Reverse osmosis materials/modules,
21:632–636
Reverse osmosis membrane process, 21:637
Reverse osmosis membrane cleaning
citric acid application, 6:647
Reverse-osmosis membranes, 15:811, 825
development of, 15:797
Reverse osmosis models, 21:638–639
Reverse osmosis permeators, 16:19
Reverse osmosis seawater desalination
process, 26:85
Reverse osmosis systems
blending in, 26:80–81
brackish and nanofiltration, 26:80–83
Reverse osmosis technology
advancements in, 21:667–673
in water desalination, 26:73–80
Reverse osmosis variables, study of, 21:642–643
Reverse pluronics, 24:151
Reverse-roll coaters, 7:12–13
method summarized, 7:5t
shear rates, 7:32t
Reverse saturable absorption, 17:457
Reverse sizing, in paper manufacture, 18:111
Reverse transcriptase, 21:281
Reverse water-gas shift reactions, 5:14–15
Reversible addition-fragmentation chain transfer (RAFT), 7:621, 623
Reversible addition-fragmentation chain transfer (RAFT) polymerization, 20:442–443, 491
Reversible enzyme inhibition, 10:256, 318
Reversible heterogeneous catalytic reactions, 25:312
Reversible hydrogenase-based biophotolysis, 13:849
Reversible perturbation reactions, 14:617
Reversible process, 24:650
Reversible superconducting region, 23:818
Reversible toxicity, 25:203
Revert titanium, recycling of, 24:848, 857
Review activities, EIA, 10:237
Rexfroam, commercial defoamer, 8:241t
Rexillum III
composition of alloy for crowns and bridges, 8:311t
Reynaud’s reaction, 10:575
Rhenium compounds, discovery and production history of, 21:693–695
chemical properties of, 21:685–686
coke formation on, 5:268–269
costs associated with, 21:691–693
disposal and production history of, 21:681–683
economic aspects of, 21:691–693
effect on copper resistivity, 7:676t
grades and specification, 21:693
health and safety factors related to, 21:684–685, 695
manufacturing and production of, 21:688–689
occurrence of, 21:682, 683–684
physical properties of, 21:686t
properties of, 21:684–687
recycling and disposal of, 21:695
shipping, 21:690–691
sources and supply of, 21:687–688
uses for, 21:695–697
Rhenium(VI) oxide
conducting oxide, 5:585
Rhenium-185, 21:684
Rhenium-187, 21:684
Rhenium alkyls, 21:700
Rhenium alloys, 21:686
Rhenium-bearing petroleum reforming catalysts, 21:688, 691
Rhenium carbonyls, 16:66; 21:697–699
Rhenium compounds, 21:681–701
health and safety factors related to, 21:700
Rhenium halides, 21:699–700
Rhenium hydrides, 21:700
Rhenium imports, U.S., 21:688t
Rhenium oxides, 21:699
Rhenium powder, 21:688, 689, 690, 693
specifications for, 21:694t
Rhenium sulfides, 21:699
Rheological measurements, 21:702–758
  techniques in, 21:739–747
  viscometers, 21:725–739
Rheological oscillation experiments, 12:16–17
Rheological properties, See also Rheology of dry foams, 12:16
  of embedding materials, 10:10
  of encapsulants, 10:12–13
  of linear low density polyethylene, 20:204–205
  of molten polymer blends, 20:356–357
  of polyester polymers, 20:4
  of polymer colloids, 20:384–386
  of solvent-containing systems, 23:99–101
  of thermoplastics, 10:178
Rheological testing, of emulsions, 10:128
Rheology, 21:702–758. See also
  Electrorheological (ER) materials;
  Magnetorheological (MR) materials
  ABS, 1:416
  acrylamide polymers, 1:309–311
  of aqueous solutions, 20:440
  coating film formation, 7:83–84
  coating processes, 7:31–33
  colloids, 7:279–281
  dispersions, 8:726–730
  elasticity and viscoelasticity, 21:719–725
  of filled polymers, 11:306–307
  of foams, 12:15–18
  of high density polyethylene, 20:160–162
  of higher olefin polymers, 20:427
  of latex, 14:709–710
  of linear low density polyethylene, 20:199
  of polysaccharide solutions and gels, 20:554–555
  practical, 21:747–748
  of printing inks, 14:315–316
  of silk, 22:631
  viscosity and, 21:702–719
  of water-soluble polymers, 20:439–441
Rheomalous flow, 7:280t
Rheometers
  commercial, 12:18–19
  self-sensing in, 21:737
Rheometric Melt Elongational (RME)
  Rheometer, 21:741
Rheoplectic flow, 7:280t
Rheoplectic fluids, 11:769
Rheopexy, 8:729; 21:707
Rheo-Tex rheometer, 21:743
Rheozan, 20:576
Rhizobacteria, deleterious, 13:349
Rhizobitoxine, 13:300
Rhizobium–legume associations, in
  nitrogen fixation, 17:296–298
Rhizofiltration, 3:783–784
  defined, 3:759t
Rhizopus nigricans, 11:4, 9
Rhizosphere
  defined, 3:757t
RHO Δ-alumina, 2:394–395
Rhodacarborane catalysts, 4:217–218
Rhodamine B
  aquaculture in U.S., 3:213t
  color, 7:332
  water treatment compound for
Rhodamine reds, 14:317
Rhodamine dyes, 20:506
Rhodium, 19:598. See also Platinum–
  rhodium thermocouple
coke formation on, 5:265, 266
medical applications of, 19:629
NO adsorption and, 10:49
separation of, 19:637
sources and production of, 19:603
supply and demand for, 19:615t
supported catalyst complexes, 5:341
thermal degradation of catalysts, 5:272
uses for, 19:617
Rhodium(II) acetate, 19:647
Rhodium-based poly(alkane oxide)s, as
  smart materials, 22:720
Rhodium bromide
  physical properties of, 4:329
Rhodium carbonyl hydrotreated(triphenylphos-
  phine), 7:595
Rhodium compounds, 19:644–648
  synthesis of, 19:646
  uses for, 19:646–648
Rhodium oxide, 10:42
Rhodium plating, 9:822; 19:648
Rhodium–platinum alloys, 19:602
Rhodochrosite, 15:540
Rhodochrosite ore, 15:589
Rhodococcus, as a host system for gene
  expression, 12:478
Rhodonite, 15:540
  color, 7:331
Rhodopsin, 9:512
Rhoeadine, 2:90
Rhoeales
  alkaloids in, 2:75
Rhombic prism lattice, 8:114t
Rhombohedral structure, of ferroelectric crystals, 11:95, 96
Rhombohedron lattice, 8:114t
Rhombooidal symmetry, 8:114t
Rhine–Poulenc process, 24:482, 485
Rhnovanil extra pure vanillin, 25:548t, 549–550
Rhnovanil fine mesh vanillin, 25:550, 552
Rhnovanil free flow vanillin, 25:550
Ribbon silicon, 23:40–41
Ribbon Thermal Shock Test, 21:513
Ribbon-type mixers, 16:719–720
in bar soap manufacture, 22:751
Riboavin, 25:796–797
Ribonucleic acid probes, 14:153
Ribonucleic acids (RNAs), 12:449; 17:602–603; 20:447. See also RNA entries
messenger and transfer, 20:824
noncovalent labeling of, 20:519
structure and function of, 17:613–621
techniques for labeling, 21:281–282
Ribonucleotide reductase, 14:556
Ribonucleotide synthesis, 17:625–626
RIBOS d-Ribose, 4:698
Ribosomal RNAs (rRNA), 17:614
in yeasts, 26:449
Ribosome chemistry, developments in, 17:736
Ribosomes, 3:30
Riboswitches, 17:621
Ribozyme Pharmaceutical–University of Colorado partnership, 24:390, 399–400
catalysis by, 17:619
Ricard–Allenet four-column sequence, 8:832
Ricard–Allenet three-column sequence, 8:832
Rice, 26:284–286
origin of, 26:266
parboiling of, 26:285–286
processing of, 26:285
Rice bran, in soap making, 22:735
Rice bran oil, 26:211
cosmetically useful lipid, 7:833t
Rice hulls
as biomass, 3:684
Rice milling, 26:285
Rice-producing countries, 26:284
Rice starch
powder used in cosmetics, 7:841t
Rice starch, 4:724t
Richardson and Zaki equation, 22:54
Richardson number, 11:747
Richardson-Zaki correlation, 11:797
Rich loading values, 23:600
Richterite, 3:289
Ricin, 5:822
Ricinelaidic acid
physical properties, 5:35t
Ricinine, 2:82
Ricinoleic acid
percent in important fats and oils, 5:47t
physical properties, 5:35t
Rickets
as vitamin D deficiency disease, 25:792
Ridgeway’s hardness scale, 1:3, 4
selected materials, 1:3t
Riebeckite, 3:288, 292
glacial occurrence, 3:291t
world production in 2000, 3:289t
Riedl–Pfeiderer process, 14:43, 48
Rieke magnesium, 12:835
Rietveld ab initio structure determination, 19:377
Rifamycin
bacterial resistance mechanisms, 3:32t
Right atrium, 5:79, 80
Right bundle branch, 5:80
Right ventricle, 5:79, 80
Rigid fillers, 11:308–309
Rigid foam
from foaming-in-place beads, 23:405–406
insulation, 23:358
uses for, 25:481
Rigid polymers, toughening of, 20:352
catalysts used in, 25:473
Rigid polyurethanes
from PMDI, 25:471–472
Rigid-rod polymers, 13:370–382
heterocyclic, 13:377–379
Rigid thermoplastic foams, polystyrene as a raw material for, 23:407
Rilandite, 6:471t
Remiterol hydrobromide, 4:360t
Rimmed steels, 23:291
R-Index flavor characterization test, 11:512
Ring alkylation
aniline, 2:786
Ring alkylation of salicylic acid, 22:4
Ring atoms, pyridine reactions at, 21:98–101
Ring chlorotoluenes, 6:337–350
dichlorotoluenes, 6:343–344
monochlorotoluenes, 6:338–343
pentachlorotoluenes, 6:345
tetrachlorotoluenes, 6:345
trichlorotoluenes, 6:344–345
uses, 6:345–346
Ring-closing alkyne metathesis (RCAM), 26:951
Ring-closing enyne metathesis (RCEYM), 26:953, 955
Ring-closing metathesis (RCM), 26:921, 922, 923
Ring closure in aldoses, 4:699
Ring closure procedures, complementary heterocycle, 21:228–229
Ring coupling, in lignin, 15:5–6
Ring dehydrogenation, 14:48
Ringer’s lactate, 4:110
Ringer’s solution, 4:110
Ring furnace, 12:734
Ring Index, 17:399
Ring-laser geometries, 23:144
Ring liners (dental investments), 8:295
Ring microresonator structures, electrooptic materials in, 17:453
Ring opening by single electron transfer (ROSET) system, 19:294
Ring-opening copolymerization, 7:627
Ring opening, in propylene oxide, 20:791–793
Ring-opening metathesis polymerization (ROMP), 15:495, 26:921, 923, 26:944, 946
Ring-opening metathesis (ROM), 26:921. See also ROM polymers
Ring-opening metathesis polymerization (ROMP) reaction, 20:413
Ring-opening polymerization (ROP), 14:271, 19:816–817, 23:702, 705
block copolymers, 7:646
of cycloolefins, 20:425–426
of lactide, 20:298–311
silicone fluids and, 22:573
in siloxane polymer manufacture, 22:558–559
without catalyst, 23:712
Ring rearrangement metathesis (RRM), 26:922
Ring-shaped sulfuric acid catalysts, 23:780
Ring spinning
cotton yarn, 8:17
Ring-substitution reactions, of salicylic acid, 22:4–5
Ring Systems Handbook, 17:399–400
Ring Test, 12:103
Rinsing, for electroplating, 9:786–787
in ion exchange, 14:412
Rio Declaration, 24:162–163, 185, 188
selected principles from, 24:194–196
Riot control agents, 5:814, 823–824
Ripeners, in photographic crystal growth, 19:182
Ripening agent
vanillin as, 25:555
Ripple, 9:778–779
RIPP separation sequence (removal of insolubles; isolation; purification; polishing), 5:781–782
RISC* enzyme, 17:620
Riser termination technologies, 11:685
Risk
product design consideration, 5:774
Risk acceptance, 13:170
flow control system, 13:169
in technology transfer, 24:365–366
of toxic chemicals, 24:184–188
sampling techniques for, 26:1045
sustainable development and, 24:183–188
uncertainty analysis in, 26:1001
Risk assessment function, 25:202
Risk, economic, 9:547–548
Risk extrapolation models, 25:244
Risk Management Program (RMP), EPA standard for, 21:830, 831
Risk, of gold mining, 12:695–696
Risk, quality control and, 21:160
Risk tradeoff analysis (RTA), 24:177
Ristocetin, 3:28
Ritalmex  
- molecular formula and structure, 5:91t

Ritmodan  
- molecular formula and structure, 5:90t

Ritter reaction  
- for lower aliphatic amine manufacture, 2:546

Ritter reactions, 1:295, 21:204–205

Rituxan  
- cell culture technology product, 5:346, 346t
- market, 5:356

Rivasin  
- molecular formula and structure, 5:155t

Rivastigmine, 2:818

Rivers  
- bioremediation of halogenated compounds, 3:776

Rivers and Harbor Act of 1899 (Refuse Act), 21:581

River water quality studies, 26:32

River water, silicones in, 22:602

Riveting, of magnesium joints, 15:367–368

RN 222Rn, 25:392

RNA, 2:554

RNA interference (RNAi), 17:614, 619–621.  
- See also Ribonucleic acid (RNA)

RNA polymerases, 20:447

RNA tertiary structure, 17:617

- See also Reverse osmosis (RO)

Roadbed stabilization/dust control  
- calcium chloride application, 4:566–567

Road construction, tire chips in, 21:478

Road deicing, salt in, 22:814, 817

Road oils, 18:673

Roast, defined, 16:128

Roasters  
- multiple-hearth, 26:561–562

Roasting  
- chocolate liquor, 6:355–356
- cocoa beans, 6:354
- coffee, 7:257–258
- of uranium ores, 25:401

Roasting furnaces, 16:141

Roasting processes, potassium  
- permanganate manufacture via, 15:603

Roast-leach electrowinning process, 16:160

Robatel extractor, 10:781

Robbins, Frederick, 11:10

Robinson Annulation Reaction, 24:571

Robinson, important experimental design text; coverage compared to other texts, 8:395t

Robotic spotting, in microarray fabrication, 16:386

Robust control  
- sampling techniques for, 26:1045–1046

Rocaltrol, 25:792

Rochelle salt copper baths, 9:806

Rochow-Müller reaction, silicone industry and, 22:548

Rocket fuel, 13:800

Rocket propellants, 10:726–727
- solid, 26:754–755

Rockets technique, 9:754

Rock gypsum, 4:583

Rock, mercury content in, 16:33

Rocks  
- circulation of water with, 26:7–12
- dating, 25:393

- See also Halite entries

Rock salt semiconductors, 22:141
- dating, 21:317–318

selenium occurrence in, 22:78

Rock surface chemistry, in volumetric sweep efficiency, 18:621

Rock varnish, photocatalytic origin of, 19:100–101

Rockwell hardness testing, 25:369

Rocuronium bromide, 4:360t

Rod  
- copper wrought alloys, 7:724–725

Rod coating  
- method summarized, 7:5t

Rod copper, 7:693

Rodebush sequence, for ethanol separation from water, 8:834–835

Rodenticides, 11:868

Rods, extrusion of, 19:790
- in eye, 7:307–308

Roentgen, Wilhelm Conrad, 21:285
- Willem, 11:399

Rofecoxib (VIOXX), 2:820

Roflurane, 4:359t

Roga agglutinating test, 6:735–736

Rogain, 5:169
- molecular formula and structure, 5:166t
Rohu
common and scientific names, 3:187t
Roinin
molecular formula and structure, 5:120t
Rokitamycin, 15:298, 304
Roll bonding technique, 16:169, 170
Roll coating, 7:11–14
method summarized, 7:5t
shear rates, 7:32t
Roll discharge systems, with rotary drum vacuum filters, 11:356–357
Rolled lead alloys, mechanical properties of, 14:775t
Rolled lead–calcium–tin alloy strip, 14:775
Rolled lead–copper alloys, 14:776
Rolled zinc alloys, 26:594–598
Roller-hearth furnace, 12:289, 290
Roller mills, 18:65
Roller printing, 9:221
Rollin film, 17:354, 373
Rolling-assisted, biaxially textured substrate (RABiTS) technique, 23:842, 844
Rolling ball viscometers, 21:738
Roll mills, 16:722
Rolls, high pressure, 16:612–613
Romanechite, 15:540
Romascone, 24:571
Romet-30/Romet-B. See Ormetoprim
ROMP catalysts, 17:707, 708
ROM polymers. See also Ring-opening metathesis (ROM) polymers, 26:947–948
Roll coatings
dispersant applications, 8:692
Roofing applications, spunbonded polyester in, 17:486–487
Roofing granules
kaolin application, 6:688t, 696
Room-and-pillar mining configuration, 20:614
Room temperature ionic liquids (RTILs), 16:583
Room temperature precipitation heat treatment aluminum alloys, 2:332–333
Room-temperature vulcanizable silicone rubber, 25:129
Room temperature vulcanizing (RTV) condensation cure process, 10:4–5
dispersions, 20:244
Room temperature vulcanizable (RTV) silicones
chemistry of, 22:595–596
properties, compositions, and applications of, 22:594–595, 596–597
Root mean square (RMS) granularity, 19:264
Root-mean-squared error of cross-validation (RMSECV), 6:50–51
Root-mean-squared error of calibration (RMSEC), 6:50–51
Root-mean-squared error of prediction (RMSEP), 6:50–51
Root-sum-square (RSS) method, 13:257
Rope discharge, in hydrocyclones, 22:287
Rope making, 11:287
Ropes, PPTA fibers in, 19:734
Ropro screen, 22:283
Rosales
alkaloids in, 2:75
Rosamusk, 24:488
Rosaricin, 15:295t, 301
ROSDAL, 6:3
Rose alcohols, 24:474
petrochemical routes to, 24:476
Rose, in perfumes, 18:370–371
Roselle, 11:293–294
Rosemary, 23:170
Rosenmund filter, 11:351
Rosenmund reaction, 2:66
Rose oxide, 24:508–509
Rosette protocol, 18:28
Rosé wine
specific processes for, 26:311
Rosewood oil, 24:500
Rosin
accelerator for dental cements, 8:285
pentaerythritol ester of, 22:43
in soap making, 22:735
Rosin acids, 24:552–553
Rosin, alkali soaps of
emulsifiers, detergents, and dispersants, 8:710t
Rosin emulsion size, in paper manufacture, 18:112–113
Rosin-Rammler function, 23:185, 186
Rosin soap size
in paper manufacture, 18:110–112
preparation of, 18:111
Rossby number, 11:747
Ross Mixers, 22:44
Rosuvastatin calcium, 5:143
molecular formula and structure, 5:140t
Rotameters, 11:782
Rotary actuator, 11:104
Rotary agitated columns, 10:777–779
Rotary atomization
in spray coating, 7:73–74
Rotary disk vacuum filters, 11:358. See also
Disk filters
Rotary drum vacuum filters, 11:345, 355–357. See also Drum filters
Rotary dryers, 9:121–122
indirect-heat, 9:129
steam-tube, 9:129–130
Rotary fiber spinning process, 13:387
Rotary furnace technologies, 21:391
Rotary hearth furnaces, 13:177–178
Rotary impeller vane meters,
11:655–656
Rotary kiln incinerators, 13:175–176
Rotary kilns, 15:52–53, 603, 26:611–612
puffing and loss of flame in, 13:182
in thermal waste treatment, 25:833–834
Rotary lobe pumps, 21:71
Rotary molds, 18:50
Rotary regenerative heat exchanger,
13:238
Rotary-screen chemical finishing,
17:513–514
Rotary style valves, 20:685
Rotary tacking meters, 14:316
Rotary tumble dryers, 18:732
Rotary vane pumps, 21:71
Rotating anode X-ray tube, 26:413
Rotating arc reactor, 1:211–213
Rotating biological contactor
defined, 3:759t
Rotating biological contactor (RBC)
in biological waste treatment,
25:901t, 906
Rotating-disk contactor (RDC), 10:778
Rotating disk electrode (RDE), 9:577
Rotating disk reactor, 22:155
Rotating elements, cross-flow filtration
with, 11:383–387
Rotating jet mixers, 16:711
Rotating vacuum dryer, 9:135
Rotational energies, 14:695
Rotational energy levels, 14:688
Rotational isomeric state (RIS) model,
20:589
Rotationally molded articles, LLDPE,
20:208
Rotational molding, 19:554. See also
Rotomolding entries
Rotational molding, of linear low density polyethylene, 20:200. See also
Rotomolding
Rotational suspension separation
encapsulation process, 16:450
Rotational viscometers, 21:731–737
computers in, 21:732
operation of, 21:736
Rotations, of molecules
cause of color, 7:326t, 328
Rotavirus vaccine, 25:496
Rotaxanes, 17:61, 24:31, 33, 51
as molecular computers, 24:60
Rotenone (Chem-Fish Synergized, Prentox, etc)
piscicide for aquaculture in U.S., 3:215t
Rotocastings, Teflon PFA, 18:337–338
Rotogravure inks, 14:322–327. See also
Gravure inks
Rotogravure printing, on food packaging,
18:45–46
Rotomolding machine, 19:554
Rotomolding, of high density polyethylene, 20:175
Rotomolding, of polyamide plastics,
19:791
Roto bodies, in steam turbines, 23:231
Roto electrostatic separators, 16:643–644
Roto rotating converter, 16:151
Rots, molecular, 17:59–61
Roto spinning
cotton yarn, 8:17
Rotor–stator devices, 10:127
Rotor–stator disperser, 8:701
Rotor-stator mills, 18:65
Roto-stator mixers, 16:674–675
Rotosil process, 22:412
Roughages, as ruminant feeds, 10:863
Roughing, in mineral separation, 16:604
Roughing services, magnetic drums used
in, 15:446
Roughness factor (r), 22:111
Roughness indexes, 15:203
Roughness ratio (–), 22:115
Roughness, surface wetting and,
22:110–113
Roughness values, 15:203
Rough surfaces, mass transfer at,
15:725–726
Rougoxin
molecular formula and structure, 5:98t
Round-robin operation
of carbon adsorption units,
25:812
Roundup/Glyphosate, 2:549t
Roundup Ready cottons, 8:2
Roundup tolerance, engineering,
12:487–490
Roundwood equivalent, 26:333
Roundwood timber products
volume and value of, 26:362t
Rous sarcoma virus, 3:136
ROVER project, 17:592
Roving structure, 11:177
Roxithromycin, 15:286, 303, 3:30
Royal Purple, dibromoindigo, 4:340
Roy tapper, 14:736
R-ratio, 13:489, 491
changes in, 13:495
RRKM theory, 14:627
RS-170 standard, 19:146–147
RTL contactor, 10:778–779
Rubber. See also Liquid rubber technology
butyl, 9:560
chloroprene, 9:561–562
ethylene–propylene, 9:559–560
glass-transition temperature, 9:553
kaolin application, 6:688t,
693–695
mineral reinforced, 22:703
nitrile, 9:560–561
properties and applications of silicone
foam, 22:585–586
properties and applications of silicone
heat-cur ed, 22:579–584
properties and applications of silicone
liquid- injection-molded,
22:584–585
selenium in, 22:102, 103
silica in, 22:377
silicone, 9:562–563
solvent-resistant, 22:583–584
styrene–butadiene, 9:556–558
synthesis, 9:555
vulcanizable silicone, 25:129
Rubber additives
organic titanium compounds as,
25:135
Rubber antiozonant manufacture, MIBK
in, 16:346
Rubber applications
organosilanes in, 22:377
precipitated silica in, 22:399–400
silica in, 22:377–378
Rubber articles, surface treatment for,
21:781–784
Rubber-bonded grinding wheels, 1:19
Rubber chemicals, sodium nitrite in,
22:858–859
Rubber compounding, 21:758–815.
See also Tire compounding
antidegradants in, 21:785–790
antioxidants in, 21:789
butyl and halobutyl rubber in, 21:766
elastomers used in, 21:759–772
ethylene–propylene rubber in,
21:765–766
fillers for rubber, 21:772–785
major factors in, 21:813
natural rubber in, 21:760–763
nitrile and acrylic rubber in, 21:769–771
polybutadiene in, 21:764–765
processing agents in, 21:790–791
raw materials for, 21:759
special polymers in, 21:771–772
special-purpose elastomers in,
21:766–769
styrene–butadiene rubber in,
21:763–764
test methods in, 21:812–813
vulcanization, 21:791–804
Rubber compounds, improvements in,
21:773
Rubber crumb, 10:710
Rubber extrusion, 10:710
Rubber fabrication, of poly(fluorosilicones),
20:243–244
Rubber-grade carbon blacks, 4:775
classification, 4:777
composition, 4:765t
properties of, 4:778t
spectrum of available products, 4:779
uses of, 4:793–796, 794t
Rubber industry
magnesium carbonate in, 15:391
titanium dioxide in, 25:21
Rubber-modified asphalt, 21:467–469
Rubber-modified copolymers,
23:368–371
Rubber-modified polystyrene,
23:368–371
manufacture of, 23:395–396
Rubber-modified styrene plastics, extrusion of, 23:398
Rubber-modified styrene polymers, 23:363, 366
embrittlement of, 23:363
Rubber modifiers, furan derivatives in, 12:280
Rubber particle cavitation, 20:353
Rubber particles, morphology of, 21:470
Rubber, polyfluorosilicone, 20:246–247
Rubber, polychloroprene, 19:840
Rubber products, microwave technology in, 16:530
See also Rubber recycling
rubber-modifying oils and processing aids for, 21:472t
See also Rubber reclaiming
asphalt modification, 21:467–469
civil engineering market for, 21:476–478
cryogenic pulverizing and mechanical tire shredding, 21:469–472
depolymerized scrap rubber, 21:467
economic aspects of, 21:479
scrap rubber as fuel source, 21:463–466
scrap tire pyrolysis in, 21:466–467
Rubber reinforcement, with PPTA and ODA/PPTA fibers, 19:734
Rubber, release agent use with, 21:606. See also Vulcanization
Rubber seed oil, 9:143
Rubbers, EPDM, 17:706–707
Rubber slurry pump linings, 21:78
Rubber substrates
ABS, 1:419–420
“Rubber-toughened polymers,” 20:352–353
Rubber, tellurium in, 24:427–428
Rubber, vulcanization of, 23:646
“Rubbery plateau,” 24:701
Rubella vaccine, 25:490–491
Rubioceae
alkaloids in, 2:75
Rubiales
alkaloids in, 2:75
Rubidium (Rb), 21:816–821
chemical properties of, 21:816–817
economic aspects of, 21:820
health and safety factors related to, 21:820–821
manufacture and processing of, 21:818–819
occurrence of, 21:817–818
packaging, shipping, and storage of, 21:819
physical properties of, 21:816, 817t
specifications and analytical methods for, 21:820
uses for, 21:823
Rubidium-87, 21:823
Rubidium bromide
physical properties of, 4:329
Rubidium carbonate, 21:822
Rubidium cation, 21:822
Rubidium compounds, 21:821–823
labeling and shipping restrictions for, 21:819t
properties of, 21:822t
uses for, 21:823
Rubidium cyanide, 8:194
Rubidium dibismuthide
alloy-like superconducting compound, 4:18t
Rubidium fluoroborate
physical properties of, 4:152t
thermodynamic properties of, 4:154t
Rubidium hydroxide, 21:821–822
Rubidium iodide, 21:823
Rubidium metal alloys, 21:816
Rubidium metal, pure, 21:818
Rubidium oxides, 21:816, 823
Rubidium ozonide, 18:417
Rubidium silicates, 22:452
Rubidium sulfate, 21:821
Rubidium superoxide, 18:417
Rubidium tetrahydroborate
physical properties of, 4:194t
Ruby, 2:405
color, 7:329
Ruby glass, 7:344
Ruby laser, 14:667, 668, 675, 696–698
Ruby-stained glass
as colloid, 7:272t
Ru catalyst, 19:621. See also Ruthenium (Ru)
Rufloxacin, 21:225
Rug cleaners
acute oral LD50 ranges, 8:446t
Rug cleaning
detersive systems for, 8:413t
Ruhemann's purple, 12:101
Ruhrstahl-Heraeus (RH) process, 23:264–265
Ruhrstahl-Heraeus oxygen blowing (RH-OB) process, 23:265
Rule-based software-engineering program, 19:520
Rule-based structure generation techniques, 16:751–752
Rule of 5, in diversity analysis, 6:18
Rules for wastewater treatment, 25:918
Rumensin, 20:136
Ruminant feeds, 10:862–873
performance modifiers in, 10:868–871
supplements to, 10:865–868
types of, 10:863–865
for young animals, 10:871–873
Ruminants
bloat in, 10:870
characteristics of, 10:862
feed efficiency in, 20:133, 136
protein nutrition of, 10:866
somatotropin administration in, 13:10–11
Runaway reactions, dangers of, 24:184
Runge–Kutta–Gill fourth-order-correct integration algorithm, 25:311
Runoff, herbicide, 13:308–309
Run-to-run control, 20:704–705
Rupture ductility, 13:476
Rupture testing, 13:474
environment for, 13:477
Rural wastewater disposal systems, 25:915–916
Rushton impeller/turbine, 16:673, 701
gas holdup with, 16:703
Rushton turbine, 1:738
Russia
flax fiber in, 11:589–590
nanoceramics research, 1:706
platinum-group metals in, 19:605, 613
production and consumption of regenerated cellulose fibers in, 11:275
titanium production in, 24:839, 847, 861, 862
titanium uses in, 24:866, 868
tungsten market in, 25:355
silicon consumption and production by, 22:510
Russian magnesium manufacturing process, 15:336–337
Rust, hydrazine removal of, 13:596
Rutaceae
alkaloids in, 2:75
Ruthenate anion, 19:639
Ruthenium(II) catalyst precursors, 26:926
Ruthenium(IV) oxide, 5:598
thermal degradation of catalysts, 5:272
Ruthenium (Ru), 19:598, 601. See also Ru catalyst
biological and medicinal applications of, 19:640–641
demand for, 19:616t
electronic applications of, 19:631
poisons in representative reactions, 5:258t
separation of, 19:611, 637
supported catalyst complexes, 5:341
Ruthenium alkylidene complexes, 26:930–932
Ruthenium-based metathesis catalysts versus molybdenum-based metathesis catalysts, 26:936–937
Ruthenium catalysts for olefin metathesis, 26:935
Ruthenium-catalyzed olefin metathesis, 26:933–934
Ruthenium complexes
chemiluminescence reagent (tris(2,2'-bipyridyl)ruthenium(II) complex), 5:856–857
Ruthenium compounds, 19:637–641
synthesis of, 19:640
uses for, 19:640–641
Ruthenium–copper clusters, 16:70
Ruthenium initiators, 26:934
Ruthenium plating, 9:823
Ruthenium–silica catalytic aerogels, 1:763t
Ruthenocene, 19:639
Rutherford backscattering spectroscopy (RBS), 24:74
technique for, 24:106
Rutherford, Ernest, 21:285
Rutherfordium (Rf), 1:492t, 493
Rutile, 24:840, 25:11, 12, 15–17, 23–24, 31
in bauxite, 2:344, 347
in clays, 6:685
in coal, 6:718
isoelectric point, 8:674t
opacifier, 7:334
Saccharin, 12:42, 15:587. See also
Synthetic sweeteners
Saccharin analogues, 24:236
Saccharin blends, 24:235
Saccharin production, newer process for,
24:235–236
Saccharin synthesis
Remsen–Fahlberg process for, 24:235
sodium nitrite in, 22:860
Saccharomyces, 26:445, 446
Saccharomyces carlsbergensis, 3:580
Saccharomyces cerevisiae, 12:478–479,
26:446, 448, 449, 3:580. See also
Bakers’ yeast
genetics and molecular biology of,
26:480–481
genome of, 26:450t
heterothallic and homothallic strains of,
26:453–454
reproduction in, 26:452
Saccharomyces uvarum, 3:580
Saccharomyces yeasts, 26:469
Sachtolith, 19:394
Sacramental wines, 26:301
Sacrificial anodes, indium in, 14:195
Saddle products, strategic separation
schemes and, 22:308–309t
Saddles, residue curve maps, 8:790
Safe Drinking Water Act (SDWA),
21:582–583, 11:625, 626
silver standards in, 22:655
Safe exposure levels
deriving, 25:242
Safe handling
of dyes, 9:234
of hazardous materials, 25:338–339
Safe human dosage (SHD), 25:236, 238, 241
Safe operating ranges, for ethylene oxide
production units, 10:652–653
Safer chemicals, design of, 12:804
Safety, 21:826–869. See also Nuclear
power facility safety; Safety factors
anthraquinone dyes, 9:341–343
azo dyes, 9:427
calculating for carcinogen exposure,
25:242–244
calculating for threshold (systemic)
toxicities, 25:236–242
in chemical reactor technology, 21:354
in commercial-scale pharmaceutical
operations, 18:736
consequence analysis and, 21:860–861
dyes and dye intermediates, 9:295–298
in facilities design, 21:846–852
in facilities operation, 21:853–854
of fillers, 11:318
fire prevention/protection, 21:858–861
food, 12:75
of food additives, 12:30
of genetic engineering procedures, 12:520
human relations and, 21:857–858
hydrogel, 13:754
of industrial enzymes, 10:307–308
inherent, 13:170
inorganic electrochemical processing, 9:643–647
of inorganic fluorine compounds, 11:856
of inorganic peroxides, 14:292–293
insulation and, 10:158
of liquid crystalline materials, 15:117–118
of magnesium acetate, 15:382–384
of methacrylic monomers, 16:277–279
nuclear reactor, 17:596–598
nutraceutical, 17:647
pilot plant, 18:732–733
process and production hazards, 21:832–846
process safety management, 21:828–832
in product handling, 21:854–857
protection of public and environment, 21:827–828
sustainable development and, 24:183–188
in transportation of chemicals, 21:856–857
uncertainty analysis in, 26:1001
with fermentation, 11:49
Safety (risk assessment) function, 25:202
Safety acts/regulations, state, 21:830–831
Safety aspects/factors
mercury-related, 16:49–51
metal carbonyls, 16:71
metal surface treatments, 16:224
methacrylic acid/derivatives, 16:261–262
methacrylic ester polymers, 16:293
methanol-related, 16:314
methyamines, 16:364
methyl chloride, 16:326
methylene chloride, 16:376–377
methyl isobutyl ketone, 16:344–345
microwave technology, 16:525–526
molecular sieves, 16:836–837
Safety assessments, 21:827
Safety checklists, 13:155
Safety control systems, nuclear power facility, 17:554
“Safety culture,” for nuclear power facilities, 17:538
Safety data, developing, 21:844
Safety factors, See also Process safety
Safety inspections, OSHA, 21:829
Safety issues/considerations
for heated and cryogenic tanks, 24:303
teaching related to, 24:184
Safety issues, emulsion-related, 10:128
Safety measures, improved, 24:184
Safety performance indexes, nuclear power facility, 17:539
Safety regulation(s)
fragrance-related, 18:388–389
of transportation, 25:337–338
Safety requirements, implementation by state regulations, 24:185
Safety review, 13:154–155
report, 13:154, 155
Safety showers, 21:849
Safety standards, 15:767–768
in fine chemical production, 11:433–434
Safety systems, 20:671–672
Safety valves, 19:476
Safe Water Drinking Act
vinyl chloride and, 25:649
Safe work practices, 21:853–854
Safflorite, 3:263t, 7:209t
Saffron, 23:170–171
colorant in cosmetics, 7:835
Safimax
fiber reinforcement for ceramic–matrix composite, 5:558t
Safranal, 24:570
Safranin acid derivatives, 24:561, 570–571
Sag, commercial defoamer, 8:241t
Sage, 23:171
Sagger furnace, 12:735
Sagging
coating film defect, 7:120–121
Sagnac interferometer, 11:152, 153, 154
Sagnac loops, 11:153
Saint Gobain process, 25:669
Sake yeasts, 26:470
Sakuma-Hattori interpolating equation, 24:454
Salad dressing
estimated maximum oxygen tolerance, 3:381t
Salads
  citric acid in, 6:645
Salar de Atacama lithium source, 15:127
Salar de Uyuni, Bolivia, 5:786, 800
Salar ion concentrations, 15:123t
Salars, 5:786
  lithium in, 15:123
Sales analysis, 15:631–632, 636
Sales volume, 9:534–535
Salicin, 22:23
  hydrolysis of, 22:24
SALIC N-Salicylidene-2-chloroaniline
  photochromic material, 6:593
  piezochromic material, 6:607
Salicyl alcohol, 22:1, 23–25
  manufacture of, 22:24
  physical properties of, 22:23–24
  reactions of, 22:24
  uses of, 22:24–25
Salicylaldehyde, 22:24
  annual consumption by region, 2:67t
  molecular formula, 5:712t
  physical properties of, 2:61t
Salicyldaldoxime
  molecular formula, 5:712t
Salicylamide, 22:17
Salicylanilide, 22:17
Salicylates
  aroma chemicals, 3:257
Salicylsalicylic acid (sulfasalazine), 23:508
Salicylic acid, 22:1–27
  in antiacne preparations, 7:844
  anti-dandruff agent, 7:851
  compounds related to, 22:1, 11–25
  function as ingredient in cosmetics, 7:829t
  health and safety factors related to, 22:9–10
  history of, 22:1
  manufacture of, 22:7–8
  medicinal uses of, 22:1
  physical properties of, 22:1–2, 3t
  reactions of, 22:2–6
  specifications for, 22:8–9
  uses of, 22:10–11
Salicylic acid derivatives, 22:11–25
  physical properties of, 22:18t
Salicylic acid esters, 22:12–17
  physical properties of, 22:13–15t
Salicylic acid salts
  medical applications of, 22:11–12
  physical properties of, 22:11t
Salicylic acid glucosides, natural, 22:7
Salicyloyl chloride, 22:3
Salicylsalicylic acid, 22:16–17
  physical properties of, 22:15t
Saligenin, 22:23, 24
Salina salt, 5:788
Saline hydrides, 13:771
Saline solutions
  as blood substitute, 4:110
Saline water use
  in municipal distribution, 26:55–56
Salinomycin, 20:130, 132, 133, 136, 137, 139
Saliva
  citric acid in, 6:632t
Salk vaccine, 11:11
Salmon
  aquacultural chemical needs, 3:209
  aquaculture, 3:183, 1883:
    large eggs, 3:189
  net-pen culture, 3:194–195
  nutrition and feeding, 3:202
  raceway culture, 3:193, 194, 195
  reproduction and genetics, 3:205, 206
  water quality requirements for aquaculture, 3:199
Salmon calcitonin, 3:843
Salmonella typhi
  vaccine candidates for, 25:502
Salmon, transgenic, 12:464
Salol, 22:16. See also Phenyl salicylate
Salt (halite), 5:785t
Salt(s), 22:797. See also Hot corrosion;
  Salts; Sodium chloride
  analysis of, 11:523
  of ascorbic acid, 25:761–762
  complex noble-gas, 17:326–330
  in continuous saponification, 22:738
  deposits of, 22:798, 799
  as drilling fluid material, 9:10
  effect on ethylene oxide polymers, 10:677–679, 680
  electrolysis of, 16:161–163
  encapsulated, 22:820
  as essential to life, 22:812, 816–817
  history of U.S. production of, 22:798–800
  hydrogen chloride reaction with, 13:820–821
  iodized, 22:815–816
  iron(II), 14:530–531
  in kettle soap making, 22:737
  metal carbonyl synthesis from, 16:68
metal chloride, 13:817–818
names adopted for, 17:388
nickel, 17:112–113, 117, 125
as nutrient, 22:815–817
organotin, 24:826–827
preventing pollution by, 9:454–455
production of, 22:797
PVA viscosity and, 25:596
of salicylic acid, 22:11–12
from seawater, 15:837
selenium, 22:88–89
semiconducting, 22:204–207
in silanol polycondensation, 22:558
soap bars and, 22:742
soluble, 9:27t
solubility in steam, 23:209–211
of sulfonated aromatic compounds, 23:525
in ternary soap–water–salt system, 22:727
tin, 24:806–807
vitreous silica reactions with, 22:419
worldwide production of, 22:810t
Salt-bath furnace, 12:295–296
Salt bridges, pressurized, 14:33
Salt cake, 5:785t
Salt distillation, of hafnium, 13:84
Salt domes, 22:798
Salt-dome sulfur deposits, 23:569
Salt effect distillation, 8:816–817
Salt flats, 5:786
Salt–fog unit, 18:72
Salt formation(s), 22:798
amino acids, 2:570
ammonia, 2:685–686
carboxylic acids, 5:40–41
citric acid, 6:637
cycloaliphatic amines, 2:501
fatty amines, 2:522
Salt industry
specifications applying to, 22:809t
in United States and Canada, 22:810–811
Saltlike carbides, 4:647, 648–650
Salt-like nitrides, 17:198–199
Salt mines, 22:799, 800
Salt-out, general separation heuristics for, 22:320
Salt retention, by colloidal silica and silica sols, 22:392
Salt roasting
for vanadium compound manufacture, 25:536–538
Salt sensitivity, 22:813
Salt spray test, 9:790
Salt substitutes, 22:819–820
Salt–sulfuric acid metal chloride decomposition process, 13:823
Saltville, Virginia, salt production at, 22:800
Salt water muds, 9:4
Salty snacks, packaging, 18:35
Salty taste, 11:566
S-aluminum–copper–magnesium alloy, 2:318–320
Saluron
molecular formula and structure, 5:162t
Salutensin
molecular formula and structure, 5:162t
Salvage applications, electroless deposition in, 9:701
Samarium (Sm), 14:631t, 634t
electronic configuration, 1:474t
Samarium–cobalt magnets, 14:651
Sampatrilat, 5:159
Sample analysis, in fine art examination/conservation, 11:404–407
Sample analysis procedure, high purity gas, 13:467
Sample approximation methods optimization via, 26:1028–1029
Sample injection
capillary electrophoresis, 4:633–634
gas chromatography, 4:611–613
liquid chromatography, 4:621–622
supercritical fluid chromatography, 4:630
Sample leverage, 6:56
Sample line connection procedure, 13:466–467
Sample loading, 13:490
Sample period, in industrial hygiene, 14:215–216
Sample plugs
in microfluidic assays, 26:970
Sample preparation, for biotransformation analysis, 16:406–407
Sample preparation, in computer-automated image analysis, 18:148
Sample size, fatigue performance and, 13:486–487
Sampling
defined, 26:998
for ir analysis, 23:138–139
in molecular uv–vis absorption spectroscopy, 23:143–144
lime, 15:72
limestone, 15:71
in particle size measurement, 18:138–139
of reactant mixtures, 14:612
safe, 21:855
in transmission signals, 11:131

Sampling accuracy
optimization and, 26:1029
Sampling guidelines, high purity gas, 13:466–468
Sampling loop, 26:1025
Sampling plan, in quality control, 21:161
Sampling strategy, in industrial hygiene, 14:214–216
Sampling techniques, 26:998–1052
adaptive techniques, 26:1016–1019
Bayesian techniques, 26:1016–1019
for chemical systems, 26:1035–1047
future trends in, 26:1047–1048
Monte Carlo methods, 26:999, 1001–1004
optimization algorithms for, 26:1023–1035
stochastic modeling in, 26:1019–1023
uncertainty analysis in, 26:1019–1023
variance reduction techniques, 26:1004–1016

Samsung
nanotube program, 1:721
Samuela carnerosana, 11:296
Samuel Courtauld 446
Sanchez-Lacombe equation of state, 24:11
SAN copolymers. See Styrene–acrylonitrile (SAN) copolymers
Sand, 5:640, 22:402
raw material for Portland cement, 5:485
unconsolidated deposits of, 17:687

Sandalore, 24:536
Sandalwood, in perfumes, 18:371
Sandalwood oil, 24:542
Sand aquifer
in bioremediation, 25:837–838
Sand–asphalt–sulfur (SAS), 23:592
Sandblasting
industrial hygiene and, 14:210–211
of magnesium parts, 15:374

Sand castings
aluminum alloys, 2:326t
magnesium alloy, 15:366
Sand cracker, 10:618
Sandel, 24:498
Sandela, 24:498
Sandenol, 24:498
Sandeol, 24:498
Sand filters
for swimming pools, 26:193
Sand filtration
in hazardous waste management, 25:821
in water treatment, 26:103–104
Sand–lime bricks, slaked lime in, 15:64
Sandmeyer reaction, 21:206
Sand mill, 9:415, 18:64–65
Sandoflam 5060, 11:493
Sandpaper, 1:1
Sandril
molecular formula and structure, 5:155t
Sands, natural photocatalytic reactions on, 19:100
Sandstone, 1:1
raw material for cement, 5:475t
Sandstone uranium Deposits, 17:520
Sandwich immunoassay, 14:138
Sandy alumina, 2:404
properties of, 2:405t
Sandy soils
waterproofing, 26:57
Sanitary uses, for iodine, 14:372–373
Sanitation
silver and, 22:641
soap in, 22:755, 756
Sanitizers
bromine pool, 26:176–177
chlorine, 26:180–181, 198
chlorine-based, 26:173–176
iodine in, 14:372
ionizers, 26:177–178, 196
ozone generators, 26:177
for pools, 26:198–199
for spas/hot tubs, 26:194, 198–199
uv, 26:178
SA node, 5:80
and cardiac arrhythmias, 5:86–88
as pacemaker node, 5:82
Sanorex, 3:92t
Sanseveria cylindrica, 11:297
Santalex, 24:498
Santanaite, 6:471t
SANTO α-Santonin, 24:549–550
Santonin rearrangement, 24:550
Santoquin, 14:583
Sapindales
alkaloids in, 2:75
See also Soap entries
continuous, 22:737–738, 741
in kettle soap making, 22:736–737
of oils and fats, 22:736–741
in vinyl alcohol polymerization, 25:609–610
Saponification number
of waxes, 26:223
Saponification value, 10:825–826
Saponite, 6:664, 696
occurrence and geology of major deposits, 6:666
structure and composition, 6:669
Sapphire, 2:345t, 405
color, 7:332
yellow, 7:337
Sapwood
biodeterioration of, 26:353
permeability of, 26:341t
Sarafloxacin, 3:222–223
registered for use in aquaculture in
Chile, 3:222t
registered for use in aquaculture in
Europe, 3:220t
Saran, 25:691, 725, 3:383
Saran film, 18:43
Sarcosinates, 24:144, 145
Sarcosine, 1:138
Sarex process, 1:676t
Sargramostim, 26:485
Sarin, 5:819, 820
SASOL-I, 6:860–862
SASOL-II, 6:764, 862–864
SASOL-III, 6:764, 862–864
SASOL Advanced Synthol (SAS) reactor, 6:863–864
SASOL α-olefin manufacture, 17:722
SASOL plants, 6:829
coal gasification, 6:778, 791–792
coal liquefaction, 6:764–765, 860–865
SASOL slurry-bed reactor, 6:862–863
SASOL Slurry-Phase Distillate (SSPD) process, 6:865
Sassolite (natural boric acid), 4:133t
Satellite X-ray lines, 24:101–102
Satigrel
molecular formula and structure, 5:182t
Satin spar, 4:583
Saturable absorption, 17:456–457
Saturable dye absorber, 14:677
Saturated aqueous salt solution, 9:34
Saturated calomel electrode (SCE), 9:571
Saturated fatty acids, 10:829, 830
Saturated hydrocarbons
adsorbent affinity, 1:674
adsorption by zeolites, 1:624
fluorine reactivity with, 11:831
isomerization of, 12:172–173
Saturated polyester resins, based on
trimethylpentanediol, 12:673
Saturated polyesters, 10:7
Saturated synthetic rubber, 10:705
Saturation and coating processes, 10:12–13
Saturation bonding, 17:509–510
Saturation color, 19:262
Saturation concentration, 15:677
Saturation index
for swimming pools, 26:186–188
Saturation kinetics, 13:446
Saturation magnetic moment, of ferrites, 11:61–62
Saturation magnetization, of M-type
ferrites, 11:67–68
Saturation, of organic pigments, 19:427
Saturation temperature, 9:100
SATURN catalyst technology, 11:688–689
Savard/Lee gas-shielded tuyere, 16:151
Savard-Lee injectors, 14:741
Savory, 23:171
Saybolt color scale, 7:310
Saybolt Universal Seconds (SUS), 15:207
Saytex HP-7010, 11:474
S–B–S block copolymers, 24:706
S–B–S polymers, 24:713–714, 715
SC9
whisker reinforcement for ceramic–
matrix composites, 5:557t
Scaba 6SRGT agitator, 1:739
Scaba SRGT impeller, 16:673
Scalar equation, 11:738
Scale(s), 26:227
connecting to programmable ports, 26:252
electronic, 26:251
functionality of, 26:251–252
hydraulic, 26:229–230
industrial and retail, 26:243–245
mechanical, 26:229–236
mechanical, 26:251
with microfluidic devices, 26:960t
performance of, 26:236–237
precision, 26:245
salt versus, 22:817
surface oxide, 13:504–506
types of, 26:243–245
Scale-control agents, 26:139–140
Scale-control chemicals high temperature, 26:73
Scale controllers, 26:260
for swimming pools, 26:192–193
Scale deposits
in industrial water treatment, 26:138–140
Scale down, 19:460
Scaled preliminary plot plan, 19:498–501
Scale formation
in seawater distillation, 26:72–73
Scale formation. See also Scaling, 4:593–595
Scale forming ions
in reverse osmosis systems, 26:81
Scale indicators, 26:260
Scale inhibitors
in reverse osmosis systems, 26:79
Scale models, of plant layout, 19:521
Scale-up
for industrial-scale extractors, 10:768–769
in mixing, 16:686–687
in sedimentation design methods, 22:58
of fermentation, 11:41, 42–43
of filtration, 11:392–393
of fluidized beds, 11:819–821
pilot plant, 19:460–461
predicting \(k_La_L\) for, 15:703–707
Scale wax, 26:215
Scaling, See also Scale formation
to deep submicron dimensions, 22:255–257
of FETs, 22:253–255, 255–257
in swimming pools, 26:186–187
Scaling biases, 11:513
Scaling factors, fluidized bed, 11:819–820
Scaling tests, in flavor characterization, 11:512–514
Scaling theory, 16:431
Scallop aquaculture, 3:189
culture systems, 3:190
world aquaculture production in 1996, 3:186t
Scandium (Sc), 14:630, 651t
Scandium carbide, 4:648, 649t
Scanners, mri, 23:858
Scanning
in fine art examination/conservation, 11:400
uv–vis diode-array absorption detectors, 23:145
Scanning auger microscope (SAM), 16:494–495
Scanning capacitance microscopy, 3:326–327
Scanning electron microscope, block diagram of, 24:77
Scanning electron microscopy (SEM), 16:464–466, 24:74, 16:490–494. See also SEM/EDS
detectors used in, 24:78
development of, 16:487–488
electron sources used in, 24:77–78
in surface imaging, 24:75–76
silica, 22:371–372
for trace evidence, 12:100
Scanning probe microscopes, in surface and interface analysis, 24:80–84
Scanning probe microscopy (SPM), 16:466, 495–503
history of, 16:495–496
Scanning spreading resistance microscopy, 3:331–332
Scanning thermal microscopy, 3:332–333
Scanning transmission electron microscopy (STEM), 24:74
Scanning tunneling microscope (STM), 16:466, 496
resolution, 3:325
Scanning tunneling microscopy (STM), 16:497–499, 24:74. See also STM entries
as a nanotechnology tool, 17:62
in surface and interface analysis, 24:80–82
Scanning tunneling spectroscopy (STS), 24:81
Scanning X-ray microscopy (SXM), 16:504–505
SCAP (escaping high cholesterol) ligands, 5:189
Scatter
- in creep and rupture properties, 13:478
Scatter diagram, 21:178
Scattering, See Light scattering
Scattering studies of ionomers, 14:463–465
Scattering techniques, 23:126–127
Scenario analyses, 24:189–190
Scenario-based approach
  for reliability, 26:1044
  in process scheduling, 26:1042–1043
Scenario identification, 13:165
SCH 58235
  molecular formula and structure, 5:140t
Schaal oven test, 10:827
Scheduling
  maintenance and, 15:474
  scheduling activities, 15:474
  scheduling problems, See Process scheduling
Scheelite, 25:349–350
Scheelite sorting, 16:626
Scheibel column, 10:777–778
Scheibel filter, 11:364
Schiff base(s), 21:203, 204, 25:100–101
  chelating agents, 5:712t
  reaction with amino acids, 2:567
  reaction with aniline, 2:786
  thermochromic materials, 6:622–623
Schiff base chemistry, 24:42
Schiff base (reductive amination) method, for covalent ligand immobilization, 6:396t
“Schizophrenic” block copolymers, 20:488
Schizophillan, 20:578
Schizosaccharomyces pombe
  genome of, 26:450t
Schlack, Paul, 19:739
Schlegel diagrams, 12:236, 238–241, 244
Schlippe’s salt, 3:65
Schmidt and Launsby, important
  experimental design text; coverage compared to other texts, 8:395t
Schmidt number, 15:685
  adsorption, 1:596, 11:746
Schmidt reaction, 2:573
  of m-hydroxybenzoic acid, 22:21
Schmutzdecke
  in water treatment, 26:104, 105
Schneider’s filter, 11:361
Schoenite, 5:785t
Scholler percolation process, 26:358
Scholl reaction, 12:171
Schotten-Baumann procedure, 10:485
Schotten-Baumann reaction, 19:798
Schottky barrier, 19:137, 138
Schottky barrier arrays, platinum silicide, 19:157–158
Schottky cathode TEDs, compound semiconductors in, 22:161
Schottky contacts
  for compound semiconductors, 22:188, 190–191
gold-based, 22:190–191
Schottky defects, 5:586
Schottky diodes, 22:245–246
  silicon carbide in, 22:539, 540
Schottky junction, 23:34
Schottky mechanism, 24:328
Schreyerite, 6:471t
Schrock alkylidyne catalysts, 26:948–949
Schrödinger’s equation, 16:734–735
Schultz-Flory distribution, 20:156
Schultz-Flory equation, 17:714
Schulze–Hardy rule, 7:289, 10:121
Schweizer, M. E., 11:248
Schwenzfeier process, 3:641
Science
  extending resources to, 21:616–617
  fast-moving frontiers of, 21:613
  new approaches to licensing, sale, and co-development of, 24:361
Science Citation Index, 18:237
Scientific applications, for noble gases, 17:370–371
Scientific data, growth of, 21:612–613
Scientific Design water-based collection and refining system, 15:506
Scientific evidence, 12:90
Scientific grade charge-coupled devices, 19:146
  applications for, 19:149–150
  performance features of, 19:148–149
Scientific research, radioisotopes in, 21:319
Scientific testing, in crime laboratories, 12:95
Scientists
  additional training for, 21:622
  corporate access to, 24:355
  education of, 21:618
SciFinder (CAS), 6:19
Scintillation counters
  cesium application, 5:703
Scintillation crystals, sodium iodide in, 22:827
Scrap tire pyrolysis, 21:476–478
SCISS β-Scission reactions, 14:280–281
SCK micelles, 20:489, 490
Scilate, 24:573
Scilate, 24:573
Sclerenchyma cells, 21:18
Scleroglucan, 20:578, 4:724t
classification by structure, 4:723t
Scleroglucan polysaccharides, 20:455
Sclerotinia sclerotiorum, 13:351
Sclerotinite, 6:707t
Scfeld's calculated X-ray photoionization
cross sections, 24:86–87
Scoping activities, EIA, 10:234
Scoping methods, EIA, 10:239t
Scopolamine, 2:79, 80
Scopolanine hydrobromide, 4:360t
Scorch behavior, in rubber compounding,
21:794
Scorch resistance, in vulcanization, 21:811
Scorch time, in vulcanization, 21:803
SCORR cleaning system, 24:22
Scotch-Marine boiler, 3:388
Scouring, 9:171, 183, 189, 192, 197
of fibers, 11:180
in wool processing, 26:384–385
Scoville Heat test, 23:159
Scrap
chemical composition of, 23:262
recovery of silver from, 22:653
as a worldwide commodity, 23:262
Scrap (revert) titanium, recycling of,
24:848, 857
Scrap copper, 21:392–393
Scrapers
in basket centrifuges, 11:389
with rotary drum vacuum filters, 11:356
Scrap metals, 16:134
Scrap processing facilities, 21:410
Scrap recovery, germanium, 12:559–560
Scrap rubber, depolymerized, 21:467
Scrap rubber fuel, 21:463–466
Scrap steel, as raw material, 23:261–262
Scrap tire(s)
civil engineering market for, 21:476–478
Scrap tire fuel, in cement kilns, 21:464
Scrap Tire Management Council (STMC),
21:463, 464
Scrap tire pyrolysis, 21:466–467
Scrap tire regulations, 21:462
Scrap tire utilization projects, goal of,
21:478
Scratch resistance, 19:582
SCR catalysts. See also Selective catalytic
reduction (SCR)
selection of, 10:100–101
types of, 10:99–100
SCR DENO_x plants, 10:101
Screen bowl decanter centrifuge,
5:541–542
Screen centrifuge
conical, 5:546–548
continuous cylindrical, 5:545–546
Screen decks, 22:279–281
deck area of, 22:281–282
Screened quicklime, 15:65
uses for, 15:61–62
Screen filters, 15:827, 828
Screening
of minerals, 16:615–618
in paper recycling, 21:436
in size separation, 22:279
in wastewater treatment, 25:888–889
Screening activities, EIA, 10:234
Screening devices, 22:275, 279–283
Screening machine, 21:383
Screening methods, EIA, 10:239t
Screening, of paper stock, 18:106
Screening smokes, 5:827, 828–830
Screen membranes, 15:827
Screen-plate process, in color photography,
19:240–241
Screen-printed biosensors, 3:810–812
Screen printing, 9:220–221
Screen process inks, 14:328
Screen sieving, 11:795
Screen size measurements, 23:158–159
Screen surfaces, 16:618
Screw conveyor process
in vinyl alcohol polymerization, 25:610
Screw conveyors, 9:131
Screw presses, 11:381
Scroll centrifuge
operation, 5:528
power, 5:521
theory of performance, 5:518
Scroll compressors, 21:535
Scroll discharge, with horizontal pan filter,
11:353
SCR reactions, 10:97–98
Scrubbers
efficiency equations for, 26:714–717
Scrubbing. See Absorption
824 SCRUBBING SOLUTION

Scrubbing solution, 11:716–717

Sculptures
  degradation of, 11:416–418
  varnishes and protective coatings for, 11:411–412

Scurvy
  ascorbic acid and, 25:745–747, 770–771
  “total fiber,” 11:612–613

SD data files, in SMILES, 6:3–6
SDS capillary gel electrophoresis (CGE)
  in microfluidic assays, 26:971
SDS–polyacrylamide gel electrophoresis
  (SDS–page), 9:745–746, 755

Sea bass
  common and scientific names, 3:187t

Seaborgium (Sg), 1:491, 492t, 497

Sea bream
  net-pen culture, 3:195

Seafood
  citric acid in, 6:646
  packaging, 18:31–32

Sea Island cotton, 8:2

Sealants, 22:27–49
  acrylic, 22:41–43, 48t
  acrylic ester polymers, 1:390
  adhesion life of, 22:31–32
  adhesives versus, 22:28
  application of, 22:47
  asbestos applications, 3:312
  butyl, 22:43–44, 48t
  butyl rubber applications, 4:454
  calcium carbonate applications, 4:555
  chlorinated paraffins applications, 6:128
  defined, 22:27
  defoamer applications, 8:245
  dispersant applications, 8:692
  durability of, 22:29–32
  economic aspects of, 22:45–46
  health and safety factors related to,
    22:46–47
  in RTV silicone preparation, 22:594–595
  manufacture of, 22:44–45
  movement capabilities of, 22:28–29
  performance characteristics of, 22:28–32
  poly(ﬂuorosilicones) in, 20:246
  polysulfide, 22:40–41, 48t
  processing of, 22:44–45
  Si-hybrid, 22:38–40, 48t
  silicone, 22:31, 32–35, 48t
  smectites application, 6:697t, 698
  solvent-releasing acrylic, 22:43
  specifications for, 22:46
  styrenic block copolymers in, 24:714
  summary of 48t
  suppliers of, 22:46t
  temperature stability of, 22:29–30
  testing and validation of, 22:28
  types and formulations of, 22:32–44
  urethane, 22:31, 35–38, 48t
  uses of, 22:47–48
  weatherability of, 22:30–31

Sealants Weatherproofing and Restoration
  Institute (SWRI), 22:28

Sealed argon bubbling (SAB), 23:264

Sealing
  for pumps, 21:80–82
  of vitreous silica, 22:415, 416

Seals, indium, 14:194, 196

SeaNine 211
  biocide for antifouling coatings, 7:156

Search Check database, 18:238

Search–match applications
  diffractometers in, 26:428

Seawater
  barium in, 3:347
  bioremediation of hydrocarbons, 3:764
  chemical recovery from, 5:786–787
  composition of, 22:797t
  corrosivity of, 26:71–72
  cycling of, 26:19
  desalting, 26:84–85
  dissolved inorganic species in, 26:21–22
  major composition of, 26:20t
  salt from, 15:837
  salt from evaporation of, 22:806–808
  selenium content of, 22:77
  uranium recovery from, 17:527

Seawater cells
  speciality for military and medical use,
    3:430t

Seawater distillation, 15:834, 21:648–650
  dispersant applications, 8:688–689

Seawater–dolomite magnesium hydroxide
  production, 15:399

Seawater magnesium oxide manufacture, 15:412
Seawater pretreatment, 16:25
Seawater reverse osmosis systems, 26:76–79
Seawater reverse osmosis, 26:97
Seawater reverse osmosis desalination systems, 26:80
Seawater reverse osmosis projects
product water contract price for, 26:98
Seawater scrubbing, 11:717
Seaweed(s)
as biomass, 3:684
bioremediation of hydrocarbons, 3:765
in iodine manufacture, 14:360
Seaweed (algal) extract gums, 13:63t
Seaweed extracts, 13:67, 68
Seaweed polysaccharides, 20:568–573
Sebamic acid production, 9:679–680
S–EB–S polymers, 24:713–714, 715
Secalogenin, 2:94
Secant modulus, of sealants, 22:29
Secondary alcohol
dispersant moieties, 8:706t
Secondary alkane-sulfonates (SAS), 23:528
Secondary amine(s), 10:392–393
predicted deviations from Raoult’s law
based on hydrogen-bonding interactions, 8:814t
Secondary batteries, 3:471–552. See also
Alkaline secondary cells; Batteries;
Lead–acid batteries; Lithium secondary cells; Primary batteries
defined, 3:409
economic aspects, 3:540–541, 551–552
health and safety factors, 3:519–520
recycling lead acid batteries, 3:541
recycling NiCd batteries, 3:520
World market 2000 estimated, 3:410t
Secondary bonding, in polymers,
20:396–397
Secondary combustion chamber (SCC), 13:175
Secondary combustors, 13:174
Secondary creep, 5:625
of fibers, 11:184
Secondary direct food additives, 12:30–31
Secondary electrons, in surface imaging,
24:76
Secondary explosives, 10:722, 724
Secondary fibers, bleaching of, 21:51–52
Secondary fixed points, \( T_{90} \) values for,
24:442t
Secondary flows, 11:765–766
Secondary intrinsic magnetic properties, of
M-type ferrites, 11:67, 68
Secondary ion mass spectroscopy (SIMS),
24:74. See also SIMS entries
archaeological materials, 5:744
Secondary ions, measurement of, 24:107
Secondary lead, 14:756–760
developments related to, 14:760
Secondary mercury production, end-uses
and sources for, 16:39–42
Secondary metabolites
fermentation products as, 11:3, 21
isolation after fermentation, 11:43
Secondary metal, 16:134
Secondary neutrals mass spectrometry
(SIMS), 24:107–108
Secondary phosphines, 19:60, 64
Secondary platinum-group metals,
19:611–612
Secondary radiations, 21:312–313
Secondary recycling, 21:378–379, 449, 450
Secondary refrigerants, 21:525
Secondary slags, electric furnace for,
14:759–760
Secondary timber products, 26:363–364
Secondary tin, 24:789
Secondary vulcanization accelerators,
21:797
Secondary wastewater treatment, 25:888
Second falling rate period, 23:66
Second-generation ionic liquids, 26:838,
847, 865
Second-harmonic generation (SHG),
target of crystal engineering, 8:86t
Second law of thermodynamics
entropy and, 24:648–651
Kelvin–Planck statement of, 24:654
Second Legendre polynomial, 15:84
Second-order nonlinear optical materials,
17:444–453
Second-order test procedure, 22:56
Sectral
molecular formula and structure, 5:94t
Securinine, 2:107
Security
of hazardous materials, 25:343
in radioactive waste disposal, 25:856,
857
Security barriers, silver in, 22:658
Security measures, nuclear power plant,
17:535–536
Securon
molecular formula and structure, 5:97t, 119t

Sedagul
molecular formula and structure, 5:91t

Sedimentation, 22:50–71, 8:719–722
as advanced wastewater treatment, 25:908
applications of, 22:50–51
colloids, 7:278–279
defined, 22:50
design methods for, 22:57–59
equipment using, 22:59–69
in fluid-dynamic separating devices, 22:275
gravity, 22:51
immiscible, 22:50–51
liquid–liquid, 22:50–51
nomenclature for, 22:69t
principles of, 22:51–56
settling tests of, 22:56–57
solid–liquid, 22:50
solid–solid, 22:50
in wastewater treatment, 25:889t, 891
in water treatment, 26:103–105
Sedimentation analysis, 18:144
Sedimentation centrifuges, 5:526–542
Sedimentation—clarification
in hazardous waste management, 25:821–822
Sedimentation classifiers, 16:619–620
in depth filtration theory, 11:339
in particle size measurement, 18:142–144
in solid–liquid separation, 16:656–657
Sedimentation rate
particle diameter and, 26:103t
Sedimentation units, stacking of, 22:66–67
Sediment
silicones in, 22:602
in sugar, 23:472
Sediment reduction, 9:441–442
Sedimentation equilibrium, 8:712–714
Sedolatan
molecular formula and structure, 5:120t
Sedridine
molecular formula and structure, 5:128t
Seebeck coefficient, 24:459
changes in, 24:460
Seebeck effect, 24:428, 458
Seed(s)
dormancy survival strategies of, 13:304
in random number generation, 26:1002
solvent extraction for, 10:817–818
Seed germination biostimulant, 13:52
Seed gum(s), 13:63t
classification by structure, 4:723t
Seed-hair fibers, 11:285
mechanical properties of, 11:290t
processing of, 11:297
uses of, 11:299t
Seed mitotic stages, abnormal, 13:355–356
Seed mucilages, 20:454
Seed oils, 10:807
triglyceride structures of, 10:811
Seed priming, 1:744
oxygen demands, 1:730t
Seed priming bioreactors
aeration biotechnology applications, 1:744
Seed stage medium, 11:28
Seed trains, in fermentation, 11:42
Segmented-arc nozzle design, 16:8
Segmented elastomeric polyurethane fibers, 25:476–477
Segmented orifice plates, 11:657–658
Segmented polyurethanes, as biomaterials, 23:722
Segmented thiopolyurethanes, 23:744
thermoplastic, 23:745
Segregation
ceramics processing, 5:648
waste minimization via, 25:883
Seismic control, virtual two-way SMA devices for, 22:349
Selacholeic acid
physical properties, 5:32t
Sellar OH, 3:383, 397
Sellar PA 3426, 3:384, 386
Sellar RB, 3:397
Selected area electron diffraction (SAED), 16:489
Selected ion monitoring mode, mass spectrometer, 6:431
Selection, in chemical product design, 5:759, 772–776
Selective carburizing, 16:205
Selective catalytic reduction (SCR), 11:719–720, 19:626 See also Nonselective catalytic reduction; SCR entries
method, 17:183
in NOx emission control, 10:97–101
problems with, 10:101
process of, 10:98–99
unit, 13:792
Selective control, 20:697–698
Selective flocculation, 8:711
Selective herbicides, 13:284–285, 313, 363
Selective leaching
  in industrial water treatment, 26:126
Selective poisoning, 5:258
Selective reflection phenomenon, 15:92
Selective solvent-free oxidation, with
clayfen, 16:568–569
Selective Surface Flow (SSF) membrane technology, 13:795
Selectivity
  adsorption, 1:583, 584
gas adsorption, 1:621–622
  of ion-exchange resins, 14:395–396
  simulated moving bed (SMB) liquid
  adsorption processes, 1:669–670
catalysts, 5:202
  instruments, 6:31
  as a catalyst property, 10:46
Selectivity coefficient, 14:395
Selector-activated sludge process, 25:900, 904–905
Selenaboranes, 4:204
Selenac, 22:73t
Selenate alums, 22:89
Selenates, 22:88, 89
gallium, 12:359
Selenazole
  uses of, 22:102
Selenazole derivatives
  uses of, 22:102
Selenic acid, 22:73t, 75t, 88–89
Selenides, 22:86–87
  binary, 22:87
Seleniferous plants, toxicity of, 22:96
Selenite, 4:583
Selenium (Se), 22:72–108. See also ZnSe system
discovery of, 22:72
economic aspects of, 22:90–93
effect on copper resistivity, 7:676t
effect on stainless steel corrosion resistance, 7:809
environmental aspects of, 22:96
health and safety factors related to, 22:95–96, 214
impurities found in, 22:92–93
inorganic compounds of, 22:75t, 86–89
manufacture and recovery of, 22:78–85
occurrence of, 22:77–78
organic compounds of, 22:76t, 77, 89–90, 94
for oxidizing iron in glass, 7:343
physical constants of, 22:72t
physical properties of, 22:72–75
purification of, 22:85–86
radioactive isotopes of, 22:72–74
replacement of boron by, 13:650
sodium reactions with, 22:765
specifications and standards for, 22:92–93
stable isotopes of, 22:72
trace and ultratrace levels of, 22:95
uses of, 22:96–103
worldwide consumption of, 22:91
worldwide production of, 22:90, 91t, 93t
Selenium analysis
  of water, 26:41
Selenium-containing donors, synthesis and
  manufacture of, 22:212
Selenium dichloride, 22:75t
Selenium diethyldithiocarbamate, 22:73t
Selenium dioxide, 22:73t, 75t, 88
toxicity of, 22:95
Selenium disulfide, 22:73t
Selenium hexafluoride, 22:75t, 87
toxicity of, 22:96
Selenium hypofluorite, 22:75t
Selenium iodides, 22:87
Selenium monobromide, 22:75t, 88
Selenium monochloride, 22:75t, 87
  in selenium recovery, 22:85
Selenium monoxide, 22:88
Selenium oxidation, selenium recovery via,
  22:81–83
Selenium oxybromide, 22:75t, 88
Selenium oxychloride, 22:73t, 75t, 88
Selenium oxyfluorides, 22:75t, 88
Selenium oxyhalides, 22:87, 88
toxicity of, 22:95

discovery of, 22:72
economic aspects of, 22:90–93
effect on copper resistivity, 7:676t
effect on stainless steel corrosion resistance, 7:809
environmental aspects of, 22:96
health and safety factors related to, 22:95–96, 214
impurities found in, 22:92–93
inorganic compounds of, 22:75t, 86–89
manufacture and recovery of, 22:78–85
occurrence of, 22:77–78
organic compounds of, 22:76t, 77, 89–90, 94
for oxidizing iron in glass, 7:343
physical constants of, 22:72t
physical properties of, 22:72–75
purification of, 22:85–86
radioactive isotopes of, 22:72–74
replacement of boron by, 13:650
sodium reactions with, 22:765
specifications and standards for, 22:92–93
stable isotopes of, 22:72
trace and ultratrace levels of, 22:95
uses of, 22:96–103
worldwide consumption of, 22:91
worldwide production of, 22:90, 91t, 93t
Selenium analysis
  of water, 26:41
Selenium-containing donors, synthesis and
  manufacture of, 22:212
Selenium dichloride, 22:75t
Selenium diethyldithiocarbamate, 22:73t
Selenium dioxide, 22:73t, 75t, 88
toxicity of, 22:95
Selenium disulfide, 22:73t
Selenium hexafluoride, 22:75t, 87
toxicity of, 22:96
Selenium hypofluorite, 22:75t
Selenium iodides, 22:87
Selenium monobromide, 22:75t, 88
Selenium monochloride, 22:75t, 87
  in selenium recovery, 22:85
Selenium monoxide, 22:88
Selenium oxidation, selenium recovery via,
  22:81–83
Selenium oxybromide, 22:75t, 88
Selenium oxychloride, 22:73t, 75t, 88
Selenium oxyfluorides, 22:75t, 88
Selenium oxyhalides, 22:87, 88
toxicity of, 22:95
Selenium photovoltaic cell, 22:100, 103
Selenium pink glass, 22:97
Selenium rectifiers, 22:99–100
Selenium ruby glass, 22:96–97
Selenium sulfide
anti-dandruff agent, 7:851
Selenium–tellurium azeotrope, 22:85
Selenium-Tellurium Development Association (STDA), 22:103
Selenium tetraboronide
physical properties of, 4:325
Selenium tetraboronide, 22:75t, 87–88
use in selenium analysis, 22:94
Selenium tetrachloride, 22:73t, 75t, 87
in selenium recovery, 22:84
Selenium tetrafluoride, 22:75t, 87
Selenium trioxide, 22:75t, 88
Selenium vapor, 22:74–75
Selenoaminocarboxylic acids, 22:96
Selenocarbazides, uses of, 22:102
Selenocyanogen, 22:89
Selenocysteine, 22:89
Selenoproteins, 22:102
Selenourea, 22:73t
Selenourea inclusion compounds, 14:172
Selenous acid, 22:73t, 75t, 88–89
use in selenium analysis, 22:94
Self-accelerating decomposition temperature (SADT) test, 18:491–492
Self-aligned (SA) FET fabrication, 22:162–163. See also Field effect transistors (FETs)
Self-aligned (SA) HBT fabrication, 22:167
Self-assembled monolayers (SAMs), 7:408, 15:192, 16:798–799
Self-assembled supermolecule, hexameric, 16:802
Self-assembly, in supramolecular chemistry, 24:49–50
Self-assembly thin film preparation method, 17:57–58
Self-association, of surfactants, 22:725
Self-baking carbon electrodes, 12:752, 757–758
Self-baking electrodes, 12:305, 755
Self-bonded reaction-sintered silicon nitride, 17:210, 211
Self-catalyzed polyols, 25:464
problems and outlook for, 22:123–124
surface characteristics of, 22:108–109
Self-cleaning objects, solar photocatalysis and, 19:101
Self-cleaning surfaces, development of, 22:117–120
Self-complementary molecules, supramolecular motifs of, 16:802
Self-condensation, of silanols, 22:566
Self-consistent field (SCF) approximate method, 16:736
Self-doping approach, 13:546
Self-esterification, 14:127
Self-exchange electron-transfer reactions, 13:429–430
Self-field, 23:834–835
Self-generating flowmeter, 11:654
Self-healing paint, 5:778
Self-humidifying proton exchange membrane fuel cells, 12:212–213
Self-immobilization, 16:88
Self-inerting spray dryer, 9:128
Self-irradiation damage, in plutonium metal, 19:684–685
Self-lubricating organic polymers, 15:248
Self-polishing antifouling coatings, 7:158
Self-propagating high temperature synthesis, ceramics, 5:664
Self-propagating high temperature synthesis (SHS) process, 16:175
Self-recognition, 16:801–804
inorganic, 16:801–803
Self-regulated drug delivery systems, 9:61–71
Self-regulating insulin delivery, 9:67
Self-regulating oscillatory insulin delivery, 9:71
Self-replication, in supramolecular chemistry, 24:49–50
Self-rising flours, 26:281–282, 283
Self-sensing, in rheometers, 21:737
Self-supporting structures, artificial graphite in, 12:745
Self-warming baby milk bottle
product design consideration, 5:779–781
Sellmeier dispersion formula, 7:338
Selsun Blue, selenium in, 22:101
Selwyn granularity, 19:221–222
SEM/EDS, 24:78. See also Scanning electron microscopy (SEM)
technique, in fine art examination/conservation, 11:406–407
Semen
citric acid in, 6:632t
<table>
<thead>
<tr>
<th>Semantic Role</th>
<th>Natural Text</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Semianthracite coal</strong></td>
<td>classification by rank, 6:711t</td>
</tr>
<tr>
<td></td>
<td>rank and heating values, 6:726t</td>
</tr>
<tr>
<td></td>
<td>vitrinite reflectance limits and ASTM coal rank classes, 6:708t</td>
</tr>
<tr>
<td><strong>Semianthracite coal grade (U.S.)</strong>, 6:713t</td>
<td></td>
</tr>
<tr>
<td><strong>Semiaromatic polyamides</strong>, 10:210, 216</td>
<td></td>
</tr>
<tr>
<td><strong>Semibatch latex manufacturing</strong>, 14:720–721</td>
<td></td>
</tr>
<tr>
<td><strong>Semibatch operation safety</strong>, 21:843</td>
<td></td>
</tr>
<tr>
<td><strong>Semibatch polymer colloid process</strong>, 20:376</td>
<td></td>
</tr>
<tr>
<td><strong>Semibetatron operation safety</strong>, 21:843</td>
<td></td>
</tr>
<tr>
<td><strong>Semibright nickel</strong>, 9:820</td>
<td></td>
</tr>
<tr>
<td><strong>Semibulk containers</strong>, 18:5–6</td>
<td></td>
</tr>
<tr>
<td><strong>Semibullvalene</strong></td>
<td>thermochromic material, 6:625</td>
</tr>
<tr>
<td><strong>Semicarbazone cleavage, microwaves in</strong>, 16:562</td>
<td></td>
</tr>
<tr>
<td><strong>Semichemical pulps</strong>, 18:94</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconducting carbides</strong>, 4:647</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconducting ceramics</strong>, 5:599–601</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconducting diamonds</strong>, 8:541</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconducting glasses</strong>, 12:587</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconducting oxides</strong>, 24:329</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconducting polymers</strong>, 7:534–535</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconductor(s). See also Amorphous semiconductors; Compound semiconductors; Organic semiconductors III-V, 9:733–736</strong></td>
<td></td>
</tr>
<tr>
<td><strong>antimony-doped</strong>, 3:53–54</td>
<td></td>
</tr>
<tr>
<td><strong>arsenic applications</strong>, 3:270t, 270–271</td>
<td></td>
</tr>
<tr>
<td><strong>atomic force microscopy of silicon etching</strong>, 3:333–337</td>
<td></td>
</tr>
<tr>
<td><strong>band gap</strong>, 5:596</td>
<td></td>
</tr>
<tr>
<td><strong>carrier mobility of selected at room temperature</strong>, 5:597t</td>
<td></td>
</tr>
<tr>
<td><strong>causes of color in doped</strong>, 7:326t, 335–337</td>
<td></td>
</tr>
<tr>
<td><strong>causes of color in pure</strong>, 7:326t, 335</td>
<td></td>
</tr>
<tr>
<td><strong>CdX</strong>, 9:800</td>
<td></td>
</tr>
<tr>
<td><strong>compound</strong>, 23:15</td>
<td></td>
</tr>
<tr>
<td><strong>defined</strong>, 22:201</td>
<td></td>
</tr>
<tr>
<td><strong>direct-gap and indirect-gap</strong>, 14:837</td>
<td></td>
</tr>
<tr>
<td><strong>energy gap at room temperature for selected</strong>, 5:596t</td>
<td></td>
</tr>
<tr>
<td><strong>energy gap of intrinsic at room temperature</strong>, 5:596t</td>
<td></td>
</tr>
<tr>
<td><strong>epitaxial deposition of</strong>, 19:116</td>
<td></td>
</tr>
<tr>
<td><strong>Group 14 (IV) elements as</strong>, 22:232</td>
<td></td>
</tr>
<tr>
<td><strong>high throughput experimentation</strong>, 7:382t, 414t</td>
<td></td>
</tr>
<tr>
<td><strong>hydrides in</strong>, 13:609</td>
<td></td>
</tr>
<tr>
<td><strong>introduction of dopants into</strong>, 14:428</td>
<td></td>
</tr>
<tr>
<td><strong>ion dose for</strong>, 14:427</td>
<td></td>
</tr>
<tr>
<td><strong>photon interaction with</strong>, 23:33–34</td>
<td></td>
</tr>
<tr>
<td><strong>as photosensitive materials</strong>, 22:716</td>
<td></td>
</tr>
<tr>
<td><strong>scanning capacitance microscopy</strong>, 3:326–327</td>
<td></td>
</tr>
<tr>
<td><strong>selenium as</strong>, 22:99</td>
<td></td>
</tr>
<tr>
<td><strong>silicon as</strong>, 22:484–487</td>
<td></td>
</tr>
<tr>
<td><strong>silicon carbide as</strong>, 22:530, 539–540</td>
<td></td>
</tr>
<tr>
<td><strong>silicon in</strong>, 22:499</td>
<td></td>
</tr>
<tr>
<td><strong>silicon oxidation in</strong>, 22:490–491</td>
<td></td>
</tr>
<tr>
<td><strong>silicon purification for</strong>, 22:493–494</td>
<td></td>
</tr>
<tr>
<td><strong>spinel ferrites as</strong>, 11:63–64</td>
<td></td>
</tr>
<tr>
<td><strong>tunneling atomic force microscopy of copper contaminated gate oxides</strong>, 3:337–338</td>
<td></td>
</tr>
<tr>
<td><strong>tunneling atomic force microscopy</strong>, 3:327–331</td>
<td></td>
</tr>
<tr>
<td><strong>vitreous silica in</strong>, 22:442</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconductor bolometer arrays</strong>, 19:166–167</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconductor coatings, doped oxide</strong>, 23:17–19</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconductor compounds, indium in</strong>, 14:197</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconductor crystals, inorganic</strong>, 9:733–734</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconductor device manufacture, high purity oxygen in</strong>, 13:459</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconductor doping, in ion implantation</strong>, 14:446–447</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconductor energy levels</strong>, 9:728–730</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconductor fabrication, standard dimensional tolerance used in</strong>, 15:184–185</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconductor film sensors</strong>, 22:716–717</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconductor industry</strong>, 22:229–230</td>
<td></td>
</tr>
<tr>
<td><strong>applications of</strong>, 22:173</td>
<td></td>
</tr>
<tr>
<td><strong>geometries of</strong>, 22:177–178</td>
<td></td>
</tr>
<tr>
<td><strong>spectral width of</strong>, 14:701</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconductor materials</strong>, 17:825</td>
<td></td>
</tr>
<tr>
<td><strong>gases used in the manufacture of</strong>, 13:456</td>
<td></td>
</tr>
<tr>
<td><strong>optically pumped</strong>, 14:701</td>
<td></td>
</tr>
<tr>
<td><strong>properties of</strong>, 17:222t, 826t</td>
<td></td>
</tr>
<tr>
<td><strong>Semiconductor-metal tandem solar absorbing surface</strong>, 23:11</td>
<td></td>
</tr>
</tbody>
</table>
Semiconductor–phosphor-based sources, for white LEDs, 14:862
Semiconductor photodetectors, 19:128–129t
Semiconductor refractive index, 14:846
Semiconductor structures, chemically perfect, 9:730
Semiconductor surfaces, 9:730–731
Semiconductor technology, 19:127
Semiconductor transport, 22:237–239
Semiconductor–vacuum interface, 22:241
Semicontinuous deodorizer, 10:815
Semicontinuous dyeing, 9:211–213
Semicontinuous ion-exchange systems, 14:403
Semicontinuous polymerization, of polyesters, 20:12
Semicrystalline polymers, 20:351, 352, 588 toughness of, 20:354
Semicrystalline resins, 19:537
Semicrystalline thermoplastics, melting temperature of, 19:538t
Semicrystalline thermoplastics, melting temperature of, 19:538t
Semi-efficient (semi-EV) sulfur vulcanization cure systems, 21:801, 802
Semiempirical molecular orbital (MO) theory, 16:739
Semifabrics, 7:671, 680, 691
Semiflexible molded polyurethane foams, 25:470
Semifusinite, 6:707t
Semi-gloss alkyd paint formulation, 18:61t
Semi-interpenetrating network (IPN) approaches, 10:436
Semi-IPN (interpenetrating polymer network) hydrogels, 13:733
Semikilled steels, 23:291
Semimoist pet foods, 10:849
Semipermanent cells, 14:228
Semiphorone, 14:583
Semiportable MRI system, 23:860–861
Semiregenerative reforming operations, 25:166
Semireinforcing blacks, 21:776
Semirigid foams, 25:470
Semirigid food packaging, 18:47–51
Semisolid drug dosage forms, 18:713
Semisolid resins, 10:372
Semisweet chocolate, 6:362
Semisynthetic 14-membered macrolides, 15:280–287
Semisynthetic hydrocolloids, 12:54
Semisynthetic metalworking fluids, 1:22, 15:240–241
Semolona, 26:284
Semon, Waldo, 25:628
Senarmontite, 3:41, 58
Sensible heat transfer, 13:196
Sensing, inclusion compounds in, 14:185
Sensit
molecular formula and structure, 5:119t
Sensitive leak testing, piping system, 19:487
Sensitivity
instruments, 6:31 photographic, 19:173
Sensitivity analysis, 9:547–548 in parameter estimation, 26:1039
Sensitivity and uncertainty analysis, in life cycle assessment, 14:823–824
Sensitivity sampling, 14:216
Sensitization
Sensitization maxima, photographic, 20:513
Sensitized materials, worldwide producers of, 19:216t
Sensitizers, for photodynamic therapy, 19:122
Sensor fabrication, 22:267
Sensors, 22:263–274
chemical, 22:264, 269
conducting polymer applications, 7:539
coordination compound applications, 7:598–599
distributed, 11:152–153
economic aspects of, 22:272
extrinsic fiber-optic, 11:148
for fiber-optic smart structures, 11:146–159
high throughput experimentation
  application for microscale, 7:424
intrinsic fiber-optic, 11:148
liquid crystal, 15:117
organic semiconductors used in, 22:225
  passive, 22:706–707
smart, 22:267, 268, 706–707, 709
using acoustic waves, 22:269–270
virtual two-way SMA devices in, 22:350
Sensors Magazine, 22:264
  optical fiber, 12:614–616
piezoresistive, 20:655–656
single-molecule, 24:54
sol–gel techniques in the manufacture of, 13:551
Sensor systems, 22:263
Sensor technology, 22:263
  decision-making tool for, 22:264–266
  economic aspects of, 22:272
  glass industry, 12:602–604t
  scientific literature on, 22:266
Sensory evaluation, of flavors, 11:511–516, 582–583
Sensory irritation
  as a toxic effect, 25:209–210
Separated recyclables, 21:368–369
Separately coupled single-stage vertical in-line pump designs, 21:64
Separation. See also Chiral separations;
  Gas separation; Liquid separation;
  Membrane separation; Size separation
activated carbon application, 4:756–757
adsorbents for, 1:612
adsorption processes, 1:612–613
  cellulose ester applications, 5:404
  centrifugal, 5:505–548
  chromatographic, 14:384
difficult, 10:788
function of crystallization, 8:95
  inclusion compounds in, 14:184–185
ionic liquids as solvents for, 26:873–877
  in nonaqueous media, 21:654–656
silver flotation, 22:646–647
tellurium from selenium, 22:85
Separation curve, in evaluating size separation, 22:276–278
Separation factor
  adsorption of mixtures, 1:593–594
Separation lanthanide processing, 14:639–642
Separation-nozzle method, 25:417
Separation of Isotopes by Laser Excitation (SILEX) technology, 25:416–417
Separation processes
  enhanced, 21:670–673
  foams in, 12:19, 21–22
  for supercritical fluids, 24:13–14
  sustainable development and, 24:175–176
Separation products, identifying, 9:753
Separations process synthesis, 22:297–339
  approaches to, 22:297–298
  for binary systems, 22:322–325
  defined, 22:297
  evolving strategies for, 22:322–329, 330
  flowsheet generation for reactive systems, 22:329–337
  heuristic distillation sequencing for nonazeotropic mixtures, 22:298–301
  methylene chloride alternatives in, 22:329, 330
  for nonideal liquid mixtures, 22:301–329, 330
  requiring third component, 22:325
  selection issues in, 22:316–322
Separation synthesis algorithm, 22:312–316
Separation technologies, 21:632
Separator(s), 3:409
  feed rates for, 15:446t. See also Gas separation
operating components of, 16:640
  spiral channel, 22:63
  tilted plate, 22:68, 69
  Vertical Gravity, 22:69
  vortex-induced, 22:62–63
Separatrix (separatrices), 22:303
Sephacryl resins
  for gel-permeation chromatography, 3:836
  products available, 3:827
Sephadex resins
  for gel-permeation chromatography, 3:836, 837
  products available, 3:827
Sepharose resins
for affinity chromatography, 3:846
for gel-permanation chromatography, 3:836
products available, 3:827
Sepiolite, 3:289
asbestos substitute, 3:314t
estimated total production, 6:683
mining, 6:681
occurrence and geology of major deposits, 6:667
structure and composition, 6:670–671
uses, 6:699–701, 700t
S–EP–S block copolymers, 24:707
Septamycin, 20:133
Septic tanks, 25:915
Sepulchrates, 24:42
Sequence amplification, by polymerase chain reaction, 12:513
Sequence analysis, automated, 12:512
Sequence-dependent cleavage, of DNA, 12:497–498
Sequence information, uses of, 12:512–513
Sequence libraries, combinatorial, 12:515–517
Sequences. See also Hammersley sequence sampling (HSS); Latin hypercube entries; Sobol sequence
quasi-Monte Carlo, 26:1011, 1013
quasirandom, 26:1016, 1036, 1048
Sequence tagged sites (STS), 12:513, 515
Sequencing batch reactor (SBR)
as advanced wastewater treatment, 25:907
in biological waste treatment, 25:905
defined, 3:759t
Sequencing, of fermentation, 11:40–41
Sequencing project results, assembly and analysis of, 12:510–512
Sequential function charts (SFC), 20:705–707
Sequential function chart notation, 20:706–707
Sequential hydrolysis, 10:536
Sequential modular approach, 20:730
Sequential polymerization, 24:704
Sequential proportioning, 26:249
Sequential substitution reactions, 16:361
Sequential synthesis film fabricator, 17:447
Sequesterant, 12:33
Sequestering agents, actinide, 24:769–770
Sequestering agents, in food, 12:62–63
Sequestrants, 14:709
Sequestration
chelating agents for, 5:731–732
SER continuous advancement process, 10:364. See also Solid epoxy resins (SERs)
Serdas, commercial defoamer, 8:241t
Serfin
molecular formula and structure, 5:155t
Sericin proteins, 22:629
in silkworm silk, 22:628
D-SERINE
content in cocoa and chocolate products, 6:368t
systematic name, formula, and molecular weight, 2:555t
taste profile, 2:605
L-SERINE
systematic name, formula, and molecular weight, 2:555t
Serine proteases, 10:278
Serotonin, 2:92, 4:85
Serpak process, 17:292
Serpasol
molecular formula and structure, 5:155t
Serpentine asbestos, 1:803, 3:288
Serprocidins, 18:258
SER testing platform, 21:741
Serum, 4:111
Serum composition, of polymer colloids, 20:386
Service marks, 25:253
Servomechanisms, 20:667
Servovoltage, 11:673
Sesame oil
cosmetically useful lipid, 7:833t
Sesame seed, 23:171
Sesamol, 10:806
Sesqui process, for sodium carbonate recovery, 22:790
Sesquiterpenoids, 24:470, 472, 541–550
SETAC-UNEP Life cycle Initiative, 14:827, 829
Set point changes, 20:667
Setter tile, 21:481
Setting operations
in wool processing, 26:386–388
Settling
hindered, 22:53–54
of suspensions, 22:53–55
zone, 22:54–55, 57, 58–59, 64
Settling aerated lagoon, 25:904
Settling-pool classifiers, 22:283–285
Settling tanks, batch-operated, 22:59
Settling tests, of sedimentation, 22:56–57
Setting up, 1:528
Settling velocity, 5:506
7-substituted tetracyclines, 24:596
73% caustic grade of caustic soda, 22:838
Severity of failures, 26:982
Severity of quench, 23:283
Sex attractant receptors, 22:269
Sex steroids, chemical structure of, 13:3
Sexually transmitted infections, 24:604–605
Sexually transmitted diseases (STDs) dendrimers as antiviral drugs against, 26:799
Seyler coal classification system, 6:709–710, 719
S-Glass fibers, 26:758
SG sol–gel abrasives, 1:7
Shadow projection X-ray microscopy, 16:504
Shaft furnace, reduction in, 14:513
Shaft kilns
annular, 15:48–49
with a cocurrent section, 15:48–52
countercurrent, 15:47–48
Shake flasks, 15:690–691
SHAKE method, 16:748
Shaking table, 16:629–631
Shale, 6:686
instability problems in, 9:35
occurrence and geology of major deposits, 6:667
raw material for cement, 5:467, 475t
stabilization of, 9:20–22
uses, 6:701
Shallow trench isolation (STI), 22:252
Shampoo
acute oral LD50 ranges, 8:446t
surfactants in, 24:158–159
Shampoosing
detergent systems for, 8:413t
Shampoo perfumes, 18:364
Shanks process, for sodium nitrate, 22:845–846
Shaped activated carbons, 4:747
Shaped refractories, 6:491
Shaped-tube electrolytic machining (STEM), 9:599–600
Shape-memory alloys
biomaterials, 3:741–750
Shape-memory alloys (SMAs), 22:339–354, 708t, 711–713, 721t
applications of, 22:345–353
crystallography of, 22:341–345
derrous, 22:342t
future outlook for, 22:353
magnetically controlled, 22:712
nonferrous, 22:342t
one-way, 22:712
operation and properties of, 22:339–341
processing of, 22:353
two-way, 22:712
Shape-memory anchors, 22:351
Shape-memory damping, virtual two-way SMA devices for, 22:349
Shape-memory effect (SME)
applications of, 22:345–353
described, 22:339
first reported, 22:341
smart materials exhibiting, 22:711
systems exhibiting 342–345
See also Smart polymers
applications of, 22:355
biodegradable networks of, 22:364
cyclic and thermomechanical characterization of, 22:358–362
defined, 22:355–356
two-way, 22:355
Shark liver oil extracts, 24:556
Shearless catalyst, 25:99
Sharpness index
  for centrifuges, 22:288
  for hydrocyclones, 22:287
  in size separation, 22:277, 278
  for wet classifiers, 22:285
Sharpness, photographic, 19:222
Shaving creams, 7:852
Shaving products, 7:851–852
Shear-dependent/-independent viscosity, 10:10
Shear, effect on ethylene oxide polymers, 10:679
Shear-extension coupling, 26:782
Shear flow-induced coalescence, of droplets, 20:331–332, 333
Shear flows, mass and heat transport within, 11:758–759
Shear force, 15:205
Shearing component, 15:204
Shearing, of staple-fiber nonwoven fabrics, 17:516
Shear modulus, 13:498, 26:777
  of dry foams, 12:16
  of silicon carbide, 22:526t
  of vitreous silica, 22:430
  of wet foams, 12:17–18
Shear plane, polymer colloid, 20:383, 384
Shear pulverization, of polymer blends, 20:326
Shear rate(s), 16:682–683, 21:702–703, 707
  estimating, 15:689
  of foam, 12:18
  range for mammalian cell culture, 5:347t
  of silicone oils, 22:576. 577
Shear stress, 16:682–683
  in Newtonian fluids, 12:15
  Oldroyd expression for, 11:771
Shear stress decay, determining, 21:708
Shear tests, 1:514
Shear thickening, 21:717
Shear thinning, 20:199, 223–224
  of liquid-crystal polymers, 20:83
Shear-thinning behavior, 21:705
Shear-thinning liquid, 21:707
Shear viscosity, 10:26
  of polyesters, 20:12–13
Shear waves, 17:422
Shear yielding, in polymer blends, 20:351, 353–354
Sheep, wool from, 11:173
Sheet and profile extrusion, low density resin for, 20:233t
Sheet and shape dental wax, 8:298 specification, 8:300t
Sheet coaters, 7:2–3
Sheet copper, 7:724
Sheet extruded food packaging, 18:48
Sheet extrusion
  VDC copolymers in, 25:725, 734
Sheet extrusion, 19:546–547
Sheet-fed offset inks, 14:320
Sheet fluorosilicates, 12:634–636
Sheet forming, of paper, 18:118–122
Sheetmetal forming dies
  bismuth alloy applications, 4:14
Sheet metal forming, of titanium, 24:859
Sheet-molding compound, 19:557, 20:117
  injection molding of, 20:118
  phenolic, 18:793
Sheet(s)
  number produced from one bale of cotton, 8:133t
  oriented polystyrene, 23:409
Sheet press, in paper manufacture, 18:121
Sheet production, of methacrylic ester polymers, 16:282
Sheet silicon, 23:40–41
Shell z-olefin manufacture, 17:713–714. See also Shell higher olefins process (SHOP)
Shellac
  hair conditioner ingredient, 7:855t
Shellac-bonded grinding wheels, 1:19
Shellac wax, 26:208
  performance enhancement in, 13:276
  performance limitations of, 13:270
Shell Coal Gasification process (SCGP), 6:779, 799–800, 829
  gasifier performance, 6:800, 801–803t, 804
Shell cross-linked micelles, 20:489
Shell cross-linked nanoassemblies, 20:489–490
Shell entrained flow gasifier, 6:799–800
Shellfish poison, 5:822
Shell higher olefins process (SHOP), 17:122, 718–720, 725, 26:939
Shell materials. See also
Microencapsulation
biodegradable, 16:441–442
types of, 16:439t
water-soluble, 16:456–457
Shell Middle Distillate Synthesis (SMDS) process, 6:778, 829
Shell-molding process, for phenolic resins, 18:788
Shell-side feed hollow-fiber modules, 15:819–821
Shell-side flow maldistribution effect, 13:258
Shell-side tube bundle pressure drop, 13:262–263
Sherritt-Cominco (SC) copper process, 23:576
Sherritt-Gordon metal recovery process, 16:154–155, 156
flow sheet for, 16:157
Sherwood–Holloway constants, 1:66t
Sherwood number (Sh), 15:685, 686t, 688, 722, 724, 726, 728, 25:290, 311
S-heterocyclics, in petroleum mid-distillates, 18:586
Shielding, inclusion compounds in, 14:183–184
Shield, nuclear reactor, 17:569
Shifted Hammersley sequence sampling, 26:1013
Shift Technical Advisor, in nuclear power facilities, 17:538
Shigella
uv disinfection, 8:652t
Shikimic acid, 13:300, 2:83–84, 96, 106
Shiners
common and scientific names, 3:187t
Ship building industry, 10:444
Shipping
of halogen fluorides, 13:129
of hydrazine, 13:585–586
Shipping, 25:329–330. See also Transport; Transportation entries
Shipping bags, 18:11
Shipping containers
corrugated paperboard, 18:17
for food products, 18:37
Shipping papers, 25:339–341
Shipping terms, 25:329
Shirakawa technique, 7:514
Shockley diode, 22:245
Shockley diode equation, 22:243, 246
Shockley equation, 14:838–839
Shock synthesis
of diamonds, 8:536
Shock treatment
of swimming pools, 26:181–182
Shop-assembled boilers, 12:327
Shop fabrication, piping system, 19:484–485
Shorelines
bioremediation of hydrocarbons, 3:764–765
Short-chain branching
in high density polyethylene, 20:159
in low density polyethylene, 20:220
Short-chain-length PHA (PHASCL), 20:249–251, 253, 257
industrial production of, 20:263
Short-chain surfactants, 24:122
Short channel effect (SCE), in scaling to deep submicron dimensions, 22:255
Short-circuit current (I_sc), 22:136
Short contact time (SCT) cracking, 11:685–686
Short Contact Time (SCT) technology, 16:842
Shortenings
estimated maximum oxygen tolerance, 3:381t
Short-fiber composites
fabrication of, 26:766
Short fiber metal–matrix composites,
casting process for, 16:168
Short fiber web layering systems, 17:504
Short oil alkyds, 2:148
Short random fiber reinforcement,
5:555, 654
performance in ceramic–matrix composites, 5:575–576
Short range order (SRO) hardening, 13:499
Short-range order, in amorphous semiconductor structure, 22:128–129
Shorts
number produced from one bale of cotton, 8:133t
Short-term exposure limit (STEL), 14:215, 216, 18:80
for tungsten, 25:372
Short-Term Public Emergency Guidance Levels (SPEGL), 21:837–838
Short-term repeated toxicity studies, 25:217
Short-term storage, food preservation by, 12:77–78
Short tons, raw value (STRV) sugar,
23:466–469
Short wavelength detectors, 19:132

