Subject Index

<table>
<thead>
<tr>
<th>a</th>
<th>abrasion drum 286</th>
</tr>
</thead>
<tbody>
<tr>
<td>abrasion transfer 42</td>
<td></td>
</tr>
<tr>
<td>accumulator</td>
<td>gas pressure 629</td>
</tr>
<tr>
<td></td>
<td>volume 629</td>
</tr>
<tr>
<td>acid gangue 356</td>
<td></td>
</tr>
<tr>
<td>additives 15</td>
<td></td>
</tr>
<tr>
<td>adhesion 13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>criteria 38</td>
</tr>
<tr>
<td></td>
<td>naturally existing 77</td>
</tr>
<tr>
<td>adhesion forces</td>
<td>calculating 17</td>
</tr>
<tr>
<td></td>
<td>modeling 17</td>
</tr>
<tr>
<td>adhesion tendency 39</td>
<td></td>
</tr>
<tr>
<td>adobe 316</td>
<td></td>
</tr>
<tr>
<td>adsorption layers 8, 605</td>
<td></td>
</tr>
<tr>
<td></td>
<td>immobile 605</td>
</tr>
<tr>
<td></td>
<td>natural phenomenon 605</td>
</tr>
<tr>
<td></td>
<td>strongly bonded 605</td>
</tr>
<tr>
<td>agglomerates 10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>abrasion resistance 75</td>
</tr>
<tr>
<td></td>
<td>breakdown 45</td>
</tr>
<tr>
<td></td>
<td>crust 71</td>
</tr>
<tr>
<td></td>
<td>determination of strength 18</td>
</tr>
<tr>
<td></td>
<td>estimation of the strength 17</td>
</tr>
<tr>
<td></td>
<td>failure mode 62</td>
</tr>
<tr>
<td></td>
<td>for disposal 534</td>
</tr>
<tr>
<td></td>
<td>from fine grained ores 359</td>
</tr>
<tr>
<td>granulation 70</td>
<td></td>
</tr>
<tr>
<td>green 39, 80, 271</td>
<td></td>
</tr>
<tr>
<td>growth 596</td>
<td></td>
</tr>
<tr>
<td>hard 636</td>
<td></td>
</tr>
<tr>
<td>high porosity 41</td>
<td></td>
</tr>
<tr>
<td>in pharmaceutical suspensions 27</td>
<td></td>
</tr>
<tr>
<td>instant 180, 217</td>
<td></td>
</tr>
<tr>
<td>mechanical destruction of 25</td>
<td></td>
</tr>
<tr>
<td>open porosity 348</td>
<td></td>
</tr>
<tr>
<td>oversized 45</td>
<td></td>
</tr>
<tr>
<td>plastic 20</td>
<td></td>
</tr>
<tr>
<td>porosity of 21</td>
<td></td>
</tr>
<tr>
<td>saturations 7</td>
<td></td>
</tr>
<tr>
<td>seed 271</td>
<td></td>
</tr>
<tr>
<td>solid bridging 636</td>
<td></td>
</tr>
<tr>
<td>spherical 145</td>
<td></td>
</tr>
<tr>
<td>spheroidal 461</td>
<td></td>
</tr>
<tr>
<td>strength 15</td>
<td></td>
</tr>
<tr>
<td>structure of 69</td>
<td></td>
</tr>
<tr>
<td>tensile strength 15</td>
<td></td>
</tr>
<tr>
<td>typical examples 7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>uniformly shaped 163</td>
</tr>
<tr>
<td></td>
<td>weaker parts 75</td>
</tr>
<tr>
<td></td>
<td>chlorate 465</td>
</tr>
<tr>
<td></td>
<td>components 7</td>
</tr>
<tr>
<td></td>
<td>destruction 41</td>
</tr>
<tr>
<td></td>
<td>fiber-based 474</td>
</tr>
<tr>
<td></td>
<td>growth 41, 490</td>
</tr>
<tr>
<td></td>
<td>pore volume 16</td>
</tr>
<tr>
<td></td>
<td>porosity 17</td>
</tr>
<tr>
<td></td>
<td>properties 45</td>
</tr>
<tr>
<td></td>
<td>random sections 7, 10</td>
</tr>
<tr>
<td></td>
<td>secondary 77</td>
</tr>
<tr>
<td></td>
<td>seed 41</td>
</tr>
<tr>
<td></td>
<td>size adjustment 580</td>
</tr>
<tr>
<td></td>
<td>strength 7</td>
</tr>
<tr>
<td></td>
<td>structure 9, 60</td>
</tr>
<tr>
<td></td>
<td>temperature 88</td>
</tr>
<tr>
<td>agglomerate strength</td>
<td>adhesive forces 17</td>
</tr>
<tr>
<td></td>
<td>compression test 19</td>
</tr>
<tr>
<td></td>
<td>determination 19</td>
</tr>
<tr>
<td></td>
<td>empirical 19</td>
</tr>
<tr>
<td></td>
<td>experimental results 19</td>
</tr>
<tr>
<td></td>
<td>in industry 19</td>
</tr>
<tr>
<td></td>
<td>maximum tensile strength 17</td>
</tr>
<tr>
<td></td>
<td>quality assurance 21</td>
</tr>
<tr>
<td></td>
<td>solid bridge 18</td>
</tr>
<tr>
<td></td>
<td>state 17</td>
</tr>
<tr>
<td></td>
<td>transitional 17</td>
</tr>
<tr>
<td>agglomerated feed</td>
<td>benefits of 350</td>
</tr>
<tr>
<td>agglomerated glass batch 373</td>
<td></td>
</tr>
<tr>
<td>agglomeration</td>
<td>acoustic 495</td>
</tr>
<tr>
<td></td>
<td>additives 303</td>
</tr>
<tr>
<td></td>
<td>ancient 5</td>
</tr>
<tr>
<td></td>
<td>avoid 33</td>
</tr>
<tr>
<td></td>
<td>beneficial uses 37</td>
</tr>
<tr>
<td></td>
<td>binderless 38</td>
</tr>
<tr>
<td></td>
<td>binding mechanisms 11, 642</td>
</tr>
<tr>
<td></td>
<td>building of nanostructures 643</td>
</tr>
<tr>
<td></td>
<td>by heat 53, 83, 244</td>
</tr>
<tr>
<td></td>
<td>crystal 161</td>
</tr>
<tr>
<td></td>
<td>dirty industries 559</td>
</tr>
<tr>
<td></td>
<td>discs 78</td>
</tr>
<tr>
<td></td>
<td>distinguishing characteristic 7</td>
</tr>
<tr>
<td></td>
<td>drums 78</td>
</tr>
<tr>
<td></td>
<td>dry 85, 493</td>
</tr>
<tr>
<td></td>
<td>endpoint 580</td>
</tr>
<tr>
<td></td>
<td>external forces 14</td>
</tr>
</tbody>
</table>
– re-melting 520
– recovery 521
– recycling 402
– scrap 520
aluminum industry 402
aluminum scrap
– punch-and-die process 521
– roller press compaction 521
ammoniator-granulator 277
ammonium nitrate 299
ammonium polyphosphate (APP) 277
amorphous food products 214
angle of nip 586
animal feed
– baling 264
– basic staples 258
– coating 266
– formulations 254
– highly densified compacts 264
– ingredients 254
– nanotechnologies 266
anticaking agents 34
applications
– metallurgical 505
– mineral 505
– for agrochemicals 266
– for animal feeds 247
– for building materials 303
– for ceramics 303
– for fertilizers 266
– for solid fuels 415
– in environmental control 485
– in the chemical industry 167
– in the food industry 207
– in the metallurgical industry 385
– in the mining industry 347
– energy related 505
approach to a new project
– of engineering 592
– of management 592
artificial aggregate 524
artificial sweeteners 169
– granulation 182
– pressure agglomeration 182
– small tablets 185
– tabletting 182
aspartame 169, 182
– agglomerated 170
– coated 202
– coating 170
– crystalline structure 202
– dry granulation 182
– encapsulated 202
– non-coated 170
aspect ratio
– needle-shaped material 608
aspiration system 134
atomic force microscope 18, 639
atomization 44
atomizers
– rotary 218
attachments
– modular 99
attraction forces
– short range 39
auto-oxidation behavior 84
automatic packaging 184