“Shotgun” sequencing strategies, 12:512

“Shotnoise,” 15:186

Shot peening, 9:705

Shoyu (soy sauce), 26:470–471

Shoyu, production of, 11:7

Shredded/fragmentized scrap, 21:410

Shrimp

aquacultural chemical needs, 3:209

aquaculture, 3:183, 189

nutrition and feeding, 3:202, 204

reproduction and genetics, 3:205

Shrinkage

compensating concrete, 5:500t, 501

reactive resin, 10:434

in unsaturated polyesters, 20:109–110

of wool textiles, 26:390–393

Shrinking

of FETs, 22:253

of ion-exchange resins, 14:398–399

Shrink-resist terminology/testing, 26:390–391

Shrink-resist science/technology development of, 26:391

Shrink-resist treatments, 26:391–393

additive, 26:393

chlorine-based, 26:392

chlorine-free, 26:392–393

Shuiskite, 6:471t

Shutdown period, 19:494

Shutdown systems, 20:671–672

Shuttle vectors, 26:482–483

Sialon-bonded silicon carbide, 22:541

Siberian red lead, 6:468

S–I–B–S block copolymers, 24:707

SiC-ceramic, 22:525. See also Silicon carbide

fabrication of, 22:535–536

mechanical properties of, 22:527–528

preparation of, 22:532–533

Sick building syndrome, 1:817

Sick sinus syndrome, 5:88

Side (tangential) spraying, 11:542

Side chain substitution reactions, in lignin, 15:6

Side-entering propeller (SEP) mixers, 16:706, 708, 709

Side reactions, 10:357–359

in silicone network preparation, 22:564

Side reboilers, 19:510–511

Siderite

in bauxite, 2:347

as drilling fluid material, 9:10

Siderophores, 14:556–557

Wall nanotube functionalization, 17:54

Siding

PVC in, 25:684

Siegenite, 7:209t

Siemens-Martin steelmaking process, 16:150–151

Siemens process, silicon purification via, 22:494–495

Siemens-Westinghouse SOFC design, 12:224–225

Sienna

pigment used in makeups, 7:836, 836t

Sieve analysis, 18:141

Sieve plates, 8:763

Sieve tray columns, 14:50

Sieving coefficients

in hemodialysis, 26:831

Sieving, in particle size measurement, 18:140–141

Sieving, of minerals, 16:615–618. See also Molecular sieves

SIGANTIC GaN technology, 17:213, 214

Sigma

fiber reinforcement for ceramic–matrix composite, 5:558t

Sigma () bonds

toluene, 25:161

Sigma-blade mixer, in bar soap manufacture, 22:751

Signaling smokes, 5:827, 830

Signal processing in the element (SPRITE), 19:162–163

Signal-to-noise (S/N) ratio

FTIR system, 24:115

in rapid scanning instruments, 14:228

Signal transduction proteins, 20:832

Signal transmission, in process control, 20:684

Significance interpretation activities, EIA, 10:236, 10:240t

Si–H absorption, 10:14

Si-hybrid sealants, 22:38–40, 48t

Silages, 10:863

Silane(s), 13:612, 22:489, 547

adhesion of sealant, 22:34

adhesion-promoting, 22:41

chemical vapor deposition precursor, 5:805t
in glass-cloth-reinforced laminates, 22:702
in growing amorphous silicon, 22:129–131
in silica manufacture, 22:368
in silicon purification, 22:494
as silylating agents, 22:697, 698, 699t, 701–703
total sales by company, 22:597t
Silane coupling agents, commercial, 22:698, 699t, 701–703
Silanediols, 25:87–88
Silane peroxides, 18:444
Silane primer segments, interdiffusion with matrix molecules, 22:703
Silanol(s)
amorphous silica polymerization and, 22:390
atomic structure of, 22:380
condensation reactions of, 22:566–567
polycondensation of, 22:556–557
water-soluble, 22:604
Silanol–alkoxysilane condensation, 22:567
Silanol bonds
in pyrogenic silica, 22:400
in silica gel, 22:394, 396
Silanol groups, 22:380, 381
in silica, 22:367
in silica surface chemistry, 22:372, 373
silicate solubility and, 22:455–456
Silanol–silanol condensation, 22:567
Silar
whisker reinforcement for ceramic–matrix composites, 5:557t
Silation chlorocarbons, 6:235
Silbutramine (Meridia), 3:93, 95, 97
Sildenafil
molecular formula and structure, 5:182t
Silica, 1:573, 5:640, 22:365–379. See also
Amorphous silica; Anthropogenic silicas and silicates; Vitreous silica
as abrasive, 1:9
analytical methods for, 22:370–372, 374t
applications of, 22:365–366, 374–378
in bauxite, 2:344
biogenic, 22:402
carbon monoxide compatibility with, 5:4t
catalytic aerogels, 1:763t
ceramic insulator, 5:593, 594–595
in ceramic–matrix composites, 5:553t, 554t
chemical degradation, 5:578
in cocoa shell from roasted beans, 6:357t
composition of, 21:494t
energy gap at room temperature, 5:596t
fiber reinforcement for ceramic–matrix composite, 5:558t
as filler, 11:311
formation of high surface area supports/catalyst, 5:325–326
fumed (pyrogenic), 22:33, 367–368, 374t, 383, 400–401, 581
fused, 22:401–402, 407–408
for gas separation, 1:618t
health and safety factors related to, 22:374
in hydrogen fluoride manufacture, 14:10
liquid chromatography stationary phase, 4:623
manufacture of, 22:367–370
nonpolar surface, 1:584
novel sorbent for liquid phase adsorption from reactive modeling, 1:680
occurrence of, 22:365–366
performance criteria in cosmetic use, 7:860t
powder used in cosmetics, 7:841t
precipitated, 22:368–369, 374t, 385, 397–400
properties of, 21:780t, 22:366–367
raw material for Portland cement, 5:485
as refractory raw material, 21:483
in reverse osmosis membranes, 25:890–891
ring structures in, 22:380, 381
as rubber fillers, 21:776, 779–781
silico(s)
sintering, 5:273–274
small particle silica chromatographic columns, 3:843
structural types of, 22:366t
structure of siliceous minerals, 22:366
synthesis, 5:643
in synthetic fillers, 11:315–316
in tin smelting, 24:787–788
as tire reinforcing fillers, 21:809
widely used support material, 5:324t
with activated alumina dust, 2:398
with activated carbon, 22:390
with activated carbon, 5:4t
with glass fibers, 22:368
with pyrogenic silica, 22:367
with pyrogenic silica, 5:485
with siliolate, 22:368
Silica aerogels, 1:753
  applications, 1:760–767
  physical properties of, 1:758, 761t
  versus xerogels, 1:758
Silica–alumina, 12:190–191
  coke formation on, 5:268
  poisons in representative reactions, 5:258t
Silica analysis
  of water, 26:39
Silica-based glass fibers
  fabrication of, 11:136–137
  transparency of, 11:132
Silica brick, ASTM classifications and specifications for, 21:509
Silica components, production of, 23:56
Silica fibers
  asbestos substitute, 3:314t
Silica gel
  as dessiccant, 8:359, 370
  acid- and base-catalyzed microstructure, 1:750
  adsorption capacity vs. years of service, 1:630
  adsorption equilibrium isotherm, 1:590
  adsorption isotherm for water, 1:622, 623
  applications of, 22:397
  characterization of, 22:396
  coarsening of, 23:65
  deactivation, 1:636
  as dessiccant, 1:589, 590, 8:359, 370
  hydrophilic adsorbent, 1:584–585
  modification of, 22:396–397
  polar adsorbent, 1:674
  preparation, 1:586
  preparation of, 22:395–396
  properties and applications of high area, 1:587t
  properties and applications of low area, 1:587t
  in vitreous silica manufacture, 22:415
  worldwide production of, 22:397
Silica-gel adsorbers, 17:752
Silica gel monoliths, expansion and contraction of, 23:73
Silica gel template, imprinting of, 16:795–796
Silica gel/water system, hydration/
  dehydration characteristics of, 23:72
Silica glass
  made by densification, 23:59
  subcritical crack growth, 5:629
Silica hydrosols, in silica gel manufacture, 22:369–370
Silicalite
  adsorption of oxygen and water on, 1:634
  hydrophobic adsorbent, 1:585
  properties and applications, 1:589t
Silica polymer–metal ions, in solution, 22:459–460
Silica receiving layers, in instant photography, 19:281
Silica reduction water softening method, 26:121
Silica refractories, 21:516
Silica refractory brick, physical properties of, 21:495t
Silica reinforced rubber, 22:703
Silica sheets, 22:383–385
Silica–silane system, 22:377–378
Silica sol–gel fiber processing, 23:80
Silica sols, 22:383, 473–474
  applications of, 22:394
  modification of, 22:393–394
  preparation of, 22:392–393
  properties of, 22:391–392
  purification of, 22:393
Silica, solubility in steam, 23:212–213
Silica-supported activated manganese dioxide, 16:568
Silica-supported catalysts, 23:54–55
Silica-supported metalloocene catalysts, 16:88
Silica, synthetic
  widely used support material, 5:324t
Silicate crystals, glass-ceramics based on, 12:631–640
Silicate glass-ceramic compositions, 12:632t
Silicate glasses, 12:571–572, 608
  durability of, 12:584–585
  modulus of elasticity of, 12:590
  thermal properties of, 12:588
Silicate glasses, atomic structure of, 22:453–454
Silicate minerals, 25:56t
Silicate modifications, via silylation, 22:696
Silicate products, prices of, 22:468t
Silicates, 26:145–146, 5:640. See also
Anthropogenic silicas and silicates
  commercial soluble, 22:451–452
Silicon-based hybrids, 13:
Silicon-based photon detectors, 19:
Silicon-based detection systems, 22:
Silicon-based semiconductors, 22:
SiO2 alkoxide sols, gelation of, 23:
Silicon alkoxides, hydrolysis and first-stage polymerization of, 23:61
Silicon alkoxide sols, gelation of, 23:77
Silicon alloys, 22:511–517. See also Ferrosilicon
specialty, 22:515, 517–521
Silicon-based commercial hybrid materials, 13:538–540
Silicon-based detection systems, 22:181
Silicon-based hybrids, 13:549–550
Silicon-based photon detectors, 19:137
Silicon-based semiconductors, 22:229–262
  in bipolar transistors, 22:246–249
device physics of, 22:241–246
in displays, 22:259
in field-effect transistors, 22:249–257
history of, 22:229–232
in MEMS, 22:259–260
miscellaneous applications of, 22:257
MOS capacitance and, 22:239
noise in, 22:237
in nonvolatile and flash memories,
  22:257–258
power semiconductors and, 22:260–261
semiconductor theory and, 22:232–235
semiconductor transport and,
  22:237–239
statistics obeyed by, 22:235–237
Silicon boride
  as diamondlike carbide, 4:654
  physical properties of, 4:653t
Silicon bronze, 7:756–757
  in galvanic series, 7:805t
nominal composition and UNS designation, 7:722t
UNS designation, 7:721t
advanced ceramics, 1:704
analytical methods for, 22:537–538
applications of, 22:525, 538–541
boron-doped, 22:535
carbon monoxide compatibility with, 5:4t
carbon-doped, 22:535
in ceramic–matrix composites, 5:553t, 554t
in ceramics, 5:582
chemical degradation, 5:578
as diamondlike carbide, 4:654
economic aspects of, 22:536–537, 540
elastic properties, 5:614t
fiber reinforcement for ceramic–matrix composite, 5:558t
fibers, 22:534
α-form of, 22:527
β-form of, 22:527
hardness compared to metals, 5:627t
hardness in various scales, 1:3t
health and safety factors related to,
  22:538
manufacture and processing of,
  22:524–525, 532–536
mechanical properties compared to other hard materials, 8:526t
natural occurrence of, 22:524
physical properties of, 4:653t
platelet reinforcement for ceramic–matrix composites, 5:556t
platelets, 22:535
polytype formation in, 22:527
in power semiconductors, 22:261
properties of, 22:525–531
reactions of, 22:531–532
as a refractory raw material, 21:491, 518–519
sialon-bonded, 22:541
in silicon production, 22:503–504
specifications and standards for, 22:537
strength, 5:517t
synthesis of, 22:524, 525
synthesis, 5:643
thermal shock resistance parameters,
  5:633t
whisker reinforcement for ceramic–matrix composites, 5:557t
whiskers, 22:533–534
worldwide production of, 22:536t
Silicon carbide ceramic fibers, 13:386
Silicon carbide fibers, 26:761
Silicon carbide particles, co-deposition of, 9:697
SiC–carbon thermoset, 10:5
Silicon casting, 22:506–507
Silicon charge-coupled devices, 19:150–151
Silicon chips, 9:694–695
Silicon crystal lattice, 23:33
Silicon compounds
titanium in, 25:55–56
Silicon dioxide, 22:380. See also Amorphous silica; Quartz
in ceramics, 5:582
in commercial soluble silicates, 22:451
in Portland cement, 5:467
reactions in cement manufacture, 5:490
in silica, 22:365
in vitreous silica, 22:407
Silicon drift detector (SDD), 26:434
Silicone
pressure-sensitive adhesives, 1:530
Silicone alkyls, 2:148
Silicone-based coatings, 17:845
Silicone-based heat transfer system, temperature range for, 18:728
Silicone cross-linking, platinum-group metal catalysts in, 19:622
Silicone elastomers, 17:840, 21:771–772 permeability of, 22:582t
Silicone encapsulants, 14:864
Silicone fluids
petroleum oil versus, 22:575t, 576
properties and applications of, 22:572–579, 601
methyl chloride in, 16:326–327
Silicone foam rubber, properties and applications of, 22:585–586
Silicone gums, properties of, 22:582t
Silicone heat-cured rubber, properties and applications of, 22:579–584
Silicone hydride, addition-curing silicones and, 22:35
Silicone industry, history of, 22:547–548
Silicone latex sealants, 22:34–35
Silicone liquid-injection-molded (LIM) rubber
compression set of, 22:585
properties and applications of, 22:584–585
Silicone lubricants, in fiber finishing, 22:594
Silicone membranes, flow through, 15:722–723. See also Membrane processes
Silicone monomers, synthesis of, 22:552–555
Silicone networks
characterization of, 22:569
filled, 22:570–572
formation of, 22:562–572
model, 22:569–570
Silicone oils, 15:226
Silicone oils, for cosmetic emulsions, 24:159
Silicone polymer plasticizers, 22:32–33
Silicone products, 22:548t
Silicone, reclaimed, 21:785
Silicone release coatings, 21:604
Silicone resins, properties and applications of, 22:586–590
Silicone rubber, 9:562–563
combustion of, 22:584
compression set of, 22:582–583
for copper wire, 7:691
cure agents for, 22:579t
electrical properties of, 22:583t
fabrication of, 22:581–582
silica in, 22:377
swelling of, 22:583
vulcanized, 22:582
Silicone rubber film, 22:583
Silicones, 22:32–35, 48t, 547–626
addition-curing, 22:35
airborne organic, 22:603
analytical methods for, 22:597–601
applications of, 22:547, 548t, 572–597
as embedding materials, 10:3–5
biological applications of, 22:601
cerium addition, 5:688
chemistry of, 22:549–555
dental impression material, 8:327–329
described, 22:547
economic aspects of, 22:597
from environmental samples, 22:600, 602t
environmental transformation of, 22:603
fiber finishing applications of, 22:592–594
in hair treatments, 22:593, 594
health and environmental factors related to, 22:601–605
history of, 22:547–549
inorganic pigment applications, 7:372t
markets for, 22:508
moisture-curing, 22:32–34
moisture-releasing, 22:34–35
network formation in, 22:562–572
notation and abbreviations for, 22:547, 549
organic pigment applications, 7:368t
polymerization of, 22:555–562
properties of, 22:572–597
reactive hot melt, 22:35
room temperature vulcanizable, 22:594–595
soil degradation of, 22:604
SILICONE SEALANT FORMULATION

total sales by company, 22:597t

typical soluble dye applications, 7:376t

weatherability of, 22:31

Silicon sealant formulation, 22:34t

in plastic encapsulant materials, 17:839

Silicone surfactants, 24:152–153

Silicone tubing, flow through, 15:722, 723

Silicon feedstock, shortage of, 23:51

Silicon germanium chip, 12:561

Silicon homojunction photodiodes, 19:153–154

Silicon hydrides, in growing amorphous silicon, 22:129–131

Silicon integrated circuits, 19:167

Siliconized coatings, 10:108

Silicon-killed free-machining steels, 24:424

Silicon lattice, 23:35

Silicon–manganese–zirconium, 26:638

Silicon microelectronics, sensor sensitivity and, 22:269

Silicon micromachining, in MEMS, 22:259–260

Silicon-modified polyacrylates, 22:40

Silicon monoxide, 22:490

in silicon production, 22:503–504

Silicon nitride, 17:201, 208, 220, 21:493, 22:541

advanced ceramics, 1:704

annual production of, 17:216

ceramic insulator, 5:593

in ceramic–matrix composites, 5:553t, 554t

in ceramics, 5:582

as diamondlike carbide, 4:654

fiber reinforcement for ceramic–matrix composite, 5:558t

hardness compared to metals, 5:627t

manufacture of, 17:210

physical properties of, 4:653t

strength, 5:517t

synthesis, 5:643

thermal shock resistance parameters, 5:633t

whisker reinforcement for ceramic–matrix composites, 5:557t

Silicon-on-insulator (SOI) technology, in scaling to deep submicron dimensions, 22:256

Silicon oxychloride, in fiber optic fabrication, 11:138

Silicon–oxygen (Si–O) backbone, in moisture-curing silicones, 22:32

Silicon oxynitride, 22:541

Silicon peroxides, 18:439

Silicon photoconductors, doped, 19:164–165

Silicon photodiodes, fabrication and performance of, 19:152–154

Silicon polymers, 22:32–33

Silicon production, 22:502–504

calcium addition in, 22:505–506

carbon in, 22:502–503

charcoal in, 22:503

commercial, 22:501–502

computer control technology in, 22:505–506

costs of, 22:511t

direct current closed furnace technology in, 22:506

environmental impact of, 22:521

quartz in, 22:502–503, 504

silicon carbide in, 22:503–504

silicon monoxide in, 22:503–504

solar-grade, 22:507–508

via electric furnaces, 22:501–502, 502–504

worldwide, 22:497, 510

Silicon products, as release agents, 21:607

Silicon reduction of ferrovanadium, 25:518


Silicon single-crystal pulling electromagnets, 23:857

Silicon smelting, environmental impact of, 22:521

Silicon species, in silicate solutions, 22:456–458

Silicon stainless steels, 23:784

Silicon steel electrical sheets, 23:309

Silicon technology, 22:481

projection of, 22:231t

sensors based on, 22:266–269

Silicon tetrabromide

physical properties of, 4:325–326

Silicon tetrachloride, in fiber optic fabrication, 11:138–139

hydrolysis of, 22:367

in pyrogenic silica preparation, 22:400

in silicon carbide manufacture and processing, 22:533

in silicon purification, 22:494, 495

solubility of chlorine in, 6:133t

synthesis of, 22:547, 11:829

in vitreous silica manufacture, 22:414
Silicon tetramethoxide, in vitreous silica manufacture, 22:415
Silicon V-groove technology, 17:448
Silicon wafers
  purity in semiconductors, 22:231–232
  in scaling to deep submicron dimensions, 22:256
Silicosis, 22:403
Silk, 22:627–635
  applications of, 22:633–634
  bleaching, 4:72–73
  commercial and artificial processing of, 22:631–632
  composition of, 22:628–629
  dyeing, 9:188
  genetic engineering of, 22:633
  processing of, 22:630–632
  production of, 11:164, 174
  properties of, 22:632–633
  secondary structure of, 22:629–630
  structure of, 22:628–630
  types of, 22:627–628
  worldwide production of, 22:631
Silk degumming enzymes, 10:304
Silk moth, juvenile hormone from, 14:343–344
Silk screening, 24:621
Silkworm cocoon silk, 22:627
  composition of, 22:628–629
  crystallinity of, 22:630
Sillimanite, 5:640
Sillimanite minerals, as refractory raw materials, 21:488
siloxane(s), 22:489–490
  atomic structure of, 22:380
  anionic polymerization of cyclic, 22:559–560
  cationic polymerization of cyclic, 22:560
  dendritic, 22:554
  emulsion polymerization of, 22:560–561
  gas chromatography stationary phase, 4:617t
  instrumental analysis of, 22:599
  plasma polymerization of, 22:561–562
  radiation-induced polymerization of, 22:561
Siloxane bonds
  hybrid materials based on, 13:536–538
  in naturally occurring silica, 22:402
  in silica gel, 22:394, 396
Siloxane bridges, silica surface chemistry and, 22:373
Siloxane compounds, in vitreous silica manufacture, 22:414
Siloxane materials, 20:240
Siloxane oligomers, in silicone polymerization, 22:555–556
Siloxanols, silylation and, 22:703
Silsesquioxane hybrids, 13:549
Silsesquioxanes, 15:188, 22:589–590
SilvaGas process, 3:696, 697
Silver (Ag), 22:636–667. See also Silver compounds. See Ag entries;
  Argentothiosulfate complexes; Batch desilverizing; Lead–silver alloys;
  Palladium–silver alloy membranes
  analytical methods for, 22:650–651
  applications of, 22:636–637, 657–662
  as bactericide, 22:656, 657, 660
  barium alloys with, 3:344
  in bimetallic monetary system, 22:647-648
  in cast dental gold alloys, 8:307t
  coke formation on, 5:266
  colloidal precipitation color, 7:343t
  colloidal suspensions, 7:275
  color, 7:334, 335
  economic aspects of, 22:645, 647–649
  effect on copper resistivity, 7:676t
  environmental concerns related to, 22:651–653
  exploration for, 22:637
  extraction of, 22:638
  in galvanic series, 7:805t
  with gold in dental applications, 8:305
  grades and specifications for, 22:649–650
  health and safety factors related to, 22:655, 657
  history of, 22:636–637, 647–648
  imports and exports of, 22:645
  manufacture and production of, 22:641, 645–646
  marketing recycled, 22:655
  mining, 16:134
  on mirrors, 22:661, 686
  native, 22:637
  natural defenses against, 22:655, 681
  occurrence of, 22:637–638, 668
  poisons in representative reactions, 5:258t
  processing of, 22:646–647
  properties of, 22:636, 638–641, 642–643t, 644
quality control of, 22:650
in quantitative analysis, 22:683–684
recycling and recovery of, 22:653–657
reserves of, 22:637–638
shipment of, 22:646
in silver compounds, 22:668
smelting of, 22:636, 645–646
in solar cells, 22:137
in solder for dental applications, 8:316
solubility limits and electrical conductivity effects on copper, 7:750t
sources and supplies of, 22:641–645
in spectrally selective thin films, 23:17
standard electrode potential, 7:799t
thermal degradation of catalysts, 5:272
thermal properties of, 22:643t
top ten countries producing, 22:644t
United States stockpile of, 22:648
water standard for, 22:655, 680, 682, 683
worldwide production of, 22:676
Silver(I) complexes, 22:674–675
Silver(I) compounds, 22:668, 669–674
solubilities of, 22:669t
Silver(II) compounds, 22:668, 669–674
Silver(II) oxide, 22:675–676
Silver(III) compounds, 22:668, 676
Silver(III)–ethylenediamine complex, 22:676
Silver accumulation, natural defenses against, 22:655
Silver acetate, 22:669
Silver acetylide, 22:670
Silver acetylides, 1:180
Silver alloys, 22:636
with magnesium and aluminum, 22:658
magnetic properties of, 22:640
natural occurrence of, 22:668
Silver amalgams, in dentistry, 22:657, 660
Silver arsenite, natural occurrence of, 22:668
Silver-assisted cleavage, dye release by, 19:294–295
Silver azide, 10:729–730, 22:670
Silver-bearing solutions, recovery of silver from, 22:653–654
Silver benzo triazole, 19:348, 362
as a photothermographic material, 19:333
Silver brazing alloys
cadmium addition to, 4:502
See also AgBr
physical properties of, 4:329
Silver bronze
in galvanic series, 7:805t
Silver–cadmium cells, 3:500–501, 4:521
Silver carbonate, 22:670
as catalyst, 22:685
Silver carboxylate(s)
asymmetric, 19:358
dimers of, 19:339
long-chain, 19:329
in photothermographic/thermographic imaging materials, 19:337–343
silver extraction from, 19:351–352
solubility of, 19:337–339
surface area controlled reactivity of, 19:340–342
thermal stability of, 19:339–340
Silver carboxylate silver sources, novel, 19:342
Silver carp
common and scientific names, 3:188t
Silver catalyst formaldehyde manufacture, 12:113–115
Silver chloride, 22:670
carrier mobility at room temperature, 5:597t
transference number of cations, anions, and electrons or holes, 5:586t
as antibacterial agent, 22:660
natural occurrence of, 22:668
in silver qualitative analysis, 22:676–677
Silver chloride electrodes
standard potential, 3:413t
Silver chromate(VI), 6:537
molecular formula, properties, and uses, 6:562t
physical properties, 6:528t
Silver chromate, 22:670
Silver compounds, 22:688–691
analytical methods for, 22:676–677
applications of, 22:683–686
as bactericides, 22:668–669
clinical uses and regulation of, 22:678–679
costs of, 22:668
economic aspects of, 22:676
environmental impact of, 22:682–683
health and safety factors related to, 22:677–682
Silver halide grains
development of, 19:205
ex situ, 19:344
gelatin enhancement of, 19:189
in situ, 19:344–345
morphologies of, 19:180
preformed, 19:345–346
Silver halide microcrystals, 19:173–175
growth of, 19:181
Silver halides, 22:671, 9:506–507
dye designs for, 9:507–508
environmental impact of, 22:683
use in photography, 7:596
in photography, 22:638–639, 657, 686
spectral sensitizing dyes for, 9:507
technology trends for, 9:510–511
Silver–hydrogen cells, 3:512
Silver–hydroquinone redox system, 19:205
Silver image
evaluation of, 19:221–222
intensification and reduction of, 19:220–221
in photography, 19:218–222
resistance to oxidation, 19:219
stability of, 19:218–219
tone of, 19:219–220
Silver image formation
chemistry of, 19:279
in Polachrome film, 19:309–311
Silver–indium–cadmium alloys, 4:503
Silver iodide, in photographic crystal
growth, 19:179
Silver ion activity, in photographic crystal
growth, 19:179
Silver-ion reduction
generation of fatty acid on, 19:359
during photographic development, 19:177–178
Silver ions
as bactericides, 22:668–669, 677–682
chemical stabilizers and, 19:365–366
in clinical applications, 22:656
environmental impact of, 22:683
in swimming pools, 22:656, 660, 681
Silver ion sources, color in, 19:340
Silver–iron cells, 3:501–502
Silver lactate, 22:671
Silver laurate, in heat-process
photographic systems, 22:686
Silver containing ceramic cartridges, as
pool sanitizers, 26:178. See also Zn–Ag
cartridges
Silver-containing ethylene oxide catalysts,
10:648–649
Silver–copper (Ag–Cu) ionization systems,
environmental limits on, 22:652
Silver–copper system, properties of, 22:644
Silver cyanide, 22:670–671, 674–675
in electroplating, 22:685–686
Silver cyclohexanebutyrate, 22:671
Silver development, corrosion model of,
19:245
Silver dichromate, 22:670
Silver diethyldithiocarbamate, in
quantitative analysis, 22:683–684
Silver diffusion transfer process, 19:212
Silver difluoride, 22:675
Silver Dye-Bleach, 19:241
Silver electrical contact alloys
cadmium addition to, 4:502
Silver electrodes, 3:430
Silver filaments, 19:219
Silver fluoride, 22:671
Silver fluoroborate hydrate, 4:157t, 158, 159
Silver halates, 22:671
Silver halide
dissolution rate of, 19:214
intrinsic sensitivity of, 19:235
as a photocatalyst, 19:343–346
Silver halide color photography, 19:231
Silver halide-containing glasses,
photochromic materials, 6:589–590
Silver halide crystals. See also Silver halide
grains; Silver halide microcrystals
in color photography, 19:234–235
dark conductivity in, 19:187
interstitial ion concentration in,
19:188–189
photoinduced electronic conductivity in,
19:187
properties of, 19:185–189
reaction of thiosulfate with, 19:190
sizes of, 19:238
studies of, 19:182
subprocesses in the growth of,
19:182–183
Silver halide emulsion(s), 19:175
photographic, 20:513
Silver ions
as bactericides, 22:668–669, 677–682
chemical stabilizers and, 19:365–366
in clinical applications, 22:656
environmental impact of, 22:683
in swimming pools, 22:656, 660, 681
Silver ion sources, color in, 19:340
Silver–iron cells, 3:501–502
Silver lactate, 22:671
Silver laurate, in heat-process
photographic systems, 22:686
Silver containing ceramic cartridges, as
pool sanitizers, 26:178. See also Zn–Ag
cartridges
Silver-containing ethylene oxide catalysts,
10:648–649
Silver–copper (Ag–Cu) ionization systems,
environmental limits on, 22:652
Silver–copper system, properties of, 22:644
Silver cyanide, 22:670–671, 674–675
in electroplating, 22:685–686
Silver cyclohexanebutyrate, 22:671
Silver development, corrosion model of,
19:245
Silver dichromate, 22:670
Silver diethyldithiocarbamate, in
quantitative analysis, 22:683–684
Silver diffusion transfer process, 19:212
Silver difluoride, 22:675
Silver Dye-Bleach, 19:241
Silver electrical contact alloys
cadmium addition to, 4:502
Silver electrodes, 3:430
Silver filaments, 19:219
Silver fluoride, 22:671
Silver fluoroborate hydrate, 4:157t, 158, 159
Silver halates, 22:671
Silver halide
dissolution rate of, 19:214
intrinsic sensitivity of, 19:235
as a photocatalyst, 19:343–346
Silver halide color photography, 19:231
Silver halide-containing glasses,
photochromic materials, 6:589–590
Silver halide crystals. See also Silver halide
grains; Silver halide microcrystals
in color photography, 19:234–235
dark conductivity in, 19:187
interstitial ion concentration in,
19:188–189
photoinduced electronic conductivity in,
19:187
properties of, 19:185–189
reaction of thiosulfate with, 19:190
sizes of, 19:238
studies of, 19:182
subprocesses in the growth of,
19:182–183
Silver halide emulsion(s), 19:175
photographic, 20:513
“Silvermigation,” 9:824
Silver metallization, electroless, 9:697
Silver mine production, worldwide, 22:645
Silver molybdenum oxide, 22:671
Silver nitrate, 22:671–672, 22:672
addition in ruby glass manufacture,
clinical use of, 22:679
maximum acceptable toxicant
concentration for, 22:682
in medicine, 22:660, 679
in photography, 22:672, 686
Silver organic acid salts, 22:672
Silver oxalate, 19:331
Silver oxide electrodes, 3:408
Silver oxides, 22:668, 672–673
Silver oxide–zinc cell, 22:684
Silver–oxygen bonds, 19:338–339
Silver perchlorates, 18:278
Silver perhalates, 22:673
Silver permanganate, 22:673
Silver phosphates, 22:673
in electrochemistry, 22:684
Silver photodeposition, 19:88
Silver plating, 9:764, 767, 823–824
Silver recovery
from color photography, 19:265
from photographic processing, 19:218
Silver salts, in photography, 22:686
Silver selenate, 22:673
Silver selenide, natural occurrence of,
22:668
Silver–silver chloride electrode, 14:29
Silver–silver chloride reference electrode,
9:572, 582
Silver–silver salt electrodes, in
electrochemistry, 22:684
Silver soap(s), 19:329
as a photothermographic material,
19:332–333
preparation methods for, 19:334,
342–343
water coating of, 19:343
Silver stain, 9:753
Silver stearate
differential scanning calorimeter data
for, 19:339–340
epitaxial interface with AgBr,
19:345–346
solid-state structure of, 19:338
Silver stearate, in heat-process
photographic systems, 22:686
Silver strikes, 9:823
Silver sulfadiazine, 22:637
clinical use of, 22:679
Silver sulfate, 22:673
as catalyst, 22:685
in electrolytic coloring, 22:686
Silver sulfide, 22:673–674
for batteries, 22:684
natural occurrence of, 22:668
Silver sulfite, 22:674
Silver sulfonantimonite, natural
occurrence of, 22:668
Silver telluride, natural occurrence of,
22:668
Silver tetrafluoroborate, 22:674, 23:715
Silver thiocyanate, 22:674
Silver thiosulfate, 22:674, 675
in floristry, 22:659, 669
wastewater treatment plants and,
22:683
Silver–thiosulfate complex, in floristry,
22:686
Silverware, 22:657
recovery of silver from, 22:653
Silver–zinc cells, 3:493–500
speciality for military and medical use,
3:430t
Silvinit, 5:785t
Silylating agents, 22:691–705
alkyl, 22:697–698
commercial, 22:692, 693t
critical surface tensions of, 22:698t
halogenated, 22:694–695
with inorganic compounds, 22:696–698
methyl, 22:693t
with organic compounds, 22:691–696
organofunctional, 22:698–703
Silylating kits, 22:692
Silylation. See also Hydrosilylation;
Silylating agents
described, 22:691
of inorganic compounds, 22:696–697
of inorganic surfaces, 22:697–698, 701
in organic chemical analysis, 22:692–695
of organic compounds, 22:691–692
in organic synthesis, 22:695–696
silicate modifications via, 22:696
Ziegler-Natta polymerization via,
22:696–697
Silylative decarbonylation, 22:552
Silyl-end blocked polyisobutylene (SiPiB),
22:39
Single nucleotide polymorphisms (SNP), 20:839
Single-pass counterflow heat exchanger, heat transfer equation for, 13:251
Single-pass heat exchangers, heat-exchanger effectiveness for, 13:254
Single-photon emission computed tomography (SPECT) cameras, 21:277
Single-point calibrations, in high purity gas analysis, 13:465
Single-point fuel injection system, 10:51
Single-product batch processes, 20:723
Single radial immunodiffusion (SRID) technique, 25:494
Single-screw extruders, 23:398, 16:723
“Single-site catalyst,” 16:82, 26:545
in HDPE production, 20:154–155
Single-site polyethylene catalyst systems, 17:725
Single slope tank bottoms, 24:296
Single-solvent fractional extraction, 10:759–760
Single-stack acceptor molecules, in organic semiconductors, 22:210
Single-stage pumps, 21:67
Single-step crystallization fractionation (CRYSTAF), 19:570
Single-step manufacture
of vinyl chloride, 25:646–647
Single-stranded DNA viruses, 3:135
Single-stranded RNA viruses, 3:135
Single stream glass recycling, 21:382–384
Singlet oxygen
photooxidation via, 9:385–386
sensitizers, 9:515–516, 518
Singlet oxygen formation, 17:774, 779
Single-wall carbon nanotubes (SWCNTs), 17:47–48, 49, 50
Single walled carbon nanotubes (SWNTs), 22:720
Single-wall nanotubes (SWNTs), 12:232, 13:852, 26:737
Single-wall tanks, 24:296
Singular value decomposition, 6:28
S–I–N junctions, 23:821
Sinking solids, lifting and distribution of, 16:692–694
Sinoatrial node, 5:80
Sinter-blast furnace technology, 14:734
Sintered alumina
physical properties of, 4:653t
Sintered diamond masses, 8:541–542
Sintered-powder metal-wick heat pipes, 13:232
Sinter forging, of metal–matrix composites, 16:172
Sinter–hot isostatic pressing (sinter-HIP) cemented carbides, 4:657
catalyst regeneration after deactivation, 5:310–311
ceramics
densification and microstructure development, 5:658–660
in fiber optic fabrication, 11:139
of M-type ferrites, 11:74–75, 83–85, 87
postsintering processes, 5:664–665
presinter thermal processing, 5:656–657
prevention of, 5:301–302
in pyrometallurgy, 16:140
of SiC-ceramic, 22:535–536
of silica gel, 22:396–397
in silicon carbide fiber manufacture, 22:534
sintering/thermal consolidation, 5:657–664
in vitreous silica manufacture, 22:412, 413
Sintering behavior, in the sol–gel process, 23:74
Sintering machines, 26:565
molybdenum, 17:9–10
of polytetrafluoroethylene, 18:300–301
phosphate ore, 19:7
Sintering process, 10:41, 94, 95
for ceramic membranes, 15:814, 815
sulfur recovery from, 23:772
with tin powder, 24:798–799
Sinter processes
tungsten, 25:367–368
Sinus arrhythmia, 5:88
Sinus bradycardia, 5:108
Sinusoidal oscillatory viscometers, 21:745–746
Sinus tachycardia, 5:88, 108
SiO2 polymer, 22:380, 381
Si–O networks, sol–gel growth of, 13:538
Si-PIN EDX detector, 26:442
SIP requirements, 1:812, 814
  typical commercial gas absorption
  process, 1:26t
SIP requirements, in air quality
  management, 1:812
Sips adsorption isotherm, 1:626
Siroflash process, 26:398
Siroscour technology, 26:384
Siromelt lance, 14:743
Sisal, 11:297
  uses of, 11:299t
S–I–S block copolymers, 24:706, 707
Si–SiO₂ interface, 9:731–732
S–I–S junctions, V-I characteristics of,
  23:820–821
Sisko model, 21:705
S–I–S tunnel junctions, 23:870, 871–872
Sitafoxacin, 21:224
Site condition evaluation, 19:531–532
Site-directed mutagenesis, 23:505
SiteID analysis, 10:335
Site plan, 19:494
Site purchase, considerations related to,
  19:531–532
Site-specific herbicide application, 13:328
Siting factors, in plant location,
  19:523–527
SI Units, I.xi–xxvi; 2–26:ix–xxiv
  conversion factors, I.xiv–xvii;
  2–26:xii–xv
  conversion of pressure units to, 20:645t
Six-Sigma quality management tool,
  21:172, 173–178
  quality improvement through, 21:179
Sixteen membered macrolides
  naturally occurring, 15:287–298
  semisynthetic derivatives of, 15:298–301
Size exclusion chromatography (sec), 6:388,
  15:12, 6:456–457
  antibody based columns with, 6:401
  in molecular weight determination,
  19:570
  protein separation, 3:831–839
Size-of-source effects, 24:455, 457
Size press, 18:122–123
Size-press saturation, 17:509
Size separation, 22:275–297
  described, 22:275–276
  devices for, 22:275, 279–283, 283–288,
  288–293
  dry classification in, 22:288–293
  economic aspects of, 22:295–296
  evaluating, 22:276–279
  health and safety factors related to,
  22:293–294
  in minerals recovery/processing,
  16:615–622
  prediction of, 22:294–295
  screening in, 22:275, 279–283
  wet classification in, 22:283–288
Size/shape-dominated substrate
  recognition, 16:775–779
Sizing
  abrasive grains, 1.9–10
  ceramics processing, 5:644
  in heat exchanger design, 13:259
  kaolin application, 6:688t
  paper, 18:109–113
  in potassium chloride refining, 20:619
Sizing agents
  alkaline, 18:112
  paper, 18:110
Sizing calculation method, 13:248–249
Sizing/crushing equipment, artificial
  graphite, 12:727–729
Sizing material
  PVA as, 25:615–617
  corrugator-applied, 18:19
Skeletal bending modes
  in heat exchanger design, 13:259
Skeletal reorganization mechanism, 26:954
Skeleton, 3:723
Sketches, plant layout, 19:497–498
Skimminanine, 2:107
Skin
  antiaging agents, 2:815–817
  chemical analysis of archaeological
  materials, 5:752
  soap and, 22:755, 756
  sodium contact with, 22:775
  sodium nitrite and, 22:858
Skin additives, for bar soap, 22:745–746
Skin cleansers, 7:849–850
Skin coloring preparations, 7:847
Skin contamination
  influence on toxicity, 25:211
  by VDC, 25:694
Skin irritants, triorganotins as, 24:829. See
  also Dermatological problems
Skin irritation
  from carbon fibers, 26:746
  in spas/hot tubs, 26:197
Skin lotions
  colloidal, 7:274t
Skin preparation products, 7:841–847
Skin problems, PCB-related, 13:141
Skin sensors, 3:749–750
Skin treatments
    vitamin A-based, 25:789–790
Skraup synthesis, 2:787
    of quinolines, 21:187–188
Skutterudite, 7:209t
SKYTA β-Skytanthine, 2:101
Slabstock foam
    flexible, 25:469
Slab-zinc processes, 26:580
Slab-zinc production, 26:581t
    in the United States, 26:580t
Slack barrels, 18:9
Slack diaphragm gauges, 20:650
Slacks (woven)
    number produced from one bale of cotton, 8:133t
Slack wax, 26:215
Slag(s), 14:498, 735, 736
    discard, 14:745
    iron blast furnace, 16:143
    in phosphorus manufacture, 19:10–11, 12
    refining, 16:150–151
    treatment of, 14:759–760
Slag composition, manganese recovery and, 15:546
Slagcrete, 6:812, 829
Slag-forming fluxes, in steelmaking, 23:257
Slag-fuming zinc oxide process, 26:613
Slagging gasifier, 6:829
Slagging rotary kiln, 13:176
Slag scrap, 21:409–410
Slagsitall materials, 12:633–634
Slag viscosity
    coal, 6:781–782
Slaked lime(s), 15:25, 29, 55
    physical and chemical properties of, 15:44–45
    production of, 15:54–56
    uses for, 15:62–65
    water treatment compound for aquaculture in U.S., 3:213t
Slating-out crystallizers, 8:135
Sleepers, 19:494
Slide coating, 7:22
    method summarized, 7:5t
    shear rates, 7:32t
Sliding angle (ζ), contact angle and drop size and, 22:113–114
Sliding plate rheometer, 21:738, 740
Slightly toxic substances, 23:113
Slimes treatment, 14:756
Sliming, 25:361
Slip casting
    ceramics processing, 5:651–652
    slip velocity, 10:764–765, 11:797
Slit-film process, for olefin fibers, 11:239, 240
Sliver structure, 11:177
Slope factors, 25:243
Slot coating, 7:20, 22
    method summarized, 7:5t
    shear rates, 7:32t
Slot-die chemical finishing, 17:514
Slow freezing, 21:561, 562t
Slow inorganic chemistry reactions, 13:416
Slow organic chemistry reactions, 13:416–419
Slowpoke reactor, 17:594
Slow-release fertilizers, 12:122, 11:123–124
Slow-releasing pharmaceutical tablets, 18:710
Slow-wave microwave applicator structures, 16:522
SL/RN process, 14:516, 518
Sludge
    activated, 25:827–830
    anaerobic, 25:899–902
    in biological wastewater treatment, 25:896–898, 899
    disposal of, 25:914
    handling and disposal of wastewater, 25:912–914
    high-mercury-content, 16:40
    in paper recycling, 21:442
    types of, 25:912
Sludge-blanket clarifiers, 22:56, 61–62
Sludge control, crude tank, 16:708–711
Sludge dewatering
    in wastewater treatment, 25:913–914
Sludge disposal technologies, 26:385
Sludge drying beds, 25:914
Sludge generation, from metal surface treatements, 16:224
Sludge handling/disposal, in the papermaking process, 18:127–128
Sludge recirculation
    in biological waste treatment, 25:830
Sludge stabilization
    in wastewater treatment, 25:912
Sludge thickening
    in wastewater treatment, 25:913, 914t
Sludge volume index (SVI), 25:898
Slug flow, 11:772
Sluicing, 11:258
Slurries
  fluid–solid, 15:725–728
  for hydrocyclones, 22:285, 286
  as pseudohomogeneous fluids, 15:688–689
  in screening, 22:282–283
  sedimentation and, 22:50, 57
  in sodium carbonate recovery, 22:791
  in sodium chloride solution mining, 22:803
  in sodium nitrite manufacture, 22:855–856
  in thickener design and scale-up, 22:283–285
Slurry (suspension) polymerization
  processes, 20:411
  for linear low density polyethylene, 20:198–199
  in polypropylene manufacture, 20:536
Slurry distillation, in aqueous dispersion polymerization, 11:199–200
Slurry-fed roasting
  of zinc, 26:563
Slurry forming
  ceramics processing, 5:651–654
Slurry handling, in minerals recovery and processing, 16:661
Slurry manufacture, of high density polyethylene, 20:168–169
Slurry-phase soil treatment, 25:843
Slurry polymerization
  of VDC, 25:695
Slurry process
  in vinyl alcohol polymerization, 25:610
  of ethylene–propylene polymer manufacture, 10:710–711
  of silica gel preparation, 22:395
Slurry pumps, 21:78
Slurry reactor, 21:334
Slurry thinning, anthropogenic silicas and silicates in, 22:473
Slurry Transportation Piping, 19:480
Slurry trench excavation
  smectites application, 6:697t, 698
Slush casting, 14:772
Slush-casting alloys, 26:593–594
Slush hydrogen, 13:765
SMA actuators, 22:346. See also Shape-memory alloys (SMAs)
  in virtual two-way SMA devices, 22:347–348
Smagorinsky model, 11:779
Small and medium size establishments (SMEs), workplace hazards in, 14:220
Small-angle light scattering (sals) techniques, 19:568
Small-angle neutron scattering (SANS), 14:710, 19:568, 20:339
Small-angle X-ray scattering (saxs), 20:339, 341–342, 26:432
  of amorphous silica, 22:474
Small beer, 26:471
Small Business Innovation Research (SBIR) program, 24:395, 399
Small Business Technology Transfer (STTR) program, 24:395
Small communities
  wastewater treatment in, 25:916
Small interfering RNAs (siRNA), 17:620, 627
Small molecule binding, high pressure studies involving, 13:448
Small molecule modeling project, flowchart for, 16:730
Small molecule permeation, barrier polymers, 3:380–388
Small-molecule permeation
  VDC polymer resistance to, 25:711
Small-molecule single-crystal structure determination, 26:423–425
Small molecules, mass spectrometry of, 15:666–667
Smallmouth bass aquaculture, 3:183
  common and scientific names, 3:188t
Small office home office (SOHO) markets, silica in, 22:376
Small particle silica chromatographic columns, 3:843
Small pore silica gel surface, drying stages of, 23:69–71
Small-pore surface, vapor pressure of, 23:68–69
Smallpox, 3:136
Small-scale (fossil-based) hydrogen production processes, 13:844
Small-signal value, 14:666
Small water-soluble molecules in hemodialysis, 26:820–821
Smaltite, 7:209t
“Smart” emulsions, 10:131
“Smart” pills, 24:61–62
Smartness, of smart materials, 22
for drug delivery, 9:43
“Smart” windows, 12:609
Smart (intelligent) textiles, 24:612, 624–625
Smart colloids, 7:298
Smart control valves, 20:672
Smart Cotton-based wound dressings, 8:31
Smart fibers, 13:391
Smart hydrogels, 13:742–743, 747, 22:716
Smart manufacturing, 11:154
Smart materials, 22:705–722
actuators, 22:708t, 709, 717–719, 721t
applications of, 22:705–706
biochemically sensitive materials, 22:708t, 716–717, 721t
chemically sensitive materials, 22:708t, 716–717, 721t
classification of, 22:706–707, 708t
described, 22:705–706
electroactive polymers, 22:708t,
717–719, 721t
electrorheological materials, 22:708t,
714–715, 721t
electrostrictive materials, 22:708t,
713–714, 721t
future of, 22:721
magnetostrictive materials, 22:780t,
714, 715, 721t
magnetostrictive materials, 22:708t, 714,
721t
miscellaneous, 22:708t, 720
nanotechnology, 22:708t, 719–720, 721t
overview of, 22:707–709
photoresponsive materials, 22:708t,
715–716, 721t
piezoelectric phenomena and, 22:708t,
709–711, 721t
shape-memory alloys as, 22:708t,
711–713, 721t
shape-memory polymers as, 22:708t, 711, 713, 721t
Web sites for, 22:722
Smartness, of smart materials, 22:707
Smart polymers. See Shape-memory polymers (SMPs)
Smart pressure transmitters, 20:663–665
features of, 20:664
SMARTS, 6:7
SmartSELECT software, 18:243, 244
Smart sensors, 22:267, 268
SMART single-crystal diffractometer
system, 26:421, 422
small-molecule structure determination
using, 26:423–425
Smart structures, fiber optic sensors for,
11:146–159
Smart transmitters, 20:672
Smart windows
electrochromic material application,
6:572t, 583
electrochromic, 23:20–22, 25
SmBa2Cu3O7 superconductor, 23:869
Smectic liquid-crystal phases, 13:370–371
in displays, 15:115
Smectic phases, types of, 15:93–94
Smectites
estimated total production, 6:683
mining, 6:679–681
occurrence and geology of major deposits,
6:664–666
properties relating to applications, 6:686t
structure and composition, 6:688–670
in unit layer mixtures, 6:671
uses, 6:691–692, 693, 696–699, 697t
Smell, sense of, 18:383–384
Smelter-grade alumina (SGA), 2:403–404
Smelters, recovery of silver from, 22:653
Smelting
antimony, 3:45
copper, 7:683–684
imperial, 14:736–739
lead, 14:734–745
manganese alloy, 15:546
secondary lead, 14:759
sulfur recovery from, 23:772–773
of tin, 24:787–788
Smelting air, 14:743–744
Smelting furnaces, early, 14:491
Smelting furnaces, ferromanganese, 15:552
Smelting processes, platinum-group metal
recovery from, 19:611–612
Smelt/smelting. See also Reduction smelting
defined, 16:128
matte, 16:144–146
SMILES (Simplified Molecular Input Line
Systems), 6:3–6
Smith, Adam, 24:364
Smith–Ewart kinetics, 14:715
Smith–Ewart recursion formula, 14:715
Smith–Ewart theory, 25:571, 572
VDC polymerization and, 25:697
SO2 pollution, 9:147
SO2, recovery of sulfur values as, 23:619.
   See also Sulfur dioxide entries
SO2SAFE system, 23:661
SO2-based sulfonation, 23:515
   See also Sulfur trioxide entries
SO3,CR α-SO3 crystals, 23:756
SO3 diluent gas, 23:550
SO3 film sulfonation technology, recent developments in, 23:553–555
SO3 processes, alternative, 23:552–553
SO3 sulfonation process plants, major suppliers of, 23:544, 545–546t
Soak cleaners, controlling, 9:782
Soak cleaning, for electroplating, 9:781–782
Soap(s), 22:723–760
   alkaline, 22:723, 726, 727, 728, 729, 757
   amine, 22:757
   analytical methods for, 22:754
   anhydrous, 22:728–729
   applications of, 22:723–724, 756–757
   bar, 22:727–728, 748–752
   carboxylate, 22:732
   defined, 22:723
   economic aspects of, 22:752–753
   fats in, 10:829–831
   formulation of, 22:741–748
   health and safety factors related to, 22:754–756
   history of, 22:723–724
   hygienic benefits of, 22:755–756
   liquid, 22:748
   with low water content, 22:729
   manufacture of, 22:723–724, 734, 736–741, 748–752
   milled translucent, 22:747
   phase behavior of, 22:725–728, 728–731
   properties of, 22:724–731
   raw materials for, 22:732–736
   social benefits of, 22:755–756
   specialty, 22:746–748
   strontium, 23:324
   top twenty companies marketing, 22:753t
   transparent, 22:747–748
   ultra-mild, 22:746
   as wetting agent, 22:757
   worldwide sales of, 22:752–753
Soap bar processing, 22:727–728, 748–752
   compositional dependence of, 22:731
   mixed soap crystals in, 22:729
Soap bars
   acute oral LD50 ranges, 8:446t
   additives for, 22:742–746
   formulation of, 22:741–742
   hydration of, 22:730–731
   minor ingredients in, 22:744–745
Soap chromatography, 6:388
Soap-coactive approach, in soap formulation, 22:745–746
Soap fragrances, 18:362–363
Soaping, in vat dyeing, 9:180
Soap making, 22:723
- as industry, 22:723, 724
- raw materials in, 22:732–736
- ternary soap–water systems and, 22:727
Soap micelles
- in PVC emulsion polymerization, 25:669
Soap recrystallization, 22:730–731
Soap suds
- as colloid, 7:272t
- occurrences of, 7:273t
Soap–water systems, phase behavior of, 22:725–728
Soarnol, 3:383
Sobol sequence
- in parameter estimation, 26:1039
- in quasi-Monte Carlo sampling, 26:1011, 1016
Social impact assessment (SIA), 10:229, 230
Social impacts, EIA, 10:245
Society of Automotive Engineers (SAE), 15:228
- standards, 15:764–765
- Society of Competitive Intelligence Professionals (SCIP), 15:645
- seminars, 15:635
Society of Flavor Chemists, Inc., 11:563
Society of Rheology nomenclature, 21:704
Society of the Plastics Industry, The (SPI)
- on PVC recycling, 25:680
- recycling coding system of, 25:681
Sociopolitical dimensions, of sustainable development, 24:189–190
Socks (mid-calf)
- number produced from one bale of cotton, 8:133t
Soda–alumina–water phase diagram, 2:274
Soda-anthraquinone (AQ) process, 21:22
Soda ash. See also Sodium carbonate
- applications of, 22:795t
- grades and specifications for, 22:793, 794t
- in preventing sodium combustion, 22:776
- storage of, 22:794
- United States production of, 22:793t, 794t
Soda ash roasting, selenium recovery via, 22:79–81
Soda cellulose IV, 5:379
Soda drossing process, 14:748
Sodalime silica (SLS) glass surface coatings, 12:608
Soda–lime silica glass,
Sodium 12-butoxydodecyl sulfate
surface tension, 8:244t
Sodium 2-acrylamido-2-methylpropane-
sulfonate (AMPS), 20:487
Sodium 3-acrylamido-3-methylbutanoate
(AMBA), 20:487
Sodium 4-styrenesulfonate-block-sodium 4-
vinylbenzoate block copolymer, 20:487
Sodium 4-vinylbenzoate, 20:469
Sodium acetate
in PVA, 25:613
Sodium acetylide, 1:179, 22:765
Sodium acid pyrophosphate (SAPP),
18:841, 843
manufacture of, 18:858
Sodium alginate, 13:67
Sodium alkylethoxy sulfate, in liquid soap,
22:748
Sodium alloys, 22:760, 779–780, 764
with aluminum, 22:780
with gold, 22:780
with lead, 22:779–780
with potassium, 22:777, 779, 780
with zinc, 22:780
Sodium aluminate, 2:345t, 358–359
analysis, 2:275–276
economic aspects, 2:275
health and safety factors, 2:276
manufacture, 2:274–275
neutralization, 2:424
physical and chemical properties of,
2:273–274
uses of, 2:276–277
in water treatment, 26:111
Sodium aluminosilicate gels, synthetic
zeolites prepared from, 16:831t
Sodium aluminosilicates, 12:578
Sodium aluminum hydride, 13:621,
623–624
Sodium aluminum phosphates, 18:839
Sodium amalgam
electrolysis of, 22:772–773
with mercury, 22:773, 780
in sodium analysis, 22:775
Sodium analysis
of water, 26:37
Sodium anthracene-9-carboxylate, 22:765
Sodium antimonide, 3:54, 3:58
Sodium ascorbate, 25:804
antioxidant useful in cosmetics, 7:830t
in ascorbic acid manufacture, 25:758
Sodium A zeolite, 16:822
Sodium azide, 13:597
Sodium azidotriphosphate, 4:827
Sodium bentonite, 6:696
Sodium bentonites, 6:664–665
Sodium benzoate
killing rate of E. coli, 8:641t
Sodium benzoate, 3:632t, 632–634
Sodium bicarbonate (baking soda)
anesthetic for aquaculture in U.S., 3:214t
in detergent formulations, 8:418
encapsulated, 16:456
in sodium carbonate recovery, 22:791
Sodium bifluoride, 22:825–826
Sodium bismuthide
alloy-like superconducting compound, 4:18t
Sodium bisulfate, 22:863t, 869. See also
Sodium sulfates
Sodium bisulfite, 23:672
for amines by reduction, 2:491
Sodium borate(s), 4:261–269
analysis, 4:269–270
in detergent formulations, 8:418
economic aspects, 4:272
health and safety factors, 4:272–273
manufacture, production, and
processing, 4:270–271
shipment, 4:271–272
specifications, 4:272
uses of, 4:273–275
Sodium borohydride, 13:613, 614–620,
4:193
economic aspects of, 13:619
as a hydrogen carrier, 13:852
hydrogen for fuel cells derived from, 4:137
inorganic reductions by, 13:618
manufacture of, 13:615
production process for, 13:617
reactions of, 13:616–619
storage and handling of, 13:619
uses for, 13:619–620
Sodium bromate, 4:334
Sodium bromide, 22:822–824
applications of, 22:824
manufacture of, 22:823
physical properties of, 4:322t, 329
solubility in water, 4:322t
Sodium C14-16-alpha olefin sulfonate
Ross and Miles foam heights with amide
fatty acid amides, 2:456t
viscosity enhancement, 2:455t
Sodium C14–16 olefin sulfonate
cosmetic surfactant, 7:834t
Sodium calcium pentaborate octahydrate,
4:242t, 278
Sodium calcium pentaborate pentahydrate,
4:242t, 278–279
Sodium carbide, 22:765
Sodium carbonate, 20:631, 22:765, 787–
797, 23:669, 8:416. See also Soda ash
applications of, 22:794–795
from brine, 5:799–800
carbon dioxide recovery from natural gas
using, 4:811
defoamer application, 8:240
described, 22:787
in detergent formulations, 8:417–418
economic aspects of, 22:792–793
environmental concerns related to,
22:793–794
grades and specifications for, 22:793,
794t
health and safety factors related to,
22:794
manufacture and processing of, 22:787,
788–792
natural occurrence of, 22:787
properties of, 22:787–788
quality control of, 22:793, 794t
in sodium nitrite production, 22:855
in synthetic sodium nitrate processing,
22:849
worldwide production of, 22:793
Sodium carbonate peroxhydrate, 4:57,
18:411–414
Sodium carboxylate poly(amidoamine)
(PAMAM) dendrimers, 26:789. See also
PAMAM dendrimers
Sodium carboxymethyl cellulose (CMC),
Sodium carboxymethylguar gum,
4:727
Sodium
carboxymethyl(hydroxypropyl)guar
gum, 4:727
Sodium cellulose xanthate, 5:367
Sodium channels
role in excitation and contraction
coupling, 5:81–82
Sodium chlorate, 6:133
economic aspects, 6:113–114
health and safety factors, 6:114–116
manufacture, 6:107–113
physical properties, 6:106t, 106–107
uses, 6:116
Sodium chlorate, 9:630
electrolyte, 9:596
production, 9:646
Sodium chloride, 22:797–822. See also Salt
analytical methods for, 22:811–812
applications of, 22:814–820
from brine, 5:800–801
corrosive effect on iron, 7:806
deposits of, 22:798, 799, 805
described, 22:797
in detergent formulations, 8:418
economic aspects of, 22:810–811
electrolysis of, 22:760
electrolysis of fused, 22:769–772
electrolytic decomposition, 6:175–177
environmental impact of, 22:813–814,
817
in hazardous waste management, 25:817
health and safety factors related to,
history of U.S. production of, 22:798–800
killing rate of E. coli, 8:641t
natural occurrence of, 22:797, 798
processing of, 22:802–808
properties of, 22:800–802
registered for use in aquaculture in
Europe, 3:220t
in sodium hydroxide manufacture,
22:832
in sodium nitrate processing, 22:845–
846
solubility of, 22:801t
solubility in steam, 23:212
standards and specifications for, 22:808–
810
transference number of cations, anions,
and electrons or holes, 5:586t
therapeutant for aquaculture in
Europe, 3:205t, 212t
thermal reduction of, 22:767
in vinyl chloride manufacture, 25:634
Sodium chloride brine, in sodium carbonate
recovery, 22:790–791
Sodium chloride electrolyte, 9:595. See also
Salt (NaCl)
Sodium chloride–water system, phase
diagram of, 22:801–802
Sodium chlorite, 6:133
Sodium chloroacetate, 1:139–140
Sodium N-chlorobenzenesulfonamide
(chloramine B), 4:54
Sodium N-chloroimidodisulfonate, 4:54
Sodium N-chloro-N-alkylsulfamates, 13:108
Sodium N-chloro-p-toluenesulfonamide (chloramine T), 4:54
Sodium chromate
  manufacture, 6:538–543
Sodium chromate(VI)
  physical properties, 6:528t
Sodium chromite, 6:535
Sodium citrate dihydrate
  molecular formula, 6:638t
  solubility in water, 6:649t
Sodium cobalt dioxide
  uses, 7:241t
Sodium cocoamphoacetate
  hair cleaner ingredient, 7:850t
Sodium cocoyl glutamate
  cosmetic surfactant, 7:834t
Sodium cocoyl isethionate, as soap bar additive, 22:746
Sodium compounds, 22:760–761, 762
  as soap bar additives, 22:744
Sodium cyanamide, 8:184
Sodium cyanate, 8:184
Sodium cyanide, 8:183–184
  analysis, 8:190
  economic aspects, 8:189
  health and safety factors, 8:190–191
  manufacture, 8:187–189
  properties, 8:184–187, 185t
  silver extraction via, 22:638, 646–647 uses, 8:191
Sodium cyanide dihydrate, 8:184
Sodium cyanide pentaammoniate, 8:184–187, 185t
Sodium cyanoborohydride, 13:613–614, 621
Sodium cyclamate, 24:236
Sodium dehydroacetate
  antimicrobial used in cosmetics, 7:831t
Sodium dichloroisocyanurate (SDCC), 8:203, 13:111, 115
Sodium dichloroisocyanurate dihydrate, 4:53
Sodium dichromate, 6:522, 9:630–632
  manufacture, 6:538–543
  U.S. exports, 6:544t
  U.S. imports for consumption, 6:545t
Sodium dichromate(VI) dihydrate
  physical properties, 6:528t
Sodium dichromate, 8:160
Sodium diethyldithiocarbamate
  molecular formula, 5:713t
Sodium dihydrobis(2-methoxyethoxy)aluminate, 13:621, 624
Sodium dimethyl dithiocarbamate, 4:826
Sodium dioxalatobismuthate(III), 4:25
Sodium dithionite 23:674–676
  analytical methods for, 23:675–676
  bleaching agent, 4:64
  cofactor regeneration using, 3:673
  economic aspects of, 23:675
  grades of, 23:675
  health and safety factors related to, 23:676
  manufacture of, 23:674–675
  properties of, 23:674
  for reductive bleaching of wool, 26:401–402
  shipment and storage of, 23:675
  uses for, 23:676
Sodium dithionite solution, 23:675
Sodium DL-2-pyrrolidinone-5-carboxylate (sodium PCA)
  cosmetic ingredient, 7:828
Sodium dodecyl (lauryl) sulfate (SDS), 9:745–746
Sodium dodecyl 3-mole ether sulfate, 24:145
Sodium dodecyl benzene sulfonate, 24:146, 2:189
Sodium dodecylsulfate (SDS), 12:3, 13:744, 24:145, 154
  adsorption of, 24:140
Sodium dodecyl sulfonate (SDSe), adsorption of, 24:141
Sodium electrodes
  standard potential, 3:413t
Sodium ethoxide, 10:528–529
Sodium ethylenesulfonate, 23:534
Sodium ethylmercurithiosalicylate, 22:25
Sodium etidronate (EHDP), as soap bar additive, 22:744
Sodium ferrate, in sodium nitrite production, 22:855
Sodium ferrite, 14:543
Sodium fluoride, 22:825, 8:340
Sodium fluoroaluminate
  manufacture, 4:155
  physical properties of, 4:152t
  thermodynamic properties of, 4:154t
  uses of, 4:156
Sodium formaldehyde sulfoxylates, 23:677
Sodium glucoheptonate, 4:708
Sodium D-glucuronate, 4:708
SODIUM D-GLUCONATE 857
SODIUM GRAPHITE REACTOR

Sodium graphite reactor, 17:571
Sodium halides, 22:763, 765, 822–829. See also Sodium chloride
Sodium heat exchangers, 22:763
Sodium hemiphasphate, 18:833
Sodium heptagermanate, 12:553
Sodium hexacyanoferrate decahydrate (YPS), 22:810
Sodium hexafluoroborate, 4:151
Sodium hydroxyaluminate, 2:360. See also Cryolite
Sodium hexahydroxoantimonate(V), 3:60
Sodium hexametaphosphate, 8:416
Sodium hexavanadate, 22:
Sodium hydrazide, 13:567
Sodium hydride, 13:609–610
Sodium hydride, in nevirapine synthesis, 18:743
Sodium hydrogen zirconium phosphate
Sodium hyaluronate
skin conditioner/moisturizer, 7:843t
Sodium hydride, 13:609–610
in nevirapine synthesis, 18:743
Sodium hydrogen zirconium phosphate
uses for, 26:638
Sodium hydroxysulfide, 23:638–639, 22:869–872, 875
applications of, 22:871–872
economic aspects of, 22:871–872
manufacture of, 22:870–871
in sodium sulfide production, 22:874
Sodium hydroxysulfite, 13:620, 22:766
Sodium hydroxysulfite assisted chelation, 21:50
for bleaching of recycled pulps, 21:52
Sodium hydrotrimefoxoborate, 4:193–197
Sodium hydroxide, 22:829–843. See also Caustic soda
analytical methods for, 22:839, 840t
applications of, 22:840–842
chemical properties of, 22:831–832
coproduct in chlorine plants, 6:171–172
derivatives of, 22:841–842t
in detergent formulations, 8:417–418
dessicant, 8:360–361
economic aspects of, 22:838, 839t
electrolysis of fused, 22:767–768
environmental concerns related to, 22:839–840
in fatty acid neutralization, 22:740
in nevirapine synthesis, 18:743
grades and specifications for, 22:838
health and safety factors related to, 22:839–840
in integrated manufacturing process, 6:237t
isolation of sodium from, 22:760
manufacture of, 22:832–837
physical constants of pure, 22:830t
physical properties of, 22:829–831
production of, 22:795
reactions with PVA, 25:603
shipment of, 22:837–838
in sodium bromide manufacture, 22:823
in sodium nitrite production, 22:855
in synthetic sodium nitrate processing, 22:849
as a pulp bleaching agent, 21:46
Sodium hydroxyfluoroborate, 4:151
physical properties of, 4:152t
thermodynamic properties of, 4:154t
Sodium hypochlorite, 13:577, 580, 6:133
bleaching agent, 4:45–46, 50–51
end use of chlorine, 6:135t
properties and characteristics compared to other disinfectants, 8:608t
Sodium hypochlorite solution
as a pool sanitizer, 26:175
Sodium hypophosphite, 19:69
phosphate from, 19:58
Sodium hypophosphite monohydrate, 19:55
Sodium intake, worldwide, 22:812
Sodium iodate, 14:375
Sodium iodide, 14:374; 22:826–827. See also NaI crystals
Sodium ions
hydrated, 26:18
in silicate glasses, 22:453, 454
in soap–water system, 22:727
Sodium lactate, 14:122
hydrophilic–lipophilic balance, 8:707t
skin conditioner/moisturizer, 7:843t
Sodium laureth phosphate
cosmetic surfactant, 7:834t
Sodium laureamphoacetate
function as ingredient in cosmetics, 7:829t
Sodium lauryl glutamate
hair cleaner ingredient, 7:850t
Sodium lauryl ether (3EO) sulfate
effect of coconut diethanolamide on foaming, 2:453t
Ross and Miles foam heights with amide fatty acid amides, 2:456t
viscosity enhancement, 2:455t
Sodium lauryl sulfate, 24:145
cosmetic surfactant, 7:834t
effect of coconut diethanolamide on foaming, 2:453t
function as ingredient in cosmetics, 7:829t
Ross and Miles foam heights with amide fatty acid amides, 2:456t
surface tension, 8:244t
viscosity enhancement, 2:455t
Sodium lignosulfonate
cosmetic surfactant, 7:835t
function as ingredient in cosmetics, 7:829t
Sodium manganate(V), 15:594
Sodium metabisulfite(V), 4:24
Sodium metabisulfite, 23:672–673
economic aspects of, 23:673
grades and specifications for, 23:673
health and safety factors related to, 23:673
uses for, 23:673
Sodium metaborate
solubility–temperature curve, 4:262
Sodium metaborate dihydrate, 4:242t, 268
uses of, 4:275
Sodium metaborate tetrahydrate, 4:242t, 267–268
uses of, 4:275
Sodium metaniobate, 17:152
Sodium metasilicates
atomic structure of, 22:454, 455
commercial, 22:465, 466t, 468t, 469t
as food/water additives, 22:468
manufacture of, 22:464, 465, 469t
Sodium metatitanate, 25:43
Sodium methanesulfonate (Amquel)
water treatment compound for aquaculture in U.S., 3:214t
Sodium methyl dithiocarbamate, 4:826
Sodium methyl naphthalene sulfonate
cosmetic surfactant, 7:834t
Sodium methyl oleoyl taurate
cosmetic surfactant, 7:834t
Sodium montmorillonite, 6:696
structure and composition, 6:668–669, 671
Sodium naphthalene, 14:247
Sodium naphthalene complex, 22:764
Sodium niobate, 17:153
Sodium nitrate, 22:843–853, 860–862
applications of, 22:843, 852–853
commercial grades of, 22:850t
crystallization of, 22:848
deposits of, 22:843–845
described, 22:843
economic aspects of, 22:849
Food Chemicals Codex specifications for, 22:851t
health and safety factors related to, 22:849–851
killing rate of e. coli, 8:641t
manufacture and processing of, 22:845–849
miscellaneous applications of, 22:852–853
properties of, 22:845
reagent grade of, 22:850t
standards and specifications for, 22:849, 850t, 851t
synthetic, 22:843, 848–849
world producers of, 22:849t
Sodium nitrate electrolyte, 9:595–596
in hole drilling, 9:599
Sodium nitrite, 22:853–862
applications of, 22:858–860
chemical analysis of, 22:856–858
described, 22:853
dry grades of, 22:856, 857t
field estimation of, 22:858
health and safety factors related to, 22:856, 858
manufacture of, 22:855–856
properties of, 22:853–855
quality control of, 22:856–858
shipment of, 22:856
specifications for, 22:856–858
storage of, 22:856
in synthetic sodium nitrate processing, 22:848
Sodium nitroprusside, 14:536
Sodium nonoxynol-25 sulfate
cosmetic surfactant, 7:834t
Sodium oleoyl isethionate
cosmetic surfactant, 7:834t
Sodium orthophosphates, 18:832t
Sodium orthosilicates
commercial, 22:465, 466t, 469t
manufacture of, 22:464, 465
Sodium oxide(s), 2:273, 22:765
in cement, 5:468
contamination by, 22:776
Sodium ozonide, 18:417
Sodium palmitate, as soap, 22:726
Sodium pentaborate
solubility–temperature curve, 4:262
Sodium pentaborate pentahydrate, 4:242t, 267
Sodium perborate, 18:398, 4:57
  anhydrous, 18:401
  monohydrate, 18:400–401
  tetrahydrate, 18:392, 398–400
  trihydrate, 18:400
Sodium perborate hydrates, 4:268–269
Sodium perborate monohydrate, 4:242t, 268–269
Sodium perborate tetrahydrate, 4:242t, 268–269, 14:40
Sodium perborate trihydrate, 4:242t, 268–269
Sodium perborate in detergent formulations, 8:419
Sodium perbromate, 4:335
Sodium percarbonate, 18:413
Sodium perchlorate, 6:133
  cell operating information for, 18:282t
  manufacture of, 18:281
Sodium periodate—silica, 16:571
Sodium permanganate monohydrate, 15:610
Sodium peroxide, 18:392, 393–394
  hydrates and peroxohydrates of, 18:394
  manufacture of, 22:777
Sodium peroxoborate, manufacture of, 14:67
Sodium peroxoborates, uses for, 18:399
Sodium peroxoborate tetrahydrate, 18:418
  manufacturers of, 18:400
Sodium perxenate, uses for, 17:336–337
Sodium phenanthrene-9-carboxylate, 22:765
Sodium phenolsulfonate
  antimicrobial used in cosmetics, 7:831t
Sodium phenoxide
  antimicrobial used in cosmetics, 7:831t
Sodium phenyl carbonate, in salicylic acid synthesis, 22:7
Sodium phosphate(s), 18:831–834, 19:18
  carbon dioxide by-product of manufacture, 4:810
  economic aspects of, 18:860
  uses for, 18:833–834
Sodium polybutadiene, 9:555, 556
Sodium polymetaphosphate, 8:416
Sodium polyphosphates, 9:16
  manufacture of, 18:858
Sodium polyphosphate glass, 18:851
Sodium polystyrene sulfonate
  cosmetic surfactant, 7:835t
Sodium polysulfide(s), 23:640
  in sodium production, 22:773
Sodium—potassium eutectic, 15:252
Sodium potassium tripolyphosphate (SKTP), 18:846
Sodium production, 9:640
Sodium pyrithione
  antimicrobial used in cosmetics, 7:831t
Sodium pyrophosphate(s), 18:841–843
  peroxohydrate, 18:415
Sodium reduction processes, 22:777
  in titanium manufacture, 24:853
Sodium restriction, 22:813
Sodium saccharin, 24:235
Sodium salicylate, 22:3
  medical applications of, 22:11, 12
  in salicylic acid synthesis, 22:7, 8
  in salicylic esterification, 22:12
Sodium salts
  caustic soda in formation of, 22:831
  hydroxybenzoic acids and, 22:4
Sodium selenate, 22:73t
  in selenium recovery, 22:79
  uses of, 22:102–103
Sodium selenide, 22:73t
  in selenium recovery, 22:79
Sodium selenite, 22:73t
  uses of, 22:102, 103
Sodium selenocyanate, 22:89
Sodium selena, 22:89
Sodium selena, 22:89
  in selenium purification, 22:86
Sodium sesquicarbonate, in sodium carbonate recovery, 22:790
Sodium sesquicarbonate in detergent formulations, 8:418
Sodium silicate(s), 22:451–452. See also Sodium silicates
  in bleaching of recycled pulps, 21:52
  consumption of, 22:471t
  crystalline structure of, 22:454–455
  dissolution of, 22:455–456
  as a flocculating agent, 11:627
  as food/water additive, 22:468
  in MQ resin manufacture, 22:587–588
  in precipitated silica preparation, 22:397–398
  production and shipment of, 22:469t
  properties of commercial, 22:466t
  in silica gel preparation, 22:395
  silicon carbide reaction with, 22:531
Sodium silicate electrolyte, 9:596
Sodium silicate solutions, 22:456–457, 458
  commercial, 22:465, 466t, 469t
  in precipitated silica manufacture, 22:368–369
Sodium silicate, 22:398–400
  in potassium eutectic, 15:252
Sodium silicate solutions, 22:456–457, 458
  commercial, 22:465, 466t, 469t
  in precipitated silica manufacture, 22:368–369
Sodium silicate(s), 22:451–452. See also Sodium silicates
Sodium silicide, 22:765
Sodium stannate, 24:806
Sodium stearate
  cosmetic surfactant, 7:834t
  hydrophilic/lipophilic balance, 8:707t
Sodium sulfate(s), 22:766, 872–874. See also Sodium sulfates, 22:862–869,
  applications of, 22:862, 869, 871–872, 874
  from brine, 5:801–802
  chemical properties of, 22:864–865
  defoamer application, 8:240
  described, 22:862–863
  in detergent formulations, 8:418
  economic aspects of, 22:867, 868t, 874
  environmental concerns related to, 22:868
  health and safety factors related to, 22:868–869
  hydrophilic/lipophilic balance, 8:707t
  manufacture and processing of, 22:862–863, 865–867
  manufacture of, 22:873–874
  minerals containing, 22:863t
  natural occurrence of, 22:863
  oxygen scavenger used in water, 7:815
  phase in Portland cement clinker, 5:472t
  physical properties of, 22:864–865
  properties of, 22:864t
  quality control of, 22:867
  in sodium carbonate recovery, 22:792.
  See also Sodium sulfates
  in sodium tetrasulfide preparation, 22:874
  standards and specifications for, 22:867, 868t
  table of, 22:863t
  vinyl chloride reactions with, 25:630
Sodium sulfate decahydrate, 22:863t, 865
Sodium sulfate peroxyhydrate hydrate, 18:415
Sodium sulfite, 23:669–672
  analytical methods for, 23:670–671
  antioxidant useful in cosmetics, 7:830t
  bleaching agent, 4:64
  economic aspects of, 23:670
  grades and specifications of, 23:670
  health and safety factors related to, 23:671
  manufacture of, 23:669–670
  in photography, 19:206
  properties of, 23:669
  shipment and storage of, 23:670
  uses for, 23:671–672
Sodium sulfonate, 23:514
Sodium–sulfur cells, 3:549–551
  in development, 3:431t
Sodium superoxide, 18:416
Sodium tellurate, 24:411
Sodium tellurite, 24:427, 428
  solution, 24:409
Sodium tetrachloroaurate(III), 7:596t
Sodium tetrafluoroaluminate
  emission from aluminum smelting cells, 2:302
Sodium tetrahydroborate, 4:193–197
  economic aspects, 4:228
  physical properties of, 4:194t
Sodium tetrasulfide, 22:874–875
  chemical analysis of, 22:875
  health and safety factors related to, 22:875
Sodium thiocyanate, 23:680–681
  uses for, 23:681
Sodium thiocyanate wet spinning process, 11:189
Sodium thiosulfate, 23:674
  use in selenium analysis, 22:94–95
Sodium titanate, 25:100
Sodium toluenesulfonate
  function as ingredient in cosmetics, 7:829t
Sodium trichloroacetate, 1:141
Sodium trichlorometaphosphinate, 4:54
Sodium trimetaphosphate (STMP), 18:844, 847–848
Sodium tripolyphosphate (STPP)
  concentration formation constants for metal chelates, 5:717t
  molecular formula, 5:712t
  U.S. production, 5:729, 730t
Sodium tripolyphosphate (STP), 8:415, 18:844–846, 849
  defoamer application, 8:240
  food-grade, 18:846
  hydration rate of, 18:845
  manufacture of, 18:855–859
  uses for, 18:845–846
Sodium tungstate
  exposures to, 25:371–372
  toxicity of, 25:372, 387
  uses for, 25:387–388
Sodium vapor lamps, 22:779
Sodium vapor, vitreous silica reaction with,
22:418
Sodium X zeolite, 16:823
Sodium zeolite water softening method,
26:122
See also Solid oxide fuel cell (SOFC)
Soft annealed copper alloys, 7:723t
SOFTANOL, 2:43
Soft-burned quicklime, 15:29
Soft coals, 6:703
Soft copolymers, 26:538, 540
Softeners, in tire compounding,
21:809–810
Softening
in fiber finishing, 22:593
of water by salt, 22:817–819
Softening glass, 15:255
Softening point defined, 6:829
Softening processes for water, 26:115–123
Softening resistance
copper wrought alloys, 7:738–739
Soft fibers. See Bast fibers
Soft-gelatin pharmaceutical capsules, 18:708
Soft independent modeling of class analogy (SIMCA), 10:330
“Soft lithography,” 15:192
for lab-on-a-chip valves, 26:975
in microfluidic cell patterning, 26:972–973
Soft magnetic spinel ferrites, 11:57
Soft oils, in toilet soap making, 22:734
Soft repulsions, 23:94
Soft rot
of wood, 26:352–353
Soft rubber
elastic properties, 5:614t
Soft sugars, 23:453
Soft tissue injuries, 3:724–725
Software. See also Computer entries;
Programmable logic controllers (PLCs); Mathematical programming;
Computer entries advanced image processing, 16:487
contrast-enhancing, 16:487
cross-file, 18:243
laboratory information management system, 21:163–164
for modeling in glass-melting tanks, 12:606
monitoring and targeting (M&T), 10:166
process control, 20:672–673, 694–695
process integration, 20:765
steam balance, 10:164
targeting, 13:219–221
term extraction and analysis, 18:244
3D physical design, 19:519–521
Software modules, 20:672–673
Soft water, salt and, 22:817–819
Soft-wheat flours, 26:283
Soft wheat mill, 26:281
Softwood(s), 21:1, 2, 26:333–334
hemicelluloses in, 21:8–9
kiln-drying time schedules for, 26:342t
main constituents in the cell wall of, 21:4t
resistance to chemicals, 26:352
Softwood fibers, in paper, 18:92
Softwood lignins, 15:2
Softwood lignosulfonates, 15:16
Softwood pulps, bleaching sequences used for, 21:32t
Softwood roundwood, 26:363
Soil(s)
in bioremediation design considerations, 25:838
breakdown of phenoxyacetic acids in, 13:314
hydrothermally treated, 14:110–111
lead content of, 14:763
retention ability of, 13:308
selenium content of, 22:77–78
silicone degradation in, 22:604, 605
for sludge disposal, 25:914
vinyl chloride in, 25:650
Soil beds
in soil and ground water treatment, 25:843
Soil bioremediation
halogenated compounds, 3:775–776
halogenated solvents, 3:772
hydrocarbons, 3:768–769
metals, 3:786
military explosives, 3:780
nonchlorinated pesticides and herbicides, 3:778
Soil chemistry, of nitrogen, potassium, and phosphorus, 11:111–113
Soil flushing
in soil and ground water treatment, 25:844
Soil fumigants, economic aspects of, 18:535–536
Soil fungi, in dew-retting, 11:605–606
Soil heaping
  defined, 3.758t
Soil heaps
  in soil and ground water treatment, 25:843
Soilings
  classes of, 10:274
  enzyme effect on, 10:277–278
Soil leaching
  in soil and ground water treatment, 25:846
Soil microbes, herbicide degradation by, 13:9
Soil nutrient, molybdenum as a, 17:39–40
Soil piles
  in soil and ground water treatment, 25:843
Soil quality, fertilizers and, 11:126–127
Soil(s)
  fatty, 10:282
  mercury content in, 16:33
  release of mercury into, 16:47
  solvent removal from, 23:110–111
Soil–sediment samples, herbicide analysis of, 13:312
Soil seed bank, 13:332
Soil sorption coefficient, 13:310
Soil stabilization
  anthropogenic silicas and silicates in, 22:473
  milk of lime in, 15:64–65
  quicklime in, 15:62
  slaked lime in, 13:64–65
Soil tests, 11:125
Soil thin-layer chromatography (stlc), 13:312
Soil treatment, 25:834–843, 843–845
  bioremediation, 25:835–836
  electrokinetics, 25:843–844
  ex situ bioremediation, 25:836, 842–843
  in situ air stripping, 25:844
  in situ bioremediation, 25:836–842
  plume containment, 25:835
  soil flushing, 25:844
  soil vapor extraction, 25:844
  sulfur use in, 23:591
  vitrification, 25:844–845
Soil-vapor extraction
  defined, 3.759t
  in soil and ground water treatment, 25:844
Soil washing
  in soil and ground water treatment, 25:846
Soil water, energy state of, 12:839–840
Soil windows
  in soil and ground water treatment, 25:843
Solanaceae
  alkaloids in, 2:75
  Solanidine, 2:105
Solar absorbing surface, spectrally selective, 23:11–12
Solar cells, 22:220, 9:729, 23:32. See also
  Photovoltaic (PV) cells
  antimony compounds, 3:53–54
  dye-sensitized, 26:878
  degradation of, 22:139
  economics of, 22:140
  efficiency of, 23:15
  for electricity generation, 23:26
  hydrogenated amorphous silicon in, 22:135, 136, 138–139
  materials for, 23:14–15
  micromorph, 22:140
  polymethine dyes in, 20:516–517
  silicon for, 22:507–508
  silicon purification for, 22:496
  stacking, 23:38–39
  vitreous silica in, 22:444
Solar collectors, 23:25
  “Solar constant,” 23:2
Solar control coatings, 23:16
Solar desalination, 26:89–94
Solar electricity, 23:51, 52
Solar energy
  photothermal conversion of, 23:10
  photovoltaic cells for, 23:32–53
  silica aerogels for passive solar collection, 1:761–762
  sodium sulfates and, 22:869
Solar energy materials, 23:1–32. See also
  Solar photocatalysis; Solar thermal converters
  ambient radiation and, 23:2–4
  for a benign indoor building climate, 23:24–25
  coatings for glazings, 23:16–19
  future of, 23:24–26
  optical properties of, 23:1–2
  radiative cooling, 23:13–14
  role in promoting public health, 23:26
  thin films, 23:6–8
transmitting and reflecting, 23:4–6
transparent thermal insulation, 23:8–10
Solar-energy-related applications,
biological conditions of relevance for,
23:3–4
Solar evaporation
for chemical recovery from brines,
5:786–787
Solar-grade silicon, production of, 22:507–508
Solar heat control, use of gold in, 12:703
Solarization effect, 19:203
Solar photocatalysis, 23:23–24
Solar photocatalytic detoxification, 19:76
Solar photocatalytic processes, 19:100–101
Solar photocatalytic reactor, using
deposited titania, 19:99
Solar photoreactors, 19:95–99
Solar salt harvesting, 22:802, 806–808
Solar spectrum, 23:2
Solar still, 26:89–92
Solar thermal converters, 23:10–13
Solar transmittance, for thin films, 23:19
Solatene, 24:558
Solder, 3:53
arsenic addition to, 3:271
composition, 3:52t
Solderability
copper wrought alloys, 7:744–745
Soldering dental investments, 8:295
Soldering, piping system, 19:484
Solder joints failure, 10:15
Solder materials
in electronic materials packaging, 17:841
mechanical and electrical properties of,
17:836t
Solders, 24:795–796
dental applications, 8:316
lead-free, 24:796
lead–tin alloy, 14:778
silver in, 22:658
uses of, 24:795t
Sole
common and scientific names, 3:188t
Solef, 7:641
Solenoid valves, in refrigeration systems,
21:540
Sol–gel, alumina derived from, 23:76–78
Sol–gel bioactive glasses, 23:82–83
Sol–gel chemistry
aerogels, 1:749–753
ceramics processing, 5:642
Sol–gel coatings, 5:665
Sol–gel coating technique, 24:750
Sol–gel compositions, 23:55–56
Sol–gel condensation reactions, 13:538
Sol–gel deposition, 23:7
Sol–gel fibers, 23:80
Sol–gel materials, 13:536, 538
Sol–gel multicomponent materials, 23:57t
Sol–gel polymerization
resorcinol with formaldehyde, 1:751–752
Sol–gel powder processes, 23:56
Sol–gel process(es), 25:130–131
advantages of, 23:54
aging in, 23:60
casting in, 23:60
for ceramic membranes, 15:814, 815
chemical stabilization in, 23:60
dehydration in, 23:60
densification in, 23:60–61, 73–75
drying in, 23:60, 66–71
economic aspects of, 23:78–79
gelation in, 23:60, 77–78
hydrolysis and polycondensation in,
23:61–62
interest in, 23:55
mixing in, 23:59–60
stabilization in, 23:71–73
steps in, 23:56–76
theoretical models for reactions involved
in, 23:64
Sol–gel processing
of optical fiber, 11:144–145
of thin films, 23:79–80
in vitreous silica manufacture, 22:415
Sol–gel products
approaches used to make, 23:56
markets for, 23:79t
Sol–gel reversibility, of hydrogels, 13:730
Sol–gel silica–PDMS hybrids, 23:81
Sol–gel silica system, chemical additions
to, 23:62
Sol–gel sintered aluminum oxide, 1:6–7
Sol–gel systems
electrochromic materials, 6:582
photochromic materials, 6:592
Sol–gel techniques, in sensor manufacture,
13:551
Sol–gel technology, 23:53–84. See also
Sol–gel process
applications of, 23:79–83
defined, 23:54
early, 23:54–55
in organic–inorganic hybrids, 23:80–82
SOGOL
molecular formula and structure, 5:93
“Solid core” model
of polymer growth, 26:528
Solid acids, 12:161
supported catalysts, 5:326–334
Solid aerosol, 7:272
occurrences of, 7:273t
Solid-bed ion-exchange rhenium recovery process, 21:690
Solid bodies, flows past, 11:753–757
Solid-bound photosensitizing dyes, 9:518
Solid bowl centrifuges, 16:659–660
Solid-burned quicklime, 15:29
Solid by-products from vinyl chloride manufacture, 25:645
Solid cathode lithium cells, 3:460–464
Solid desiccants, 8:367–371
Solid-dose narcotics testing, 12:98–99
Solid electrolytes, nitrides as, 17:219
Solid emulsions, 7:272
occurrences of, 7:273t
Solid enzyme formulations, 10:272–273
Solid epoxy resins (SERs), 10:356. See also SER continuous advancement process characterization of, 10:384
in epoxy powder coatings, 10:440
higher molecular weight, 10:445
high molecular weight, 10:388
Solid Fat Content (SFC), 10:827
Solid Fat Index (SFI), 10:826
Solid fats, 10:817
measurement of, 10:826–827
Solid feeders for swimming pools, 26:179
Solid fiber paperboard packaging, converting, 18:20–21
Solid-film lubricants bonded, 15:248–251
performance properties of, 15:249t
Solid-film lubrication, 15:244–252
Solid–fluid equilibria, for crystalline solids, 24:10–11
Solid–fluid reactions, 21:343–344
Solid–fluid separation, 22:52
Solid foams, 7:272
occurrences of, 7:273t
Solid fuel combustion technology, 7:463–467
Solid–gas mass transfer, 15:684
Solid handling, pilot plant, 18:732
Solid hydrogen, 13:765
physical and thermodynamic properties of, 13:761t
Solidification in coating processes, 7:26–34
function of crystallization, 8:95
in radioactive waste treatment, 25:853
Solid-ion interactions, 14:429–442
Solid/liquid (S/L) dispersions, surfactants in, 24:156–157
Solid/liquid (S/L) interface, surfactant adsorption at, 24:138–144
Solid–liquid encapsulation process, 16:444
Solid–liquid equilibria (SLE), 22:302
strategic separation schemes and, 22:310–311t
Solid–liquid mass transfer coefficients in airlift reactors, 15:727t
relationships for estimating, 15:719–721t
Solid–liquid protein separation, 12:136
Solid–liquid sedimentation, 22:50, 51
Solid–liquid separation (SLS) flocculating agents in, 11:623–624
in minerals recovery/processing, 16:655–660
selecting equipment for, 11:346–348
stages of, 11:341–344
Solid–liquid separator, 15:710
Solid lubricant coatings cemented carbides, 4:669
Solid lubricants, 15:247t
for extreme environments, 15:256
metal films as, 15:251–252
Solid metal, reduction to, 16:147–149
Solid mixtures, quantitative analysis of, 14:238–239
Solid oxide fuel cell(s) (SOFCs), 12:201, 204, 205, 223–227, 13:845, 860–861
Solid-phase epitaxy, 14:447
Solid phase extraction (SPE) capillary chromatography sample preparation, 4:609–610
sample prep for liquid chromatography, 6:445–446
Solid phase microextraction (SPME), 11:518, 18:381
capillary chromatography sample preparation, 4:609, 610
Solid-phase organic synthesis (SPOS), 16:548, 549
Solid phase oxygen
in bioremediation design considerations, 25:840–841
Solid-phase reagents, 12:136
Solid-phase regrowth (SPR), in compound semiconductor processing, 22:190
Solid phases, soap, 22:728–731
Solid-Phase Synthesis database, 6:20
Solid polymer electrolyte (SPE) process, 13:783, 784
Solid precursors, in chemical vapor deposition, 22:153
Solid rocket propellants, 10:726, 26:754–755
density of, 11:795
mixing in fluidized beds, 11:807–808
Solids
bulk handling of, 18:5
combustion of, 13:174
floating, 16:694–696
molecular recognition in, 16:794–796
safe handling of, 21:852
sinking, 16:692–694
Solid samples
methods for examining, 14:229–230
mull method for examining, 14:229
Solids backmixing, 11:821
Solids concentration, in solid–liquid separation, 11:342, 343
Solids-free completion/workover fluids, 9:26–27
Solids handling, industrial hygiene and, 14:208–209
Solid soil detergency, 8:423–424, 428–433
Solid–solid reactions, catalyst deactivation mechanism, 5:256, 278–280
Solid–solid sedimentation, 22:50
Solid solutions
copper wrought alloys, 7:728
with perovskite-type compounds, 11:96, 97–98
Solid solution strengthening, 13:473–474, 480, 523
Solids retention time (SRT), 25:900
Solids separation, in solid–liquid separation, 11:342, 344
Solids suspension(s), 7:272t, 16:692–696
degrees of, 16:693
occurrences of, 7:273t
“Solid-state” hydrogen, 13:850
Solid-state crossed Cannizzaro reactionp, 16:574
Solid-state electronics, 9:727–728
rate of progress in, 9:736
Solid-state lasers, 14:675, 688, 696–699, 702
Solid state lighting (SSL) applications, LEDs in, 22:175
Solid-state metal–matrix composite processing, 16:169–173
Solid-state multielement detector arrays, 23:141
Solid-state polymerization (SSP), 20:41–42, 44
Solid-state polymerization process, in polyamide plastic manufacture, 19:783
Solid-state reactivity, 8:86–89
Solid-state requirements, in large-scale pharmaceutical synthesis, 18:729
Solid-state testing, of polymers, 19:575
Solid state transformations, of higher olefin polymers, 20:418
Solid superacids, 12:192
Solid surface(s)
ad sorption of surfactant ions on, 24:140
flow past, 15:717–718
Solid tantalum capacitors (STC), 24:326
Solid transparent insulation materials, 23:8–9
Solidus Temperature, 13:487
Solid walls, flows near, 11:751–753
Solid waste(s)
from the chloride process, 25:64
ethylene-plant, 10:627
from geothermal operations, 12:535
pretreatment for, 10:536
PVC and, 25:679–680
regulation of, 21:586–589
from the sulfate process, 25:63
from waste treatment processes, 25:65
Solid waste management, 25:862–882
characterizing solid waste sources in, 25:863, 866–869
history of, 25:862–863
identifying solid waste sources in, 25:863–866
toxicity reduction in, 25:870, 875–876
waste collection systems for, 25:869–870
waste disposal in, 25:876–881
waste volume reduction in, 25:870–875
Solinox process, 23:771
“Solka Floc” (SF) cellulose fiber slurries, 15:707
Sols, 23:54, 7:272t
acid-catalyzed and base-catalyzed, 23:63
Solubility
  of anthropogenic silicas and silicates, 22:455–458
  in antidegradant selection, 21:787
  of L-ascorbic acid, 25:751–752
  of ethylene oxide polymers, 10:675–679
  of fullerene, 12:234
  of gases in silicone fluids, 22:578
  of gases, 15:683
  of gelatin, 12:438
  of higher olefin polymers, 20:423
  of hydroxybenzoic acids, 22:2t, 3t
  in ionic liquids, 26:863–865
  of limestone, 15:32
  of maleic anhydride, maleic acid, and fumaric acid, 15:484t
  multidimensional representation of, 23:90–91
  of polycarbonates, 19:799–801
  of polymers, 20:403–405
  precipitation and, 25:821
  of proteins, 20:449–450
  of silicones in water, 22:602–603
  of silver sulfide, 22:673
  of slaked lime, 15:45
  of sodium bromide, 22:823
  of sodium chloride (salt), 22:801t
  of sodium iodide in water, 22:827t
  of sodium nitrite in nonaqueous solutions, 22:854t
  of sodium nitrate in water, 22:853, 854
  of sodium sulfates, 22:864–865
  of sodium, 22:764
  of vanillin, 25:548
  of VDC copolymers, 25:703–706
  of vitamins, 25:788t
Solubility behavior, protein, 12:131–135
Solubility coefficients
  for polymer penetrants, 25:711t
Solubility diagrams, 22:302
Solubility limit, 13:513–514
Solubility parameter(s), 20:403, 404, 23:89–91, 24:3
  for finish removers, 18:77
Solubility parameter–charge effects model, 21:661
Solubility properties, of fats and oils, 10:823
Solubility–temperature relationship(s)
  sodium with other elements, 22:763
  for surfactants, 24:125–126
Solubilization
  chelant applications, 5:732
  chelants, 5:727–728
  inclusion compounds in, 14:184
  in polymer blends, 20:355
Solubilized vat
  soluble dyes, 7:373t
Solubilizing agents
  cosmetic surfactants, 7:834t
Solubilizing vehicles, large molecule, 16:410
Soluble alkali silicates, 22:452
Soluble anodes, 9:776
Soluble dyes
  colorants for plastics, 7:359, 371, 373–375t, 379
Soluble electrolytes, ternary soap–water systems and, 22:727
Soluble glass, 22:452
Soluble hydrophilic dyes, 9:190
Soluble microbial products (SMP)
  in biological wastewater treatment, 25:896. 897
Soluble oil metal-working fluids, 1:22
Soluble oils, 15:240
Soluble silicates, 22:451–452
  dissolution of, 22:455–456
  history and applications of, 22:452
Soluble starch synthases, 12:492
Soluble titanium glycolate complexes, 25:87
Solute clearances
  in hemodialysis, 26:819–823, 831
Solute flux equation, 21:639
Solute flux, in reverse osmosis, 21:637–638
Solute–membrane interactions, in organic separations, 21:660
Solute permeability coefficient, 21:639
Solutes
  activity coefficient of, 23:91
  diffusivities of, 15:672t
  diffusivity and mass transfer in
    supercritical fluids, 24:7–8
  molecular diffusivities of, 10:751
  solvation studies of, 23:109
Solute solubilities, in supercritical fluids, 24:6
Solution(s)
  adhesives, 1:532–534
  aerosols, 1:772–773
  cloud point of, 24:126
  polysaccharide, 20:554–555
  recovery of metal from, 16:154–156
  silicates in, 22:456–458
  surfactants in 724–724
SOLUTION BLENDING, OF POLYMER BLENDS

Solution blending, of polymer blends, 20:326–327
Solution-cast composite membranes, 15:813
Solution casting, 15:801
Solution constraints, in chemometrics, 6:62–63
Solution crystallization, general separation heuristics for, 22:319–320
Solution-diffusion (SD) models, 21:639–640, 660
Solution–diffusion tubing, flow through, 15:722, 723
Solution dumps, 9:797
Solution/electrode interface, 9:574–581
Solution-enhanced dispersion by supercritical fluids (SEDS), 24:17, 18
Solution heat treatment aluminum alloys, 2:331
Solution kinetics, 9:579
Solution manufacturing, of high density polyethylene, 20:167–168
Solution mining for chemical recovery from brines, 5:788
of potassium chloride, 20:613
of sylvinite, 20:615
of sodium chloride, 22:802–805
Solution NMR spectroscopy, 14:182
Solution–phase microwave reactions, 16:540
Solution pH standards, 14:25t
Solution polymerization, of acrylonitrile, 11:200–201
Solution polymerization process, for aromatic polyamides, 19:718–720
Solution polymerization, 20:408
acrylamide polymers, 1:321
acrylic ester monomers, 1:381–383
for linear low density polyethylene, 20:196–197
of methacrylic ester polymers, 16:283–285
of PVA, 25:670
reactors, 16:284
of VDC, 25:695
of vinyl acetate, 25:570
Solution polymerized stereo polymers, IISRP classification of, 21:764t
Solution polymers, 20:461
Solution polymer specifications, 16:291
Solution precipitation, 15:804–811
of PVA, 25:614–615
Solution prepregging, 20:284–285
Solution processing, 14:80
Solution process, of ethylene–propylene polymer manufacture, 10:708–710
Solution properties of lignin, 15:13
of polyampholytes, 20:479
of VDC copolymers, 25:703–706
Solution spectrophotometry, 9:232
Solution spinning of acrylic fibers, 11:204–211
high-strength fibers from, 11:214
copolymer concentrations for, 11:204t
Solution treated and rolled copper alloys, 7:723t
Solution treated copper alloys, 7:723t
Solution turbidimetry, 20:439
Solution viscosity, 10:677, 678
of PVA, 25:595–597
Solution (wet) spinning, 16:8, 10, 15:816, 817–818
Solvating extractants, 10:751
Solvation energy, 23:96
Solvation/phase behavior, role of water in, 20:439
Solvation properties, of supercritical solvents, 14:80–81
Solvatochromic materials, 22:708t
Solvatochromic probes, 26:853–855
Solvatochromic spectral shifts, 23:96
Solvatochromy, 20:517
Solvay, 7:641
Solvay process, 15:63
environmental factors in, 22:794
of sodium carbonate recovery, 22:787, 790–792
slaked lime in, 15:63
Solvent(s), see also Industrial solvents; Supercritical solvents allergic effects of, 23:120
alternative, 12:808–809
apolar, 10:205
for aromatic polyamide manufacture, 19:714
association parameters for, 15:673t
autoignition temperature of, 23:117–118
behavior in mixtures, 23:109
biodegradation of, 23:110–111
in can manufacturing, 10:107
carcinogenic, 23:113–114
chlorinated paraffins applications, 6:129
classes of, 23:108
comparative analysis of, 23:88t
contamination cleanup for, 23:111–112
in cosmetic molded sticks, 7:840t
in cosmetics, 7:832
defined, 12:33
designer, 26:840
desolvation, 16:450
diffusivity in, 15:672–673
diffusivity of, 23:102–104
effect on polyamide plastics, 19:783
effect of pressure on, 13:404
estimates of toxicity for, 23:113
fate in water, 23:109–110
as fermentation products, 11:2–3
flammability limits for, 23:115–116
flexography and gravure, 14:325t
in food, 12:67
free-volume correlation data for, 23:103
furan derivatives as, 12:279–280
glycol monoethers as, 12:656–658
for gravure inks, 14:324–326
groups and average properties of, 23:87–89
as hepatotoxic agents, 23:119
hydrofluorocarbons as, 13:723–725
in hydrogen sulfide recovery, 23:600–601
in hydrothermal processing, 14:82–83
as indoor emission products, 23:111
influence on chemical reactivity, 23:107–109
interacting and noninteracting, 23:99
in large-scale pharmaceutical synthesis, 18:726–727
in liquid–liquid extraction, 10:749
mutagenic, 23:114
negative piezoelectricity, 6:611
negative thermoelasticity, 6:626
nonaqueous, 14:32
occupational exposure indicators for, 23:114–115
organic, 10:597
paint, 18:59–60
performance criteria in cosmetic use, 7:860t
as petroleum products, 18:667
plasticizer alcohols for, 2:23
polar, 10:205, 207
polar aprotic, 10:369, 386
polarity of, 23:86
printing viscosity and, 14:323
proprietary and special industrial, 10:553
propylene glycol, 12:668
for PVA, 25:594–595
for PVDC, 25:704t
quaternary ammonium compounds, 2:775
rate of evaporation of, 23:106
reaction with hydroperoxides, 18:432–433
reaction rate properties of, 10:107
regulations impacting, 23:120–121
removal of, 23:104–107
removal from air, 23:111
removal from soil, 23:110–111
reproductively toxic, 23:114
safer, 12:804
sodium as, 22:763–764
sustainable development and, 24:170–171
swelling and plasticization related to, 23:97–99
toluene, 25:181
in transparent soaps, 22:747–748
transport phenomena in, 23:101–107
for VDC copolymers, 25:705t
for VDC laquer resins, 25:734
VDC polymer degradation via, 25:713
VDC polymer degradation in nonpolar, 25:717–718
Solvent-based inks, drying, 14:328
Solvent-based separations, design of, 20:745
Solvent behavior, 23:96–109
Solvent Black 3
colorant for plastics, 7:374t
Solvent Blue 35, 36, 58, 59, 70, 101, 102, 104, 128
colorant for plastics, 7:374t
Solvent casting, 14:229–230
Solvent-catalysts, nickel, 17:122
Solvent cleaning
for electroplating, 9:780–781
of metal surfaces, 16:213
Solvent-containing systems, rheological properties of, 23:99–101
Solvent deasphalting, 18:647
Solvent dehydration, pervaporation in, 18:513–515
Solvent dewaxing, 18:662, 670
Solvent dyeing, 9:160, 204, 243
Solvent effects, 23:96
in polyamic acid formation, 20:268
Solvent evaporation, 9:74
polymer precipitation by, 15:806
of printing inks, 14:313
Solvent evaporation encapsulation technology, 16:446
Solvent exchange, 13:433
Solvent exchange kinetics studies, high pressure, 13:433–435
Solvent exchange reactions, 13:408, 416
Solvent exposure, toxic effects of, 23:118–120
Solvent exposure tests, on plastics, 19:583
Solvent extraction, 10:744–746, 781–782
advantage of, 10:746
for aroma isolation, 11:518
in food processing, 10:787
in hazardous waste management, 25:822–823
in hydrogen peroxide manufacture, 14:54
in hydrometallurgical recycling, 21:399–400
in oil processing, 10:807
of oils, 10:818
in phosphoric acid purification, 18:825
of uranium ores, 25:403–404
in wastewater treatment, 25:889t, 892t, 893–894
Solvent extraction metal recovery, 16:155–156
process, 15:216
separation of tantalum and niobium via, 24:319–321
sulfur recovery by, 23:574
Solvent extraction techniques for niobium, 17:138
in niobium analysis, 17:143
Solvent extraction technology, 19:609–611
Solvent fractionation, 10:813
Solvent-free coating systems, 10:437–438
Solvent-free organic reactions, microwave-accelerated, 16:555–584
Solvent-free oxidation, with clayfen, 16:568–569
Solvent-free processing, 24:170–171
Solvent-free protocol, ecofriendly advantages of, 16:585
Solvent Green 3, 5, 28
  colorant for plastics, 7:374t
Solvent-induced gelation, 9:75
Solvent-induced spectral broadening, 23:96–97
Solvent-laden air (SLA), 10:95
Solvent mixtures flash point of, 23:116
viscosity of, 23:99
Solvent Orange 107, 60, 63, 7
  colorant for plastics, 7:374t
Solvent polarity/hydrophobicity probing, polymethine dyes in, 20:517
Solvent polarity/temperature, in initiating systems, 14:268
Solvent power, 23:89
Solvent preparation, for Grignard reactions, 12:823
Solvent properties of perfluorinated inert liquids, 11:880–881
of steam, 23:209–213
Solvent quality, determinants of, 23:86
Solvent recovery activated carbon application, 4:754–755
of cellulose solvents, 11:274
from spinning processes, 11:209–210
using vapor permeation, 18:515–516
in vinyl alcohol polymerization, 25:610
Solvent Red 1, 111, 135, 149, 155, 168, 169, 172, 179, 195, 196, 197, 207, 23, 24, 242, 26, 52
  colorant for plastics, 7:374t
Solvent reduction, resources related to, 23:120
Solvent-Refined Coal (SRC) process, 6:765–767, 834–837
Solvent-releasing acrylic sealants, 22:43
Solvent-releasing butyl sealants, 22:43–44
Solvent resistance, of polycarbonates, 19:799–801
Solvent-resistant elastomers, 9:560–562
Solvent-resistant membranes, 21:656
Solvent-resistant rubber, 22:583–584
Solvent selection, in liquid–liquid extraction, 10:746–749
Solvent–solute interactions, 26:855, 23:91–96
  acid/base interactions in, 23:96
  dispersion in, 23:92–93
  electrostatic forces in, 23:91–92
  hydrogen bonding in, 23:94–95
  hydrophobic interactions in, 23:95
  polarization in, 23:92
  repulsion in, 23:93–94
Solvent strength, of pure fluids, 24:3–4
Solvent systems, for acid gas removal, 12:376–377
Solvent treatment, in petroleum refining, 18:661–663
Solvent Violet 11, 13, 14, 36, 38, 59
colorant for plastics, 7:374t
Solvent—weld adhesives, 1:532
Solvent Yellow 114, 14, 16, 160, 163, 176,
179, 185, 33, 72, 93, 98
colorant for plastics, 7:374t
Solvolysis, of polyamide fibers, 19:746
Solvophobic theory, 21:661
Solvothermal processing, 14:80
Soman, 5:819, 820
Somatic cell nuclear transfer, species and
cell types used for, 12:452t
Somatic cells
gene transfer with, 12:457–459
nuclear transfer from, 12:451–452
Somatosalm
registered for use in aquaculture in
Europe, 3:220t
Somatotropin, 13:2
as an animal growth regulator, 13:9–12
Somatotropin secretogogues, 13:2
Sommelet–Hauser rearrangement
quaternary ammonium compounds,
2:737
Somogyi method, in sugar analysis, 23:475
Sonication, 16:410–411
Sonic limit, heat pipe, 13:230
Sonogashira coupling
ionic liquids in, 26:891–892
Sonophotocatalysis, 23:24
Sonozone, 17:779
Sony Snapshot Printer, 19:321
Soot, 7:473. See Carbon black
SORBATHENE, 1:646
Sorbead
adsorption capacity vs. years of service,
1:630
Sorbent-enhanced reforming, 13:845
Sorbent fibers, 16:28
in hollow-fiber membranes, 16:26
Sorbent walls, hollow fiber with, 16:26
Sorber process, 1:612, 664, 676t, 676–677
SORBI 1,4-Sorbitan, 4:710
SORBI 1,6-Sorbitan, 4:710
in ascorbic acid manufacture, 25:756,
757
Sorbic acid, 12:58
antimicrobial used in cosmetics, 7:831t
physical properties, 5:33t
Sorbitan esters, 24:150
Sorbitan monolaurate, 4:710
Sorbitan monooleate, 4:710
Sorbitan monopalmitate, 4:710
Sorbitan monostearate, 4:710
Soritrate
molecular formula and structure, 5:110t
L-Sorbose
in ascorbic acid fermentation synthesis,
25:754
in ascorbic acid production, 25:753–754,
755–758
Sorel cements, 15:395
Sorghum sudanense, 13:352–353
Sorghum wax, 26:212
Sorivudine, 4:360t
Sorption
herbicide, 13:307–308
of phenoxyacetic acid herbicides, 13:314
in wastewater treatment, 25:912
Sorption balances, vitreous silica in, 22:441
Sorption properties, of fibers, 11:169–170
Sorption selectivity, 15:838
Sorting
of cells, 26:971–972
Soritis
molecular formula and structure, 5:138t
Sotacor
molecular formula and structure, 5:94t
SOTAL L-Sotalol
molecular formula and structure, 5:94t
Sotalex
molecular formula and structure, 5:94t
Sotalol (D,L), 5:102, 103
molecular formula and structure, 5:95t
Soups
estimated maximum oxygen tolerance,
3:381t
Source air pollution sampling, 26:673
Source-based macromolecular
nomenclature, 17:403
Source–drain current, 22:136
Source gases, 13:456
Source list, for separation synthesis, 22:315
Source management
for air quality management, 1:812–814
indoor air pollution, 1:826–831
Source modeling, 13:165–166
Sources, for separation synthesis, 22:315
Source separated recyclable items
  in waste collection, 25:869
Source-to-drain current, 22:165
Sourdoughs, 26:464
Sour gases, 23:630
  hydrogen sulfide absorption from CO₂-
    rich sour gases using MDEA, 1:72–76, 78–80
Sour natural gas, 23:597
Sour syngas
  defined, 6:829
Sour taste, 11:566
South Africa, platinum-group metal deposits in, 19:604, 612
South African gold mines, 12:686
South African manganese mining, 15:555
South America
  natural graphite in, 12:781
  sodium nitrate in, 22:843–845
  tin mining in, 24:783, 800
Southern blotting, 12:454, 499, 500
  technique, 9:756
Southern quahog
  common and scientific names, 3:188t
Soviet Union
  germanium stockpiles in, 12:548–549, 557
  rhenium from, 21:683, 684, 685t, 687–688
SOₓ emission control area (SECA), 23:589
  SOₓ emissions, from FCC unit regenerators, 11:715–718
Soxhlet extraction
  capillary chromatography sample preparation, 4:609
SOₓ reduction catalyst additive, 11:717–718
SOₓ removal catalyst systems, 11:718
Soyaalkylamines, 2:519
  melting point, 2:521t
Soya bean oil, in soap making, 22:735
Soya oil
  fatty acid composition, 2:519t
Soybean(s)
  fatty acid composition, 5:56t
  solvent extraction of, 10:818
Soybean meal
  in nonruminant feeds, 10:837
  in ruminant feeds, 10:866
Soybean oil, 9:143, 150, 151
  in defoamer formulations, 8:237–238
  epoxidized, 9:152
  feedstock for higher aliphatic alcohols, 2:28t
  hydrogenation of, 10:810
  Soybean products, in pet foods, 10:852
  Soy isoflavones
    anticancer activity trials, 2:826
  Soy products, 17:668–669
  Soy sauce (shoyu), 26:470–471
  Soy wax, 26:212
  Space cooling
    dessicant applications, 8:356t
  Space exploration
    plutonium-238 in, 19:669
    virtual two-way SMA devices in, 22:350
  Space printing, 9:213
  Space reactors, 17:591–592
  Space satellites, use of gold in, 12:703
  Space Shuttle
    silica aerogel application, 1:766
    Space technology, silicon carbide in, 22:541
    Space vehicles, vitreous silica in, 22:443, 444
  Space velocity, in ethylene oxidation, 10:650
Spain
  aquaculture production, 3:189t
  Spalart-Allmaras model, 11:780
  Spanning, 13:465
  Spans, 24:150
  Spansule brand drug granules, 18:709
  Sparflaxacin, 3:29, 21:220, 223, 224, 226, 231
  Sparger air filtration, in fermentation, 11:36
  Spargers, 11:33–34
  Sparging, 13:268
    in beer making, 3:579
  Spark ignited (SI) engines, 10:60
  Sparkling wines, 26:300, 301, 310
  fermentation of, 26:314–315
  Spark plugs, platinum-group metals in, 19:630
SPARTAN, 7:385, 399, 422
  construction of, 26:194
  skin irritation in, 26:197
  water treatment for, 26:194–196
  Spatial light modulator(s), 15:117
  electrooptic materials in, 17:452
  Spatial resolution, improved, 15:187
  Spa treatment, ozone use in, 17:809
Spectral normal emissivity, of vitreous silica 873

Spawning aids registered for aquaculture in U.S., 3:217 registered for use in aquaculture in Europe, 3:220
Spearmint, 24:537
Special-grade carbon blacks, 4:775 uses of, 4:796–800, 798t
Special industrial solvents, 10:553
Speciality enzymes, 3:816
Specialized training, for technical service personnel, 24:346
Specially denatured alcohol (SDA), 10:553–554
Special polymers, in rubber compounding, 21:771–772
Special-population vaccines, 25:493–497
Special purpose coppers, 11:423–424
Specialty coppers, 7:751–752
Specialty epoxy resins, 10:373–376
Specialty fibers, 24:614
Specialty pumps, 21:68–70
Specialty soaps, 22:746–748
Specialty sugars, 23:482–483, 484–488 large-grain, 23:481–482
Specialty surfactants, 24:152–153
Specialty sweeteners, 12:44
Species balance equation, 21:346–347
Species continuity equations, 21:346
Species differences influence on toxicity, 25:210
Species in a mixture, fugacity of, 24:678–680
Spectral power distribution, standard illuminant, 7:313
Spectral properties of aminophenols, 2:654t
Spectral reflectance, for MOCVD, 22:155
Spectral selectivity, 23:1, 4
radiative cooling and, 23:14
Spectral sensitivity curves, 9:502
Spectral sensitization, 19:110–111,
360–361
for color and black and white imaging,
9:506–515
in photochemical technology, 9:515–520
in photography, 19:192–196
Spectral sensitizers, 9:500–501
classes of, 9:503–506
demand for, 9:502–503
nondegrading, 9:507
Spectral-sensitizing dyes, 19:192–196
Spectral transmittance, 23:18
Spectrofluorometry, 10:258
Spectrographs, 23:133
Spectrometers, 23:133
commercial, 24:104–105
energy dispersive, 26:434–435
wavelength dispersive, 26:433–434
X-ray, 26:433
Spectrometry, 23:125
total reflection X-ray fluorescence,
26:435–437
X-ray fluorescence, 26:432–435
Spectrophotometer(s), 18:70, 19:586,
7:324–326
enzyme immunoassay and, 14:143
stopped-flow, 13:421
Spectrophotometric methods for sulfonamide determination, 23:509
in reaction monitoring, 13:417
Spectroscopic analysis, 23:128
Spectroscopic methods, 23:125, 10:508
for assessing flax fiber quality, 11:616
for niobium impurity determination,
17:143–144
for nitride analysis, 17:216–217
Spectroscopic properties of crotonaldehyde, 2:62t
Spectroscopic transitions, widths and strengths of, 23:130–133
Spectroscopy, 23:125–153. See also
Infrared spectroscopy
of anthropogenic silicas and silicates, 22:470
ATR-FTIR, 24:111–114
background of, 23:128–135
dye laser as a source for, 14:705
infrared, 23:136–143
instrumentation in, 23:133–135
for MOCVD, 22:155
molecular uv–vis absorption, 23:143–145
in phenolic resin analysis, 18:774–775
in polycarbonate analysis, 19:819
radio wave and microwave, 23:135–136
sensors using, 22:271
silica surface chemistry and, 22:372–373
of silicon, 22:498
in silicone network characterization,
22:569
of silicones, 22:598, 599
silver analysis via, 22:651
of sodium, 22:774–775
termiology for quantities in,
23:125–126
transmission, 14:228–230
vibrational, 21:321–322
Spectrum manipulation, 14:236–237
Spectrum smoothing function, 14:236
Specular reflectance, 14:231
Specular reflection and object mode perceptions, 7:306t
Speculative resources (SR), 17:522, 524t
Speed of sound, as a property of steam,
23:204
Spent acid burning, 23:772
Spent acid decomposition plants, 23:792
Spent acid regeneration gas cleaning equipment, 23:782
Spent acids, decomposing, 23:772
Spent catalysts, as a source of platinum-group metals, 19:611–612
Spent fuel, 25:400
Spent radioactive fuel, 25:851, 852
treatment of, 25:853–854
Spermaceti, 26:208
in dental waxes, 8:296
Sperm-mediated gene transfer, 12:456–457
Sperrylite, 3:263t
SPF (Sun Protective Factor), 7:845
Sphaerocobaltite, 7:209t
color, 7:331
Sphalerite, 26:555, 4:472t
Sphene
colorants for ceramics, 7:348t
Sphere, flow across, 15:721t
Sphere-of-influence (SOI), 19:355–356, 358
Spherical bubbles, in foams, 12:7–8
Spherical fillers, phenolic resin, 18:796–797
Spherical micelle model, 24:124
Spherical micelles, 24:120, 121
properties of, 24:123
Spherical particle reinforcement, 5:555
Spherical substrate recognition, 16:775–776
Sphericity, 11:795
Spheripol process
plant and operating costs for, 20:545
reliability and operability of, 20:545
Spheripol technology, 20:526, 531, 536–539
process capability in, 20:539
Spherizone process, safety of, 20:546–547
Spherizone technology, 20:539–545
product versatility in, 20:544–545
Spheroidal iron, silicon and aluminum in production of, 22:516–517
Spheroidization annealing, 23:290
Spherulites, 20:162, 398
of VDC copolymers, 25:703
Spice equivalents, 11:579t
Spice fragrances, 18:360
Spices, 23:153–172
adulteration of, 23:160–163
cleanliness of, 23:160
commercial growing of, 23:154, 155
cultivation of, 23:154–155
defined, 23:153
flavors of, 23:154
harvesting, 23:155
individual, 23:163–171
labeling, 23:159–160
microbiological quality of, 23:159
microbiology of, 23:156–157
moisture level of, 23:158
processing, 23:156–157
quality assurance for, 23:157–160
role in disinfection, 8:605
safety concerns related to, 23:160–163
specific adulteration issues related to, 23:161–163
supply of, 23:155
testing of, 23:159
treatment processes for, 23:157
Spicy odor, 3:229t
Spider orb web, structure of, 22:630
Spider silk, 22:627
composition of, 22:628t, 629
crystallinity of, 22:630
glands, 22:627, 628t
Spider silk protein, 12:464–465
Spidroin 1 protein, 22:629
Spills, industrial hygiene and, 14:213
Spills and leaks
anatomy and remediation of, 24:309
causes of, 24:306–309
prevention and detection of, 24:309–312
storage tank facility, 24:305–312
Spinal curvature, superelastic and pseudelastic SMA devices for, 22:351
Spinbath, in wet fiber spinning, 11:206–207
Spin coating, 7:23
Spin coating process, 23:79–80
Spin/draw/cut/bale units, for polyester
spinning technologies
See also Solution spinning; Yarn spinning technologies
air gap, 11:209
of continuous-filament yarns, 19:749–758
of cuprammonium rayon, 11:264–265
dry fiber, 11:204–206, 206–209
of fibers, 11:174, 175
flash, 17:479–480
melt fiber, 11:210–211
new developments in, 19:751–753
olefin fiber, 11:232–234
of PBI fibers, 13:381
of PPTA, 19:724–725
solvent recovery from, 11:209–210
of synthetic fibers, 24:616–617
of viscose, 11:256–257
wet fiber, 11:189
Spinning basket reactor, 21:352, 353
Spinning-cup atomizers, 23:659
Spinning-cup sulfur burner, 23:660
Spinning machines, 19:749
Spinning processes, hollow-fiber, 16:7–12
Spinning pump, for olefin fiber extrusion, 11:231
Spinning systems, wet ring, 11:615–616
Spinning/web formation, for spunbonded nonwoven fabrics, 17:469–474
Spinodal curves, 20:320–321
Spinodal decomposition, in polymer blends, 20:321, 322
Spin on glass (SOG) technique, 24:750
Spinosad, 14:346
Spinplates, rectilinear, 17:470
Spin probe testing, of plastics, 19:589
Spin welding, of ethylene–tetrafluoroethylene copolymers, 18:327
Spiral Bourdon tube, 20:648
Spiral channel separator, 22:63
Spiral elevator mixers, 16:720
Spiral gravity flow concentrator, 16:632
Spiral mandrel
in VDC film extrusion, 25:732–733
Spiral plate construction, 10:157
Spiral-wound membrane modules, 15:818–819, 823–824, 838
Spiral wound pervaporation modules, 18:512
Spiral-wound reverse osmosis membrane element, 26:75
Spiramycin
registered for use in aquaculture in Japan, 3:221t
Spiramycin complex, 15:290, 291t, 300
Spirit soluble azo dyes, 9:421
Spirit thermometers, 24:464
3-(2′-Spiroadamantane)-4-methoxy-4-(3″-phosphoryloxy)-1,2-dioxetane (AMPPD)
chemiluminescence reagent, 5:855
3-(2-Spiroadamantane)-4-methoxy-4-(3″-β-D-galactopyranosyl-oxyp henyl)-1,2-dioxetane (AMGD)
chemiluminescence reagent, 5:855
Spirogermanium, 12:554
Spironolactone, 5:159, 168
molecular formula and structure, 5:154t, 165t
Spirooxazines
thermochromic materials, 6:620–621
Spiropyranes
photochromic materials, 6:597–598
piezochromic materials, 6:608
thermochromic materials, 6:620–621
Splashes, 26:158, 159–161
Splash loading, 14:208
SPLENDA, 24:237
Splint coal, 6:705
Split injection
gas chromatography, 4:612, 6:416–417
Splitless injection
gas chromatography, 4:612, 6:417–420
Split-peak effect, in affinity chromatography, 6:398
Split-plot situations
amount of coverage in experimental design texts compared, 8:395t
Split recarbonation, 26:118
Split/splitless injectors, 6:383
Split-stream dealkalization process, 14:416
“Splitting” technique
sampling via, 26:1016
Split water treatment, 26:118–119
SPODU β-Spodumene solid solution, 12:638–639
Spodumene, 15:122
s-polarized light, 24:115
Sponge-and-dough bread production, 26:461
Sponge consolidation, in titanium manufacture, 24:854
Spontaneous emission, 14:848–850
Spontaneous emission enhancements, 14:855
Spontaneous emulsification, 10:127
Spontaneous fermentations
for wine production, 26:468
Spontaneous fission, 21:304–305
Spontaneous ignition temperature, 7:438t
Spontaneously twisted nematics, 15:92
Spontaneous polarization, in compound semiconductors, 22:152
Spontaneous polymerization of VDC, 25:695
Spontaneous radiative transition rate, 14:849
Sporeamicins, 15:280
SPORE database, 6:20
Spore germination, in food processing, 12:76
Spores
  indoor air pollutant, 1:804
  lotus effect repellancy against, 22:122
Sporinite, 6:707t, 719
Sports applications, for high performance fibers, 13:396
Sports equipment, use of polyamide plastics in, 19:795
Sport shirts (woven)
  number produced from one bale of cotton, 8:133t
SportWool, 26:380–381
“Spot colors,” 9:214
Spotfire, 6:21
Spotting fluids, 9:24–25
Spouted bed dryers, 9:123
Sprains, 3:724
Spray aerators, 26:162
Spray bonding, for fabric applications, 17:508
Spray chambers, 26:688, 715
Spray chamber scrubbers, 26:713–714
Spray chilling, 11:550–551, 555
  flavor encapsulation by, 11:540
Spray chilling encapsulation processes, 16:448
Spray cleaning, of metal surfaces, 16:213
Spray coating processes, 7:23, 68–76
  economic aspects, 7:75–76
Spray column absorbers, 1:27
Spray cone angle, 23:187
Spray correlations, 23:189–192
Spray deposition, of metal–matrix composites, 16:173
Spray-dried products, 11:542–543
Spray-dried resins, production of, 18:769
Spray droplet size distribution, 23:185–186
Spray drop size, 23:174–175
Spray-dry encapsulation processes, 16:447–457
Spray dryers, 9:126–127, 292
Spray drying, 9:74, 416
  coffee, 7:262
  encapsulation by, 11:537–539
Spray drying technology, heat pipes in, 13:238
Spray dyeing, 9:227
Spray dynamic structure, 23:188–189
Spray equipment, 23:175
Spray fluid properties, 23:185
Spray flux, 23:193
Spray-forming, of particulate metal–matrix composites, 16:175
Spray functions, 23:174t
Spray impact, 23:197
  measurements, 23:194–195
Spray processes, for sodium carbonate peroxohydrate, 18:412
Spraying techniques, in fluidized-bed encapsulation, 11:541–542
Spray instrumentation, 23:192–195
Spray irrigation
  in biological waste treatment, 25:901t
Spray measurement results, 23:193
Spray nitrators, 17:167
Spray nozzles, 23:172–173
Spray parameters, 23:185–188
Spray pattern, 23:187–188
  selection criteria for, 23:198
Spray processes, design of, 23:174
Spray pyrolysis, 24:750
Spray pyrolysis technique, 21:154
Spray reactor, 21:334
Sprays, 23:172–201
  aerosols, 1:773–774
  characteristics of, 23:184–192
  evaporation of droplets in, 23:184
  future directions of, 23:198
  industrial applications of, 23:195–198
  liquid atomizers, 23:175–176
  nomenclature related to, 23:199t
  noncombustion applications for, 23:195–197
  physics of liquid atomization, 23:176–184
  purposes of, 23:172
  surface applications for, 23:196–197
  transformation of bulk liquid to, 23:175
Spray technology, 23:173
  advances in, 23:174–175
Spray towers, 25:810, 26:688, 689
Spray-up molding, 26:768
Spray-up process, for unsaturated polyesters, 20:116
Spread function, 19:222
Spunbonded nonwoven fabrics, 17:460–494
- aging tests, 17:481–482
- applications for, 17:482–492
- bonding, 17:474–478
- characteristics of, 17:463–469
- disposable applications for, 17:489–492
- durable and disposable markets for, 17:482
- durable applications for, 17:483–489
- with elastomeric properties, 17:468
- fibers for, 17:465t
- as filters, 17:488
- flash spun fabrics, 17:479–480
- immobilization of fibers in, 17:464
- marketing, 17:462–463
- medical applications for, 17:490–491
- meltblown fabrics, 17:478–479
- nylon in, 17:466
- packaging applications for, 17:492
- physical properties of, 17:464t
- producers of, 17:461–462t
- specialized tests for, 17:468–469
- spinning and web formation operations for, 17:469–474
- test methods for, 17:480–482
- as three-dimensional solid objects, 17:488–489

Spunbonded processes, 17:463
Spunbonded structures, novel, 17:466
Spunbound fibers, 11:236, 240–241
Spun fibers, 16:18, 20
Spunlace nonwovens, 17:507
Spunlace fabrics, production of, 17:516
Spun yarn, 11:177, 178, 250. See also Yarn spinning technologies
- crystalline structure of, 11:237–238

Spurrite (5-calcium disilicate monocarbonate)
- phase in Portland cement clinker, 5:472t

Spurrite (calcium aluminate chloride)
- phase in Portland cement clinker, 5:472t

Spurrite (calcium aluminate fluoride)
- phase in Portland cement clinker, 5:472t

Spunback
- copper wrought alloys, 7:737–738

Spring copper alloys, 7:723t
- relief annealed, 7:723t

Spring yarn, 11:177, 178, 250. See also Yarn spinning technologies

Springback

Springback

SpresiReact database, 6:20

Spring and bellows pressure element, 20:650

Squaraine dyes, 9:514

Square antiprismatic
- geometry for metal coordination numbers, 7:574, 575t

Square prism lattice, 8:114t

Squeeze casting, of metal–matrix composites, 16:167–169
Squeeze films, 15:212
SQUIDs, 23:861
  S–I–S tunnel junctions used in, 23:870, 871–872
Sri Lanka, natural graphite in, 12:780
Stability
  of amorphous silicon, 22:139–140
  in antidegradant selection, 21:787
  of colloidal silica and silica sols, 22:391–392
  of diesel fuel, 12:425–426
  electrostatic, 10:119–121
  electrosteric, 10:122
  hydrogen peroxide, 14:39–40
  inclusion compounds in, 14:183–184
  of ion-exchange resins, 14:400–403, 412
  of ketones, 14:578–580
  of latex, 14:708–709
  of OLEDs, 22:219
  of organic semiconductors, 22:209–210
  of silver sulfide, 22:674
  steric, 10:121–122
  of VDC polymers, 25:719–721
Stability analysis, 11:762
Stability improvers, diesel fuel, 12:421
Stabilization
  photographic, 19:215–216
  in the sol–gel process, 23:71–73
Stabilization–solidification
  in hazardous waste management, 25:823–824
Stabilized levitation, 23:866–867
Stabilized liquid sulfur trioxide, 23:517
Stabilized polystyrenes, 23:366
Stabilized zirconia
  carbon monoxide compatibility with, 5:4t
Stabilizers
  cadmium monoxide compatibility with, 5:4t
  defined, 12:33
  emulsion, 10:116
  food, 12:51–54
  glass, 12:595–596
  iodine, 14:370
  of olefin fibers, 11:230
  for oxidative degradation, 10:683
  in photography, 19:196–197
  in polyamide plastic manufacture, 19:784–785
  for protecting art, 11:411, 412–414
  for PVC polymers, 25:671–672, 674
  in unsaturated polyester resin formulation, 20:105
  in vinyl acetate polymerizations, 25:573–574
Stabilizing agents
  for brewing, 3:584
Stabilizing compounds, in PTG imaging systems, 19:362–366
Stable angina, 5:108
Stable free radical polymerization (SFRP), 20:442, 443
Stable node(s)
  residue curve maps, 8:790
  in separating nonideal liquid mixtures, 22:303
Stachyose, 4:707
“Stack-and-draw” process, 22:444
Stack cooling, PAFC, 12:218
Stacking fault energy (SFE), 13:486
Stacking fault interactions, 13:498–499
Staebler-Wronski (SW) effect, 23:42
  in hydrogenated amorphous silicon, 22:139
Stage classification, 22:293
Stagewise experimentation, 8:392–393
Staggered herringbone mixer (SHM), 26:967
Staggered-type electrodes, 9:137
Staggers Rail Act of 1980, 25:324
Stain bleaching, 10:284
Stainblockers, 9:190
Stain controllers
  for swimming pools, 26:192
Staining properties, in antidegradant selection, 21:787
Staining techniques, 9:753
Stainless steel(s), 15:563, 23:300–306
  austenitic, 23:305–306
  chromium addition, 6:468, 469
  compositional and property linkage, 7:809
  compositions of, 23:302–304t
  corrosion, 7:809–810
  dental applications, 8:314–315
  economic aspects, 6:497
  environmentally induced cracking, 7:814
  ferrite grades of, 23:301
  ferritic, 23:305
  high temperature service, heat-resisting, 23:306–308
  martensitic, 23:305
  martensitic grades of, 23:301
  modified, 13:511
  molybdenum in, 17:16
Stainless steel 201, 202
  compositional and property linkage, 7:809
Stainless steel 2418 MoN
  compositional and property linkage, 7:809
Stainless steel 302
  in galvanic series, 7:805t
Stainless steel 303, 304
  compositional and property linkage, 7:809
Stainless steel 303SE
  compositional and property linkage, 7:809
Stainless steel 304L
  compositional and property linkage, 7:809
Stainless steel 309, 310, 314, 316
  compositional and property linkage, 7:809
  in galvanic series, 7:805t
Stainless steel 316L, 317, 317L, 321, 330,
  347, 403, 409, 410, 416, 420, 430, 456
  compositional and property linkage, 7:809
  in galvanic series, 7:805t
Stainless steel catalytic converters, 23:781
Stainless-steel electrodes, 25:19
Stainless steel metallic suture materials, 24:207
Stainless steel piping, 23:783
Stainless steel Rex 734
  compositional and property linkage, 7:809
Stainless steels Alloy 2C cast and wrought in galvanic series, 7:805t
Stainless steel surgical needles, 24:206
Stain removal
  cellulases and, 10:283
  degree of, 10:277
Stain resistance, of paint, 18:71
Stains, 9:153
  detergent enzymes and, 10:274–275
  exterior, 18:67–68
Stakeholders, in motor fuel manufacture, 12:387
Stalactites, 15:29
Stalagmites, 15:29
Stalk fibers, 21:18
Stamp-pad inks, 14:328
Standard cell potential, 15:750
Standard electrode potential
  selected ions, 7:799t
Standard engine bench cycle (SBC), 10:33
Standard Evaluation Procedures (SEPs), 18:544, 547
Standard free energy per monomer, 24:129
Standard hydrogen electrode, 3:413
Standard illuminants, 7:315–316
Standard Industrial Classification (SIC), 21:570
Standard Industrial Classification (SIC) industries
  timber-related, 26:363–364
Standardization
  computerization and, 15:759
  economic aspects of, 15:753–754
  legal aspects of, 15:754–755
  new areas for, 15:759
  of oils, 10:825
  of organic pigments, 19:450–452
Standardization process flow chart, 15:744
Standardizing
  milk chocolate, 6:364
Standard Method of Test for Distillation of Petroleum Products, 24:284
Standard Oil of New Jersey (Exxon), 24:259
Standard Operating Procedures (SOP), 21:165
Standard platinum resistance thermometers (SPRTs), 24:444–447
  basic designs for, 24:445
  measurement accuracy of, 24:446
  measuring the resistance of, 24:447
  resistance–temperature relationship for, 24:445–446
Standard potential, 3:413
  selected electrodes, 3:413t
Standard practice instructions (SPI), 21:165–166
Standard reference data, 15:747
Standard reference materials (SRMs), 15:744–745
Standard road cycle (SRC), 10:33
Standards. See also Specifications; Water standard
chemical technology, 15:748–751
defined, 15:741
directories and cross-references to, 15:769
hafnium, 13:87
inorganic pigment, 19:384
international, 15:755–757
iodine, 14:366–367
for ion-exchange resins, 14:414–415
linear low density polyethylene, 20:203
low density polyethylene, 20:226–227
national, 15:757–759
nitrogen, 17:282–283
noble gas, 17:366–367
for nonlaboratory environments, 15:760
phenol, 18:752–753
polyamide plastics, 19:793
pyridine, 21:116–117
in radioactive waste management, 25:853
reliability and, 26:993
silicon carbide, 22:537, 538
sodium chloride, 22:808–810
sodium sulfates, 22:867, 868t
sugar, 23:470–472
tank design, 24:303
toluene, 25:175
for vinyl acetate polymers, 25:576–578
for vinyl alcohol polymers, 25:612–613
Standards and specifications journals,
15:768–769
Standards Engineering, 15:769
Standard-setting organizations, 9:227
Standard specific gravity (SSG) procedure,
18:293
Standard stainless steels, compositions of,
23:302–304t
Standard state, for molecules, 24:687–688
Standard state enthalpy change
for methanol synthesis, 25:305
Standard-state heat, 24:688
Standard-state heat of reaction, 24:688
Standards-writing organizations, 15:760
Standard Test Conditions (STC), 23:38
Standard test methods, 15:747–748
Standpipe pressure profiles, 11:818
Standpipes, in circulating fluidized beds,
11:817–819
Stand-retting, 11:606
Stannane, 13:613, 24:813
Stannates, 24:801
metal, 24:801, 806
Stannic bromide
physical properties of, 4:329
Stannic chloride, 24:801, 803–804
in tetraorganotin preparation,
24:811–812
Stannic chloride pentahydrate, 24:804
Stannic oxide, 24:805
carrier mobility at room temperature,
5:597t
films, 24:804
hydrated, 24:805–806
semiconductor, 5:600
toxicology of, 24:808
Stannous 2-ethylhexanoate, 24:826–827
Stannous bromide
physical properties of, 4:329
Stannous chloride, 24:801, 802–803
addition in ruby glass manufacture,
7:344
end use of chlorine, 6:135t
Stannous chloride dihydrate, 24:802,
803
Stannous fluoride, 24:801, 804, 8:340
Stannous fluoroborate, 24:807
Stannous octanoate, 24:826
Stannous oxalate, 24:827
Stannous oxide, 24:804–805
Stannous oxide hydrate, 24:805
Stannous pyrophosphate, 24:807
Stannous sulfate, 24:806–807
Stannylquinones, 21:254
Stanton number (St), 15:687t
Stanylenika 460 HRST, 19:764
Staphylococci, coagulase-negative, 21:216
Staphylococcus aureus
antibiotic resistant, 3:30–31, 33, 34, 35,
36, 37
biosensor for, 3:811
silver ion versus, 22:677
Staphylokinase, 5:179
Staple dental implants, 8:345
Staple-fiber nonwoven fabrics, 17:495–518
applications for, 17:517
definitions related to, 17:495–496
fibers for, 17:497
finishing, 17:512–516
history of, 17:495
production of, 17:516–517
uses for, 17:516–517
web consolidation for, 17:505–512
web formation in, 17:497–500
web layering for, 17:500–501
weights of, 17:501
Staple fibers, 11:164, 247, 24:620
acrylic, 11:189, 192t
drying of, 11:257–259
geometric properties of, 11:166–167
high tenacity, 11:260
pilling of, 11:211
regenerated cellulose, 11:250
textile yarns from, 11:177
washing of, 11:257–259

Staple processes, polyester fiber, 20:16–17
Staple properties, of polyamide fibers, 19:747

Staplers, wound closure, 24:205
Star anise, 23:164
Star-branched butyl rubber, 4:437–438
Starch(es), 4:703–704, 20:452–453
as blood substitute, 4:111–112
cationic, 18:114–115
in cereal grains, 26:271–274
in cocoa shell from roasted beans, 6:357t
compression effects in centrifuges, 5:513
depolymerization, 4:712
in ethanol fermentation, 10:534–535
ertherified, 20:563
as a flocculant, 11:627
high-amylose, 26:288
Mark-Houwink parameters for, 20:558t
modified and unmodified, 12:52–53
in paper manufacture, 18:122–123
performance criteria in cosmetic use, 7:860t
powder used in cosmetics, 7:841t
role in animals, 4:697
uses of, 4:718–720

Starch 1-octenylsuccinates, 4:724t
Starch acetates, 4:721
Starch adhesive, in corrugated paperboard products, 18:17–18
Starch adipates, 4:724t
Starch biosynthesis
enzymes involved in, 12:490–494
in plants, 12:486, 490–494
Starch-degrading industrial enzymes, 10:288t
Starch esters, 4:721, 20:562
Starch ethers, 4:720
Starch graft copolymers, 4:722
Starch-granule morphology, 26:273
Starch hydrolysates, hydrogenated, 12:39
Starch industry, enzyme use in, 10:252–253
Starch liquefaction, 10:287–288
Starch molecule, techniques for characterizing, 20:562
Starch phosphates, 4:724t
Starch sodium phosphate monoesters, 4:721
Starch soils, 10:285
Starch-splitting enzymes, 10:302
Starch succinates, 4:721, 724t
Starch synthases, 12:492–493
dependence on branching enzyme, 12:493–494

Starch copolymers, 7:610t, 654–655
STARDUST mission
aerogel applications, 1:766
Stark spectra, 23:136
Star polymers, inorganic-core, 13:542
STAR process, 4:417, 418
Stassfurite, 4:133t
-Stat- designation, 7:609t
State emergency response commission (SERC), 21:589
State Implementation Plans (SIPs), 21:583–584
State-of-the-art multipurpose plants, in fine chemical production, 11:437–439
State-of-the-art patent information searches, 18:235
State properties, of mixtures, 24:671–672
State right to know (RTK) laws, ink regulation under, 14:332
State safety acts/regulations, 21:830–831
States, change in entropy between, 24:649
State variables, to fix the properties of a mixture, 24:681–682
STATGRAPHICS plus 5 (quality and design)
features compared to other software, 8:398t
Static coefficient, 15:205
Static dielectric constant ($\varepsilon_0$), of compound semiconductors, 22:150t, 151
Static electroanalytical measurements, 9:586
Static flow calibration, 11:651
Static friction, 11:224
Static mixer(s), 13:276, 16:712–716
mass transfer enhancement by,
15:708–709
pressure drop in, 16:714–715
Static properties of glazing coatings,
23:16–19
Static SIMS method, 24:107, 108
Static uncertainties, 26:1019–1021
Statins, 2:821–822, 5:137, 138–140t,
142–143
molecular formula and structure, 5:138t
“Stationary mechanism,”16:99–102, 110
Stationary blades
low pressure, 23:231
in steam turbines, 23:230
Stationary phase, 6:374–375, 1:678
in affinity chromatography, 6:392–393
capillary chromatography, 4:603
chiral, 6:79–82
commonly used materials and their applications, 6:425t
gas chromatography, 4:615–616, 617t,
liquid chromatography, 6:384, 440
manufacturer’s designations for, 6:426t
supercritical fluid chromatography,
4:631
Stationary source emission catalysts,
19:625–626
Stationary tank mixers, 16:721–722
Statistical amphiphilic polymers, 20:484–490
Statistical association fluid theory (SAFT),
24:11
Statistical copolymers
classification in terms of monomer sequence distribution, 7:608t
IUPAC source-based classification,
7:609t
Statistical design of experiments (DOE),
19:467
Statistical effects in CA resists, 15:182
Statistical market research data analysis,
15:636
Statistical methods, 9:548
Statistical process control (SPC),
Statistical quality control (SQC),
Statistical quality control charts,
21:162–163
Statistical significance, 8:402, 6:26
Statutes, tank facility, 24:304–305. See also Regulation
Staurolite
in coal, 6:718
“Stayman” apples, 13:33
Steady-state analysis
of ideal and nonideal catalytic tubular reactors, 25:279–281
Steady-state approximation, 14:625
Steady-state creep, 5:625, 13:472
in γ-form silicon carbide, 22:529t
Steady-state creep rate, 16:189–190
Steady-state currents, 9:577
Steady-state mass balance
in porous catalytic pellets, 25:271–272
Steady-state microscopic mass transfer equation, 25:271–272
Steady-state monotonic loads, 13:480–481
Steady-state process optimization, 20:702
Steam, 23:201–247
chemical properties of, 23:209–215
in coal gasification, 6:771, 772
corrosion in, 23:242–244
corrosion rates of metals in, 23:243t
dielectric constant of, 23:205–207, 208
economic aspects of, 23:244
in enhanced oil recovery, 18:618
for fermentation, 11:45
formulations of the properties of,
23:202–203
general separation heuristics for, 22:321
generation of, 23:201, 215–228
in hazardous waste management,
25:814–815
hydrothermal, 12:528–529
information sources for, 15:766
molecular nature of, 23:209
physical properties of, 23:202–203
properties of, 23:201–202, 203, 204
as a reactant, 23:213–215
sodium reactions with, 22:765
solubility of salts in, 23:209
solvent properties of, 23:209–213
superheating and reheating, 23:233
surface tension of, 23:205, 208
thermal conductivity of, 23:207
thermodynamic properties of,
23:203–204
transport properties of, 23:204–205
use in chemical technology, 23:201
use in coal gasification, 23:239
use in coal liquefaction, 23:239–240
use in evaporation and distillation, 23:240
use in industrial processes, 23:238–240
use in petroleum recovery, 23:240
uses for, 23:228–242
viscosity of, 23:207
Steam-activated reforming technology, 20:779
Steam-assisted gravity drainage (SAGD), 18:618
Steam atmosphere pyrolysis, 21:466
Steam balances, 10:146, 147, 148
Steam blanketing, 26:130
Steam bleeds, 10:160
Steam-chest expanded food packaging, 18:48
Steam cleaning
high pressure, 23:240
of metal surfaces, 16:213
Steam cracking 18:557, 558
acetylene as coproduct, 1:187, 208–210, 216
butadiene manufacture, 4:378, 379
butylenes manufacture, 4:412–414
coproducts and by-products of, 18:559–560
Steam cracking, propylene manufacture via, 20:775–776
Steam cycles
for electric power generation, 23:228–237
nuclear, 23:234–236
Steam distillation, 8:776–777
Steam dryers, superheated, 9:138–139
Steam explosion pulping process, 21:21
Steam Explosion Treatment, 11:608
as cellulose solvent route, 11:272
Steam fixation, 9:216
Steam-foaming agents, in mobility control, 18:627–628
Steam gasification
defined, 6:829
Steam-generating systems
oxidizing chemistry in, 23:226–227
water chemistry in, 23:219–228
water treatment in, 23:222–226
Steam-generation equipment, 23:215–218
Steam generators, 23:215–216
heat recovery, 23:218
nuclear, 23:217
once-through, 23:217
Steam heating, 23:238
Steam hydrolysis, 10:503
Steam instability, 23:336
Steam jet ejector refrigeration systems, 21:554–555
Steam–methane reforming (SMR), 13:776–780
in ammonia production, 23:239
Steam methane reforming facility, 13:792
of natural gas, 13:841–842
Steam models, 10:164
Steam purity, 23:219–220, 222
in industrial water treatment, 26:135–136
monitoring, 23:227–228
Steam-raising converter, in methanol synthesis, 16:309–310
Steam refining, in soap making, 22:735
in ammonia manufacture, 2:688–701
Steam reforming
of naphtha, 16:303–304
of natural gas, 16:302–303
Steam reforming processes, 23:238–239
Steam-regenerative caustic treatment, 18:661
Steam stability, of dehydrogenation catalysts, 23:336
Steam stripping
in hazardous waste management, 25:824
Steam systems, 10:139–141
design of, 10:146
operation and maintenance of, 10:159–161
rebalancing, 10:164–165
Steam temperatures, maintaining, 23:227
Steam-to-hydrocarbon ratio (SHR), 23:336
Steam trap, testing, 10:160
Steam treatment, of spices, 23:157
Steam-tube dryers, 9:129–130
Steam turbine mechanical drives, 23:237
Steam turbines, 23:229–231
design of, 10:146–148
turbine oils for, 15:239–240
Stearalkonium chloride, 7:854
hair conditioner ingredient, 7:855
Stearalkonium hectorite, 7:853
Stearamidopropyl betaine
hair cleaner ingredient, 7:850
Stearane
hydrophile–lipophile balance, 8:707
Stearic acid 22:756
acid soap and, 22:728
boiling point, 5:53t
percent in important fats and oils, 5:47t
percentage in selected fats and oils, 2:519t
physical properties, 5:29t
as a processing agent, 21:791
in toilet soap making, 22:733t
Stearic acid trifluoroborane, 4:144t
Stearolic acid, 5:34t
Stearal alcohol
properties of commercial, 2:11t
Stearylamine, 2:519
Stearyl erucate
cosmetically useful lipid, 7:833t
Stedico
molecular formula and structure, 5:96t
Steel(s), 14:490, 23:247–316. See also
Iron-iron carbide phase diagram;
Stainless steels
for aerosol containers, 1:781
alloy, 23:297–309
austenitic manganese, 15:562–563
behavior in high temperature steam, 23:243–244
bismuth addition, 4:12
calcium added to, 4:530
carbides in, 4:691
carbon, 23:291–297
case nitrided, 16:207
casting of, 23:266–270
cemented carbides for machining, 4:663–664
cerium addition, 5:681–682
classification of, 23:248
commercial, 23:272
controlled rolling of, 23:298
conventional hardening of, 16:196–199
determination of chemical composition of, 23:260–261
economic aspects of, 23:309–311
environmentally induced cracking of
  high strength, 7:813–814
  ferrosilicon and, 22:515–516
  fluorspar flux, 4:570, 578
  hardenability of, 23:283–284
  hardness compared to ceramics, 5:627t
  health and safety factors related to,
    23:311–313
  heat-treating processes for, 23:284–291
  highly alloyed, 23:286
  high strength, 23:308–309
  high strength low alloy, 15:563
  increasing the strength of, 23:298
  killed, 22:515
  ladle metallurgy and, 23:263–265
  low alloy, 13:508–510
  metallography and heat treatment of,
    23:271–274
  microscopic grain size of, 23:277
  microstructure of, 23:271–272
  molybdenum in, 17:15–17
  nitriding, 17:208
  permanganate pretreatment of, 15:621
  phase transformations in, 23:277–280
  pickling, 16:222–223
  plastic deformation of, 23:271
  plastic working of, 23:270–271
  prices of, 23:310–311
  properties of, 23:250
  selenium and metallurgy of, 22:97–98
  stainless, 15:563
  statistics for, 14:524t
  usefulness of, 23:247
  world production of, 14:525t
Steel-belted tires, 21:805
“Steel Can Scrap Specifications,” 21:415
Steel cans
  recycling of, 25:871
Steel drums, as industrial materials
  packaging, 18:6–7
Steel fibers
  asbestos substitute, 3:314t
Steelhead trout
  common and scientific names, 3:188t
  net-pen culture, 3:194–195
Steel industry
  greenhouse gas emissions from, 14:526
  niobium in, 17:144–145
  niobium use in, 23:829
  silicon alloys in, 22:515
  vanadium in, 25:525
  vanadium consumption in, 25:517–518
Steelmaking, 16:150–151
  environmental concerns related to,
    14:525–526
  oxygen in, 17:762
Steelmaking dust, recycling, 21:361–362
Steelmaking processes
  acid or basic, 23:250
  addition agents in, 23:262–263
  early, 23:248–249
  electric furnace, 23:251–255
  energy needed for, 23:253
  heat balance in, 23:257
  oxygen, 23:255–260
Steel mill products, United States
shipments of, 23:313t
Steel mills, scrap grades used by, 21:413
Steel phosphating, 15:251
Steel-plate printing, 14:329
Steel-pouring pit refractories, 21:511t
Steel production, 23:247–248
quicklime in, 15:61
sulfur use in, 23:591
Steel quenching
bismuth alloy applications, 4:13–14
Steel Recycling Institute (SRI), 21:406
Steel structures, fireproofing, 21:841
Steel waterfowl shot, 4:14–15
Steep-angle conical tank bottoms, 24:296
Steeping
of barley, 15:527–528
in beer making, 3:566
of regenerated cellulose fibers,
11:252–253
Steeping parameters, 15:528t
Steep tanks, 15:527–528
Stefan-Boltzmann law, 19:131
Stefan–Maxwell equations, 1:43–46, 598
Stefan’s law, 7:327
Steinhart-Hart equation, 24:451
Stellite 1
applications, 7:224t
composition of wear-resistant alloy,
7:221t
properties, 7:223t
Stellite 12
applications, 7:224t
composition of wear-resistant alloy,
7:221t
properties, 7:223t
Stellite 190
applications, 7:224t
composition of wear-resistant alloy,
7:221t
Stellite 21, 7:222, 224–225
applications, 7:224t
composition of wear-resistant alloy,
7:221t
properties, 7:223t
Stellite 306
applications, 7:224t
composition of wear-resistant alloy,
7:221t
Stellite 4
applications, 7:224t
composition of wear-resistant alloy,
7:221t
properties, 7:223t
Stellite 6, 7:222
applications, 7:224t
composition of wear-resistant alloy,
7:221t
properties, 7:223t
Stellite 6B, 7:222
applications, 7:224t
properties, 7:223t
Stellite 6K, F
applications, 7:224t
composition of wear-resistant alloy,
7:221t
Stellite-type alloys
carbides in, 4:647
Stellite-type alloys, 7:220–226
Stelometer, 11:614
“Stem corrections,” in liquid-in-glass
thermometers, 24:464–465
Stem cell technology, 11:13–14
STEM-drilling, 9:599–600
Stem fibers, 11:285
Stencil weight, of acetylene cylinders, 1:215
Stenosis, 4:83, 84
Stent coatings, controlled release of
antirestenotic agents from, 9:82
Stents
shape memory alloys, 3:746
superelastic and pseudoelastic, 22:352
Step and flash imprint lithography,
15:193–195
Step-growth condensation reactions, for
water-soluble polymers, 20:441
Step-growth copolymerization, 7:611,
632–635
Step-growth polymerization, 24:705,
20:405–406
Step-growth reactions, 24:16
Step-scan ftir photoacoustic analysis,
19:564
Step-shear test, 21:708–709
Sterculic acid(s), 5:28, 36t
Stereochemistry
of Ziegler-Natta polymerization,
26:510–514
Stereochemistry, cyclohexane, 13:706
Stereocontrol
mechanisms of, 26:513–514
Stereoelective aluminum complexes,
20:304–305
Stereoselective initiating systems, 20:303–306
Stereoselective initiators, 20:312–313
Stereoisomerism, in polymers, 20:397
Stereoisomers
of ascorbic acid, 25:748
Stereolithographic fabrication, 19:117–118
Stereomicroscopy, in fine art examination/conservation, 11:400
Stereoparents, 17:402
Stereoregularity
in PVC polymerization, 25:666
Stereoregulation, of polypropylene, 20:529
Stereoselective α-olefin polymerization, metallocene symmetries relevant to, 16:105
Stereoselective acylations, 12:176–177
Stereoselective additions, microwaves in, 16:553–554
Stereoselective alkylations, 12:165–166
Stereoselective hydrolysis, 16:400
Stereoselective propene polymerization, catalyst symmetries for, 16:104
Stereoselectivity, in α-olefin insertion, 16:99–102
in hydroboration, 13:644
Sterespecific polymerization,
heterogeneous, 20:410–411
Steric acid
hydrophilic–lipophilic balance, 8:707t
Sterically hindered acids, 10:490
Steric effects, in QSAR studies, 10:329
Steric energy, 16:742
Steric repulsion, 23:93
Steric stabilization, 10:121–122
of latex, 14:709
Sterilant gases, ethylene oxide, 10:664
Sterilize filtration, 12:138
in fermentation, 11:36
Sterilizability
of dialyzers, 26:824
Sterilization, in fermentation, 11:35–36
Sterilization-in-place (SIP), 11:40
Stern-Langmuir equation, 24:139
Stern-Langmuir isotherm, 24:138
Stern plane, 7:285–286
Steroidal ketones, dehydrogenation of, 21:243
Sterol response element-binding proteins (SBREPs), 5:189
Sterols, 10:804–805
structure of, 17:669
Stevens rearrangement
quaternary ammonium compounds, 2:737
Stevia, 12:42–43
Stevia plant, 24:239
Stevioside, 24:239–240
Stibabenzene, 3:72
Stibaboranes, 4:204
Stibiconite, 3:41
Stibine, 3:57–58
Stibine oxides, 3:73–74
Stibnite, 3:41
Stibonic acids, 3:72
Stichtite, 6:471t
Sticker, in glass dissolution, 22:456
Sticky dental wax, 8:299–300
specification, 8:300t
Stiction, in mercury thermometers, 24:465
Stiff differential equation, 25:285
Stiffness loss, in fatigue, 16:187–188
of fibers, 11:181, 182
Stiffness values, of paper, 18:101
Stilbene(s), 25:181
photochromic material, 6:593, 599–600
soluble dyes, 7:373t
in VDC polymer degradation, 25:717
Stilbene dyes, 9:264, 359–360, 401
Still bottoms, 25:814
Stille reaction
ionic liquids in, 26:892
Still photography, charge-coupled devices
in, 19:148
Still wines, 26:301
Stimulated emission, 14:660–661, 662, 669
Stimuli-responsive amphiphilic polymers, 20:482–483
Stirling cycle, 8:43
Stirred autoclave, 14:89, 92t
Stirred autoclave reactor, 20:216
Stirred batch RO unit, 21:644
Stirred mills, 16:615
Stirred tank bioreactors, 1:737–740
oxygen transfer driving force, 1:734
Stirred tank electrochemical reactor (STER), 9:660–662
Stirred tank geometries, for mixing and blending, 16:669–671
Stirred tank reactor(s) (STR), 9:660, 15:697–698
Stirred tanks, 15:692–694, 726
mass transfer correlations for, 15:699t
Stirred vessels, 15:692
estimating shear rates for, 15:689–690
Stitchbonding, 17:507
STM experiments, 24:81. See also Scanning
tunneling microscopy (STM)
STM images, interpreting, 24:81–82
STN service (CAS), 6:19
Stobbe condensation, 23:420, 421
Stochastic condensation (STA)
optimization via, 26:1029–1032
in process synthesis and design, 26:1040
Stochastic genetic algorithm (SGA)
optimization via, 26:1029, 1032
Stochastic modeling, 26:1019–1023,
1025–1026, 1026–1028
Stochastic optimization strategy, 20:728
Stochastic processes
in reliability modeling, 26:988
Stock numbers, 17:391–392
Stock options, Black-Scholes formula for,
24:366
Stoichiometric combustion air
requirement, 12:322t
Stoichiometric concentration, 21:840
Stoichiometric organic synthesis, metal
carbonyls in, 16:72
Stoichiometric parameters, in reactor
technology, 21:337–338
Stoichiometric ratios, epoxy/curing agent,
10:418–420
Stoichiometric relation, 21:336
in multiple chemical reactions, 25:272
Stoichiometric transfer, 24:739
Stoichiometry, in reactor technology,
21:335–338
Stoker boilers, 21:465
Stoker-grate boilers
for biomass combustion, 3:686–689
Stokes’ diameters, 18:142
Stokes’ equation, 21:737, 26:960
Stokes’ flow regime, 11:796
Stokes’ law, 5:506, 22:51, 52, 53
in sedimentation design methods,
22:57
Stokes’ number (Stk), 22:57, 23:184, 190
in depth filtration theory, 11:340
Stokes’ Raman scattering, 21:322
Stokes’ scatter, 16:485–486
Stokes’ shifts, 20:512
Stomach poison insecticides, 14:339
Stone
chemical analysis of archaeological
materials, 5:744–745
Stone artworks
degradation of, 11:416–418
varnishes and protective coatings for,
11:411–412
Stone processing
health and safety factors related to,
15:74
noise levels of, 15:75
Stone-washing, 10:302
Stop-bath treatment, 19:212–214
Stopes–Heerlen classification
higher rank coals, 6:707t
Stopped-flow (sf) devices, 13:420–421
Stopped-flow instruments, 14:614
Stopped-flow mixing, 14:613–614
Stopping and Range of Ions in Matter
(SRIM) program, 14:441
Storage
of acetonitrile, 17:232–233
of azobisnitriles, 17:241
of benzonitrile, 17:243
cryogenic, 24:300
ethylene, 10:622–623
ethylene oxide, 10:657
of excess weapons plutonium, 19:700
food preservation by, 12:77–79
formaldehyde, 12:119–120
frozen food, 12:82, 83
of Grignard reagents, 12:832–835
of hydrated lime, 15:56–57
of hydrazine, 13:586–588
of hydrogen, 13:850–852
of hydrogen chloride, 13:830
hydrogen peroxide, 14:55–56
of ion-exchange resins, 14:415
of magnesium hydroxide slurry, 15:403
of malts, 15:531
of methacrylic acid/derivatives, 16:258–261
of methanol, 16:313–314
of 2-methylglutaronitrile, 17:245
of organic esters, 10:509
of pentenenitriles, 17:246
of phosphorus(V) oxide, 19:50
of phosphorus oxychloride, 19:40
of phosphorus pentachloride, 19:44
of phosphorus sulfides, 19:48
of phosphorus trichloride, 19:36
of plutonium metal, 19:685
of quicklime, 15:56
of phenol, 18:753–754
of phosgene, 18:808–809
of pool/spa sanitizers, 26:198–199
propylene, 20:781
propylene oxide, 20:808–809
of PVA, 25:612
of pyridines, 21:117
of radioactive waste, 25:854–855
of rice, 26:285
of rubidium, 21:819
sugar, 23:453
of sugar beets, 23:455–456
of toluene, 26:240
of tritiated water, 21:308
of uranium metal, 25:411
of wine, 26:318–320
Storage and display, in fine art
examination/conservation, 11:408–409
Storage and shipping
desiccant applications, 8:356t
Storage devices, 20:669
Storage modulus, 20:346, 21:722
Storage polysaccharides, 20:452–453
Storage stability, emulsion, 10:128
Storage tankage, in plant layout,
19:513–514
Storage tanks, 24:280. See also Tanks
sulfuric acid and oleum, 23:783
Storage tanks hazards, 21:844
Storeroom management, 15:471
STORET water quality database, 13:313
Stormer viscometer, 18:69, 21:736, 737
Storm water
control and treatment of, 25:915
Stove oil, 18:669
Straight oils, 15:240
Straight pipe, flow in, 15:719t
Straight plaiters, 17:501
Strain 21:719
in fermentation, 11:22–25
in filled polymers, 11:308–309
in olefin fibers, 11:225, 226, 227–228
relaxor ferroelectrics and, 11:106
Strain(s), 3:724
cyclic, 13:481–483
defined, 13:473
of sealants, 22:29
Strained silicon wafers, in scaling to deep
submicron dimensions, 22:256
Strainers, in refrigeration systems, 21:539
Strain fixity rate $\left(\varepsilon_{f}\right)$, in testing shape-
memory polymers, 22:361
Strain-gauge load cells, 26:243, 26:241,
26:230–234
advantages and disadvantages of,
26:232–233
Strain-gauge pressure transducers, 20:655
Strain gauges, 20:654–655
Strain hardening, of stainless steel alloys,
13:511
Strain hardening effect, 20:224
Straining efficiency, 11:340
Strain rate, 13:473
Strain recovery rate $\left(\varepsilon_{r}\right)$, in testing
shape-memory polymers, 22:361
Strain sensors, 11:150, 151–152
Strain tensor, for noncentrosymmetry pont
group crystals, 11:93–94
Strain versus time curve
factors affecting, 13:473
material and microstructure effect on,
13:473–474
“Strategy for a Future Chemicals Policy,”
24:193
Strategic alliances, evaluation of, 24:389
Strategic consistency, organizational
competitiveness and, 21:623–625
Strategic environment assessments (SEA),
10:228, 233
Strategic intelligence, 21:629
Strategic partner universities,
collaborations with, 24:389
Strategic separation schemes, 22:307–312
table of, 22:308–311t
Strategic stockpile buildup, 12:548–549
Stratification
in sampling, 26:1007–1008, 1010–1011
Stratified sampling, 26:1007–1011
Stratosphere, 21:526
Stratospheric ozone, 17:784–790
Stratospheric ozone depletion,
1:808–811
Stratospheric ozone layer depletion,
21:525–529
Stratospheric Photochemistry, Aerosols,
and Dynamics Expedition (SPADE),
17:785
Straw
as biomass, 3:684
Strawberries
citric acid in, 6:632t
Straw oil
solvent in commercial gas absorption
process, 1:26t
Stream heat transfer coefficients, 13:195–196, 220
Streaming potential(s), 14:30
floculation and, 22:55
Streamline plot, 13:273–274
Stream matches
at the Pinch, 13:199–200
setting the heat load of, 13:200–201
Stream methods, 18:146–151
Streams
cationic constituents of, 26:23–24
chemical analyses of, 26:23
circulation rates of elements in, 26:27–32
effects of human activities on, 26:26–27
sulfate concentration in, 26:31
Stream water composition, 26:22
chemical reactions that govern, 26:23–26
weathering reactions and, 26:24–25
Stream water geochemistry
principles of, 26:22–27
Stream water quality
factors affecting, 26:22–32
trends in, 26:32–34
Strecker degradation
amino acids, 2:569
Strecker reaction, 23:514
Strecker synthesis, 2:571
Strength
catalyst supports, 5:281–285
ceramics, 5:615–619
coal, 6:725
requirement for ceramics, 5:582
of silicon carbide, 22:527–528
of vitreous silica, 22:428–429
Strength, see also High-strength fibers;
High-strength olefin fibers; Tensile strength
of fibers, 11:181, 183
of filaments, 11:247
of fillers, 11:304
of lyocell fibers, 11:271
of metal–matrix composites, 16:180
Strengthening mechanisms
in high temperature alloy design, 13:495–504
summary of, 13:503–504
Streptase, 5:177
molecular formula and structure, 5:172t
Streptavidin
purification, 3:845
use in DNA-based biosensor, 3:807
Streptococcal antigen, 14:141–142
Streptococcus faecalis
uv disinfection, 8:652t
Streptococcus pneumonia
antibiotic resistant, 3:36
Streptococines, 20:505
Streptokinase, 5:175, 176
molecular formula and structure, 5:172t
Streptomyces, 15:271, 272
genetic engineering of, 11:23
as a host system for gene expression, 12:478
Streptomyces caelestis
antibiotic resistant, 3:35
Streptomyces erythreus
antibiotic resistant, 3:35–36
Streptomyces fradiae
antibiotic resistant, 3:35, 10
Streptomyces griseus, 11:9, 10
Streptomyces lividans
bacterial resistance mechanisms, 3:32t
discovery of, 11:9
synthesis of, 11:10
Streptomyces venezuelae, 15:272, 279
Streptomycin
Stress(es). See Internal stress tests
cyclic, 13:481–483
defined, 13:473
exponents of dimensions in absolute, gravitational, and engineering systems, 8:584t
Stress anisotropy, in ferrites, 11:62–64
Stress-corrosion cracking (SCC), 7:810,
812, 23:301
aluminum alloys, 2:337
as failure mechanism, 26:983, 984
gold alloys, 12:687–688
in industrial water treatment, 26:128, 131
Stress corrosion cracking (SCC) resistance, 13:514
Stress fractures
bones, 3:725
Stress injuries, 3:724
of materials, 10:10
Stress optical coefficient, of vitreous silica, 22:432–433
Stress relaxation, in olefin fibers, 11:227–228
Stress-relaxation measurements
of styrene-based plastics, 23:362
on tempering, 23:285–286
Stress relaxation resistance
copper wrought alloys, 7:739–740
Stress relaxation tests, 19:581,
21:742–743, 13:475
basic, 13:476–477
Stress rupture test, basic, 13:476
sealant strain and, 22:29
Stress softening, of filled networks, 22:572
Stress–strain curve, 21:744
for polycarbonate resin, 19:810
types of, 19:580
Stress–strain curves, for fibers, 11:181,
182, 183, 184
Stress–strain diagram, 21:721
Stress–strain instrument, 21:744
Stress–strain properties, of styrene
plastics, 23:359–362
Stress/strain range, fatigue properties and,
13:484–489
Stress–strain relationship, 26:779–780
Stress-strength interference diagram
in reliability analysis, 26:996
Stretch-blow molding, 19:554
Stretch blow-molding process, 20:46
Stretch film, LLDPE, 20:206–207
Stretching, in wet fiber spinning, 11:208
Stretch wrapping, 18:46–47
Stretch yarns, bicomponent, 19:761
Stretford process, 23:633
Stribeck curve, 15:209
“Strike” of a dye, 9:163
String discharge, with rotary drum vacuum
filters, 11:356
String ribbon technology, 23:41
Strip copper, 7:693, 724
Striped bass
aquacultural chemical needs, 3:209
aquaculture, 3:183
common and scientific names, 3:188t
Stripping
alkanolamines from olefin oxides and
ammonia, 2:137
general separation heuristics for, 22:321
Stripping column, 25:606–608
Stripping factor, 1:86
Stripping formulations, tetrahydrofururyl
alcohol in, 12:278
Stripping section, 8:750, 755
Strip plating, 9:767–768
Stroke
and blood coagulation, 4:81
Stroma-free hemoglobin, 4:113
“Strong” amphiphiles, 16:424
“Strong metal to support interaction”
(SMSI), 10:42
Strong-acid catalysts, in phenolic resin
polymerization, 18:760–761
Strong acid cation-exchange resins,
14:381–382
Strong acid cation exchangers, 14:411
Strong base anion-exchange resins,
14:382–383
Strong base anion exchangers, 14:395, 411
Strong inversion, in silicon-based
semiconductors, 22:239
Strong nitric acid process, materials of
construction for, 17:187–188
Strong phosphoric acids, equilibrium
composition of, 18:827t
Strontianite, 23:317, 321
Strontium (Sr) 23:316–325
chemical properties of, 23:318
economic aspects of, 23:320–321
effect of micro additions on silicon
particles in Al–Si alloys, 2:311–312
in ferrites, 11:59
health and safety factors related to,
23:321
in M-type ferrites, 11:66, 68t, 69, 71t,
74, 75
occurrence of, 23:316–317
physical properties of, 23:317t
production of, 23:318
properties of, 23:317–318
United States statistics for, 23:320t
uses for, 23:318–319, 321
world mine production, reserves, and
reserve base for, 23:317t
Strontium-90, 23:318
Strontium(II)
concentration formation constant of
chelates, 5:717t
Strontium β-alumina, 2:406t
Strontium acetate, 23:321
Strontium bromide, 23:323
physical properties of, 4:329
solubility in water, 4:322t
Strontium carbonate, 23:319–320, 321–322
uses of, 23:322
Strontium chloride, 23:318, 323
Strontium chromate, 23:323, 6:557t, 558
air standards and classification, 6:549t
molecular formula, properties, and uses,
6:562t
physical properties, 6:528t
prohibited pigment in anticorrosive coatings, 7:195t
uses, 6:523
Strontium compounds, 23:319–324
estimated distribution of, 23:320t
world production of, 23:319–320
Strontium cyanide, 8:197
Strontium ferrate (1:1), 5:598
Strontium fluoride, 23:323
Strontium fluoroborate tetrahydrate, 4:153
Strontium halides, 23:323
Strontium hexaferrite, 23:323
Strontium hydride, 13:613
Strontium hydroxide, 23:324
Strontium iodide, 23:323
Strontium–lead alloys, 14:779
Strontium minerals, 23:320
producers of, 23:319
Strontium nitrate, 23:319, 321, 323
Strontium oxide, 23:318, 324
Strontium peroxide, 18:396, 23:324
Strontium–silicon alloy, 22:520
Strontium sulfate, 23:322, 324
Strontium sulfide, 23:322
Strontium titanate
carrier mobility at room temperature, 5:597t
Strontium titanate 23:324, 25:21
gems cut from, 25:46
semiconducting ceramic, 5:599–600
semiconductor, 5:600
superconductivity in, 5:603
Strontium tribismuthide
alloy-like superconducting compound, 4:18t
Strouhal number, 11:747, 756, 757
Structural adhesives, 1:534–545
Structural alloys, of titanium, 24:840
Structural analysis, in fine art
examination/conservation, 11:400
Structural applications
for composite materials, 26:755
for epoxy resins, 10:450–460
Structural carbohydrates, 21:2
Structural composites, epoxy, 10:450–452
Structural foam molding, 19:552–553, 818
Structural formulas, 17:386
Structural graphite shapes, applications for, 12:760–761
Structural hybrid materials, properties and applications of, 13:549–550
Structural keys, 6:7
Structural material(s)
moi bydium compounds in, 17:38–39
wood as, 26:343–354
Structural optimization, 20:711
Structural properties
of bayerite, 2:423t
of boehmite, 2:423t
of diaspor, 2:423t
of gibbsite, 2:423t
of nordstrandite, 2:423t
of transition aluminas, 2:39, 2:406t
Structural representations, complex, 16:731–733
Structural steels, tellurium in, 24:425
Structure(s), see also Chain structure;
Chemical structures; Cocontinuous structures; Controlled structure;
Crystal structure; Molecular structure;
Morphology; Phase structure
of carbon fibers, 26:737–739
detergent systems for, 8:413t
HDPE, 20:157–162
LLDPE, 20:182–184, 203–205
polyesterether elastomer, 20:72–73
polyester fiber, 20:21
polyether antibiotics, 20:137–139
polymide, 20:276–278
polymer, 20:395–405
protein, 20:449
PTT, 20:68t
of PVDC, 25:699–709
of vinylidene chloride polymers, 25:699–721
water-soluble polymer, 20:437
of wood, 26:333–334
of wool, 26:372–376, 376–379
of wool proteins, 26:378–379
Structure–activity hypotheses, 10:333–334
Structure–activity relationships (SAR), 10:327t
of quinolone antibacterials, 21:215, 221–228
in sulfonamides, 23:506–507
Structure analysis, for plastics, 19:563–569
Structure-based enzyme inhibitor design, 10:335–337, 339
Structure-based macromolecular nomenclature, 17:403
Structured abrasives, 1:14–15
Structure determination of block copolymers, 20:340–342
of polymer blends, 20:339–342
Structured packing characteristics, 8:774t
Structure generation techniques, rule-based, 16:751–752
Structure–odor correlations research, 18:383–384
Structure patent searching, 18:242–243
Structure–property relations, in liquid crystalline materials, 15:102–107
Structure–property relationships cellulose, 5:368–381
cement paste structure and concrete properties, 5:482–484
and ceramics processing, 5:666–667
and chemical product design, 5:764
Structuring, of filled networks, 22:571
Struverite, 24:316
Strychnine, 2:74, 94, 97
Stucco, 4:583, 583t, 5:500t
finish coats, 5:500t
Stuckofen furnace, 14:491
Studentized residuals, 6:56
Student researchers, managing the role of, 24:388–389
Stuffer-box crimping, 19:754
STYRENE 4-Styrenesulfonate, 23:535
Styrenated alkyds, 2:148
Styrenated oils, 9:151
Styrene(s), 23:325–357. See also Polystyrene
in acrylonitrile copolymerization, 11:203
acute effects of overexposure to, 23:347t
Alfrey–Price parameters, 7:617t
anionic polymerization of, 14:
245–246
block copolymer synthesis, 7:647t
commercial block copolymers, 7:648t
copolymerization of, 14:252, 256, 385, 23:389–393
derhydration of 1-phenylethanol to, 20:805
demand for, 24:274–275, 277
Diels–Alder adduct from cyclopentadiene, 8:222t
economic aspects of, 23:345
free-radical polymerization of, 23:377–384
fumarate polyester reaction rate with, 20:105–107
glass transition and melting temperature for soft/hard segments, 7:649t
health and safety factors related to, 23:346–348
nitration of, 16:581
North American producers of, 23:345t
polymerization of, 14:251, 257
as print templates, 16:795
producing from alternative raw materials, 23:343–344
production from butadiene, 23:344
properties of, 23:326–328
reactions of, 23:328
reactivity ratio from Alfrey–Price scheme compared with experimental data, 7:618t
reactivity ratios in anionic copolymerization, 7:626t
specifications and analysis of, 23:345–346
spontaneous polymerization of, 23:378–379
from toluene, 25:181–182
uses for, 23:348
Styrene–acrylic acid block copolymers, 20:485
Styrene-acrylonitrile copolymer (SAN), 10:204–205
Styrene–acrylonitrile resins, 23:325, 401
Styrene–acrylonitrile (SAN) copolymers, 1:409, 439–456, 23:389
and ABS, 1:414
antioxidant applications, 3:120–121
batch mode recipe for, 1:446t
benzene as raw material, 3:620
chemical properties and analytical methods, 1:441–442
economic aspects, 1:452–453
health and safety factors, 1:454
manufacture, 1:443–448
oxygen permeability at 25°C, 3:400
physical properties and test methods, 1:440–441, 441t
processing, 1:448
semibatch emulsion mode recipe for, 1:445t
U.S. production and consumption, 1:453t
uses of, 1:454–455, 455t
Styrene-based copolymers, 10:171
orientation of, 23:399
Styrene-based plastics. See also Styrene plastics
blow molding, 23:399
mechanical properties of, 23:360t
stress—strain curves for, 23:361
Styrene-based polymers, ignition temperatures and burning rates of, 23:403t
Styrene-based resins, extrusion of, 23:398
Styrene block copolymers, as mixed plastics compatibilizers, 21:454
Styrene–butadiene (SB) block copolymers, 20:324, 23:377, 393
Styrene–butadiene copolymer latex binders, 19:360
Styrene–butadiene copolymer(s) (latex), 23:367, 389–390
from butadiene, 4:375, 383, 384t
compatibilization efficiency of, 20:336
Styrene–butadiene copolymerization, 14:256
Styrene–butadiene latex, 23:348
Styrene–butadiene rubber (SBR), 9:556–558, 23:325, 348
from butadiene, 4:384t
colloidal suspensions, 7:275
effect of nonblack fillers on properties of, 21:783t
“mutual recipe” for polymerizing, 9:556–557
nitrogen diffusion coefficients in, 4:447
properties of, 9:558
in rubber compounding, 21:763–764
in tire compounding, 21:807, 808
Styrene–butadiene–styrene (SBS) copolymers, 23:367
Styrene-co-α-methylstyrene (SAMS), 23:386
Styrene copolymer foams, 23:404
Styrene copolymers, 23:366–367
properties of, 10:206t
Styrene derivative polymers, 23:367–368
Styrene derivatives, 23:348–355
Styrene–diene block copolymers, 14:251
Styrene–divinylbenzene copolymers, 23:391. See also Macromeric
sulfonated styrene–divinylbenzene copolymers
sulfonated, properties and applications, 1:587
Styrene–divinylbenzene resins, 23:353
Styrene-DVB copolymers, 14:388
Styrene ionomers, 14:466, 481
properties of, 14:470–473
Styrene liquid, 23:347
Styrene–maleic anhydride (SMA) copolymers, 23:391
copolymer, 10:207
Styrene manufacture, 24:259
Styrene manufacturing, 23:326, 334–345
development of high selectivity catalyst for, 23:339
Styrene markets, 23:345
Styrene–methacrylonitrile copolymers
oxygen permeability of block and random, 3:386
Styrene monomer (SM), 23:325
chain transfer to, 23:383
physical properties of, 23:327t
Styrene monomer advanced reactor technology (SMART) process, 23:343
Styrene plants, 23:339
Styrene plastics, 23:358–416. See also Styrene–based plastics
additives used in, 23:400t
characterization of, 23:401–402
commercial processes for, 23:393–397
degradation of, 23:372–373
economic aspects of, 23:400–401
environmental considerations related to, 23:373–376
fabrication of, 23:397–400
health and safety factors related to, 23:402–403
injection molding of, 23:397–398
properties of, 23:359–364
surface appearance of, 23:363–364
types of, 23:364–371
uses for, 23:358, 403–409
Styrene polymerization, 23:347–348, 376–393
cationic, 23:386–388
chain-transfer (CT) agents in, 23:383–384
inhibition of, 23:382
ionic, 23:384–388
kinetic models for, 23:380
mechanisms of, 23:376–377
in the presence of polybutadiene rubber, 23:391–393
process versus mechanism for, 23:393t
Ziegler-Natta-initiated, 23:388
Styrene polymers
  brittle fracture of, 23:363
  burning of, 23:403
  extrusion of, 23:398
  glass-reinforced, 23:371
  tensile strengths of, 23:359
Styrene product, factors in the quality of, 23:338–339
Styrene vapors, 23:403
Styrenic block copolymers, 24:702, 703–704
  in adhesives, coatings, and sealants, 24:714
  applications for, 24:709–715
  blends with asphalts, 24:715
  blends with oil gels, 24:715
  blends with other polymeric materials, 24:714–715
  commercially available, 24:705
  compounding, 24:713t
  as substitutes for vulcanized rubbers, 24:713–714
Styrenic monomers, 23:348–349
  amine-containing, 20:473–475
Styrenic resins, 14:380, 399, 24:714
Styrenics
  antioxidant applications, 3:120–121
Styrenic weak base resins, 14:389
Styrofoam, 23:405
StyroPlus process, 23:343
2-Styryl-1,4-benzoquinones, 21:257
Styryl
  soluble dyes, 7:373t
  Styryl dye chromophore, 20:518
  Styryl dyes, 20:509, 9:258–259
  Styryls, 20:506
  Styryl Yellow
colorant for plastics, 7:375t
styx number, for boron hydrides, 4:182–183
Suanite, 4:243t
Subacute exposures, 25:203
Subatmospheric pressures, regions of, 20:657
Subbing formulations, gelatin in, 12:444
Subbituminous coal grade (U.S.), 6:713t
Subchronic exposures, 25:203
Subchronic pesticide testing, 18:548
Subchronic toxicity studies, 25:217–218
Subcooling, in vapor–compression refrigeration systems, 21:545
Subcritical annealing, 23:290
Subcritical crack growth
  ceramics, 5:628–630
Subcritical regime, 11:755
Subdew point Claus tail gas operation, chemistry of, 23:615
Subdew point systems, 23:614–616
Subeconomic petroleum resources, 18:595
Sublevel stoping, 25:357
Sublimation pressure, 24:663–664
Sublimation thermal-transfer printing, 9:338
Sublimed iodine, 14:362
Submacerals, 6:706
  Stopes–Heerlen classification, 6:707t
Submarine hydrothermal systems, 14:84
Submarine power plant, 17:590
Submerged aeration, 15:696–714
Submerged-arc furnaces, 12:303–304, 753
Submerged-tube desalination plan, 26:70
Submersible aspirating aerators, 26:169, 170t
Submersible pumps, 21:65, 66
Submicrometer size fibers, 11:186
Subperiosteal dental implants, 8:
  344–345
  a-substituted anthraquinone derivatives, 9:301
  1,4,5,8-substituted anthraquinones, 9:325–326
  7-substituted tetracyclines, 24:596
Substance toxicity, indicators of, 23:112–114
Substituent effects, 9:510
Substituted alkylhydrazines, 13:572–573
Substituted amide waxes, 26:221
Substituted cyclopentadienyl uranium complexes, 25:440–441
Substituted cyclopentadienyl (Cp) complexes, thorium in, 24:770–772
Substituted N-halamines, preparation of, 13:105
Substituted heat-reactive resins, 18:782
Substituted isoquinolines, 21:208
Substituted nickel carbonyl complexes, 17:114
Substitute natural gas (SNG), 13:692, 768
Substituted phenols, 18:757–758
Substituted polystyrene, glass-transition temperatures of, 23:367t
Substituted pyridines
physical properties of, 21:96–97t
reactions of, 21:101–108
Substituted thiazoles, microwave-assisted synthesis of, 16:576–578
Substitution
in M-type ferrites, 11:66, 69
in silanol polycondensation, 22:557
waste minimization via, 25:884
Substitution phenomenon, 17:395
Substitution products, naphthalene, 17:73
Substitution reactions
amine oxides, 2:469
amino acids, 2:568
butylenes, 4:409
of hydrogen peroxide, 14:40–41
propylene, 20:775
toluene, 25:162–163
Substitutional solid solutions, alloying, 13:497–498
Substitution-defect pigments, 19:405
Substitutive bromination, 4:343–344
Substoichiometric sulfur burners, 23:660
Substrate additions, in microbial transformations, 16:411–412
Substrate materials
in electronic materials packaging, 17:827–829
mechanical properties of, 17:828t
thermal and electrical properties of, 17:829t
Substrate properties, lubrication and, 15:250
Substrate recognition
artificial receptors for, 16:792–794
lipophilic interaction dominated, 16:783–786
multiple and multisite, coreceptor- and coupled-system, 16:786–789
size and shape dominated, 16:775–779
π-stacking and charge-transfer dominated, 16:782–783
Substrate reduction, nitrogenase, 17:305–306
Substrates
in biotransformations, 16:395–396
electron transfer and, 9:388
microarray, 16:383
for paper release coatings, 22:592
Substructure–likeness search, 6:8
Subsurface aspirating aerators, 26:168
Subsurface brines, iodine from, 14:362–365
Subthreshold leakage, in FETs, 22:253, 254
Subtractive color photography, 19:283
Subtractive dye imaging systems, 19:284–298
Subtractive dye precursors (couplers), 19:242
Subtractive hybridization, 13:354
Subtractive image dyes, 19:262
Subtractive instant color films, 19:296
Subtractive mixing, in color photography, 19:241–245
Subunit viral vaccines, 25:505
Sucaryl, 24:226
Succinic acid, 23:416–435
from adipic acid, 1:554
analytical methods for, 23:425–426
in beer, 3:582t
chemical properties of, 23:417–423
in citric acid cycle, 6:633
commercial specifications of, 23:425t
conversion of glucose to, 18:569
degradation of, 23:423
dehydration of, 23:419
determination of small concentrations of, 23:426
effect of heat on, 23:418–419
esterification of, 23:419
halogenation of, 23:420
health and safety factors related to, 23:428
manufacture and processing of, 23:424
miscellaneous reactions of, 23:423
occurrence of, 23:416–417
oxidation of, 23:419–420
physical properties of, 23:417, 418t
reactions with nitrogen compounds, 23:421–422
reactions with sulfur compounds, 23:422
reaction with urea, 23:422
recovery of pure, 23:424
shipping, 23:425
uses for, 23:426–430
Succinic acid diesters, 23:419
Succinic anhydride, 1:557, 23:416–435
analytical methods for, 23:425–426
chemical properties of, 23:417–423
commercial specifications of, 23:425t
condensation with aldehydes and ketones, 23:420–421
degradation of, 23:423
determination of small concentrations of, 23:426
diamine reaction with, 23:422
effect of heat on, 23:418–419
esterification of, 23:419
Friedel–Crafts reactions of, 23:421
halogenation of, 23:420
health and safety factors related to, 23:426
hydration and dehydration of, 23:419, 424
hydrogenation of, 23:420
manufacture and processing of, 23:423–424
oxidation of, 23:420
physical properties of, 23:417, 418t
puriﬁcation of, 23:424
reactions with sulfur compounds, 23:422
shipping, 23:425
uses for, 23:426–430
Sucinic anhydride derivatives, 15:486
Sucinic esters, 23:420
Sucinimides, 13:112, 23:421
Sucinogluccan
   classiﬁcation by structure, 4:723t
Sucinogluccan, in polymer ﬂooding, 18:624
Sucinoglycans, 20:576–577
Sucinonitrile, 8:174
Sucinyl chloride, 23:420
Sucinyl coenzyme A
   in citric acid cycle, 6:633
Sucralfate, 23:481
Sucralose, 12:42, 23:480, 651,
   24:236–238
   synthesis of, 24:237–238
Sucronic acid, 24:247
Sucrose, 12:38, 23:435–436, 24:237, 4:700,
   702, 706–707
   alkaline degradation of, 23:442
   analysis in green coffee, 7:253t, 254
   analysis in roasted, brewed, and instant coffee, 7:255t
   in cane sugar, 23:437
   chemical properties of, 23:441–442
   in cocoa shell from roasted beans, 6:357t
   conditioning and storage of, 23:465
   continuous countercurrent extraction from sugar beets, 23:456–459
   crystallization and recovery of, 23:463–465
   in feedstock for chemical synthesis, 23:479–480
   fermentation in beer making, 3:577
   in formulation for sweet (dark) chocolates, 6:362t
   hydrophile–lipophile balance, 8:707t
   in formulation for sweet milk chocolates, 6:362t
   hydrogen-bond formation in, 23:438
   hydrolysis of, 23:442–443
   oxidation of, 23:442
   pharmaceutical applications of, 23:481
   physical properties of, 23:437–438
   solubility of, 23:439–440
   subthreshold levels of, 23:479
   thermal degradation of, 23:442, 444
   uses for, 23:479
Sucrose acrylate derivatives, 23:480
Sucrose concentration, polarimetric determination of, 23:473
Sucrose derivatives, 23:480
Sucrose esters, 23:480
Sucrose hydrolysis, 23:462
Sucrose monoesters (SMEs), 23:480, 481
Sucrose polyester, 23:481
Sucrose separation
   ion-exclusion processes for, 1:677
Sucrose stearate
   cosmetic surfactant, 7:834t
   Suction blow molding, 19:791
   Suction specific speed, deﬁned, 21:62–63
   Sudden failures, 26:981
   Sueding, of staple-ﬁber nonwoven fabrics, 17:515
Suffixes, 17:398
Sugar(S), 23:435–492, 24:224. See also
   Specialty sugars
   bulk density of, 23:439t
   chemical properties of, 23:441–444
   composition of, 23:443t, 449t, 4:696. See also Carbohydrates
   in cotton ﬁber, 8:19t
   crystallization, 23:449
   determination of components in, 23:477–478
   direct consumption, 23:450–451
   dispersant applications in processing, 8:689
   economic aspects of, 23:466–470
in ethanol fermentation, 10:533–534
health and safety factors related to,
23:478–479
physical properties of, 23:437–441
processing of beets to, 23:456
product quality and requirements for,
23:472
specifications and standards for,
23:470–472
uses for, 23:479–483
in wine, 26:303, 310
Sugar alcohols, 12:38–41, 24:245
Sugar amides, 2:446
Sugar analysis, 23:472–478
physical methods of, 23:472–474
Sugarbeet molasses, 23:453–454
Sugar beets, 23:436. See also Beet entries
cultivation of, 23:454–455
processing of, 23:456
receiving, storage, and handling of,
23:455–456
Sugar cane wax, 26:211–212
Sugar color, determination of, 23:478
Sugar-Containing Products Re-export
Program (USDA), 23:467
Sugar cubes, 23:482
Sugar decolorizing
adsorbents, 1:587t
Sugar deliveries, U.S., 23:468–469t
Sugar drug coatings, 18:707
Sugar factory, flow diagram of, 23:448
Sugar industry, ion-exchange resin in,
14:418
Sugar of lead, 14:793
Sugar production
eyear, 23:436
integration with PHB production,
20:258–259
from sugar beets, 23:454–466
from sugarcane, 23:444–454
Sugar products, in paper restoration,
11:414
Sugar purification
liquid separation adsorption, 1:678
Sugar refining, slaked lime in, 15:64
d-Sugars, 4:697
alpha and beta configurations, 4:699
l-Sugars, 4:697
Sugar separation
adsorbents, 1:587t
Sugar surfactants, 24:152
Sugar trade,
23:467–469, 471
Suicide enzyme inhibition, 10:322, 325
Suicide substrate enzyme inhibitors,
13:299
“Suicide” vector, 12:471
Sulfabenzamide, 23:508
Sulfacetamide, 23:508
Sulfadiazine
bacterial resistance mechanisms, 3:32t
registered for use in aquaculture in
Canada, 3:218t
registered for use in aquaculture in
Europe, 3:220t
Sulfadimethoxine
registered for use in aquaculture in
Canada, 3:218t
registered for use in aquaculture in
Europe, 3:220t
registered for use in aquaculture in
Japan, 3:221t
therapeutant for aquaculture in U.S.,
3:205t, 212t
Sulfa drugs, 3:3. See Sulfonamides
Sulfaguanidine, 23:508
Sulfamate baths, 9:817, 818–819, 832–833
Sulfamates, 13:104
Sulfamation, 23:514, 538
Sulfamerazine
registered for use in aquaculture in
Europe, 3:220t
therapeutant for aquaculture in U.S.,
3:212t
Sulfamethoxazole, 23:510
bacterial resistance mechanisms, 3:32t
year of disclosure or market
introduction, 3:6t
Sulfametrol, 23:642
Sulfamic acid, 13:104, 23:538
Sulfamic acid batch sulfation/neutralization process, 23:539–540
Sulfamides, 23:653
Sulfamidochrysoidine year of disclosure or market introduction, 3:6t
Sulfamonomethoxine registered for use in aquaculture in Japan, 3:221t
Sulfamyl chlorides, 23:648
Sulfanes, 23:639, 640, 641
Sulfanilamide(s), 18:684
\(N^1\)-heterocyclic, 23:507–508
PABA antagonism to, 23:501
Sulfanilamide derivatives, 23:493, 494
Sulfapyridine, 21:104
year of disclosure or market introduction, 3:6t
Sulfate(s), 23:576–578
in bioremediation design considerations, 25:840
in the Claus process, 23:608, 609
dispersant moieties, 8:706t
extraction of sulfur from, 23:576–577
gallium, 12:359
geochemical studies of, 26:30–31
iron, 14:544–545
occurrence of, 23:576
thallium, 24:633
vanadium, 25:536
zirconium, 26:649
Sulfate analysis of water, 26:38
Sulfate cakes, 22:863
Sulfate clouds, effect on ozone depletion, 17:789
Sulfated alcohol ethoxylates rat oral LD50 values, 8:445
Sulfated alcohols, 23:537
Sulfated algal polysaccharides, 20:453–454
Sulfated alkenes, 23:538
Sulfated carbohydrate products, 23:538
Sulfated cyclodextrin-based chiral stationary phase, 6:87
Sulfated fatty acids, 23:538
Sulfated fatty alcohol ethoxylates, 23:537
Sulfated fatty oils, 23:538
Sulfated products industrial processes for the manufacture of, 23:539–555
U.S. consumption and pricing for, 23:517t
Sulfated zirconia, 5:331–333
Sulfate esters, 23:653
Sulfate formation, on Claus catalysts, 23:610–614
Sulfate ion radicals, 14:292
Sulfate ions, in water softening, 22:818
Sulfate leach liquors extraction of uranium from, 25:403
Sulfate of potash, 5:785t
recovery from brine, 5:798–799
Sulfate process plants, 25:34
for titanium dioxide pigments, 25:33–35
in titanium manufacture, 24:849, 850
wastes, 25:62
Sulfate ratio control, in Claus conversion chemistry, 23:611–612
Sulfate-reducing bacteria, 23:569, 577
Sulfate-reducing conditions defined, 3:757t
Sulfate-resistant cement, 5:498
Sulfate surfactants, 24:145
Sulfate titanium dioxide production process, 19:388–391
Sulfathiazole, 18:684
Sulfation, 23:513, 514, 536–538
higher aliphatic alcohols, 2:4
in higher olefins, 17:713
Sulfation operations, industrial changes affecting, 23:515–516
Sulfation processes, general overviews of, 23:555
Sulfation reactions, reagents for, 23:517–520
Sulfation roasting, selenium recovery via, 22:81–83
Sulfatoethylsulfonyl groups, reactive, 9:319–320
Sulphenamide vulcanization accelerators, 21:799
Sulfenyl chloride derivatives, 21:106
Sulfenyl chlorides, 23:645
Sulfidation, 13:506–507
Sulfide flotation, 16:649. See also Sulfide mineral flotation
Sulfide mineral flotation collectors used in, 16:648–649t
modifiers used in, 16:651t
Sulfide minerals, 16:624
  adsorption of sulfide collectors on, 16:649
Sulfide ores, 16:598, 23:574–578
  nickel recovery from, 17:91–92
  occurrence of, 23:574–575
  pyrometallurgical processes for, 23:575
Sulfide oxidation, microwaves in, 16:570–571
Sulfide roasting, in pyrometallurgy, 16:138–139
Sulfides, 12:190–191
  gold, 12:707
  collectors for the flotation separation of, 16:647
  iron, 14:545
  polyarylene, 23:704–706
  reactions with bromine, 4:303–304
  rhenium, 21:699
  semiconducting, 19:411
  tungsten, 25:384–385
Sulfide stress cracking (SSC), 17:16, 23:635–636
Sulfide sulfur, in hydrogen fluoride
  manufacture, 14:11
Sulfide toning, photographic, 19:220
Sulfimates, 12:182
  titanium, 25:119–120
Sulfinic acid salts, 23:658
Sulfinol process
  carbon dioxide recovery from natural
  gas, 4:814
Sulfisozole
  registered for use in aquaculture in
  Japan, 3:221t
Sulfitation, 9:275
  in beet juice purification, 23:461
  of unsaturated hydrocarbons, 23:526
Sulfitation sugar, 23:450
Sulfitation sulfonation processes, 23:540–541
Sulfite anion, in color photography, 19:246–247
Sulfite–bisulfite–metabisulfite–sulfurous
  acid system, 23:672
Sulfite ester, 23:651
Sulfite lignins, 15:15–18
Sulfite oxidation
  $k_T\beta_L$ measurement
  method, 15:679
Sulfite pulping, 21:22–23, 4:45
Sulfite pulps, bleaching sequences used for, 21:32t
Sulfites
  bleaching agents, 4:63–64
  in wine, 26:327
  2-Sulfopropyl methacrylate (SPMA), 20:468
  3-Sulfopropyl methacrylate (SPMA), 20:468
  5-Sulfosalicylic acid, 22:17
    molecular formula, 5:712t
Sulfotolylated polysaccharides, 23:536
Sulfotolylating agents, 23:536
Sulfobetaine-core micelles, 20:488
Sulfobetaines, 20:479
Sulfobromophthalein sodium, 4:360t
Sulf/garboxybetaines, synthetic routes for, 20:480
Sulfochlorination, of paraffins, 23:527–528
Sulfur group(s), 23:717
  ion-exchange group used in protein
    purification, 3:830t
Sulfurohalides, gallium, 12:357
Sulfurohalogenates, gallium, 12:357
Sulfolan
  from butadiene, 4:369, 384
Sulfolan process, 10:782, 785, 25:168, 170, 3:606
Sulfolene, 23:658
Sulfomethylation
  acrylamide polymers, 1:314–315
Sulfomethyl benzylidene bornanone
  cosmetic uv absorber, 7:846t
Sulfomethyl group
  ion-exchange group used in protein
    purification, 3:830t
Sulfometuron–methyl, 13:322
  $m$-Sulfobenzoic acid, in $m$-hydroxybenzoic
    acid manufacture, 22:21
Sulfonamides, 13:108–109
Sulfonamide antibacterial agents,
  resistance to, 23:503–505
Sulfonamides, 9:281, 23:493–513,
  13:108–109
analysis of, 23:509
  antibacterial activity of, 23:500, 501
  antibacterials, 3:9
  antimetabolite theory of, 23:500
  bacterial resistance mechanisms, 3:32t
  bacteriostatic action of, 23:498
  biological mechanism of action of, 23:501–503
development of, 3:3
discovery of, 23:493–494
  economic aspects of, 23:508–509
half-lives of, 23:498
health and safety factors related to, 23:510
lipid solubilities of, 23:500
physiochemical properties of, 23:499–501
pK_a values of, 23:500
preparation and manufacture, 3:16
preparation and manufacture of, 23:507–508
structure–activity relationships in, 23:505–508
sulfones and other structures related to, 23:506
therapeutic utility, 3:20
United States production of, 23:509t
uses of, 23:494–498
world market for, 3:16t
Sulfonamide therapy, 23:498–499
mechanisms of resistance to, 23:505–506
Sulfonate(s)
dispersant moieties, 8:706t
for enhanced oil recovery, 23:531–533
fatty acid ester, 23:528–529
in lignin, 15:12
for lube additives, 23:533
oil soluble, 23:530
overbased, 17:726
Sulfonate color, 23:553
Sulfonated aromatic compounds, salts of, 23:525
Sulfonated cation exchangers, 14:402
Sulfonated DNA probe, 14:153–154
Sulfonated kraft lignins, 15:20
toxicology of, 15:20
Sulfonated phenolic resin, water-soluble, 23:722
Sulfonated poly(phenylquinoxaline)s, 23:719
Sulfonated poly(styrene-divinylbenzene) ion-exchange resins, manufacture of, 23:536
Sulfonated polyesters, 23:536
Sulfonated polymers, 23:534–536
Sulfonated polystyrene membranes, 23:720
Sulfonated products
industrial processes for the manufacture of, 23:539–555
U.S. consumption and pricing for, 23:517t
Sulfonated resins, 10:477
polystyrene, 10:478
Sulfonated styrene–divinylbenzene copolymers. See Styrene–divinylbenzene copolymers, sulfonated
Sulfonate moieties, incorporation into polymers, 23:534, 535
Sulfonate surfactants, 24:146
Sulfonating reagents
composition of, 23:520t
indirect, 23:522–523t
of aromatic compounds, 23:520, 521t
benzene, 3:602–603
economic aspects of, 23:516
general overviews of, 23:555
heats of, 23:524t
in higher olefins, 17:713
intermediates obtained by, 9:276–277t
of lignin, 23:529–530
maleic anhydride, 15:496
of naphthalene, 17:73–74
reactants and reaction products of, 23:515
reaction with aniline, 2:788–789
quinoline, 21:184
of simple aromatic compounds, 23:524
of salicylic acid, 22:5
Sulfonation conversion, 23:524
Sulfonation-derived products, uses for, 23:514–516
Sulfonation equipment, 23:515
Sulfonation operations, industrial changes affecting, 23:515–516
Sulfonation plant gas effluents, 23:552
Sulfonation plants, operations of, 23:552
Sulfonation polymer, derivation by, 13:546
Sulfonation processes
batch stirred tank SO_3, 23:543
continuous SO_3 single-pass, 23:543–552
multistep, 23:718–719
Sulfonation reactions, reagents for, 23:517–520
Sulfonation reaction profiles, 23:548–549
Sulfonation reagents, highly acidic, 23:539
Sulfonation–sulfation systems, 23:544
Sulfonation/sulfation processes, 23:513–563. See also Sulfation entries; Sulfonation entries
selection of and options for, 23:515
Sulfonation technology, uses for, 23:514–516
Sulfonbenzimide (saccharin), 15:587
Sulfone(s)