b
baby diapers 475
back-up manufacturing 565
backmixing 155
bag-set 31
bakeries 209
baking
– cookies and crackers 212
baling
– disadvantage 520
baling presses 264
ball mills 365
bailing 348
bailing cones 353
bailing disk 456
bailing drums 353
bailing pan 353
– pattern of charge motion 577
– performance 578
– segregation 577
– variables 576
batteries
– cathode 467
– dry, alkaline 464, 467
Bauxite 403
bed
– permeability 190
bentonite 304, 356
binder 7, 15, 618
– acceptable 511
– addition 601
– application of 602
– bitumen 500
– cement 500
– cold cure 446
– corn starch 417
– costs 418, 453
– disappear 356
– fibrous 512
– glass 502
- immiscible 42, 412
- inherent 601
- interactions 601
- liquid 80
- matrix 7, 500
- need for 602
- paper fluff 512
- permanent 504
- pitch 446
- produced chemically in-situ 205
- recirculated 42
- thermoplastic 429
- top-spray arrangement 105

binder addition
- automatic 602
- manual 602

binding liquid
- pre-dispersion 204

binding mechanisms 11
- enhancement 14
- models 16
- natural 15

BioBinder process 454
biocides 186
- granular 188
- oxidizers 186
- tablets 188

biomass 53, 421, 487
blast furnace 347, 386
- alternative 398
- burden structure 350
- increased capacity 348
- operation 350
- optimal burden 347
- outdated 398

Bleichsoda 171
blend
- stabilizing 91

blender
- all types 100
- combinations 102

bonds
- permanent 499
bouillon cubes 241
- contain organic fibers 241

bowl mixer/agglomerator 93
brake linings 463, 467, 473
brand maintenance 658
brand recognition 658

bread
- making of 4, 207

bricks 316
- high-quality 316
- mass production 316
- refractory bricks 316

bridging 31
briquettes
- chip-like 527
- continuous string 395
- cooling 395
- defects 395
- egg or pillow shaped 430
- for home heating 435
- Gröndal 375
- hard coal 435
- high density 380
- inert 452
- large 430
- maximum amount 515
- properties of 412
- separation 629
- single 395
- size 587
- smokeless 439
- union-type 424
- well-densified 379

briquetting
- anthracite 433
- cast iron chips 376
- cast-iron borings 402
- charcoal 444
- excessive wear 376
- glass batch 381
- hot 376, 379
- iron ore 347
- material with high elasticity 422
- of coal 398
- of fine coal 417
- of fine iron ores 374
- of iron-bearing fine residues 509
- of fine iron ores 374
- roller presses 376
- solid fuels 440

briquetting or compacting process 431
briquetting plants
- lignite 424
- brown smoke 492
- brownian motion 489
build-up 76, 271
- undesired 603

building blocks (bricks)
- artificial 303
building materials
- abrasive 309
- great variety 338
- pre-mix 309
- shaped 339
building products
- clay-based 317
bulk blending 270, 288
bulk characteristics 548
bulk volume 77
bulking agent 183