oxidation of sulfides to, 16:571
predicted deviations from Raoult’s law
based on hydrogen-bonding
interactions, 8:814t

Sulfone formation, temperature and,
23:554

Sulfonic acid anchoring groups, 8:683t
Sulfonic acid catalysts, 10:477
Sulfonic acid hydrazides, 13:575, 593
Sulfonic acid-modified supported catalyst
supports, 5:330–331

Sulfonic acids, 20:468
achiral derivatizing agents, 6:96t
counterion exchange in, 23:534
Sulfonium polymers, 23:714–716
Sulfonium salts, 15:166
Sulfonimidoyl chlorides, self-condensation
of, 23:745–746

Sulfonylation, 12:181
Sulfonyl chlorides, 12:181
Sulfonylurea herbicides, 13:322–323
Sulfonylureas, 13:301
crop resistance to, 13:361

o-Sulfonamidophenol dye-release
compounds, 19:290

Sulfophthalic acid, 16:221
Sulfopolymers, 23:717
Sulffopropyl group
ion-exchange group used in protein
purification, 3:830t

p-Sulfonamidonaphthol dye-release
compounds, 19:289

Sulsosuccinamates, 23:526
Sulsosuccinates, 23:526, 24:146

Sulfonation, 23:514
of paraffins, 23:527–528
Sulfonation processes, 23:539
Sulfonation reaction, 23:658

Sulfoxides(s)
oxidation of sulfides to, 16:570–571
predicted deviations from Raoult’s law
based on hydrogen-bonding
interactions, 8:814t

Sulfoxyl acid, 23:669
β-Sulfur trioxide, 23:756
Sulfur (S), 23:563–596. See also Pb Mo6S8;
Thio- entries
absorbed by quicklime, 15:41
agricultural uses for, 23:589–590
allotropy of, 23:564–565
in antiacne preparations, 7:844

anti-dandruff agent, 7:851
analytical methods for, 23:587
bacteriological, 23:577–578
calorific value, 15:41
catalyst poison, 5:257t, 258–263
in chromium ferroalloys, 6:501t
in coal, 6:714, 716, 718, 728, 732
in coal gasification, converted to
hydrogen sulfide, 6:772, 775

combination with elements, 23:568
combustion of, 23:658–660
constants and chemical properties of,
23:565–568
corrosion difficulties with, 23:568
in crystal aggregates, 23:569
crystallization of, 23:565, 567
diesel fuel, 12:424–425
dyesite content of fibers and, 11:195
colloidal suspensions, 7:275
eyearly uses for, 23:563–564
economic aspects of, 23:581–583
effect on copper resistivity, 7:676t
effect on rubber aging, 21:786
effect on stainless steel corrosion
resistance, 7:809
environmental concerns related to,
23:587–589
extraction of, 23:570–574
in ferromanganese, 15:544–545
in fertilizers, 11:113
fire-flood extraction method for, 23:574
hydrometallurgical processes for, 23:576
in kerosene, 18:668
mining techniques for, 23:570
modifying or plasticizing, 23:739
molten, 23:564
occurrence of, 23:569–570
in organic reactions, 23:568
in petroleum naphtha, 18:583–584
in a phosphoric acid fuel cell, 12:219
physical constants of, 23:566–567t
in polymer analysis, 11:196
from potassium sulfate, 20:626
production of, 23:578–581
properties of, 23:564–568
in quicklime, 15:41
reactions of tin with, 24:801. See also
Diorganotin sulfides
recovery of, 23:597–620
recovery from copper smelter gases,
selenium and, 22:87, 101
self-sustaining ignition temperature of, 23:771
silver(I) complexes with, 22:675
silver reactions with, 22:668
small scale recovery of, 23:619
in sodium production, 22:773
in sodium tetrasulfide, 22:874–875
sold or used in the United States, 23:585–586t
soluble dyes, 7:373t
solubility of, 23:567
sources of, 23:564
stable isotopes of, 23:567
substituents in pyridines, 21:105–106
terminology related to, 23:583–584
thermal processes for extracting, 23:573–574
thio-entries
uses for, 23:589–594
world production of, 23:579–581t, 582
replacement of boron by, 13:650
Sulfur(VI) acids
 supported, 5:330–333
Sulfuration, 12:182
Sulfur-bearing cap rock, 23:572
Sulfur-bearing stress reducers, 9:817
Sulfur burners, 23:659, 772
Sulfur burning, 23:771–772
Sulfur burning plants, 23:755, 773–778
dry process air in, 23:774
Sulfur cements
 applications, 5:500t
Sulfur chlorides, chemistry of, 23:640
Sulfur circulation
 in the hydrologic cycle, 26:30–31
Sulfur coating formulations, 23:593
Sulfur compound removal processes, 23:622
Sulfur compound removal, molecular sieves
 in, 16:840–841
Sulfur compounds, 23:621–701
 aroma compounds in roasted coffee, 7:256t
 in beer, 3:582t
 chelating agents, 5:712–713t
 in FCC feed, 11:716
 hydrogen sulfide, 23:629–638
 oxidation of, 15:609
 oxyhalides, 23:647–651
 reaction with ozone, 17:777, 781
 sodium hydrosulfide, 23:638–639
 thiophasaene, 23:625–626
titanium in, 25:57–59
trichloromethanesulfenyl chloride, 23:627–629
Sulfur concrete (SC), 23:592
Sulfur-containing compounds, in natural gas, 12:369
Sulfur-containing conjugated polymers, 23:709
Sulfur-containing organotins, as PVC stabilizers, 24:822
Sulfur-containing polymers, 10:201–204, 23:702–753
 one-pot synthesis of, 23:704
 poly(disulfide)s, 23:711–714
 polyelectrolytes containing sulfur linkages, 23:738–742
 poly(monosulfide)s, 23:702–711
 polysulfates, 23:725
 poly(sulfonic acid)s, 23:717–725
 polysulfoxides, 23:733–735
 poly(sulfuroxime), 23:745–746
 polythioacetals, 23:732–733
 polythiocarbonates, 23:725–729
 polythioesters, 23:729–732
 polythiourethanes, 23:735–738
 polyurethanes containing sulfur linkages, 23:742–745
 sulfonium polymers, 23:714–716
 uses for, 23:702
Sulfur-containing spiro orthocarbonates,
cationic polymerization of, 23:729
Sulfur-cured EPDM, 21:804t. See also
 Ethylene–propylene–diene monomer (EPDM) rubber
Sulfur deposits
 evaporite basin, 23:569–570
 salt-dome, 23:569
 volcanic and native, 23:570
Sulfur dichloride, 23:645–647
 chemical reactions of, 23:645–646
 electrophilic reaction of, 23:706
 end use of chlorine, 6:13t
 manufacture of, 23:646
 shipment and storage of, 23:646
 uses for, 23:646–647
Sulfur dioxide, 10:38, 12:59, 86; , 23:568, 655–668. See also SO2
 absorption in alkaline aqueous solutions, 23:657
 in acid deposition, 1:805
 adsorption isotherm for activated carbon, 1:585
Sulfur dioxide vapor, inhalation of, 23:657
control processes for, 26:91t
conversion to sulfur trioxide, 23:778
corrosivity of, 23:662–663
criteria pollutant, 1:813t
diffusion coefficient in air at 0°C, 1:70t
economic aspects of, 23:663–664
effects on plants, 23:666
gas purification of vent streams, 1:618t
generation of, 23:666
health, safety, and environmental factors related to, 23:665–666
limits on, 23:588
manufacture of, 23:658–662
in mega-cities, 1:788t
mutagenic effects of, 23:666
in organic chemistry of, 23:656–657
organic chemistry of, 23:657–658
oxidation of, 23:656
oxygen scavenger used in water, 7:815
physical and thermodynamic properties of, 23:655–656
production from spent sulfuric acid, 23:661–662
recovery from flue gases, 23:661
reduction by methane, 23:657
reduction of, 23:656
scrubbing of, 26:690–691
in selenium recovery, 22:82–83, 85
shipment and storage of, 23:663
sodium reactions with, 22:766
solubility of, 23:761–762
as a solvent, 23:668
use in selenium analysis, 22:94
uses for, 23:664, 667–668
Sulfur dioxide concentrations, in oleum, 23:792
Sulfur dioxide emissions, lime industry, 15:76
Sulfur dioxide emissions, 23:666–667
Sulfur dioxide gas, 23:774
generation of, 23:771–773
production of, 23:659
Sulfur dioxide gas stream, 23:769
Sulfur dioxide vapor, inhalation of, 23:665
Sulfur dyes, 9:181–182, 242, 262–263. See also SO₂ pollution
Sulfur furnaces, 23:771
heat of combustion from, 23:774
Sulfur halides, 23:640–647
Sulfur hexafluoride gas protection systems, 15:344
Sulfur hexafluoride production, 11:846
Sulfur hexafluoride reactive ion etching, in lotus effect surfaces, 22:120
Sulfuric acid, 24:260, 12:190, 23:563, 669, 754–801
in acid deposition, 1:805
air pollutant, 1:797
analysis and specifications for, 23:790–792
applications of, 23:754
in ascorbic acid manufacture, 25:757
boiling points and freezing points of, 23:762–763
carcinogenicity of, 23:794–795
chemical properties of, 23:762
consumption of, 23:788
density of, 23:760
dessicant, 8:365–366
economic aspects of, 23:788–790
equipment for, 23:779–783
health and safety issues related to, 23:792–795
history of, 23:754–755
in hydrogen fluoride manufacture, 14:11
lead–acid battery electrolyte, 3:538–539
manufacture of, 23:767–771
melting points of, 23:764
in nitric acid concentration, 17:185
nitrates and nitrogen oxide compounds in, 23:792
in plating solutions, 9:808
physical contact with, 23:794
physical properties of, 23:759–764
prices of, 23:789–790
process details and flow sheets related to, 23:773–779
quantitative analysis of, 17:190
raw materials used to manufacture, 23:768
recovery of, 23:582
resistivity of battery electrolyte, 3:417
selenium reactions with, 22:76
shipping and handling of, 23:792–794
in sodium carbonate recovery, 22:792
sodium reactions with, 22:766
sold or used in the United States, 23:585–586t
solubility of boron halides in, 4:140t
specific conductance of, 23:760, 761
specific gravity of, 23:759
supported, 5:327
sulfur use in, 23:590
toxicity of, 23:794–795
United States trade in, 23:583
uses for, 23:589, 788
use in selenium analysis, 22:94
vapor pressure of, 23:763
worldwide production of, 23:790
Sulfuric acid alkylation, 14:20
Sulfuric acid catalysts, 23:780
Sulfuric acid concentrators, 23:787
Sulfuric acid corrosion, materials of
construction for, 23:783–785
Sulfuric acid equilibrium conversions,
23:776
Sulfuric acid leach liquors, nickel and
coaltar extraction from, 10:791
Sulfuric acid lithium recovery process,
15:125–126
Sulfuric acid mists, 23:771
physiological responses to, 23:794
Sulfuric acid piping, 23:782–783
Sulfuric acid plants, 23:659
conversion efficiency of, 23:776
energy efficient, 23:786–787
special designs for, 23:785–787
Sulfuric acid production, sulfur dioxide in,
23:667
Sulfuric acid recombination, 10:538
Sulfuric acid solutions
 electrical conductivity of, 23:759–761
 index of refraction of, 23:761
 viscosity of, 23:761
Sulfuric acid stack emission limit, 23:774
Sulfuric acid storage tanks, 23:783
Sulfur impregnation, 23:593–594
Sulfur–iodine (S–I) cycle, 13:848
Sulfurized olefins, 23:642
Sulfur ligands, platinum, 19:656
Sulfur linkages
 polyesters containing, 23:738–742
 polyurethanes containing, 23:742–745
Sulfur mining technology, 23:572–573
Sulfur monochloride
 end use of chlorine, 6:135t
Sulfur monochloride, 23:640–644
 as a chlorinating agent, 23:644
 commercial uses of, 23:644
 economic aspects of, 23:644
 health and safety factors related to,
 23:644
 manufacture of, 23:643
 organic reactions of, 23:642
 physical properties of, 23:640, 641t
 as a precursor for mustard gas, 23:644
 shipment and storage of, 23:643
 thermodynamic properties of, 23:641t
 uses for, 23:643–644
Sulfur mustards, 5:816, 817
Sulfur nitrides, 23:654
Sulfurous acid, 23:657
Sulfur oxide additives, 11:690–692
catalytic reduction of, 11:691. See also
SOx entries
Sulfur oxide emissions, reducing,
11:689–692. See also SOx emissions
Sulfur oxide removal
cerium application, 5:687
Sulfur oxides (SOx), 1:789, 797, 10:102,
23:655
as air pollutants, 26:668
from combustion, 7:472
Sulfur oxygen acids, 23:669–678
Sulfur polymer cement (SPC), 23:592–593
Sulfur recovery
 from ore, 23:574
 by solvent extraction, 23:574
Sulfur recovery plant, 23:601
Sulfur recovery unit (SRU), 13:793
Sulfur reduction additives, 11:688–689
Sulfur reduction, in gasoline, 11:686
Sulfur sensitization, in photography,
19:190
Sulfur/sulfur
nitrogen heterocycles, 9:289
Sulfur tetrafluoride, 11:863
Sulfur trioxide, 23:515, 517–520, 525, 661,
754–801
air pollutant, 1:797
in cement, 5:468
in screening smokes, 5:829–830
See also ClSO3H; Continuous falling film
SO3 sulfonation process; Continuous
SO3 processes; Falling film continuous
SO3 sulfonation technology;
Multitubular falling film continuous
SO3 sulfonation units; SO3 entries
density of, 23:757
as an electrophile, 23:519
physical properties of, 23:755–759
polymers of, 23:519t
process details for, 23:778–779
production of, 23:769
pure, 23:756
thermodynamic properties of, 23:756, 758
toxicity of, 23:794
vapor pressure of, 23:758
Sulfur trioxide complexes, 23:519
Sulfur trioxide-pyridine adduct, 23:519
Sulfur trioxide-trimethylamine adduct, 23:519
Sulfur values, recovery as SO₂, 23:619
Sulfur vapor, molecular composition of, 23:565
Sulfur vulcanization, 10:713, 9:554, 560, 21:793, 794
classifications for, 21:800
Sulfur wells, 23:570–572
Sulfonyl chloride, 23:651–654, 656
chemistry of, 23:651–653
decomposition of, 23:652
economic aspects of, 23:654
end use of chlorine, 6:135t
health and safety factors related to, 23:654
manufacture of, 23:653–654
organic chemistry of, 23:653
physical properties of, 23:651, 652t
shipment and storage of, 23:654
solubility of chlorine in, 6:133t
thermodynamic properties of, 23:652t
uses of, 23:654
Sulindac, 2:827
β-Sultones, 23:527
Sulzer-BX
characteristics, 8:774t
Sulzer static mixers, 10:772
Sum-frequency generation (SFG), 24:72
Sumifix Supra dyes, 9:473–474
Sumithion MC
formulation, 7:564t
Sumitomo
fiber reinforcement for ceramic–matrix composite, 5:558t
Sumitomo Corporation
advanced materials, 1:694, 719–722
Sumitomo-Nippon Shokubai process, 16:256
Sumitomo one-step MIBK process, 16:339
Summary report, in Investigational New Drug Applications, 18:693
Summer flounder
aquaculture, 3:189
Sun bleaching, in paper restoration, 11:414
Sun–Chen equation, 15:675
Sunett, 24:233
Sunfish
aquaculture, 3:183
Sunflower oil, in soap making, 22:735
Sunflower oils, 9:143
hydroperoxidized, 9:152
Sunflower seed oil
cosmetically useful lipid, 7:833t
Sunlight
cholecalciferol (vitamin D₃) and, 25:781
Sunlight, acrylic fiber resistance to, 11:193
Sun Microsystems, corporate decision making in, 24:386–387
Sunn hemp, 11:294
uses of, 11:299t
Sun Oil
advanced materials research, 1:692
Sun Protective Factor (SPF), 7:845
Sunscreens, 7:844–846
Sunscreens, salicylic acid esters in, 22:12, 16
Superabrasive grinding wheels, 1:21
Superabsorbent polymers (SAPs), 13:752–753
Superabsorbers, 1:326
Superacidic zeolites, 12:192
Superacids, 11:852, 12:164, 170, 172, 187, 191
solid, 12:192
Superalloy coatings, 13:507
Super alloys
cerium addition, 5:682
Co-base, 13:503, 525–527
cobalt applications, 7:246
controlled expansion, 17:101
Fe-base, 13:503
high throughput experimentation, 7:414t
nickel- and cobalt-based, 17:137
nickel-base, 17:103
niobium in, 17:145
Superamides, 2:443, 454
Superaustenitic stainless steels
compositional and property linkage, 7:809
Supercalendered coated paper, 18:124
Supercapacitors, 1:767
Super-chilled dies, in bar soap manufacture, 22:752
Superconductivity, 23:801–881
applications of, 23:853
bulk materials applications for, 23:865–870
ceramics, 5:603–605
discovery of, 23:801
in fixed and stabilized levitation, 23:866–867
Meissner effect and, 23:802–803, 813
nomenclature related to, 23:873–876
use in linear collider, 23:862
vanadium in, 25:526
Superconductivity, in fullerenes, 12:235–236
of niobium, 17:146
silver and, 22:640
Superconductors, 5:603–605, 14:652
active bulk applications of, 23:868
applications of, 23:852–872
barium compounds, 3:343, 369
critical temperature of, 23:802
current percolation through grain boundaries in, 23:842–845
demagnetizing effect in, 23:811–812
electromagnetic losses in, 23:818
experimental studies of, 23:810
flux flow in, 23:823–825
fullerenes in, 17:51
high frequency losses in, 23:818
high throughput experimentation, 7:414t
hollow, 23:803
low temperature, 23:828–836
magnetic separation applications for, 23:870
magnetization curves of, 23:807
market requirements for, 23:852
metal–matrix composites in, 16:192–193
metalorganic, 23:851
TBCCO, 23:872
Type I, 23:807–808, 812–813
Type II, 23:807–809, 813–815
silver in, 22:659
Supercritical antisolvent (SAS) Process, 24:17, 18
Supercritical atomization
in spray coating, 7:70
Supercritical carbon dioxide, 9:456, 24:2, 15
applications of, 24:20
as a medium for chemical reactions, 12:808–809
as a polymer processing aid, 24:8–9
technologies, 24:22
Supercritical drying
aerogels, 1:748, 753–754
ceramics processing, 5:656
Supercritical ethylene, polymerization in, 17:702
Supercritical extraction, 10:766–767
Supercritical fluid chromatography (SFC), 4:628–629, 6:375, 14:233, 24:12–13
applications, 4:631
brief overview, 6:388–389
columns, 4:631
detectors, 4:631
hyphenated techniques, 4:631
instrumentation, 4:629–630
mobile phase, 4:630
sample injection, 4:630
of silicones, 22:599
stationary phases, 4:631
Supercritical fluid chromatography—Fourier transform infrared spectroscopy (SFC-FTIR), 4:631
Supercritical fluid chromatography—mass spectrometry (SFC-MS), 4:631
Supercritical fluid dyeing (SFD), 24:20
Supercritical fluid extraction (SFE)
capillary chromatography sample preparation, 4:609
in hazardous waste management, 25:824
technique, 24:13
Supercritical fluids (SCFs), 14:84, 10:818,
24:1–29, 664
common, 24:3t
crystallization application, 8:135
dispersions in, 24:9–10
experimental techniques for, 24:11–12
hydrogenolysis for higher alcohol manufacture, 2:18–19
inverse emulsion polymerization of acrylamide, 1:323–324
in materials processing, 24:19–22
in microelectronic engineering, 24:22–23
phase behavior of, 24:4–7
polymers and, 24:8–9
processes and applications for, 24:12–23
properties of, 24:3–10
in reactions, 24:14–17
research on, 24:2
separation processes for, 24:13–14
solution-phase behavior, 24:11
transport properties of, 24:7–8
Supercritical phase behavior, modeling of, 24:10–11
Supercritical regime, 11:756
Supercritical solvents, solvation properties
of, 14:80–81
Supercritical technology, 23:242, 13:449
Supercritical water (SCW) properties,
waste detoxification and, 14:108
Supercritical water oxidation (SCWO),
24:16–17
Supercritical water oxidation
in hazardous waste management, 25:824
in wastewater treatment, 25:912
Supercritical water oxidation processes,
14:108
Supercritical water reactions, 24:16–17
Supercurrents, diamagnetic and
paramagnetic, 23:802–803
Superdex, 3:839
Superdislocation, 13:499
Superdispersants, 8:677
Superduplex stainless steels
compositional and property linkage,
7:809
Superduty fireclay
carbon monoxide compatibility with, 5:4t
Superelastic devices, 22:345, 350–352
Superelastic effect (SE), 22:339, 340
Superelasticity
shape-memory alloys for biomaterials,
3:741–742
Superelectrons, 23:819–820
Superfibers, 24:624
Superficial filtering velocity, 26:710
Superficial velocity, 11:766
Superfilling, 9:774
Superfinishing stones, 1:19
Superflex catalytic cracking
dibutylene manufacture, 4:417
Superfluid helium, 17:353–354
Superfluid phases, of helium-3, 17:354–355
Superfluids, 17:352–354
Superfractionation, 23:333–334
Superfund Amendments and
Reauthorization Act (SARA), 10:514,
21:588–589, 14:581
Superfund Innovative Technology
Evaluation (SITE), 25:837
Superfund legislation, 21:588
Superfund Reauthorization Act, 21:589
Super glue, 1:539
Super Grubbs catalyst, 26:933
Superheated aqueous solution processing,
14:80
Superheated steam dryers, 9:138–139
Superheated steam turbines, 26:135–136
Superheating, in vapor–compression
refrigeration systems, 21:543–545
SuperHeavy Elements (SHEs), 1:465,
494–499
Superhydrophilicity, superhydrophobicity
versus, 22:121
Superhydrophobicity
development of, 22:117–120
processing of, 22:117, 118–119t
superhydrophilicity versus, 22:121
surface structure and, 22:110–113
transparency and, 22:121
Super inflated rayon, 11:261
Superintegrons, 3:31
Superionic conducting glass systems, 12:586
Superior vena cava, 5:80
Super iron cells, 3:431t
Superlattice(s), 13:499, 19:166
via MOCVD, 22:158–160
Superleaks, 17:354
Super Lewis acids, 12:191
Superluminscent LEDs, 22:176
Supermilling acid dyes, 26:396
Super milling dyes, 9:184, 185
Super-moire pattern, 17:428
Supermolecular organization, of polyamide fibers, 19:740
Supernatants, sedimentation and, 22:50
Superoxide absorbable suture, biodegradation and, 24:220
Superoxide dismutase (SOD) enzymes, 13:297
Superoxide dismutase
copper containing, 7:776
Superoxide, photooxidation by, 9:386
Superoxide radicals, 17:772
Superoxides, 18:416–417
Superparamagnetic beads in microfluidic cell sorting, 26:971
SuperPhénix liquid-metal fast-breeder reactor, 17:587–588
Superphosphate, 11:119
ammoniated, 11:120
triple, 11:119–120
Superphosphoric acid, 18:826
Super Photon Ring (Spring-8), 26:412
Superplastic forming (SPF), of titanium, 24:859
SuperPro software, 26:1040
Superradiant lasers, 14:690
Supersensitization, 9:510
Supersoft copolymers, 26:538, 540
Super spring copper alloys, 7:723t
Superstructure, creating and optimizing, 20:726–728
Superstructure–likeness search, 6:8
Superstructure optimization, 22:297, 298
Superstructures
corrosion protection coatings, 7:204
two- and three-dimensional, 17:57
Supertropical bleach for decontamination of chemical warfare agents, 5:835
Supertwisted nematic display, 15:114
Super twisted nematic liquid crystal display (STN-LCD), 9:340
Super ultra-low emissions vehicle (SULEV), 13:855
Super ultra-low emission vehicle standard (SULEV), 10:57
Supervisory process control, 20:668
Supplemental antibiotics, in ruminant feeds, 10:870
Supplemental Register, 25:258, 259
Supplementary Information for the International Temperature Scale of 1990, 24:436
Supplementary units, in SI system, 1:xi; 2–26:ix
Supplementation, in young animal feeds, 10:872
Supplements, in ruminant feeds, 10:867–868
Suppliers of Advanced Composite Materials Association (SACMA), 26:745–746
Supply chain management sampling techniques for, 26:1043–1044
Supply temperature, in heat exchange, 13:189
Support coated open tubular (SCOT) columns, 4:615; 6:379
Supported liquid membranes, 16:28
Support material, in fluidized-bed encapsulation, 11:540
affinity chromatography, 6:392–393
chromatography, 6:375
gas chromatography, 6:375
Supported metals heterogeneous catalysis by, 5:245–248
Supports, design codes for, 19:482
Suppositories, for drug delivery, 18:713
Supramolecular architectures interpenetrating, 24:52
transition metals in, 24:42–43
Supramolecular assemblies, 24:31, 39–40
in solution, 24:34
synthesis and structures of, 24:49
Surface coating technology, for solar energy materials, 23:1
Surface conductivity, of vitreous silica, 22:430
Surface curvature, color coding for, 10:340
Surface defect densities, 9:731
Surface deformation, case hardening by, 16:207–208
Surface diffusion
  macropore diffusion, 1:596
  micropore diffusion, 1:596
Surface driers, 2:149, 9:147
Surface elemental composition analysis, 24:84
Surface-emitting LEDs, 22:174
Surface-emitting semiconductor lasers, 22:177–179
Surface energy, 1:505–506
Surface-enhanced Raman scattering (SERS), 16:486; 21:327–328; 24:72
Surface-enhanced Raman spectroscopy, silver and, 22:640
Surface-enhanced resonance Raman scattering (SERRS), 21:327–328
  advantage of, 21:329
Surface Evolver software, 12:11
Surface excess, 24:512–513
Surface Evolver software, 12:11
Surface force apparatus, 1:517
Surface grinding
  ceramics processing, 5:654–655
Surface-hydration amorphous silica, 22:380
Surface grinding
  ceramics processing, 5:654–655
Surface-layers dissociation behavior, in polymer colloids, 20:381–383
Surface layer impregnation, hydrothermal technology for, 14:105, 106t, 107t
Surface layers, IR spectra of, 24:110
Surface micromachining
  in MEMS, 22:260
  of MEMS devices, 26:964
Surface modification
  adsorbents, 1:585
  molecular composition analysis, 24:109–116
Surface molecular composition analysis, 24:109–116
Surface monolayers, molecular recognition at, 16:796–801
Surface morphology, analysis of, 24:75–84
Surface mount technology (SMT), 20:60, 10:373, 458
Surface of nasal impact frequency (SNIF), 11:520–521
Surface organometallic chemistry (SOMC), 26:929
Surface overpotential, 9:611
Surface oxides
  morphology of, 13:507
  of refractory metals, 13:521
Surface oxide scale, 13:504–506
Surface plasmon resonance (SPR), 6:405
  for immunosensor detection, 3:802
Surface polarity
  adsorbents, 1:586
Surface preparation, 1:512–513
Surface protection, poly(fluorosilicones) in, 20:244–245
Surface renewal theory, 1:46
Surface roughness
  dust and self-cleaning, 22:115–116
  superhydrophobicity and, 22:110–113
Surfaces
  deburring, 9:597–598
  nano-microstructured, 22:720
  photocatalytically active, 23:23
Surface sensitive properties, controlled modification of, 14:428–429
Surface sizing, of paper, 18:122–123
Surface species, characterization of, 24:110
Surface stability, of high temperature alloys, 13:504–508
Surface stabilized ferroelectric liquid crystal device, 15:115
Surface sulfur deposits, extraction of sulfur from, 23:573–574
Surface superconductivity, 23:811
Surface tension, 9:112, 24:119, 120, 134, 11:776
  of fats and oils, 10:822
  of foams, 12:3–4
  in heat pipe design, 13:230
  of mercury, 16:36
Surface wave, 17:422. See also S-wave
Surfactant adsorption, 24:119, 133–144
at the air/liquid and liquid/liquid interfaces, 24:133–138
approaches for treating, 24:134
measurement of, 24:139
at the solid/liquid interface, 24:138–144
Surfactant blends, in oil displacement efficiency, 18:628–629
Surfactant-defoamers
surface tension, 8:244t
Surfactant-enhanced alkaline flooding, 18:630
Surfactant-enhanced aquifer remediation (SEAR), 16:429
Surfactant-free polymerization (SFEP), 13:744
Surfactant-polymer flooding, 18:628
Surfactant precipitation, in volumetric sweep efficiency, 18:621
Surfactant propagation, in enhanced oil recovery, 18:629
Surfactants, 9:22–23, 784. See also Surface-active agents
admixture for cement, 5:485
amphoteric, 14:709
amphoteric (zwitterionic), 24:148
anionic, 24:144–146
applications for, 24:119, 155–161
aquatic toxicity of, 24:154
Bancroft’s rule for, 10:125
biodegradation of, 24:154–155
cationic, 10:283, 24:147–148
ceramics processing, 5:647
commercially produced, 24:119–120
in cosmetics, 7:832, 834
detergent alcohols for, 2:19–20
in detergent formulations, 8:415
derived from mono- and polysaccharides, 24:151–152
dialkyl, 24:147
dispersants contrasted, 8:686
in emulsions, 24:155–156
FDA approval of, 24:160
effect of coconut diethanolamide on foaming of, 2:453t
effect on colloid wettability, 7:283
in emulsion polymerization, 16:285
ethyleneamines application, 8:500t, 504–505
fatty acid amides, 2:453–455
fatty amines, 2:534
as filter aids, 16:659
flotation deinking, 21:438
health and safety factors related to, 24:153–155
hydrocarbon use in, 13:688–689
ionic and nonionic, 10:126, 24:118–161
in industrial water treatment, 26:141
in liquid soap, 22:748
markets for, 16:434–435
micellization and, 24:119, 127–133
in microemulsions, 24:157–158
mobility-control, 18:625–628
nonionic, 14:709, 24:148–152
in paper pulping, 21:435
plasticizer alcohols for, 2:23
in pharmaceuticals, 24:159–161
physical properties of, 22:724–725
in polymer colloids, 20:386
polymeric, 24:153
rat oral LD50 values, 8:445
soap and, 22:723–724, 725
in soap bars, 22:741–742, 745–746
solubility–temperature relationship for, 24:125–126
specialty, 24:152–153
as stabilizers, 24:138
surface tension, 8:244t
in suspensions, 24:156–157
synthetic, 22:724
SUTURES 913

in synthetic latex manufacture, 14:717–719
    types of, 22:724
  in VDC emulsion polymerization, 25:722–723
    with defoamers, 8:239
Surfactant solutions, properties of, 24:120–124
Surfactant–surfactant interaction, 24:142, 143
Surficial uranium deposits, 17:521
Surfmers, 14:719
Surfynol 104, 8:244t, 8:241t
Surgery
    shape-memory polymers in, 22:355
    superelastic and pseudoelastic SMA devices in, 22:351–352
Surgical instruments, magnetically guided, 23:861
Surgical needles, 24:206–207
Surgical prostheses, antiwear treatment of, 14:450
Surnames
    as trademarks, 25:257
Surrogate endpoint, 17:649
SurShield barrier material, 12:608
Survivor function, 26:987
Suspended-level viscometer, 21:728–729
Suspended magnets, 15:437–439, 455
Suspended particle devices (SPD) film, 12:609
Suspended solids
    effect on volumetric gas–liquid mass transfer coefficient, 15:711–713
    as membrane foulants, 21:664
Suspending agents
    cosmetic surfactants, 7:835t
    in suspension polymerization, 16:288
Suspension aids
    kaolin application, 6:696
    palygorskite/sepiolite application, 6:701
    smectites application, 6:697t
Suspension-bath process, 15:592
Suspension cell cultivation, 11:11
Suspension effect, 14:30
Suspension hydrogel polymerization, 13:731
Suspension polymerization, 14:392, 20:408
  ABS, 1:419–423
  acrylic ester monomers, 1:385–386
  of methacrylic ester polymers, 16:288–289
  of PVC, 25:658, 659, 666–668, 669
  of VDC, 25:695, 696–697, 724–725
  of vinyl acetate, 25:570
Suspension polymerization reactor equipment, 16:288–289
Suspension polymer specifications, 16:293
Suspensions, 7:272t
  of calcium alginate beads, 15:713
  occurrences of, 7:273t
  polymer, 10:683
  of polyurethane foam particles, 15:713
  sedimentation and, 22:50
  settling of, 22:53–55
  surfactants in, 24:156–157
Suspoemulsion(s), 10:131, 24:158
Sustainability (sustainable development), 12:806–807
Sustainability, environmental impact assessment and, 10:245
Sustainable chemistry, 24:162
Sustainable development, 24:197
    chemistry and, 24:162–205
    economic-ecological efficiency and, 24:188–189
    life-cycle assessment and, 24:182–183
    metrics for sustainability assessment, 24:179–182
    organizational and political initiatives related to, 24:190–194
    safety, hazard analysis, and risk assessment in, 24:183–188
    sociopolitical dimensions of, 24:189–190
    tools for, 24:176–179
Sustainable industrial activity, 20:710
Sustained drug release, for CNS-related disorders, 9:82–83
Sustained loads, piping system design for, 19:482
Sustainment activities, 10:166
Suture compliance, 24:214–215
Suture materials, 24:205
    categories of, 24:207
    coated, 24:212–213
    essential properties of, 24:213–214
Sutures, 24:205–224
    biodegradation and absorption properties of, 24:218–223
    biological properties of, 24:216–218
    handling property of, 24:215–216
    knot tie-down performance of, 24:213, 215–216
physical and mechanical properties of, 24:214–215
sizes, and physical configurations of, 24:207–214
surgical needles and, 24:206–207
tissue reaction to, 24:218
trade names and manufacturers of, 24:208–212
unstressed, 24:222–223
Suzuki coupling, 13:651
Suzuki cross-coupling
ionic liquids in, 26:891
microwave-assisted, 16:552
Swaged surgical needles, 24:206
Swaging, 25:360
Swan, Joseph, 11:248
S-wave, 17:422–423
Sweat
citric acid in, 6:632t
Sweaters
number produced from one bale of cotton, 8:133t
Sweating furnaces, 21:396
Sweep flocculation, 11:632
Sweet ’n Low, 24:236
Sweet carbohydrates, structural features of, 24:247
Sweet chocolate, 6:361–366
amino acids content, 6:368t
composition, 6:369t
theobromine and caffeine content, 6:367t
typical formulation, 6:362t
Sweet dessert wines, 26:315–316
Sweetener decolorization
activated carbon application, 4:753
Sweetener deliveries, estimates of, 23:467
Sweeteners, 24:224–252, See also High intensity sweeteners
alternative, 24:225
analysis of, 11:523
bulking agents in, 24:244–245
classes of, 12:38
corn-starch-based, 26:288–289
nonnutritive, 24:226–242
specialty, 12:44
Sweetland filter, 11:366
Sweetness enhancers, 24:245–246
Sweetness inducers, 24:245–246
Sweetness inhibitors, 24:246
Sweetness potency, 24:225
Sweetness Triangle, 23:438
Sweet stimuli, 24:249
Sweet syngas
defined, 6:829
Sweet taste receptor, 24:246–247
identification of, 24:248
Sweet-taste transduction mechanisms, 24:246–249
Sweet wines
fermentation of, 26:316
Swellable matrices
controlled release pesticide formulations, 7:559
Swelling
in acrylonitrile copolymerization, 11:203
in aqueous dispersion polymerization, 11:197
of fibers, 11:170
of ion-exchange resins, 14:398–399
of silicone rubber, 22:583
solvent-related, 23:97–99
Swelling constant, 23:98
Swelling equilibrium, 23:97
Swelling kinetics, 23:98
Swelling tests, coal, 6:727, 734–735, 755
Swimming pool reactors, 17:593–594
Swimming pools
ancillary chemicals in, 26:188–193
copper ions in, 22:681
environmental limits on silver in, 22:652
materials of construction used in, 26:186
sanitizer and chemical feeders for, 26:178–179
silver ions in, 22:656, 660, 681
sodium bromide in, 22:824
test kits for, 26:193
water quality maintenance for, 26:179–188
water treatment of, 26:172–194
Swimming pool/spa water treatment
economic aspects of, 26:196
Swimming pool/spa water treatment
health and safety factors related to, 26:196–198
Swimming pool treatment, ozone in, 17:809
Swine
nutrient requirements of, 10:843–844t
production, 10:836
transgenic, 12:463–464
Swinging basket bottle centrifuge, 5:529
Swirl atomizers, 23:179, 180–182
Swirl nozzle, 23:180
SwissProt ENZYME Web site, 10:260
Switchable mirrors
electrochromic material application, 6:572t
Switched mode power supplies (SMPS), ferrites in, 11:77–82
Switches, organic semiconductors used in, 22:225
Switzerland
bioengineering research program, 1:702
Swollen polymer gel phase
in PVC polymerization, 25:667
SX-70 cameras, 19:278, 302, 306
SX-70 film, 19:303–304
opacification in, 19:304–305
SX-70 film pack, 19:306–307
SX-70 image formation, 19:304
SYBYL, 10:341
Sycar resins, 10:5
Sylvinite, 11:122
Sylvinite ores, 20:615–616
crushing, 20:616
scrubbing and desliming, 20:617
Sylvite, 5:785t
Symbiotic associations, in nitrogen fixation,
17:299–300
Symbols, 1:xvii–xxiv; 2–26:xxv–xxii
element, 17:386–387
rules for writing, 1:xviii–xix; 2–26:
xxvi–xxvii
Symmetrical dialkyl peroxides, 18:436, 446
Symmetrical dyes, substituent effects in
heterocyclic nuclei of, 20:509–510
Symmetrical membranes
dense, 15:800–801
microporous, 15:801–804
Symmetrical polymethylene dyes,
20:505–506
Sympathomimetic amines, 3:91–95
Symrise process, 24:514–516
Synadrin
molecular formula and structure, 5:120t
Synagis
cell culture technology product, 5:346,
346t
Synchrotron radiation (SR), 24:90, 102,
26:412, 437
applications using, 26:441–442
Synchrotron radiation facility, 26:438
Synchrotron radiation X-ray fluorescence
(SR XRF)
archaeological materials, 5:742
Syndiotactic poly(1-butene) (PB), 20:417
Syndiotactic polymers, of higher olefins,
17:707
Syndiotactic polymerization, 16:99–102
Syndiotactic poly(methacrylate) esters, glass
transition temperatures of, 16:273t
Syndiotactic polypropylene, 20:524
Syndiotactic polystyrenes (SPS), 23:365
Syndiotactic polystyrene, 10:180–183
applications for, 10:183
properties of, 10:182
Syndiotactic propylene polymers, 17:704,
705
Syndiotactic structure
of PVC polymer, 25:666, 667
Syneresis, 22:56
as an aging mechanism, 23:64–65
Synergic bonding, 16:59
Synergism, antimony–halogen,
11:460-461
Synergist, 12:33
Synergistic toxic effects, 25:214
Syngas plants, suppliers of, 13:789
Syngenite, 5:785t
Synperonic
commercial block copolymer, 7:648t
commercial defoamer, 8:241t
Synthetic foams, 23:404
Synthane process, 6:763
Syntheses, see Chemical synthesis
environmental assessment of, 24:
180–182
safer, 12:809–810
sustainable development and, 24:
172–175
Synthesis activities, EIA, 10:236
Synthesis gas (syngas), 13:766, 17:763
in ammonia synthesis, 2:695–701
carbon monoxide manufacture, 5:
12–15
chemicals from, 18:679
from coal gasification, 6:772, 775–778
conversion to acetaldehyde, 1:109
defined, 6:829
in heavy oil upgrading, 18:620
for indirect coal liquefaction, 6:833,
858–867
production of, 17:293–295
reactions of, 13:767–769
Synthesis gas chemicals, hydrocarbon use
in generating, 13:687
Synthesis gas generation processes,
alternative, 16:306–307
Synthesis gas generation routes, for methanol, 16:302–307
Synthesis gas mixture ("syngas"), 13:842.
See also Syngas plants
Synthesis loop, methanol, 16:307
solution catalyzed reactions, 5:219–220
Synthetic absorbable sutures, absorption delay of, 24:219t
Synthetic active manganese dioxides, 15:585
Synthetically Modified Polysaccharides, 20:457–459
Synthetic antioxidants, 12:60, 10:828
Synthetic-based fluids (SBF), 9:6
Synthetic-based muds, 9:6
Synthetic-based oil soluble sulfonates, 23:530
Synthetic camphor, 24:540
Synthetic compounds, as plant growth regulators, 13:39–56
Synthetic crude oil, 18:640
Synthetic cyclic molecules, 24:35
Synthetic diamond, 8:530–543
catalyzed synthesis, 8:531–535
crystal growth, 8:535
crystal morphology, 8:534–535
crystal structure, 8:537–538
direct graphite-to-diamond process, 8:535–538
economic aspects, 8:542
industry, 8:539–542
metastable vapor-phase deposition, 8:538–539
semiconducting diamonds, 8:541
shock synthesis, 8:536
sintered diamond masses, 8:541–542
static pressure synthesis, 8:536–537
Synthetic DNA, mutagenesis by, 12:518
Synthetic dyes, 9:238, 239
Synthetic elastomers, 21:759, 9:550–567
age-resistant, 9:559–560
characteristics, 9:551t
compounding and vulcanization, 9:554–555
defined, 9:550–552
general-purpose, 9:555–559
liquid rubber technology, 9:563–566
solvent-resistant, 9:560–562
temperature effect on polymer properties, 9:552–554
temperature-resistant, 9:562–563
Synthetic esters, 10:499
Synthetic ester waxes, 26:220
detergent systems used in scouring of raw, 8:413t
Synthetic fiber blends, dyeing, 9:203–204
bleaching, 4:72
titanium dioxide in, 25:30
Synthetic fibers, 1:693
See also Manufactured fibers
advent of, 11:590
crimping, 20:16
economic aspects of, 11:176
future of, 11:280–281
hydrocarbon use in, 13:689
spinning of, 24:617–618
Synthetic fillers, 11:314–316
for rubber, 21:778–781
Synthetic fragrance materials, 18:372–379
Synthetic fuels, 12:431
in advanced cracking techniques, 20:778
Synthetic fuel technology, solvent extraction in, 10:786
Synthetic fused silica, 22:413–415
Synthetic graphite, 4:735
Synthetic gums, 13:63t
Synthetic heme, 4:114
Synthetic heparin, 4:96–97
Synthetic herbicides, 13:284
Synthetic insecticides, 14:347
Synthetic insoluble silicates, preparation and applications of, 22:474–475
Synthetic iron oxides, 19:398–402
Synthetic lactic acid, 14:124
Synthetic latex manufacture, 14:712–723
basic components of, 14:715–720
process modeling in, 14:722
Synthetic latex products, in paper coating, 18:124–125
Synthetic latices, 14:707
Synthetic linalool, 24:501
Synthetic lubricants, 13:687–688
Synthetic lubricating oil base stocks, 15:215
Synthetic lubricating oils, higher olefin polymers in, 20:432
Synthetic macrocyclic compounds
chelating agents, 5:713t
Synthetic manganese carbonate, 15:573
Synthetic manganese dioxides, 15:586–588
Synthetic marble, 16:283
Synthetic materials, as perfume ingredients, 18:354
Synthetic metalworking fluids, 15:240, 1:22
Synthetic/modified drying oils, 9:148–152
Synthetic natural gas (SNG) from coal gasification, 6:772, 776–777, 829
Synthetic nerolidol, 24:547
Synthetic oligonucleotides, 17:621
Synthetic organic chemicals industry, 24:253–254
Synthetic organic chemistry application of flash vacuum pyrolysis in, 21:141–154
supercritical water reactions in, 24:16
Synthetic organic chemicals economic evaluation of, 24:253–279
oil and petroleum refining and, 24:254
Synthetic Organic Chemical Manufacturers Associations (SOCMA), 21:580
Synthetic organic fibers, 24:614
Synthetic organic insecticides, 14:339
Synthetic organic pesticides, economic aspects of, 18:532
Synthetic organic polymers, manufactured fibers based on, 24:616–618
Synthetic polyamide fibers, dyeing, 9:188–191, 469–470
Synthetic polyisoprene, 9:559
Synthetic polymer architectures, 26:786
Synthetic polymeric micelles, 20:482
Synthetic polymers global production of, 20:373
as flocculating agents, 11:628
Synthetic polypeptides, 15:109, 20:450
Synthetic precipitation leachate procedure, 25:868–869
Synthetic procedures families of, 26:508
Synthetic products, sulfur use in, 23:591
Synthetic pulps, 18:96
Synthetic pyridines, 21:116, 118
Synthetic receptors, 3:808–810
Synthetic research in the fragrance industry, 18:381–383
safety and environmental factors in, 18:382–383
Synthetic resins, as graphite filler materials, 12:724
Synthetic rubber(s), 1:693, 21:761. See Ethylene–propylene polymers. See also Butyl rubber
acetylene-derived sources, 1:228
synthesis of first butyl rubber after disruption of natural rubber supply in WW II, 4:433
Synthetic rubber consumption, 9:556t
Synthetic sequences, microwaves in, 16:549–552
Synthetic silica, 22:380
Synthetic sodium nitrate, 22:843
processing of, 22:848–849
Synthetic strategy, in large-scale pharmaceutical synthesis, 18:723–726
Synthetic suture materials, 24:205–206
Synthetic sweeteners, 12:38. See also Saccharin
Synthetic tanning agents (syntans), 9:190
Synthetic transporter, 24:58
Synthetic water-soluble polymers, 20:441–443
Synthetic waxes, 26:218–221
Synthetic zeolite powders, agglomeration of, 16:834–835
Synthetic zeolites, 16:829
hydrogel processes for preparing, 16:831–833
structure of, 16:817–818
uses for, 16:835
Synthol process, 6:82, 778, 8629
Synthons, 24:40
chiral, 11:5
Syripts, 4:715
composition of, 23:443t
high maltose, 23:486
Syscor molecular formula and structure, 5:129t
System 80+ reactor, 17:595
Systematic generation, 22:298
Systematic nomenclature, 17:394
Systematic sampling, 26:1018
System boundaries, in life cycle assessment, 14:810–811
System energy, changes in, 24:646
System expansion, in life cycle assessment, 14:815
System failure, probability of, 13:167
System flow diagram, in life cycle assessment, 14:811–813
Systemic infections, sulfonamides for, 23:498–499
Systemic poisons, 21:836
Systemic toxicity, 25:202–203
System-level modeling for reliability, 26:990
Systems
  reliability of, 26:982
  reliability modeling of, 26:986–990
  reliability standards for, 26:993
Systems for Nuclear Auxiliary Power (SNAP), 17:592
Systems biology, 15:668, 20:833
Systolic blood pressure, 5:108
Szaibelyite (ascharite), 4:133t, 243t
Szent-Györgyi, Albert, 25:746, 748
T1R family of taste receptors, 24:248
T90, 24:442
  mathematical definition of, 24:446
TA alcohols, 2:8t
Taber abraser wear test, 9:713–714
Tabersonine, 2:98
Table of Isotopes, 24:754
Table representation, in chemoinformatics, 6:3–6
Table wines, 26:300
  fermentation of, 26:313
  higher-sweetness, 26:315
Tablet press drug dosage form, 18:705–706
Tabtoxin, 13:299
Tabular alumina, 2:411, 414, 21:489
  uses of, 2:414–415
Tabular particle size measurement, 18:136–137
Tabular photographic crystals, 19:183–184
Tabun, 5:818–819, 820
Tachyarrhythmias, 3:711
Tachycardia, 5:87, 88, 108
Tachydotar
  molecular formula and structure, 5:95t
Tachydrite, 5:785t
Tachyhydrite, 5:785t
Tacke, Ida, 21:681
Tackifier resins, 22:43
Tackifiers, 25:582
Tacosal
  molecular formula and structure, 5:91t
Tacrine, 2:817–818
Tactic polystyrenes, 23:365
Tadalafil
  molecular formula and structure, 5:182t
  Tafel kinetics, 9:612
  Taffy process, 10:359–361, 387
Taft number, 21:657
Tagamet, 6:73
TAGAT D-Tagatose, 24:245
Tagatose, 12:43
Taguchi approach, 8:399–400
  amount of coverage in experimental design texts compared, 8:395t
Taguchi gas sensors, 22:271–272
Taguchi orthogonal arrays commercial experimental design software compared, 8:398t
Tail gas
  processing, 23:614
  scrubbers, 23:770
  sulfur species, reduction to H2S, 23:617–618
treatment, in an organic solvent, 23:618
“Tailing,” 9:207
Tailings dam construction, 16:662
Tailings disposal, in minerals recovery and processing, 16:661–663
Tailings ponds, 16:662–663
Tailored polymeric membranes, 18:511
Taiwan
  aquaculture production, 3:189t
  piezoelectric ceramics research, 1:708
Takadiastase, 10:251, 11:8
Takahax process, 23:633
Takamine, Jokichi, 11:8
Takasago l-menthol process, 24:516–517
Takayama crystal test, 12:102
Takehara Type T-K-K crimper, 19:755
Take-up, of olefin fibers, 11:236–237
Talc, 5:640
  asbestos substitute, 3:314t
  as filler, 11:312
  hardness in various scales, 1:3t
  performance criteria in cosmetic use, 7:860t
  pigment used in makeups, 7:836t
  powder used in cosmetics, 7:841t
  in release agents, 21:602
  as a rubber filler, 21:778
Talc perfumes, 18:364
Talin, 24:242
Tall oil
  alkali soaps of
  in defoamer formulations, 8:237–238
  emulsifiers, detergents, and dispersants, 8:710t
  fatty acid composition, 5:56t
  stabilization, 14:370
Tall oil fatty acids (TOFA), 9:143–144
Tallow
  fatty acid composition, 5:56t
  feedstock for higher aliphatic alcohols, 2:28t
Tallowalkylamines, 2:519
  melting point, 2:521t
Tallow, in soap making, 22:732, 735, 742
Tallow oil
  fatty acid composition, 2:519t
Talmadge and Fitch procedure, 22:57, 59
Talo phosphatation, 23:452
D-Talose, 4:698
T-aluminum–copper–magnesium alloy, 2:318–320
T-aluminum–magnesium–zinc alloy, 2:320t
Tambocor
  molecular formula and structure, 5:92t
Tamed Grignard reagents, 25:107
Tamman temperature, 5:272
Tamoxifen, 2:825
Tamper-evident packaging, 18:26, 27–28
Tamper-resistant packaging regulations, 24:296–298
Tamper-resistant packaging forms, examples of, 18:26t
Tanapox, 3:136
Ta–Nb raw materials, processing of, 24:320. See also Niobium (Nb);
  Tantalum entries
Tandem mass spectrometry, 15:664–665, 667, 668
  archaeological materials, 5:743
Tandem reaction sequence, in quinone chemistry, 21:250
Tandem scanning microscope (TSM), 16:484
Tangential velocity, in hydrocyclones, 22:285
Tangerines
  citric acid in, 6:632t
Tanguis cotton, 8:2
Tanimoto coefficient
  diversity searches using, 6:16
  similarity searches using, 6:8
Tank(s), 24:280–313
  breakage, 24:306
  capacities, 24:281
  car capacities, 18:5
  cells, 9:664
  classification of, 24:288
components of, 24:288–296
  corrosion protection coatings, 7:204–205
cryogenic, 24:299–301
design considerations for, 24:303
deterse systems for, 8:413t
electroplating, 9:759. See also Plating
tanks
  engineering considerations for,
  24:296–303
  fixed-roof, 24:288–289
  flash point and, 24:285
  floating-roof, 24:289–292
  heated, 24:301–303
  internal and external pressure of, 24:287
  materials of construction for, 24:298–299
  miscellaneous properties related to,
  24:287
  pressure and, 24:285–287
  radioactive waste storage in, 25:855.
  See also Imhoff tank; Septic tanks
  regulations related to, 24:304–305
  required component thicknesses for,
  24:296–298
  selection criteria for, 24:299, 300
  small, 24:296
  special engineering considerations for,
  24:299–303
  specific gravity and, 24:282–283
temperature and, 24:283
  vapor pressure and boiling point in,
  24:284
Tank bottoms, 24:292–296
  comparisons of, 24:295t
  designs for, 24:294
  fabrication of, 24:297
Tank facilities, spills and leaks from,
  24:305–312
Tank liners, in leak detection, 24:311–312
Tank roofs, fabrication of, 24:298
Tank roof types, comparisons of,
  24:290–291t
Tank scales, 26:244, 246
  designs for, 26:252–260
  feeding equipment for, 26:258
Tank shells, fabrication of, 24:297–298
Tank specifications, for wet drum ore concentrator, 15:448
Tank through-flow classifier, 22:289, 290
Tank turnovers method, 16:688
Tank type reactor, 17:594
Tanker truck hydrogen delivery, 13:853
Tannate drug complexation, 18:710
Tannic acid
in cocoa shell from roasted beans, 6:357t
Tanning, 9:225. See Leather tanning agents, 9:189–190
Tannins
in cocoa shell from roasted beans, 6:357t
Tantalic acid, 24:335
Tantalite, 24:316, 319
concentrates, 24:331
Tantalo-columbites, processing, 17:137
Tantalo-niobates, 17:134
Tantalum (Ta), 24:313–338. See also Tantalum compounds
anodic oxide films on, 24:327–330
chemical vapor deposition precursor, 5:805t
corrosion of, 24:330
corrosion resistance of, 23:785, 13:826
economic aspects of, 24:331–333
effect on stainless steel corrosion resistance, 7:809
enrichment of, 24:319t
imido alkylidene complexes of, 26:927, 17:133
health and safety factors related to, 24:333–334
market size for, 24:331
occurrence of, 24:315–317
parts and biomedical devices fabricated from, 24:327
physical and chemical properties of, 24:314–315
post-reduction processing of, 24:324–325
processing of, 24:317–321
production of, 24:321–325
separation from niobium, 24:319–321
in superconducting devices, 23:828–829
for superconducting tunnel junction, 23:829
supply of, 24:317
in titanium alloys, 24:856
Tantalum10% tungsten alloys, 25:375
Tantalum capacitors, 24:314, 331–333
advantages of, 24:332
Tantalum carbide (2:1), 4:649t, 24:335,
4:647, 649t, 681–682
cemented, 4:655–656
as industrial hard carbide, 4:674
lattice, 4:652
physical properties of, 4:679t
preparation, 4:675
quality control methods, 4:692–693
solid solution for steel machining, 4:663
solid solutions with other carbides, 4:686–689
stoichiometry, 4:651
Tantalum compounds, 24:321–322,
334–335
hazards of, 24:335
Tantalum fluoroborate hydrate, 4:157t,
158, 159
Tantalum halides, 24:334–335
Tantalum hydride, 13:627
Tantalum junctions, 23:870–871
Tantalum metal, 24:314
extraction from compounds, 24:322–325
uses of, 24:325–327
Tantalum metal dust, exposure to, 24:334
Tantalum minerals, chemical compositions of, 24:315t. See also Tantalum ores
Tantalum-Niobium International Study Center (TIC), 24:331
Tantalum nitrides, 24:335
Tantalum ores, 24:316. See also Tantalum minerals
Tantalum oxide film, 24:314
Tantalum oxides, 24:322, 334
Tantalum pentachloride, 24:335
Tantalum pentfluoride, 24:334–335
Tantalum pentoxide, electrochemical reduction of, 24:322
Tantalum powder, 24:323, 324–325
capacitor-grade, 24:326
safety of, 24:333–334
Tantalum products, world shipments of, 24:331t
Tantalum reserves, 24:316–317
Tantalum wire, 24:326–327
Tape, metal plating for, 17:834
Tape-automated bonding (TAB), 17:823,
824, 833–836
Tape casting
ceramics processing, 5:652–653
Tape-casting methods, 12:222
Tape joint compounds
palygorskite/sepiolite application, 6:700t, 701
smectites application, 6:697t
Tape material, 17:834
Tapered aeration
in biological waste treatment, 25:828
Tapered module design, 15:835
Tapholes, blast furnace, 14:505–507, 509
Taphonomy, 5:752
Tapioca/cassava starch, 4:724t
“Tapping mode,” in atomic force microscopy, 17:63
Tapping mode AFM, 24:84
Tapping mode atomic force microscopy (TMAFM), 14:465, 16:501
Taq polymerase, 12:513
Taquidil
molecular formula and structure, 5:91t
Tar
from coal gasification, 6:774
defined, 6:829
Tarapacaite, 6:471t
Tar-bonded refractories, 21:503
Target
factor analysis, 6:52–53
flowmeters, 11:663
TARGET software, 18:250
Target temperature, in heat exchange, 13:189
Targeted gene deletions
conditional, 12:460–462
plant wounding, 13:349
production of, 12:459–460
Targeting software, 13:219–221
Tariff rate quota (TRQ) sugar, 23:466–469
Tariffs, magnesium, 15:347
Tartric acid, 5:34t
Tarka
molecular formula and structure, 5:151t
Tarnish, silver sulfide as, 22:673–674
Tarragon, 23:171
Tartaric acid, 12:45–46
in dental cements, 8:282
molecular formula, 5:712t
(S,S)-Tartaric anhydride chiral derivatizing reagent, 6:76t
Tartrazine, 9:389
Tartrazine Yellow
pigment for plastics, 7:366t
Task direction, 15:463–464
Taslan texturing, 19:753
Taste
control in municipal water treatments, 26:123–124, 11:564–569. See also Flavors
generalizations about, 11:566
types of, 11:564–565
variation in, 11:565
Taste analysis
of water, 26:36
Taste buds, 11:565
Taste perceptions, 11:510–511
Taste receptors, discovery of, 24:248
Taste sensitivity, magnitude of, 11:566
Taste specification
for vanillin, 25:548–549
Taste substances
analysis of, 11:521–524
nonvolatile compounds as, 11:566
selection of, 11:523–524
Taste tests, of flavor materials, 11:566t
Tasters, expert, 11:515
“Taster groups,” differences in, 11:515
TATB, 10:736–737
Tatoray process, 3:608
Taurine, in pet foods, 10:856
Tautomerism, 9:247–250, 254
azo dye, 9:365–366
Tax and Trade Bureau (TTB), 26:328, 329, 26:330
Taxanes, 24:553–554
Taxes, plant location and, 19:530
Tax-Free Industrial and Denatured Alcohol Act of 1906, 10:553
Taxol, 24:553
Taxotere, 24:554
Taylor antifoam, commercial defoamer, 8:241t
Taylor instability, 11:763
Taylor number, 11:747, 23:190
Taylor System, 21:171
Tazarotene, 25:789
Tazettine, 2:87
TBCCO films, 23:872
TBTS, 2:550t
TCCA, 13:115
TCISOPOE 99mTc isotope, uses for, 21:319. See also Technetium (Tc)
T-curve behavior
ceramics, 5:620
TD50 dose, 25:234–235. See also Threshold dose
tDF drum filter, 11:377–378
TD resins, 22:586, 588–589
applications of, 22:589
Tea, 2:108, 6:366
TEA-ABIETOYL HYDROLYZED COLLAGEN 921
TEA-ABIETOYL HYDROLYZED COLLAGEN
TEA-lauryl sulfate
cosmetic surfactant, 7:834t
Teams, Six-Sigma, 21:174
TEA-oleyl sarcosinate
cosmetic surfactant, 7:834t
Tearing resistance, of paper, 18:101
Tear resistance, of higher olefin polymers, 20:429
Tears
citric acid in, 6:632t
TEA salicylate
cosmetic uv absorber, 7:846t
Tebufenozide, 14:345
Tebuthiuron, 13:324
Tech mining, 24:362
Technetium (Tc), 21:681. See also 99mTc isotope
Technetium carbonyl, 16:66
Technical art history, 11:398
Technical Association of the Pulp and Paper Industry (TAPPI), 21:17
Technical enzymes, 10:310
Technical-grade active ingredient analysis, 18:544
Technical-grade active ingredients (TGAIs), 18:544, 545
Technical grade sodium nitrite, 22:856, 857t
Technical journals, 24:347
Technical service, 24:338–351
development process and, 24:348
focus of, 24:339
functions of, 24:341–347
future of, 24:350
objective of, 24:338–339
spectrum of, 24:340–341
technology and, 24:349–350
troubleshooting aspect of, 24:348
Technical service organizations, structure of, 24:344–345
Technical service personnel
participation in trade and professional organizations, 24:347
specialized training for, 24:346
Technical service professionals, 24:342
training by, 24:344
Technical textiles, 24:623–624
Techniques for Approximating the International Temperature Scale of 1990, 24:450
Technologic data, growth of, 21:612–613
Technology(ies)
differences among, 24:394
extending resources to, 21:616–617
factors affecting the price of, 24:364–365
fast-moving frontiers of, 21:613
immunoassay, 14:138–140
microfluidics, 26:959
role in technical service, 24:349–350
trajectory, 21:623, 628
transportation, 25:344
Technology strategy, designing, 21:610, 622–623
Technology transfer, 24:351–403
analysis and negotiation procedures for, 24:363–366
background rights and copyrights in, 24:377–378
barriers to collaboration in, 24:366–372
benefits of, 24:393
best practices and exemplars in, 24:380–391
compensation in, 24:374–375
confidentiality in, 24:375–376
contracts in, 24:373–377
courses in, 24:392
e emergence and evolution of, 24:351–361
external interface management in, 24:366
facilities and administrative costs in, 24:376–377
future of, 24:392–395
in a global economy, 24:361
impact of, 24:360–361
intellectual property in, 24:377
licensing in, 24:378–380
managing, 24:361
negotiating agreements in, 24:372–380
organizational competency in, 24:361–362
protean nature of, 24:394
R&D organization effectiveness and, 24:359
role of colleges and universities in, 24:352–354, 359–361
role of government in, 24:357–358, 359–361
role of industry in, 24:354–357, 359–361
unlocking the benefits of, 24:362
using to invent, develop, and extract value, 24:361–366
Technology transfer offices, 24:381–382
Technology transfer opportunities, maximizing, 24:362
Technology transfer partnerships, models for, 24:390–391
Technology transfer professionals role in collaboration, 24:391–392
skills required for, 24:392
Technology trends in vinyl chloride manufacture, 25:645–647
Technology value, models for determining, 24:363–366
Technora fiber, 13:376–377
TechStreet technical information superstore, 15:763
Tecnoflon, 7:641
Tecmanine, 2:101
Tectosilicates, 22:453t
Tedisamil, 5:106
Tedlar PVF film, 20:592
Teflon carbon monoxide compatibility with, 5:4t, 10:219. See also PTFE as an embedding material, 10:8, 18:288. See also Polytetrafluoroethylene (PTFE), 9:697
Teflon AF applications of, 18:342
economic aspects of, 18:341–342
fabrication of, 18:340–341
health and safety factors related to, 18:342
Teflon AF-1600, properties of, 18:341t
Teflon AF-2400, 18:341t
Teflon AF copolymers, properties of, 18:340. See also Tetrafluoroethylene–perfluorodioxole copolymers
Teflon FEP, 7:641
Teflon FEP fluorocarbon resin, properties of, 18:309t
Teflon HP Plus copolymers, 18:331
in lotus effect surfaces, 22:117
Teflon PFA. See also Tetrafluoroethylene–perfluorovinyl ether applications of, 18:338–339
chemical properties of, 18:332–333
economic aspects of, 18:338
electrical properties of, 18:334
health and safety factors related to, 18:338
heat aging of, 18:333–334
mechanical properties of, 18:331–332
properties of, 18:331–335
Teflon PFA 350, 18:336, 7:641
applications of, 18:338
Teflon PFA beads, rotocasting, 18:337–338
Teflon PFA film, optical properties and radiation effects for, 18:335
Teflon PFA fluorocarbon resin, thrust-bearing wear-test results for, 18:333t
Teflon PFA resins cryogenic properties of, 18:333t
extrusion of, 18:336
fabrication of, 18:335–338
thermal stability of, 18:333–334
Teflubenzuron registered for use in aquaculture in Europe, 3:220t
Teflurane, 4:359t
Tefzel applications for, 18:327–328
health and safety factors related to, 18:328–329
properties of, 18:320t
resistance to chemicals, 18:323–324t
water absorption of, 18:324
Teichoic acids, 4:706
Teicoplanin, 3:28
chirobiotic phase, 6:90
bacterial resistance mechanisms, 3:32t
Teijinconex, 19:720, 727
Tekkosha process, 22:772–773
Telechelic condensation, monodisperse model networks and, 22:570
Telechelic polyisobutlenes, synthesis of, 14:269
Telechelic polymers, 14:252
Telecommunication links, with fiber-optic smart structures, 11:157–158
Telecommunications, ferrites in, 11:75–77
Teledium, 24:426
Telephone interviewing, 15:633
Telescopes, vitreous silica in, 22:444
Telinite, 6:707t
Telithromycin, 15:287
Tellerette packing, 1:28
Telluraboranes, 4:204
Tellurate(IV) glasses, semiconductivity in, 12:587
soluble, 24:416
Tellurium effect on copper resistivity, 7:676t
Tellurium (IV), 24:414
oxidation of, 24:415
Tellurium (Te), 24:404–433. See also
HgCdTe photodiodes; Tellurium compounds
as an additive to magnesium, 24:427
analytical methods for, 24:414–416
catalyst poison, 5:257t
chemical properties of, 24:407–408
commercial products from, 24:411
catalyst poison, 5:257t
determination of trace amounts of,
24:416
economic aspects of, 24:411–413
electrolysis conditions for recovery of,
24:410t
environmental concerns and recycling
for, 24:417
extraction of, 24:409
health factors related to, 22:214
health and safety factors related to,
24:416–417
industrial precautions for handling,
24:416–417
isotopes of, 24:405
in lead alloys, 14:777–778. See also
Lead–tellurium alloys
main uses for, 24:412
manufacture of, 24:408–411
minerals containing, 24:404–405
physical properties of, 24:405–407
purification of, 22:85–86, 24:411
reactions of, 24:407–408
recovery of, 24:408–411
selenium recovery and, 22:79, 81, 82,
85
sodium reactions with, 22:765
specifications and grades of, 24:414t
thermal properties of, 24:406–407
U.S. imports for consumption of,
24:413t
uses for, 24:422–428
world production of, 24:412
Tellurium-bearing pitch copper wrought
alloy
mechanical properties, 7:678t
Tellurium chlorides, 24:427
Tellurium compounds, 24:416
chemical relations of, 24:418
inorganic, 24:417–422
isolated organic, 24:423t
organic, 24:422
Tellurium-containing donors, synthesis
and manufacture of, 22:212
Tellurium–copper alloys, 24:425–426
Tellurium crystals, 24:405–406
Tellurium decafluoride, 24:419
Tellurium dibromide, 24:420
Tellurium dichloride, 24:419–420
Tellurium diethylthiocarbamate, 24:411
Tellurium dimethylthiocarbamate, 24:428
Tellurium dioxide, 24:407–408, 409, 411,
420, 428
in selenium recovery, 22:81–82
Tellurium halides, 24:419–420
Tellurium hexafluoride, 24:419
Tellurium lead, 24:426
Tellurium–lead alloys, 24:426
Tellurium-mediated radical polymerization
(TERP), 20:442, 444
Tellurium metal, 24:409
Tellurium nitrate, 24:422
Tellurium nitride, 24:419
Tellurium oxides, 24:420–421
Tellurium oxychlorides, 24:420
Tellurium oxydibromide, 24:420
Tellurium perchlorate, 24:422
Tellurium pseudohalides, 24:422
Tellurium selenides, 24:419
Tellurium sulfate, 24:422
Tellurium sulfide, 24:419
Tellurium tetrabromide, 24:420
physical properties of, 4:326
Tellurium tetrachloride, 24:420
Tellurium tetrafluoride, 24:419
Tellurium tetraiodide, 24:420
Tellurium trioxide, 24:421
Tellurous acid, 24:86
Telomeres, 17:608
Telo-inertinite, 6:707t
Telomer formation, 11:865
Telomerization, 2:261
butadiene, 4:374–375
TEM00 mode, 14:683. See also Gaussian
mode (TEM00)
Temafloxacin, 21:224
Temelastine, 4:359t
Temper
alloy copper alloys, 7:693
copper wrought alloys, 7:722, 723t
Temperature-cycle testing, of embedding material, 10:10
Temperature-dependent enthalpy changes
effect on maximum temperature in
macroporous catalysts, 25:303–305
Temperature differential reduction, in
distillation columns, 10:153
Temperature error, 24:455–456
Temperature flattening, in heat pipes,
13:228
Temperature gradients
in microfluidics, 26:968
Temperature-induced gelation, 9:75
Temperature-jump method, 13:425–427
Temperature level (TL)
HSTA algorithm and, 26:1031–1032
Temperature limitations, of shape-memory
alloys, 22:345
Temperature measurement(s), 24:433–
467, 15:469, 11:783–784
of critical current density, 23:847–848
fixed-point thermometer calibration, 
24:440–444
industrial platinum resistance
thermometry, 24:447–450
industrial radiation thermometry, 
24:455–458
international temperature scales, 
24:436
ITS-90 platinum resistance thermometer
range, 24:444–447
ITS-90 radiation thermometer range, 
24:452–455
liquid-in-glass thermometry, 24:464–465
microwave, 16:524
platinum-group metals in, 19:632
thermistor thermometry, 24:450–452
thermocouple thermometry, 24:458–463
triple point of water, 24:439–440
Temperature performance, of HPPE fibers,
13:383
Temperature programmed desorption,
22:156
Temperature programmed gas
chromatography, 6:411–413, 421–422
Temperature properties, of polyamide
fibers, 19:744–745
Temperature ranges, resistance furnaces, 
12:287–288
Temperature reaction rate profiles, 10:86
Temperature-resistant elastomers, 
9:562–563
Temperature rising elution fractionation
(TREF), 26:537
method, 20:204
in molecular weight determination, 
19:570
Temperature-sensitive drug delivery,
9:61–62
Temperature sensitive hydrogels,
13:747
Temperature sensitive mixtures, strategic
separation schemes and, 22:311
Temperature sensors, selection and
installation of, 20:679–680
Temperature stability, of sealants, 
22:29–30
Temperature standards, 15:749
Temperature swing adsorption (TSA)
process, 13:459, 1:636–642
damage to internal structure of
adsorbent, 1:636
design, 1:656
regeneration, 1:655
Temper designations, magnesium alloy,
Tempered martensite, constituent
properties of, 23:281–282
Tempering
milk chocolate, 6:364–365
glass, 12:598
of martensite, 16:198–199
steel, 23:285–287
“Template” molecules, 16:817
Template-directed chemical reactions,
17:637–638
Template
leaching, 15:803–804
monomer, 16:795
synthesis, 24:41
Temporary setting
in wool processing, 26:387
Temporary shape, of shape-memory
polymer, 22:355–356, 357
Temporary wet-strength resins, in paper
manufacture, 18:116
Tenacity, 11:260. See also Toughness
of acrylic fibers, 11:190
of fibers, 11:183, 184
of olefin fibers, 11:226
Tenacity, 19:742
Tenase complex, 4:86–87
Tencel, 11:261, 267, 268, 269
Tendering, 9:182
Tendinopathy, induced by fluoroquinolone, 21:231
Tendonitis, 3:724–725
Tendons, 3:722–723, 724
Tenecteplase, 5:176–177
molecular formula and structure, 5:172
Tenoblock
molecular formula and structure, 5:94
Tenoretic
molecular formula and structure, 5:94, 161
Tenorite, 7:771
color, 7:331
Tenormin
molecular formula and structure, 5:94
Tensile properties
of carbon fibers, 26:739–741
definitions of, 19:742–744
fatigue strength and, 13:486
of liquid-crystal polymers, 20:84
of polyamide fibers, 19:742–744
testing of, 19:579
of wool, 26:382–383
Tensile strength, 19:743, 5:615. See also Strength
of absorbable sutures, 24:219
of acrylic fibers, 11:190
catalyst supports, 5:282–285
of olefin fibers, 11:225–227
of sutures, 24:214
of vitreous silica, 22:428–429
Tensile strength equations, 26:778–779
Tensile strengthening, in high temperature alloys, 13:495–500
Tensile stress, 5:614
of shape-memory polymers, 22:360
Tensile tester, 21:744
Tensiometer, 12:840–841
Tension weighing systems, 26:253
Tensol
molecular formula and structure, 5:93
Tensor notation, 6:25
Tenotoxin, 13:300, 356, 357
Tenuate, 3:91, 92
Teprotide, 5:148
Teraheurtz spectroscopy, 23:142
Teratogenesis
as a toxic effect, 25:208–209
Teratogenic effects, of ethylene glycol, 12:655
Teratogenicity
influence of vanillin on, 25:556
Teratogenic solvents, 23:119
Teratology studies, 25:219
Terazosin, 5:160
molecular formula and structure, 5:156
Terazosin HCl
molecular formula and structure, 5:156
Terbacil, 13:324
Terbium (Tb), 14:631t, 635t
electronic configuration, 1:474
Terbuthylazine, 2:549t, 550t
Terbutryn, 13:322
Terdentate ligands, 9:395
Terephthalates, 10:514
Terephthalic acid, 10:185, 188, 20:96. See also Pure terephthalic acid (PTA)
production
manufacture of, 25:184
manufacture of polyesters from,
20:34–35
from toluene, 25:182
Terephthalic acid manufacture, platinum-group metal catalysts in, 19:622
Terephthalic acid PET bottle resin process, 20:48–50
Terephthaloyl chlorides (TCL), 19:715
polycondensation, 7:635
polymers derived from, 23:730
TERFENOL-D (terbium dysprosium iron alloy), 22:714
TERGITOL, 2:43
Term extraction and analysis software, in patent searching, 18:244
“Terminal model” theory, 19:832
Terminal activity coefficients, 8:743
Terminal lakes
brine deposits, 5:784–786
Terminal operations, 25:329
Terminal settling velocity, 22:53
Terminal velocity, 11:796–797
Termination
polymer autoxidation, 3:102, 104
Termination reactions, 14:274
Terminology
shrink-resistant, 26:390–391
Termites, 26:353

See also Tertiary alloys
Ternary aluminum alloys, 2:316–323
Ternary azeotropes, 10:476, 479, 482
Ternary compounds, nomenclature for, 17:389
Ternary heterogeneous azeotrope, 8:823
Ternary plutonium oxides, 19:689
Ternary semiconductor alloys, heterostructures and superlattices in, 22:158–160
Ternary soap–water–salt system, phase behavior of, 22:727–728
Ternary thorium oxides, 24:762
Terne steel, 14:778
Terodiline, 5:122
molecular formula and structure, 5:120t
Terpene, 24:468
Terpene aldehydes
aroma chemicals, 3:248
Terpene derivatives, production of, 18:385
Terpene resin manufacture, 24:476
Terpenes, 9:34
aroma chemicals, 3:236–241
biodegadation, 3:760, 763t
Terpenic esters
aroma chemicals, 3:235
Terpenoid(s), 18:592, 24:468–591
analysis of, 24:470
biological significance of, 24:470–474
biosynthesis of, 24:470
carotenoids, 24:557–561
coupling systems in, 24:468–470, 471
diterpenoids, 24:550–555
hemiterpenoids, 24:483
industrial significance of, 24:474
from isobutylene, acetone, and formaldehyde, 24:480
from isoprene, 24:482
from isoprenol, 24:480–482
major industrial synthetic routes to, 24:474–482
from methylbutenol and methoxypropene, 24:479–480
monoterpenoids, 24:484–541
naming of, 24:469–470
from β-pinene, 24:477–478
from γ-pinene, 24:477–478
sesquiterpenoids, 24:541–550
tail-to-tail coupling in, 24:470, 471
triterpenoids, 24:555–557
use as hormones, 24:474
volatility of, 24:473
Terpenoid chemistry, research into, 24:482
Terpenoid degradation products, 24:561–577
Terpenoid pheromones, 24:473
Terpenoid skeletons, 24:469
biosynthesis of, 24:471
Terpin hydrate, 3:231
α-Terpineol, 24:477, 509–512, 3:231
hydrogenation of, 24:512
α-Terpinyl acetate, 24:512
α-Terpinyl chlorides, 24:479
α-Terpinyl esters, 3:231
γ-Terpinene, 3:230
Terpinolene, 24:493
Terpolymers
vinyl acetate, 25:575
Terpolymers, ethylene–acrylic elastomer, 10:697
Terpolymers, solution polymerization of, 16:284–285
Terramycin
registered for use in aquaculture in Canada, 3:218t
registered for use in aquaculture in Europe, 3:220t
therapeutant for aquaculture in U.S., 3:205t, 211t
water treatment compound for aquaculture in U.S., 3:213t
Terrorism, by product tampering, 18:26
Tertiary alcohol
dispersant moieties, 8:706t
esters of, 10:485, 506
Tertiary alkyl ethers, 10:575
Tertiary alloys, as compound semiconductors, 22:144–145. See also Ternary alloys
Tertiary amine(s), 10:392, 393, 403, 405, 25:458–459, 9:477
catalytic curing reactions of, 10:411–412
commonly used, 10:412
predicted deviations from Raoult’s law based on hydrogen-bonding interactions, 8:814t
Tertiary amine accelerated polymercapton/epoxy systems, 10:410
Tertiary amine-carbonate technology, 14:122
Tertiary amine catalysts
health and safety factors related to, 25:480
Tertiary amine polymethacrylates, 20:471
tertiary-butylidemethylsilyl (TBDMS), cleavage of, 16:559, 560
Tertiary creep, 13:472
Tertiary metal phosphates, 18:457
Tertiary nitriles, 12:180
Tertiary phosphone oxides, 19:66
Tertiary phoslines, 19:64
Tertiary recycling, 21:449
of PET, 21:450
Tertiary wastewater treatment, 25:888
Tesla, 15:434
Testing, see also Nondestructive evaluation
(a) Plastic testing
automotive emission, 10:31–35
drug, 21:573–574
of dyes, 9:230–234
for ethylene oxide polymers, 10:684–686
of flavor materials, 11:582–583
flocculant, 11:638–639
of inks, 14:331
nondestructive, 17:414
of nuclear power facility safety features, 17:557
paint, 18:68–73
for reliability, 26:991–992
of sealant adhesion life, 22:31
of sealant weatherability, 22:30–31
of shape-memory polymers, 22:358–362
shrink-resistant, 26:390–391
of tamper-evident packaging effectiveness, 18:28
triple-track, 10:9–10
Testing to failure
for reliability, 26:991
Test kits
for sodium nitrite, 22:858
for swimming pools, 26:193
Test methods, 9:31
LLDPE, 20:203–205
LDPE, 20:227–230
quality assurance and, 21:166–167
for refractories, 21:511–513
in rubber compounding, 21:812–813
for spunbonded nonwoven fabrics, 17:480–482
standard, 15:747–748
for toluene, 25:175–177
in toxicology, 25:214–223
for vanadium compounds, 25:540–541
Test organisms
in toxicology, 25:227
Testosterone, 13:3
Tests, of antioxidant efficiency, 21:789–790
Test temperatures, in fatigue testing,
13:487–488
Tetanus vaccine, 25:488–490
Tetra(dimethylamino)ethylene, 22:720
1,1,2,2-Tetrachloroethane
production from acetylene, 1:180
1,2,3,4-Tetrachlorobenzene
Antoine constants, 6:215t
physical and thermodynamic properties, 6:214t
toxicity, 6:218t
1,2,3,4-Tetramethyleclobutadiene
dichloride, 17:115
1,2,3,5-Tetrachlorobenzene, 6:211
physical properties, 6:213t
1,2,4,5-Tetrachlorobenzene
Antoine constants, 6:215t
physical and thermodynamic properties, 6:214t
toxicity, 6:218t
1,2,5,6-Tetrahydrobenzaldehyde (THBA), 1:278, 278t
1,2,5,6-Tetrachlorotoluene, 23:713
1,4,5,8-Tetrasubstituted anthraquinones, 9:307
1-Tetradecanol
physical properties of, 2:3t
2,2',5,5'-Tetramethylbismole, 4:30
2,2,4,6-Tetraphenylidihydro-1,3,5-triazine
piezochromic material, 6:609
2,2,6,6-Tetramethylpiperidinoxy (TEMPO), 7:621–622
2,2,6,6-Tetramethylpiperidine, 3:109
2,2,6,6-Tetramethyl-4-piperidinone
production from acetone, 1:163
2,3,4,4-Tetrachloronaphthalene-1(4H)-one
(βTCDHN)
photochromic material, 6:587
2,3,4,5-Tetrachlorotoluene, 6:345
physical properties, 6:344t
2,3,4,6-Tetrachlorotoluene, 6:345
physical properties, 6:344t
2,3,4,6-Tetra-O-acetyl-α-D-glucopyranosyl bromide, 4:705

2,3,4,6-Tetra-O-acetyl-β-D-glucopyranosyl isothiocyanate chiral derivatizing reagent, 6:76t

2,3,5,6-Tetrachlorotoluene, 6:345

Physical properties, 6:344t

2,3,7,8-Tetrachlorodibenzofuran (TCDF) toxicity of, 25:648

2,4,4,6-Tetrabromo-2,5-cyclohexadien-1-one, 4:302

2,4,4,6-Tetramethyl-m-dioxane production from acetaldehyde, 1:106

2,4,4,6-Tetraphenyldihydro-1,4-dihydropyridine piezochromic material, 6:609

2,4,6,8-Tetrathiomorphorinopyrimido[5,4-d]pyrimidine (TMP) chemiluminescence reagent, 5:853–854

2,4,7,9-Tetramethyl-5-decyno-4,7-diol, 1:249t effective surfactant for coatings, 7:124

2,4,7,9-Tetramethyl-5-decyno-4,7-diol in defoamer formulations, 8:238

2,4,8,10-Tetraoxaspiro[5,5]undecane, 2:50

2,5,3,4-Tetrachlorobiphenyl, 3:776

3,3',4,4'-Tetraaminobiphenyl (TAB), 13:380

3a,6,6,9a-Tetramethyldodecahydronaphtho[2,1-b]furan, 24:572–573 production from sclareol, 24:574

Tetra-4-tolytdisbismuthine, 4:30

Tetraacetyl ethylene diamine (TAED), 9:369–370, 4:66, 70 as peracid precursor system, 4:59–61

Tetraalkoxides, 25:83

Tetraalkyllead process, 9:674

Tetraalkyl thiuram disulfides, 19:834


Tetraallyltitanate, 25:73
Tetrabromophthalic anhydride
physical properties of, 4:357t
Tetrabromophthalic anhydride/diol
physical properties of, 4:357t
Tetrabutylammonium bromide (TBAB),
2:550t, 16:557–558, 566
Tetrabutylphosphonium hydroxide, 22:573
Tetraphytin, toxicity of, 24:831
Tetraphyturea, 2:550t
Tetracalcium aluminate,
7-hydrate, 5:479t
13-hydrate, 5:479t
19-hydrate, 5:479t
Tetracalcium aluminate hydrate,
5:477t
Tetracalcium aluminate monosulfate,
10,8, x-hydrate, 5:479t
12-hydrate, 5:479t
14-hydrate, 5:479t
16-hydrate, 5:479t
Tetracalcium aluminoferrite
phase in Portland cement clinker, 5:472t
Tetracalcium phosphate
in dental cements, 8:281, 283
Tetracalcium trialuminatesulfate
phase in Portland cement clinker, 5:472t
Tetracarbonato uranium salts, 25:432
Tetracarbonylhydridocobalt, 7:233
Tetracarbonylnickel(0), 7:578t
Tetracene
photochromic material, 6:587
Tetracesium oxide, 5:700
Tetrachloro- reduction process, in
titanium manufacture, 24:851
Tetrachloroethene, see Perchloroethylene
chlorocarbon/chlorohydrocarbon of
industrial importance, 6:227t
in integrated manufacturing process,
6:237t
Tetrachloroethylene (PCE), 6:269
azeotropic mixtures with butyl alcohols,
4:395t
bioeremediaon substrate, 3:770–772
economic aspects, 6:271
environmental concerns, 6:273
health and safety factors, 6:272–273
in integrated manufacturing process,
6:237t
manufacture, 6:270–271
physical and chemical properties, 6:267–269, 268t
production from acetylene, 1:220
shipping and storage, 6:271
in soil and ground water treatment,
25:834
specifications, 6:271–272
uses, 6:273
Tetrachloroferrate compounds
in vinyl chloride manufacture, 25:634
Tetrachloroglyceruril, 4:54, 13:110
Tetrachloroisindolinone pigments, 19:446
Tetrachloromethane
chlorocarbon/chlorohydrocarbon of
industrial importance, 6:227t
ozone depleting potential, 1:809t
Tetrachloronitrobenzene, 13:45t, 57
Tetrachlorophthalic acid (TCPA), 19:332
Tetrachlorophthalic anhydride (TCPA),
10:406, 407t
Tetrachlorophthalic
end use of chlorine, 6:135t
Tetrachlorosilane
azeotrope with acrylonitrile, 1:399t
Tetrachlorotoluenes, 6:345
physical properties of, 6:344t
Tetrachlorphthalic anhydride (TCPA),
11:479
Tetrachromatic sources, for white LEDs,
14:862
Tetracobalt dodecacarbonyl, 16:63
Tetracosanoic acid
physical properties, 5:30t, 5:32t
Tetracyanoethylene, toxicity of, 22:214
Tetracyanoquinodimethane (TCNQ)
electrochemistry of, 22:212–213
as semiconducting salt, 22:204, 207, 208
as single-stack acceptor molecule,
22:210
synthesis and manufacture of,
22:212–213
Tetracyclines
bacterial resistance mechanisms, 3:32t
registered for use in aquaculture in
Japan, 3:221t
Tetracycline derivatives, 24:593
Tetracycline resistance determinants,
24:606t
nomenclature of, 24:607
Tetracyclines, 24:592–612, 3:26, 30
analysis of, 24:594
antibacterial activity of, 24:595
binding domain of, 24:601–602
biological aspects of, 24:601–603
biological considerations related to,
24:600–603
biosynthesis of, 24:600–601
as chelating agents, 24:594
clinical uses for, 24:604–605
conformations and hydrogen bonding of, 24:599
economic aspects of, 24:603–604
electronic structure and biological activity in, 24:599–600
manufacture of, 24:603
molecule of, 24:594
novel, 24:597–598
oxidation of, 24:596
physical properties of, 24:592–594
resistance to, 24:604, 605–607
semisynthetic modifications of, 24:594–598
structure–activity correlations in, 24:599–300
total synthesis of, 24:600
uses for, 24:604–607
veterinary uses for, 24:605
Tetracyclododecene–ethylene copolymers, 20:433
properties of, 20:422
Tetracyclopentadiene, 8:224t
Tetradecabromodiphenoxylenebenzene, 11:467
physical properties of, 4:355t
Tetradecanoic acid
physical properties, 5:29t
n-Tetradecanol
toxicological properties of, 2:7t
cis-9-Tetradecaenoic acid
physical properties, 5:31t
Tetratedentate chelants, 5:709
Tetraethoxysilane, monodisperse model networks and, 22:570
cis-1,2,3,6-Tetrahydrophthalic anhydride, 4:372
Tetraethylammonium (TEA) silicates, 22:452
Tetraethylammonium bromide, 2:549t
Tetraethylidismuthine, 4:30
Tetraethylene glycol, 12:654, 655, 660, 10:665
Tetraethylene glycol dimethacrylate (TEGDMA), 13:733, 734
Tetraethylene glycol bis(allyl carbonate) properties of, 2:253t
Tetraethylenepentamine
physical properties, 8:486t
prices of commercial, 8:496t
typical specifications, 8:496t
Tetraethyllead (TEL), 12:391
sodium in manufacture of, 22:760, 777, 780, 1:810, 3:597, 10:53. See also
Leaded gasoline
manufacture of, 10:584, 589
production of, 10:590
Tetraethyllead toxicity, 24:175
Tetraethylorthosilicate (TEOS), in vitreous silica manufacture, 22:415
Tetraethyl orthosilicate (TEOS), 23:81–82
hydrolysis of, 23:54, 55, 61, 64
Tetraethylorthosilicate (TEOS)
silica gelation from, 1:748
Tetraethylthiuram disulfide, 2:549t
Tetraethyl titanate, 25:71
Tetrafluoride
in uranium production processes, 25:437–438
Tetrafluoroaluminates, 2:372–379
Tetrafluoroorboric acid, 4:150
Tetrafluoroethane
physical properties of, 1:781t
photooxidation of, 11:883
Tetrafluoroethylene-(TFE)-hexafluoropropylene (HFP)
copolymers, 7:641
Tetrafluoroethylene-(TFE)-perfluoropropyl vinyl ether copolymers, 7:641
Tetrafluoroethylene–perfluorovinyl ether, 18:329–339. See also Teflon PFA
copolymerization of, 18:330–331
Tetrafluoroethylene–perfluorodioxole copolymers, 18:339–342. See also Teflon AF copolymers
applications of, 18:342
economic aspects of, 18:341–342
health and safety factors related to, 18:342
monomer preparation, 18:339
synthesis of, 18:339–340
Tetrafluoroethylene (TFE)
copolymerization with hexafluoropropylene, 18:307–309
manufacture of, 18:288–290
physical properties of, 18:290t
polymerization of, 18:291
properties of, 18:289
synthesis of, 18:289
uses for, 18:289–290
Tetrafluoroethylene–ethylene copolymer
powder coatings, 7:41
Tetrafluoroethylene (TFE) materials, acid resistance of, 23:785
Tetrafluoromethane, in krypton, 17:362
Tetrafunctional reactive dyes, 9:476–477
Tetrafunctional titanates, 25:122
Tetraglycidyl methylenedianiline (MDA), 10:372–373
Tetragonal crystal system, 8:114t
Tetragonal lattice structure, of silicon, 22:482
Tetragonal pyrimidal geometry for metal coordination numbers, 7:575t
Tetragonal structure, of ferroelectric crystals, 11:95, 96
Tetragonal symmetry, 8:114t
Tetragonal zirconia polycrystals, 5:571
Tetrahedral geometry for metal coordination numbers, 7:574, 575t
Tetrahedral phase diagrams, 22:302
Tetrahedral structure silicate glasses, 22:453–454
vitreous silica, 22:408–409
Tetrahedral substrate geometry, recognition of, 16:778
Tetraheteroglycans classification by structure, 4:723t
Tetraheteroglycans, 13:64
Tetrahydroalkylanthrahydroquinones (THRAQ), 14:45
Tetrahydroborates, 4:193–197
physical properties of alkali metal, 4:194t
structural systematics, 4:179–180
Tetrahydrofolic acid polyglutamate (THF polyglutamate), 25:801
Tetrahydrofuran (THF), 12:121, 259, 268, 275, 276, 823, 14:246, 247, 10:567, 568–569, 576, 578
and acetylene demand, 1:217
azeotrope with water, 8:818
block copolymer synthesis, 7:647t
from butadiene, 4:371
in lithium cells, 3:459
polymerization of, 14:271
solubility of dispersant tails in, 8:685
solvent for anionic copolymerization, 7:626t
uses for, 10:582
Tetrahydrofuran borane, 4:186
Tetrahydrofuran trifluoroborane, 4:144t
Tetrahydrofureryl alcohol, 12:276–279
manufacture and uses of, 12:277–279
reactions of, 12:277
as a solvent, 12:278
Tetrahydrofururyl methacrylate, 12:279
Tetrahydrogeranil, 24:506
Tetrahydrogeranyl nitrile, 24:531–532
Tetrahydroisoquinolines, 21:201, 202, 204, 206, 208
Tetrahydroinalool, 3:231
Tetrahydromuguol, 24:491
Tetrahydromyrcenol, 24:488
Tetrahydronaphthalenes, 17:75t, 76
Tetrahydrophthalic anhydride (THPA), 15:487, 20:97
Tetrahydropyridines, 21:111
Tetrahydroquinolines, 21:187, 192, 198–199
Tetrahydroxyalkylethylenediamine titanate complexes, 25:95
Tetrahydroxyborate anion, 4:256–258
Tetrahydroxycuprate, 7:770
Tetrahyzmena, ribozyme from, 17:618, 619
Tetrairidium dodecacarbonyl, 16:63
Tetraisopropyl titanate, 25:92
Tetrakaiodecahedron structure, 12:8
Tetrakis(2,4-di-tert-butylyphenyl)-4,4'-biphenylenediphosphonite, 3:114
Tetrakis(2-chloroethyl) ethylenediphosphate, 11:491
Tetrakis(4-hydroxyphenyl)ethylane, 10:371
Tetrakis(8-quinolinolato)tungsten(IV) effective atomic number of noble gas, 7:590t
Tetrakis(dimethylthiocarbamato) tellurium(IV), 24:428
Tetrakis(hydroxymethyl)phosphonium hydroxide, 19:67
Tetrakis(pentafluorophenyl)borate (TPFB), in silicone network preparation, 22:568
Tetrakis-1,2,3,4-tert-butyltetrasibetane, 3:71
Tetrakisazo dye, 9:363
Tetrakis–Cp thorium complexes, 24:772
Tetrakis–Cp uranium complexes, 25:441
Tetrakisdialkylaminotitanates, 25:100
Tetrakisligand nickel(0) complexes, 17:115
Tetrakistriphenyolphosphinenickel(0), 17:115
Tetrakistriphenyolphosphinenickel(0), 17:115
Tetrakis[methylene(3,5-di-tert-butyl-4-hydroxyhydrocinnamate)methane, 3:107
Tetralin vapor, 17:76
Tetralky pyrophosphates, 19:27
4-(1,1,3,3-Tetramethylbutyl)phenol. See 4-tert-Octylphenol
Tetramethaphosphoric acid, 18:829
Tetramethylammonium tetrafluoroborate, 4:144t
Tetramethylammonium hydroxide, 22:573
control of dissolution properties in, 15:177
Tetramethylammonium ozonide, 18:417
Tetramethylammonium
triacetoxyborohydride, 13:614
Tetramethylosmium ion
present in water and food, 3:276t
Tetramethyldecyenediol
LD50 for mice, 1:253t
physical properties of, 1:250t
Tetramethyldisiloxane (TMDSO), 24:747
plasma polymerization of, 22:562
Tetramethyl distibane
thermochromic material, 6:617
Tetramethylenediamine (TEMED),
9:749–750
Tetramethylene glycol. See Butanediol
Tetramethylene sulfoxide (TMSO)
as PVDC solvent, 25:705
Tetramethylethlenediamine (TMEDA),
25:163
Tetramethyllead, sodium in manufacture
of, 22:777, 780
Tetramethylloacylatediurea
cotton cross-linking agent, 8:26
Tetramethylolmethane, 2:47
Tetramethylorthosilicate (TMOS),
polymerization of, 23:62
Tetramethylphosphonosuccinate (TMPS),
19:29
Tetramethylphosphonium chloride, 19:20
Tetramethylsuccinonitrile (TMSN), 17:241
Tetramethylthiuram disulfide (TMTD),
21:794
m-Tetramethylxylylene diisocyanate
(TMXDI), 25:463
Tetraminecopper(II) chromate
molecular formula, properties, and uses, 6:562t
Tetra-n-butyl titanate, 25:71
Tetradrine, 2:89
Tetraneopentyltitanium, 25:107, 108
Tetranitride
molecular formula and structure, 5:111t
Tetranitrol
molecular formula and structure, 5:111t
Tetranorbornyltitanium, 25:107
Tetranuclear carbonyls, structure of,
16:62–64
Tetraorganoborate anions, 13:659
Tetraorganotins, 24:810–813
chemical properties of, 24:810–811
physical properties of, 24:810t
preparation of, 24:811–813
toxicity of, 24:831
uses of, 24:813
Tetraoxane, 12:123
Tetraphenylantimony iodide, 3:77
Tetraphenylbismuth bromide, 4:33
Tetraphenylbismuth chloride, 4:33
Tetraphenylbismuthonium perchlorate,
4:33
Tetraphenylbismuthonium
tetrafluoroborate, 4:33
Tetraphenyl dibenphen-A diphosphate,
11:495
Tetraphenyl dibuthione, 4:29–30
Tetraphenylphosphonium permanganate,
15:601
Tetraphenylporphin
molecular formula, 5:712t
in “double heterostructure” OLEDs,
22:217
Tetraphenyl resorcinol diphosphate,
11:494–495
Tetrapotassium hexakiscyanoferrate
trihydrate, 14:534
Tetrapotassium peroxydiphosphate, 18:404
Tetrapotassium pyrophosphate (TKPP),
18:843
Tetrapotassium pyrophosphate, 8:416
TETRA process, 10:782, 25:169, 3:606
Tetrapyroles
chelating agents, 5:712t
Tetrasaccharides, 4:697
Tetrasilicic acid, 8:294
Tetrasodium chromate(IV), 6:535
Tetrasodium ethylenediaminetetraacetic
acid (EDTA), as soap bar additive, 22:744
Tetrasodium hexakiscyanoferrate
decahydrate, 14:535
Tetrasodium pyrophosphate, 8:415–416
emulsifiers, detergents, and dispersants, 8:710t
Tetrasodium pyrophosphate (TSPP), 18:841–842
manufacture of, 18:859
Tetrasulfur nitride, 23:654
Tetra system, 14:48–49
Tetratellurafulvalene, synthesis of, 22:212
Tetrathiafulvalene (TTF). See also
Bis(ethylenedithio)tetrathiafulvalene (BEDT-TTF)
electrochromic systems based on, 22:224–225
as semiconducting salt, 22:204, 207
as single-stack donor molecule, 22:210–211
Tetrathiafulvalene (TTF), 23:707
electrochromic material, 6:581, 581t
polymers of, 23:708–709
Tetrathiomolybdate ion, 17:22–23
Tetravalent lead, 14:783
Tetravalent manganese compounds,
15:579–592
Tetravalent tellurium. See Tellurium(IV)
Tetravalent tungsten, 25:386
Tetravalent uranium coordination complexes, 25:434
Tetrazene, 10:730
Tetrazolyl guanyltetrazene hydrate, 10:730
Tetrolic acid, 5:34t
Tetronasin, 20:131, 136
Tetryl, 10:732
Teuber reaction, 21:263
Teveten
molecular formula and structure, 5:152t
Tex, 11:182, 247
Texaco Coal Gasification process (TCGP), 6:798–799
Texaco gasification process, 13:780–781
Texaco gasifier, 6:761, 783t, 798–799, 829
Texanol, 4:461, 467
Texaphyrins, 24:56
Texas A&M University, fuel cell research, 19:627–628
Texas Permian Basin, enhanced oil recovery in, 18:615–617
sulfur deposits in, 23:570
Textile applications, sodium dithionite in, 23:676
Textile bags, 18:10
Textile bleaching, 4:44–45, 71–73
enzyme applications, 4:66–67
enzymes for effluent treatment, 4:67–69
Textile carding, 17:498–499
Textile drying, microwave technology in, 16:530
Textile dyes, 19:423
Textile Fiber Product Identification Act (TFPIA), 20:2
Textile fibers, 17:497
bleaching, 4:71–73
classification of, 24:613–614
dye affinity of, 19:759t
limiting oxygen index of, 11:194, 195t
physical characteristics of, 24:618–619
properties of, 17:498t, 19:740
total world production of, 24:614
U.S. consumption of cellulose acetate
flakes for tow, 5:428t
Textile finishing, reactive
organophosphorus compounds in, 11:498
Textile industry
electroless deposition in, 9:701–702
fibers in, 11:163–164, 165, 166
ezyme use in, 10:251–252, 301–304
process optimization in, 9:443
oxidoreductases in, 10:303–304
supercritical impregnation in, 24:20
water use in, 26:56
Textile manufacturing
cotton, 8:16–18
defoamer applications, 8:249
detersive systems for, 8:413t
Textile materials, types of, 24:619–620
Textile mill discharges, toxicity of, 9:446
Textile printing, 9:213–222
colorants for, 9:214–218
machinery for, 9:220–221
styles of, 9:218–220
Textile processing
alkanolamines from olefin oxides and
ammonia, 2:139
amine oxides, 2:473
amino acid resins, 2:637–644
fatty acid amides, 2:457
Textile production, foams in, 12:23–24
See also High performance fibers
Textiles, 24:612–626
crystal ester polymers, 1:389
cromium application, 6:559
citric acid application, 6:648
CMC applications, 5:452t
consumption, 9:155
dye fading in, 9:368
dye-induced phototendering, 9:388–389
dyeing and printing, 24:620–622
fastness tests, 9:227–230
fiber-forming polymers, 24:612–613
fiber production trends, 24:614–615
finishing, 24:622–623
heat setting of, 24:623
hydrogen peroxide bleaching of, 14:64
information sources for, 15:766
kaolin application, 6:688t
silicone treatment of, 22:592–594
smart (intelligent), 24:624–625
technical, 24:623–624
uses for, 24:612
uses of succinic acid and succinic
anhydride in, 23:429t
vinyl acetate polymers in, 25:585
Textile sizing
PVA in, 25:615–617
MPDI fibers in, 19:733–734
Textile spinning, fiber orientation in,
17:470
Textile structures, three-dimensional,
13:390–391
See also Yarn spinning technologies
Texture analysis
diffraactometers in, 26:430
with General Area Detector Diffraction
System, 26:431
Textured semiconductor surfaces, 14:847
Textured yarn, 11:178
Texture mapping technique, 10:339–341
of lyocell fibers, 11:271
Texturing
of fibers, 11:175
of olefin fibers, 11:238–239
Texturing processes
for polyester fibers, 20:18–19
in spinning continuous- filament yarns,
19:753–754
Texturing speeds, for polyester fibers, 20:19
Texturizer, 12:33
TGA analysis, of phenolic resins, 18:776
TGIC-cured powder coatings, 10:441
Thailand
aquaculture production, 3:189t
Thalidomide, 18:685
Thalitone, 5:168
molecular formula and structure, 5:161t
Thallation, 24:634
benzene, 3:603
Thallium(I) acetate, 24:630–632
Thallium(I) compounds, in organic
reactions, 24:635
Thallium(I) formate, 24:630
Thallium(I) halides, 24:632
Thallium(I) ion, 24:629
Thallium(I) nitrate, uses for, 24:636
Thallium(I) salts, 24:630, 632
Thallium(I) sulfate, uses for, 24:636
Thallium (III) compounds, in organic
reactions, 24:635–636
Thallium(III) fluoride, 24:632
Thallium(III) ion, 24:630
Thallium(III) salts, 24:632
Thallium(III) trifluoroacetate, 24:635
Thallium (Tl), 24:627–641
analytical methods for, 24:636–637
atomic properties of, 24:630t
commercial, 24:627
environmental concerns related to,
24:639
isotopes of, 24:628–629
occurrence of, 24:627
physical properties of, 24:628t
production of, 24:627–628
shipping, 24:637
toxicity of, 24:637–639
uses for, 24:628
uses in organic reactions, 24:635–636
Thallium amalgam—thallous chloride
electrode, 14:29
Thallium-based devices, 23:872
Thallium-based HTS superconductors,
23:848–850. See also Tl-based
superconductors
Thallium bromide
physical properties of, 4:329
Thallium carbonates, 24:630
Thallium carboxylates, 24:630–632
Thallium-catalyzed epoxidation process,
10:655
Thallium compounds, 24:629–635
properties of, 24:631t
Thallium dichromate, 6:538
Thallium halides, uses for, 24:636
Thallium hydrides, 24:632
Thallium hydroxides, 24:632–633
Thallium intoxication, 24:638, 639
Thallium metal, 24:627–629
Thallium nitrates, 24:633
Thallium organometallics, 24:633–635
Thallium oxides, 24:632–633
Thallium poisonings, 24:637, 638–639
Thallium stress test, 24:629
Thallium sulfates, 24:628, 633
Thaumatin, 12:43, 24:241–242
Thaumatin II, 24:242
Theaspiranes, 24:572
Thebaine, 2:89
Thenardite, 22:863, 5:785t
Thenoyltrimfluoroacetone
molecular formula, 5:712t
Theobroma cacao, 6:350
Theobromine, 2:105–106
in chocolate and cocoa, 6:366–367
in cocoa shell from roasted beans, 6:357t
content of finished chocolate products, 6:367t
content of various chocolate liquours, 6:366t
Theophylline, 2:105–106, 108
Theoretical plates
bubble tray absorbers, 1:84
capillary chromatography, 4:605
capillary electrophoresis, 4:608
Therapeutants
promising chemicals for aquaculture, 3:222–223
registered for aquaculture in U.S., 3:210,
217
U.S. aquaculture, 3:205t
Therapeutic applications, of propylene glycol, 12:668
Therapeutic gold complexes, 12:700–701
Therapeutic index, 18:252
Therapeutic pet foods, 10:849
Therapeutic products, from genetically engineered microbes, 12:480
Therapeutic proteins, 3:816
Therapeutics, supramolecular chemistry in, 24:56–57
Therapies, photochemical, 19:120–122
Thermal analyses
of wood, 26:349–351
Thermal analysis-infrared spectroscopy, 14:233–234
of phenolic resins, 18:776–777
of silicon surface chemistry, 22:373
Thermal analysis techniques
in plastics testing, 19:570–579
survey of, 19:572t
Thermal annealing, in ion implantation, 22:186–187
Thermal applications, of vitreous silica, 22:439–440
Thermal barrier coatings, 1:711–712
Thermal behavior, of polycarbonates, 19:805
Thermal blacks, 4:762, 798t
manufacture, 4:785–786
Thermal bonding, 17:475–476, 510–512
Thermal capacity rate, 13:253
Thermal−chemical decomposition of ozone, 17:770–773
Thermal chlorination, of ethane, 10:588
Thermal coefficient of expansion (TCE), 10:10
Thermal composition of PVA, 25:603–604
Thermal conductance, heat pipe, 13:227, 228
Thermal conductivity (k), 10:177
abrasives, 1:5
of artificial graphite, 12:716–717
of Co-base alloys, 13:527
of dimethylsilicone, 22:578
exponents of dimensions, 8:585t
gauges, 20:659–660
of graphite, 12:744, 745, 746, 775–776
in hydrogen determination, 13:790–791
increased levels of, 13:471
of refractory materials, 12:762
of silicon carbide, 22:526t, 527, 538, 539
values, 13:243
of vitreous silica, 22:427–428
Thermal conductivity detector (TCD)
gas chromatography, 4:614, 6:380, 427t, 428–429
Thermal control, silver in, 22:660–661
Thermal cracking, See also Cracking entries
n-butane in, 13:697
butylenes manufacture, 4:416
by-products of, 10:605–606
of commingled plastics, 21:454–455
conversion in, 10:600–601
environmental laws related to, 10:604–605
ethylene manufacture by, 10:599–609
industrial furnaces for, 10:601–609
mechanism of, 10:599–600, 12:403
in petroleum processing, 18:647–651
Thermal-cracking processes
modification of, 25:170
propylene, 20:778
Thermal cracks, cutting tool failure mode, 4:660
Thermal decomposition
of hydrazine, 13:566–567
of limestone, 15:32
of maleic anhydride, 15:490
Thermal decomposition products, exposure to, 18:304
Thermal degradation
catalysts, 5:256t, 270–274
of catalysts, 10:94
of higher olefin polymers, 20:422
of limestones, 15:40
of linear low density polyethylene, 20:183–184
of polycrystalline plastics, 19:782
of VDC polymers, 25:711–717, 720, 721
of wood and cellulosic substances, 26:349
Thermal design methods, for heat exchangers, 13:248–263
Thermal design parameters, effect of uncertainties in, 13:257–258
Thermal desorption
in thermal waste treatment, 25:834
Thermal dewatering, 16:660
Thermal diffusion
in pseudo-binary mixtures, 25:305–309
Thermal diffusion carburization, 4:675
solid solutions of industrial carbides, 4:688
Thermal diffusion inversion, 25:308
Thermal diffusivity (a), of vitreous silica, 22:428, 9:112
Thermal dissociation
of slaked lime, 15:45
of zircon, 26:629–630
Thermal drying, 16:660
Thermal dye sensitization, 9:514–515
Thermal effects, on SETs, 22:171–172
Thermal efficiency, economic aspects of, 23:244
Thermal energy (heat)
exponents of dimensions, 8:585t
Thermal energy balance, 25:274
stored in hot dry rock, 12:539–540
Thermal enhanced oil recovery process, 18:617
Thermal equilibrium, 14:657
Thermal evaporation, 24:725, 726
in compound semiconductor processing, 22:188–189
Thermal expansion
requirement for ceramics, 5:582
Thermal expansion coefficient, 10:177
of binary compound semiconductors, 22:145, 146–147t
of oxide scale, 13:505
Thermal expansion mismatch, in metal–matrix composites, 16:182–183
Thermal expansion
of plutonium metal, 19:679
of vitreous silica, 22:426–427
Thermal expansion testing, of plastics, 19:582–583
Thermal factors, in ethylene oxidation, 10:650
Thermal fatigue resistance, 13:527
Thermal flowmeters, 11:676–677
differential-temperature, 11:676–677
Thermal food preservation technology, 12:79–81
Thermal gelation, 13:73
Thermal gel stabilization, 23:71
Thermal generation, of Ag+ intermediate complexes, 19:355
Thermal gravimetric analysis (tga), 18:851
Thermal imaging, of plastics, 19:589
Thermal imidization, 20:269–270, 282
Thermal indicators, virtual two-way SMA devices in, 22:348–349
Thermal iniferters, 14:297
Thermal insulation
aerogel applications, 1:760–762
high performance fibers in, 13:398
transparent, 23:8–10
Thermal insulators, foams as, 12:24
Thermal ionization detector (TID) gas chromatography, 4:613
supercritical fluid chromatography, 4:631
Thermal ionization mass spectrometry (TIMS)
archeological materials, 5:743
Thermal isomerization, of organoboranes, 13:661
Thermally activated chemical vapor deposition, 24:744–745
Thermally activated conductivity, in organic semiconductors, 22:202
Thermally conductive path, 14:863
Thermally coupled sequences, for distillation, 22:300–301
Thermally stimulated conductivity (TSC), 19:586
Thermally stimulated creep (TSCr) method, 21:742–743
Thermally stimulated current spectrometry (TSC), 21:743
Thermal mass meters, 20:681
Thermal mechanical analysis (TMA), of polyester fibers, 20:21
Thermal motion, in silicon-based semiconductors, 22:237–238
Thermal oxidation, 10:77–78, 79 in VOC control, 26:683–685
Thermal oxidation rates, silicon, 22:490
Thermal oxidizers
heat recovery from, 26:684–685
Thermal point bonding, 17:476
Thermal polyaspartate (TPA), 12:812
Thermal polyaspartate polymers, biodegradable, 12:812
Thermal polymerization, 18:659 of ink film, 14:314
Thermal power
dissipated by LEDs, 14:863–864
exponents of dimensions, 8:585t
Thermal pressure decomposition, 17:256
Thermal printhead devices, 19:334–335
Thermal probes, 11:785
Thermal processes, 24:434. See also Heat entries; Temperature entries catalyst, 10:52–53
Thermal process phosphoric acid, 18:820–823
Thermal properties. See also Temperature of aromatic polyamides, 19:718
of asbestos, 3:300–304
of diesel fuel, 12:423
of ethylene–tetrafluoroethylene copolymers, 18:319–321
of fibers, 11:167
of filled polymers, 11:309–310
of gallium, 12:342
of glass, 12:588
of glass-ceramics, 12:629–630s
of lignin, 15:13
of linear low density polyethylene, 20:184
of olefin fibers, 11:229t
of polyamide plastics, 19:776–777
of polyester fibers, 20:8–9
of propylene, 20:770, 771t
of regenerated cellulose fibers, 11:274
of silicon, 22:484t
of silk, 22:633
of silver, 22:643t
of tellurium, 24:406–407
of thermoplastics, 10:176–177
of vitreous silica, 22:416–417, 426–428
of wool, 26:381–382
Thermal pyrolysis
in vinyl chloride manufacture, 25:634, 635, 641–642, 642–645
Thermal quenching, 11:456
Thermal reactions, in a deflagrating explosive, 10:720
Thermal reactors, 17:568
Thermal recycling technologies in wastewater treatment, 25:889t, 894–895
Thermal reduction magnesium manufacturing, 15:338–342
of gypsum, 23:577
sodium via, 22:767
Thermal reforming, 18:657–658
Thermal reserve zone, 14:501
Thermal runaway, 25:315
Thermal safety, in fine chemical research and development, 11:426
Thermal shock resistance of artificial graphite, 12:718
of ion-exchange resins, 5:633
textiles, 10:430–434
parameters for selected materials, 5:633t
requirement for ceramics, 5:582
Thermal sizing, of a heat exchanger, 13:252–253
Thermal spalling, in refractories, 21:500–502
Thermal spalling resistance, of refractories, 21:512–513
Thermal stability
N-halamines, 13:100–101
of ion-exchange resins, 14:401–402
of ionic liquids, 26:845–847
of olefin fibers, 11:229
of organic semiconductors, 22:209
of polyimides, 20:277
of silicones, 20:600
of Teflon AF, 18:340
Thermal stability tests, of organic peroxides, 18:491
Thermal strength, of refractories, 21:512–513
Thermal stresses, 13:488
requirement for ceramics, 5:582
in metal–matrix composites, 16:181–183
Thermal stress resistance
  ceramics, 5:632–633
Thermal swing adsorption
  factors governing choice of method, 1:614t
Thermal techniques, in nondestructive evaluation, 17:420–421. See also Heat entries; Heating entries
Thermal-transfer printing, 9:242, 338
Thermal transfer processes, 19:320
Thermal treatment. See Heat treatment copper–beryllium alloys, 3:654
  nickel–beryllium alloys, 3:657–658
of macrofouling organisms, 26:150
Thermal vaporization sources, 24:727
Thermal vaporization rate, 24:725
Thermal waste treatment, 25:831–834, 843–845
catalytic oxidation, 25:833
  factors affecting, 25:831–833
  fluidized beds in, 25:833
  liquid injection, 25:833
  multiple hearth furnaces in, 25:833
  rotary kilns in, 25:833–834
  thermal desorption, 25:834
Thermate, 5:827
Thermid IP-600®, 20:276
Thermionic detector (TID)
gas chromatography, 6:381
Thermionic electron guns, 24:102
Thermistors, 11:783
calibration equations used for, 24:451
  high sensitivity of, 24:451–452
  uncertainties in temperature measurements using, 24:452
Thermistor thermometry, 24:450–452
Thermite, 5:826–827
Thermite reaction
  ferrovanadium preparation by, 25:518
Thermittivity
  exponents of dimensions, 8:585t
Thermoacoustic refrigeration, 8:43
Thermoacoustic refrigeration systems, 21:556–558
Thermochemical modeling, 14:85–86
Thermochemical properties, of polyamide fibers, 19:746
Thermochemistry, blast furnace, 14:499–505
Thermochromic coatings, 6:627
Thermochromic materials
  inorganic compounds, 6:618–619
  metal complexes, spectral transitions, 6:615–618
  organic and polymer compounds, 6:619–626
  uses, 6:626–627
  negative thermosolvatochromism, 6:626
Thermocouple circuits, 24:460
  guiding principles for, 24:459–460
Thermocouple gauge, 20:660
Thermocouple junctions, 24:460
Thermocouples, 11:676, 783, 20:679–680
  low signal levels associated with, 24:463
  standard letter-designated, 24:461, 462t
Thermocouple standards, 24:461
Thermocouple thermometry, 24:458–463
Thermodynamic analysis, of distillation, 20:751
Thermodynamic calculations, 14:86t
Thermodynamic critical magnetic fields, 23:809–811
Thermodynamic data tables, choosing reference states for, 24:644
Thermodynamic efficiency
  batteries, 3:414
Thermodynamic models, of microemulsion behavior, 16:431
Thermodynamic properties
  of acetone, 1:162t
  of acrylonitrile, 1:398t
  of ammonium fluoroborate, 4:154t
  of benzene, 3:598t
  of bismuth, 4:4t
  of carbonyl sulfide, 23:622t
  of cesium fluoroborate, 4:154t
  of chlorobenzene, 6:214t
  of chromium carbide, 4:651t
  computing, 16:740; 24:688
  of gaseous ethylene, 10:595t
  of hydrogen, 13:760–766
  of hydrogen chloride, 13:809–818
of hydrogen sulfide, 23:631t
interrelationships among, 24:651–653
of iron carbide, 4:651t
of lactic acid, 14:115t
of liquid ethylene, 10:595t
of lithium fluoroborate, 4:154t
of manganese carbide, 4:651t
of mercury, 16:35t
of methacrylates, 16:279t
of molybdenum carbide, 4:651t
of plutonium metal, 19:681
of potassium fluoroborate, 4:154t
reference states for, 24:687–688
of rubidium fluoroborate, 4:154t
of sodium fluoroborate, 4:154t
of sulfur dioxide, 23:415
of sulfuryl chloride, 23:652t
of thionyl chloride, 23:648t

Thermodynamics, 10:138–139, 24:641–695
basis of, 24:642–643
batteries, 3:410–415
calculation of changes in thermodynamic properties, 24:656–660
chemical equilibrium calculations, 24:687–690
chemical reaction notation and balance equations for a mixture, 24:668–671
chemical vapor deposition, 5:809–810
distillation, 8:741–747
equations of, 24:643
equilibrium states in, 24:660–661
first law of, 24:645–648
fugacity, 24:665–666
fugacity of a species in a mixture, 24:678–680
Gibbs phase rule, 24:681–682
heat engines, heat pumps, and turbines, 24:653–656
ideal gas mixture, 24:673–674
interrelationships between thermodynamic properties, 24:651–653
of lead–acid battery cells, 3:524–526, 527
mass balance equation, 24:644–645
maximum work obtainable (or minimum work required) for a change of state involving mixtures, 24:690–692
of micellization, 24:127–133
mixture phase equilibrium calculations, 24:680–681
of mixtures, 24:667–668
of MOCVD, 22:154
nomenclature related to, 24:692–694t
phase and chemical equilibrium criteria in multicomponent mixtures, 24:675–678
phase equilibrium in a one-component system, 24:661–665
of pure fluids, 24:643–644
second law of, 24:648–651, 654
state properties of mixtures and the Gibbs–Duhem equation, 24:671–672
vapor–liquid equilibrium calculations, 24:682–686
of wetting, 22:110–111, 112, 113
Thermodynamics, fuel cell, 12:205–211
methanol, 16:301–302
of cyclodextrin inclusion compounds, 14:167
Rankine cycle, 23:231–234
Thermodynamic stability, of MgB₂
superconductors, 23:833
Thermodynamic state variables, interrelationship with measurable properties, 24:644
Thermodynamic system, description of, 24:643–644
Thermodynamic tables, 24:658
Thermodynamic temperature, 15:749
measurements, 24:436
Thermodynamic thermometers, types of, 24:435t
Thermodynamic variables, perturbation of, 14:614–617
calculating the change in, 24:658–659
Thermoelectric applications, of tellurides, 24:428
Thermoelectric refrigeration systems, 21:555–556
Thermofluid transport, in pulsating heat pipes, 13:236
Thermofor catalytic cracker (TCC), 11:819
Thermoformed acrylic sheet, 20:116
Thermoformed food packaging, 18:48–49
Thermoforming, 10:179, 19:555
ABS, 1:427–428
Thermoforming, of high density polyethylene, 20:174
Thermoforming process, 23:398–399
Thermographic black and white developers, 19:347
Thermographic imaging, 19:320–321
Thermographic imaging materials. See Photothermographic/thermographic imaging materials
Thermogravimetric analysis (TGA), 14:234, 19:718
in phenolic resin analysis, 18:776
in plastics testing, 19:571
of polymers, 13:379
Thermogravimetry (TGA)
in monitoring VDC polymer degradation, 25:715
of silicon surface chemistry, 22:373
Thermolin, 11:491
Thermoluminescence (TL) dating, in fine art examination/conservation, 11:418–419
Thermomechanical analysis (tma), 19:573
Thermomechanical fatigue (TMF), 13:488
Thermomechanical finishing, 17:514–516
Thermomechanical properties, of unsaturated polyesters, 20:112–114
Thermomechanical pulp (TMP), 21:20
Thermomechanical pulping (TMP), 18:93
Thermometers, 11:783
industrial resistance, 24:447
Thermometry
industrial platinum resistance, 24:447–450
industrial radiation, 24:455–458
thermistor, 24:450–452
thermocouple, 24:458–463
Thermooxidative degradation of higher olefin polymers, 20:422–423
of linear low density polyethylene, 20:183–184
Thermophiles
in composting, 25:873
Thermophilic bacteria, 16:404
Thermophilic digestion, 3:702
Thermophilic enzymes, 3:669
Thermophoretic deposition, 11:137–138
Thermoplastic blends, EPM/EPDM use in, 10:717
Thermoplastic composites mechanical properties and relative costs of, 26:762t
Thermoplastic copolyester elastomers, 20:70–71
Thermoplastic elastomers (TPE), 9:565–566, 24:695–720
applications for, 24:709–717
based on block copolymers, 24:697t
based on graft copolymers, ionomers, and structures with core-shell morphologies, 24:699
based on hard polymer/elastomer combinations, 24:699t
based on silicone rubber blends, 24:700
commercial production of, 24:705–708
economic aspects of, 24:708–709
elastomer phase in, 24:703
glass-transition and crystal melting temperatures of, 24:702t
hard phase in, 24:703–704
health and safety factors related to, 24:717–718
molecular weight of, 24:702
price and property ranges for, 24:709t
property–structure relationships of, 24:701–704
proportion of hard segments in, 24:702–703
reprocessing, 24:718
service temperatures of, 24:701
structure of, 24:696–700
as substitutes for vulcanized rubbers, 24:713–714
synthesis of, 24:704–705
trade names of, 24:710–712t
world consumption of, 24:695
Thermoplasticity, of ethylene oxide polymers, 10:679–680
Thermoplastic matrices, 26:764–765
Thermoplastic–matrix composites advantages and disadvantages of, 26:773–774
Thermoplastic molding resins, polyimides as, 20:283–284
Thermoplastic molding applications for VDC copolymers, 25:726–727
Thermoplastic olefin polymer of amorphous structure (TOPAS), 16:113
Thermoplastic polyester bottles, recycling, 20:54–56
Thermoplastics, 20:31–95. See also Liquid-crystal polymers (LCPs)
blow-molded bottles, 20:45–47
bottles for demanding contents,
20:52–53
chemical properties of, 20:65
crystal structure of CHDMT pure isomers, 20:61–62
economic aspects of, 20:53–54, 58–59,
67–68
health and safety aspects of, 20:67, 77
in hot fi
manufacture of, 20:75–76
manufacturers of, 20:78, 79t
market for, 20:77–78
mechanical properties of, 20:65–66,
73–75
PBT molding resins, 20:62–64, 64–65
PCT molding resins, 20:60–61
PET bottle resin process, 20:48–50
physical properties and morphology of,
20:71–73
physical properties of PET, 20:57–58
polymerization processes for, 20:39–45
processing, 20:66–67, 76
properties of PCT, 20:61, 62
PTT molding resins, 20:68
safety and environmental factors related to, 20:59–60
uses for, 20:31, 77–78
Thermoplastic polymers, 22:703
Thermoplastic polyethylene macrodiols for, 25:460t
Thermoplastic polyurethanes (TPUs), 25:459–460
Thermoplastic polyurethane elastomers, 25:456, 475–476
Thermoplastic processing, 10:178–179
of poly(ethylene oxide) resins, 10:684
Thermoplastic properties
of engineering thermoplastics,
10:172–178
Thermoplastic resins, development of,
10:172, 19:536, 537–539
packaging requirements for, 19:538
Thermoplastics, 15:407, 2:620. See also
Engineering thermoplastics
amorphous, 19:537
as embedding materials, 10:8
epoxy-based, 10:365
fabrication of, 26:765–766
in hazardous waste management, 25:824
high performance, 10:451
high throughput experimentation, 7:382t
history of, 10:169–172
organic pigment applications, 7:368t
processing of, 10:178–179
properties of, 10:172–178
as shape-memory polymers, 22:713
worldwide usage of, 20:150t
Thermoplastic segmented thiopolyurethanes, 23:745
Thermoplastic thiopoly(ester-urethane)s, high elasticity, 23:743
Thermosensitive acrylamide hydrogels,
13:737–738
Thermosensitive hydrogels, 13:743
THERMOSET “Thermoset recycling pyramid,” 18:780–781
Thermoset elastomers, 20:71
Thermoset epoxy resins, curing of, 10:421
Thermoset flexible polyurethane foams properties of, 25:461
Thermoset matrix composites, 21:456
Thermoset molding properties
of diallyl isophthalate, 2:262t
Thermoset polymers, 25:455
cured, 10:425
Thermoset polyurethanes, 25:460–461, 476
Thermosets, 10:456, 20:390
Thermoset sealants, 22:35
Thermosetting-encapsulation compounds,
17:839
Thermosetting matrices, 26:762–764
Thermosetting molding compounds,
20:405–406
Thermosetting phenolic resins
in wood, 26:355
Thermosetting plastics
amino acid resins and plastics,
2:618–619
organic pigment applications, 7:368t
Thermosetting polyimides, 20:284
Thermosetting polymers, 26:761
Thermosetting powders
physical and coating properties, 7:42t
Thermosetting reactive polymers
in hazardous waste management, 25:824
Thermosetting resins, 19:536–537,
556–559
compression, injection, and transfer
molding of, 19:556–558
open-mold processing of, 19:558
film formation from solutions of, 7:79–80
properties for powder coating, 7:43t
PVA in, 25:617
silylation and, 22:703
Thermosetting systems, in polyimide
addition reactions, 20:274–275
Thermo-shrinking polymers, 7:298
Thermospray ionization
liquid chromatography, 4:625
Thermostating, 13:413
Thermostat Recycling Corporation (TRC),
16:42
Thermostats, mercury-switch, 16:42
Thermosyphon, 13:225, 226
Thermosyphon reboiler, 11:774
Thermotropic LCPs, 13:381–382
Thermotropic liquid crystalline compounds,
15:87–89t
Thermotropic liquid crystals, 15:86–98
bent-core, 15:98
discotic phases of, 15:96
frustrated phases of, 15:94–96
metallomesogens, 15:97
nematic liquid crystals, 15:86–92
smectic liquid crystals, 15:92–94
Thermotropic mesophases, 20:79
Thermotropic polycarbonates, 19:804
Thermotropic polyesters, liquid-crystalline,
20:34
Thermotropic polymers, 13:371, 372
Thermotropic polymer liquid crystals,
15:107
Thermowells, 20:680
THERMX PCT, properties of, 20:62t, 63t
thexi-states, 19:110
Thexylalkoxyboranes, 13:639
Thexylborane, 13:635
Thexylhaloboranes, 13:639
THF (tetrahydrofuran) dehydration,
18:515
7-Thia-8-oxoguanosine, 2:823
Thiaboranes, 4:170, 204
preparation, 4:205
Thiacrown ether monomers, 23:707
Thiacrown ether polymer ligands, 23:702
See also Vitamin B1
Thiamine deficiency, 26:291
Thiamine hydrochloride, 25:795
Thiamine hydrochloride
therapeutant for aquaculture in U.S.,
3:212t
Thiamine mononitrate, 25:795
Thiamphenicol
registered for use in aquaculture in
Europe, 3:220t
registered for use in aquaculture in
Japan, 3:221t
Thiapyrillum sensitizer, 9:513
Thiazide diuretics
antihypertensive agents, 5:161–164t,
167, 168
Thiazine
soluble dyes, 7:373t
Thiazole(s)
aroma chemicals, 3:261
microwave-assisted synthesis of,
16:576–578
soluble dyes, 7:373t
Thickeners, 22:63–69
bridge, 22:65
caisson, 22:65
circular basin, 22:63–64
continuously operated, 22:59
deep-cone, 22:65–66
defined, 12:33
design and scale-up of, 22:58–59
in finish removers, 18:79
food, 12:51–54
Lamella, 22:63, 67–69
in polychloroprene latex compounding,
19:858
in sedimentation, 16:656–657
traction, 22:65
uses of, 22:64–65
Thickening, 22:50, 57
Thickening pressure filters, 11:382–388
Thick-film resistors, ruthenium dioxide-
based, 19:641
Thick-film techniques, industrial platinum
resistance thermometer manufacture
using, 24:447
Thick-film technology
biosensor production, 3:810–812
Thiele–Giddes model, 8:760
Thiele modulus, 5:225
Thiele modulus, 21:342–343
Thiele-Winter acetoxylation, 21:249
Thiexinol methylbromide, 4:360t
Thiirane complexes, 23:712
Thiiranes, polymerization of, 14:259
Thimerosal
antimicrobial used in cosmetics,
7:831t
Thin electrolyte structures, 12:225
Thin film(s)
advanced materials, 1:723–726
amorphous semiconductors and, 22:128, 129–131
angular selective, 23:16, 19
anodically colored electrochromic
inorganic, 6:579–580
cathodically colored electrochromic
inorganic, 6:578–579
cellulose acetates, 5:435–439
from chemical solution, 24:747–750
doped/undoped electrochromic organic,
6:580–582
forces in, 12:5–6
growth by chemical vapor deposition,
5:803–812
indium, 14:195
microporous, 14:98–99
in OLEDs, 22:215
piezochromic materials, 6:607–610
product design for multilayered polymer
films for secure documents, 5:767–769
product design for UV barrier,
5:772–774
randomly oriented, 12:16
as solar energy materials, 23:6–8
sol–gel processing of, 23:79–80
spectrally selective, 23:12–13, 16–19
transparent lotus effect, 22:121
from vapor, 24:743–747
vitreous silica in, 22:442
Thin-film analysis, 24:113–114
bombardment effects used for,
24:106–107
Thin-film balance apparatus, 12:7
Thin-film composite membranes, 21:633
Thin-film deposition, laser ablation for,
24:740
Thin-film dewetting, 7:409
Thin film drainage, 12:13
Thin-film evaporators (TFE), 15:259
in hazardous waste management, 25:815
Thin-film ferroelectrics, 11:100, 107
Thin-film formation techniques,
24:721–753
chemical vapor deposition, 24:743–744
electroplating, 24:747–750
ion plating, 24:736–738
metalorganic chemical vapor deposition,
24:745
physical vapor deposition, 24:721–743
plasma-enhanced and photochemical
vapor deposition, 24:745–746
plasma polymerization, 24:746–747
pulsed laser deposition, 24:738–743
spray pyrolysis, 24:750
sputter deposition, 24:728–736
thermally activated chemical vapor
deposition, 24:744–745
vacuum evaporation, 24:724–728
wetting, 24:750
Thin-film insulators
ceramics, 5:582
Thin-film module, monolithically
integrated, 23:48
Thin-film photochemical reaction mixture,
19:108
Thin-film platinum silicide, 19:632
Thin-film shape, laser parameters and,
24:741–742
Thin-film solar cells, 23:26
preparation of, 17:55–58
Thin-film strain gauges, 20:654–655
Thin-film technologies, advantages of,
23:47
Thin-film transistors (TFTs), 22:222
in displays, 22:259
hydrogenated amorphous silicon in,
22:135, 136, 138–139
Thin-layer chromatography (tlc), 6:384,
9:233–234
in biotransformation analysis,
16:407–408
chiral additives, 6:76–77
chiral stationary phases, 6:80–81
for drug screening, 12:97
silylation for, 22:692
Thioacetaldehyde
production from acetaldehyde, 1:105
Thioamides, preparation of, 16:551
Thioantimonic acid, 3:65
THIOB 4,4’-Thiobisphenol, 23:646
Thiobacillus, 11:4
Thiobarbituric acid test (TBA), 10:827
Thiobencarb, 13:320, 321
Thiocarbamate herbicides, 13:303,
320–321
Thiocarbamate herbicides
carbonyl sulfide use for, 23:625
Thiocarbamyl chlorides, 23:626
Thiocyananilide, 4:827, 837
Thiocarbonyl chloride, 4:837

THIOCARBONYL CHLORIDE 945
Thio compounds
aroma chemicals, 3:259
Thiocyanate, as a fixer accelerator, 19:261
Thiocyanate-complex liquid–liquid zirconium extraction process, 26:630
Thiocyanates, 23:678
  economic aspects of, 23:681
  manufacture, shipment, and analysis of, 23:680–681
  uses for, 23:681
Thiocyanate solution, in silver quantitative analysis, 22:677
Thiocyanic acid, 23:678–681
Thiodiacids, 23:740
  2,2'-Thiodiethanethiol, acid-catalyzed condensation of, 23:732
Thiodiols, 23:744
Thiodipropionic acid dialkyl esters, 23:111–112
Thioethers, 21:105–106
Thioformamide, 8:174
Thiglycolic acid antioxidant useful in cosmetics, 7:830t
Thiglycolic acid
  molecular formula, 5:713t
  production from chloroacetic acid, 1:138
Thiohydrazides, 13:575
  colorant for plastics, 7:374t
Thioindigo pigments, 19:444
Thiokol A, 23:711
Thiokol elastomers, 21:771
Thiol activation, in microarray fabrication, 16:385
  in styrene–butadiene polymerization, 9:557
Thiols
  achiral derivatizing agents, 6:96t
  chemiluminescence reagents for determination, 5:851–853
  reactions with carbonates, 6:306–307
  reactions with chloroformates, 6:294
Thiols, in silicone network preparation, 22:567
Thiomethacrylates, bifunctional, 23:731
Thionation reactions, microwaves in, 16:562–563
Thionyl bromide, 23:647
  physical properties of, 4:326
Thio compounds
aroma chemicals, 3:259
Thiocyanate, as a fixer accelerator, 19:261
Thiocyanate-complex liquid–liquid zirconium extraction process, 26:630
Thiocyanates, 23:678
  economic aspects of, 23:681
  manufacture, shipment, and analysis of, 23:680–681
  uses for, 23:681
Thiocyanate solution, in silver quantitative analysis, 22:677
Thiocyanic acid, 23:678–681
Thiodiacids, 23:740
  2,2'-Thiodiethanethiol, acid-catalyzed condensation of, 23:732
Thiodiols, 23:744
Thiodipropionic acid dialkyl esters, 23:111–112
Thioethers, 21:105–106
Thioformamide, 8:174
Thiglycolic acid antioxidant useful in cosmetics, 7:830t
Thiglycolic acid
  molecular formula, 5:713t
  production from chloroacetic acid, 1:138
Thiohydrazides, 13:575
  colorant for plastics, 7:374t
Thioindigo pigments, 19:444
Thiokol A, 23:711
Thiokol elastomers, 21:771
Thiol activation, in microarray fabrication, 16:385
  in styrene–butadiene polymerization, 9:557
Thiols
  achiral derivatizing agents, 6:96t
  chemiluminescence reagents for determination, 5:851–853
  reactions with carbonates, 6:306–307
  reactions with chloroformates, 6:294
Thiols, in silicone network preparation, 22:567
Thiomethacrylates, bifunctional, 23:731
Thionation reactions, microwaves in, 16:562–563
Thionyl bromide, 23:647
  physical properties of, 4:326
Thio compounds
aroma chemicals, 3:259
Thiocyanate, as a fixer accelerator, 19:261
Thiocyanate-complex liquid–liquid zirconium extraction process, 26:630
Thiocyanates, 23:678
  economic aspects of, 23:681
  manufacture, shipment, and analysis of, 23:680–681
  uses for, 23:681
Thiocyanate solution, in silver quantitative analysis, 22:677
Thiocyanic acid, 23:678–681
Thiodiacids, 23:740
  2,2'-Thiodiethanethiol, acid-catalyzed condensation of, 23:732
Thiodiols, 23:744
Thiodipropionic acid dialkyl esters, 23:111–112
Thioethers, 21:105–106
Thioformamide, 8:174
Thiglycolic acid antioxidant useful in cosmetics, 7:830t
Thiglycolic acid
  molecular formula, 5:713t
  production from chloroacetic acid, 1:138
Thiohydrazides, 13:575
  colorant for plastics, 7:374t
Thioindigo pigments, 19:444
Thiokol A, 23:711
Thiokol elastomers, 21:771
Thiol activation, in microarray fabrication, 16:385
  in styrene–butadiene polymerization, 9:557
Thiols
  achiral derivatizing agents, 6:96t
  chemiluminescence reagents for determination, 5:851–853
  reactions with carbonates, 6:306–307
  reactions with chloroformates, 6:294
Thiols, in silicone network preparation, 22:567
Thiomethacrylates, bifunctional, 23:731
Thionation reactions, microwaves in, 16:562–563
Thionyl bromide, 23:647
  physical properties of, 4:326
Thiouria inclusion compounds, 14:172
Thiouras, in polychloroprene curing, 19:848
Thioxanthenes

Thiouria

Thioxanthene Orange
colorant for plastics, 7:374t
Thioxanthenes
typical soluble dye applications, 7:376t
Thioxanthene Yellow
colorant for plastics, 7:374t
Third-generation ionic liquids, 26:838
Third generation photovoltaic cells, 23:44
Third-order nonlinear optical materials,

17:453–457
identifying, 17:454–455
Third stage separator (TSS), 11:714–715
35-mm instant camera, 19:277–278
35-mm transparency films, 19:282. See also Polachrome 35-mm film
30% reagent-grade hydrogen peroxide, 14:59
Thixotropic agents, 10:4, 430
Thixotropic behavior, of filled networks,

22:572
Thixotropic casting

ceramics processing, 5:652–653
Thixotropic flow, 7:280t
Thixotropic fluids, 11:768–769
Thixotropic injection molding

15:366–367
Thixotropic paints

organic titanium compounds in, 25:127
estimating, 21:709
Thomas equation, 15:688–689
Thomas steemaking process, 16:150
Thompson scattering, 7:339
Thompson-Stewart process, 14:794
Thompson, William (Lord Kelvin),

24:433–434
Thomsonite, hagemannite, 2:364t
Thonzonium bromide, 4:360t
Thoria, 25:374
Thoria, as a refractory raw material, 21:491
Thorianite, 24:755, 756
Thorite, 24:755
Thorium(IV)
concentration formation constant of chelates, 5:717t
Thorium (Th), 1:463–491, 464t, 21:286,
287, 24:753–782. See also Thorium complexes; Thorium compounds;
Thorium isotopes

alpha and gamma spectrometry of,

24:774
analytical chemistry of, 24:774–775
atomic properties of, 24:755
 electronic configuration, 1:474t
economic aspects of, 24:756–757
health and safety factors related to,

24:775–776
hydration and hydrolysis in aqueous solution, 24:764
ion type and color, 1:477t
metal properties of, 1:482t
nitrogen donor ligands and,

24:766–768
occurrence of, 24:755–756
oxo ion salts of, 24:764–766
oxygen donor ligands and, 24:768–770
phosphorous donor ligands and, 24:768
purity requirements for, 24:756
recovery from ores, 24:756
as radioactive waste source, 25:851
uses for, 24:757–759
Thorium alkoxide complexes, 24:770
Thorium alloys, 24:758
Thorium aryloxide complexes, 24:770
Thorium bromides, 24:763
Thorium carbide (1:2), 4:649t, 690, 4:690,

4:648, 649t
Thorium carbides, 24:761, 4:689–690
Thorium carbonate, 24:765
Thorium carboxylates, 24:768–769
Thorium chlorides, 24:762–763
Thorium complexes

allyl, 24:773
bimetallic organometallic, 24:773–774
catecholate-type, 24:769
coordination, 24:763–770
hydrocarbyl, 24:773
organometallic, 24:770–774
Thorium compounds, 24:757, 761–763
regulation of, 24:776
Thorium–cyclooctatetraenyl compounds,

24:772–774
Thorium dioxide, 24:761–762
Thorium fluorides, 24:762
Thorium halides, 24:762–763
Thorium hydrides, 24:761
Thorium hydroxide, 24:756
Thorium iodides, 24:763
Thorium isotopes, 24:753–754
concentrations and ratios of, 24:755–756
radioactive decay properties of, 24:754t
Thorium metal, 24:759–761
  in alloys, 24:760–761
  preparation of, 24:759–760
  properties of, 24:760–761
  reactions of, 24:761
Thorium nitrate, 24:757, 766
Thorium oxalates, 24:768–769
Thorium oxide, 21:491
Thorium oxides, 24:757, 761–762
Thorium oxyhalides, 24:762
Thorium perchlorate, 24:764
Thorium phosphates, 24:765–766
Thorium pnictides, 24:761
Thorium sulfate, 24:764
Thorium–uranium fuel cycle, 24:758–759
Thorocene, 24:772
Thorotrast, 24:775–776
  3A zeolite. See Zeolite 3A
Three-boiling beet sugar crystallization scheme, 23:463–465
Three-color photography, 19:233–234
Three-dimensional (3D) transistors, in scaling to deep submicron dimensions, 22:256
Three-dimensional carbon–carbon composites, 26:774
Three-dimensional chemical databases, 6:9–14
Three-dimensional electrode flow cells, 9:665–666
Three-dimensional engineering, prototyping photoinitiated polymerization in, 19:117
Three-dimensional food packaging, 18:48–49
Three-dimensional shaping, 9:600–602
Three-dimensional textile structures, 13:390–391
Three-electrode system, 9:573
  300-series stainless steels, 13:510–511
Three-level lasers, 14:666, 696
  inversion in, 14:669
3M Corporation
  advanced materials research, 1:696
  thin film research, 1:725
Three Mile Island (TMI) accident, 6:813, 17:533, 597
Three-phase direct-arc furnace,
  12:299
Three-phase furnaces, 12:304
Three-roll mills, 18:65
Three-screw pumps, 21:73
Three-stage (ternary) cascade refrigeration systems, 21:549–550
Three-stage refrigeration systems, 21:546
Three-way catalyst, durability of, 10:50–52
Three-way catalysts (TWCs), 14:649,
  19:624
Three-way catalytic converter
  chemical reactions and surface chemistry, 10:46–50
  design of, 10:39–46
  surface chemistry and reaction mechanisms, 10:49–50
Three-way control valves, 20:686
Three-way conversion (TWC) catalysts, 10:38, 40
  chemical reactions of, 10:48–49
Three-way conversions, 10:102
D-Threonine
  systematic name, formula, and molecular weight, 2:556t
D-Threose, 4:698
  threo-isomers, 21:15
L-Threonic acid, 25:751
L-Threonine
  systematic name, formula, and molecular weight, 2:556t
Threreone
  center of symmetry, 2:554
  content in cocoa and chocolate products, 6:368t
  systematic name, formula, and molecular weight, 2:556t
  taste profile, 2:605
Threshold (systemic) toxicities
  calculating safety for, 25:236–242
Threshold dose, 25:233. See also TD50 estimating, 25:235
Threshold gain, 14:665
Thresholding process, 18:148
Threshold inhibitors, 26:139
Threshold limit values (TLV), 1:819,
  10:509, 21:837–838
  for cyclohexane, 13:711
  for ethyl alcohol vapor, 10:551
for lithium hydride, 13:628
for lead, 14:765
for maleic anhydride, 15:510
for nickel carbonyl, 17:119
silicon, 22:499
silver, 22:682
for sulfuric acid, 23:795
of tellurium, 24:417
of thallium, 24:638
time-weighted average concentration
(TLV-TWA), 23:114
for vanadium compounds, 15:424
Threshold odor number (TON), 26:36
Threshold stress, 16:190–191
Threshold voltages, 14:839
Thrifty genes, 3:88
Thrips, 8:9
Thrombin, 4:84, 87, 88, 89
Thrombin activatable fibrinolytic inhibitor
(TAFI), 4:89
Thrombin inhibitors, 4:100t, 100–102, 106
Thrombolytic agents, 5:172t, 175–179
Thrombomodulin, 4:84, 88
Thrombosis, 4:83, 84
risk factors for, 4:90t
Thromboxane, 4:103–104
Thromboxane A2, 4:85
Throttling devices, in refrigeration
systems, 21:538
Through-circulation dryers, 9:120, 148
Through dryers, 2:149
Throwing power, 9:773
Thujaopsene, 24:543–544
Thulium (Tm), 14:631t, 635t
electronic configuration, 1:474t
Thyme, 23:171
Thymidine kinase (TK), 12:460
Thymol, 24:526–527
hydrogenation products of, 24:516
properties of, 24:527
Thymol iodide, 14:376
Thyrists, 9:618
Thyrists, 22:252
Thyroid gland
citric acid in, 6:632t
Thyroid stimulating hormone (TSH),
enzyme immunoassay for, 14:147
Thyssen Niederrhein (TN) process,
23:264
Tiacetatodiphenylantimony, 3:76
TIBA, 13:305
Tibricol
molecular formula and structure, 5:128t
Tibromodiphenylantimony, 3:76
1,2,4-Tichlorobenzene
Antoine constants, 6:215t
Tickle refiners, 18:105
TiCl3 catalyst systems, 26:504–505
Ticlopidine, 4:104
Ticon
composition of alloy for crowns and
bridges, 8:311t
Ticona, 7:641
Ticonium hard
base-metal dental alloy, 8:309t
Tidco Barmac crusher, 16:612
Tier 2 automotive emission standards,
10:31–32
Tigecycline, 24:598, 602
Tiger shrimp
common and scientific names, 3:188t
Tighten, lube, clean (TLC), 15:465
Tight-head drums, 18:6
Tiglic acid
physical properties, 5:35t
Tikosyn
molecular formula and structure, 5:96t
Tilapia
aquaculture, 3:183, 188
large eggs, 3:189
nutrition and feeding, 3:202
reproduction and genetics, 3:205, 206
water quality requirements for
aquaculture, 3:199
world aquaculture production in 1996,
3:186t
Tildiem
molecular formula and structure, 5:97t,
118t
Tile cleaners
for swimming pools, 26:193
Tile grout, 5:500t
Tiller’s guide, for selecting SLS equipment,
11:347–348
Tilmicosin, 15:301
Tilted plate separators, 22:68, 69
Tilting press, 12:731–732
Timberol, 24:566
Timber products
primary, 26:361–363
secondary, 26:363–364
value of, 26:361t
Timber-related value added, 26:364
Time
exponents of dimensions in absolute, gravitational, and engineering systems, 8:58t
failures over, 26:987, 988–989
Time charts, 25:327
Time delay and integration (TDI) enhancement, 19:163
Time-dependent compliance, of polymer blends, 20:347–348
Time-dependent deformations, of fibers, 11:185
Time-domain kinetic measurements, 14:620
Time of flight (TOF), 15:660–661
Time-of-flight (ToF) mass analyzers, 24:109
Time of flight diffraction (TOFD), 19:486
Time-of-flight instrumentation, in particle counting, 18:150–151
Time-of-flight-SIMS technique, 24:109
Time-resolved fluorimetry, 14:148–149
Time-resolved spectra, analysis of, 14:613
Time standards, 15:749–750
Time–temperature parameters (TTP), 13:471, 478, 479
creep properties and, 13:480
Time–temperature superposition, 21:746–747
Time-temperature-transformation (TTT) diagram, 10:422–423
diagram(s), 12:567, 23:278
Time, titanium contract with Boeing, 24:846
Time-weighted average (TWA), 14:215
concentration, 25:372
exposure limit, for tantalum, 24:334
Time-Zero SX-70 film, 19:303, 305–307
Tin (Sn). See Lead–antimony–tin alloys; Lead–calcium–tin alloys; Lead–lithium–tin alloys; Lead–tin alloys, 24:782–800. See also Tin alloys; Tin compounds
allotropes of, 24:786
analytical methods for, 24:790–792
in antimony alloys, 3:52t
atomic structure of, 22:232
in barium alloys, 3:344, 4:12t
bismuth recovery from concentrates, 4:5–6
in carbon steels, 23:297
catalyst poison, 5:257t
chemical properties of, 24:786–787
economic aspects of, 24:790
effect on copper resistivity, 7:676t
fluorine reactivity with, 11:829
in galvanic series, 7:805t
with gold in dental applications, 8:305
health and safety factors related to, 24:792
history of, 24:782–783
isotopes of, 24:786
mining of, 24:783–784
occurrence of, 24:783–784, 800
physical properties of, 24:784–786
processing of, 24:787–789
reactions with organic halides, 24:821
in RTV silicone preparation, 22:595, 596
secondary, 24:789
specifications for, 24:790–792
silicone chemistry and, 22:549
solubility limits and electrical conductivity effects on copper, 7:750t
standard electrode potential, 7:799t
uses for, 24:782–783, 792–794
world mine production of, 24:783t, 790
Tin alloys, 24:794–799
in bearing metals, 24:796–798
bronzes, 24:796
in coatings, 24:794–795
with iron, 24:798
miscellaneous uses of, 24:798–799
pewter, 24:798
in solder, 24:795–796
special, 24:798
type metals, 24:798
Tin–antimony–copper white bearing alloys, 3:52
Tin antimony gray cassiterite formula and DCMA number, 7:347t
Tin–antimony–lead alloys, 3:53
Tin babbitt, 3:52, 52t
Tin-base babbitts, 24:797
Tin brass, 7:754
nominal composition and UNS designation, 7:722t
Tin brasses
UNS designation, 7:721t
Tin bronze, 7:754–755
effect of alloying on mechanical properties, 7:677
Tin bronze G
in galvanic series, 7:805t
Tin Bronze M
in galvanic series, 7:805t
TIN compounds, 24:800–837. See also

Stann- entries

commercially important, 24:801
ecoconomic aspects of, 24:831–832
history of, 24:800–801
inorganic, 24:801–808
manufacture of, 24:803–804
organotin, 24:808–831
types of, 24:800–801

Tin–copper–lead coatings, 24:795
Tin dioxide, 5:583
Tin fluoroborate hydrate, 4:157t, 158, 159
Tin halides, 24:801–804
commercially important, 24:801–802

Tin–indium solders, 17:841
Tin–lead coatings, 24:794
Tin–lead plating, 9:826
Tin–lead solders, 17:841, 24:795–796
Tin metal, reactions with organic halides, 24:821
Tin–nickel coatings, 24:794
Tin–nickel plating, 9:826
Tin ores, 24:783, 784, 791, 800
Tin oxide, 24:786
opacifier, 7:334

“Tin pest,” degradation of art via, 11:418
Tin phosphides, 19:59
Tinplate, 24:793
Tin plating, 9:765
electrolytic, 24:793, 802–803
stannous sulfate in, 24:807
Tin powder, 24:798–799
Tin recycling, economic aspects of, 21:405–406
Tin slags, 24:316
upgrading of, 24:318–319
Tin Sol process, 24:806
Tin sulfides, 24:801
Tin/tin alloy plating, 9:824–827
Tin–tin bonds, in organotin compounds, 24:826

Tinting, of paint, 18:66
Tinting strength, of inorganic pigments, 19:381
Tint trials, 19:384
Tin vanadium yellow cassiterite
formula and DCMA number, 7:347t
Tinzaparin, 4:95t, 5:175
molecular formula and structure, 5:172t
Tin–zinc coatings, 24:794–795
Tin–zinc plating, 9:826–827
TiO2-based heterogeneous photocatalysis, 14:102. See also Titanium dioxide
TiO2-pigmented inks, 25:29–30. See also
Titanium dioxide entries; Titanium oxide entries

TiO2 thin films, 25:131
TIP LED, 14:847–848
Tipping pan vacuum filter, 11:352–353
Tire compounding, 21:804–812
component parts in, 21:805
compound formulating in, 21:811
estamomers in, 21:807–808
filler reinforcement in, 21:808–809
materials in, 21:806–811
softeners, extenders, and plasticizers in, 21:809–810

Tire compounds, aged and fatigued
properties of, 21:811–812

Tire cord, 2:643–644
Tire-derived fuel (TDF), 21:463–464
industrial uses for, 21:465
use in electrical generation, 21:465
use in pulp and paper mills, 21:464
Tire pulverizing, cryogenic, 21:469–470
Tire retreading, 21:479

Tires
recycling of, 25:872
Tire shredding, mechanical, 21:470–472
nylon, 19:765–766
reclaimed rubber in, 21:784–785
Tire-to-energy facilities, 21:466
Tire tread compounds, composition of, 21:806t

Tire yarns, 11:259–260, 273
Tirofiban, 4:104t, 105, 5:173–174
molecular formula and structure, 5:171t
Tischenko reaction, 12:110, 2:63
Tissue adhesives, 24:205
Tissue conditioners, 8:324–325
Tissue cultures
preservation using cryogenics, 8:42
Tissue engineering, porous hydrogels for, 13:750–751
Tissue factor, 4:86–87
role in hemostatic system, 4:85
Tissue factor pathway inhibitor (TFPI), 4:88
Tissue paper products, 18:129–130
Tissue plasminogen activator (t-PA)
bioseparation from mammalian cell culture, 3:821–826
peptide map, 3:841, 842
selling price, 3:817t
Tissue reactions, to sutures, 24:218
Tissue-type plasminogen activator (t-PA) and hemostatic system, 4:89
human, use as thrombolytic agent, 5:175–178
molecular formula and structure, 5:172t
new under development, 5:178–179
Titanate coupling agents, 25:129
Titanate coupling mechanism, 25:129
Titanates, 25:21
\( \beta \)-chlooroalkoxy, 25:73
ester interchange catalyzed by, 25:80
fluoroalkyl-substituted, 25:73
glycol, 25:87–88
inorganic, 25:43–47
lower valent, 25:102–104
Titanatranes, 25:93–94
Titania. See also Titanium dioxide entries;
Titanium white entries
anionic doping of, 19:101
catalytic aerogels, 1:763t
fate of photo-holes in, 19:82–85
in photocatalysis, 19:75–76
solar photocatalytic reactor using, 19:99, 1:6
synthesis, 5:643
Titania aerogels
supercritical carbon dioxide effect, 1:756
in Claus conversion chexnistry, 23:611–612
Titania particles, silver chloride-coated, 22:660
Titania–silica
acidic properties of, 1:764
aerogel preparation effects, 1:765
catalytic aerogels, 1:763t
Titania–silica–vanadia
catalytic aerogels, 1:763t
Titanium
abundance of, 24:838
addition to aluminumm wrought alloys, 2:327
allotropes of, 24:838
analytical methods for, 24:864
chemical vapor deposition precursor, 5:805t
chlorine from electrolysis of magnesium chloride in manufacture of, 6:175
economic aspects of, 24:839, 860–862
effect on copper resistivity, 7:676t
effect on stainless steel corrosion resistance, 7:809
environmental concerns related to, 24:864–865
ethylacetocacetate complexes of, 25:135
in galvanic series, 7:805t
grades of, 24:862–864
health and safety factors related to, 24:865–866
history of, 24:838–839
lower oxides of, 25:13–15
mechanical properties of, 24:841, 842t
in M-type ferrites, 11:69. See also PbZrO\(_3\)–PbTiO\(_3\)-based (PZT) materials
occurrence of, 24:840, 845
physical properties of, 24:841, 842t
processing of, 24:857–860
properties of, 24:840–845
quality control of, 24:862–864
recycling of, 24:864–865
reducing defects in, 24:840
reduction to solid metal, 16:147–148
in RTV silicone preparation, 22:596
sodium in manufacture of, 22:777
solubility limits and electrical conductivity effects on copper, 7:750t
solution color of ions in glass, 7:343t
sources of, 24:845–848
specifications for, 24:853t, 862–864
in stainless steel, 23:306. See also Nb–Ti entries
tin alloys with, 24:798
tolerance by body, 3:708, 24:838–870.
See also Titanium alloys; Titanium sponge
uses of, 24:838–840, 866–868
Titanium amides, 25:102
Titanium aluminum nitride, 25:102
Titanium aluminide
Titanium alloys
Titanium alloy, electrochemical machining
Titanium(II) oxide, 5:598
Titanium(III) alkoxides, 25:102
Titanium(III) β-diketonates, 25:104
Titanium(III) chelates, 25:102
Titanium(IV) alkoxylides, 25:84–85t
Titanium(IV) aryloxyhalides, 25:84–85t
Titanium(IV) bis(cyclopentadienyls), 25:113–115t
Titanium(IV) complexes, 25:97–101
Titanium(IV) compounds
Titanium(IV) cyclopentadienyls, 25:110, 111–112t
Titanium(IV) organometallics, 25:105–120
Titanium(IV) sulfate, 25:59
Titanium(IV) tetraalkoxides, 25:75–77
Titanium(IV) tetraaryloxyhalides, 25:84–85t
Titanium(IV) reactions with alcohols, 25:80
Titanium 1,3-propylenedioxide bis(ethyl acetoacetaete), 25:91
Titanium acylates, 25:96–97, 119
Titanium alkoxide complexes, 25:124
Titanium alkoxides, 25:71, 82t, 110
Titanium alkoxides, 25:81–82
Titanium alkyl halides, 25:83
Titanium alkyls, 25:107
Titanium alloy, electrochemical machining
Titanium alloys
ASTM specifications for, 24:862–864
dental applications, 8:311–314
defects in, 24:855
fatigue behavior of, 24:841, 845
hip implants, 3:734
mechanical properties of, 24:841,
843–844t
for orthopedic devices, 3:728, 734
properties of, 24:840
tolerance by body, 3:708, 24:838–839,
854–856
uses of, 24:866–868
Titanium aluminide
aluminum extraction from, 2:295
Titanium aluminum nitride, 4:668
preparation, 4:676
Titanium anodes, 15:591
Titanium aryloxides, 25:78
Titanium beach-sand mining, 24:847
Titanium borides, 25:5–6
physical properties of, 25:7
Titanium bromide
physical properties of, 4:329
Titanium bromides, 25:54
Titanium carbide, 4:647, 649t, 680–681,
6–9
annual world production of, 25:8
in ceramic–matrix composites, 5:553t,
554t
chemical degradation, 5:578
chemical vapor deposition precursor, 5:80t
cemented, 4:655–656
with coated carbide tools, 4:664
commercial applications of, 25:9
as industrial hard carbide, 4:674
physical properties of, 4:679t, 25:7
preparation, 4:675, 676
quality control methods, 4:692–693
solid solution for steel machining, 4:663
solid solutions with other carbides,
4:686–689
stoichiometry, 4:651
Titanium carbonitrides, 17:218
Titanium carbonitrde
chemical vapor deposition precursor,
5:805t
with coated carbide tools, 4:664
preparation, 4:676, 677
Titanium-catalyzed ester interchange, 25:80
Titanium chelates, 25:86–97
Titanium chloride-based Ziegler catalysts,
20:154
Titanium chlorides, 25:49–50
manufacture of, 25:52–53
Titanium chloroacetate complexes, 25:96
Titanium citrates, 25:89
Titanium complexes
chiral, 25:98–99
fluorocarbon groups containing, 25:98
of unsaturated alcohols, 25:73–74
Titanium compounds. See also Inorganic titanium compounds; Organic titanium compounds
esterification with PVA, 25:601
Titanium-containing polyethers, 25:116
Titanium diboride, 25:5–6, 4:668
preparation, 4:676
Titanium dibromide, 25:54
Titanium dichloride, 25:49
Titanium difluoride, 25:47
Titanium diiodide, 25:54–55
Titanium dioxide, 5:583, 25:1, 2, 15–23.