cage mills 72
caking 31, 270
– avoid 33
– during food processing 214
caking problems 36
capillary flow 80, 87
capillary pressure 7, 16
capping 122, 618, 622
capsule
– functionality 56
– material 56
carbon black 177, 634, 650
– oil-agglomerated 652
carboxymethylcellulose (CMC) 146
carrier materials 269
– easily degradable 294
cast-iron borings 402
catalyst 189
– bed 190
– carriers 190, 318
– chemically unchanged 189
– cylindrical pellets 190
– porous bodies 190
– strength 190
– surface area 189
– vanadium pentoxide 643
cathode mass
– pre-granulated 467
cement 303, 333
– fineness 333
cement manufacturing
– dry-process 337
– semi-dry process 337
– wet process 337
cement raw meal 372
– pre-agglomeration of 304
cementing materials 333
ceramic floor tiles 307
ceramic materials 303
ceramic parts
– industrial 318
– punch-and die presses 318
– sanitary, and household 318
ceramic pre-form 313
ceramic products
– intermediate 306
ceramics
– additives 343
– composites 346
– consolidation of powders 315
– forming 315
– high-performance 313, 346
– incorporation of 645
– post-treatment 333
– properties 339
cereal 207
cermets 481
cGMP (current good manufacturing practice) 118, 150
chaos theory 18
charcoal 415
– barbecuing 444
– industrial 444
charcoal briquettes
– binder pregelatinized 444
– consumer product 444
– in food preparation 444
charcoal briquetting 444
– mix formulation 445
chemical industry
– diverse applications 167
chemical oxygen generator 465
– for airline application 466
chemical products 169
chemical reactions
– exothermal 532
– exothermic 84, 389
chemical surface properties
– modifications 613
chemicals 167
– flakes 198
– molten 198
– water treatment 186
chlorates 464
chutes
– spiral 365
– transfer 365
CIP 88, 108, 123, 150, 182
classification 24
clay
– expanded 318
clay minerals 313
clean air legislation 428, 440
clean production 593
clean room 93
cleaning
– CIP 108
– external 96
– mechanical 76
– pharmaceutical applications 93
– requirements in the pharmaceutical indus-
– washing 76
– wet 150
– WIP 108
clinker 334
closed system 98
CMC
– directly compactable 147
co-generation 533
co-manufacturing 565
co-manufacturing facility 569
coal
– agglomerates 456
– applicable 447
– auto-ignition 452
– binderless briquetting 428
– binders 452
– briquettes 419
– brown 420
– coking 446
– density 428
– deposits 419
– disposal sites 418
– extrusion 454
– fine suspended coal 455
– fines 415
– for power plants 452
– hard 420
– in water 455
– logs 444, 454
– lower rank 456
– micro-agglomerates 456
– oxidized 456
– pelletizing 417
– quality 415
– recovery 456
– sludges 456
– sub-bituminous 452
– wetting 456
coal briquettes
– consumer products 432
– conventional 446
– domestic 432
– smokeless 446
coke
– binderless 419
– history 436
– larger 436
– new developments 439
– present status 439
– quality requirements 434
– with binders 419, 432
coal fines
– briquetting 430
– extrusion 454
– hard 430
– new products from 419
– unmarketable 419
collector medium
– particulate 493
collision probability 490
colloidal templating 645
compacted pieces
– inert 452
compaction
– continuous 406
– double sided 197
– low densification speed 624
– metal swarf 404
– non-continuous 404
– of very fine particles 624
– roller press 406
– unidirectional 319
– versatility 288
compaction curve 585
compaction cycle
<table>
<thead>
<tr>
<th>Subject Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>– control 624</td>
</tr>
<tr>
<td>– cycle time 622</td>
</tr>
<tr>
<td>– machine design 624</td>
</tr>
<tr>
<td>– short 622</td>
</tr>
<tr>
<td>compaction mechanism 47</td>
</tr>
<tr>
<td>compaction/granulation 242, 281</td>
</tr>
<tr>
<td>– advantages 290</td>
</tr>
<tr>
<td>– block diagram 81</td>
</tr>
<tr>
<td>– dry granulation 569</td>
</tr>
<tr>
<td>– for pharmaceutical applications 136</td>
</tr>
<tr>
<td>– for pigments 201</td>
</tr>
<tr>
<td>– improved 182</td>
</tr>
<tr>
<td>– prior to encapsulation 202</td>
</tr>
<tr>
<td>– prior to tabletting 185</td>
</tr>
<tr>
<td>– roller compactor 531</td>
</tr>
<tr>
<td>– salt by 380</td>
</tr>
<tr>
<td>compaction/granulation plants</td>
</tr>
<tr>
<td>– economic operation 288</td>
</tr>
<tr>
<td>compactor mill 377</td>
</tr>
<tr>
<td>compacts 71</td>
</tr>
<tr>
<td>– density differences 130</td>
</tr>
<tr>
<td>– dry ice 244</td>
</tr>
<tr>
<td>– spherical 413</td>
</tr>
<tr>
<td>complex rations 260</td>
</tr>
<tr>
<td>compliance fuel 440</td>
</tr>
<tr>
<td>– bulk commodity 452</td>
</tr>
<tr>
<td>– coal-based 452</td>
</tr>
<tr>
<td>– natural 452</td>
</tr>
<tr>
<td>composite materials 60</td>
</tr>
<tr>
<td>composites 488</td>
</tr>
<tr>
<td>compressed air 52</td>
</tr>
<tr>
<td>compressed air pockets 431</td>
</tr>
<tr>
<td>compressed gas</td>
</tr>
<tr>
<td>– expansion of 49</td>
</tr>
<tr>
<td>– pockets 617</td>
</tr>
<tr>
<td>compressed residual gas 48</td>
</tr>
<tr>
<td>compression stroke 422</td>
</tr>
<tr>
<td>concave menisci 16</td>
</tr>
<tr>
<td>concentrate 347</td>
</tr>
<tr>
<td>concern</td>
</tr>
<tr>
<td>– environmental 489</td>
</tr>
<tr>
<td>concrete</td>
</tr>
<tr>
<td>– history 333</td>
</tr>
<tr>
<td>– hydraulically setting 333</td>
</tr>
<tr>
<td>conditioner 255</td>
</tr>
<tr>
<td>conditioning</td>
</tr>
<tr>
<td>– steam 255</td>
</tr>
<tr>
<td>conditioning drum 286</td>
</tr>
<tr>
<td>confectionery products 236</td>
</tr>
<tr>
<td>conflict of interest 566</td>
</tr>
<tr>
<td>consultants 542</td>
</tr>
<tr>
<td>consumer appeal 86</td>
</tr>
<tr>
<td>consumer product 324</td>
</tr>
<tr>
<td>– pleasing appearance 446</td>
</tr>
<tr>
<td>contaminants 380</td>
</tr>
<tr>
<td>– from processing 489</td>
</tr>
<tr>
<td>contaminations 64</td>
</tr>
<tr>
<td>continuous operation</td>
</tr>
<tr>
<td>– simulating 549</td>
</tr>
<tr>
<td>contract manufacturing 89, 565</td>
</tr>
<tr>
<td>contract service 568</td>
</tr>
<tr>
<td>convenience foods 210</td>
</tr>
<tr>
<td>convenience of application 658</td>
</tr>
<tr>
<td>cooker 240</td>
</tr>
<tr>
<td>cooling</td>
</tr>
<tr>
<td>– efficient 384</td>
</tr>
<tr>
<td>coordination number 17</td>
</tr>
<tr>
<td>coordination point 9, 70, 597</td>
</tr>
<tr>
<td>– conditions at 611</td>
</tr>
<tr>
<td>– sites 11</td>
</tr>
<tr>
<td>core</td>
</tr>
<tr>
<td>– removal of 646</td>
</tr>
<tr>
<td>Corex 398</td>
</tr>
<tr>
<td>costs</td>
</tr>
<tr>
<td>– investment 41</td>
</tr>
<tr>
<td>– operating 41</td>
</tr>
<tr>
<td>couffinhal press 420, 429</td>
</tr>
<tr>
<td>creep 618</td>
</tr>
<tr>
<td>cross-contamination 92</td>
</tr>
<tr>
<td>crushing 61</td>
</tr>
<tr>
<td>– compacts 82</td>
</tr>
<tr>
<td>– industrial 62</td>
</tr>
<tr>
<td>– multi-stage 75</td>
</tr>
<tr>
<td>– particle size distributions 67</td>
</tr>
<tr>
<td>– rollers 67</td>
</tr>
<tr>
<td>– selective 64</td>
</tr>
<tr>
<td>crushing and layering 42</td>
</tr>
<tr>
<td>crushing behavior 550</td>
</tr>
<tr>
<td>crushing mechanisms</td>
</tr>
<tr>
<td>– compression 66</td>
</tr>
<tr>
<td>– impact 66</td>
</tr>
<tr>
<td>crust formation 88</td>
</tr>
<tr>
<td>crystallization 3</td>
</tr>
<tr>
<td>crystals</td>
</tr>
<tr>
<td>– agglomerated 165</td>
</tr>
<tr>
<td>– needle-like 182</td>
</tr>
<tr>
<td>cullet 373</td>
</tr>
<tr>
<td>curing 41, 500</td>
</tr>
<tr>
<td>– natural 80, 535</td>
</tr>
<tr>
<td>customer service 566</td>
</tr>
<tr>
<td>customer service department 566</td>
</tr>
<tr>
<td>cut size 82</td>
</tr>
<tr>
<td>– ideal 23</td>
</tr>
<tr>
<td>cutting ropes 235</td>
</tr>
<tr>
<td>cyclones 337, 489</td>
</tr>
<tr>
<td>– high-efficiency 492</td>
</tr>
</tbody>
</table>
drying
  – capillary flow 70
  – drying zone 70
  – externally 98
  – incrustation 87
  – microwave 96
  – partial 103
DSD, Duales System Deutschland 518
  – requirements 543
  – special design criteria 543
  – special design requirements 543
  – enrobers 203
  – enrobing of seeds 301
  – entrapped gas 121
  – explosive expansion 625
  – environment 446
  – protection of 446
  – environmental control 493
  – equipment 493
  – causing agitation 45
  – of the charge 603
  – operation 603
  – output 603
  – redundant 260
  – relative filling 603
  – size 601
  – type 601
  – upset 603
ESCS (expanded shale, clay, and slate) 310
  – evactherm 306
  – excipient 100, 126
  – elastic properties 146
  – expanded clay 310
  – expander 240
  – expander–extruder 262
  – expansion of compressed gas 622
  – experience 590
  – explosives 464
  – Exter Press 421
  – extrudates 318
  – interchangeble die plates 318
  – pressuer-cooker 240
  – screen 142
  – extrusion 71, 140, 618
  – aerated masses 235
  – axial 240
  – characteristics 583
  – continuous 443
  – extrusion channel 421
  – adjustable 423
  – briquettes in 423
  – gradual release 423

effluent stream analysis 594
  – Eirich planetary mixer 305
  – elastic deformation 52, 618
  – relaxation of 49
  – residual 420, 618
  – temporary 618
  – elastic recovery 422, 618
  – excessive 628
electric arc furnace (EAF) 387
  – electric power generation 383
  – electrical double layer 499
  – electification 499
  – focused ion beam 58
  – electrocoagulators 499
  – electron beam 58
  – charge pattern 640
  – drawing 640
  – electron microscopy 488
  – emulsifiers 249, 614
  – emulsion solvent diffusion (ESD) 161
encapsulation 56
  – en crustation 158
  – soluble polymer 159
  – special effects 159
energy
  – conversion 244
  – forms 62
  – input 62
  – recovery 533
engineered materials 61, 645
  – high quality 658
  – high value 658
  – special effects 658
engineering
  – fundamentals 543
  – requirements 543
  – special design criteria 543
  – enrobers 203
  – enrobing of seeds 301
  – entrapped gas 121
  – explosive expansion 625
  – environment 446
  – protection of 446
  – environmental control 493
  – equipment 493
  – causing agitation 45
  – of the charge 603
  – operation 603
  – output 603
  – redundant 260
  – relative filling 603
  – size 601
  – type 601
  – upset 603
ESCS (expanded shale, clay, and slate) 310
  – evactherm 306
  – excipient 100, 126
  – elastic properties 146
  – expanded clay 310
  – expander 240
  – expander–extruder 262
  – expansion of compressed gas 622
  – experience 590
  – explosives 464
  – Exter Press 421
  – extrudates 318
  – interchangeble die plates 318
  – pressuer-cooker 240
  – screen 142
  – extrusion 71, 140, 618
  – aerated masses 235
  – axial 240
  – characteristics 583
  – continuous 443
  – extrusion channel 421
  – adjustable 423
  – briquettes in 423
  – gradual release 423
fabrics
  – engineered 474
  – non-woven 459
falling curtain 299
farming
– cattle or 260
– fish and shrimp 260
FASTMET 526
feed
– compound 247
– concentrated 247
– water farms 263
– with high bulk density 625
feed characteristics 551
feed components
– preferred 260
feed composition
– controlling effect 606
feed for tableting machines
– granular material 135
feed material
– characteristics 546
– compactibility 547
feed mill 248
– conventional 262
– new systems 262
– pelleting 253
feed mix
– agglomeration 384
feed mixture
– plasticity 619
feed pellets 258
feed shoe 119
feedback 550
fertilization 267
fertilizer
– accretion process 270
– bulk blending 530
– bulk-blend grade 288
– complex 269
– granular 268
– granulation 267
– granulation plant 283
– mixed (NPK) granulated 268
– multi-component granules 270
– natural 486
– nitrogen 267
– potassium 267
– slow-release 297
– specially formulated 270
– wet granulation 273
fertilizer granulation
– drum 268
– granulating mixer 268
– NPK 281
– potash 281
– roller presses 268
fertilizer salts
– solubility of 276
fertilizer spikes 293
– special 293
fertilizer technology 266
FGD gypsum 507
FIBC (flexible intermediate bulk containers) 548
fiber 475
– accumulate 531
– artificial 474
– bonding processes 477
– binder 477
– entanglement 476
– influence of 531
– manufacturers of 568
– natural 474
– super absorbent 475
– wood 523
film coaters
– drum 150
– high-definition 150
film coating 149, 631
filter cakes 505
filtering
– deep bed 462
– high-efficiency 462
filters 489
filtration
– gas-phase 461
– gaseous contaminants 462
final binding mechanism 262
final part
– distorted 319
– structure of 469
fine feed materials
– reciprocating ram presses 625
– roller presses 625
fine grinding 27
fines 182, 597
– charcoal 444
– conversion 64
– formation of 68
– minimize the production of 64
– recycling 183
– undesirable 64
FINEX DR process
– fluidized bed 398
Finnet
– innovations 574
– scale-up considerations 574
firing of ceramics
– ideal kiln 343
fishery salt 380
Subject Index