See also TiO₂ entries; Titanium oxide entries

carrier mobility at room temperature, 5:597t

ceramic applications of, 25:20

chemical degradation, 5:578

chemical vapor deposition precursor, 5:805t

cosmetic uv absorber, 7:846t

crystals, 19:387

dispersion aerogel preparation effects, 1:765

disulfide, 25:57, 58

disulfide electrodes

sloping discharge curve, 3:414

disulfides, 25:57, 58

disulfides electrodes

carbonate, 13:626

dispersion

physical and chemical properties of, 25:15–18

pigment used in makeups, 7:836t,

14:317. See also TiO₂-based

heterogeneous photocatalysis, 18:58

powder used in cosmetics, 7:841t

preparation of, 25:18

production of, 19:385, 387–393

PVC and, 25:684

reactivity of, 25:17–18

semi-conductor, 5:600

as soap bar additive, 22:744

sulfate production process for, 19:388–391

in surface coatings, 25:23–25

synthesis, 5:643

transparent, 19:412–413

uses for, 19:393,
in wastewater treatment, 25:910–911

Titanium dioxide coating, 12:609–610

Titanium dioxide effluent treatment, 9:435

Titanium dioxide–ferric oxide

pigment used in makeups, 7:836t

Titanium dioxide mineral feedstocks, 25:31–33

Titanium dioxide pigment particles, encapsulation of, 19:392

Titanium dioxide pigments, 25:21–23

chloride process for, 25:36–37

grading, 25:24–25

manufacture of, 25:33–37

manufacturers of, 25:39–41t

sulfate process for, 25:33–35

Titanium dioxide pigments industry

economic aspects of, 25:41–42

Titanium dioxide process feedstocks analyses of, 25:32t

Titanium Dioxide White (Rutile)

pigment for plastics, 7:369t

Titanium Dioxide White (Anatase)

pigment for plastics, 7:369t

Titanium disilicide, 25:56

Titanium dispersion

aerogel preparation effects, 1:765

disulfide, 25:57, 58

disulfide electrodes

sloping discharge curve, 3:414

Titanium esters, 25:1

Titanium fluorides, 25:47–49

Titanium halides, 25:47–55

Titanium hydride, 13:626

Titanium hydrides, 25:5

Titanium–hydrogen system, 25:3–5

phase diagram for, 25:5

Titanium iodides, 25:54–55

Titanium/isopropoxy/nitrilotriethoxy ratio, 25:93

Titanium lactate complexes, 25:88

Titanium magnesium alloys, 13:626

Titanium–magnesium chloride recycle

magnesium manufacturing processes, 15:337–338

Titanium malates, 25:89

Titanium metal, 25:61

Titanium methides, 25:78

Titanium mill shipments, 24:839

Titanium monosulfide, 25:57

Titanium monoxide, 25:13–14

Titanium monochloride, 25:53

Titanium nitrate, 25:10–11

Titanium nitride(s), 25:9–10

chemical vapor deposition precursor, 5:805t

with coated carbide tools, 4:664
matrix for ceramic–matrix composites, 25:55t
physical properties of, 25:7
preparation, 4:676, 677
Titanium–nitrogen compounds, 25:9–12
mining and processing, 25:11–12
Titanium ores, 24:845, 846t
world mine production of, 24:848t
Titanium oxide, 21:491, 25:53
in bauxite, 2:344, 347
opacifier, 7:334
superconductivity in, 5:603
in synthetic fillers, 11:314
Titanium oxide ore, chloride-process refining of, 24:849–851
Titanium oxides, 25:12–59. See also Titanium dioxide entries
hydrated, 25:15
mining and processing, 25:12–13
Titanium oxide, world production of, 24:860–861
Titanium phosphates, 25:57
Titanium phosphide(s), 19:58, 25:56–57
Titanium phosphorus-containing chelates, 25:91–92
Titanium phosphorus compounds, 25:56–57
Titanium pyrophosphate, 25:57
Titanium sesquisulfide, 25:14
Titanium sesquisulfide, 25:58
Titanium silicates, 25:56, 102
Titanium silicides, 25:55–56
Titanium–silicon alloy, 22:520
Titanium silicon compounds, 25:55–56
Titanium slag, 19:388, 389
Titanium sponge
ASTM specifications for, 24:853t
consolidation of, 24:854
environmental concerns related to, 24:864–865
Kroll (magnesium-reduction) process
manufacture of, 24:851–853
price history of, 24:861t
sodium-reduction process manufacture of, 24:853
U.S. consumption of, 24:847–848
world production of, 24:860, 861t
Titanium subsulfide, 25:57
Titanium sulfates, 25:58–59
Titanium sulfides, 25:57–58
Titanium sulfinites, 25:119–120
Titanium sulfur compounds, 25:57–59
Titanium tetraacylates, 25:96
Titanium tetrabromide, 25:54
Titanium tetrachloride, 15:343, 25:31, 36, 50–52, 110
affinity for water, 25:51
physical properties of, 25:51t
producers and economic aspects of, 25:53
Titanium tetrachloride–alumina
catalytic aerogels, 1:763t
Titanium tetrachloride grades of, 24:851t
in titanium manufacture, 24:849–851
solubility of chlorine in, 6:133t
Titanium tetrafluoride, 25:48, 86
Titanium tetraiodide, 25:55
Titanium tetraperoxylchlorate, 18:278
Titanium tetraphenoxides, 25:73
Titanium-Titanium Lap Shear test, 20:285
Titanium tribromide, 25:54
Titanium trichloride, 25:49–50
Titanium trichloride hexahydrate, 25:50
Titanium triethanolamine chelates, 25:128
Titanium trifluoride, 25:47–48
Titanium triiodide, 25:55
Titanium trisacetylacetonate, 25:102
Titanium trisulfide, 25:58
Titanium vanadium antimony gray rutile
formula and DCMA number, 7:347t
Titanium–vanadium mixed-metal
alkoxides, 25:100
Titanium white pigments, commercial production of, 19:388
Titanium white rutile pigment, 19:391
Titanium zinc oxide, 5:603
Titanium–zirconium–molybdenum (TZM)
alloy, 17:14–15
Titanocene, 25:118
Titanocene catalysts, 16:79
Titanocene dichloride, 25:105
Titanocene synthons, 25:116
Titanocycles, 25:116
silicon-containing, 25:117
Titanogypsum, 4:593
Titan-o-niobates, 17:133
Titanous oxalate, 25:104
Titanous oxychloride, 25:54
Titanous sulfate solutions, 25:59
Titanoxanes, 25:78, 79
Titanoyloxyphthalocyanine, 25:134
Titanyl sulfate, 25:59
Title, invention, 18:160
Tritadose
  molecular formula and structure, 5:110t
Titratable base number (TBN) sulfonates, 23:533
Titration
  chelating agents, 5:724–726
  of hydrogen peroxide, 14:59
  of iodine, 14:367, 368
Titration techniques for plutonium, 19:699
Titre, in soap making, 22:736
Titrimetric methods in selenium analysis, 22:94
T-jump cell, 13:428
T-jump experiment, 14:614–616
T-junction design
  for microfluidic mixer, 26:966
TI1223 conductors, 23:850
Tl–Ba–Ca–Cu–O system, superconductivity in, 23:848
Tl-based conductors, 23:850
Tl-based superconductors, 23:842
TLC, See Thin-layer chromatography
TNZ, 10:737–738
TNB-thiol method for covalent ligand immobilization, 6:396t
TNKase, 5:176–177
  molecular formula and structure, 5:172t
TNT, 10:732–734
TNT equivalency method, 13:166
Toads
  alkaloids in, 2:75
Tobacco
  cadmium in, 4:491–492, 495
citric acid application, 6:648
economic aspects, 2:108
  risk factor for CHD, 5:109
Tobacco alkaloids, 2:82–83
Tobacco smoke
  indoor air pollutant, 1:802
Tobicillin
  registered for use in aquaculture in Japan, 3:221t
Tobramycin
  bacterial resistance mechanisms, 3:32t
Tocainide, 5:100
  molecular formula and structure, 5:91t
  Tocopherol, 17:652, 653, 25:793
  in cocoa beans and chocolate products, 6:370t
  \( \alpha \)-Tocopherol, 25:793
  \( \beta \)-Tocopherol, 25:793
  \( \gamma \)-Tocopherol, 25:793
  \( \delta \)-Tocopherol, 25:793
  Tocopherols
    in cocoa beans and chocolate products, 6:370t, 10:805–806, 12:60, 61, 17:651, 25:793–794
  Tocopheryl acetate skin conditioner/moisturizer, 7:843t
  \( \alpha \)-Tocotrienol, 25:793
  \( \beta \)-Tocotrienol, 25:793
  \( \gamma \)-Tocotrienol, 25:793
  \( \delta \)-Tocotrienol, 25:794
  Tocotrienols, 10:805–806, 25:793–794
  Tokodorite, 15:588
  “Toffee-appling,” during polymerization, 20:45
Togaviruses, 3:137
Tohdite, 2:428
Toilet bar soap acute oral LD50 ranges, 8:446t
Toiletries
  citric acid application, 6:648
  Toilet soaps, fatty acids in, 22:732, 733t
Tokamak
  whisker reinforcement for ceramic–matrix composites, 5:557t
Tokuyama Soda one-step MIBK process, 16:339
Tolerable Upper Intake Level (UL), 25:784, 786t, 17:652
Toll-like receptor 7, 2:823
Tollmien-Schlichting instability, 11:762
m-Tolualdehyde physical properties of, 2:61t
o-Tolualdehyde physical properties of, 2:61t
para-Tolualdehyde, 25:182
p-Tolualdehyde physical properties of, 2:61t
Tolu balsam
  benzoic acid in, 3:625
2,4(6)-Toluene diisocyanate (TDI)
  carbon monoxide in production of, 5:7–8
2,4(6)-Toluene diisocyanate (TDI)
  with alkyd resins, 2:164
Toluene
  addition reactions to the aromatic ring, 25:165
alkylation of, 2:188, 25:182
analytical and test methods, handling, and storage for, 25:175–177
aroma chemicals derived from, 3:234
azeotrope with ethylenediamine, 8:487t
azeotropic mixtures with butyl alcohols, 4:395t
basicity and reactivity relative to, 25:161t
biodegradation, 3:762, 763
bioremediation of groundwater, 3:766–768
as a by-product in dehydrogenation, 23:335
chemical properties of, 25:159–165
dealkylation of, 25:180
demand for, 24:277
derivatives of, 25:182–186
disproportionation of, 24:274
diffusion coefficient in air at 0° C, 1:70t
economic aspects of, 25:172–175
economic evaluation of, 24:274–277
in gasoline, 3:597
health and safety factors related to, 25:178–179
hydrodealkylation to produce benzene, 3:606–608
hydrogenation reactions of, 25:162
industrial-grade, 25:178t
inhaled, 25:179t
isomer distributions in the monoalkylations of, 25:164t
liquid-phase air oxidation to benzoic acid, 3:627–628
manufacture and processing of, 25:165–171
nitration-grade, 25:178t
nitration of, 17:265, 266, 25:193
oxidation reactions of, 25:162
physical properties of, 25:159, 160t
π-complex formation by, 25:161
potential uses for, 25:182
reactivity as VOC, 1:792t
recovery of, 25:168–170
as a solvent, 25:181
sources of, 25:165–168
solubility of aminophenols in, 2:653t
solubility of benzoic acid in, 3:626t
solubility of dispersant tails in, 8:685
solubilities of fatty acids in, 5:40t
solvent for cosmetics, 7:832, 18:678, 23:329
specifications, standards, and quality control for, 25:175
styrene from, 25:181–182
in styrene manufacture, 23:343–344
substitution reactions on the methyl group, 25:162–163
terminal activity coefficients of mixture with ethanol, 8:743t
typical commercial gas absorption process, 1:26t
U.S. producers of, 25:177t
uses for, 25:179–182
vapor-phase catalytic ammoniation of, 17:243
Toluene-2,5-diamine intermediate used in oxidation hair dyes, 7:858t
Toluene-benzoic acid process, of phenol manufacture, 18:750
Toluene diamine (TDA), 13:797
Toluenediamine (TDA), 25:189–201. See also Toluenediamines
chain extenders for, 25:197
derivatives of, 25:196–197
diazotization of, 25:192
health and safety factors related to, 25:196
manufacture of, 25:192–196
Ni catalysts for, 25:195
phosgenation of, 25:189–191
physical properties of, 25:189
reactions of, 25:189–192
reactors for the production of, 25:195
uses for, 25:196–197
Toluenediamine(s) (TDA)
alkylation, 2:197
alkoxylation of, 25:191–192
specifications and physical properties of, 25:190t
Toluene diisocyanate manufacture, phosgene in, 18:810
Toluene diisocyanate (TDI), 25:182–183, 189, 191, 455. See also 2,6-TDI
flexible foams from, 25:457
overexposure to, 25:479
Toluene disproportionation to benzene and xylenes, 25:184–185
equilibrium distribution for, 25:185t
molecular sieves in, 16:844
Toluenedithiol (Dithiol)
molecular formula, 5:712t
Toluene reactions
isomer distribution and reactivity ratio for, 25:164t
Toluenesulfonamide–formaldehyde resin, 7:853
Toluene sulfonic acid, 25:185, 15:168
Toluenesulfonyl chloride, 25:186
para-Toluenesulfonic acid, 25:185
p-Toluenesulfonylhydrazide, 13:593
Toluhydroquinone, 20:105
Toluidine
alkylation, 2:197
Toluidine Red, 19:435
p-Tolunitrile, 12:179
2-p-Tolylsulfinyloquinones, 21:257
Tolylfluoridide, 9:147
Tomaset, 13:46t, 57
Tomato-based products
estimated maximum oxygen tolerance, 3:381t
Tomatoes
citric acid in, 6:632t
Tonalide, 24:494
Toner(s)
photothermographic, 19:332
for photothermographic/thermographic imaging materials, 19:350–352
recycling of, 19:358–359
thermographic and photothermographic effects on, 19:352
Toners, 14:317
electrographic, 14:329, 9:424
Tongue, in taste perception, 11:565
Toning baths, photographic, 19:219–220
Tonocard
molecular formula and structure, 5:91t
Tool design, electrochemical machining, 9:597
Tool failure modes, 4:657–660
Toolholding
cemented carbides in, 4:662–663
Tooling
epoxy, 10:459–460
processing methods for, 10:460
Tools, ion implanted, 14:450
Tools of Quality, 21:174
Tool steels
carbides in, 4:647
cemented carbides in, 4:662–663
Toothpaste, 7:851
Toothpastes, silica in, 22:376. See also Dentifrices
Tooth restorative resins, 8:333
Top (surface) driers, 9:147
Top- and bottom-blown basic-oxygen processes, 23:260
Topas, 10:180
Topaz
brown, 7:337
hardness in various scales, 1:3t
in coal, 6:718
Top-blown basic oxygen process, 23:256–259, 260
for steelmaking, 23:249
Top-blown oxygen steelmaking, 16:151
Top blown rotary converter (TBRC), 14:742
selenium recovery via, 22:83
Top-blown rotary furnace, 21:394
Topcoats
for metal coatings, 7:127
Top-down technology, 17:45
Top driers, 2:149
Top-feed vacuum filters, 11:350
Top feed, with rotary drum vacuum filters, 11:357
Top-fermenting yeasts, 26:465
Topicals
registered for use in aquaculture in Europe, 3:220t
TOPKAT, 6:19
Top-level analysis, 20:752, 753
Topoisomerase IV, 14:216–217
inhibition by quinolones, 21:220–221
Topoisomers, 17:610
Topologically close packed (TCP) phases, 13:479
Topology, receptor, 16:774–775
Toprol-XL
molecular formula and structure, 5:95t
Top-spray fluidized-bed units, 16:448
Top spraying, in fluidized-bed encapsulation, 11:541–542
Torque, mixer power and, 16:686
Torque-actuated valves
for lab-on-a-chip, 26:975
Torque meter, 21:58
Torque motor, enhanced, 23:870
Torsemide, 5:169
molecular formula and structure, 5:164t
Torsional braid analysis (TBA), 18:772
Torsional braid analyzer (TBA), 21:745
Torsional deformations, of fibers, 11:181
Torsional pendulum, 21:745
Tosco II process pyrolysis study, 21:466
Tospearl, 22:1
Torsional braid analyzer (TBA), 18:775
Torsional deformations, of fibers, 11:181
Torsional pendulum, 21:745
Toughness index, of manmade fibers, 11:184
Tourmaline
color, 7:332
in clays, 6:685
in coal, 6:718, 4:133
Towel paper grades, 18:130
Tower capacity expansion, 10:616
Tower melter, 21:391
Tower press, 11:360–361, 379. See also
Manor tower press
Tower side-draws, recovery of, 18:521
Town gas, 6:787, 789, 829
Tow processing, in wet fiber spinning, 11:208
Tows, 11:177
acrylic, 11:189, 212
synthetic fibers as, 11:247
Toxic agents, 5:814
Toxic air pollutants (TAPs), 1:802
Toxicants, 25:201
Toxic applications, pumps for, 21:76–78
Toxic characteristic leach procedure test, 14:759
Toxic characteristic leach procedure (TCLP) limit, 14:765
Toxic chemicals, management and risk assessment of, 24:184–188
Toxic compounds, 9:448
Toxic effects
differing types of, 25:204t
of PCBs, 13:137–138
Total developed pump head, 21:173
Total reflection X-ray fluorescence (TXRF), 24:72
Total reflection X-ray fluorescence spectrometry, 26:435–437
Total sideband suppression (TOSS) technique, 23:741
Total site pinch analysis, 20:751
Total solids flux, in thickener design and scale-up, 22:58
Total sulfur, in hydrogen fluoride manufacture, 14:11
Total suspended particulates (TSP), 1:798
Toth adsorption isotherm, 1:626, 627
Toughening
ceramic–matrix composites, 5:561–568
Toughening agents, 10:434–436
Toughness, 19:743–744
abrasives, 1:4
of fibers, 11:181, 184. See also Tenacity
of metal–matrix composites, 16:180–181
of polymer blends, 20:350–356
of silicon carbide, 22:528t
Toughness index, of fibers, 11:184
Total ion chromatogram, mass
Total ion electrolyte concentration,
Total artificial heart (TAH), 3:719
Total chloride content, of epoxy resins, 10:386
Total cost assessment (TCA), 12:814
Total developed pump head, 21:57–58
Total dissolved solids (TDS), 21:646, 647
reverse osmosis removal of, 25:890
in wastewater, 25:887
“Total fiber” scutching, 11:612–613
Total discharge, 12:815
Total ion chromatogram, mass
spectrometer, 6:431
Total ion electrolyte concentration, determination of, 14:423
Total lime, 15:29
Totally chlorine free bleaching (TCF) technologies, 10:304–305
Totally chlorine-free (TCF) bleaching processes, 21:44
Total mineralization, of organic pollutants, 19:90
Total organic carbon (TOC), 13:581
analysis of water, 26:42
in photocatalysis, 19:98, 99
in wastewater treatment, 25:885, 886, 887t
Total oxidation reactions, in the presence of water, 19:87
Total oxygen demand (TOD)
in wastewater treatment, 25:885
Total phosphorus content, determining, 18:851
Total productive maintenance (TPM), 15:477–478
Total Quality Management (TQM), 21:173
Total site pinch analysis, 20:751
Total solids flux, in thickener design and scale-up, 22:58
Total sulfur, in hydrogen fluoride manufacture, 14:11
Total suspended particulates (TSP), 1:798
Toth adsorption isotherm, 1:626, 627
Toughening
ceramic–matrix composites, 5:561–568
Toughening agents, 10:434–436
Toughness, 19:743–744
abrasives, 1:4
of fibers, 11:181, 184. See also Tenacity
of metal–matrix composites, 16:180–181
of polymer blends, 20:350–356
of silicon carbide, 22:528t
Toughness index, of fibers, 11:184
Tourmaline
color, 7:332
in clays, 6:685
in coal, 6:718, 4:133
Towel paper grades, 18:130
Tower capacity expansion, 10:616
Tower melter, 21:391
Tower press, 11:360–361, 379. See also
Manor tower press
Tower side-draws, recovery of, 18:521
Town gas, 6:787, 789, 829
Tow processing, in wet fiber spinning, 11:208
Tows, 11:177
acrylic, 11:189, 212
synthetic fibers as, 11:247
Toxic agents, 5:814
Toxic air pollutants (TAPs), 1:802
Toxicants, 25:201
Toxic applications, pumps for, 21:76–78
Toxic characteristic leach procedure test, 14:759
Toxic characteristic leach procedure (TCLP) limit, 14:765
Toxic chemicals, management and risk assessment of, 24:184–188
Toxic compounds, 9:448
Toxic effects
differing types of, 25:204t
of PCBs, 13:137–138
Toxic equivalence factors (TEFs), 13:140
Toxic free radical activity, herbicides that
enhance, 13:297
Toxicity characteristic, maximum
concentration of contaminants for,
21:587t
Toxicity characteristic leaching procedure
(TCLP), 21:586
test for hazardous waste, 25:866, 868
Toxicity data
advantages and disadvantages of,
25:229–232t
Toxicity indicators,
23:112–114
Toxicity inhalation tests, 10:660
Toxicity studies
acute, 25:217
chronic, 25:218
short-term repeated, 25:217
subchronic, 25:217–218
Toxicity units (TU), 25:887
Toxic materials, 21:833–836
control of exposure to, 21:838–839
sampling, 21:855
Toxic metal ion release, 9:439
Toxic metal removal, nanofiltration in,
21:653
Toxicological properties
of n-dodecanol, 2:7t
of 2-ethylhexanol, 2:7t
of higher aliphatic alcohols, 2:7t
of n-hexadecanol, 2:7t
of n-hexanol, 2:7t
of isodecanol, 2:7t
of n-octadecanol, 2:7t
of n-tetradecanol, 2:7t
of n-undecanol, 2:7t
Toxicology. See also Air toxics; Forensic
toxicology; Toxic entries
of allyl chloroformate, 6:302t
of α-amino acids, 2:601–603
α-aminonitrile, 17:239
of amyl alcohols, 2:774t
of arsenic, 3:277–278
assessment, 12:813–814
of benzyl chloroformate, 6:302t
of butyl acrylate, 1:363t, 377t
of 4-tert-butyl cyclohexyl chloroformate,
6:302t
in chemoinformatics, 6:19
of chlorobenzenes, 6:218t
classification of toxic effects, 25:202–204
of curing agents, 10:461
of DEHP, 25:674–675
do diazimon, 7:564t
of diethylen glycol bischloroformate,
6:302t
of diglycidyl ether of bisphenol A,
10:460–46
of ethoxyphenol novolac resins, 10:461
of ethyl-4-nitrophenyl phenylphosphono-
thionate, 6:74
do ethyl acrylate, 1:363t, 377t
of ethyl chloroformate, 6:302t
of ethylene bischloroformate, 6:302t
of ethyl ether, 10:580
of ethylene oxide, 10:659–661
of 2-ethylhexanol, 2:7t
of 2-ethylhexyl chloroformate, 6:302t
of 2-ethylhexyl chloroformate, 6:302t
factors influencing toxicity, 25:210–214
food, 12:75
do Grignard reagents, 12:831
of higher aliphatic alcohols, 2:7t
of ionic liquids, 26:865–866
of inorganic tin compounds, 24:807–808
of isobutyl chloroformate, 6:302t
of isocyanates, 25:479
of isodecanol, 2:7t
of iso-octanol, 2:7t
of isopropyl chloroformate, 6:302t
isouquinoline, 21:206
key terms related to, 25:245–246
of Knox Out 2FM, 7:564t
of lignosulfonates and sulfonated kraft
lignins, 15:20
lubricant, 15:256–260
of maleic anhydride, maleic acid, and
fumaric acid, 15:511t
of methyl acrylate, 1:363t, 377t
of methyl chloroformate, 6:302t
of methyl parathion, 7:564t
naphthalene, 17:82–83
nature of toxic effects, 25:204–210
of n-dodecanol, 2:7t
of n-hexadecanol, 2:7t
of n-hexanol, 2:7t
of n-octadecanol, 2:7t
of n-propyl chloroformate, 6:302t
of n-tetradecanol, 2:7t
of n-undecanol, 2:7t
of organic esters, 10:509–513
of organotin compounds, 24:827–831
PBDE, 13:143
of PennCap M, 7:564t
of phenyl chloroformate, 6:302t
phosphines, 19:66
phosphorus oxychloride, 19:40–41
phosphorus pentachloride, 19:44
phosphorus sulfides, 19:48
phosphorus trichloride, 19:36
of PVC, 25:678
pyridine, 21:117–118
quinoline, 21:193–194
of sec-butyl chloroformate, 6:302t
of sensitizing dyes, 9:520
testing, 12:95–96
testing procedures in, 25:214–223
thallium, 24:637–639
of tungsten compounds, 25:387
uranium, 17:528–529
Toxicology information, in Investigational New Drug Applications, 18:692–693
of anthropogenic silicas and silicates, 22:467
methylamine, 16:364
of organic peroxides, 18:489–490
phosphorus flame retardants, 11:501–502
of sulfur monochloride, 23:644
Toxicology prediction, 6:19
Toxicology studies
general, 25:215–216
guidelines for evaluating, 25:224t
pesticide-related, 18:547–548
review of, 25:223–224
specific, 25:218–223
types of, 25:217–218
Toxicology testing, 25:213
Toxic PCB congeners, 13:139
Toxic reagents, use of catalysts to minimize, 12:80
Toxic Release Inventory (TRI), 16:345, 21:589
and chromium, 6:517
database, 16:46, 47
ink regulation under, 14:333–334
Toxic Substances Control Act (TSCA) List, Grignard reagents listed on, 12:833–834t, 15:256, 259
Toxic substances, regulation of, 21:829
removal of, 14:423
in microbial transformations, 16:412
Toxic use reduction (TUR) regulations, 21:590
Toxic waste, from PVC, 24:170
C-Toxiferine, 2:74, 99
Toxins
liquid chromatography applications, 6:465
Toyopearl resins, 3:827
Toyo Ultimate Laminate Cans (TULC), 10:447
TPP-2M relation, 24:87–88, 89
TPS biomass gasifier, 3:695
T-Q Plot, 13:190
TR1/2 taste receptors, 24:248
Traceability, to designated standards, 15:748
Trace analysis, of silicones, 22:599–600
Trace component analysis, for fats and fatty oils, 10:828
Trace elements
analysis of, 25:370
silicone chemistry and, 22:549–550
Trace evidence, 12:99–102
analytical techniques for, 12:99–100
Trace impurity removal adsorbents for, 1:612
Trace levels, of selenium, 22:95
Trace mercury, determining, 16:44–45
Tracer, 12:33
Tracer chemicals
instability of, 21:276
storage conditions for, 21:276
Tracer methods, in leak detection, 24:311
Tracer type correlation flowmeters, 11:675
Tracheobronchitis
effect on heart, 5:107
Trachoma, 14:338
Tracking resistance testing, 19:587
Traction, 3:726–727
Traction thickener, 22:65
Trade
wheat, 26:276–278
Traded sugar-containing products, 23:468–469t
Trade magazines, 24:347
Trademark applications
  intent-to-use, 25:260–261
  use-based, 25:259–260
Trademark Certification Act of 1984, 24:358
Trademark conflicts, 25:256
Trademark infringement, 25:262–263
Trademark licensing, 25:264–265
Trademark protection
  right to, 25:253
Trademark registration, 25:258–264. See also
  Foreign trademark registration
effect of, 25:262–264
foreign priority and, 25:263–264
  maintaining, 25:261–262
procedure for, 25:259–261
rights to, 25:258–259
  under state law, 25:266
Trademark Revision Act, 25:254
Trademark rights
  abandonment of, 25:265
  transfer of, 25:264–265
Trademarks, 25:253–269. See also
  Descriptive marks
  fame enjoyed by, 25:256
  function of, 25:253
  history of, 25:254–255
  ownership of, 25:253
  proper use of, 25:265–266
  selection of, 25:255–258
  versus patents and copyrights, 25:254
Trademark search, 25:255–256
Trademark Trial and Appeal Board, 25:260
Trade names, 25:254, 263
Trade organizations, technical service
  personnel participation in, 24:347
Trade secret program, 18:194
Trade secrets, 18:157
  business transactions and, 18:194
  commercial relevance of, 18:191
  creation of, 18:192
  exploitation of, 18:193–195
  protection of, 18:192–193
  rights related to, 18:191
  violation of, 18:195
Tragacanthin, 4:723t, 724t
Trainees, evaluating, 15:475
Training
  in-house, 24:344
  safety-related, 24:184
  maintenance and, 15:474–475
  personnel, 21:857
  training–monitoring set, 6:69
  training process, of shape-memory alloys, 22:341
  training programs, in fine chemical production, 11:435
  training requirements, for personnel, 24:345–347
  training simulators, ethylene plant, 10:622
Trains
  higher performance, 23:863
  superconducting levitating, 23:864–865
Tramp iron magnetic drums, 15:439–441
Tramp iron magnetic separation, 15:436–441
Tramp iron removal equipment, 15:435
Trandate
  molecular formula and structure, 5:157t
Trandolapril
  molecular formula and structure, 5:151t
Trangorex
  molecular formula and structure, 5:95t
Tranquilizers, 11:868
  trans-2-Hexenal
    permeation in selected barrier polymers, 3:389t
Transactinides, 1:491–499, 492t
Transalkylation, 12:162
  acrylamide polymers, 1:315
  reaction, 23:329
  side reactions in, 23:329
Transamination
  biocatalysis by aminotransferases, 3:677–681
  pyridoxine and, 25:798
Transamination biocatalysts, 16:402–403
Trans, commercial defoamer, 8:241t
Trans-claving ribozymes, 17:627
Transcription, 12:449
Transdermal drug delivery, 9:46–48
  efficacy, 9:47
  systems, 18:711
Transducer Electronic Data Sheet (TEDS) standard, 22:264
Transducers
  in acoustic wave sensors, 22:269–270
  biosensors, 3:795
  electronic, 20:652
  polymer ferroelectrics in, 11:106–107
  in sensor technology, 22:265–266
  ultrasonic waves from, 17:423–424
of methyl methacrylate, 16:241
using methyl esters, 18:519–520
Transesterification catalysts, diorgaoatins as, 24:824
Transesterification process
advantages of, 19:816
for polycarbonates, 19:814–818, 10:490, 491, 499, 811, 831
types of, 10:503
Transfected myelomas
cell culture technologies used for, 5:351t
Transfer coefficient correlations, 15:688
Transference number
- cations, anions, and electrons or holes in
  selected ceramics, 5:586t
  of ions, 3:416
Transfer functions, in process control, 20:689
Transferline exchanger coking, 10:607–609
Transferline exchangers (TLEs), 10:603
  high pressure shell and tube, 10:609
Transfer line exchanger (TLE)
in vinyl chloride manufacture by
  pyrolysis, 25:643
Transfermium elements, names of, 17:387t
Transfer molding, 10:458
  of Teflon PFA, 18:337
  of thermosetting resins, 19:557–558
Transfer of copyrights, 7:788–791
Transfer panels, 11:33–34
Transfer printing, 9:221, 242
Transfer processes, relationship among, 15:731
Transferred deoxyribonucleic acid
  (T-DNA), introduction into plants, 12:485
Transferred electron devices (TEDs),
  compound semiconductors in,
  22:160–162
Transfer RNAs (tRNAs), 17:614, 617–618, 20:824
  in yeasts, 26:449
Transfer-roll chemical finishing, 17:513
Transformation
  herbicide, 13:309
  of plant species, 12:485
  plasmid, 12:501
Transformation Induced Plasticity (TRIP), 23:298
Transformation toughening
  ceramics, 5:621–622
Transformed composition space, 22:330–331
Transforming particles
  ceramic–matrix composite
  reinforcement, 5:571–572
Transgene expression, controllable, 12:453
Transgenes, 12:452, 453
  constructing for random insertion,
  12:453–462
  expression of, 12:456
  integration of, 12:456
  introduction into plants, 12:485
  methods for random insertion of,
  12:454–459
  microinjection of, 12:454–456
Transgenesis, genetic modification of
  animals by, 12:452–453
Transgene technology, 13:346
Transgenic animals. See also Animal
genetic engineering; Transgenic farm
animals; Transgenic mice
applications of, 12:463–467
creating with random gene insertion,
  12:453
expenses for, 12:454
  with growth-promoting genes,
  12:463–464
hemizygous, 12:456
  with innate immunity, 12:464
utility of, 12:453
Transgenic crops
  field testing of, 13:362
  future of, 13:362–363
  resistance to herbicides, 13:333
Transgenic farm animals, production of
  recombinant proteins in, 12:464–465
Transgenic mice, 12:455
  for biomedical research, 12:466–467
Transgenic plants, polyhydroxyalkanoate
  production in, 20:262
Transgenic soybean plants, Roundup
tolerance of, 12:489
Transglycosylases (TGs), 3:24–29
Transient equilibrium, 21:294
Transimidiation, 20:276
Transistors, 22:241. See also Bipolar
  junction transistors (BJTs); Bipolar
  transistors; Chemically sensitive field-
  effect transistors (ChemFETs); Enzyme-immobilized FETs (ENFETs);
of vitreous silica, 22:407, 408, 411, 430–431
Transparency mapping, 10:340–341
of optical fiber, 11:132
of organic pigments, 19:429
polymer, 20:402
Transparent composites, sol–gel technology in, 23:81
Transparent conducting oxides (TCOs), 22:135, 12:610–611
Transparent fused silica, 22:401
Transparent lotus effect thin films, 22:121
Transparent nonmetals and object mode perceptions, 7:306t
Transparent OLEDs (TOLEDs), 22:219
Transparent pigments, 19:412–413
Transparent resins, production of, 23:731
Transparent soaps, 22:747–748
cast-mature process for, 22:749
Transparent thermal insulation, 23:8–10
Transparent vitreous silica
chemical durability of, 22:417
density of, 22:422
devitrification of, 22:421
manufacture of, 22:412–415
viscosity of, 22:424t
Transpeptidases, 3:27
Transport. See also Transportation of ascorbic acid, 25:771
of hydrated lime, 15:56–57
of quicklime, 15:56
of radioactive waste, 25:855–856
in waste collection, 25:869–870
Transportation, 25:322–348. See also Shipping; Transport
cost of, 25:323
economic regulation of, 25:331–336
modes of, 25:324–329
outlook for, 25:343–344
refrigerated, 21:565–566
regulation of, 21:592
safety regulation of, 25:337–338
of vinyl chloride, 25:651
Transportation arrangements
variety of, 25:334
Transportation costs, plant location and, 19:529
Transportation equipment
copper applications, 7:712–713
Transportation fuels, desulfurization of, 23:588
alternative, 12:386
Transportation, high performance fibers in, 13:391
Transportation industry, silicon consumption by, 22:509–510
Transportation management, 25:323
Transportation market, natural gas for, 12:383
Transportation mileage allowances, 25:335
Transportation rebates, 25:335
Transportation service regulation of, 25:323
Transportation structure
diversity and flexibility of, 25:328–329
Transport-bed process technology, 15:504–505
Transport-bed reaction technology, 15:504–505
Transport disengaging height (TDH), 11:814
entrainment above, 11:814–816
Transport effects, in reactor technology, 21:341–345
Transport equations, for the surface force-pore flow model, 21:341–345
Transport gasifier, 6:798
Transport models, reverse osmosis, 21:638–639
Transport of Ions in Matter (TRIM) program, 14:432
Transport phenomena. See also Chemical reactor transport phenomena
for chemical reactor design, 25:269–322
Transport phenomena, electrochemical cell, 9:657–660
Transport Phenomena for Chemical Reactor Design (Belfiore), 25:295, 297
Transport phenomena, in MOCVD, 22:154–155
Transport phenomena, in solvents, 23:101–107
Transport properties
of compound semiconductors, 22:148, 150t
of ionomers, 14:462–463
of propylene, 20:772t
of steam, 23:204–205
of supercritical fluids, 24:7–8
of zincblende semiconductors, 22:148, 149t
Transthyretin (TTR), 13:143
Transuranic (TRU) waste, 17:598
Transuranic waste (TU, TRU), 25:851
disposal of, 25:859
Transurs, 14:719
Transverse electromagnetic modes (TEM), 14:672, 673
TrapMan probe, 10:160
Trapped light, in light emitting diodes, 14:846
Trapped magnetic fields, 23:868–869, 870
Trapzene, 18:395
Trasacor molecular formula and structure, 5:156t
Trash-bag market, LLDPE, 20:206
Trash pumps, 21:78
Traveling wave tube (TWT) amplifiers, 16:520
Travertine, 15:29
Tray absorbers, 1:27–28, 83–86
Tray and compartment dryer in hazardous waste management, 25:816
Tray columns, 15:695–696
Tray dryers, 18:731–732
Tray towers, 25:810
Treacle, 23:483
Treating, information sources for, 15:766
Treatment and storage and disposal facilities (TSDFs), 21:588
Treatment, in-line fiber treatment, 16:12
Treatment plants
silicones from, 22:602
silver thiosulfate and, 22:683
Trecetilide, 5:103, 106
Tree exudates, 26:357
Trees, dating, 21:317
Treflan/Trifuralin, 2:550t
TREF profile, 26:542
Trehalose, 12:43
Tremolite, 1:803, 3:288, 289
elemental analysis, 3:293t
fiber morphology, 3:294t
geological occurrence, 3:291t
physical and chemical properties of, 3:300t
world production in 2000, 3:289t
Trenbolone acetate (TBA), 13:3
long-term administration of, 13:5
Trenbolone acetate–estradiol implant treatment, 13:4, 5
Trend alarm, 20:672
T resins, 22:586, 589–590
Tresyl chloride/tosyl chloride method, for covalent ligand immobilization, 6:396t
Tretinoin, 25:789
Tri (n-butyl)phosphate (TBP), 19:674
Tri-1,10-phenanthroline-iron(II), 7:589
1-Triacontanol
physical properties of, 2:3t
cis-21-Triacontenoic acid
physical properties, 5:32t
Triaacetate chiral stationary phase, 6:88t
Triacontane, 8:205
Triacontanol, 13:25t
as a plant growth regulator, 13:36–37
Triacylglycerol oils, 10:831
Triacylglycerols, 10:802, 819
chemical properties of, 10:823–825
classes of, 10:826
α-Trialkylsiloxyhydroperoxides, 18:452
3,5,5-Trialkoxy-1,2,4-trichlorocyclopentadienes, 21:256
Triacontylacetic acids, 5:57–69
reactions with carbon monoxide, 5:6–7
Triaalkylbismuth dilahides, 4:31–33
Triaalkylbismuthines, 4:26–28
Triaalkylboranes, 13:632, 648, 650
carbonylation of, 13:654–656
protonolysis of, 13:647
reactions of, 13:649
Triaalkyl-gold(III) complexes, 12:708
Triaalkylphosphate, 19:41, 11:489
Triaalkylphosphines, 19:60
Triaalkylphosphites, 19:54
manufacture of, 19:37
Triaalkylsilylefins, acylation of, 12:185
Triaalkylstibines, 3:69
Triaalkyltin halides, 24:814
Triaalkyltins, toxicology of, 24:827
Triaalkylammonium, 2:538t
physical and chemical properties of, 2:540t
Triaalkylcyanurate (TAC), 2:265–267
Triaalkyl isocyanurate (TAIC), 2:265–267
Triaalkyl isocyanurate (TAIC), 8:204
Triaminotriethylamine
molecular formula, 5:712t
Triaminotriphenyl methane soluble dyes, 7:373
Triammonium phosphate, 18:835
Triamterene, 5:168
molecular formula and structure, 5:165
Triamylamine, 2:538
physical and chemical properties of, 2:540
Triangle flavor characterization test, 11:512
Triangle theory (adsorption equilibrium theory), 1:682
Triangular distributions, 26:1020, 1021
Triangular equilibrium diagram, 10:747–748
Triangular phase diagrams, 22:302
Triangular plane geometry for metal coordination numbers, 7:575
Triarylbumath dilahides, 4:31–33
Triarylbumuthines, 4:26–28
Triaryl carbonium dyes, 11:453–454
Triarylpyrazolines, 19:112
Triarylthibinines, 3:69
Triarylsulfonyl salts, photolysis of, 10:414
Triarylsulfonyl salt photoinitiators, 14:272
1,2,3-Triazoles, synthesis of, 22:695–696
Triazacyclononane derivatives, 24:56
Triazine-based antibiotics, 26:799
Triazine herbicides, 13:284, 321–322
Triazines, 18:769, 9:298–298
Triazines. See also, Environmental fate of triazines
Triazole-based fungicides, 13:306, 595
Triazoles, 5:89, 9:288–289
Triazone, 2:640
s-Triazine-2,4,6-triol, 8:200
Tribaloy T-800
composition of wear-resistant alloy, 7:221
Trasicid acid, 18:817
Trasicid lead silicate, 14:796
Trasicid lead sulfate, 14:790
for PVC polymers, 25:671
Tribenzoate chiral stationary phase, 6:88
Tribenzylbismuthine, 4:27
Tribenzyether chiral stationary phase, 6:88
Tribenzytin chloride, preparation of, 24:816
Triblock copolymer, 24:704
Triblock copolymers, 14:252, 23:367, 7:66
Tribological behavior ceramics, 5:630–632
Tribological surfaces, 15:202
Tribology, 15:201–202
Tribology, ion implantation and, 14:449–450
Triborohydride ion, 4:185
Tribo-sensor, 3:749–750
1,2,3-Tribromopropane, 4:359
2-(Tribromomethylsulfonyl)-benzothiazole-silver, 19:364
2,4,6-Tribromoaniline
physical properties of, 4:352
2,4,6-Tribromophenol, 22:6
2,4,6-Tribromophenol, 4:301–302
physical properties of, 4:352, 357
Tribrissen registered for use in aquaculture in Canada, 3:218
registered for use in aquaculture in Europe, 3:220
Tribromamine, 13:101, 103–104
Tribromamine, 4:319
Tribromoacetic acid, 1:143
Tribromomethane, 4:348
Tribromomethyl print stabilizers, 19:363, 365
Tribromophenylmaleimide
physical properties of, 4:357
Tribromosilane
physical properties of, 4:326
Tributylamine, 2:550
Tributyl phosphate surface tension, 8:244
Tributyl phosphate (TBP) extraction, 25:405
Tributyl phosphate zirconium extraction process, 26:630
Tributyltin acrylate, in antifouling paint, 24:818
Tributyltin fluoride antifouling, 7:160
Tributyltin phosphate, as wood preservative, 24:818
Tributyltins, 24:817
as skin irritants, 24:829
Tricadmium diarsenide, 4:510
Tricadmium diphosphide, 4:510
Tricaine methanesulfonate
anesthetic for aquaculture in U.S., 3:214t
registered for use in aquaculture in Canada, 3:218t
registered for use in aquaculture in Europe, 3:220t
Tricalcium aluminate
hydration, 5:477t, 477–478
in Portland cement, 5:467
in Portland cement clinker, 5:472t, 473t
Tricalcium aluminoferrite
hydration, 5:477t
Tricalcium phosphate (TCP), 18:837–838, 838–839
manufacture of, 18:854, 856
Tricalcium silicate
in cement, 5:468
hydration, 5:477t
phase in Portland cement clinker, 5:472t
in Portland cement, 5:467
Tricapped trigonal prismatic
geometry for metal coordination numbers, 7:574, 575t
Tricaprin
solvent for cosmetics, 7:832
Tricarballylic acid
for cotton esterification, 8:30
Tricarboxydictichlorobis
(triphenylphosphine)molybdenum(II)
effective atomic number of noble gas, 7:590t
Tricerium tetrasulfide, 5:677
Tricesium oxide, 5:700
Trichlor, 26:188
Trichloramine, 13:103
Trichloronon
registered for use in aquaculture in Europe, 3:220t
registered for use in aquaculture in Japan, 3:221t
therapeutant for aquaculture in U.S., 3:205t
Trichloroacetaldehyde
end use of chlorine, 6:135t
Trichloroacetate, 13:324
Trichloroacetic acid, 1:140–141
physical properties of, 1:141t
Trichloroacetic acid esters, 14:267
Trichloroacetic acid (TCA) hydrolysis, 17:624
Trichloroacetyl chloride, 6:269
S-2,3,3-Trichloroallyl diisopropyl-(thiocarbamate), 2:549t
1,2,3-Trichlorobenzene
toxicity, 6:218t
1,2,4-Trichlorobenzene
physical and thermodynamic properties, 6:214t
toxicity, 6:218t
uses, 6:224
1,3,5-Trichlorobenzene, 6:211
Trichlorocarbonanalide, as soap bar additive, 22:746
Trichlorodiphénylamintimony, 3:75
Trichloroethane, production of, 19:113
1,1,1-Trichloroethane, 6:239, 245
bioremediation substrate, 3:760–772
chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
consumption, 6:245t
in integrated manufacturing process, 6:237t
ozone depleting potential, 1:809t
1,1,2-Trichloroethane, 25:631–632
preparation of VDC from, 25:692
from vinyl chloride manufacture, 25:634–638
Trichloroethene
clorocarbon/chlorohydrocarbon of industrial importance, 6:227t
production from acetylene, 1:219–220, 229
2,2,2-Trichloroethyl chlorofomate
molecular formula, 6:291t
chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
consumption, 6:245t
economic aspects, 6:264–265
health and safety factors, 6:265–266
in integrated manufacturing process, 6:237t
manufacture, 6:263–264
physical and chemical properties, 6:261–263
shipping and storage, 6:264
in soil and ground water treatment, 25:834, 6:260–261
specifications and standards, 6:265
uses, 6:266–267
Trichlorohydroxydiphenyl ether, as soap bar additive, 22:746
Trichloroisocyanuric acid (TCCA), 4:53, 8:202, 13:98, 111
Trichloromelamine, 13:111, 116, 4:54
Trichloromethane
chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
Trichloromethanesulfonyl chloride, 23:628–629
manufacture of, 23:628
1,1,1-Trichloro-2-methyl-2-propanol, 6:282
Trichloromethylsilane, in silicone polymerization, 22:556
Trichloromonofluoromethane (Propellant 11)
2,4,5-Trichlorophenoxyacetic acid, 23:653
physical properties of, 1:776t
Trichlorophenylantimony monohydrate, 3:75
Trichlorophosphineimide, 19:57
1,1,1-Trichloro-2-propanol
production from acetaldehyde, 1:105
2,4,5-Trichloropyrimidine dyes, 9:467
Trichlorosilane
silicon consumption and, 22:508
in silicon purification, 22:494, 495
Trichlorotitanium monoacrylates, 25:96
2,3,4-Trichlorotoluene, 6:344–345
physical properties, 6:344t
2,3,5-Trichlorotoluene
physical properties, 6:344t
2,3,6-Trichlorotoluene, 6:344–345
physical properties, 6:344t
2,4,5-Trichlorotoluene, 6:344–345
physical properties, 6:344t
2,4,6-Trichlorotoluene, 6:345
physical properties, 6:344t
3,4,5-Trichlorotoluene
physical properties, 6:344t
Trichlorotoluuenes, 6:344–345
physical properties, 6:344t
1,2,2-Trichloro-1,1,2-trifluoroethane (CFC 113), 6:269
Trichlorovinylsulfenyl chloride, 23:629
Trichoderma reesi, 12:479, 480
Trichoderma viride, 10:536
Trichotheccene mycotoxins, 14:144, 146
Trichromatic sources, for white LEDs, 14:862
Trichromatic theory, of color, 7:304, 308
Tricinnamate chiral stationary phase, 6:88t
Trickle-bed reactor, 21:333–334
Trickling filter
in biological waste treatment, 25:901t, 905–906
Triclinic crystal system, 8:114t
Triclinic parallelepipeded lattice, 8:114t
Triclinic symmetry, 8:114t
Triclocarban
antimicrobial used in cosmetics, 7:831t
Triclocarban (TCC), as soap bar additive, 22:746
Triclopyr, 13:322, 21:106
Triclosan
antimicrobial used in cosmetics, 7:831t, 847, 851
function as ingredient in cosmetics, 7:829t
Triclosan (TCS), as soap bar additive, 22:746
Tricobalt tetralanthanum decaoxide uses, 7:241t
Tricor, 5:146
molecular formula and structure, 5:141t
Tricresyl phosphate, 11:493, 494
Tricyanocuprate(I), 7:578t
Tricyanovinyl dyes, 9:258
Tricyclic encapsulating ligand, tetraprotonated form of, 24:44
cis, trans-Tricyclodecanediamine
physical properties of, 2:500t
Tricyclohexyl citrate
physical properties, 6:649t
Tricyclohexyltin chloride, 24:816
Tricyclohexyltin hydroxide, as pesticide, 24:817
Tricyclopentadiene, 8:224t
Tridecanoic acid
physical properties, 5:29t
Tridecanol
properties of commercial, 2:12t
Tridecenoic acid
physical properties, 5:31t
Tridecyl alcohol
    list pricing, 2:9t
Tridecyl acid
    physical properties, 5:29t
Tridendate ligands, 7:577–578
Tridentate chelants, 5:709
Tridymite
    phase equilibria in the C–A–S system, 5:468
Trief cements, 5:502
2,4,6-Triethylbenzene, with guanidinium substituents, 24:45
3-Triethoxysilylpropyl-5,5-dimethylhydantoin, 13:113–114
Triethanolamine (TEA)
    buffer for ion-exchange chromatography, 3:830t
    molecular formula, 5:712t
    physical properties of, 2:123t
    specifications, 2:132t
Triethanolamine lauryl sulfate
    effect of coconut diethanolamide on foaming, 2:453t
Triethanolamine stearate,
    acid soap and, 22:728
    soap structure and, 22:729
Triethoxytitanium, 25:102
Triethyl aluminum (TEAL), 2:345t, 358, 20:529
    feedstock for higher aliphatic alcohols, 2:27t, 25:118
Triethylamine, 14:253, 2:537t, 549t
    ACGIH TLV, 2:548t
    physical and chemical properties of, 2:540t
    specifications and economic data, 2:551t
Triethylamine borane, 4:186
Triethylaminoethyl group
    ion-exchange group used in protein purification, 3:830t
Triethyl antimonate, 3:66
Triethyl citrate
    physical properties, 6:649t
Triethyl(dimethyl)antimony, 3:79
Triethylenediamine, 8:485
    physical properties, 8:486t
Triethylene glycol, 10:665, 12:659–660
    as dessicant, 8:366
    solvent in commercial gas absorption processes, 1:26t
Triethylene glycol bis(allyl carbonate)
    properties of, 2:253t
Triethylene glycol dimethacrylate
    monomer for dental cements, 8:278
Triethylenetetramine
    as chelant, 5:709
    molecular formula, 5:712t
    physical properties, 8:486t
    prices of commercial, 8:496t
    typical specifications, 8:496t
Triethylenenetramine (TETA)
    in epoxy adhesives, 1:536
Triethyl phosphate reaction, 10:530
α,α,α-Trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine, 2:550t
3,3,3-Trifluoropropene, 20:241–242
3-Trifluoroacetyl-1R-camphorate, 6:98
Triflates, cross-coupling of organoboranes with, 13:651
Triflic acid, 22:598
Tri-Flo separator, 16:634
Trifluoroacetylacetone
    molecular formula, 5:712t
Trifluoroacetyl chloride
    chiral derivatizing agent, 6:96t
Trifluoroalkylated aromatics, 12:168
Trifluoroboroxine, 4:142
Trifluromethanol, 23:626
Trifluoromethyl compound herbicides, 13:325
Trifluoromethyl peroxide, 18:446
Trifluoropropyl groups, in moisture-curing silicons, 22:32
Trifluoropropylmethyldisiloxane, 22:583
Trifluorosilylnitroxide cation, 17:332
Trifluorotetraoxotriantimonic(III) acid, 3:62t
Trifluorovinyl ethers, 18:289
Trifluralin
    registered for use in aquaculture in Australia, 3:222t, 13:319
Trifunctional dyes, 9:475–476
Trifunctional initiators, 14:252–254
TRIGA reactor, 17:594
Trigeminal stimuli, chemical analysis of, 11:524
Triglyceride
    in fatty acid neutralization, 22:740
    in soap making, 22:732
Triglyceride composition, 10:826
Triglyceride esters, 15:218
Triglyceride molecule stereochemistry, 10:802

Triglycerides
- direct hydrogenolysis, 2:18
- transesterification in higher alcohol manufacture, 2:13
- enthalpy values for, 10:820t
- fatty acids found in, 10:803t
- melting points for, 10:820t, 821
- niacin and, 25:798, 9:142

Triglycidyl ether of p-aminophenol, 10:372

Triglycidyl isocyanurate, 8:214

Triglycidyl isocyanurate (TGIC), 10:373, 375, 402, 7:48–50, 136

Trigonal
- geometry for metal coordination numbers, 7:574
- trigonal bipyramidal
  - geometry for metal coordination numbers, 7:574, 575t
- trigonal plane
  - geometry for metal coordination numbers, 7:575t
- trigonal prismatic
  - geometry for metal coordination numbers, 7:574, 575t

Trigonelline, 7:253
- analysis in green coffee, 7:253t
- analysis in roasted, brewed, and instant coffee, 7:255t

Trihaloacyl aromatics, 12:175

Trihalomethane analysis of water, 26:44

Trihalomethane control
- in municipal water treatment, 26:125
- trihalomethanes (THMs), removal from drinking water, 17:806–807

Trihalomethyl ketones, 10:488

Triheteroglycans
- classification by structure, 4:723t
- 2,15,16-Trihydroxyhexadecanoic (ustilic) acid
  - physical properties, 5:35t
- 2,4,6-Trihydroxy-s-triazine, 8:200
- 9,10,16-Trihydroxyhexadecanoic (aleuritic) acid
  - physical properties, 5:35t

Trihydrate bauxites, 2:347

Trihydroxycuprate, 7:770

Triiodoacetic acid, 1:144

Triiodomethane, 14:376

Triiron dodecarbonyl, 16:63

Triiron tetroxide, 14:542

Triisobutylaluminum, 2:345t

Triisobutylaluminum
- production from butylenes, 4:426
- physical properties of, 2:123t
- specifications, 2:132t

Triketones, 13:357

Triaurin in mascara, 7:862

Trilinolein
- cosmetically useful lipid, 7:833t

Trilithium initiator, 14:254

1,3,5-Trimethyl-2,4,6-tris(3',5'-di-tert-butyl-4-hydroxybenzyl)benzene, 3:107

1,3,5-Trimethylbenzene. See Mesitylene

2,2,4-Trimethyl-1,2-dihydroquinoline, 3:108

2,2,4-Trimethyl-1,3-pentanediol, 12:672–674

2,2,4-Trimethyl-1,3-pentanediol monoisobutyrate
- butyraldehyde derivative, 4:461, 467

2,2,4-Trimethyl-1,3-pentanediol (TMPD)
- butyraldehyde derivative, 4:461, 467

2,2,4-Trimethyl-1-pentanol
- physical properties of, 2:3t

2,2,4-Trimethyl-3-hydroxypentanal butyraldehyde derivative, 4:461

2,2,4-Trimethylpentane
- azeotrope with benzene, 3:598t

2,4,4-Trimethylpentyl esters, as initiators, 14:267

2,4,6-Trimethylphenol
- production by alkylation, 2:197

3,3,5-Trimethylcyclohexanone, 14:588

3,3,5-Trimethylcyclohexylamine
- physical properties of, 2:499t

3,5,5-Trimethyl-1-hexanol
- physical properties of, 2:3t

3,5,5-Trimethyl-2-cyclohexenone. See Isophorone

Trimellitates
- for PVC polymers, 25:674

N-Trimethylsilyldiethylamine, as silylating agent, 22:692, 693t

N-Trimethylsilylimidazole (TSIM), as silylating agent, 22:692, 693t
N-Trimethylsilylimidazole
chiral derivatizing agent, 6:96t
Trimeric uranyl hydroxide complexes, 25:430
Trimetallic uranyl cluster, 25:431
Trimetaphosphoric acid, 18:829
Trimethapan, 5:159
Trimethine dyes, 9:505, 509
Trimethine unsymmetric homodimeric cyanine dyes, 20:520
Trimethine unsymmetric monomeric cyanine dyes, 20:520
Trimethoprim, 23:510
bacterial resistance mechanisms, 3:32t
registered for use in aquaculture in Europe, 3:220t
from vanillin, 25:554
world market for, 3:16t
year of disclosure or market introduction, 3:6t
Trimethoprim-sulfamethoxazole, resistance to, 23:504–505
Trimethylacetic acid, 5:60–61
Trimethylaluminum (TMA), 16:85, 87, 88, 92, 93
Trimethylamine (TMA), 16:356, 357
reactions, 16:359
Trimethylamine, 14:390
Trimethylaminealane, in MOCVD epitaxy, 22:156
Trimethylaminoethyl group
ion-exchange group used in protein purification, 3:830t
Trimethylarsine oxide (TMAO)
present in water and food, 3:276t
Trimethylchlorosilane
in MQ resin manufacture, 22:587–588
as silylating agents, 21:692, 695
Trimethyl cyanurate, 8:205
Trimethylene terephthalate (PTT), 18:569
Trimethylgallium (TMGa)
gallium arsenide semiconductor and, 22:152–153
modeling GaAs growth from, 22:154, 156–157
Trimethylhexamethylene diisocyanate (TMDI), 14:588
Trimethyl isocyanurate, 8:205
Trimethylolpropane, 2:47
economic aspects, 2:52
physical properties of, 2:48t
Trimethylolethane, 2:47
physical properties, 2:48t
Trimethylolpropane butyraldehyde derivative, 4:461, 467, 2:47
economic aspects, 2:52
physical properties of, 2:48t
Trimethylolpropane acrylic esters, 2:53
Trimethylsilanol, in silicone polymerization, 22:556
Trimethylsilation, of silicate solutions, 22:458
Trimethylsilyl (TMS) derivatives in organic synthesis, 22:695–696
as silylating agents, 22:694
Trimethylsilyl azide, as silylating agent, 22:695–696
Trimethylsilyl enol ethers, synthesis of, 22:696
Trimethylsilyl iodide (TMSI), as silylating agent, 22:694–695
Trimethylsilyl methacrylate (TMSMA), 20:477
Trimethylstibine, 3:58, 69
Trimethylstibine oxide, 3:73
Trimethylstibine sulfide, 3:74
Trimethylsilyl groups, 13:537
Trimethyltin chloride, 24:823
Trimethylyvinylammonium chloride. See Neurine
Tri-N₂ complexes, 17:312
Tri-n-butylamine, 2:538t
physical and chemical properties of, 2:540t
specifications and economic data, 2:551t
Tri-n-butyl citrate
physical properties, 6:649t
Tri-n-dodecylamine
melting point, 2:521t
Trinexapac-ethyl, 13:45t, 57
Tri-n-hexadecylamines
melting point, 2:521t
1,3,5-Trinitrobenzene, 3:602
2,4,6-Trinitrophenol, 22:5, 6
2,4,6-Trinitrophenol, 3:601, 602
2,4,6-Trinitrophenol, 10:732
2,4,6-Trinitrophenylmethyl nitramine, 10:732
2,4,6-Trinitrotoluene
bioremediation substrate, 3:779–780
2,4,7-Trinitro-9-fluorenylidene malononitrile (TNF-MN)
electrochromic material, 6:581, 581t
Trinickel orthophosphate, 17:112
Trinitrotoluene (2-methyl-1,3,5 trinitrobenzene; TNT), 10:732–734
Trinitrotoluene (TNT), 17:160, 25:1558
Tri-n-octylamine
melting point, 2:521t
Tri-n-propylamine, 2:537t
physical and chemical properties of, 2:540t
specifications and economic data, 2:551t
Trinuclear carbonyls, structure of, 16:62–64
Trinuclear dodecacarbonyl species, 16:63
3,4,6-Tri-O-acetyl-1,5-anhydro-2-deoxy-D-ARABINO-HEX-1-ENTOL, 4:713
Tri-O-acylglycerols (TAGs), 10:281
Trioctylphosphine oxide (TOPO), 19:66
Triode gauge, 20:660–661
Triols, phosphine oxide, 11:501
Triorganohydridosilanes, in silicone chemistry, 22:65
Triorganotin chlorides, in triorganotin preparation, 24:815–816
Triorganotin halides, physical properties of, 24:814–815
Triorganotin hydroxides, 24:815
Triorganotin oxides, 24:815
Triorganotins, 24:813–818
acute oral toxicities of, 24:828–829
as antifouling agents, 24:818
commercially important, 24:814t
physical properties of, 24:813–814
preparation of, 24:815–817
reactions of, 24:814–815
uses of, 24:817–818
Tri-o-thymotide[2281-45-0], 14:178–179
1,2,3-Trioxolanes, 18:460
1,2,4-Trioxacycloheptanes, 18:455
1,2,4-Trioxacycloalkanes, 18:454–455
1,2,4-Trioxanes, 18:461
1,2,4-Trioxolanes, boiling points of, 18:462t
Trioxane, 12:123
polymerization of, 14:271
Tripenterythritol, 2:46, 47
economic aspects, 2:52
manufacture, 2:51–52
physical properties of, 2:48t
Triperoxides, cyclic, 18:459
Triperoxymanganate(IV), 15:579
2,4,5-Triphenylimidazole. Séc Lophine
Triphendioxazine dyes, 9:259–261
Triphendioxazine chromophores, 9:320
Triphenylbismuth bis(4-vinylbenzoate), 4:33
Triphenylbismuth dichloride, 4:33
Triphenylbismuth difluoride, 4:27
Triphenylbismuth dimethacrylate, 4:33
Triphenylbismuthine, 4:26
Triphenylbismuth iodide isocyanate, 4:32
Triphenylbismuth iodide azide, 4:32
Triphenylbismuth oxide, 4:32
Triphenylcarbamate
chiral stationary phase, 6:88t
Triphenylcarbenium (trityl)-borate salts, 16:96
Triphenyl methane
soluble dyes, 7:373t
Triphenylmethane dyes, 12:50
Triphenyl methane phenols
soluble dyes, 7:373t
Triphenylmethylcesium, 5:694
Triphenylphosfonium iodide, 14:370
Triphenyl phosphate, 11:485, 494
Triphenylphosphine, 19:60, 61, 10:363, 20:300
Triphenylphosphine oxide, 11:485, 495, 19:20
Triphenylphosphine, preparation of, 12:823
Triphenyl phosphite, 19:74
Triphenylstibonium tetraphenylcyclopentadienylide, 3:77–78
Triphenyltin, as skin irritant, 24:829
Triphenyltin hydroxide, 24:817
as eye irritant, 24:829
Triphenymethane
soluble dyes, 7:373t
Triphosphorus pentanitride, 19:57
“Triple bottom line,” 12:807
Triple-bond stretching, 14:235
Triple helices, 17:609
Triple-helix formation, 17:528
Triple-jet crystal growth methods, 19:179
Triple-layer ODRs, 14:858–859
Triple point of water, 24:439–440
Triple-point temperature, 24:440
Triple porphyrin receptor, 16:787
Triple superphosphate, 11:119–120
Triplet multiplicity, 19:109
Triplet quenching additives, 14:703
Tripodal coelenterands, 24:45
Tripodal ligands

rigid, 24:45
thorium and, 24:767
Tripoli, 1:9
Tripolyphosphates, 18:844–846
Tripotassium dicitratobismuthate, 4:36
Tripotassium hexakiscyanoferrate, 14:535
Tripotassium phosphate (TKP), 18:834
2,4,6-Tripropyl-1,3,5-trioxane
butyraldehyde derivative, 4:461
cis-Tripopyl-bismuth dibromide, 4:31–32
Tripolyethylene glycol, 12:664
uses for, 12:669–670
trans-Tripopyl-bismuth dibromide, 4:31–32
9-Triptycyl ring systems, 17:60
Triruthenium dodecacarbonyl, 16:63
Tris
buffer for ion-exchange chromatography, 3:830
Tris(1,10-phenanthroline)iron(2+) ion, 14:549
Tris(1,10-phenanthroline)ruthenium(II), 7:598
Tris(1,10-phenanthroline)iron(3+) ion, 14:549
Tris(2,2'-bipyridine)iron(2+) ion, 14:549
Tris(2,2'-bipyridyl)ruthenium(II) complex
chemiluminescence reagent, 5:856–857
Tris(2,3-dibromopropyl) phosphate, 11:502
Tris(2,3-dihydroxypropyl)isocyanurate, 8:204
Tris(2,3-epoxypropyl)isocyanurate, 8:214
Tris(2,4-di-tert-butylphenyl)phosphate, 3:114
Tris(2,4-pentanedionato)iron(III), 14:546
Tris(2-chloroethyl)amine (HN3), 5:816
Tris(2-chloroethyl) phosphate, 11:502
Tris(2-hydroxyethyl)isocyanurate, 8:204, 213
Tris(3,5-dicyclohexyl-4-hydroxybenzyl)isocyanurate, 8:205
Tris(3-chloro-2-hydroxypropyl)isocyanurate, 8:204
Tris(aminoethyl)amine (tren), 24:46–47
Tris(chloroethyl) phosphate (TCEP), 25:472
Tris(chloroisopropyl) phosphate (TMCP), 25:472
Tris(chloromethyl)isocyanurate, 8:205
Tris(dimethylamino)phenol, 1:536
Tris(dithiolene) molybdenum complexes, 17:23
Tris(ethanediato)ferrate, 14:548
Tris(hydroxymethyl)isocyanurate, 8:204–205
Tris(nonylphenyl)phosphate, 3:113
Tris(N-phenylenecarbamoylmethyl)isocyanurate, 8:205
Tris(tribromoneopentyl) phosphate, 11:492
Tris(tribromophenyl) triazine, 11:467
Tris-1-phenylethylcarbamate chiral stationary phase, 6:88t
Tris-3,5-dichlorophenylcarbamate chiral stationary phase, 6:88t
Tris-3,5-dimethylphenylcarbamate chiral stationary phase, 6:88t
Trisaccahrides, 4:697
Trisany, 4:358t
Trisaturates, 10:813
Trisazo dyes, 9:363
Triscarbonato uranium(VI) solids, 25:432
Tris-Cp uranium complexes, 25:440
2,4,6-Tris(dimethylaminomethyl)phenol (TDMAMP), 10:412
Tris-dibromopropyl isocyanurate, 11:467
Tris-dibromopropylisocyanurate physical properties of, 4:355t
Tri-sec-butanolamine physical properties of, 2:123t
Trisodium aluminum hexafluoride, 7:596
Trisodium hexakiscyanoferrate, 14:535
Trisodium hexanitrobismuthate(III), 4:25
Trisodium orthophosphate, 8:416
emulsifiers, detergents, and dispersants, 8:710t
Trisodium phosphate, 8:416
Trisodium phosphates (TSPs), 18:831, 833
manufacture of, 18:853
Trisodium trithiosulfatobismuthate(III), 4:25
Trisphenol epoxy novolacs, 10:371–372
Tristimulus colorimeters, 7:325
Trisubstituted alkene synthesis, 13:653
Trisubstituted silyl group, in silylation, 22:691
Trisulfuric acid, 23:765
Tris(dimethylaminomethyl)phenol, 1:536
Tri-t-butoxyaluminumhydrides, 13:624
Triterpenoids, 24:555–557
Trititanium pentoxide, 25:14
Tritium, 8:456–480; 13:759
analytical methods, 8:477–478
chemical properties, 8:472–474
health and safety factors, 8:478–479
natural production and occurrence, 8:474–475
nuclear properties, 8:471–472
physical properties, 8:469–471
production, 8:475–476
in radioactive tracer synthesis, 21:273–274
uses, 8:479–480
Triton X-100
dispersant, 8:710

Tritracontanoic acid
physical properties, 5:30

Triuranium octaoxide, 25:425–426

Trivalent chromium plating, 9:803, 804
Trivalent lanthanides, 14:633
Trivalent manganese, 15:576–579
compounds, 15:576–578
Trivalent organouranium complexes, 25:440

Trivalent tungsten complex, 25:385–387

Trixylenyl phosphate, 11:493, 494

Trombone coolers, 23:779
Trommsdorf Effect, 16:281–282
in styrene polymerization, 23:382

Trona, 5:785
Trona deposits, sodium carbonate from, 22:787, 788–790

Tropane, 2:79

Tropical bleach, 4:45, 52
Tropical fishes
aquaculture, 3:183
Troposphere, 21:526
Tropospheric ozone, 17:790–793
as greenhouse gas, 1:806, 807
Trost-Tsuji coupling reaction
ionic liquids in, 26:890–891

Troubleshooting, technical service and, 24:341–342

Trousers (dress/sport)
number produced from one bale of cotton, 8:133t

Trousers (work)
number produced from one bale of cotton, 8:133t

Trout
aquacultural chemical needs, 3:209
aquaculture, 3:183, 188

large eggs, 3:189
nutrition and feeding, 3:202
raceway culture, 3:193
reproduction and genetics, 3:205, 206
water quality requirements for aquaculture, 3:199
Trovafloxacin, 21:222, 224, 231
Troykyd defoamer, commercial defoamer, 8:241t

Truck exhaust emission standards, 12:429t
Truck in-out operations weight indicators for, 26:251

Trucks
gasoline engine oils for, 15:227–232
heavy duty diesel engine oils for, 15:233–235
Truck scales, 26:244
portable, 26:246
True boiling point (TBP) curves, 12:396
True fruit flavorings, 11:571
True Heat process, 20:50
True moving-bed countercurrent adsorption system, 1:681
Truncated inverted pyramid (TIP) die, 14:847. See also TIP LED
Trypan red, 3:2
d-Tryptophan
systematic name, formula, and molecular weight, 2:558t

Tryptic enzymes, 10:252
l-Tryptophan
systematic name, formula, and molecular weight, 2:558t

Tryptophan
alkaloids derived from, 2:78, 92–99
content in cocoa and chocolate products, 6:368t
systematic name, formula, and molecular weight, 2:558t
taste profile, 2:605
Tschernichite, 16:813

T-shirts
number produced from one bale of cotton, 8:133t

TSWEET software package, 1:76

T-type inks, 14:326
T-type polymers, 21:767

Tube bending
bismuth alloy applications, 4:13
Tube bundle dimensions, 13:253
Tube collectors, 26:702
Tube-cooled converter, in methanol synthesis, 16:309
Tube furnaces, 12:739
Tube-in-orifice jet nozzle design, 16:8, 9
Tubeless siphon phenomenon, 21:740
Tube precipitators, 26:703
Tuberculosis effect on heart, 5:107
Tuber gum, 13:63t
Tubes
  copper, 7:693–695
  polyimide, 20:282–283
Tubeside flow maldistribution effect, 13:258
Tubing flow through, 15:722, 723
  HDPE, 20:174
  LLDPE, 20:208
  vitreous silica in, 22:442
Tubing extrusion, 19:543–544, 790
Tubocurarine, 2:74, 89, 90
Tubular bowl centrifuge
  theory of performance, 5:508, 518
Tubular centrifuge
  operation, 5:532–534
Tubular diffusers, 26:165
Tubular Exchanger Manufacturers
  Association Inc. (TEMA), 13:266, 19:507
Tubular loop reactors, 15:710
Tubular membrane modules, 15:821
Tubular pervaporation modules, 18:512
Tubular plug flow experimental reactor, 21:352, 353
Tubular reactor, 14:722, 20:216–217, 25:269, See also Packed catalytic tubular reactors
  ideal nonisothermal packed catalytic, 25:310–316
  methanol synthesis in, 25:270
Tubular resins, 20:215
Tubular walls, heat-transfer rate across, 13:244–245
Tucker3 models, 6:58, 62
Tufcel, 11:260, 261
Tuff
  high-level radioactive waste disposal in, 25:857
Tula istle, 11:296
Tumbling
  mixing by, 16:719
  of staple-fiber nonwoven fabrics, 17:516
Tumbling mills, 16:613–614
Tumor cells and skin
  preservation using cryogenics, 8:42
Tumorigenic data, for magnesium oxide, 15:413
Tumorigenic responses, 25:222–223
Tumor necrosis factor (TNF)
  role in hemostatic system, 4:89
Tumors, hydrazine-related, 13:590–591
Tunable diode lasers (TDLs), 23:143
Tunable diode laser systems, 23:138
Tunable optical properties, windows with, 23:25
Tunable uv–vis lasers, 23:144
“Tuneable” separation systems, 21:654
Tung oil, 9:143, 149, 150, 10:814–817
Tungstate catalysts, 21:48
Tungstates, 25:381–382
  properties of, 25:382t
Tungsten (W). See Nickel–chromium–
  molybdenum (tungsten) alloys, 25:349–376
  as an alloy addition, 25:374
  analytical methods for, 25:369–370
  anionic complexes of, 25:386–387
  chemical processing of, 25:361–363
  chemical properties of, 25:352–354
  chemical vapor deposition precursor, 5:805t
  economic aspects of, 25:364–368
  effect on cobalt alloys, 7:220
  effect on copper resistivity, 7:676t
  environmental concerns related to, 25:370
  grades, specifications, and quality control for, 25:368–369
  health and safety factors related to, 25:371–375
  isotopes of, 25:350t
  manufacturing and processing, 25:357–363
  minerals of, 25:350t
  mining, 25:361
  occurrence of, 25:350
  oxidation states of, 25:352–354
permissible exposure limits for, 25:372–375
physical properties of, 25:350–351, 353t
prices of, 25:364t
resistance to chemicals, 25:354
sources and supplies of, 25:354–357
statistics related to, 25:356t
U.S. import duties for, 25:365t
world concentrate production of, 25:352t
wrought, 25:360
Tungsten alloy machine chips, 25:371
Tungsten blues, 25:381
Tungsten borides, 25:386
Tungsten bromide
physical properties of, 4:329
Tungsten bronzes, 5:598, 25:381
Tungsten carbide, 4:647, 649t, 674, 677–679, 691
cemented, 4:655–672
in ceramic–matrix composites, 5:554t
as industrial hard carbide, 4:674
lattice, 4:652
mechanical properties compared to other hard materials, 8:526t
new tool opportunities, 4:694
physical properties of, 4:679t
preparation, 4:675, 676
quality control methods, 4:692–693
solid solutions with other carbides, 4:686–689
stoichiometry, 4:651
2:1, 4:649t
Tungsten carbide–cobalt alloys, 4:663
Tungsten carbides, 25:372–373, 385
uses for, 25:388
Tungsten compounds, 25:377–390
interstitial, 25:385–387
toxicity of, 25:387
uses for, 25:387–388
Tungsten dibromide, 25:379
Tungsten dichloride, 25:379
Tungsten diiodide, 25:379
Tungsten dioxygenide, 25:380
Tungsten disilicide, 25:386
Tungsten disulfide, 25:384–385
uses for, 25:387
Tungsten halides, 25:377–384
Tungsten–halogen lamps, vitreous silica, 22:441
Tungsten heavy alloy (WHA) penetrators, 25:421
Tungsten hexabromide, 25:379
Tungsten hexacarbonyl, 25:377
Tungsten hexachloride, 25:378
uses for, 25:387
Tungsten hexafluoride production, 11:846, 25:378
Tungsten inert gas (TIG) welding electrodes, 25:374
Tungsten inert gas (TIG) welding, of titanium, 17:368, 24:857–858
Tungsten metalworking, 25:360–361
Tungsten minerals, 25:361
Tungsten–nickel–iron alloys
high-density, 25:375
Tungsten nitrides, 25:385–386
Tungsten ores, 25:364
mining, 25:357–358
Tungsten oxides, 25:380
electrochromic materials, 6:572t, 578–579, 579t
Tungsten oxydibromide, 25:379
Tungsten oxydichloride, 25:379
Tungsten oxydiiodide, 25:380
Tungsten oxyhalides, 25:377–384
Tungsten oxytetrabromide, 25:379
Tungsten oxytetrachloride, 25:379
Tungsten oxytetrofluoride, 25:378
Tungsten oxytrichloride, 25:379
Tungsten pentachloride, 25:378–379
Tungsten powders, 25:359, 375
Tungsten-producing companies
major, 25:366–367t
Tungsten products
consumption and stocks of, 25:373t
Tungsten resources
world, 25:351t
Tungsten–rhenium alloys, 25:375
Tungsten–rhenium thermocouple, 24:461
Tungsten silicides, 25:386
Tungsten stockpiles, 25:354, 364
Tungsten tetrabromide, 25:379
Tungsten tetrachloride, 25:379
Tungsten tetrafluoride, 25:378
Tungsten tetraiodide, 25:379
Tungsten tribromide, 25:379
Tungsten triiodide, 25:379
Tungsten trioxide
electrochromic material, 6:573, 25:380, 381
uses for, 25:388
Tungsten trisulfide, 25:385
Tungstic acid, 25:349, 361, 381
Tunicates

cellulose source, 5:363

Tunnel breakdown, in silicon-based semiconductors, 22:244–245

Tunneling atomic force microscopy (TAFM; TUNA), 3:327–331

copper contaminated gate oxides, 3:337–338

Tunneling, in QEDs, 22:169

Tunnel test, 11:458

Turbidimetric agglutination immunoassays, 14:140–142

Turbidimetry, 18:143

Turbidity

in analysis of water, 26:35–36

Turbinado sugar, 23:482–483

Turbine cylinders, 23:230–231

Turbine meters, 11:666–667

Turbine oils, for industrial steam and gas turbines, 15:239–240

Turbine pumps, 21:68, 69

Turbines, 16:672

corrosion in, 23:244

high performance, 23:307

steam, 23:229–231

thermodynamics of, 24:655–656

Turbine steam, deposition of contaminants from, 23:228

Turbine type impellers, 16:699

Turbo expanders, in cryogenic processes, 13:698

Turbostratic carbon, 12:790, 26:738

Turbotray dryers, 9:119

Turbulence

gas transfer and, 26:156–157

implications of, 21:617–618

in the R&D context, 21:614–616

in thermal waste treatment, 25:832

in wet classifiers, 22:285

Turbulence damping factor, 16:698

Turbulence models, 11:779, 780

Turbulent-bed regime, 11:724

Turbulent boundary layer, 11:753

Turbulent diffusion flames, 7:448–449


computation of, 11:778–781

in microfluidics, 26:960

relationships for estimating, 15:719–721t

Turbulent fluidization regime, 11:801, 802–803

Turbulent modeling, 11:781

Turbulent noise detectors, 11:673

Turbulent premixed flames, 11:673

Turf growth regulators, 13:54

Turf growth retardant, 13:57

Turkeys, nutrient requirements of, 10:842t

Turmeric, 23:171

Turnaround period, 19:494

Turnarounds, industrial hygiene and, 14:210

Turnbull's blue color, 7:332, 14:536

Turner–Newall classification, asbestos, 3:310

Turning

ceramics processing, 5:654–655

Turning headers, 13:271

Turning-loss coefficient, 13:262

Turnings/borings scrap, 21:409

Turnips

citric acid in, 6:632t

Turnover number, 10:254–255, 14:626

Turpentine, 24:475–476

composition of, 24:476

steam distillation, 8:777

Turpentine oil, 3:230

Turquoise

color, 7:331

Turquoise MX-G for dye–ligand affinity chromatography, 6:402

Tuz Golu (lake), 5:784

Tversky similarity, 6:8

T vessicant agent, 5:816

physical properties, 5:817t

Twaron fiber, 13:373

Tween surfactants, 24:150

12-membered ring macrolides, 15:272, 275t

2,6-TDI, reaction with a polyether triol, 25:459. See also Toluene diisocyanate (TDI)

Twin coil inductor, 12:312, 313

Twin-cone classifier, 22:289

Twining, in shape-memory alloys, 22:340–341, 343, 344, 345

Twin-screw encapsulation, 11:537

Twin-screw extruders, 19:540, 541

in PVC siding manufacture, 25:684–685

mixing in, 19:542

Twin-screw mixers, 16:723
Two-phase zeolite-based alkylation, 25:845
Two-phase vacuum extraction (TPVE) in hazardous waste management, 25:845
Two-phase zeolite-based alkylation, 23:331–332
Two-way shape-memory alloys (SMAs), 23:256
Two-way memory, of shape-memory alloys, 22:341, 346–350
Two-way shape-memory alloys (SMAs), 22:712. See also Virtual two-way SMA devices
Two-phase cascades, 17:455, 457
2+2 cycloadditions, of maleic anhydride, 15:489–490
Two product heuristic, for simple distillation, 22:299
Two-resistance model for cake filtration, 11:333–335
Two-stage cascade refrigeration systems, 21:548
Two-stage oxygen delignification technology, 21:45
Two-stage percolation process, 26:358–359
Two-stage regenerator design, 11:723
Two-stage reverse osmosis system, 26:78
Two-stage separation plants, 15:840
Two-stage vapor–compression refrigeration system, 21:546
Two-step Ziegler stoichiometric process, 17:715
Two-truck tray dryer, 9:118–119
Two-way memory, of shape-memory alloys, 22:341, 346–350
Two-way shape-memory alloys (SMAs), 22:712. See also Virtual two-way SMA devices
Type II superconductors, 979