flake breaker 139, 284
flame reactors 634
flat die pelleting
– waste materials 444
floating roller
– response 629
flocculation 496
– addition of salts 499
flocculation agents
– suspended 581
flocculation 471
flowability 471
flue gases
– desulfurization 506
fluid bed
– bottom-spray 155
– coater 154
– coating 155
– operated continuously 110
– rotating disc 154
– rounding effect 111
fluid drum granulator (FDG) 297
fluid flow
– gases 617
– liquids 617
fluid-bed granulation
– filters 107
– spray nozzles 107
fluid-bed granulator
– rotating plate 110
– vacuum 110
fluidization 88
fluidized bed
– drying 102
– granulated formulations 102
– processing chamber 105
– vacuum processing 110
fluidizing forces 471
flywheel 422
food 213
– additives 210
– amorphous 213
– bars 236
– convenience 236
– dietary ballast components 242
– engineered 210
– functional 210
– functional components 211
– glasses 211
– intermediate moisture 211
– manufactured 207
– organic fibers 242
– processing and preparation 236
– re-wet agglomeration 221
food agglomerate 211
food coulis
– briquetting of 246
food industry
– high-shear mixer 227
– pan agglomerators 227
food materials
– list of 227
food polymer science 211
food processing 209
food products
– coating of 246
– extrusion 229
– glass transitions 211
– glassy state 211
– instant 217
food system
– glass dynamics 211
forces
– binding 61
– centrifugal 471
– physical 7
– separating 61
– short-range 7
formed coke 446
– developments 446
– roller briquetting 447
foundry
– briquettes 402
fractal dimensions 17
fractals 612
fracture mechanics 62
freight pipelines 443
Froude number 576–577
fuel
– agglomerated spherical oxide 457
fumed silica 634
Fun foods 210
functional coatings 631
Functional food 210
functional molecules 614
furnace
– bell 343
– elevator 343
– manual pusher 343
– mesh-belt 344
– multiple hearth 526
– roller hearth 344
– rotary hearth 526
future solid-fuel related applications 440
Subject Index

I  164

granule

– agglomerated 77
– average density 92
– crumblers 258
– directly compressible 91
– fill for gelatin capsules 91
– formed naturally 270
– from press agglomeration 242
– improved structure 102
– instant 91
– irregular shape 82
– loosely assembled 101
– molecular adhesion 195
– properties of 412
– quality 82
– small 305

graphite

– synthetic 467

grate-kiln 336, 364

– calcination 377

gravity feed chute 448

green engineering 593

green part 313

– dimensions of 313
– firing of 313

green pellets

– resistant to thermal shock 358

grinding

– between two surfaces 29
– dry 27
– efficiency 27
– impact 29
– limit of 27
– wet 30

grinding aids 29

grinding chamber

– choking 63

grounding 27

growth agglomeration

– carbon black 651
– formation of nuclei 204
– kinetics 602
– mechanisms of 495
– one-pot 579
– transfer of experience 609

growth agglomeration process 596

growth phenomena 45

growth/tumble agglomeration

– stochastic effects 577

gypsum 507

hammer mills 72

– exit grate 63
Hazard and Operability study (HAZOP) 590
HAZOP
– deviation 591
– guide words 590
– investigate every item 591
– level of concern 591
– phrases 592
– questions 590
– reality check 592
– remedial actions 591
– sequence of events 591
health risks 92, 488
heap
– permeability 534
heap leaching 534
hearth layer 361
heat of evaporation 88
high-pressure agglomeration 51
– brittle breakage 621
– compressed air pockets 621
– degassing 622
– dispersibility 195
– expensive machinery 621
– low residual porosities 621
– plastic deformation 621
– pressure/densification plots 622
– spring-back 622
high-pressure roller mill 66
high-speed choppers 93
high-speed tabletting
– capping 121
hot briquetted iron (HBI) 392
hot briquetting 376, 446
– Minette ore 377
– no binders 376
hot compacted iron: HCI 398
hot compaction 483
hot gas 88
– downdraft 336
hot isostatic pressing (HIP) 324
– to remove defects 327
hump-back kiln 344
hybridization 56, 471, 650
hybridizer 650
hydration
– increase in volume 513
– natural 513
hydraulic accumulator 287
hydraulic pressurizing system
– accumulator(s) 626
– operational diagram 626
– roller press 626
hydrostatic pressing 325

i
ice briquettes 244
immiscible binder agglomeration 204
immiscible liquid agglomeration
– immiscible binder 413
impact mill 72
imperfections 61
incinerators
– stoker fired 528
incomprehensible
– terminology 5
individual particles
– organized structure 640
industrial applications
– development of 541
inert filler material 100
infant formula 214
innovative technologies 38
instant pharmaceutical specialties 102
instant products 159
instrumentation 583
integrated steel mills 386
interdisciplinary effort 659
interfacial polymerization 302
interlocking bonds 473
International Maritime Organization (IMO) 390
investment
– size of 574
iron 347
iron ore
– beneficiation 365
– pelletization 349
– pellets 348
iron ore pelletization plants
– complete 365
iron ore pelletizing
– green (moist) balls 355
iron ore pellets
– composition 350
– post-treatment 356
– self-fluxing 350
– uniformity 350
isostatic pressing 323, 584, 630
– ceramic parts 324
– for making porous products 327
– for tableware 327
– laboratory 547
– uniform consolidation 324
itabirites 349
Subject Index

J
jet mills 26
jigging 26
Justus von Liebig 266

k
kaolinite 305
kiln
– shut down or started-up 337
knife heads 78
knowledge
– empirical 589
– interdisciplinary 589

I
laboratory cleanliness 560
laboratory tests 545
lamination 618, 622
landfills
– rehabilitation 522
– managed 502
– special design considerations 522
– unprotected 499
lateral force microscope 18
laundry
– machine washing 171
– manual 171
laundry detergent 170, 193, 203
– higher bulk density 172
– high density 193
– shelf-life 198
– spheronizing 193
– solid compounds 195
– tablets 195, 203
laundry detergent powder
– spray drying 171
law suits
– after accidents 592
legislation
– anti-pollution 487
– disposal 84
licking stones 265
life-science applications 659
ligand stabilization 649
lightweight ceramic aggregate 310
lignin sulfonate 181
lignite 420
– harder 431
lignite briquette
– environmental concerns 428
lignosulfonate 443, 513
lime 411
– briquetted 411
– slaked 333
limestone 411
liquid
– distribution 601
– incompressible 617
liquid addition
– objectionable 127
liquid bridges 8
liquid removal
– method of 215
– reason for 216
liquid saturation 7–8
livestock farming 247
livestock feeds 247
logistics
– first in – first out 377
long sintering cycles 343
losses
– dusting 372
– oxidation 372
low and medium pressure agglomeration 50
low cost
– granulation 84
low-pressure agglomeration
– small extrudates 81
low-pressure agglomerators/extruders
– operating problems 619
– throughput 619
lubricant 15, 322, 622
luminescence
– electrically activated 645
magnesium oxide (MgO) 378
– briquetting 378
– calcination 378
– from seawater 379
– precipitated 379
– refractories 378
magnetite 359
maintenance 64
making of bread
– agglomeration 4
maltodextrin 169, 183
mandrel 467
manganese dioxide 464
manufacturing
– furnace black 651
– small scale 566
manufacturing facilities
– clean room 639
market
– success 89
market research 658
marketing 88
marumerizer 142
marzipan 236
master batch 201
– ingredients 201
material
– agglomerative behavior 545
– aging of 548
– amorphization 28
– caked 33
– circulating streams 42
– coating 54
– comparable 548
– engineering 505
– functionality 569
– granular 61
– hazardous 488
– hygroscopic 3
– manufacturing of 7
– nanophase 644
– nanostructured 642
– nanotechnological 643
– oversized 64
– organic 443
– properties 546
– sampling 548
– soluble 3
– surface properties 595
– temperature sensitive 87
– truly valuable 594
– with unique properties 7
maximum amount 516
maximum pressing force 49
Mazeline press 430
mechanical process engineering 3
mechanical process technology
– based on natural phenomena 541
– installations of 595
– plant design 595
– unit operations 207
mechanical processes
– designs 541
– misconceptions 541
mechanical vapor recompression 530
mechanism of densification 49
mechanofusion 56, 471, 650
medicines 4
– for oral application 85
MegaPerls 193
melt solidification 4
melts
– coating 55
merchant DR plants 387
merchant DRI 387
– inert 390
– inhibit reoxidation 390
– shipment of 389
metal oxides
– nanoarchitectured 643
metal powders 481
– shaping and densification of 481
– sintering 481
metallized fines and chips 395
metallurgical industry
– additives 409
metals 347
– extremely hard 645
– heavy 533
method(s) of size enlargement by agglomeration
– pre-selection of 545
micro-agglomeration 78
microcapsules
– long term release 302
microcracks 453
microencapsulation 56, 89, 297
– electrostatic 160
– functionalizing 159
– in agrochemistry 302
– packaging method 159
micronutrients 266, 270
microscopic surface structures 11
microspheres
– hollow 647
microwave drying 96
milk 215, 248
– evaporation of 215
– agglomerated 250
– coating 251
– dry powder 249
– large size 251
Milorganite 530
mineral coal 415
mineral ingredients
– densification 313
minerals 347
– mixed fertilizer
– segregation 292
mixer agglomeration 577
mixer/agglomerators
– low-shear 101
mixing 27
– dry 27
– electrical bipolar 638
– electrostatically assisted 470
Subject Index

- high-efficiency 356
- moist bulk solids 27
mixing tools 78
mixture
- segregation 60
- sludge and coal 454
- stabilization of 470
- stabilizing 91
modifications
- application-related 459
modular design 99
modularization 593
moisture 14
molasses 255, 443
molding compound 467
- formulation 468
- granules 468
- particle size distribution 468
- pre-agglomerated 469
molecular forces 634
molecules
- amphiphilic 614
- functional 614
multi-clones 492
municipal refuse
- organic 529
municipal sewage 454
municipal waste
- incinerator 522
- landfills 522
- pellets 522
municipal waste processing 518
mush test 380

n
nanoaggregates 648
nanocomposites 638, 644
nanoparticle
- agglomerated 635
- comminution 634
- controlled aggregation 638
- functional 643
- functionalized 648
- gas-phase synthesis 634
- incorporation of 645
- individual 638
- larger structures 645
- low bulk density 650
- modifications 638
- new products 642
- not visible 639
- ordered structures from 648
- precipitation 639
- processing 650
- preparations 649
- self-assembly 639
- small mass 638
- uncontrolled aggregation 638
- with special characteristics 643
nanoparticle ensembles 645
nanophase resistors 645
nanotube 643
nanowire 645
natural materials 4
natural resources
- conservation of 485
near-net-shape 313, 479
needle-shaped particles
- broken 609
- direct application 609
net-shape articles 322
neutral axis 322
neutral plane 71, 323
new plant
- engineering 573
Nitrophoska 267
no load
- gap 627
nodulizing 515
non-wovens
- agglomeration 475
- applications 474
- bonding 477
- end-use 474
- fibrous web 474
- finishing 477
- high quality materials 474
- manufacturing methods 475
- misconceptions 474
- origins of 474
- post-treatments 477
- products 474
- properties 475
- web forming 474
nonpareil nuclei 153
nozzle
- flat fan 222
- imperfect 151
- liquid spray 44
- spray 218
- steam 435
nucleation 42, 271
nuclei 40
nuisance dust 365
nutraceuticals 227
nutrient
– availability 266
– elements 266
– plant 267
nutritional needs
– animals 261

Ocean County Utility Authority (OCUA) 529
oil-agglomeration 455
old mine waste deposits
– secondary processing of 505
Omnitex 471
one-pot processing 549
one-pot-technologies 88
operating
– gap 627
operating parameters 550
operating pressure
– fluctuate 627
operation
– optimal conditions 384
operational hydraulic diagram
– machine performance 628
operator involvement
– minimal 602
opportunity fuels 440
optimization 578, 584, 602
– compromise 66
ordered mixture 470
ore fines 347
– sintering 347
ores 347
– concentration of 347
– low-grade 347
organic feeds
– conditioned 240
organic matter 420
out-sourcing 571
outlook 655
oxidizers 188
– shocking 188
– stability 188
oxone 188
oxygen
– variable production of 466
oxygen candles 465