Twin-wire paper formers, 18:120
Twisted nematic LCDs, 15:113
characteristics of, 15:114
Twisted pair wire cable, 7:714
Twisted yarn, 11:178
Twist grain boundary (TGB) liquid crystal phase, 15:95
Two-bath, two-stage dyeing process, 9:198
Two-bladed impellers, 16:672–673
“Two-color” thermometers, 24:457
Two-component epoxy–amine coatings, 10:443
Two-component epoxy resin systems, 10:453
2D foam studies, 12:16, 17
2-Dimensional gas chromatography, 4:617–618
Two-dimensional (2D) electrophoresis, 9:755
Two-dimensional (2D) photodiode arrays, 19:153
Two-dimensional (2D) separation systems in microfluidic assays, 26:970
Two-dimensional (2D) transistor structures, in scaling to deep submicron dimensions, 22:256
Two-dimensional data searches, 6:6–8
Two-dimensional electrode flow cells, 9:664–665
Two-equivalent couplers, 19:250, 255
Two-film concept, in absorption, 1:37, 46
Two-film theory of gas absorption in water, 26:154–158
200-series stainless steels, 13:510–511
248-nm chemically amplified resists, polymers for, 15:175–176
Two hybrid screening yeast applications in, 26:488–490
2-KDa peptides, 18:260
2-1 insertion, 16:99
Two-phase alloys, 13:500–501
Two-phase aqueous extraction, 10:767
Two-phase extractions, aqueous, 15:717
Two-phase flow distribution, 13:270
Two-phase flows, 11:771–777
Two-phase model, of fiber structure, 11:171
Two-phase systems in microfluidics, 26:968
Two-phase theory of fluidization, 11:805–806
Two-phase vacuum extraction (TPVE) in hazardous waste management, 25:845
Two-phase zeolite-based alkylation, 23:331–332
Two-photon absorption, 17:455, 457
2+2 cycloadditions, of maleic anhydride, 15:489–490
Two product heuristic, for simple distillation, 22:299
Two-resistance model for cake filtration, 11:333–335
Two-stage cascade refrigeration systems, 21:548
Two-stage oxygen delignification technology, 21:45
Two-stage percolation process, 26:358–359
Two-stage regenerator design, 11:723
Two-stage reverse osmosis system, 26:78
Two-stage separation plants, 15:840
Two-stage vapor–compression refrigeration system, 21:546
Two-step Ziegler stoichiometric process, 17:715
Two-truck tray dryer, 9:118–119
Two-way memory, of shape-memory alloys, 22:341, 346–350
Two-way shape-memory alloys (SMAs), 22:712. See also Virtual two-way SMA devices
Two-way shape-memory alloys (SMAs), 22:712. See also Virtual two-way SMA devices
Twin-wire paper formers, 18:120
Two-Phase zeolite-based alkylation, 25:845
Two-phase vacuum extraction (TPVE) in hazardous waste management, 25:845
Two-phase zeolite-based alkylation, 23:331–332
Two-photon absorption, 17:455, 457
2+2 cycloadditions, of maleic anhydride, 15:489–490
Two product heuristic, for simple distillation, 22:299
Two-resistance model for cake filtration, 11:333–335
Two-stage cascade refrigeration systems, 21:548
Two-stage oxygen delignification technology, 21:45
Two-stage percolation process, 26:358–359
Two-stage regenerator design, 11:723
Two-stage reverse osmosis system, 26:78
Two-stage separation plants, 15:840
Two-stage vapor–compression refrigeration system, 21:546
Two-step Ziegler stoichiometric process, 17:715
Two-truck tray dryer, 9:118–119
Two-way memory, of shape-memory alloys, 22:341, 346–350
Two-way shape-memory alloys (SMAs), 22:712. See also Virtual two-way SMA devices
Tyrosin(s), 15:290, 292t, 300
bioconversion of, 15:298
derivatives of, 15:301
Tylosin-type aglycones, 15:299t
Tyndall scattering, 23:127
Type 1–10 resins, 10:359
Type 1 photooxidation, 9:387
Type 1 photoredox pathway, 9:387
Type 2 photooxidation, 9:385
Type A, B containers
radioactive waste transport in, 25:855
Type A encapsulation processes, 16:439–446
Type A gelatin, 12:440
Type B encapsulation processes, 16:439, 447–451
Type B gelatin, 12:440–441
Type II anion exchangers, 14:390
Type I/II zwitterionic SCK micelles, 20:490
Type II metallic superconductors, pinning force in, 23:826
Type II superconductors, 23:807–809, 813–815
high pinning, 23:828
magnetization curve followed by, 23:815
maximum current density of, 23:822
Type II topoisomerases, 21:216–217
Type I–IV silicas, manufacture of, 22:413
Type I strong base anion exchangers, 14:390
Type I superconductors, 23:807–808, 812–813
Type metal, 3:53, 24:798
Type N hydrated lime, 15:29
Type S hydrated lime, 15:29
Type V gel–silica, 23:75–76
Type VI gel–silica, 23:76
Tyrian purple
color, 7:332
Tyrril, 7:639
\(\text{d-Tyrosine}\)
systematic name, formula, and molecular weight, 2:557t
Tyrosine
alkaloids derived from, 2:78, 83–92
content in cocoa and chocolate products, 6:368t
systematic name, formula, and molecular weight, 2:557t
\(\text{l-Tyrosine}\)
systematic name, formula, and molecular weight, 2:557t
\(\text{l-Tyrosine metabolism}\)
ascorbic acid in, 25:768
Tyrrano
fiber reinforcement for ceramic–matrix composite, 5:558t
TYZOR AA, 25:89, 90, 128
TYZOR AA75, 25:90
TYZOR DC, 25:91
TYZOR ET, 25:71, 102
TYZOR GBA, 25:91
TYZOR IBAY, 25:91
TYZOR ISTT, 25:129
TYZOR LA, 25:89, 128
TYZOR OGT, 25:88, 128
TYZOR TE, 25:94, 95, 100, 126, 128
TYZOR TnBT, 25:71, 125, 126, 128
TYZOR TOT, 25:73
TYZOR TPT, 25:71, 72, 80, 82, 83, 88, 95, 126
U(III) bis-Cp complexes, 25:440
U(III) coordination complexes, 25:435
U(IV) bis-Cp complexes, 25:440
U(IV) nitrates, 25:428–429
U(IV) sulfate system, 25:429
U(VI) carbonate system, 25:431
U(VI) phosphate complexes, 25:433
U\(^ {235}\)U, 25:392, 397. See also Uranium isotopes
enrichment of, 25:412
reducing, 25:409
U\(^ {238}\)U, 25:392, 397. See also Uranium isotopes
in \(^ {235}\)U enrichment, 25:412
UAg (potential difference), 19:343
Ubbelohde viscometer, 21:728–729
Ubiquinones, 17:673, 21:239
UCB collection and refining technology, 15:506
Udel, sulfonation of, 23:718–719
Udex process, 3:606, 10:782, 25:168
UG2 deposits, 19:604–605
Ugi reactions, using microwave irradiation, 16:579–580
Ukraine, titanium production in, 24:847
UL 94 flame testing, 19:588
UL94 flammability test, 10:175–176
Ulexite (boronatrocalcite; cottonball), 4:133t, 241, 243t, 245, 5:785t
Ullmann condensation reaction, 9:309, 310, 444
Ullmann reaction, 10:575
Ulmic coals, 6:703
-ulos suffix, for sugars, 4:696
Ultem, 10:217, 218
Ultimate strain, 11:183
Ultimet
composition of wear-resistant alloy, 7:221t
Ultraaccelerators, 10:713
Ultracapacitor cells
in development, 3:431t
Ultra centrifuge, 5:506
operation, 5:528
Ultrafiltration, 16:27, 24:14, 10:268, 11:387, 15:723–725, 824–825
as advanced wastewater treatment, 25:909
in hazardous waste management, 25:817, 818
hollow-fiber membrane modules for, 15:823
hollow-fiber membranes in, 16:24–26
hollow fibers in, 16:7
ULTRAVIOLET IRRADIATION

industrial success of, 16:25
membrane technology in, 15:827–834
for photographic emulsions, 19:185
sample prep for liquid chromatography, 6:445
in wastewater treatment, 25:889, 890
Ultrafiltration coefficient (Kuf), 26:818
Ultrafiltration diafiltration, 12:137–138
Ultrafiltration effluent treatment, 9:432
Ultrafine fibers, 13:389–390
Ultrafine filaments, 11:240
Ultrafine TiO₂
organic titanium compounds as precursors to, 25:130–132
Ultraforming process, 25:167
Ultragel resins
for affinity chromatography, 3:846
Ultra-high hydrostatic pressure, food preservation by, 12:86–87
Ultra-high modulus (UHM) carbon fibers, 26:759
Ultra-high molecular weight polycarbonates, 19:802
Ultra-high purity selenium, 22:93
tellurium, 24:411
Ultra-high temperature (UHT) technologies, 18:32
Ultra-high-vacuum (UHV) environments, 24:75
Ultralow expansion (ULE) vitreous silica, 22:443–444
Ultramarine color, 7:333
function as ingredient in cosmetics, 7:829
pigment used in makeups, 7:836
Ultramarine Blue
pigment for plastics, 7:370
Ultramarine pigments, 19:406
Ultramarine Pink
pigment for plastics, 7:370
Ultramarine Violet
pigment for plastics, 7:370
Ultra-mild soap, 22:745
Ultraphosphates, 18:816
Ultrapure barium, 3:345
Ultrapure water, reverse osmosis for, 21:650
Ultrapure water production, by reverse osmosis, 15:834
Ultraselective Y (USY)-type zeolite catalyst, 23:331
Ultra-small-angle neutron scattering spectrometer (usans), 20:339
Ultrasound
disinfection, 8:637–642
equipment, 17:437
flowmeters, 11:673–675
images, 17:424–425
inspection, 15:469
Ultrasonic acoustic waves, measurement of the propagation of, 21:744
Ultrasonically stimulated drug delivery systems, 9:58, 81
Ultrasonic cleaning, of metal surfaces, 16:212–213
Ultrasonic irradiation
in wastewater treatment, 25:912
Ultrasonic properties, vitreous silica, 22:429–430
Ultrasonic relaxation measurements, 24:127
Ultrasonic relaxation loss, of vitreous silica, 22:429–430
Ultrasonics, for MOCVD, 22:155
Ultrasonic spectroscopy, in particle size measurement, 18:152–153
Ultrasonic techniques, in nondestructive evaluation, 17:421–425
Ultrasonic testing (UT)
piping system, 19:486 of plastics, 19:588
Ultrasonic waves, 17:421
Ultrasonic welding, of ethylene–tetrafluoroethylene copolymers, 18:327
Ultrasound, in silicone network characterization, 22:569
Ultraspécific boilers, 23:228–229
Ultrathene, 7:640
Ultratrace levels, of selenium, 22:95
Ultraviolet absorbers, salicylic salts as, 22:12
Ultraviolet aging, of polyamide plastics, 19:783
Ultraviolet cutoff, of vitreous silica, 22:430–431
Ultraviolet degradation, of olefin fibers, 11:229–230
Ultraviolet inks, 14:314, 321
Ultraviolet irradiation
silicone network preparation via, 22:567
VDC polymer degradation via, 25:713
Ultraviolet irradiation (for cellulose), for covalent ligand immobilization, 6:396t
Ultraviolet light effect on rubber, 21:786
initiation of autoxidation, 3:103
photo-irradiation by, 23:716
plastics damaged by, 25:684
promising new uses for aquaculture, 3:223–224
PVC and, 25:684
sealant durability and, 22:30
silicone fluid transparency to, 22:579
silver fluoride and, 22:671
use in recirculating aquaculture biofiltration, 3:197
VDC polymer degradation and, 25:718–719
in wastewater treatment, 25:910–911
Ultraviolet light disinfection, as advanced wastewater treatment, 25:910
Ultraviolet light ozone generation, 17:800
Ultraviolet light stabilizers, for PVC polymers, 25:675
Ultraviolet lithography, extreme, 15:189–191
Ultraviolet photoelectron spectroscopy (UPS), 24:72
Ultraviolet radiation, 21:526. See also ultraviolet light
Ultraviolet radiation analyzers, 20:682
Ultraviolet ray screeners, in polychloroprene latex compounding, 19:858
Ultraviolet spectroscopy, of silicones, 22:599t
Ultraviolet stabilizers, in polyamide plastic manufacture, 19:784
Ultraviolet sunscreen agents, salicylic acid esters as, 22:12, 16
“Umami” receptor, 24:248
Umami sensation, 11:523, 565
Umber pigment used in makeups, 7:836, 836t
Umbrella-roof tanks, 24:289
Umezawa, Hamao, 11:10
UMICORE roaster/smelter, 26:564

U-minerals
dating, 25:393
Unaccomplished moisture change, 9:97
Unagitated columns, in commercial extractors, 10:769–774
Unbound moisture, 9:97–98
Unbridged catalysts, oscillating, 16:109
Unbridged metallocenes achiral, C2v-symmetric, 16:104
chiral, C2-symmetric, 16:108
Uncalced gypsum, 4:598
Uncertainties, in thermal design parameters, 13:257–258
Uncertainty in computer-aided molecular design, 26:1037–1038
in control systems, 26:1045–1047
in process scheduling, 26:1042–1043
in process synthesis and design, 26:1040
in supply chain management, 26:1043–1044
optimization under, 26:1025–1032
Uncertainty analysis, 26:1019–1023
sampling in, 26:999–1001
Uncertainty, economic, 9:547–548
Uncertainty factors (UFs), 26:1020
in risk assessment, 25:237–238
Uncoated papers, 18:128
Uncompetitive enzyme inhibition, 10:321
Unconfined aquifer, 12:838
Unconformity-related uranium deposits, 17:519
Unconsolidated ocean deposits, 17:686–691
Uncoupled variables, 8:388–389
Uncouplers, 14:349
Uncoupling proteins target of antiobesity drugs, 3:97–98
Uncured epoxies, 10:384–387
Uncured epoxy resin test methods, 10:384t
Undecanal, 2:59
Undecanoic acid
physical properties, 5:29t, 5:37t
n-Undecanol
toxicological properties of, 2:7t
1-Undecanol
physical properties of, 2:3t
10-Undecenoic acid
physical properties, 5:31t
Undecyclic acid
physical properties, 5:29t
Undecylenic acid
physical properties, 5:31t
10-Undecynoic acid (dehydro-10-undecylenic), 5:34t
Underflow
in hydrocyclones, 22:285, 286, 287
in wet classifiers, 22:284
Underground brine, 5:786
Underground coal gasification, 6:763–764
Underground disposal
of high-level radioactive waste, 25:856, 857
Underground injection control (UIC) wells, 21:583
Underground natural gas storage, 12:380
Underground salt mining, 22:802, 805–806
Underground storage tanks (USTs), 21:588
Underground tanks, 24:281
Undersothing, 26:118
Underwater life-support atmospheres,
oxygen in, 17:765
Underweight, 3:88t
Underwriters’ Laboratories (UL), 15:767

Underwriters Laboratory UL 94 Standard for Safety, 11:457–458
Undifferentiated chemicals, 20:712
Undiscovered petroleum resources, 18:595
Unfilled tooth restorative resins, 8:333
Uniaxial extensional viscosity, measuring, 21:740

Uniaxial viscosity, 21:718
Unimodal aluminum filled composites,
Union Carbide, 10:18–24
Union Carbide, silicone industry and, 22:548
Union Carbide Catalyst, 16:79
Union Carbide gas-phase technology, 20:169
Union Carbide, technical service laboratory at, 24:339
Union dyeing, 9:198
Unipol gas-phase process, 20:411
Unipol process, 20:194
UNIQUAC model, 8:745

Uniretic
molecular formula and structure, 5:150t
Unit cells
of PVDC, 25:699–700
in X-ray diffraction, 26:416

Unit cost product cost estimation, 9:532–533
United Kingdom
advanced materials research, 1:696
coal grades, 6:713t
food laws in, 23:160–161
lime industry in, 15:75. See also British entries
piezoelectric ceramics research, 1:709

United Nations Conference on
Environment and Development (UNCED), 24:162–163
United Nations Environmental Program (UNEP), 21:416
United Nations Food and Agriculture Organization (FAO), 18:541. See also U.N. entries

U.N. package markings, 18:4. See also
United Nations Food and Agriculture Organization (FAO)
U.N. packaging codes, 18:7t
for bags and composite packagings, 18:12t
methyl chloride producers in, 16:324t
methyl isobutyl ketone production in, 16:343t
methylenedichloride producers in, 16:375t
mineral commodities in, 16:599–600t
molybdenum consumption of, 17:35–36t
molybdenum imports of, 17:4t
molybdenum ore exports of, 17:3t
nanoceramics research, 1:706
nanofiber research, 1:722
naphtalene capacities of, 17:78t
natural gas consumption in, 12:381
natural gas production in, 12:372
natural gas reserves in, 12:366–367
natural gas storage activity in, 12:380t
naturally occurring silver compounds in, 22:668
nickel consumption of, 17:118t
nickel economics in, 17:94t
nitric acid producers in, 17:189t
nitrobenzene production in, 17:258t
nonfuel minerals in, 16:607
occurrence of sodium carbonate in, 22:787
oil and gas reserves in, 18:596–601
oil production patterns in, 24:255–258
olefin fiber production in, 11:242, 243
organic chemical industry economic patterns in, 24:263–265
organic pigment and dye demand in, 19:450t
organic pigment imports by, 19:451t
organic polymer coagulant and flocculant producers in, 11:643–644t
paper production in, 18:90
patent law in, 18:200, 201
pesticide registration requirements in, 18:543–550
pesticide regulatory policy in, 18:536–537
PET production in, 20:20
petrochemical industry in, 24:254
petroleum refineries in, 24:258
phenol producers in, 18:752t
phenolic resin manufacturers in, 18:774
phosphate rock production by, 19:17
phosphate rock statistics for, 19:15t
phosphorus compound production in, 19:676, 68t
photovoltaic market in, 23:50
piezoelectric ceramics research, 1:708
potash exports by, 20:639t
potash imports by, 20:638t
potassium sulfate producers in, 20:626t
prices for iron compounds, 14:558t
printing legislation in, 14:332
producers of ethylene oxide in, 10:658
production and consumption of
regenerated cellulose fibers in, 11:275, 276t
production and importation of zinc compounds by, 26:618t
propylene market in, 24:273
propylene producers in, 20:780t
PVC capacity of, 25:676, 677t
radioactive waste transport in, 25:855
recycled-materials markets of, 21:374
recycling trade statistics for, 21:403–404t
regenerated cellulose fibers in, 11:249–250
rhenium from, 21:682–683, 684, 685t, 687–688
rhenium imports of, 21:688t
roundwood timber products harvested in, 26:362t
salt consumption in, 22:811
salt production in, 22:810–811
sealant and adhesive consumption in, 22:45t
sealant testing and validation in, 22:28
selenium imports by, 22:92t
silicon alloy producers in, 22:497t
silicon carbide analysis in, 22:537–538
silicon carbide standards in, 22:537
silicon carbide standards for, 22:536, 537t
silicon statistics for, 22:498t
silicone production in, 22:601
silver consumption in, 22:676
silver grades and specifications in, 22:649–650
silver heap leaching in, 22:647
silver imports and exports by, 22:645
silver mining in, 22:649t
silver production by, 22:641
smart hybrid polymer coatings research, 1:715
soda ash production in, 22:793t, 794
sodium hydroxide production in, 22:829
sodium sulfate consumption of, 22:862
sodium sulfate production in, 22:863, 865–867, 868t
sodium sulfide production in, 22:874
specific watersheds in, 26:34
spent radioactive fuel storage in, 25:854–855
spent radioactive fuel treatment in, 25:853
spent radioactive fuel treatment outside, 25:854
sugar refining capacity in, 23:467t
sugar supply and use in, 23:471t
sulfur and sulfuric acid sold or used in, 23:585–586t
sulfur imports by, 23:582–583
sulfuric acid industry in, 23:788–789
sulfur sources in, 23:578
sulfur statistics for, 23:582t
thickeners used in, 22:66
tin consumption in, 24:831t
tin mining and consumption in, 24:790
titanium consumption in, 24:860
titanium production in, 24:838, 839, 861
titanium sponge consumption in, 24:847–848
titanium uses in, 24:866, 867, 868
toluene producers in, 25:177t
tungsten consumption and stocks in, 25:373t
use of compressed natural gas in, 12:432
use of incineration in, 13:172
use of solvents in, 23:85
vinyl chloride consumption in, 25:647
vinyl chloride production in, 25:647t
vinyl packaging in, 25:682
wastewater legislation in, 25:883, 917–918
wastewater treatment regulation in, 25:917–918
water shortages in, 26:53
water use in, 26:4
wine production, consumption, and import/export in, 26:322–323
zinc production in, 26:557t

United States Adopted Names (USAN)
Council, 25:265
United States Approved Names (USAN) glossary, 17:402
U.S. Chemical Safety and Hazard Investigation Board, 21:832
U.S. Clean Air Act Amendments of 1990, 18:566. See also Clean Air Act entries; United States entries

U.S. Community Right-to-Know Act, 21:831
U.S. Defense Logistics Agency (DLA), titanium sponge solicitation by, 24:848. See also United States
U.S. Department of Agriculture (USDA), 12:33–34; 21:568. See also Department of Agriculture (DOA)
U.S. Department of Energy (DOE), radioactive waste management by, 25:852, 855, 856, 857. See also Department of Energy (DOE)
U.S. Department of Labor Safety Standards, 15:768
U.S. Department of Transportation, nitric acid categories, 17:188
U.S. Department of Transportation (DOT), 21:568, 25:332. See also Department of Transportation (DOT)
labeling regulations of, 21:115t
radioactive waste transport regulation by, 25:855
United States Enrichment Corporation (USEC), 25:413, 416
U.S. Environmental Protection Agency (USEPA), biotechnology regulation by, 13:285, 18:541–542. See also Environmental Protection Agency (EPA)
U.S. Environmental Protection Agency (USEPA), pesticide tolerance levels and, 14:337
U.S. Environmental Protection Agency Toxic Substances Control Act (U.S. EPA TSCA) Chemical Inventory and Test Submission Data Base, 13:694
U.S. EPA Tier 2 specification, gasoline sulfur content, 10:54. See also Environmental Protection Agency (EPA)
U.S. Food and Drug Administration (FDA), 21:571–580. See also FDA entries
approval and enforcement centers within, 21:572
consumer protection function of, 21:572–573
Defect Action Levels (DALs) of, 23:160
organization and roles of, 21:571–573
regulation of biological products, 21:573–573
regulation of cosmetics, 21:579–580
regulation of drug products, 21:573–576
regulation of food products, 21:578–579
regulation of medical devices, 21:576–578
regulation of veterinary products, 21:579
in spice labeling, 23:159–160
U.S. Food, Drug, and Cosmetic Act, 18:389
U.S. freight shipments, 25:324t
U.S. Geological Survey (USGS) data, 26:32
United States Geological Survey National Water Quality Assessment (NAWQA) program, 26:33–34
U.S. HPV Challenge Program, 24:186
U.S. Metric Association, 15:768
United States Geological Survey National Institute of Standards and Technology (NIST) steam tables, 23:202
United States National Laboratories (USNL), 24:358
U.S. Nuclear Regulatory Commission (NRC), 17:528, 532, 539, 597–598. See also NRC safety goal
radioactive waste treatment under, 25:853, 856, 857
patent examination process within, 18:179–180
regulations of, 18:178
United States patents, elements of, 18:161–163
U.S. Pharmacopeia (USP), 12:151, 18:701
suture standards of, 24:207
United States Pharmacopeia and National Formulary, in fine chemical production, 11:435
U.S. proof, conversion of, 10:549t
U.S. steel products, net shipments of, 23:312t
U.S. Technical Advisory Group (US TAG), 15:756
U.S. Toxic Substance Control Act (TSCA) Inventory of Chemicals, 23:347
U.S. universities, impact of collaboration on, 24:370
U.S. Used Oil Recycling Act, 21:427
Uniterm fragmentation system, 18:242
Unit flow, 21:72
Unit hypercube
for Hammersley sequence sampling, 26:1012–1013
pseudorandom number generation and, 26:1002
Unitized secondary containment tanks, 24:296
Unit operations, in beet juice purification, 23:459–461
Unit processes, dye chemistry, 9:269–283
Unit process, in life cycle assessment, 14:809
Unit square
in sampling techniques, 26:1003, 1004, 1014, 1015
Unit standards, 15:751
Unit symbols, 1:xvii–xxiv; 2–26:xxv–xxii
rules for writing, 1:xviii–xix;
2–26:xvi–xvii
UNITY, 6:11
Univariate regression, 6:28–31
figures of merit, 6:30–31
Univasc
molecular formula and structure, 5:150t
Univer
molecular formula and structure, 5:97t, 119t
Universal Copyright Convention, 7:794–795
Universal dimensionless specific speed, 21:59
Universal DIR couplers, 19:259
Universal quasichemical (UNIQUAC) equation, 10:747
Universal viscosity performance curve, 11:667
Universities
advanced materials research programs, 1:693
barriers to collaboration with, 24:368–372
bioengineering research programs, 1:702
facilities and administrative costs to, 24:376–377
protecting confidential information in, 24:376
role in regional economic development, 24:371
role in technology transfer, 24:352–354
University administration, role in
facilitating research partnerships, 24:381–382
University–industry collaborations, impacts of, 24:369–371
University–industry research centers, 24:395

University of Manchester Institute of Science and Technology (UMIST) program, 20:734, 763

University of Massachusetts Office of Strategic Technology Alliances, 24:381, 382

University researchers
effect of collaboration on, 24:369
role in facilitating research partnerships, 24:380–381

Unleaded gasoline
blending octane number in, 25:180t

Unmodified alkyds, 2:148

Unmodified starch, 12:52–53

UNOX process, 1:744

Unpigmented HDPE, 21:451

Unproven technology investment cost estimates, 9:530

Unrecovered toluene, 25:172

Unreliability
failures due to, 26:982

Unsaponifiable material, in soap making, 22:736

Unsaturated alcohols
titanium complexes of, 25:73–74

Unsaturated compounds, osmium, 19:643

Unsaturated esters, 10:487

Unsaturated fatty acids, 10:814
percent in important fats and oils, 5:47t

Unsaturated hydrocarbons, 10:486–487, 23:526–527
adsorption by zeolites, 1:624
catalyst poison, 5:257t
sulfation and bisulfation of, 23:526
sulfonation of, 23:513

Unsaturated ketones, 14:585–590

Unsaturated oil, reduction of, 10:810

Unsaturated polyesters, 10:7, 20:95–119
air inhibition in, 20:110
application processes for, 20:116–118
chemical properties of, 20:114–115
closed-mold processes for, 20:117–118
cure exotherm for, 20:109
dielectric properties of, 20:114
flammability of, 20:115–116
formulation of, 20:102–105
mechanical properties of, 20:111–112
open-mold process for, 20:116–117
performance characteristics of, 20:110–111
polyesterification of, 20:98–102
process equipment for, 20:97–98
raw materials for, 20:96–97
shrinkage of, 20:109–110
temperature range of catalyst systems for, 20:108t
thermomechanical properties of, 20:112–114
weathering of, 20:116

Unsaturated polyester resin matrix systems, 26:762

Unsaturated polyester resins (UPR), 1:574, 23:348
organic titanium compounds in, 25:126
Unsaturated polyester cross-linking mechanism, 20:105–116
catalyst selection in, 20:107–109

Unsaturated polyester (UPE) resins, silica in, 22:377

Unsaturated transannular peroxides, 18:448

Unsaturation
in VDC polymer degradation, 25:712–713

Unsaturation, in oils, 10:826

Unsensitization phenomenon, 19:237

Unshaped refractories, 6:491

Unslaked lime, 15:29

Unstable angina, 5:109

Unstable flows, 11:761–765

Unstable node, in separating nonideal liquid mixtures, 22:303

Unstable nodes, residue curve maps, 8:790

Unstable reagents, measurement strategies for, 14:621

Unsteady RANS (URANS), 11:781. See also Reynolds-averaged Navier-Stokes (RANS)

Unsteady-state direct oxidation process, 10:656

Unsymmetrical dialkyl peroxides, 18:445–446

Unsymmetrical dimethylhydrazine (UDMH), 13:571–572, 579, 584, 585, 588, 596
toxicity of, 13:590

Unsymmetrical functional tetraorganotins, 24:812–813

Unsymmetrical polymethine dyes, 20:505, 506, 508–509

Untwisted yarn, 11:178
Unusual environments, characteristics of, 15:761t
Unzipping in VDC polymer degradation, 25:714–715
UOP FCC unit, 11:700–702
UOP/HYDRO MTO process, 18:568
UOP Olefins separation process, 17:724
Up-and-Down Method, 25:217
U/Pb decay schemes, 25:383–394
Updraft sintering, 26:565
Upflow anaerobic sludge blanket (UASB) in biological waste treatment, 25:902
Upgraded slag (UGS), 25:12, 33
Upland Cotton, U.S., 8:13
U-Polymer, 10:189
Upper critical solution temperature (UCST), 20:320, 322
Upper explosive limit (UEL), 21:840
Upper flammability limit, 23:115
Upper flammable limit (UFL), 21:840
Upper Freeport (MVB) coal carbon structural distribution based on NMR, 6:715t
empirical composition, 6:730t
Upper lasing level (ULL), 14:674
Upper working temperature, 10:177
Upside down mixing, 19:850–851
Uracil, fluorination of, 11:831
Uracil herbicides, 13:324
Uralkys, 2:164
uses of, 2:167–168
Uraninite, 25:396–397
Uranium effect on copper resistivity, 7:676t
Uranium (U), 1:463–491, 464t, 21:286, 287, 25:391–454. See also U entries
analytical methods for determination of, 25:417–420
atomic properties of, 25:394
bimetallic complexes of, 25:442
coordination complexes of, 25:434–437
coprecipitation of, 25:417
demand for, 17:526, 25:400
economic aspects of, 25:420–421
electrochemical separation of, 25:418
electronic configuration, 1:474t
exposure to, 25:442–443
fissile isotopes of, 25:444
health and safety factors related to, 25:442–444
hydrometallurgical treatment of, 16:156
ion type and color, 1:477t
liquid–liquid extraction of, 25:417
literature related to, 25:597
metal properties of, 1:482t
occupational protection against, 25:443–444
occurrence in nature, 25:394–397
organometallic complexes of, 25:439–442
organometallic compounds of, 25:439
projected production complexes of, 17:526
as radioactive waste source, 25:851, 852
recovery of, 13:125
recovery from ores, 25:400–406
stockpiles of, 25:398–400
supply projections for, 17:526
toxicology of, 17:528–529
uses for, 25:391, 420–421
Uranium(IV) ion, 25:430
Uranium(IV) pyrophosphate, 25:433
Uranium(IV) ring systems, 25:441
Uranium(V) phosphine complexes, 25:436
Uranium(VI) biscardonato complexes, 25:431
Uranium(VI) carbonate solids, 25:431
Uranium(VI) orthophosphates, 25:433
Uranium–aluminum alloys, 25:421
Uranium analysis spectroscopic methods for, 25:418–420
wet chemical, 25:418
Uranium bromides, 25:439
Uranium carbide (1:2), 4:649t, 690 (2:3), 4:649t, 4:648, 649t, 689–690, 690 stoichiometry, 4:651
Uranium carbide fuels, 25:427
Uranium carbides (UCs), 25:421, 427–428
Uranium carbonates, 25:430–432
Uranium chlorides, 25:438–439
Uranium compounds, 25:421–434 handling, 17:529
Uranium dioxide, 25:422–423
Uranium-enrichment process gas centrifuge, 25:413–415
Uranium exploration, 25:398
URAnium EXtraction (UREX) process, 25:420
Uranium extraction, 10:788
from ore leach liquors, 10:789–790
Uranium fluoride exposure acute, 25:443
Uranium fluorides, 25:437–438
Uranium halide complexes, 25:437–439
physical constants for, 25:437t
Uranium hexachloride, 25:439
Uranium hexafluoride, 11:845, 859, 25:438
Uranium hydrocarbyl complexes, 25:441–442
Uranium hydroxides, 25:430
Uranium iodides, 25:439
Uranium isotopes, 25:391, 392–394
alternative separation methods for, 25:417
electromagnetic separation of, 25:415–416
enrichment of, 25:412–417
gaseous-diffusion process for, 25:412–413
laser separation of, 25:417
radioactive decay properties of, 25:393
Uranium metal, 25:407–412
alloys and phase transformations of, 25:411
chemical properties of, 25:411–412
crystalline forms of, 25:409–410
irradiation effects of, 25:412
mechanical properties of, 25:410–411
preparation of, 25:407–409
properties of, 25:409–412
storage and handling of, 25:411
Uranium mineral resources, 17:518–521
geochemical nature and types of, 17:519–521
Uranium minerals, 25:396–397
Uranium mononitride, 25:427
Uranium nitrides, 25:426–427
Uranium ore
concentrates, 25:407
as radioactive waste source, 25:851
Uranium oxides, 25:421–426
as radioactive waste source, 25:851–852
Uranium oxygen phase diagram, 25:422
Uranium pentaboronide, 25:439
Uranium pentachloride, 25:438–439
Uranium pentfluoride, 25:438
Urea–formaldehyde
indoor air pollutant, 1:804
Uranium peroxide, 18:410
Uranium phosphate complexes
solid, 25:433
Uranium phosphates, 25:432–434
Uranium–phosphine coordination complexes, 25:436
Uranium pickling, 9:788
Uranium–plutonium fuels, 19:668
Uranium production, 17:525–526
by country, 25:400t
Uranium radioisotopes, 21:319
Uranium reactor fuel manufacture, hydrogen fluoride in, 14:19
Uranium recovery, ion-exchange resins in, 14:421–422
Uranium refining, 25:404–405
Uranium reserves, 17:521–522
low-grade, 17:527–528
by country, 25:399t
Uranium separation/reprocessing oxo ion salts in, 25:428–429
Uranium silicides, 25:421
Uranium stocks depleted, 25:400
Uranium tetrabromide, 25:439
Uranium tetrachloride, 25:438
Uranium tetrafluoride reduction of, 25:407–408
Uranium transport mechanisms, 25:394
Uranium tribromide, 25:439
Uranium trioxide, 25:426
Uranium tris(tetrahydroborate), 4:196
Uranium–vanadium ores, 25:517
Uranium–zirconium alloys, 25:421
Uranocene, 25:441
Uranyl(VI) ion hydrolysis of, 25:430
Uranyl(VI) phosphates
three-dimensional frameworks of, 25:434
Uranyl(VI) sulfate complexes, 25:403
Uranyl chloride, 25:423
Uranyl dihydrogenphosphate trihydrate, 25:434
Uranyl hydroxides, 25:430
Uranyl metaphosphates, 25:433
Uranyl nitrate, 25:428
Uranyl perchlorate crystals, 25:429
Uranyl sulfate system, 25:429
Urban air quality, 17:814–815
Urea(s), 8:206–207
in amino acid resins, 2:621–622
carbonic acid inhibitor, 5:169
chlorination of, 13:106–107
molecular formula and structure, 5:164t
in nitrogen fertilizers, 11:117
reactions with PVA, 25:601
skin conditioner/moisturizer, 7:843t
substituted, 10:413
Urea-ammonium phosphates, 11:121
Urea cyanurate, 8:207
Urea ENFETs, 3:799–800
Urea–formaldehyde adhesives, 1:544
Urea–formaldehyde (UF) resins, 15:777
Urea-formaldehyde, in nitrogen fertilizers, 11:117
properties of filled molding compounds, 2:633t
Urea herbicides, 13:32
Urea inclusion channel, 14:173
compounds, 14:172
Urea kinetic modeling (UKM), 26:823
Urea peroxide, 14:67
Urea peroxohydrate, 18:414–415
Ureaphil, 5:169
molecular formula and structure, 5:164t
Urea process, 13:581–582
Urea recognition, 16:792–793
Urea reduction ratio (URR), 26:822
Urea-responsive drug delivery, 9:65
Uremic toxins
protein bound, 26:821
Uremic toxins, 26:820
Urena lobata, 11:295
Urethane adhesives, 1:540–543
Urethane alkyds, 2:164–165
Urethane coating resins
global consumption of, 25:478
Urethane coatings
for corrosion protection, 7:199
economic aspects of, 25:477–478
uses for, 25:481–482
Urethane elastomers, 21:772
Urethane groups, 25:454
Urethane intermediates, 10:666
Urethane-modified alkyds, 18:56
Urethane-modified isocyanurate (PUIR) foams, 25:473
Urethane network polymers, 25:455
Urethane oils, 2:164
Urethane polymers, 25:454–485
economic aspects of, 25:477–478
formation and properties of, 25:457–461
health and safety factors related to, 25:479–481
history of, 25:455–456
isocyanates in, 25:461–464
processing, 25:468–477
raw materials for, 25:461–468
recycling, 25:478
uses for, 25:481–482
Urethane powder coatings, 7:51–52
gloss retention in outdoor exposure, 7:49
physical and coating properties, 7:42t
Urethane resins
coating resins, 7:98–100
Urethanes, 22:35–38, 48t
obtained from aromatic diisocyanates, 25:462–463
weatherability of, 22:31, 37
Ureyte, 6:471t
Uric acid recognition, 16:793
Urinalysis in toxicology studies, 25:216
Urinary pathogens, resistance to trimethoprim- sulfamethoxazole, 23:505
Urinary tract infections, sulfonamides for, 23:499
Urine
ascorbic acid excretion via, 25:771
citric acid in, 6:632t
Urine alcohol concentrations, 12:96
Urocanic acid (and esters)
cosmetic uv absorber, 7:846t
Urokinaise, 5:175, 177
molecular formula and structure, 5:172t
Urokinaise plasminogen activator, 3:825
Urokinaise-type plasminogen activator and hemostatic system, 4:89
Uronic acids, 4:711
Uron resins, 2:640–641
Uruguay Round Agreements Act, 18:686
USAPTP-75 Test Cycle for standard emission tests, 10:33
Use-based trademark applications, 25:259–260
Used fuel
from nuclear power facilities, 17:547–551
underground disposal facility for, 17:549
Used oil(s), 21:420. See also U.S. Used Oil Recycling Act
characteristics of, 21:421–423
chemical analyses of, 21:422–423
contaminant levels in, 21:423t
User requirement specification (URS), in fine chemical production, 11:433
USFilter Electrocatalytic electrolysis cells, 9:669
US FTP 06, 10:34, 37
USPatents files, 18:248
USPATFULL files, 18:247–248
Ustilic acid
physical properties, 5:35t
Utilitarian works, copyright, 7:786
Utilities
nonproduct contact, 11:45–46
product contact, 11:44–45
Utilities, safety of, 21:847–850
Utility, as a patentability requirement, 18:176
Utility boiler, boiler-water limits for, 23:220t
Utility dental wax, 8:300
specification, 8:300t
Utility patents, 18:205
Utility requirements documents (URD), for nuclear power facilities, 17:556
Utility system design, 10:146–152
Utility system equipment, energy consumption of, 10:152–158
Utility systems, 10:134
Utility turbines, 23:230
Utility turbine systems, 23:229
U-tube manometer, 20:646
U-tube viscometers, 21:728
UVA radiation band, 21:526
Uvarovite, 6:471t
uv barrier films
product design for, 5:772–774
UVB radiation band, 21:526
UVC radiation band, 21:526
uv-curable coatings, 10:446
uv cure technology, 10:382–383
uv detectors
liquid chromatography, 6:448–449
uv-H$_2$O$_2$ pool sanitizers, 26:178
uv irradiation
cotton, 8:28
properties and characteristics compared to other disinfectants, 8:608t
ultraviolet disinfection of wastewater, 8:643–653
ultraviolet germicidal irradiation in inactivating airborne microorganisms, 8:654
uv laminating adhesives, 10:459
uv pool sanitizers, 26:178
uv-resistant glass
cerium applications, 5:684
uv stabilizers, 10:6
uv–vis absorbance detectors
liquid chromatography, 4:622
uv–vis absorption spectroscopy, 23:143–145
uv–vis–ir spectroscopy, components and materials used in, 23:134t
uv–vis monochromators, 23:143
uv–vis spectra, 23:145
V(z) curve, 17:437
V$_2$O$_5$ powder purified, 25:520. See also Vanadium pentoxide
V4 gold-based dental alloy, 8:307t
Vacancy Solution Model (VSM) gas separation, 1:629
Vaccenic acid
physical properties, 5:31t
Vaccine production process technology in, 25:505–506
Vaccine research, 25:486
Vaccines, 11:5–6
adverse reaction events from, 25:507–508
against parasites, 25:501
aquaculture applications, 3:207
cell cultivation processes for, 11:11
cell culture technology products, 5:345–346
under development, 25:497–501
for the general population, 25:487–493
HBV, 3:154–155
HCV, 3:161
HIV, 3:148–149
price of, 25:507
selectively used, 25:493t
for special populations, 25:493–497
from yeast, 26:486–488
Vaccines, coccidiosis, 20:139–140
Vaccine technology, 25:486–512
combination vaccines, 25:504–505
adjuvants in, 25:503
commercial vaccines, 25:487
economic aspects of, 25:506–508
future, 25:501
genetic engineering and, 25:501–503
immunology and, 25:501
peptide vaccines, 25:503–504
scope of, 25:505
Vacuum-arc 
furnace, 12:302–303 
melting process, 17:10 
Vacuum arc remelting (VAR), in SMA 
processing, 22:353 
Vacuum carburizing, case hardening by, 
16:210 
Vacuum cooling 
of food, 21:560 
general separation heuristics for, 22:319 
Vacuum deposition, 
coating, 7:24 
system, 24:722 
techniques, 15:250 
Vacuum distillation 
in petroleum processing, 18:646–647 
selenium recovery via, 22:85 
Vacuum drier, in bar soap manufacture, 
22:750 
Vacuum dryers, 9:134–135 
Vacuum drying, 22:45 
encapsulation by, 11:539 
Vacuum evaporation, 23:787, 24:724–728 
avantages and disadvantages of, 
24:727–728 
Vacuum filters, 11:349–358, 25:913. See also Vacuum filtration 
enclosed agitated, 11:351 
flocculants in, 11:637–638 
horizontal belt, 11:354–355 
horizontal rotating pan, 11:353–354 
leaf, 11:352 
Moore, 11:352 
nutsche, 11:350–351, 352 
Rosenmund, 11:351 
rotary disk, 11:358 
rotary drum, 11:345, 355–357 
tipping pan, 11:352–353 
Vacuum filtration, 11:324. See also Vacuum filters 
Vacuum forming, 19:555, 23:398, 399 
“Vacuum gas-solid reaction” (VGSR) 
technique, 21:150 
Vacuum gas oil, light 
steam cracking product distribution, 
4:379t 
Vacuum gas oils (VGOs), 18:579, 
586–589 
class isolation and measurement 
techniques for, 18:581 
oxygen in, 18:589 
Vacuum gauges, 20:645–646, 657 
Vacuum-induction melting (VIM), 
17:99–100 
Vacuum induction melting (VIM), in SMA 
processing, 22:353 
Vacuum measurement, 20:657–663 
Vacuum melting, 23:253–254 
Vacuum oxygen decarburization (VOD) 
process, 23:265 
Vacuum packaging, food preservation by, 
12:78 
Vacuum pan dryer, 9:135 
Vacuum pan evaporators, in sodium 
chloride solution mining, 22:803 
Vacuum processes, in ladle metallurgy, 
23:264–265 
Vacuum processing chamber configuration, 
24:723 
Vacuum pumps, 21:68–69 
Vacuum radiation furnaces, 12:295 
Vacuum residua. See also Petroleum 
residua (resid) 
compositional information concerning, 
18:590 
in petroleum, 18:589–591 
Vacuum retort bullion, 14:753 
Vacuum retorting, lead refining by, 
14:752–753 
Vacuum-retort process, 16:147 
Vacuum rotary dryer 
in hazardous waste management, 
25:815–816 
Vacuum seals, indium in, 14:194 
Vacuum sizing/cooling 
in PVC siding manufacture, 25:684–685 
Vacuum swing adsorption (VSA) processes, 
17:751, 753 
Vacuum systems, energy consumption by, 
10:156 
Vacuum technology, 24:75. See also VAR 
(vacuum-arc remelting) furnace 
Vacuum tubes 
cesium application, 5:702 
Vadose zone, 3:767–768 
defined, 3:757t 
Vadosil 
molecular formula and structure, 5:111t 
Vaginal drug delivery, 9:50 
Valence band, 5:595, 22:234 
in insulators, 22:201, 202 
Valence band maximum, in compound 
semiconductors, 22:148 
Valencene, 24:549
Valentinite, 3:41, 58
Valeric acid
  physical properties, 5:29t
Valethamate bromide, 4:360t
Validation, in fermentation, 11:47–49
Validation programs, in commercial-scale pharmaceutical operations, 18:734–736
Validity patent information searches, 18:234–235
Validity searches, 18:207–208
D-Valine
  systematic name, formula, and molecular weight, 2:555t
Valine
  content in cocoa and chocolate products, 6:368t
  systematic name, formula, and molecular weight, 2:555t
  taste profile, 2:605
L-Valine
  systematic name, formula, and molecular weight, 2:555t
Vallecitos boiling water reactor (VBWR), 17:580
Vallez filter, 11:365
Valonia ventricosa
cellulose source, 5:363
Valox, 10:188
Valsartan
  molecular formula and structure, 5:154t
  “Value of research” methodology, 26:1045
Value added chain, for fine chemicals, 11:424, 425t
Value extraction, 24:362–363
Value materials standards, 15:742
Valve plates, 8:763
Valves, 11:33
  for aerosol handling, 1:782–784
  for lab-on-a-chip, 26:975
  nonmechanical, 11:819
Valves
  adiabatic pressure-reducing, 24:647–648
  fugitive emissions from, 10:70–71
  piping system, 19:474–476
  pressure rated, 13:414
  smart control, 20:672
Valvular disease, 3:711
  cardiac device solutions, 3:713–714
Valvuloplasty, 3:717
Vamac ethylene–acrylic elastomers, 10:697, 698t, 699
van’t Hoff equation, 1:591
Vanadates, 25:534
Vanadic acid
  ammonium salts of, 25:525
Vanadium(v). See PANi/V2O5 entries
  25:512–528. See VFe protein; V-nitrogenases
  chemical properties of, 25:515–516
  consolidation and fabrication of, 25:522–523
  coordination compounds of, 25:538
  discovery of, 25:513
  economic aspects of, 25:523–524
  FCC catalysts and, 11:682
  health and safety factors related to, 25:524–525
  manufacture of, 25:517–522
  occurrence of, 25:513
  physical properties of, 25:514–515
  pure, 25:519–520
  recovery from salt-roast leach solution, 25:537–538
  recovery of, 25:538–539
  refining of, 25:520–522
  solution color of ions in glass, 7:343t
  in titanium alloys, 24:856
  toxicity of, 25:541
  U.S. consumption of, 25:527t
  U.S. statistics for, 25:524t
  uses for, 25:512–513, 525–526
  water exchange rates and activation parameters of hexaaqua complexes, 7:589t
Vanadium oxycarboxy chloride, 25:535
Vanadium(II)
  concentration formation constant of chelates, 5:717t
Vanadium(II) oxide, 5:598
Vanadium(III)
  concentration formation constant of chelates, 5:717t
Vanadium(III) acetylacetonate, 25:540
Vanadium(III) chloride, 25:535
Vanadium(IV) chloride, 25:535
Vanadium alloys
  fabrication of, 25:523
  properties of, 25:516–517
  toxicity of, 25:525
Vanadium–aluminum master alloy, 25:529
Vanadium-bearing minerals, 25:513, 514t
Vanadium-bearing ores, 25:513
  processing, 25:517
Vanadium borides, 25:533
Vanadium carbide (2:1), 4:649t, 685
cemented carbides, 4:656
as industrial hard carbide, 4:674
physical properties of, 4:684t
stoichiometry, 4:651
Vanadium catalyst residues, 10:709–710
Vanadium catalysts, 23:755
in sulfuric acid manufacture, 23:780
Vanadium compounds, 25:529–544
analytical and test methods for, 25:540–541
chemical properties of, 25:529–536
economic aspects and specifications for, 25:539–540
exposure to, 25:524
health, safety, and environmental considerations for, 25:541
imports and exports of, 25:540
interstitial and intermetallic, 25:533–534
magnetism and color of, 25:533t
manufacture of, 25:536–539
physical properties of, 25:529, 531–532t
production of, 25:539
U.S. stockpile of, 25:540
uses for, 25:542
Vanadium-containing ores, 25:401
Vanadium dioxide
thermochromic material, 6:618, 627
Vanadium diphosphide, 19:58
Vanadium disilicide, 25:533
Vanadium extraction, 23:404
Vanadium halides, 25:534–535, 539
Vanadium metal
preparation of, 25:519
Vanadium oxide, 25:534
poisons in representative reactions, 5:258t
Vanadium oxychloride, in titanium manufacture, 24:851
Vanadium oxyhalides, 25:534–535, 539
Vanadium oxytrichloride, 25:540
Vanadium pentoxide, 25:519. See also V₂O₅
powder
ammonium salts of, 25:525
energy use in manufacture of, 25:540
Vanadium pentoxide, as titanium production hazard, 24:865–866
Vanadium–phosphorus oxide (VPO) catalyst, 15:498, 499–500
Vanadium powder, 25:519
Vanadium products
minerals processing to, 25:530
Vanadium–silicon alloy, 22:520
Vanadium slags, 25:517
Vanadium sulfates, 25:536
Vanadium tetrachloride, 25:540
Vanadium–uranium ore
Australian, 25:539
Vanadyl perchlorate, 18:279
van Arkel-de Boer method, 25:407
process (iodide bar), 16:149, 26:632
refining, 13:85–86
van Arkel gas decomposition process, 17:207
Vancomycin, 3:26, 28, 30, 34, 17:729–730, 732
bacterial resistance mechanisms, 3:32t
chirobiotic phase, 6:90
Vandalism, as a cause of tank spills and leaks, 24:306
Van Deemeter plot, 6:413
van der Meulen process, 4:323
dan van Waals attraction, 10:119
bonding, 26:772
van der Waals’ forces, 11:800
in adhesion, 1:502, 584
and adsorbent selectivity, 1:584
in adsorption, 1:583
in AFM, 24:82, 83
atomic force microscopy, 3:322
atomic force microscopy based on, 8:71–72
floculation and, 22:55
in gas adsorption, 1:620
in silk, 22:631
in water treatment, 26:106, 107
dan van der Waals interaction, in foams, 12:4–7
dan van der Waals interaction distance, 10:121
dan van der Waals one-fluid mixing rules, 24:685
Van Driest’s rule, 8:589
Vane anemometers, 11:666
Vane classifiers, 22:288–289
Vanilla, 23:171
Vanilla beans, 25:544–545
Vanillin, 5:368, 25:544–556
analysis of, 25:555
antimicrobial effect of, 25:554
applications of, 25:551–555
chemical properties of, 25:550–551
extracting, 25:545
in formulation for milk chocolates, 6:362t
in formulation for sweet (dark) chocolates, 6:362t
grades of, 25:549–550
health and safety factors related to, 25:555–556
physical properties of, 25:548t
preparation from guaiacol, 25:546
preparation from ortho-chloronitrobenzene, 25:546–547
preparation from waste sulfite liquors, 25:547
production by biotechnology, 25:547–548
production of, 25:545–548
reduction of, 25:551
specifications for, 25:548–550
toxicity of, 25:556
Vanillin production, 15:17
Vanillin sugar, 25:553
Vaniltek, 25:554
Van Laar model, for VLE, 8:744–745
van Leeuwenhoek, Anton, 11:7
van Leeuwenhoek, Antoni, 16:468
Vanthoffe, 5:785t
Vapor, ignition energy of, 10:662. See also Gas entries
Vapor–air explosions, prevention of, 21:860
Vapor cloud explosions, 21:842
Vapor compression (VC) desalination plant, 26:68
Vapor compression distillation, 26:67
Vapor–compression refrigeration cycle, 21:542–543
Vapor–compression refrigeration systems, 21:540, 541–545
components of, 21:534
multistage, 21:546
operation of, 21:542
superheating and subcooling in, 21:543–545
Vapor compression refrigeration
dessicant applications, 8:356t
Vapor-compression submerged-tube
desalination plant, 26:70
Vapor condensation, 10:151–152
Vapor deposition
hot-filament chemical, 17:214–215
plasma enhanced chemical, 17:215
Vapor deposition chamber, 24:724, 725
Vapor dew-point line, 8:741
Vapor diffusion, 9:109–110
Vapor dilution, safe, 10:662–663
Vapor entrainment, 16:696
Vapor flow control, in variable-conductance heat pipes, 13:233–234
Vapor formation, catalyst deactivation mechanism, 5:256t
Vapor grown carbon fibers (VGCFs)
production of, 26:730 26:736–737
Vaporization, without dissociation, 24:726
Vaporization-condensation sequence, 9:110
Vaporization rate, 9:103
Vapor–liquid equilibrium constant, 1:29–30
Vapor–liquid–equilibrium (VLE) data, for propylene, 20:770
Vapor–liquid equilibria, 8:740–748, 22:302
azeotropic and extractive distillation,
8:786–790, 24:663–664, 686
calculations of, 24:682–686
favorable for distillation, 8:778
phase compositions in, 22:331
simulation, 1:30
strategic separation schemes and, 22:310–311t
Vapor–liquid–liquid equilibrium
calculations, 24:681, 686–687
Vapor/liquid ratio tests, 12:396
Vapor–liquid–solid (VLS) growth, in silicon carbide whisker fabrication,
22:534
Vapor lock, 12:397
Vaporous carryover, 23:220
Vapor(s)
diffusivity in, 15:673–675
polymer blend permeability to,
20:357–358
thin films from, 24:743–747
Vapor permeation, 18:507–509
benefits of, 18:515
membranes, 18:510–511
modules, 18:511–512
on-line, 18:518
solvent recovery using, 18:515–516
Vapor-phase epitaxy (VPE), 24:743
Vapor-phase esterification, 10:482–484
Vapor-phase ethylene hydration process,
10:538, 539
Vapor-phase ethylene process, 10:486–487
Vapor-phase flame-retardant mechanisms,
11:485–486
Vapor-phase fluorination, 11:863
Vapor-phase growth, silicon purification via, 22:496–497
Vapor-phase hydrolysis, in vitreous silica manufacture, 22:414, 415
Vapor-phase inhibitor concentration, 10:649
Vapor-phase inhibitors, 7:816
Vapor-phase mole fraction, 24:683
Vapor-phase nitrations, 17:257
Vapor-phase oxidation inhibitors, 10:644
Vapor-phase paraffin nitration, 17:167–168
Vapor phase polymerization process, for aromatic polyamides, 19:720
Vapor-phase techniques, of fiber optic fabrication, 11:136
Vapor pressure, 24:284
above formaldehyde solutions, 12:108–109
of hydroxybenzoic acids, 22:3t
of ionic liquids, 16:35–36
as a property of steam, 23:203
of vitreous silica, 22:419
Vapor pressure thermometers, 24:466
Vapor recompression, 10:151
Vapor recompression evaporators, in sodium chloride solution mining, 22:803, 804
Vapor-recovery unit, propylene recovery at, 20:778
Vapor sensors, acoustic wave sensors and, 22:270
Vapor–solid reactions, catalyst deactivation mechanism, 5:256t, 274–278
Vapor temperature range, for heat pipe fluids, 13:230
Vapor transport, catalyst loss by, 10:94
Vapor velocity, in heat pipes, 13:229
Vapor VOC incinerators, 26:684
VAR (vacuum-arc remelting) furnace, in titanium manufacture, 24:854
Vardenafil
molecular formula and structure, 5:183t
Variable-area flowmeters, 11:663–664
Variable conductance heat pipes (VCHP), 13:233–235
Variable etalons, 11:151
Variable frequency drive (VFD), 10:149–150, 11:39–40
Variable path length cells, 14:228
Variable pressure scanning electron microscope (VPSEM), 16:493, 466
Variable speed drive, 10:156
Variable temperature cells, 14:234
Variable-volume view cell, 24:12
Variance reduction techniques sampling via, 26:1004–1016
Variance scaling, 6:35–38
Variant Creuzfeld–Jacob Disease (vCJD), 4:125
Varicella vaccine, 25:491–492
Varicella-zoster virus (VZV), 3:136, 25:496
Varietals
ceramics, 5:608–609
labeling, 26:309
titanium dioxide in, 25:20
white, 26:306–307
Varivax
cell culture technology product, 5:346
Varnish(es), 9:149–150, 18:68
degradation of, 11:414–415
in fine art examination/conservation, 11:410–412
phenolic resin, 18:783
removal of, 18:81
Varnish formulations, 10:442
Varnish removal, in fine art examination/conservation, 11:412, 413
Vascor
molecular formula and structure, 5:97t, 118t
Vascular access devices, 3:720
Vascular grafts, 3:717–718, 721
Vaseretic
molecular formula and structure, 5:149t
Vaska complex–fullerene crystal lattice, 12:249–250
Vaska's compounds, 19:649, 650
Vasodilan
molecular formula and structure, 5:111t
Vasodilators nitrate as, 5:109–116, 110–111t
Vasolan
molecular formula and structure, 5:97t, 119t
Vasopastic angina, 5:108–109
Vasopeptidase inhibitors antihypertensive agents, 5:159154t
Vasoplex
molecular formula and structure, 5:111t
Vasotec
molecular formula and structure, 5:149t

Vasotran
molecular formula and structure, 5:111t

Vat Blue 4
pigment for plastics, 7:367t

Vat Blue 5, 5,5',7,7'-tetrabromoindigo, 4:361t

Vat Blue 19, dibromodibenzanthrone, 4:361t

Vat dye pigments, 19:443–444

Vat dyes, 9:179–181, 216, 242, 24:620
anthraquinone, 9:303, 329–336
anthrimidocarbazole, 9:324

Vat Orange 1,
dibromodihenzopyrenequinone, 4:361t

Vat Orange 2, 4,12-dibromopyranthrone, 4:361t

Vat paper former, 18:118–119

Vat Red 1
colorant for plastics, 7:374t

Vat Red 41
colorant for plastics, 7:374t

Vat Violet 1
colorant for plastics, 7:374t

Vat Yellow 1
pigment for plastics, 7:366t

Vat Yellow 20
pigment for plastics, 7:366t

Vaulted tanks, 24:296

Vauquelinite, 6:471t

Vazo products, 17:241–242

VC filter, 11:372–373

vCJD (variant Creutzfeldt-Jakob Disease),
transmission of, 12:140

VDC copolymer foams, 25:737. See also
Vinylidene chloride (VDC); Vinylidene chlorides polymers

VDC copolymer latex, 25:735–736
film properties of, 25:736t

VDC copolymers
in ignition-resistant applications, 25:737
VDC resin degradation, 25:726

VDR receptor, 25:792

Veatchine, 2:103

Veba-Chemie one-step MIBK process, 16:338

Vector DNA, joining with passenger DNA,
12:501–503

Vectors
pseudorandom, 26:1002

VECTRA, 20:31, 82, 399

VECTRA LCP resins, 20:80

VECTRA liquid-crystal polymers, 20:83
chemical resistance of, 20:85t

Vectran, 13:381

Vectra, 10:192

Vecuronium bromide, 4:360t

Vegetable fibers, 11:285–301, 24:613
abaca, 11:295
abutilon, 11:295
bast fibers, 11:291–295
breaking and scutching of, 11:291–292
broom corn, 11:298
broom root, 11:298
cantala, 11:296
caroa, 11:296
chemical composition of, 11:288–289
classification of, 11:285
coir, 11:297
commercially interesting, 11:286t
crin vegetal, 11:298
defined, 11:285
dimensions of, 11:289–290
economic aspects of, 11:298–300
flax, 11:292
fruit-hair fibers, 11:297
hackling of, 11:292
hard fibers, 11:295–297
harvesting of, 11:291–292
 hemp, 11:292, 293
henequen, 11:296
history of, 11:287
istle, 11:296
jute, 11:292, 293
kapok, 11:297
kenaf, 11:292, 293–294
leaf fibers, 11:295–297
Manilla maguey, 11:296
Mauritius hemp, 11:296
mechanical properties of, 11:290t
palm fibers, 11:298
phormium, 11:296–297
physical properties of, 11:290–291
piassava, 11:298
pretreatment of, 11:291–292
processing of, 11:291–298
properties of, 11:288–291
ramie, 11:292, 294
retting of, 11:291
roselle, 11:293–294
sanseveria, 11:297
seed-hair fibers, 11:297
sisal, 11:297
sunn hemp, 11:294
urena, 11:295
uses of, 11:299t, 300
world markets for, 11:288
world production of, 11:298t

Vegetable oil, 5:27, 28
cosmetically useful lipid, 7:833t
epoxidized, 10:377–380
in pet foods, 10:853

Vegetable oil ester base stocks, 15:218

Vegetable oil production, 10:818

Vegetable protein hydrolysates, 10:301

Vegetables
citric acid in, 6:632t, 646
controlled atmosphere storage of,
   21:564–565
frozen, 21:562, 563
estimated maximum oxygen tolerance,
   3:381t
as source of ascorbic acid, 25:764–765,
   767t

Vegetable tannage, 9:225

Vegetal biomass, polysaccharides from,
   20:555

Vegetal waxes, 26:203, 209–213

Vehicle, defined, 12:33

Vehicle emission factors (EFs), 26:717
Vehicle evaporative control system,
   10:59

Vehicle exhaust emission standards,
   12:416t

Vehicle factors, in engine knock, 12:391–392

Vehicle intake system, icing of, 12:398

Vehicle miles traveled (VMT), 26:717, 721

Vehicle Recycling Partnership (VRP),
   21:471

Vehicles
   use of nonwoven goods in, 17:517
   for waste collection, 25:869

Vehicle used oil, contaminant levels in,
   21:423t

Vehicle volatility requirements, 12:399

Vein uranium deposits, 17:520

“Velcro effect,” 17:52

Velocimeters, laser Doppler, 11:675

Velocity
   interstitial and superficial, 11:766
   measurement of, 11:784–785

Velocity head (H), impeller, 16:676

Vendor Information System for Innovative
   Treatment Technologies (VISITT),
   25:835

Veneering dental investments, 8:295

Venice Lagoon, surface water
   bioremediation, 3:781

Vented nickel cells
   world market estimated, 3:410t

Vent gas, ethylene content of, 10:645

Ventilation
to improve indoor air quality, 1:820,
   823–826
   selected outdoor air requirements, 1:824t

Ventilation plant, 21:849–850

Ventricles, 5:79, 80

Ventricular arrhythmias, 5:88–89
   antiarrhythmics for, 5:99–104

Ventricular assist devices (VADs), 3:718

Ventricular fibrillation, 3:711, 5:89

Ventricular tachycardia, 5:89, 101, 108
   antiarrhythmics for, 5:99–104

Vents, effluent from, 14:207

Vent streams
gas separations and purifications, 1:618t

Venture analysis
   multiyear, 9:537–544

Venture capital funding
   advanced materials research, 1:693

Venturelo–Ishii systems, 18:415–416

Venture scenarios, economic evaluation of,
   9:525

Venturi scrubbers, 13:180, 18:823, 26:714,
   716–717

Venturi tubes, 11:659–660

Venturi-type flow tubes, 20:680

Veramix
   molecular formula and structure, 5:97t,
      119t

Verapamil, 5:104, 116, 121
   molecular formula and structure, 5:97t

Verapamil hydrochloride
   molecular formula and structure, 5:119t

Verapin
   molecular formula and structure, 5:97t, 119t

Verbund, 24:197

Verelan
   molecular formula and structure, 5:97t,
      119t
Verexamil
  molecular formula and structure, 5:97t, 119t
Vermiculite
  asbestos substitute, 3:314t
Vermilion
  color and bad gap, 7:335t
Vernaldehyde, 24:485
Vernolate, 13:321
Vernolic acid
  physical properties, 5:35t
Verospiron
  molecular formula and structure, 5:154t
Versailles Project on Advanced Materials and Standards (VAMAS), 15:756
Versatic acid, glycidyl ester of, 10:381–382
Vertical automatic filter presses, 11:360–361, 379
Vertical axial deposition (VAD), in fiber optic fabrication, 11:140–141
Vertical Bridgman process, 12:557
Vertical cavity surface-emitting laser (VCSEL) diodes, 14:701, 22:178–179
  near-ir, 22:180
Vertical concentric reactor system, 23:547
Vertical electric-arc furnace, 16:147
Vertical extrusion encapsulation, 11:536–537
Vertical Feret’s Diameter (VFD), 18:147
Vertical Gravity Separator (VGS), 22:69
Vertical heaters, 19:511
Vertical leaf filters, 11:364–366
Vertical magnetic field-type (VMC), 23:857
Vertical pumps, 21:68
Vertical reactor, 22:154, 155
Vertical recessed plate automatic press, 11:360–361, 379
Vertical retort process
  for zinc, 26:576–577
Vertical shaft impact (VSI) crusher equipment, 21:380
Vertical thermosiphon reboiler, 19:510
Vertical tube evaporator (VTE), 26:65–66
Vertical tube ozone generators, 17:799–800
Vertical-tube vapor-compression process, 26:69
Vertical vessel(s)
  horizontal leaf filters, 11:366–367
  in plant layout, 19:504, 505
  vertical leaf filters, 11:364
  Verti-Press filter, 11:361
Very fast death factor (VFDF), 2:73
Very fast kinetics, 14:620–621
Very high lubestocks, 13:688
Very large-scale integration (VLSI) silicides in, 22:511
  vitreous silica in, 22:442–443
Very low density lipoproteins (VLDLs), 5:136–137
Very low density polyethylene (VLDPE), 20:180
Very low density polyethylene (VLDPE) resins, 17:700, 701
Very smart textiles, 24:625
Very wet foam, structure of, 12:7
Vesicle, 15:99, 100
Vessel cells, 21:18
Vessel Peclet number, 25:279
Vessels, for fermentation, 11:31–34
Vessels, in plant layout, 19:504–505
Vessicants, 5:816–818
Vestamid
  commercial block copolymer, 7:648t
Veterinary medicine, macrolides in, 15:306–307
Veterinary products, FDA regulation of, 21:579
Veterinary uses, for tetracyclines, 24:605
Vetiver oil, 24:542
Vetivert oil, in perfumes, 18:371
Vetkool coal grade (Netherlands), 6:713t
VFe protein, 17:308
Viagra
  molecular formula and structure, 5:182t
Vibrating inclined screens, 22:280, 281
  economic aspects of, 22:295
Vibrating plate extractor (VPE), 10:780
Vibrating screen decks, 22:279–281
Vibrating screens, 16:616
Vibration(s)
  cake deposition prevention by, 11:382–383
  cake discharge by, 11:366–367
  cause of color, 7:326t, 328
  flow-induced, 13:270
  molecular, 14:224–225
  of molecules from quarrying, 15:75
  Vibrational analyses, 14:620
Vibrational energies, 14:695
Vibrational energy levels, 14:688
Vibrationally excited ozone, 17:794
Vibrational spectroscopy, 16:743–745, 24:109
Vibration analysis, 15:469
Vibration dampers, virtual two-way SMA devices in, 22:349
Vibratory compaction
  ceramics processing, 5:649
Vibratory mills, 16:615
Vibronic energy levels, 14:688–689
Vibroscope, 11:182
Vicat softening temperature, 19:577
V-I characteristics
  of S–I–S junctions, 23:820–821
  of S–N–S junctions, 23:821
Vicinal dichlorides, 13:103
Vicinal silanol groups, 22:380, 381
  silica surface chemistry and, 22:373
Vickers hardness, of vitreous silica, 22:429
Vicryl, 24:219
Vicryl Plus, 24:222
Victoria green garnet
  formula and DCMA number, 7:347t
Victor Meyer reactions, 17:157–158
Vicr trophy reactive, PEEK, 10:197–198
Video camera charge-coupled devices, 19:146–147
Video image recorders, 19:322
View cells, 24:12
Vigoureux printing, 9:213
Vilastic VE viscometer, 21:739
Vilsmeier aldehyde synthesis, 12:187
Vilsmeier reaction, 12:179
Vilsmeier reagent, 24:238
Vinblastine, 2:98, 99
Vincaleukoblastine (vinblastine), 2:98, 99
Vincamine, 2:94, 98
Vincristine, 2:77, 98, 99
Vinyl, 1:115, 132, 133, 12:46
  derivation from ethanol, 10:555. See also
  Acetic acid
  production of, 11:7
Vineyards, 26:309–310
Vinyl
  bans against using, 25:682
  environmental impact misconceptions concerning, 25:681–682
  recycling of, 25:681–682
  β-Vinylacrylic acid
    physical properties, 5:33t
  4-Vinylacetate, 20:473
  4-Vinyl-1-cyclohexene, 4:372
  4-Vinylguaiacol, 7:257t
  5-Vinyl-2-norbornene, 4:372
  5-Vinyl-2-norbornene (VNB), 10:706
  2-Vinylpyridine, 21:101
  4-Vinylpyridine
    comonomer with acrylonitrile, 1:451t
  β-Vinyl silicones, 22:553, 554
Vinyl acetate, 1:102, 230, 10:596,
  Alfrey–Price parameters, 7:617t
  acetic acid for production, 1:115, 133
  acetylene–derived, 1:181, 217, 219, 230,
    253–254
in acrylonitrile copolymerization, 11:203
  azeotropes of, 25:559t
  bioremediation substrate, 3:780
  blends, 25:575–576
  block copolymers of, 25:575
  bulk polymerizations of, 25:570
  carbon monoxide in production of, 5:5
  comonomer with acrylonitrile, 1:451t
  continuous emulsion copolymerization processes for, 25:569–570
  copolymerization parameters of, 25:559t
  copolymer paints, 25:584
  copolymers, 25:574–575
  determination of, 25:561
Diels–Alder adduct from
cyclopentadiene, 8:222t
  emulsion polymerization of, 25:566–570
  emulsion polymerization mechanisms for, 25:571
  hydrolysis of, 25:557–558
  mini-emulsion processes for, 25:570
  monomer, 25:558–560
  plasticizing comonomers with, 25:583–584
  polymerization of, 25:605–606,
    606–608
  polymerization processes in, 25:566,
    568–570
  polymerizations grafting and stabilizers in, 25:573–574
  properties and characteristics of, 25:558t
  PVC copolymerization with, 25:670, 671t
  production of, 10:486–487
  rate of emulsion polymerization for, 25:571–573
  solubilities of, 25:559t
  solution polymerization of, 25:570
  storing, 25:560–561
  suspension polymerization of, 25:570
  toxicity of, 25:562
  uses for, 25:560
Vinyl acetate-based resin, 18:57

VINYL ACETATE-BASED RESIN
Vinyl acetate—crotonic acid—vinyl neodecanoate copolymer
hair conditioner ingredient, 7:855t
Vinyl acetate emulsion polymerization
kinetics of, 25:574
Vinyl acetate—ethylene copolymers, 21:772
Vinyl acetate monomer, polymerization of, 20:462
Vinyl acetate polymerization, branching mechanism for, 19:838–839
Vinyl acetate polymerizations
chain transfer in, 25:573
initiation of, 25:571
rate of, 25:571–573
Vinyl acetate polymers, 25:557–591
in adhesives, 25:578–583
as concrete additives, 25:585–586
economic aspects of, 25:576
finishing techniques for, 25:569
in paints, 25:583–584
in paper, 25:584–585
properties of, 25:562–566
specifications and standards for, 25:576–578
uses for, 25:578–586
Vinyl acetate production, platinum-group metal catalysts in, 19:622
Vinyl acetate resins, 25:586
Vinyl acetate vapor
exposure to, 25:561
Vinylacetic acid
physical properties, 5:31t
Vinylacetylene
acetylene–derived, 1:181, 230
Vinyl alcohol, 1:102
polymerization of, 25:608–610
Vinyl alcohol polymers, 25:591–627. See also Poly(vinyl alcohol) (PVA)
analytical and test methods for, 25:613
chemical properties of, 25:600–605
copolymers of, 25:611
economic aspects of, 25:611–612
health and safety factors related to, 25:613–614
manufacture of, 25:605–610
mechanical properties of, 25:598–600
physical properties of, 25:592–597
processing of, 25:614–615
specifications and standards for, 25:612–613
uses of, 25:615–619
Vinyl alcohol—vinyl acetate copolymer
melting temperature of, 25:594
Vinylated oils, 9:151–152
Vinylation
acetylene-derived chemicals, 1:181, 253–258
Vinyl bromide
physical properties of, 4:351t, 357t
Vinyl chloride (VC), 25:628–657. See also
13:833, 24:268, 6:238–239 acrylic esters from, 10:556
Alfrey–Price parameters, 7:617t
bioeremediaion substrate, 3:770–772
chemical reactions of, 25:629–633
chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
comainomer with acrylonitrile, 1:451t
copolymerization with VDC, 25:697, 698, 700, 702, 706–707
decline percentage made from acetylene, 1:228
economic aspects of, 25:647
end use of chlorine, 6:134t
environmental considerations related to, 25:648–650
health and safety factors related to, 25:650–651
history of, 25:628
in integrated manufacturing process, 6:237t
manufacture of, 25:633–645
physical properties of, 25:628–629
production from acetylene, 1:180, 217, 219, 230, 253
PVC copolymerization with, 25:670, 671t
reducing to ethyl chloride, 10:588
silicone chemistry and, 22:551
single-step manufacture of, 25:646–647
specifications for, 25:648
technology trends for, 25:645–647
toxicity of, 25:648–649
uses of, 25:651
world consumption, 6:245t
world production of, 25:650
Vinyl chloride monomer (VCM), 10:597
economic aspects of, 25:647
impurities in, 25:648t
Vinyl chloride polymers, 25:657–691. See also Poly(vinyl chloride) (PVC)
chemical properties of, 25:665–668
compounding of, 25:670–676
VINYLIDENEFLUORIDE-(VDF)-CHLOROTRIFLUOROETHYLENE 1003

creation of, 25:657–658
economic aspects of, 25:676
environmental considerations related to, 25:679–683
health and safety factors related to, 25:676–678
history of, 25:657
physical properties of, 25:658–665
PVC resin manufacturing processes, 25:669–670
uses of, 25:657, 683–685
Vinyl chloroformate
molecular formula, 6:291t
Vinyl cleaners
for swimming pools, 26:193
Vinyl-containing polymers, silicone heatcured rubber and, 22:579
Vinyl cyanide. See Acrylonitrile (AN)
Vinylic group, in silicone network preparation, 25:719–721
polymerization of, 20:586–588
production from acetylene, 1:220, 231
Vinyl group, in silicone network preparation, 22:563
Vinyl hydrogen fumarate, 25:567
Vinyl hydrogen maleate, 25:567
Vinylic derivatives, hydroboration of, 13:641
Vinylic organoboranes, 13:662
Vinylidene, 25:633
Vinylidene chloride (VDC), 25:692–694
chlorocarbon/chlorohydrocarbon of industrial importance, 6:227t
health and safety factors related to, 25:692–694
in integrated manufacturing process, 6:237t
manufacture of, 25:692
properties of, 25:692, 693t
PVC copolymerization with, 25:670, 671t
Vinylidene chloride copolymers
diffusion of oxygen and carbon dioxide
in, 3:382t
good barrier-to-permanent gases, 3:383, 384
oxygen permeability at 25C, 3:400
permeability of plasticized household films, 3:387t
permeability to selected permanent gases, 3:381t
water-vapor transmission rate (WVTR), 3:387t
Vinylidene chloride polymers, 25:691–745
commercial polymerization of, 25:721–725
degradation chemistry of, 25:711–719
economic aspects of, 25:725
history of, 25:691–692
monomer of, 25:692–694
polymerization of, 25:694–699
processing of, 25:721–725
stabilization of, 25:719–721
structure and properties of, 25:699–721
uses of, 25:725–737
Vinylidene chloride–vinyl chloride (VDC–VC) copolymers
in molding, 25:726–727
in monolayer blown-film processes, 25:729
Vinylidenefluoride-(VDF)-chlorotrifluoroethylene (CTFE)
copolymers, 7:641
Vinylidene fluoride-(VDF)-hexafluoropropylene (HFP) copolymers, 7:641
Vinylidene fluoride, 20:587
Vinylidene chloride, 6:239–240
acetylene-derived, 1:228
copolymer with acrylonitrile, 1:451t
consumption, 6:245
end use of chlorine, 6:134t
Vinyl lithium, 25:630
Vinylmagnesium chloride, 25:630
Vinylmethylpolydimethylsiloxane, monodisperse model networks and, 22:570
Vinyl monomer manufacturing, exhaust gases from, 10:106
Vinyl monomers, 20:394t
addition polymerization of, 20:391
cationic polymerization of, 14:268
copolymerization of, 14:275
grafting of, 19:763–764
polymerization of, 14:299
Vinyl neodecanoate, 5:69
Vinyl organosol can coatings, 18:38
Vinyl polymers, microstructure analysis of, 16:86–87
Vinylpyridine-based copolymers, 20:472
Vinylpyridines, 21:119
uses for, 21:127
N-Vinyl-2-pyrrolidinone production from acetylene, 1:181, 217, 254
N-Vinylcarbazole, 1:254
N-Vinyl-N'-acryloylurea, 1:292
N-Vinylpyrrolidinone (NVP) monomer, 20:464
Vinylquinolines, 21:198
Vinyls
aryl phosphates in, 11:493
for corrosion protection, 7:200–201
physical and coating properties, 7:38
Vinylsiline–hydride interchange reactions, in silicone network preparation, 22:564
Vinyl solid waste
PVC and, 25:679–680
Vinyl sulfides, 25:630–631
Vinyltoluene, 20:110, 113, 23:329,
349–350, 25:182, 185
chemical analysis of, 23:351t
Vinyltoluene monomer, 23:349

Vinyl-type monomers
in wood, 26:354
Violanthrone soluble dyes, 7:373t
Violanthrone dyes, 9:330
Violanthrone Violet colorant for plastics, 7:374t
Violet leaf, in perfumes, 18:371–372
Violets
CIE chromaticity diagram, 7:313, 315
typical applications of inorganic in plastics, 7:372t
typical applications of organic in plastics, 7:368t
typical soluble dye applications, 7:376t
Violet titanium(III) acylates, 25:104
Violagens electrochromic materials, 6:572t, 573–574
Vioxx, 2:820
Viral disease
yeast as a model for, 26:496
Viral vaccines, 5:351t, 11:5–6
Vircol 82 dial mixture, 11:496
Virgin biomass as biomass, 3:684
Virginia Center for Innovative Technology (VACIT), 1:697
Virgin ink concentrate, 14:323
Virial equation of state, 24:657
Virkatone ECO system, 9:485
Virtual current, 9:582, 583
Virtual phase charge-coupled device (VPCCD), 19:151–152
Virtual screening, 6:8–9, 14
Virtual two-way SMA devices, 22:345, 346–350
Viruses. See also Antiviral agents
aquatic animals susceptible to, 3:206
classification, 3:135–138
in fermentation, 11:46. See also Viral vaccines
indoor air pollutant, 1:804–805
infection process, 3:139–142
liquid crystal phases in, 15:112
suspensions, 7:273t
Virus inactivation, 12:139–141
in Factor VIII process, 12:144
methods of, 12:141t
and removal from plasma, 153
Virus-like particles (VLPs), 26:451–452
Vis-breaking, 14:275
Viscoelastic behavior, measuring, 21:741–744. See also Viscometers
Viscoelastic bodies, mechanical models of, 21:719–721
Viscoelastic effects, in fibers, 11:185
Viscoelastic flow, 8:729
Viscoelastic fluids, 11:742, 771
Viscoelasticity tests, 19:580
Viscoelastic liquids, blending of, 16:691
Viscoelastic materials, 21:702
dynamic behavior of, 21:721–723
Viscoelastic processes
in filled networks, 22:572
of MQ resins, 22:588
Viscometers, 21:725–739
capillary, 21:726–731
commercial, 21:725
moving body, 21:737–739
rotational, 21:731–737
types of, 21:726
Viscometry, of silicones, 22:600
Viscose, 4:716
aging of, 11:255–256
deareration of, 11:255–256
dexanthation of, 11:255
dissolution of, 11:254–255
filtration of, 11:255–256
spinning of, 11:256–257
Viscose fibers, 11:247. See also Regenerated cellulose fibers
history of, 11:248–249
Viscose process, 5:383, 11:251–263
environmental issues related to,
11:278–279
modified, 11:259–263
Viscose rayon, 11:247, 250
Viscose Spinning Syndicate, 11:249
Viscosifiers, 9:35–36
Viscosity, 21:702–719. See also Alkali–gravity–viscosity (AGV) charts
of aqueous solutions of poly(ethylene oxide), 10:675, 677
of concentrated polymer solutions,
21:712
of diesel fuel, 12:424
of dilute polymer solutions, 21:710–711
of dispersed systems, 21:714–717
drying oil, 9:149
effect of pressure on, 13:404, 15:208
effect of temperature on, 21:709–710
epoxy resin, 10:385
extensional, 21:717–718
of fats and oils, 10:820–822
fillers and, 11:306–307
fluorocarbon, 11:860
of formaldehyde, 12:108
of gelatin solutions, 12:439
of helium II, 17:353
of ionic liquids, 26:856–858
liquid metal, 15:252
lubrication and, 15:206–209
in olefin fiber spinning, 11:233–234
paint, 18:62
of polycarbonates, 19:801–802, 805
of polymers, 11:195–196
of polysaccharides, 20:551–553, 554
of PVA, 25:595–597, 600, 612t
in sedimentation, 22:51–52, 53
of silicone oils, 22:573–575, 576. 577
of silk, 22:631
of sodium silicate glass, 22:461–462,
463
in solid–liquid separation,
11:342–343
of supercritical fluid mixtures, 24:7
of VDC copolymers, 25:706
of vitreous silica, 22:423–426
of water-soluble polymers, 20:439–441
of waxes, 26:223
Viscosity-average molecular weight, of polymers, 11:195–196
Viscosity breaking (Visbreaking),
18:648–649
Viscosity constant, 23:824
Viscosity expressions, 21:711t
Viscosity improvers, for lubricants,
15:225–226
Viscosity index (VI), 15:207
Viscosity-induced flow maldistribution,
13:271
Viscosity performance curve, 11:667
Viscosity ratio, 21:710, 715–716
Viscosity-reducing chemicals, 9:15–19
Viscosity reduction, filtration control,
9:17–19
Viscosity–shear–time profiles, 21:708
Viscosity–stress curves, 21:714
Viscosity–temperature relationship,
15:207
Viscosity–temperature coefficient (VTC), of silicone oils, 22:576. 577
Viscosity–time measurements, 21:707–708
Viscous drag, 23:825
Viscous limit, heat pipe, 13:230
Viscous liquid blending, in laminar regime, 16:690–691.
Viscous shear effects, 16:697.
Viscozyme L, 11:609.
Visible LEDs, 22:175.
Visible light, 7:304.
Vision 21 Concept (USDOE), 6:833.
Visken
molecular formula and structure, 5:157t.
Vista α-olefin manufacture, 17:714.
Vistalon, 7:637.
Visual inspection, 17:415
Visual testing (VT) piping system, 19:485.
Vitallium, 3:729, 7:221
base-metal dental alloy, 8:309t.
Vitallium FHS alloy
hip implants, 3:734.
Vitamin A, 25:787–790
carotenes as precursors of, 25:790
production from Wittig reaction, 2:65.
Vitamin B, 17:651
antiaging effects, 2:822
in beer, 3:582t, 588.
Vitamin B1, 25:795–796. See also
Thiamine
content in cocoa beans and chocolate products, 6:370t.
dietary sources of, 25:796
metabolic functions of, 25:796.
Vitamin B12, 11:10, 25:803–804
cobalt’s role in, 7:218, 238
dietary sources of, 25:804
folic acid and, 25:802
metabolic functions of, 25:804
Vitamin B2, 25:796–797
content in cocoa beans and chocolate products, 6:370t.
dietary sources of, 25:797
metabolic functions of, 25:797.
Vitamin B6, 25:798–799
content in cocoa beans and chocolate products, 6:370t.
dietary sources of, 25:799
drug–nutrient interactions involving, 25:798
metabolic functions of, 25:798
Vitamin C, 25:745–781, 804–805. See also
Ascorbic acid
dietary sources of, 25:805
metabolic functions of, 25:805
synthesis of, 11:8, 25:782
Vitamin C redox system, 25:746.
Vitamin D, photochemical synthesis of, 19:116–117.
Vitamin D receptor, 25:792
Vitamin D2, 25:791
Vitamin E, 3:117, 17:651–653
anticancer activity trials, 2:826
ascorbic acid and, 25:769
deficiency, 17:652
production of, 17:653.
Vitamin E family, 25:793–794
dietary sources of, 25:794
metabolic functions of, 25:794.
Vitamin F, 25:807
Vitamin K, 25:794–795
dietary sources of, 25:795
metabolic function of, 25:795
Vitamin K antagonists, 4:98–100
Vitamin K1, 17:653–655, 25:795
synthesis of, 17:654.
Vitamin K2, 25:795
Vitamin market, terpenoids in, 24:474.
Vitamin P, 25:797.
Vitamins, 25:781–808
analytical methods for, 25:807
biotin, 25:800
calciferols, 25:791–793
carotenes, 25:790–791
chloroform application, 6:288
classification and nomenclature of, 25:787, 788t
cofactor forms of, 25:781
content of cocoa beans and chocolate products, 6:370t
defined, 25:781
discovery and isolation of, 25:782
folic acid, 25:800–803
as food additives, 12:68–70
history of, 25:781–787
importance to human health, 26:291
liquid chromatography applications, 6:465
market tor, 17:651
molecular distillation, 8:777
VOLATILE FATTY ACIDS (VFAS) 1007