P&ID (Process and Instrumentation Diagram) 591
packed bed reactor 190
pallet cars 361
pan agglomeration 461
pan agglomerator
– stepped 371
Papyrus Ebers 114
parameters
– evaluation of 544
part
– with variable cross sections 319
particle
– adhering 76
– affinity 26
– arrangements 642
– aerosol 493
– array of 58
– brittle 48, 617
– coating 56
– collisions 596
– colloidal 70
– collisions 489
– concentration 490
– core 56
– deposition of 640
– elastic 617
– electrostatically charged 470
– engineered 161
– flow patterns 155
– individual 459
– interaction 11
– malleable 48
– manipulation 640
– mass 598
– monodisperse 622
– motion 41
– nanoscale 460, 470
– narrowly sized 597
– natural adhesion 596
– original 60
– oversized 74
– physical characteristics 617
– plastic 617
– plastic deformation 617
– population balances 636
– pre-agglomerated 40, 271
– rearrangement 48
– real 599
– recirculating 40
– sampling 636
– segregation of 534
– shape 599, 602
– size 17, 41, 459
– size 14, 597, 618
– size distribution 597
– small 10
– spherical 145, 597
– stronger 74
– surface area 14, 598
– surface properties 595
– suspended 412
– ultrafine 76, 84, 489
– with high aspect ratios 609
particle engineering 471
particle formation
– growth mechanisms 636
particle size 600
– acceptance interval 606
– furnace black 651
– misrepresented 608
– needle-shaped material 608
– representative 606
– specifications 606
particle size analysis 26
particle size analyzers 608
particle size distribution
– bi- or multimodal 606
– infinite variability 606
– specification 606
particles in
– manipulation techniques 58
particulate bulk solids
– dry 8
– saturations 7
particulate solid
– collection 489
– directly compressible 123
– for tabletting 123
– hazardous 499
– particle size 14
– pre-granulated 123
particulate systems
– cake formation 36
parts
– complex 467
– net shape 467
peat 420
pellet
– coal-fiber 454
– free-flowing 373
– hardening processes 351
– higher quality 356
– liquid components 373
– layered 372
– magnetite 359
– multi-component 371
– quality 365
– reactive 373
– self-fluxing 367
pellet cooler 257
pellet fines 367
pellet mill 241, 296
– conditioner 255
– cylindrical die 254
– design 260
– extrusion 255
– flat die 254, 454, 527
– integral feeder/conditioners 254
pelleting 253, 443, 619
– advantages 191
– compressed gas pockets 620
– feed distribution 621
– flat die 146
– friction in the bores 620
– operating problems 620
– production capacity 621
pelleting of animal feed
– screw extruders 253
pelletizing facility
– pellet fines 367
percolation 534
perforated dies
– cleaning of 621
– low structural integrity 620
performance
– guaranteed 589
– undesirable 606
peridur 356
peripheral system components
– selection of 287
pet food
– developments 260
pharmaceutical
– pre-treated 126
pharmaceutical applications 85
– roller presses for 132
pharmaceutical compaction/granulation system
– single granulator 139
– two-stage milling 139
pharmaceutical industry 624
– needs 112
– profit margins 132
– roller compacting presses 132
– ultra-clean 150
– validation requirements 574
– value of the material 132
– wet agglomeration techniques 91
pharmaceutical specialties 149
phenomenon
Subject Index

natural 3
phosphate rock 377
pig iron 387
pigment 177, 199, 204, 303
– artificial inorganic 178
– artificial organic 178
– characteristic performance 180
– coloring of concrete 181
– dry processing 200
– granules 200
– high-performance 178
– ineffective distribution 200
– instant properties 199
– micro-agglomerated 180
– natural inorganic compounds 177
– particle size 204
– particulate colorants 177
– perception of color 177, 204
– synthesized 204
pigment black
– dry agglomeration 652
pill making 85
– binders 90
pills 4
– coating the 4
pilot plant 547, 588
– continuous processing 557
plant
– conventional 593
– designing 589
– general-purpose 593
– modular 593
– multi-product 593
– multi-purpose 593
– underperforming 563
plastic master batches 181
plasticity 15
plenum 102
polishing drum 195
pollutants
– particulate 488
pollution
– secondary 487, 499
pollution control 485
pollution prevention 593
polyimides 467
polymer
– affinity 498
– flocculation 496
– recycling of 537
– super absorbent 475
polymer recycling
– elements of 538
polymer science
– glass transitions 211
– glassy state 211
polymeric flocculants 496
polymers
– pore size
– distribution 20
poles 617
porosity 10, 61
– high 21
– temporary additives 21
portland cement 333
post-treatment 42, 79, 172, 458, 597, 619, 659
– agglomeration by heat 469
– application of heat 339
– atmosphere 630
– external suppliers 581
– problems 630
– puffing 241
– sintering 53
– thermal 473
potash
– granular 281
potassium chloride 267, 348
powder
– composition 533
– drink 217
– floating 216
– in a liquid 217
– milk 217
– pre-agglomerated 89
– reconstitution of 216
– toxic 413
powder metallurgical manufacturing 481
powder metallurgy 53
– advantages 479
– agglomeration tools 481
– hot and cold compaction 481
powder metallurgy (PM) 479
power plant
– coal-fired 506
pozzolana 333
PRB coal
– PRB coal 453
pre-agglomerated particles
– recirculation of 220
pre-agglomeration 85
– compaction/granulation 469
– objective of 469
pre-forms
– spark plug insulator 324
pre-granulated formulations 127
pre-granulation
– prior to tableting 93
preconditioning 79
prefers 636
predensification 379
preferential coalescence 42
press agglomeration
  – plastic deformation 473
presses
  – punch-and-die 53
  – roller 53
pressing channel
  – friction 421
pressure
  – no-load 627
  – operating 627
pressure accumulator
  – damaged 628
  – overload 628
  – response 628
  – size 628
pressure agglomeration 47
  – advantage of 464
  – batch or shift operation 51
  – campaign 51
  – defined volume 616
  – degree of densification 464
  – equipment 50
  – high-pressure 51
  – laboratory tests 546
  – level of force 47
  – low- and medium-pressure 50
  – mechanical parameters 50
  – methods 47
  – most widely used and versatile 657
  – selection of 48
  – throughput per unit 50
  – versatile processes 509
pressure agglomeration technologies 616
pressure assisted sintering (PAS) 303
pressure increase
  – rate of 424
prilling 268
primer 465
PRIMUS 527
process
  – aerosol 636
  – capacity 604
  – economics 74
  – fundamentals 543
  – inconsistencies 604
  – modifications 601
  – optimization 636
  – pre-selection 545
  – requirements 543
  – selection 543
pug mill 267
– blunger 267
pug sealer 317
punch
– slow movement 404
– stroke 404
punch-and-die presses
– coal briquettes 430
– cubers 241
– dwell time 625
– ejection 118
– feed for 74
– hydraulic cylinders 625
– in the food industry 241
– laboratory 585
– principle of 116
– rotary 118
– small hydraulic 408
– withdrawal 118
punch-and-die pressing
– small machines 547