Nobel prizes awarded for research on, 25:782, 783t
in nonruminant feeds, 10:838
as nutraceuticals, 17:649–655
pantothenic acid, 25:799
production of, 25:806
properties of, 25:805–806
pseudovitamins, 25:807
RDA and AI of, 25:785t
in ruminant feeds, 10:867–868
solvent extraction in preparing, 10:786
stability of, 25:806t
syntheses of, 25:782
vitamin A, 25:787–790
vitamin B₁, 25:795–796
vitamin B₂, 25:795–797
vitamin B₆, 25:798–799
vitamin B₁₂, 25:803–804
vitamin C, 25:804–805
vitamin E family, 25:793–794
vitamin K, 25:794–795
Vitamins and Minerals Amendments, 18:685
Vitellin, 22:679
Viton A, 7:641, 24:91–92
Viton B, 7:641
Vitrain, 6:704, 705
Vitravene, 17:629–630
Vitreosil, viscosity of, 22:424t, 425
Vitreous, 5:582
Vitreous carbon, 4:738
Vitreous fibers, 13:386–388
Vitreous silica, 22:380, 407–451. See also
Amorphous silica; Vitreous silica
manufacture
applications of, 22:407–408, 439–445
atomic structure of, 22:408–410
chemical durability of, 22:417–419
classification of, 22:408
commercial, 22:408t, 411–412
corrosion rates of, 22:418t
described, 22:407–408
devitrification of, 22:420–421
diffusion coefficients in, 22:421t
diffusion of gases in, 22:421–422, 423t
economic aspects of, 22:438–439
hardness in various scales, 1:3t
hydroxyl concentrations of, 22:433t
impurities in, 22:410, 411t
manufacturers and suppliers of, 22:439t
natural occurrence of, 22:407
properties of, 22:407, 416–438
radiation effects on, 22:433–438
ultralow expansion, 22:443–444
Vitreous silica manufacture, 22:407, 410–416
history of, 22:410–412
modern, 22:412–416
Vitrification, 10:422–423
in soil and ground water treatment, 25:844–845
of spent nuclear fuel, 25:854
Vitrified grinding wheels, 1:18
Vitrinite, 6:703, 707t, 830
and coal gasification performance, 6:779–780
heated coals, 6:733
most abundant maceral, 6:706, 719
reflectance, 6:707, 708
reflectance limits and ASTM coal rank
classes, 6:708t
structure, 6:716
Vitriol
color, 7:331
Vitrodetrinite, 6:707t
Vivostar
gold-based dental alloy, 8:307t
VK process, 19:748
Vlamkool coal grade (Netherlands), 6:713t
VLDPE resins, 20:186
VLS (silicon carbide)
whisker reinforcement for ceramic–matrix composites, 5:557t
V-nitrogenases, 17:303
VOC regulations, 10:438, 443. See also
Volatile organic compounds (VOCs);
Volatile organic content (VOC)
VOC removal. See also Volatile organic
compounds (VOCs)
adсорption processes, 1:613
anaerobic digestion for, 3:702
gas adsorption for, 1:641–642, 651
Vogel-Fulcher-Tamman CVFT) equation,
12:588
Void content, effects of fabrication on,
18:302–303
Void-filling material, in wet classifiers,
22:284, 285
Volatil e acidity
in wine, 26:330
Volatile compounds
fluorinated, 11:831
in wine, 26:303–304
Volatile fatty acids (VFAs), 10:865, 20:136
for ruminal bacteria, 10:871
Volatile metals, 14:643
reduction to gaseous metal, 16:146–147
Volatile nitrides, 17:206
Volatile oil, as a spice quality parameter, 23:158
Volatile organic chemicals/compounds (VOCs), 1:789, 796, 10:128, 17:815, 24:197, 25:456. See also VOC removal, VOC regulations
as air pollutants, 26:668
catalytic incineration and, 19:625
categories of, 10:86
control of, 26:679–687
from coal gasification, 6:810
defined, 6:830
in finish removers, 18:82
in fragrances, 18:389
indoor pollution, 1:819
in inks, 14:331, 334
ketones as, 14:575
in paint, 18:59, 74
in photochemical smog, 1:793–795
reactivities, 1:792t
from thermoplastics processing operations, 19:539
trends in emissions, 1:796
in wastewater treatment, 25:883, 886
Volatile organic compound reduction, strategies for, 10:68
Volatile organic compound emissions anthropogenic, 24:164–165
reduction of, 24:171
Volatile organic compounds, extracting from spices, 23:156
Volatile product separation, in petroleum processing, 18:646
Volatiles, in manganese, 15:544
Volatile suspended solids (VSS) in biological wastewater treatment, 25:896, 898
Volatility in antidegradant selection, 21:786–787
of diesel fuel, 12:423–424
of fluorine, 11:828
of gasoline, 12:396–397
Volatilization herbicide, 13:309
in metal refining, 16:149
in solvent removal from soil, 23:110
of triazine herbicides, 13:321
Vulcanic sulfur deposits, 23:570
extraction of sulfur from, 23:573–574
Volcanic uranium deposits, 17:521
Volhard titration, 26:845
Voltage-dependent activation energy barrier, 9:571
Voltage for open-arc furnaces, 12:301–302
in superconducting, 23:819–825
Voltage-gated sodium channel (VSC) effectors, 14:347–348
Voltaic electricity, 9:760
Voltailef, 7:641
Voltaammetry, 9:568, 570, 577–581
anodic and cathodic stripping, 9:569
Voltammograms, 9:577–578, 579, 772
cyclic, 9:580
Volume exponents of dimensions in absolute, gravitational, and engineering systems, 8:584t
reducing solid-waste, 25:870–875
Volume averaging, in cake filtration, 11:336
Volume changes, by vitreous silica, 22:438
Volume flux, of droplets, 23:187
Volume fraction, in filtration, 11:328
Volume fraction calculation, in equivalent box model, 20:345–346
Volume mean diameter, 23:186
Volume of activation, 13:407–408
reaction features giving rise to, 13:408
Volume pinning force, 23:827
Volume profiles, 13:448
Volume resistivity, of thermoplastics, 10:176
Volume resistivity of thermoplastics, 10:176
Volumetric analysis, 11:856
Volumetric flowrate chemical reactor, 25:296
Volumetric gas–liquid mass transfer coefficient, 15:677–678
estimation for gases other than oxygen, 15:682–683
factors affecting, 15:711–713
measurement of, 15:679–682
predicting for scaleup, 15:703–707
Volumetric iron compound analysis, 14:559
Volumetric methods, for tellurium determination, 24:415
Volumetric sweep efficiency in enhanced oil recovery, 18:620–622
in oil recovery, 18:613
Volumetric thermal expansion (VTE), of artificial graphite, 12:717
Vulcanized silicone rubber, 22:644
Vulcanizing agents, 21:
Vulcanization system components, in tire
Voluntary materials standards, 15:742
Voluntary sulfur, 23:569
von Liebig, Justus, 25:628
von Neumann law, 12:15
von Willebrand factor, 4:85–86, 12:137, 147
Vorsyl separator, 16:634
Vortex aeration, 15:694
Vortex finder, in hydrocyclones, 22:285, 286
Vortex-induced separator, 22:62–63
Vortex-induced vibration, 11:756
Vortex meters, mass flowmeters, 20:681
Vortex patterns, 11:755
Vortex precession meters, 11:668
Vortex shedding, 11:756
Vortex shedding meters, 11:668–669
Vortices, superconductor, 23:824–825
Voyage charters, 25:327
VP Sandoflam 5085, 11:491
V-type inks, 14:326
Vulcanizable silicone rubber, 25:129
Vulcanizable silicones, properties and applications of, 22:594–595, 596–597
Vulcanizates
EPDM, 10:713
EPM/EPDM, 10:715
ethylene–acrylic elastomer, 10:698, 700t, 701
ethylene–propylene polymer, 10:715–716
chemicals used in, 21:795–800
cure system design in, 21:800–802
effect of compounding ingredients on, 21:803
measuring, 21:791–794
retarders of, 21:800
role of activators in, 21:798–799
Vulcanization elastomer, 9:554–555
silica in, 22:377
Vulcanization agents, 21:796t
Vulcanization system components, in tire compounding, 21:810–811
Vulcanized silicone rubber, 22:582
Vulcanizing agents, 21:794–795
peroxides as, 22:579–580
Vultacs, 23:644
Vuorelaineite, 6:471t
VX nerve agent, 5:819
physical properties, 5:820t
Wackenroeder’s liquid, 23:632
Wacker oxidation, 5:217–218
Wacker process, 7:594, 10:596, 19:653
Wad, 15:538
Waelz zinc oxide process, 26:612
Waferboard bonding, phenolic resins in, 18:791
Wafer contamination, in ion implantation systems, 14:445–446
WAG process, 18:626
“Wait and see” problems, 26:1025, 1028
Wakamatsu reaction, 2:573
Wakame
common and scientific names, 3:188t
Waksman, Selman, 11:3, 9, 10
Walking catfish
common and scientific names, 3:188t
Wall baffles, 16:684–685
Wall coated open tubular (WCOT) columns, 4:615, 6:377–378, 424
Walleye
aquaculture, 3:183
common and scientific names, 3:188t
“Wall-plug efficiency,” 14:843
Walnut oil
cosmetically useful lipid, 7:833t
Walther equation, 15:207
Warburganal, 24:550
Warehouse operations, 25:329
Warehousing, safety in, 21:855–856
Warewashing
bleaching agent applications, 4:71
Warfare agents, detection of chemical, 22:716–717
Warfarin, 4:98, 25:795
Warm-box resin, 12:273
Warm/hot exhaust dyeing, 9:177
Warm isostatic pressing
ceramics processing, 5:649
Warm lime water softening method, 26:120
Warm-up, engine, 12:397–398
Warp knitting, 24:619–620
Warp sizing
PVA in, 25:615–617
Wash brine, in solar salt harvesting, 22:807–808
Washcoat, 10:103
Wash-draw-dry-relax fiber process, 11:205
Wash effect, 10:277
Wash-fastness of fibers, 11:169
Washing
  in filter presses, 11:360
  in kettle soap making, 22:736
  in paper recycling, 21:436–437
  in photography, 19:214–215
  in solid–liquid separation, 11:344
  of staple fibers, 11:257–259
  in wet fiber spinning, 11:208
Washing/surface removal agent, 12:33
“Wasserglass,” 22:452. See also Water glass
Wastage, economics of, 15:37
Waste(s). See also Solid wastes
  chemical elements in, 21:364
  commingled plastic, 21:453–456
  minimization of, 21:856
  minimizing, 12:806
  from organic ester production, 10:513–514
  preventing, 12:803
  as raw materials, 10:165
Waste acids, from nitration plants, 17:163
Waste characteristics
  in thermal waste treatment, 25:831–832
Waste collection systems
  for solid waste, 25:869–870. See also Garbage collection
Waste disposal
  copper, 7:705–708
  phosgene, 18:810
  from wineries, 26:318
Waste disposal procedures, on-site, 9:796
Waste Electrical and Electronic Equipment (WEEE), 9:721
Waste Electrical and Electronic Equipment (WEEE) legislation, 20:60
Waste exchanges, 21:407
Waste facilities, design of, 21:842
Waste fuel
  Portland cement industry consumption, 5:497t
Waste gas streams, decomposing phosgene in, 18:807
Waste generation, rates of, 21:363–364
Waste handling, in industrial hygiene, 14:213
Waste heat, 10:138
Waste-heat boilers, 10:144
Waste heat recovery exchangers, 13:267
Waste ink disposal, 14:333
Waste interception network, 20:739–740
Waste Isolation Pilot Plant (WIPP), 25:859
Waste lime products, disposal of, 15:77–78
Waste management, 9:443
  electroless deposition, 9:719–720
  in metals recycling, 21:406–407
  plating industry, 9:794–797
Waste minimization techniques, 25:883–885
Waste oils, 21:419, 420
  chemical analyses of, 21:422–423
Waste organsics incineration, hydrogen chloride produced from, 13:824
Waste recycling, advanced, 21:454
Waste Resource Center (WRC), 9:457
Waste separation, multmetal, 21:400
Waste streams, treatment of, 21:671–673
Waste sulfite liquors
  vanillin preparation from, 25:547
Waste-to-energy (WTE) facilities, 3:688–689
  in solid waste volume reduction, 25:872–873
Waste-to-energy (WTE) operations, 21:411
Waste treatment
  anthropogenic silicas and silicates in, 22:471
  electrochemical, 9:642–643
  hydrothermal, 23:240–242
  ion exchange in, 14:422–423
  microwave technology in, 16:530
  in papermaking, 18:126–127
Waste treatment plants, silicones from, 22:602
Waste treatment processes. See also Hazardous waste management; Radioactive waste management; Solid waste management
  for radioactive waste, 25:853–854
  titanium-related, 25:64–65
Waste vitrification process, 12:616
Wastewater, 9:443. See also Effluent treatment
  constituents of, 25:885–887
  copper in, 9:446
  electrochemical treatment of, 9:644t
  health and safety factors related to, 18:780
  hydrogen peroxide treatment of, 14:64
  odorous compounds found in, 26:723t
organics removal from, 18:521
recycled, 9:452–453
silicones in, 22:602
Wastewater disinfection, ozone use in, 17:809
Wastewater neutralization, 25:818
Wastewater reclamation from reverse osmosis systems, 26:83–84
Wastewater reverse osmosis reclamation systems, 26:79–80
Wastewater treatment, 25:882–920
advances in, 25:910–912
alternative biological technologies in, 25:902–905
biological aerobic, 1:744–745
bromine disinfection, 8:623
calcium chloride application, 4:567
defoamer applications, 8:249
economics of, 25:883
elimination of, 9:456
enzymes for textile bleaching effluents, 4:67–69
fixed-film processes in, 25:905–906
foams in, 12:24–25
government regulation of, 25:917–918
health and safety factors related to, 25:916–917
hybrid processes and increased water recovery in, 21:669–670
minimizing waste in, 25:883–885
oxygen transfer in, 15:713–714
peracetic acid disinfection, 8:630
physicochemical methods of, 26:385
potassium permanganate in, 15:619
private and rural disposal systems for, 25:915–916
recycling technologies in, 25:888–902
reverse osmosis for, 21:645
sewage and, 25:882
sludge handling and disposal in, 25:912–914
in small communities, 25:916
storm-water control in, 25:915
ultrasonic disinfection, 8:643
ultraviolet disinfection, 8:643–653
advanced, 25:906–910
wastewater characterization for, 25:885–887
of watercraft waste, 25:916
Wastewater treatment plants, silver thiosulfate and, 22:683
Wastewater treatment facilities, industrial hygiene at, 14:213
Wastewater treatment sludge as biomass, 3:684
Waste zero system, 14:110
Water, 26:1–50. See also Dessicants, Drinking water; Hydrolysis; Liquid water; Oxide–water interfaces; Seawater; Sodium chloride–water system; Wastewater; Wastewater entries, Ice as an absorption liquid, 26:688
acrylamide solubility in, 1:290
acrylonitrile solubility in, 1:399
actinide ion stability in aqueous solution, 1:480
activity of, 9:98
adipic acid solubility, 1:555
adsorption of vapor on poly(vinylidene chloride) carbon, 1:634
adsorption on silicalite, 1:634
for agriculture, 26:57–58
amorphous silica polymerization and, 22:389–390
analysis of principal mineral constituents and gases in, 26:36–40
analytical methods for, 26:34–46
anthropogenic silicas and silicate additives in, 22:468
arsenicals present in, 3:276
asbestos solutions, 3:301–302
azeotrope with acetone and 2-propanol, 8:795–796
azeotrope with acetonitrile, 8:818
azeotrope with benzene, 3:598
azeotrope with 1-butanol, 8:747–748
azeotrope with ethanol, 8:747, 803, 818
azeotrope with ethylenediamine, 8:487
azeotrope with methyl acetate, 8:799
azeotrope with tetrahydrofuran, 8:818
azeotropes with acrylonitrile, 1:399
azeotropes with amyl alcohols, 2:766
azeotropes with n-butylaldehyde, 4:460
azeotropic mixtures with butyl alcohols, 4:395
beer and brewing, 3:573, 582
boron removal from, 14:418
carbon disulfide, 4:823
cauastic soda solutions in, 22:830, 831–832
as chelant, 5:709
chemical composition of, 26:17–22
chemical means to remove, 10:477
chemical variety in, 26:21–22
circulation with rocks, atmosphere, and biota, 26:7–12
Clarke–Othmer process for acetic acid–water for ethanol separation, 8:834
in cocoa shell from roasted beans, 6:357t
in commercial soluble silicates, 22:451
concentrations of the principal elements in, 26:17, 19
consumer prices for, 26:96
consumption in coal gasification, 6:810–811
deionization and dealkalization of, 14:416–417
demand for winery operations, 26:318
in developing nations, 26:54
dielectric constant of, 23:241
dissolution of amorphous silica in, 22:387–388
dissolved heavy metals in, 26:22t
as a drilling fluid, 9:2
in dyeing, 9:159–160
effect on equilibrium constant, 10:475
in electrolysis, 9:634–635
ethylene oxide reaction with, 10:637
explosive contact with titanium, 24:865
factors affecting stream water quality, 26:22–32
fate of solvents in, 23:109–110
in fatty acid neutralization, 22:739–740, 741
for fermentation, 11:44, 45
fiber interactions with, 11:168–169
fluorine reactivity with, 11:829–830
formic-acid–water–m-xylene azeotrope, 8:821
forms in dehydration, 23:71–72
gas bulk separation, 1:618t
gas purification, 1:618t
as greenhouse gas, 1:806, 807t
hydrogeochemical cycle, 26:4–12
in industry, 26:56–57
ion product of, 23:207–209
in leaching chemistry, 16:152
lead content of, 14:763
in melt fiber spinning, 11:210
mercury releases to, 16:47–49
in methyl acetate separations system, 22:333–337
in mobility control, 18:625–626
nitrate removal from, 14:417
nonisothermal absorption of acetone into, 1:60
ozone absorption in, 17:769
for parenteral drug dosage, 18:714
pasteurization, 8:636–637
permeability in selected household films, 3:387t
pesticide contamination of, 18:551
phosgene reaction with, 18:804
photocatalytic decomposition of, 23:24
physical properties in analysis of, 26:35–36
physical properties of light and heavy compared, 8:459t
polarity relative selected molecules, 8:813t
in Portland cement hydration, 5:477t
product of bioremediation, 3:756–757
properties of, 26:12–17
propylene oxide reaction with, 20:794
for purification of hydrocarbon-derived acetylene, 1:203
PVA solubility in, 25:594–595, 597
γ-radiation of, 14:719
in radioactive waste disposal, 25:856, 857, 858
as radioactive waste source, 25:852
radioactive waste storage in, 25:854–855
reaction of photo-holes with, 19:84
reaction with calcium carbide, 4:534
reaction with halogen fluorides, 13:126
recovery and reuse of, 9:454–455
removal from esterification reaction, 10:476–477
removing from sludge, 25:913–914
Rodebush sequence for ethanol separation from, 8:834–835
role in materials transformation, 14:80
role in solvation/phase behavior, 20:439
in RTV silicone preparation, 22:594
scarcity of, 25:882
selenium oxyacids and, 22:88–89
selenium pellets in, 22:103
in selenium recovery, 22:84
in silanol condensation, 22:567
in silicon semiconductor technology, 22:232
silicone fluid solubility in, 22:578
in silicone latex sealants, 22:34–35
silicone rubber and, 22:584
silicone solubility in, 22:602–603
as smart material, 22:720
in soap bar hydration, 22:730–731
soap bars and, 22:742
soap with low water content, 22:729
soda ash solutions in, 22:795
sodium carbonate solubility in,
22:787–788
in sodium chloride solution mining,
22:802–805
sodium hydrosulfide solutions in, 22:870
sodium iodide solubility in, 22:872t
sodium nitrite solubility in, 22:853, 854
sodium reactions with, 22:765, 775
sodium sulfide solutions in, 22:873
solubilities of alkanoic acids in, 5:39t
solute species in, 26:16–17
solvent in commercial gas absorption
processes, 1:26t
in solvent recovery, 11:209–210
as a solvent, 26:12–16
splitting, 13:849
as a supercritical fluid, 24:2
surfactants in, 22:724–725
in synthetic latex manufacture, 14:711
terminal activity coefficients of mixture
with ethyl acetate, 8:743t
terminal activity coefficients of mixture
with hexane, 8:743t
terminal activity coefficients of mixture
with methyl acetate, 8:743t
ternary heterogeneous azeotropes, 8:823
thermodynamic constants for phase
changes of, 26:13t
total oxidation reactions in the presence
of, 19:87
transfer of ozone into, 17:801–802
transport in barrier polymers, 3:403
triple point of, 24:439–440
typical commercial gas absorption
process, 1:26t
typical commercial gas absorption
process, 1:26t
use in the United States, 26:4
vapor–liquid equilibrium of ammonia–
water system, 2:682
vinyl chloride and, 25:628
vitreous silica devitrification and,
22:420–421
vitreous silica reaction with, 22:417
Wentworth process for ethanol
separation from, 8:834–835
Water absorption, thermoplastic,
10:176
Water–acetone–chloroform azeotrope,
8:821
Water activity
in food deterioration, 12:76–77
in food processing, 12:84
Water–atmosphere interaction, 26:8
Water balance chemicals
for swimming pools, 26:192
Water-based drilling fluids, 9:33–35
Water-based fluorescent lamp coatings,
ethylene oxide polymers in,
10:688–689
Water-based inks, 14:326
Water-based muds, 9:3–5
Water-based writing inks, 14:328
Water-borne adhesives, 25:475
Waterborne alkylds, 2:156–158
Waterborne automotive coatings, 10:448
Waterborne can coating system,
10:445–446
Waterborne coatings, 7:127–128, 10:443
Waterborne coating technologies, 10:349
Waterborne contact adhesives, phenolic
resins in, 18:784
Waterborne polyamides, 10:400
Water-borne polyurethane coatings,
25:474
Water-borne transport, 25:327–328
Waterborne wood preservative treatments,
26:348
Water-break test, 9:782
Water carriers, 25:327
liability of, 25:336
Water chemistry, in steam-generating
systems, 23:219–228
Water circulation
types of, 26:20
Water clarification, in paper recycling,
21:441–442
“Water continuous” microemulsions,
16:423, 424, 425
Water conditioning, salt use in,
22:817–819
Water consumption
growth in, 26:97
Water contact angle hysteresis, 22:109, 110,
113–114
Water content  
  influence on gelation time, 23:63  
of ion-exchange resins, 14:398  
Water-cooled condensers, 23:218  
in refrigeration systems, 21:536  
Water-cooled heat exchangers, 19:507  
Water-cooled ozone generators, 17:799–800  
Water-cooled refractory furnace linings, 12:300–301  
Water cooling systems, 10:150–151  
Water-correcting agents, in food, 12:67  
Watercraft waste  
  treatment of, 25:916  
Water cycle  
  tungsten in, 25:352  
Water decontamination, photocatalytic, 19:87–94  
Water desalination, 26:51–102  
  economic aspects of, 26:96  
  energy requirements for, 26:59–61  
  freshwater manufacture via, 26:58–61  
  future prospects for, 26:96–98  
  membrane desalination processes, 26:73–87  
  in the Middle East, 26:54  
  need for, 26:58–59  
  solar, 26:89–94  
Water desalination. See also Distillation processes, Water problem  
Water desalination processes, 26:59, 61  
Water-dominated hydrothermal resources, 12:530–533  
Water electrolysis, hydrogen production from, 13:843  
Water Environment Federation (WEF) carbon adsorption guidelines, 25:811  
Water environments  
  natural, 26:2  
Water exchange, effect of pressure on, 13:441–442  
Water exchange kinetics experiments, 13:433  
Water, extinguishing capability of, 21:858–859  
Water Factory 21 site, 21:648  
Waterfall aerators, 26:162  
Waterflooding, of oil reservoirs, 18:613  
Water flux  
  of membranes, 21:643  
  in reverse osmosis, 21:637  
Water-for-injection (WFI), 11:44  
Water–formic acid–1,2-dichlorethane azeotrope, 8:823  
Waterfowl shot  
  bismuth alloy applications, 4:14–15  
Water–gas shift reaction, 12:221–222  
  metal carbonyls in, 16:73–74  
Water glass. See also “Wasserglass” in precipitated silica manufacture, 22:368–369  
  in silica gel manufacture, 22:369–370  
Water-granulated silicon, 22:506  
Water hardness  
  and detergency, 8:420–426  
  in swimming pools, 26:185–186  
Water–hydrogen chloride system, 13:813–817  
Water-immiscible core materials, in microencapsulation, 16:442, 443  
Water injection molding, 19:789  
Water-in-oil (W/O) emulsions, 19:13  
Water-insoluble ethylenic poly(disulfide)s, 23:714  
Water-insoluble compounds, in phosphate fertilizers, 11:122  
Water-insoluble ethylenic poly(disulfide)s, 23:714  
Water management, in proton exchange membrane fuel cells, 12:212–213  
Water-miscible core materials, in microencapsulation, 16:442  
Water molecules, 26:14–15  
Water pills, 5:167  
Water pollutants, photocatalytic degradation of, 23:23  
Water problem, 26:51–58  
Water purification  
  adsorbents, 1:587t, 612  
  product design of family unit, 5:764–766  
Water purification chemistry, 15:581  
Water purification  
  iodine in, 14:373  
  silver in, 22:655  
Water purity monitoring, in steam-generating systems, 23:227–228
Water quality
for aquaculture, 3:198–201
for beer making, 3:573
liquid chromatography applications, 6:465
Water quality assessment, in papermaking, 18:128
Water quality, fertilizers and, 11:126
Water quality maintenance
for spas/hot tubs, 26:194–195
for swimming pools, 26:179–188
Water quality risk, from herbicides, 13:310–311
Water quality standards, 21:581–583
Water reactions, supercritical, 24:16–17
Water-reducers, for cement, 5:485
Water-reduction strategies, in papermaking, 18:126–127
Water removal
molecular-sieve effect for, 16:824
molecular sieves in, 16:837–840
Water removal, from condensation reactions, 18:516–520
Water repellancy
cotton, 8:27–28
lotus effect and, 22:109–110, 112
of lotus leaves, 22:108–109
Water-repellent cements, 5:500t
Water repellent effectiveness (WRE), 26:354
Water repellents
organic titanium compounds in, 25:122
Water reservoirs
exchange of water between, 26:2
Water reservoirs, 26:2–4
Water resources, 26:1–2
U.S. spending on, 26:54–55
Water resources, pollution of, 24:164
Water retting, 11:291, 292, 602–604
Water rinse finish removers, 18:81
Water-sealing construction materials, superabsorbent polymer in, 13:753
Water-sensitive formations, stabilization of, 9:20–22
Water softener effluent analyses, 26:121t
Water softeners, 22:818–819
Water softening installations, fouling of, 14:415
Water softening, ion exchange in, 14:415–417
Water solubility
of ionic liquids, 26:859–863
Water-soluble amphoteric cyclocopolymers, 23:721
Water-soluble benzotriazoles, 26:400
Water-soluble dendritic nanoparticles, 26:796
Water-soluble functional polymers, 24:171
Water-soluble granules, in phosphate fertilizers, 11:122
Water-soluble gums, 4:722–724, 13:64
applications of, 13:73–75
Water-soluble initiators, 14:719
Water-soluble polymers, in mobility control, 18:628
amine-containing styrenic monomers, 20:473–475
developments in, 20:490–491
hydrodynamic volume of, 20:437–439
inorganic, 20:459
macromolecular coil size in, 20:438
miscellaneous cationic monomers of, 20:475–482
naturally occurring, 20:444–450
nonionic, 20:460–464
polyelectrolytes, 20:464–472
polysaccharides, 20:450–459
polyvinylpyridines, 20:472–473
statistical amphiphilic polymers, 20:484–490
stimuli-responsive amphiphilic polymers, 20:482–483
structure of, 20:437
synthetic methods for, 20:441–443
viscosity and rheology of, 20:439–441
Water-soluble proteins, commercial use of, 20:450
Water-soluble reactive dyes, 9:465
Water-soluble rhodium catalyst, 19:647
Water-soluble silanols, 22:604
Water-soluble suture coating materials, 24:212
Water-soluble vitamins, 12:68
Water sources
pollution of, 26:53
Water-splitting electrodialysis membranes, 14:121
Water standard, for silver, 22:655, 680, 682, 683
Water supplies, tastes and odors in, 17:804–805
Water-swelling clay stabilization, 18:615
Water system design, 20:757–760
applications of, 20:764
Water systems, high purity, 17:807–808
Water-to-carbide acetylene generators, 1:207
Water treatment, 26:102–152. See also
Aeration water treatment, Industrial
water treatment
ABS manufacture, 1:421–422
activated carbon application, 4:752
aerators, 26:158–170
alkanolamines from nitro alcohols, 2:120
cogulation and flocculation in, 26:106–111
end use of chlorine, 6:134t
high calcium lime in, 15:69t
iodine disinfection, 8:629
lignosulfonates in, 15:18
membrane processes in, 26:111–115
municipal, 26:123–125
nuclear cycle, 23:235–236
oxygenated, 23:226–227
polyacrylamide applications, 1:300
sedimentation and filtration, 26:103–105
slaked lime in, 15:63
sodium sulfite in, 23:671
softening processes, 26:115–123
in steam-generating systems, 23:222–226
sulfur dioxide in, 23:667–668
sulfur use in, 23:591
of swimming pools, spas, and hot tubs, 26:172–202
uses of succinic acid and succinic
anhydride in, 23:429t
Water treatment additives, 23:224t
Water treatment, anthropogenic silicas and
silicates in, 22:470–471
Water treatment compounds
registered for aquaculture in U.S., 3:217
Water treatment filter types
properties of, 26:104t
Water treatment
hydrazine in, 13:595–596
ion exchange in, 14:415–418
Water treatment market, 11:642
Water treatment schemes, for steam-
generating systems, 23:223–224t
Water triple-point cells, 24:439, 440
Water turbidity, ozonation for, 17:805
Water, ultrapure, 15:834
Water usage, reduction in, 9:443
Water use, 26:51–52
Water vapor
permeability of polymers to, 25:708t,
709–710
properties of, 26:16t
Water vapor, effect on ozone decomposition, 17:774
Water vapor imbibition, polymer
precipitation by, 15:807–808
Water vapor transmission rate (WVTR)
for VDC copolymers, 25:709–710
Water-vapor transmission rate (WVTR),
barrier polymers, 3:375, 387–388
selected polymers, 3:387t
Waterwall furnaces, 12:319, 320, 326
Water washing, in soap making, 22:735
Waterways
environmental limits on silver in,
silicones in, 22:602
Water-wet reservoirs, 18:614
Water wet resins, shipping, 14:413
Wathlingenite, 5:785t
Watson characterization factor (K), 18:644
Watson–Crick model, 17:603, 605, 606, 608
Watson, James, 11:10
Wattersite, 6:471t
Watts baths, 9:817, 819, 832
Waveform
fatigue properties and, 13:488–489
in fatigue testing, 13:491, 493
Waveguide dispersion, 11:135
Waveguide fabrication, photochemical
approach to, 19:116
Wave interference
in X-ray diffraction, 26:414–415
Wavelength dispersive X-ray analysis
(WDX), 24:78
Wavelength dispersive X-ray fluorescence
spectrometric (xrf) methods, 25:60
Wavelength dispersive spectrometer
(WDS), 16:488, 26:433–434
Wavelength dispersive X-ray fluorescence
(WDXRF)
archaeological materials, 5:742
Wavelength division multiplexing (WDM)
LEDs for, 22:176
photon detectors for, 22:182
Wavelength, in photocatalysis, 19:78
Wavelength-integrated enhancement, 14:852
Wavelength, silicon transmissivity versus, 22:488
Wave mechanics theory, 21:290
Wax
functional properties of, 26:215
Wax component separation, 26:223–224
Wax cracking, 17:723
Wax emulsion stabilizer
palygorskite/sepiolite application, 6:700t
Waxes, 10:801, 26:203–226. See also Wax entries
alcohols from, 2:2
analytical techniques for, 26:221–225
animal, 26:206–209
chemically modified, 26:220
constituents of, 26:204–206
in cosmetic molded sticks, 7:840t
in cotton fiber, 8:19t
for inks, 14:318
melting and congealing points of, 26:222
natural, 10:499
petroleum, 18:670–671
synthetic, 17:727, 26:218–221
vegetal, 26:209–213
Wax esters, 26:204–205
cosmetic applications, 2:21
Wax sizing materials, 18:20t
Wax sweating, 18:670
Wax sizing materials, 18:20t
Weatherability of sealants, 22:31, 37
Weatherability, epoxy coating, 10:443–444
Weatherable epoxy resins, 10:374–375
Weatherable siding
PVC in, 25:684
Weather decks
corrosion protection coatings, 7:204
Weatherfastness
of organic pigments, 19:450–451
of pigments, 19:428
Weathering
of rock minerals, 26:23
role in geochemical processes, 26:7
Weathering effects, tests on plastics, 19:583–585
Weathering environments
cycle of sulfur in, 26:30
Weathering, of inorganic pigments, 19:382, 383
Weathering, of unsaturated polyesters, 20:116
Weatherometer test, 18:72
Weaton-Najarian zinc condenser, 26:577
Weaving, 11:178
cotton, 8:17–18
Web-bonding nonwoven processes, 17:496–497
Web consolidation, for staple-fiber nonwoven fabrics, 17:505–512
Web drafting, 17:501–502
Web dryers, 9:119–120
Weberite, 2:364t
Weber number (We), 11:746, 15:687t, 23:183, 184, 190
Web folders, 17:501
Web formation
aerodynamic, 17:502–504
carding in, 17:498–499
in manufacturing nonwovens, 17:497–500
opening and blending in, 17:498
wet-laid, 17:504
Web formation/spinning, for spunbonded nonwoven fabrics, 17:469–474
Web knitting, 17:507
Web layering
short fiber, 17:504
for staple-fiber nonwoven fabrics, 17:500–501
Web offset heat-set publication inks, 14:320
Web offset inks, 14:319–320
Webs chemical binders applied to, 17:508
three-dimensional, 17:503
Web sites
engineering thermoplastic data sheet, 10:221t
enzyme list, 10:260
Web sites, for smart materials, 22:722
Web spreading, 17:501–502
Web, structure of spider orb, 22:630
Wedge meters, 11:661
Weed control
with allelopathy, 13:352–357
inoculate approach to, 13:346–347
plant pathogens and insects in, 13:331–332
Weed killers, 13:283
Weed management
agents/techniques for, 13:328–333
with glyphosate-resistant crops, 13:359
microbial biocontrol agents used for, 13:347t
Weed management, 12:487
Weed management products, adoption of, 13:348
Weeds
allelopathic suppression of, 13:353
biocontrol of, 13:350
biocontrol with plant pathogens, 13:346–352
controlling, 13:281–282
infestations of, 13:281
Weed seeds, control of, 13:332–333
Weed suppression
partial, 13:353–354
rotational crops for, 13:353
Weft knitting, 24:619
Weibull distribution function, 5:617–619
Weibull distribution, 26:988
Weibull parameters, 5:618
Weibul-type curing silos, 23:465
Weigh hoppers parallel, 26:249
Weigh hoppers, 26:248
Weighing, 26:226–262
continuous, 26:248
methodologies for, 26:245–251
of predefined quantities, 26:246–248
principles of, 26:228
regulatory aspects and performance characteristics of, 26:236–238
types of scales, 26:243–245
U.S. regulations related to, 26:237–238
Weighing accuracy factors affecting, 26:239–243
Weighing applications industrial, 26:227
Weighing technologies, 26:228
Weigh modules, 26:253
capacity of, 26:254–255
Weight controlling, 26:248
Weight-average molecular weight, 20:101
of polymers, 11:195, 196
Weighted average capital cost (WACC), 9:535, 541–542, 544
Weighting factor, in environmental assessment, 24:180
Weighting function in stochastic annealing, 26:1029–1030
Weighting, in impact assessment, 14:821
Weighting method in multiobjective optimization, 26:1033
Weight of equivalent equilibrium section (WES), 1:653
Weight of unused bed (WUB), 1:653
Weight per epoxide (Wpe), 10:355, 385
Weights and measures standards, 15:768
Weigh vessels loading, 26:256
Weigh vessels mechanical considerations for, 26:255–256
Weigh vessels, 26:252–253
Western Europe, ethylene production in, 24:270
Westheimer, Frank, 16:727, 741
Westinghouse AP600 reactor, 17:595
Westinghouse Bettis Laboratory, 17:573
Westinghouse Model 412 pressurized water reactor, 17:574–577
West Nile encephalitis, 14:338
West Nile virus (WNV), 3:135, 137
antiviral therapy, 3:165–168
infection process, 3:164–165
Weston cell, 15:750
Wet adhesion coatings for corrosion protection, 7:168
Wet air oxidation in hazardous waste management, 25:824
Wet- and dry-jet wet spinning, 16:10–11
parameters involved in, 16:11
Wet ashing techniques, 18:276
Wet asphalt modification process, 21:468
Wet ball milling, in ferroelectric preparation, 11:98–99
Wet basis, 9:98
Wet bulb temperature, 9:98, 100
Wet chemical analytical methods, for silver, 22:650–651
Wet chlorination, selenium recovery via, 22:83–85
Wet collectors, in controlling dust, 15:76
Wet collectors, in controlling dust, 15:76
Wet classiﬁcation, 22:283–288
Wet combustion, in enhanced oil recovery, 18:631
Wet deposition, 26:10
Wet dispersion image analysis, 18:147
Wet drum concentrator selection, feed factors in, 15:446–447
Wet drum magnetic separators, low intensity, 15:442–449
Wet drum ore concentrator specifications, 15:447–449
Wet drum separators, operating considerations for, 15:445. See also Wet drum magnetic separators
“Wet-end chemical additives,” 18:98
Wet etching, in compound semiconductor processing, 22:182–183, 184t
Wetfastness, 9:173, 191, 256
improving, 9:328, 329
Wet ﬁber spinning, 11:189, 206–209
abrasion resistance and, 11:211

Weirs, 11:664
Weirs, in wet classiﬁers, 22:284
Weissenberg effect, 11:771, 16:691, 21:724
Weizmann, Chaim, 11:8
Welan, 13:69, 4:724t
classiﬁcation by structure, 4:723t
properties of, 13:74t
Welchol, 5:145
Weldability
copper wrought alloys, 7:746–748
Weldalite alloy, 22:658
Welded tube, 7:694
Welding electrodes
cerium application, 5:683
functions and composition for, 25:18–19
Welding, industrial hygiene and, 14:210
Welding, information sources for, 15:766
Welding, of titanium, 24:857–858
Welding, piping system, 19:484
Weld-line effects, 20:83
Weldon-Pechiney process, 13:820
Wellan, 20:576
Well counting, 21:277
Well design, monitoring, 12:843–846
Well drilling fluids
barite applications, 3:353
barium carbonate applications, 3:361
Weller equation, 19:111, 112
Weller, Thomas, 11:10
Wellman–Galusha gasiﬁer, 6:794, 830
Wells
in soil and ground water treatment, 25:835
“Well-stirred mixture” assumption, 14:609
Wells, for hot dry rock applications, 12:540–541
Wells, in sodium chloride solution mining, 22:802–803
Well water
for aquaculture, 3:198–199
Well water, salt in softening, 22:817–819
Welognite, 26:624
Wentworth process, for ethanol separation from water, 8:834–835
Wenzel’s equation, 22:111–112
Wenzel contact angle, 22:111
Werner nomenclature scheme, 17:391–392
Werner-Pfeiderer (WP) Compounder, 22:44
Werner-type inclusion compounds, 14:171–172
West Basin Reclamation Plant, 26:84
Western blotting technique, 9:756
Wet fixation, 9:216
Wet foams
  shear modulus of, 12:17–18
  structure of, 12:7–8
Wet gas sulfuric acid (WSA) process, 23:785–786
Wet granulation drug dosage form, 18:702–704
Wet grinding, 16:614
Wetherill furnace, 26:611
Wet high intensity magnetic separators (WHIMS), 15:435, 449–450
Wet hydrogen sulfide, 23:635
“Wet-laid nonwovens,” 18:96
Wet-laid nonwoven processes, 17:496
Wet-laid processes, 11:179, 180
Wet-laid web formation, 17:504
Wet lamination, 14:711–712
Wet magnetic drums. See also Wet drum magnetic separators
  media recovery, 15:443
  for ore concentration, 15:445–447
Wet magnetic separators, 15:442
Wet milling, 9:292
Wet milling, asbestos minerals, 3:308
Wet permanent setting
  in wool processing, 26:388
Wet phosphoric acid, economic aspects of, 18:860
Wet-pit volute pumps, 21:65, 66
Wet-process kilns, 5:489–490
Wet process lead refining, 14:751
Wet-process phosphoric acids, 18:819–820, 824–826
  concentrated, 18:828
  purification of, 18:824–826
Wet pulps, 11:219
Wet rendering, 10:817
Wet ring spinning systems, 11:615–616
Wet screening, 14:392–393
Wet-screening devices, 22:275
  slurries for, 22:282–283
Wet scrubbers, 13:179–180, 26:713–717
  industrial applications of, 26:714t
Wet section, of multipurpose plant, 11:427
Wet-sieving, in particle size measurement, 18:141
Wet spinning, 15:816, 817–818, 16:8, 10, 19:723
  of MPDI, 19:724
  of ODA/PPTA, 19:725
Wet spinning, of polymer fiber, 24:617
Wet spinning NaSCN salt process, 11:206, 207
Wet spinning organic solvent process, 11:206–207
Wet-strength additives, in paper manufacture, 18:115–116
Wettability
  colloids, 7:282–283
Wetted-wall columns, 15:694–695
Wetted-wall plants, 18:820
Wetting
  and adhesion, 1:507–508
Wetting, 22:110–111. See also Prewetting
  by sodium, 22:761–762, 762–763
  surface tension and, 22:112
Wetting ability, 9:112–113
Wetting agents, 11:305
Wetting agents, soaps as, 22:757
Wetting, of fillers, 11:304–305
Wetting, film formation using, 24:750
Wet well gas
  commercial gas absorption processes, 1:26t
“What-if scenarios,” in plant layout, 19:521
What-if analysis, 13:156–157
Wheat, 26:262–294
  as cereal grain, 26:276–284
  in breadmaking, 26:270
  milling of, 26:279–282
  production, trade, and uses of, 26:276–278
  quality type of, 26:277–278
  yield by country, 26:277t
Wheat flour
  air classification of, 26:282
  grades of, 26:281
  types of, 26:282–284
Wheat germ glycerides
  cosmetically useful lipid, 7:833t
Wheat gluten hydrolyzate, 10:298
Wheat grain
  starch in, 26:271–272
Wheat starch, 4:724t
Wheat starch, purification of, 10:290
Wheatstone bridge, 26:232
Wheel-and-axle host concept, 14:180
Wheeler-Lea Act, 18:684
Wheels, sulfur-impregnated, 23:593
Whelk-O-1 phase, 6:84
Whey, 14:419
“Whipple’s rules,” 20:138
Whisker reinforcement, 5:554, 555, 654
performance in ceramic–matrix
composites, 5:572–575
physical properties, 5:557t
synthesis, 5:642–643
and toughening, 5:622
Whiskers, silicon carbide, 22:533–534
White
and blackbody color, 7:327
CIE chromaticity diagram, 7:313, 315
“White-box” approach
in reliability modeling, 26:987, 988, 990
White alumina hydroxide, 2:429
properties of commercial, 2:429t
White asbestos
world production in 2000, 3:289t
White bearing alloys, 24:796
White biotechnology, 10:307–308
White chocolate, 6:351–352
White crappie
common and scientific names, 3:188t
White flies, 8:9
White goods
recycling of, 25:871
White lead
prohibited pigment in anticorrosive
coatings, 7:195t
White LED, 14:861–862
White light, from LEDs, 14:861–862
White masonry cements, 5:500t
White metal, 24:796
White mortars, 5:500t
Whitening agents, in paper manufacture,
18:114
White pan bread
yeasts in, 26:461–463
White Paper of the European Commission,
24:192–194
political objectives of, 24:194
White pepper, 23:162–163, 170
White phosphorus, 19:2, 3
analysis of, 19:12
manufacture of, 19:4–13
screening smoke, 5:829
White pigments(s), 19:381, 380, 385,
387–397, 25:22, 23
lead whites, 19:397
lithopone, 19:395–397
titanium dioxide, 19:387–393
zinc oxide, 19:393–394
zinc sulfide, 19:394–395
White pigments, for inks, 14:317
White Portland cements, 5:500t
White river crawfish
common and scientific names, 3:188t
White shrimp
common and scientific names, 3:188t
White wines
fermentation of, 26:313, 26:467
specific processes for, 26:310–311
Whiting, 15:29
Whiting, as filler, 11:311
Whole-cell biocatalysts, from fermentation,
11:4–5
Whole-cell biocatalysts, organic solvents
and, 16:412–413
Whole cells, 3:669–671
Whole-cell systems
ionic liquids in, 26:897
Whole cluster pressing
in white wine, 26:311
Whole-wheat flour, 26:279, 283
Whole yeast vaccines, 26:488
“Who needs it” concept, 24:190
Wicking limit, heat pipe, 13:230
Wicks
capillary capability of, 13:233
loop heat pipe, 13:237
Wick structure, heat pipe, 13:227, 232
Wide angle X-ray scattering (waxs), in
polymer blend structure
determination, 20:339
Wiedemann–Franz rule, 7:732–733
Wien’s displacement law, 19:131
Wiener processes, 26:1022
Wiesner reaction, 15:7
Wijs Reagent
acetic acid for, 1:131
Wildlife, pesticide hazards to, 18:549
Wilkinson’s catalyst, 7:593,
13:644, 645
Wilkinson hydrogenation, 5:210
Williams–Landel–Ferry (WLF) equation,
21:710
Williamson ether synthesis, 10:574
Williamson flow model, 21:705
Wilson’s disease, 7:710
Wilson model, for VLE, 8:745
Wilsonville Coal-Liquefaction facility,
6:766, 841–844
Winch dyeing, 9:208
Wind energy
in desalination processes, 26:93–94
Window insulation, noble gases in, 17:378
Window material, in ir cells, 14:228–229
Windows
PVC in, 25:684–685
Windows, with tunable optical properties, 23:25. See also Smart windows
WindStor system, 25:526
Wind-turbine–generator system
electricity produced by, 26:94
“Wine Aroma Wheel,” 26:325
Wine, 26:295–332, 3:561–562
analytical methods and quality control for, 26:324–326
benefits of, 26:327–328
“breathing” of, 26:319–320
chemical and physical analyses of, 26:324
chemical compounds found in, 3:582t
classification of, 26:300–302
composition of, 26:302–304
constituents of, 26:303
diversity and variation in, 26:295–296
during the Middle Ages, 26:298
economic aspects of, 26:320–323
estimated maximum oxygen tolerance, 3:381t
euphoric effect of, 26:297
fermentation of, 26:312–314
filtration of, 26:317
fining of, 26:317–318
health and safety factors related to, 26:326–328
history of, 26:296–300
international classifications for, 26:331t
labeling of, 26:329–330
price of, 26:323
processing of, 26:316–318
protection of regional names for, 26:330–331
records related to, 26:331
regional, 26:301–302
regulations related to, 26:328–331
sensory analysis of, 26:324–325
spoilage of, 26:326
stabilization of, 26:316–317
storage (maturation and aging) and blending of, 26:318–320
volatile compounds in, 26:303
writings related to, 26:298
yeasts in, 26:467–469
Wine appreciation/connoisseurship, 26:296, 324–325
Wine blends, 26:302
Wine bottles, recycling, 21:381
Wine clarification
smectites application, 6:697t, 699
Wine consumption
global annual, 26:322t
Wine exports
global, 26:322t
Wine grapes. See also Varietals
cultivation of, 26:297–298
Wine industry, 26:295
recombinant yeast in, 26:493
Winemaking, 26:305–316
variety selection, fruit production, and harvest in, 26:306–310
Wine producing countries, 26:321t
Wine production
spontaneous fermentations for, 26:468
Wineries
waste disposal from, 26:318
Wine studies, 26:298–300
Wine styles
processing flows for, 26:305–308
Wine yeasts, 26:468–469
choosing, 26:312–313
Winkinase
molecular formula and structure, 5:172t
Winkler gasifier, 6:730, 761, 796, 797, 830
Winkler titration, 26:40
Winnowing
chocolate liquor, 6:356
Winslow, Samuel, 22:798
Winterbon, Sigmund, and Sanders (WSS) theory,
14:433
Winter flounder
aquaculture, 3:189
Wintergreen, salicylic acid synthesis from, 22:7
Winterization
of corn oil, 26:289
Winter wheats, 26:276–277
Wiped-film evaporator
in hazardous waste management, 25:815
WIPO Copyright Treaty, 7:795
WIPO Performance and Phonograms Treaty, 7:795
Wire
LDPE, 20:234–236
polyimide coated, 20:282
PVC in, 25:685

Wire-bar (Mayer) chemical finishing, 17:513
Wire bonding, 9:694–695
Wire coating extrusion, 19:548–549
Wire, extrusion of, 19:790

Wire insulation
HDPE, 20:174–175
LLDPE, 20:208–209

Wire interconnect materials in electronic materials packaging, 17:830–833
properties of, 17:833t

Wire mills, 7:690

Wire plating, 9:768

Wire rod, 7:671
copper wrought alloys, 7:25
fabrication, 7:691–692

Wire sieves, 18:140
Wire, tantalum, 24:326–327

Wire-wound rod coating, 7:11

Wiring
superelastic and pseudoelastic, 22:351, 352
virtual two-way SMA devices in, 22:350

Wiring, ethylene–tetrafluoroethylene copolymers in, 18:327

Wiron S
composition of alloy for crowns and bridges, 8:311t

Wisconsin nitric acid process, 17:186, 292

Witch hazel distillate
skin conditioner/moisturizer, 7:843t

Witherite, 3:343, 351

Wittig olefination reactions, microwaves in, 16:564

Wittig reaction, 2:64–65, 19:65

Wobbe Number, 12:378–379

Wohl–Aue synthesis, 2:787

Wohlwill refining process, 22:647
Wolff–Chaihoff effect, 14:373
Wolff–Kichner reduction, 13:569–570, 16:565

Wolffram, 25:349. See also Tungsten entries
Wollastonite, 5:640
asbestos substitute, 3:314t
filler for powder coatings, 7:45
Wollastonite glass-ceramics, 12:634

Women’s colognes, 18:356
Women’s fragrances, 18:357

Wood(s), 7:273t, 26:332–370
activated carbon manufacture from, 4:746, 747
adsorption by, 26:335–340
bending of, 26:356
biodeterioration of, 26:352–354
cellulose source, 5:363, 367
charcoal production from, 26:360
chemical composition of, 26:336–337t
as chemical raw material, 26:356–358
composition of, 26:334–335
drying of, 26:341–342
economic aspects of, 26:361–364
effect of fire retardant chemicals on, 26:351
effect of liquid absorption on, 26:347–348
effect of temperature on, 26:344–347
extractives in, 21:15
fire performance of, 26:351
fire retardant treatment for, 26:348
fuel properties of, 26:359–360
hydrolysis of, 26:358–359
impregnation with MF resins, 15:791
information sources for, 15:766
mechanical properties of, 26:334, 344
modified, 26:354–356
moisture content of, 26:338–340
permeability of, 26:340–341
pressure treatment of, 26:353–354
pretreatments of, 21:20
pyrolyzed, 26:356–357
reaction to heat and fire, 26:348–351
resin-impregnated, 26:355–356
resistance to chemicals, 26:352
shrinking and swelling of, 26:340
as a source of ethanol, 26:351
specific gravity of, 26:338, 339t
strength properties of, 26:343–348
structure of, 21:1–4
structure of, 26:333–334
as structural material, 26:343–354
structural variations in, 26:334
surface burning characteristics of, 26:351
thermal analyses of, 26:349–351
transport in, 26:341
wood alcohol. See Methanol
wood ash, 26:359–360
Wood-based chemical industries, 26:357
Wood bonding, phenolic resins in, 18:790–791
Wood cell wall, 21:4
  cellulose in, 21:5–8
  chemical composition of, 21:5–16
  hemicelluloses in, 21:8–10
  lignin–carbohydrate linkages in, 21:14–15
  lignins in, 21:10–14
Wood chip bonding, phenolic resins in, 18:790
Wood coatings, exterior, 18:67–68
Woodell’s hardness scale, 1:3t
Wood fibers, 11:173, 21:1–4
Wood hemicelluloses, sugar moieties of, 21:9
Wood–liquid relationship, 26:335–342
Wood panel, hardening of melamine resins for, 15:780–781
Wood preservation
  zinc chloride in, 26:617
Wood preservatives, 3:270, 26:348
  arsenic demand pattern in U.S., 3:270t
  chemical composition of chromium based, 6:558
  chromium application, 6:523, 559–560
Wood primers, 18:67
Wood products, 26:333
Wood protection
  organic titanium compounds in, 25:132
Woodpulp, chemical analyses of 18:95
  future of, 11:281. See also
  Pulp entries
  in sodium sulfide production, 22:874
Wood pulping
  alkanolamines from olefin oxides and ammonia, 2:139
  magnesium sulfite in, 15:422
Wood species
  determination of, 26:334
Wood turpentine, 24:475
Woody odor, 3:230t
Woody perfumes, 18:358
Wool. See also Wool dyeing, 26:370–410
  acid hydrolysis of, 26:376
  bleaching, 4:72–73
  bleaching and fluorescent whitening of, 26:401–402
  chemical structure of, 26:376–379
contaminants in, 26:384
  covalent and non-covalent bonds in, 26:377, 378
  detergents systems used in scouring of raw, 8:413tv
  dyeing, 26:394–397
  dyeing mechanism for, 26:395–397
  early reactive dyes for, 9:468–469
  easy-care wovens, 26:393
  fiber damage in dyeing, 26:397
  fiber diameter range of, 26:370–371, 372
  fiber-reactive dyes for, 9:187–188
  fiber size and shape of, 26:379–380
  fine, 26:370–371, 372, 374
  flame-resist treatment of, 26:404
  heat of sorption of, 11:168t
  importance of, 26:370
  insect-resist treatment of, 26:402–404
  long-staple ring spinning of, 26:386
  new textile fiber from, 26:388–389
  physical properties of, 26:379–383
  pilling of, 11:211
  printing, 26:397–399
  production of, 11:173–174
  protein composition of, 26:376–379
  raw wool specification, 26:370–372
  regenerated cellulose fibers and, 11:250
  structure of proteins in, 26:378–379
  tensile properties of, 26:382–383
  thermal properties of, 26:381–382
  thermal yellowing of, 26:401
  treatment with a fluorescent whitening agent, 26:400
  water interactions with, 11:168
  water sorption of, 26:380–381
  world production of, 26:371t
  yellowing of, 26:399–401
Wool blends, dyeing, 9:202–203
Wool dyeing, 9:183–188
  permanent setting in, 9:493–494
Wool dyes, acid, 9:394
Woolen wool-processing system, 26:383, 385–386
Wool fabrics, chemical finishing of, 24:622–623
Wool fiber
  characteristics of, 26:372–376
  growth of, 26:373
  morphology of, 26:373–376
Wool fibers, reactive dye systems for, 9:491–492
Wool finishes, 26:404
Wool follicles
  cellular and molecular processes in, 26:375–376
Wool grease, 26:208–209
  alcohols from, 2:2
Wool keratin
  photo-degradation of, 26:400
Wool cards, 17:499
Wool lipids, 26:379
Woolmark Company, 26:404
  test methods of, 26:391
Wool processing, 26:383–389
  carbonizing in, 26:385
  scouring stage in, 26:384–385
  setting operations in, 26:386–388
  on the worsted and woolen systems, 26:385–386
Wool-producing countries, 26:371
Wool scouring wastes
  disposal or treatment of, 26:384–385
Wool textiles
  shrinkage of, 26:390–393
Wool yarn
  detersive systems for, 8:413t
Wootz, 23:248–249
Workability, of silver, 22:641
Worker fatalities, 21:826
Work force, training, 19:528
Work functions, silicon-based semiconductors and, 22:239–240
Work holding and supporting
  bismuth alloy applications, 4:14
Working capital, in fine chemical production, 11:428
Working capital estimates, 9:530–531
Working electrodes, 9:568–571, 585
Working fluids, heat pipe, 13:230–233
Working Party of Experts on the Official Control of Pesticides, 18:541
Working solution, 14:43, 44
  composition of, 14:46–47
  hydrogen peroxide recovery from, 14:50–51
  oxidation of, 14:49–50
  regeneration and purification of, 14:51
  treating with a dehydrogenation catalyst, 14:51
Working-solution components, recovery of, 14:51
Work of adhesion, 1:506–507, 21:602
World population, 24:162
World Summit on Sustainable Development, 24:163, 194
“Plan of Implementation” of, 24:185
World War I, fermentation research during and after, 11:8, 9
World War II
fermentation research during and after, 11:8–9
petroleum-based synthetic organics in, 24:259–260
World-Wide Fuel Charter (WWFC), 10:54, 12:388
Worm end products, 18:646
Worsted wool-processing system, 26:383–384, 385–386
Worsted yarn, 11:178
Wort, 3:563, 564, 574, 575, 583
separation, 3:578–579
Wound closure, suture size and, 24:205
Wound closure biomaterials, 24:205. See also Sutures
Wound dressings
cotton smart, 8:31
ethylene oxide polymers in, 10:687
hydrogels in, 13:751–752
Woven fabrics, 11:178
dyeing, 9:170–171
Woven flax fibers, 11:594
Woven plastic bags, 18:12
Wovens
easy-care, 26:393
WPI database, 18:223–225, 243, 246
WPI Markush database, 18:246. See also Markush entries
WPIM Markush database, 18:242
Wrapping papers, 18:129
Wrinkling
coating film defect, 7:123
Wrinkle recovery, in fiber finishing, 22:593–594
Wrinkle resistance, in fiber finishing, 22:593–594
Writing inks
eyear, 14:311
water-based, 14:328
Wrought
copper–beryllium alloys, 3:653t, 655t
iron, 14:491
lead–antimony, 14:771
lead–calcium–tin alloys, 14:775
lead–calcium–tin anodes, 14:776
lead–tellurium alloys, 14:778
nickel alloys, development of, 17:98
nickel–beryllium alloys, 3:657t, 658t
Wrought (I/M) processing techniques, 13:519, 520
Wrought alloys, 13:524
Wrought copper alloys, 7:720–764
alloy designations, 7:721t, 721–722
alloys for strengthening, 7:728–730
alloy specific properties, 7:749–762
applications, 7:762–764
economic aspects, 7:762
formability, 7:733–749
mechanical properties, 7:678t
product forms and processing, 7:723–728
properties, 7:730–733
Wrought products, titanium, 24:858–859
Wrought stainless steels, 13:510–511
Wrought tin, 24:792
Wrought tungsten, 25:360
WS-23 coolant, 24:524
WS-3 coolant, 24:524
“Within-the-batch” control, 20:704
W-type inks, 14:326
W-type polymers, 21:767
Wu and Hahamada, important experimental design text; coverage compared to other texts, 8:395t
Wurster coating, 11:542
Wurster units, 16:448–449
Wurtz-Fittig reaction, 22:767
Wurtzite, 4:472t
Wurtzite semiconductors, 22:141, 152
Wurtz reaction, in tetraorganotin preparation, 24:812
Wustite-iron reactions, 14:501–503
Wyodak (SB) coal
carbon structural distribution based on NMR, 6:715t
empirical composition, 6:730t
X14889 C polyether, 20:120
X-206 antibiotic, 20:131, 135, 137
Xanthomonas bacteria, 18:624
Xanthan, 13:70, 20:455, 575
properties of, 13:74t
function as ingredient in cosmetics, 7:829t
Xanthan gum, in polymer flooding, 18:622–624
Xanthans, 4:724t, 728–729
classification by structure, 4:723t
Xanthate, in sulfide flotation, 16:647
Xanthate process, energy use in, 11:279
Xanthates, 21:142
from carbon disulfide, 4:825, 837
Xanthate-terminated polymers, 19:852
Xanthation, of regenerated cellulose fibers, 11:253–254
Xanthene dyes, 9:503, 519
Xanthates
soluble dyes, 7:373t
typical soluble dye applications, 7:376t
Xanthogen disulfide modification, in
polychloroprene manufacture, 19:852
Xanthomonas campestris, 13:349, 351
Xanthophylls, 10:806
Xanthum gum fermentation
aeration biotechnology applications,
1:743
Xarator
molecular formula and structure,
5:138t
XCUBE CCD camera, 26:441
XD process, 16:173–175
XeCl laser, 14:692
Xenalon
molecular formula and structure, 5:154t
Xenates, 17:326
Xenical, 3:95
Xenon(VI) oxide fluorides, 17:329t
Xenon(Xe), 17:344
in the aerospace industry, 17:376
commercial, 17:368t
complex salts and molecular adducts of,
17:326–330
from nuclear power plants, 17:362
fluoro- and oxofluoro cations and anions
of, 17:327t
medical applications of, 17:377
physical properties of, 17:350
Xenon-135, in nuclear reactors, 17:565
Xenon bonding
to carbon, 17:331–332
to nitrogen, 17:330–331
to polyatomic groups, 17:330–333
Xenon compounds, 17:323–330
Xenon dichloride, 17:325
Xenon difluoride, 17:325, 328
preparing, 17:336
uses for, 17:336
Xenon-filled flash lamps, 17:372
Xenon fluorides, 17:323–325
binary, 17:335–336
Xenon–gold cations, 17:332
Xenon halides, 17:323–325
Xenon hexafluoride, 17:325, 329
uses for, 17:336
Xenon ion lasers, 14:685
Xenon isotopes, in fission reactors, 17:375
Xenon oxide difluoride, 17:326
Xenon oxide fluorides, 17:326
Xenon oxides, 17:325–326
Xenon oxide tetrafluoride, 17:326
Xenon testing, in plastics weathering,
19:584–585
Xenon tetafluoride, 17:328–329
Xenon tetroxide, 17:325–326
Xenon trioxide, 17:325
uses for, 17:337
Xenotime, 14:636
Xenotransplantation, 12:466
Xerogels, 23:56
structure of, 23:78
Xerogels, silica, 22:370, 394, 474
Xerography, 9:222
Xerography, selenium in, 22:91, 100–101
Xeroradiography, selenium in, 22:101
Xerox
advanced materials research, 1:696
nanocomposite development, 1:717
Ximelagatran, 4:100t, 102
Ximenic acid
physical properties, 5:32t
Ximenynic acid, 5:34t
Ximenynolic acid
physical properties, 5:35t
XLC cross-linking agent, 9:490–491
Xolair
cell culture technology product, 5:346t
XOR distance
diversity searches using, 6:16
similarity searches using, 6:8
XPS instrumentation, 24:100–107
XPS spectra, 24:85–86, 91. See also X-ray
photoelectron spectroscopy (XPS)
X-ray absorption fine structure (XAFS)
technique, 14:464–465
X-ray absorption near edge structure
(XANES), 24:72
X-ray absorption near-edge structure (XANES) spectroscopy, 25:418
X-ray absorption studies, of ionomers, 14:463–465
X-ray area detector, 26:421
X-ray contrast media, iodinated, 14:371
X-ray crystallography, computer graphics and, 16:733–734
X-ray crystallography in protein structure determination, 20:835
X-ray detector, 26:420
X-ray diffraction (XRD). See also X-ray single-crystal diffraction, 24:72
application in high throughput experimentation, 7:395, 420–421
Bragg’s law and, 26:418–419
from a crystal lattice, 26:416–418
in fine art examination/conservation, 11:406
for MOCVD, 22:155
patterns of, 26:415–416
principles of, 26:414–418
of silica, 22:380, 382
silica surface chemistry and, 22:373, 374
X-ray diffraction profile, 26:417
X-ray diffractometers commonly used, 26:422
X-ray effect, 20:661
X-ray electromagnetic spectrum, 26:411–412
X-ray films, sensitization of, 19:360–361
X-ray fluorescence (XRF), 24:95, 23:127, 26:413, 432–435. See also EDXRF instruments
application in high throughput experimentation, 7:395, 421
archaeological materials, 5:742
in fine art examination/conservation, 11:403–404
in ore sorting, 16:626
in polymer analysis, 11:196
silver analysis via, 22:651, 677
total reflection, 26:435–437
X-ray fluoroscopy, 26:440
X-ray holograms, silver and, 22:639, 657–658
X-ray images, 19:199–200
X-ray imaging, selenium in, 22:101. See also Extended X-ray absorption fine structure (EXAFS) analysis
X-ray imaging techniques, 16:504
X-ray imaging tests, 26:440
X-ray-induced X-ray emission, 24:109
X-ray instruments, 26:411
for special applications, 26:430–432
X-ray irradiation
silicone network preparation via, 22:567
of vitreous silica, 22:435–436
X-ray lithography, 15:159, 160
thin film applications, 1:725
X-ray lithography, in compound semiconductor processing, 22:193
X-ray methods, determining trace mercury using, 16:45
X-ray microscopy, 16:464, 504–505
X-ray monochromator, 26:419–420, 24:102
X-ray photoelectron spectrum, 24:85
X-ray photoelectron spectroscopy (XPS), 24:72, 84–87. See also XPS entries
angle-resolved, 24:90
effects of elastic scattering in, 24:88
quantitative, 24:92–94
X-ray photoelectron spectroscopy (XPS) archaeological materials, 5:744
X-ray photons, 26:413, 419
X-ray powder diffraction (XRD), 18:851
X-ray radiography, 26:440–441
X-ray reflectometer, 26:430
X rays, 21:284–286, 311
colorization of, 26:411–413
characterization and generation of, 26:411–413
X-rays. See Radiography
annihilation radiation and, 21:312–313
energies of, 21:311
hazards of, 21:285
X-ray scattering of PVC particles, 25:659, 660
X-ray scattering, wide-angle and small-angle, 19:567–568
X-ray sedimentation, 18:143
X-ray single-crystal diffraction instruments for, 26:419–422
X-ray source(s), 26:419
XPS, 24:101
X-ray spectrometers, 26:433
X rays, use of iodine in, 14:371
X-ray technology, 26:411–444
  macromolecule single-crystal structure
determination, 26:425–426
  properties of X rays, 26:413–414
  small-molecule single-crystal structure
determination, 26:423–425
X-ray testing, of plastics, 19:588
X-ray tubes, 26:412–413
X-section rayon, 11:262
XYDAR, 20:31, 38, 80, 82, 399
Xydar resins, 10:192
Xylanases, 10:297, 300, 305
  as bleaching agents, 4:64
Xylans, 21:28–29
  classification by structure,
  4:723t
Xylem, major cell types in, 21:2t
XYLEN 2,6-Xylenol. See 2,6-
  Dimethylphenol
3,5-Xylenol, 14:589
Xylene(s), 18:678
  biodegradation, 3:763t
  bioremediation of groundwater,
  3:766–768
  economic evaluation of, 24:274–277
  in gasoline, 3:597, 619
  mixed, 24:275, 276
  production by alkylation, 2:194–195
  recovery of, 18:565
  as a significant international commodity,
  24:277
  toluene disproportionation to,
  25:184–185
  from toluene hydrodealkylation to
  produce benzene, 3:607
Xylene capacity, U.S., 24:277t
Xylene isomerization, molecular sieves in,
  16:845
Xylene separation, molecular sieves in,
  16:841
Xylenes, sulfonation of, 23:524–525
Xylitol, 4:709; 12:41
XYLOA l-Xyloascorbic acid, 25:745. See
  also Ascorbic acid
Xylocard
  molecular formula and structure, 5:91t
Xyloglucans
  classification by structure, 4:723t
Xylo neural
  molecular formula and structure, 5:91t
l-Xylonitrile
  in ascorbic acid synthesis, 25:752
d-Xylose, 4:698
Xylose, 5:368
l-Xylose
  in ascorbic acid synthesis, 25:752
Xylotocan
  molecular formula and structure,
  5:91t
Xylolenes, 21:143
XY plot, 21:178
Y-12 calutron plant, 25:416
YAG lasers, 14:668, 688
  applications of, 14:698–699
  optics of, 14:698
Yamanashi MAGLEV Test Line, 23:865
Yankee dryer, 18:122, 129
Yard wastes
  as biomass, 3:684
Yarn(s), 24:619–620
  acrylic, 11:212
  antistatic, 19:761
  bulked-continuous-filament, 11:225
  continuous-filament, 19:749–758
  crystalline structure of, 11:237–238
  high density polyethylene, 11:225
  jets for, 11:256
  low orientation, partially oriented,
    highly oriented, and fully oriented,
    19:752–753
  regenerated cellulose, 11:250
  staple manufacturing of, 19:754
  synthetic fibers as, 11:247
  take-up of, 11:236–237
  tire, 11:259–260, 273
  washing and drying of, 11:257–259
Yarn dyeing, 9:206–207
  continuous, 9:211
Yarns, dry jet-wet spun, 13:375–376
Yarn spinning technologies, 11:163–164,
  165. See also Spinning; Spun yarn;
        Textile yarns
Yarrowia lipolytica
  genome of, 26:450t
YBa2Cu3O7 coil, 23:861
YBa2Cu3O7 compound, 23:868
YBD-grade fluorine cell anode,
  11:835
Yeast, 1:731. See also Yeasts
  Yeast activity
    effect of osmotic pressure on, 26:463
  Yeast alcohol dehydrogenase, 3:672
  Yeast allergies, 26:480

YEAST ALLERGIES 1029
Yeast artificial chromosomes (YACs), 26:483
Yeast artificial chromosome (YAC) cloning experiments, 12:507–508
Yeast biomass
  production of, 26:472
Yeast biotechnology, 26:492–494
Yeast cakes, 26:460
Yeast cells, 26:448–452
Yeast deletion mutants, 26:498
Yeast-derived
  GM-CSF, 26:485
Yeast extracts, 26:475–476
Yeast fermentations
  large-scale, 26:459
Yeast-fermented foods/beverages, 26:455–457
Yeast gene arrays, 26:490, 491
Yeast gene deletion libraries, 26:490–492
Yeast genome, 12:515, 26:446
  comparison of, 26:450t
Yeast leavening
  effectiveness of, 26:463
Yeast media, 26:480
Yeast mutants, 26:492
Yeast pathogens, 26:446
Yeast plasmids, 26:481–482
Yeast(s), 1:731, 26:445–478. See also Yeast antigen display on, 26:488
  advantages in recombinant DNA technology, 26:479
  in baked goods, 26:461
  in beer making, 3:580–581
  in brewing, 26:464–467
  in cheese manufacture, 26:492
  composition, nutrients, and growth rate of, 26:455, 456t
  degree of flocculence of, 26:466
  as dietary supplements, 26:472
  in distilled beverages, 26:469–471
  as enablers, 26:488–492
  in fermentation, 11:7, 8
  fermentative and respiratory metabolism in, 26:454–455
  in the food and beverage industry, 26:480
  as food, 26:471
  in the food industry, 26:459–464
  future possibilities for using, 26:497–498
  genetically modified, 26:478
  genetics and molecular biology of, 26:480–481
  growth rate in, 26:459
  high value protein products from, 26:484–486
  as host cells, 11:23, 24
  hybridization of incompatible strains of, 26:454
  isolating ascospores or vegetative cells of, 26:453
  in Japanese rice wine, 26:470
  large scale production of, 26:480
  in medical research, 26:494–497
  microbial biomass and single-cell protein, 26:471–474
  molecular and therapeutic applications for, 26:478–501
  morphology, reproduction, and life cycle of, 26:446–452
  mutation of, 26:454
  new biosynthetic pathways in, 26:493–494
  outlook for, 26:476
  oxygen demands, 1:730t
  pathogenic, 26:475–476
  protein secretion by, 26:483
  purified cultures of, 26:458, 468
  purified proteins available from, 26:485t
  raw materials for growth of, 26:458
  recovery of, 26:457
  role in food spoilage, 26:475
  safety concerns related to, 26:479–480
  selectable markers in, 26:482–483
  in soy sauce (shoyu), 26:470–471
  species of, 26:447t
  strain improvement and development of, 26:453–454
  transformation of, 26:481–483
  uses for, 26:445–446
  vaccine proteins produced in, 26:487t
  vaccines from, 26:486–488
  vegetative reproduction in, 26:452
  in wine, 26:312–313, 467–469
Yeast(s), as host systems for gene expression, 12:478–479
Yedlinite, 6:471t
Yellow
  and blackbody color, 7:327
  CIE chromaticity diagram, 7:313, 315
Yellow brass
  corrosion, 7:810
  in galvanic series, 7:805t
Yellow-cake, 25:404–405
Yellow couplers, in chromogenic chemistry, 19:253–254
Yellow index (YI), 10:176
Yellowing of wool, 26:399–401
Yellow perch common and scientific names, 3:188
Yellow pigments, 19:405–406, 7:351–352
for inks, 14:317
monoazo, 19:431
Yellow prussate of soda (YPS), 22:805
Yellow pyrazolone salt, 19:434
Yellows
- typical applications of inorganic in plastics, 7:372t
- typical applications of organic in plastics, 7:368t
- typical soluble dye applications, 7:376t
Yellowtail common and scientific names, 3:188
net-pen culture, 3:195
Yellow-tip index, 12:378
Yield diagrams, 14:86
Yield point, 19:743
Yield stresses, 21:703–704
Yitispiranes, 24:572
Ytterbium (Yb), 14:631t, 635t
electronic configuration, 1:474t
Yttria, 5:583, 14:630
Yttria-stabilized zirconia (YSZ), 26:637
Yttric rare earths (RE), 14:631
Yttrium(III) concentration formation constant of chelates, 5:717t
Yttrium(Y), 14:644, 645
Yttrium aluminosilicate (YAS) glass microspheres, 12:612
Yttrium aluminum garnet (YAG), 19:411
color, 7:331
Yttrium–aluminum–garnet (YAG), 14:658. See also Nd:YAG laser; YAG laser
Yttrium–barium–copper oxide, 3:343, 369
Yttrium–barium–copper–oxide ceramics superconductivity in, 5:603–605
Yttrium distribution, in mineral sources, 14:637t
Yttrium-doped zirconia, 5:571
strength, 5:617t
Yttrium–gallium compounds, 12:353–355
Yttrium oxide, 14:650
in SiC-ceramic fabrication, 22:535
Yttrium trifluoride, 8:340
Y-TZPb thermal shock resistance parameters, 5:633t
Yucca Mountain, 25:852, 857
y–x composite curve diagram, 20:740–741
Z-28 zeolite technology, 11:683
Zadipina molecular formula and structure, 5:129t
Zahir mechanism, 10:401
Zanidip molecular formula and structure, 5:127t
Zaroxolyn molecular formula and structure, 5:162t
Zavalin cell culture technology product, 5:346t
Z-blade mixer, in bar soap manufacture, 22:751
Z-configuration, 19:836, 837
ZDAC, 2:550t
ZDBC, 2:550t
Z-DNA, 17:608–609. See also Deoxyribonucleic acid (DNA)
Zeaxanthin, 17:656–658
synthesis of, 17:644
Zebeta molecular formula and structure, 5:156t
Zenapax cell culture technology product, 5:346t, 346t
ZENITE, 20:31, 82
Zeolite(s), 16:811, 812–814, 17:161. See also Molecular sieve entries; Synthetic zeolite entries, Mordenite
acidic, 16:825
adsorption analysis for, 16:836
adsorption equilibrium isotherm, 1:590
adsorption in, 16:821–823
adsorption kinetics in, 16:824
applications of, 14:99
as aluminum compounds, 2:345t, 359 bromine preloading, 1:590
catalytic reactions in, 16:824–825
clay conversion process for, 16:834
coke formation on, 5:269–270
colloidal, 7:273t
deactivation, 1:636
as desiccants, 1:589–590, 8:357, 370
in detergent formulations, 8:417
dispersed metals in, 16:826
for gas separation, 1:618t, 636
in hazardous waste management, 25:816–817
high throughput experimentation with, 7:403
heterogeneous catalysis, 5:237–245
hydrophilic adsorbent, 1:584–585
hydrothermal preparation of, 14:97–99
ion exchange in, 16:826–827
large pore silica, 16:817–818
low silica, 16:830
manufacture of, 16:829–835
as molecular sieves, 16:811, 812–814
narrow micropore distribution size,
1:586
nonregenerative processing, 1:649–650
nucleation and crystallization of, 14:99
poisons in representative reactions,
5:258t
pore dimensions, 5:239t
pressure swing adsorption (PSA),
1:642–647
properties and applications of selected,
1:589t
resistance to mass transfer of coked,
1:600–601
secondary structure unit in, 16:817
selecivity, 1:584
selectivity in, 16:827–828
selectivity in C8 aromatic systems, 1:675t
shape-selective catalysis, 5:242–244
siliceous, 16:818
simulated moving bed (SMB) liquid adsorption processes, 1:669, 671, 674, 686 stabilized, 16:825–826
supported acid catalysis by, 5:333–334
supported base catalysis by, 5:335–336
temperature swing adsorption (TSA),
1:636–642
in wastewater treatment, 25:912
widely used support materials, 5:324t
Zeolite A, 2:345t
in detergent formulations, 8:417
manufacture, 2:359
pore dimensions, 5:239t
structure, 1:675
Zeolite 3A
as desiccant, 1:589–590, 8:370
nonregenerative processing, 1:649
properties and applications, 1:589t
Zeolite 4A
adsorption isosteres for water vapor,
1:625
as desiccant, 1:589, 8:370
nonregenerative processing, 1:649
properties and applications, 1:589t
variation of activation energy with kinetic molecular diameter for diffusion, 1:600t
Zeolite 5A, 1:652
as desiccant, 8:370
n-heptane diffusivities in, 1:599
properties and applications, 1:589t
sorption of ethane–carbon dioxide mixtures, 1:603
variation of activation energy with kinetic molecular diameter for diffusion, 1:600t
Zeolite 10X, 1:652
properties and applications, 1:589t
Zeolite 13X
as desiccant, 8:370, 1:589
nonregenerative processing, 1:649
properties and applications, 1:589t
Zeolite adsorption selectivities, tailoring,
16:824
Zeolite AgX
properties and applications, 1:589t
Zeolite-based alkylation, in ethylbenzene synthesis, 23:331–333
Zeolite catalysts, 10:100, 16:362, 25:171
shape-selective, 25:170
Zeolite compositions, 16:813t
Zeolite crystallization, 16:830–831
Zeolite HZSM5
  properties and applications, 1:589t
Zeolite identification, 16:836
Zeolite KX
  adsorption chromatography application, 1:610
Zeolite KY
  properties and applications, 1:589t
Zeolite LTL
  pore dimensions, 5:239t
Zeolite minerals, 16:812–813
  organic substrate intercalation in, 13:548
  properties of, 16:815–817
Zeolite ore, 16:813–814
Zeolite powders, agglomeration of,
  16:834–835
Zeolite-promoted cracking catalysts, 16:842
Zeolites, β- and USY-, 24:477–478
Zeolite SrBaX
  properties and applications, 1:589t
Zeolites, silicate, 22:474–475
Zeolites, superacidic, 12:192
Zeolite structures, 16:814–817
tetrahedra in, 16:814
Zeolite ultrastabilization, 11:679–680
Zeolite X, 5:238–239, 2:345t
  for liquid separation adsorption, 1:674
  manufacture, 2:359
  structure, 1:675
Zeolite Y, 2:345t, 5:238–239, 11:678, 679
  coke formation on, 5:270
  for liquid separation adsorption, 1:674
  manufacture, 2:359
  structure, 1:675
Zeolite ZSM-5, 11:678
Zeolitic cracking catalysts, 16:835
Zeolitic deposits, 16:813
Zeonex, 10:180
Zeotypes
  target of crystal engineering, 8:86t
Zeranol, 13:3
Zero Defects (ZDs), 21:173
Zero differential overlap (ZDO) technique,
  16:737
Zero emission coal and carbon technology,
  13:845, 846
Zero-emission electric vehicle (ZEV),
  22:773, 778
Zero-equation models, 11:779
Zero gas, 13:464
Zeroing, 13:464–465
Zero-insertion-force (ZIF) connector, in
  virtual two-way SMA devices, 22:347
Zero-linked hemoglobin, 4:122
Zeroth-order chemical kinetics in packed catalytic tubular reactors,
  25:281–283
Zero-valent iron effluent treatment, 9:434
Zero-VOC technologies, 18:74
“Zero waste” concept, 25:863
Zero Waste Alliance (ZWA), 12:816
Zestoretic
  molecular formula and structure, 5:150t
Zestril
  molecular formula and structure, 5:150t
Zε-carotene, 13:294
Zeta phase soaps, 22:729
Zeta potential, 9:159, 740
colloids, 7:287, 290
floculation and, 22:55
measurements, 24:141
Zetia, 5:140t, 143–144
Zettatechnology, 17:44
Z-forming process, 25:171
Ziac
  molecular formula and structure, 5:156t
Ziegler-based catalysts, slurry process for,
  20:168
Ziegler catalysts, 17:701, 702, 703; 20:195
  in HDPE production, 20:15
  heterogeneous, 16:88 4
  heterogeneous multicenter, 20:196
  for LLDPE production, 20:190–191
  pseudohomogeneous, 20:197
Ziegler, Karl, 20:151
  17:704; 20:410, 26:502–554. See also
  Ziegler-Natta polymerization
  application of, 26:533–544
  evolution of, 26:503–506
  families of, 26:504–506
  future trends in, 26:544–546
  for high-density polyethylene,
    26:541–542
  for linear low density polyethylenes,
    26:542–543
  for multiphase copolymers, 26:537–540
  versus metallocene catalysts, 16:82–83
  in α-olefin polymerization, 20:424
  performance of, 26:545
for polyethylene products, 26:540–543
polymer particle growth over,
26:526–533
for polypropylene products, 26:534
positive attributes of, 26:545
for random propylene copolymers,
26:536–540
selecting, 26:543–544
Ziegler-Natta catalyst system, 26:503
iodine use in, 14:370
Ziegler-Natta-initiated polybutadiene rubbers, 23:400
Ziegler-Natta-initiated styrene polymerization, 23:388
Ziegler-Natta-polymerized polybutadiene, 23:393
carbometalation in, 25:108–109
mechanism of, 23:376–377
via silylation, 22:696–697
Ziegler-Natta polymerization, 26:510–533
electron donor action in, 26:518–521
hydrogen in, 26:525
kinetic profiles of, 26:523–524
kinetics of, 26:521–526
mechanism and stereochemistry of,
26:510–514
models of active centers in, 26:514–518
Ziegler-Natta stereospecific catalysts,
23:365
Ziegler-Natta technologies, 10:180
Ziegler polymerization, 10:708–709
Ziegler polymerization catalysts, 26:656
Ziegler process
described, 2:32–36
and hydrated aluminas, 2:431
major producers, 2:27t
for producing even-numbered higher alcohols, 2:1, 10
Ziegler reaction, 24:489–490
Ziegler resins, 20:161
Ziegler stoichiometric process
one-step, 17:715–718
two-step, 17:715
Ziegler transition metal catalyst system,
20:151–152
Zimbabwe, natural graphite in, 12:780
Zimbabwe, platinum-group metals in, 19:605, 613
Zimeldine, 4:359t
Zinc (Zn), 26:554–604. See also
Aluminum–magnesium–zinc phase diagram; Magnesium–zinc phase diagram, Lead–zinc ores; Zn entries,
Zn–Ag cartridges, Zn–Se system;
Zn-soap, agglomerate fed roasting of, 26:564–565
analytical methods for, 26:584–585
applications of, 26:555
barium alloys with, 3:344
biological leaching process for, 26:577
by-product metals of, 26:600
in cast dental gold alloys, 8:307t
catalyst poison, 5:257t
chemical properties of, 26:559–560
in coal, 6:718
in coatings, 24:794–795
in cotton fiber, 8:20t
dry fed roasting of, 26:563–564
economic aspects of, 26:578–583
effect on copper resistivity, 7:676t
electrolysis of, 26:571–573
electrothermic process for, 26:577
electrowinning of, 16:159–161
in ferrites, 11:60–62, 72, 73, 77, 78–81t
in galvanic series, 7:805
in coatings, 24:794–795
in galvanic series, 7:805
in cocoa and chocolate products, 6:371t
flash roasting, 26:562
fluidization roasting of, 26:562–563
galvanizing, 26:583–584
health and safety factors related to,
26:585–586
horizontal retort process for, 26:577
Imperial Smelting Furnace process for,
26:574–576
melting and casting, 26:573–574
mine production in the United States,
26:557t
multiple-hearth roasters for, 26:561–562
occurrence of, 26:555–557
oxidizing element reaction with,
26:560
physical properties of, 26:557–558
pickling, 16:223
processing of, 26:560–578
production growth compared to
aluminum and other metals, 2:301t
pure, 26:558, 559
purification of, 26:569–571
pyrometallurgical processes for,
26:574–577
pyrometallurgical recycling of,
21:395–396
recovery from leach residue,
26:567–568
recovery from recycled scrap, 26:556
reduction of, 26:565–578
roasting of, 26:560–565
role in nutrition, 26:616
rolled, 26:594–598
secondary production of, 26:580
secondary recovery of, 26:578
silicone chemistry and, 22:549
slurry-fed roasting of, 26:563
sodium alloy with, 22:780
solubility limits and electrical conductivity effects on copper, 7:750t
specifications and grades of, 26:583–584
standard electrode potential, 7:799t
supported catalyst, 5:329
U.S. production, consumption, and prices of, 26:579t
uses for, 26:586–600
vertical retort process for, 26:576–577
with gold in dental applications, 22:102
world mine production of, 26:556t, 581t
Zinc(II)
concentration formation constant of chelates, 5:717t
Zinc acetate
accelerator for dental cements, 8:285
Zinc acetate catalyst, 18:762
Zinc–air cells, 3:455–459, 512–515
characteristics, 3:446t
in development, 3:431t
Zinc alloys
analysis of, 26:585
high strength, 26:591–593
melting of, 26:589–590
superplasticity of, 26:597
Zinc alloys, pickling, 16:223
Zinc–aluminum alloys, 26:593
Zinc–aluminum eutectoid alloys, 26:597–598
Zinc antimonide, 3:44, 53–54
Zinc atomizing process, 26:598
Zinc baths, 9:828–829, 830t
Zincblende semiconductors, 22:141
band structure of, 22:142–144
transport properties of, 22:148, 149t
Zinc borates, 4:282–283
Zinc brass
nominal composition and UNS designation, 7:722t
Zinc bromide
manufacture, 4:324–325
physical properties of, 4:322t, 329–330
solubility in water, 4:322t
Zinc–bromine cells
in development, 3:431t
Zinc–bromine cells, 4:314
Zinc–cadmium alloys, 4:502
Zinc-calixarene complexes, 24:47
Zinc–carbon bonds, 26:605
Zinc catalyst, in fatty acid neutralization, 22:740, 741
Zinc chloride, 26:616–617
as cellulose solvent, 11:272
dessicant, 8:360
end use of chlorine, 6:135t
function as ingredient in cosmetics, 7:829t
U.S. production and importation of, 26:618t
Zinc chromate
air standards and classification, 6:549t
prohibited pigment in anticorrosive coatings, 7:195t
U.S. exports, 6:544t
U.S. imports for consumption, 6:545t
uses, 6:523
Zinc Chrome Cobalt Aluminate Blue pigment for plastics, 7:370t
Zinc chromite
molecular formula, properties, and uses, 6:563t
Zinc citrate
molecular formula, 6:638t
Zinc coatings, 26:586
Zinc–cobalt alloy plating, 9:831
Zinc compounds, 26:605–621
as algicides, 26:189
health and safety factors related to, 26:614
prices of, 26:606–609t
properties of, 26:605–609
uses of, 26:606–609t
water solubility of, 26:605
zinc chloride, 26:616–617
zinc oxide, 26:610–616
zinc sulfate, 26:617–619
Zinc concentrates, 26:599t
direct leaching of, 26:568–569
Zinc deficiency, 26:292
Zinc dialkyldiarlyl dithiophosphato (ZDDP), 15:214, 221
compounds, 15:222–223
Zinc dialkyldithiophosphate (ZDTP), 26:616
Zinc diborate dihydrate, 4:242t
Zinc die-casting alloys, 26:580–582, 587–591
compositions of, 26:588t
Zinc die castings, 26:582t, 591
Zinc disothiophosphate (ZDDP), 2:23
Zinc dithionite, 23:676–677
bleaching agent, 4:64
Zinc dust/powder, 26:573, 598–600
production of, 26:582–583
types of, 26:599
uses for, 26:599–600
Zinc electrodes, 3:408, 424
standard potential, 3:413t
Zinc electrolyte, 16:160
Zinc electrowinning, 9:639
effect of impurities in, 26:570t
Zinc ethylene-1,2-bisdithiocarbamate
biocide for antifouling coatings, 7:156
Zinc electrodes, 3:408, 424
standard potential, 3:413t
Zinc electrolyte, 16:160
Zinc electrowinning, 9:639
effect of impurities in, 26:570t
Zinc ethylene-1,2-bisdithiocarbamate
biocide for antifouling coatings, 7:156
Zinc exports
U.S., 26:579
Zincex process, 26:578
Zinc Ferrite Brown
pigment for plastics, 7:370t
Zinc ferrite brown spinel
formula and DCMA number, 7:348t
Zinc Ferrite Buff
pigment for plastics, 7:369t
Zinc fingers, 20:831–832
Zinc fluoroborate hexahydrate, 4:157t, 158, 159
Zinc formaldehyde sulfoxylates, 23:677
Zinc forming-die alloys, 26:594
Zinc foundry alloys, 26:591–594
Zinc hydrosulfitre (dithionite), 26:559
Zinc hydroxypropyridinemethione
biocide for antifouling coatings, 7:156
Zinc–iron alloy plating, 9:831
Zinc iron chromite brown spinel
formula and DCMA number, 7:348t
Zinc Iron Chromite Brown
pigment for plastics, 7:369t
Zincite
color and bad gap, 7:335t
Zinc leaching procedure, 26:566–567
Zinc–lead blast furnace, 16:147
Zinc–lead ores, smelting process for, 14:736–739. See also Lead–zinc ores
Zinc oxide–eugenol (ZOE) dental cements, 8:278, 284–286
classification and composition, 8:284t
Zinc oxide–eugenol impression pastes, 8:285–286
Zinc oxide–eugenol surgical pastes, 8:286
Zinc oxide treatments, 26:613–614
Zinc–oxygen cells, 3:512–515
Zinc perchlorate, 18:278
Zinc peroxide, 18:397
Zinc phenolsulfonate
antimicrobial used in cosmetics, 7:847
Zinc phosphate, 18:839–840
allowed pigment in anticorrosive coatings, 7:195t
coating, 18:829
Zinc phosphate dental cements, 8:278, 280–281
classification and composition, 8:279t
Zinc phosphates, environmental concerns related to, 16:224
Zinc phospating, 16:215–217
Zinc phosphosilicate
allowed pigment in anticorrosive coatings, 7:195t
Zinc plating, 9:765
Zinc polycarboxylate dental cements, 8:281–282
classification and composition, 8:279t
Zinc process
of tungsten recycling, 25:355–357
Zinc process, for sodium dithionite manufacture, 23:675
Zinc production
hazards of, 26:586
Zinc-production mines leading, 26:557
Zinc production processes
distribution of, 26:579t
Zinc pyrithione
antimicrobial used in cosmetics, 7:831t
function as ingredient in cosmetics, 7:829t
Zinc recycling, economic aspects of, 21:406
Zinc reduction, 16:146–147
standard electrode potential for, 16:159–160
Zinc refining, 16:149
Zinc retort, 21:395
Zinc-rich primers, 7:178–179, 184
Zinc ricinoleate
powder used in cosmetics, 7:841t
Zinc rolling slabs, 26:596
Zinc salt (1:2), hydrate, 4:242t
Zinc salts, 26:605
Zinc scrap, 21:395
Zinc selenide
piezochromic material, 6:607
Zinc sheet, 26:596–597
Zinc–silver oxide cells, 3:414, 451–454
characteristics, 3:446t
divalent, 3:454–455
Zinc-slab production in the United States, 26:580t
Zinc slush-casting alloy compositions, 26:594
Zinc smelters, 26:584
Zinc smelting, 26:554
electrothermic, 26:612
Zinc sodium chromate
molecular formula, properties, and uses, 6:562t
Zinc stearate 14:480
accelerator for dental cements, 8:285
performance criteria in cosmetic use, 7:860t
Zinc sulfate, 19:396, 26:617–619
U.S. production and importation of, 26:618t
Zinc sulfide, 19:394–395, 26:560–561, 26:555
color, 7:336
piezochromic material, 6:607
Zinc sulfonated ethylene–propylene–terpolymer (Zn–EPDM), 14:480. See also Zn sulfo–EPDM ionomers;
Zn–EPDM elastomeric ionomers
Zinc telluride
piezochromic material, 6:607
Zinc tetroxychromate, 6:557t, 558
Zinc triborate monohydrate, 4:242t
Zinc-undecylenate, in soap, 22:757
Zinc vapors, oxidation of, 19:394
Zinc white
color and bad gap, 7:335t
Zinc yellow, 6:556–558, 557t
U.S. imports for consumption, 6:545t
Zinc/zinc alloy plating, 9:827–832
Zineb, 7:591
biocide for antifouling coatings, 7:156, 161
Zinifex Ltd., 26:564
Zinin reduction, 2:490–491
Zircaloy tubes, 17:573
ansa-Zirconocene catalysts,
\[ C_2 \text{-symmetrical}, \] 16:114
ansa-Zirconocene complexes, 16:107
Zircon, 26:621–622
carbon monoxide compatibility with, 5:4t
cau{t}ic fusion of, 26:628
in clays, 6:685
chlorination of, 26:629
in coal, 6:718
colorants for ceramics, 7:348t
decomposition of, 26:627–630
fluorosilicate fusion of, 26:629
opacifier, 7:334
thermal dissociation of, 26:629–630
uses for, 26:637
Zirconate compounds, 26:637
uses for, 26:637–638
Zircon, decomposition of, 13:81–82
Zirconia, 19:410. See also Fused zirconia advanced ceramics, 1:704
catalytic aerogels, 1:763t, 19:410
in ceramic–matrix composites, 5:553t
composition of, 21:494t
energy gap at room temperature, 5:596t
liquid chromatography stationary phase, 4:623
MgO and CaO partially stabilized, 5:571
as refractory raw materials, 21:489, 519
sulfated, 5:331–333
supported catalysts, 5:336–337
transformation toughening, 5:621–622
Zirconia, as a medical-grade bioceramic, 14:103
Zirconia, calcium oxide stabilized, 5:622
strength, 5:617t
Zirconia ceramics
cerium application, 5:685
Zirconia furnaces, in fiber optic fabrication, 11:142
Zirconia grain-stabilized (ZGS) platinum, 19:602
Zirconia, magnesium oxide stabilized, 5:622
Zirconia, partially stabilized
elastic properties, 5:614t
hardness compared to metals, 5:627t
Zirconia–phosphate
catalytic aerogels, 1:763t
Zirconia refractory brick, physical properties of, 21:495t
Zirconia–silica
catalytic aerogels, 1:763t
Zirconia–sulfate
catalytic aerogels, 1:763t
Zirconia toughened alumina (ZTA), 5:571
Zirconia toughened mullite (ZTM), 5:571
Zirconia, with 18% \( \text{CeO}_2 \)
transference number of cations, anions, and electrons or holes, 5:586t
Zirconia, with 50% \( \text{CeO}_2 \)
transference number of cations, anions, and electrons or holes, 5:586t
Zirconia, with 7% \( \text{CaO} \)
transference number of cations, anions, and electrons or holes, 5:586t
Zirconium (Zr). See \( \text{PbZrO}_3–\text{PbTiO}_3 \)-based (PZT) materials, 13:78, 26:621–664
analytical methods for, 26:635–636
chemical properties of, 26:624–627
commercial grades of, 26:633
corrosion resistance of, 13:826, 26:626–627, 23:785
dispersoid former, 2:325, 327
economic aspects of, 26:632
electron-beam melting of, 26:632
grades and commercial designations of, 26:635t
health and safety factors related to, 26:636
impurities in, 26:636
in magnesium alloys, 15:365
occurrence and mining of, 13:80–81, 26:622–624
physical properties of, 26:624, 625–626t
processing of, 26:627–632
reduction of, 26:631–632
refining, 26:632
separation of, 26:630–631
sodium in manufacture of, 22:777
solubility limits and electrical conductivity effects on copper, 7:750t
specifications and standards for, 26:633–635
tin alloys with, 24:798
use with nitric acid, 17:187. See also Titanium–zirconium–molybdenum (TZM) alloy
U.S. statistics and specifications for,
26:634t
uses for, 26:637–639
world statistics for, 13:81t
Zirconium–allyl complexes, 26:656–657
Zirconium-bearing manganese silicon,
22:519
Zirconium carbide, 4:649t, 686
cemented carbides, 4:656
as industrial hard carbide, 4:674
physical properties of, 4:684t
preparation, 4:675, 676
stoichiometry, 4:651
Zirconium carbide nitride, 26:627
Zirconium carbinitrile
with coated carbide tools, 4:664
Zirconium chloride, 26:646
Zirconium compounds, 26:639–657
alkoxides, 26:650–651
alkyl and aryl complexes, 26:655
amides, imides, and alkamides,
26:651–652
borides, 26:641
carbide, 26:640
carbonates, 26:648–649
carboxyl complexes, 26:654–655
carboxylates, 26:651
chalcogenides, 26:641
dinitrogen complexes, 26:655
halides, 26:643–647
hydrides, 26:639–640, 653–654
hydroxides, 26:647
hydroxyl, 26:647
mixed-metal systems, 26:655–656
nitrates, 26:648
nitriles, 26:640
organometallic, 26:652–657
oxide chlorides, 26:647–648
oxides, 26:641–643
phosphates, 26:649–650
phosphides, 26:641
silicates, 26:643
sulfates, 26:649
Zirconium copper
effect of alloying on mechanical
properties, 7:677
Zirconium dichloride, 26:646
Zirconium dichlorobis(dimethylamide),
26:652
Zirconium hydride, 13:626–627
Zirconium hydroxy oxychloride,
26:648
Zirconium iron coral zircon
formula and DCMA number, 7:348t
Zirconium isotopes, 26:622t
Zirconium metal
uses for, 26:638
Zirconium mine production
world, 26:633t
Zirconium monochloride, 26:646, 647
Zirconium organometallic compounds
as catalysts, 26:656–657
Zirconium oxide
bomb reduction of, 26:632
opalifier, 7:334
uses for, 26:637
Zirconium oxychloride, 26:648
Zirconium phosphate
uses for, 26:638
Zirconium powder, 26:624, 636
Zirconium praseodymium yellow zircon
formula and DCMA number, 7:348t
Zirconium silicate
opalifier, 7:334
powder used in cosmetics, 7:841t
performance criteria in cosmetic use,
7:860t
Zirconium silicate crystals, 19:405
Zirconium–silicon alloy, 22:520–521
Zirconium tetraboride, 26:645
Zirconium tetrachloride, 26:629, 630–631,
644–645
two-stage sodium reduction of,
26:631–632
Zirconium tetrafluoride, 26:643
uses for, 26:638
Zirconium tetrahalides
physical properties of, 26:644t
Zirconium tetraiodide, 26:645
Zirconium tetraisopropoxide, 26:645
Zirconium trichloride, 26:645
Zirconium vanadium blue zircon
formula and DCMA number,
7:348t
Zirconium vanadium yellow baddeleyite
formula and DCMA number,
7:346t
Zirconocene catalysts, 16:79, 82
Zirconocene complexes, 16:89, 91
Zirconocene concentration, 16:94
Zirconocene–MAO catalysts, 16:93, 114
Zirconocenes, doubly bridged, 16:107
Zirconocene systems, 16:93
Zirconocenium–borate catalysts, 16:96
Zirconocenium cations, 16:95
Zircon pigments, 19:404–405
Zircon refractories, ASTM classifications and specifications for, 21:509–510
Zircon sands, 13:81
analysis of, 26:623t
Zirpro Process, 26:404
Ziziphin, 24:246
Zn-Ag cartridges
for swimming pool/spa water treatment, 26:196
Zn–EMAA ionomers, 14:464–465, 474, 482. See also EMAA ionomers
Zn–EPDM elastomeric ionomers, 14:482
ZnSe system, for laser diodes, 22:179
Zn-soap, in fatty acid neutralization, 22:740
Zn–SPS ionomer, 14:479
Zn sulfo–EPDM ionomers, 14:483
Zn-sulfonated polystyrene (ZnSPS) ionomer, 14:465
Zocor, 5:143
molecular formula and structure, 5:140t
Zonal centrifuge
operation, 5:530–532
Zonal elution, 6:404–405
Zone electrophoresis, 9:738, 742, 743–746
Zone refining
selenium purification via, 22:86
of silicon, 22:492–493
Zone settling, 22:54–55, 57, 58–59
in thickeners, 22:64
Zooplankton species
wax esters in, 26:204–205
Zorbex, 3:841
ZSM-11
pore dimensions, 5:239t
ZSM-5, 5:240–241
coke formation on, 5:270
phosphorus-stabilized, 11:695–697
pore dimensions, 5:239t
ZSM-5 additives, performance differences among, 11:695–697
ZSM-5 technologies, 11:694–695
ZSM-5 zeolite catalyst, 23:331
Zweifel alkene synthesis, 13:652
Zwietering constant values, 16:694t
Zwitterionic buffer systems, 14:26
Zwitterionic polymers, 20:481
Zwitterionic surfactants, 22:724; 24:133, 148, 154
as soap bar additives, 22:745
Zwitterions, 9:746–747; 10:411
Zymase, 10:251
Zyvox, 17:732