q
quality assurance (QA) 612
quantum dot 643, 645

r
ram extruders 52
ram extrusion press 421
– briquetting cycle 421
– conversion of elastic into plastic deforma-
tion 625
– deaeration 625
– hydraulic drives 625
– new applications 440
– non-coal applications 443
– redesigned 440
random coalescence 42
range cubes 265
raw material conservation 593
raw materials
– secondary 488
re-agglomeration 470
re-work 619
reciprocating ram press 421
recirculating load 579
recirculation
– closed loop 74
– recirculation rate 579
recombination bonding 28
recoverable coal fines 418
recovery
– binder 110
recovery of dust
– coffee 242
recrystallization 70, 213
recuperation of sensible heat 361
recycle 549, 619
– surge hopper 276
– uncontrolled 602
recycled material
– quality standards 538
recycled plastics
– applications 539
– low-cost manufactured parts 539
recycling 488, 602
– agglomeration equipment 527
– aluminum 520
– facilities 519
– hot 383
– influence of 557
– legislation 538
– major 518
– plastics 537
– polymers 538
– waste gas 383
recycling fines
– influence of 557
reduction ratio
– importance of 66
reference plant 544, 549
regional material recycling 518
rejects 62
reoxidation
– exothermic 84
representative samples 587
residence time 579, 582
resistance to flow 617
resource conservation 505
RESS process 46
reverberatory furnaces 408, 521
ring roller press 431
risks
– technical and financial 575
roasted pyrite residues 371
roller briquetting presses 435
roller crushers 27
roller mill 67
– multiple-pass 72
– profiled roller surfaces 68
roller press 132, 244, 420
– briquetting 377, 430
– cantilevered 232
– circumferential speed 586
– compaction/granulation 377
– de-aeration 138
– densification ratio 625
– floating roller 626
– for pharmaceutical applications 138
– high-pressure 242, 585
– hinged frame 283
– hot briquetting 398
– hot densification of DRI 398
– laboratory evaluation 547
– large 448
– large hot 380
– low pressure 585
– new applications 444
– new solid fuel related applications 440
– nip 586
– operating parameters 286
– optimization 626
– performance 585
– phosphate rock 377
– pressurization system 626
– redesigned 440
– rotary bar 231
– screw feeder(s) 281
– specific force 586
– speed of compaction 626
– toothed 230
– troubleshooting 626
rotary screen 355, 604
rotary kiln 334
– agglomeration 334
– problems 365
– process 334
– wet process 334
rotary press
– multiple dies per station 186
rotary punch-and-die presses
– feeder 119
– pressing cycle 119
– punches 119
rotary tabletting machine
– adjustable cam drives 625
– capacities 121
– double sided 121
– multiple tooling 121
– overload protection 119
– single sided 121
rotary tabletting presses
– multi-station 125
rotating fluid bed processor 471
roughness peaks
– melting 15
rounded granule
– by coating 299
saccharin 169
safety factors 573
safety features 592
– excessive 592
– required 592
salt 380
salt (sodium chloride) 32, 242
– briquettes 380
– crystallized by-product 380
– pretzel 242
– rock 380
– water softeners 380
sample
– representative 547
sanitary applications 562
satellites 218
scale-up 89, 549, 573, 589, 601, 603
– art 581
– begins with testing 581
– dimensional analysis 575
– experience factors 579
– geometrically analogous 577
– low pressure agglomeration 581
– pellet mills 582
– problems 556
– punch-and-die 582
– rotary presses 583
– spheronizers 582
– tabletting 583
scaled-up
– common sense 581
– tumbling and growth procedures 581
scraping screen 384
scanning probe microscope 18, 639
scanning probe microscopes 639
Schugi 222, 251
science
– agglomeration 5
SCOPE 21 451
scrap 387, 505
– bales 520
– home 403
scrapers 355
– to limit build-up 273
screen
– spiral 414
screening 24
– of moist bulk materials 25
– wet 25
screw extrusion presses 443
scrubber
– deep bed 462
– wet 493
secondary fractures 63
secondary plastic raw materials 538
– extrusion techniques 539
Subject Index

– pellets 539
– punch-and-die pressing 539
secondary pollution 507
secondary raw material 502, 505, 534, 538
– metallic iron 524
secondary solid fuel
– pelleting 533
seeds
– coating 301
segregation 463, 470, 534
– avoiding 127
– by size 354
– during agglomeration 276
self-assembly 645
self-ignition 84
semi-autogenous mills 365
semi-cooking 447
separation 23
– after drying 603
– curve 23
– cut size 23
– degree of 23
– influence of agglomeration 23
– property 24
– quality 23
– sharpness 23
service provider 516
services
– to all parties 566
settling behavior 381
shaft furnaces 358
– hardening of iron ore pellets 359
shaft kilns 334
shape
– macroscopic outline 610
– microscopic surface roughness 610
shape characterization 600
shape formers 235
shaping pressure
– dependence on 616
– influence of 616
sheet thickness 587
shelter 4
sifting 24
silica fume 303, 309
silo
– mass flow 31
similarity 575
– considerations 576
– geometrical 575
– material 575
– partial 575
– process-related 575
simulation
– effects of recycling 557
– entire production line 587
single particle
– characteristics 633
– homogeneity 633
single-pot processing 93
sink/float processes 365
sinter
– two-stage cooling 384
sinter breaker 361
sintering 53, 84, 333, 381, 414
– batch 381
– continuous 381
– controlling the combustion 630
– downdraft 382
– environmental concerns 630
– final strength 355
– for recirculation 385
– gas cleaning 630
– heat recovery 630
– high porosity 53
– in solid state 53
– ore fines 381
– pan 381
– shrinkage 7, 53
– solid fuels 381
– sophisticated control features 384
sintering furnaces
– batch 343
– continuous 344
sintering plant 383
size enlargement
– cost 499
– in the animal feed industry 248
– safe handling, storage, and disposal 499
size enlargement by agglomeration
– advantages 59
– beneficial 59
– current importance 657
– for general applications 77
– future 657
– general application 61
– new fields of application 655
– reason for 60
size-reduction processes
– optimal 64
slitting slabs 235
sludge
– drying 530
– management 530
– processing 529
slugging 129
slugging presses
– disadvantages 132
slurry 8
small particles
– adhesion of 23
soap 171
sodium chloride 348
sodium cyanide 201
– briquetting 202
soil conditioner 530
sol-gel process 414, 457
solid dosage forms 85
– in the pharmaceutical industry 89
solid fuel 415
– coal 415
– complementary 533
– fines 415
– fluff 528
– secondary 523, 526, 533
– for smelting 415
solid materials
– characterization of 488
solid waste 486
– minimization 485
– particulate 486
– pre-sorted 519
– steel industry 515
solid waste management 505
solids
– adhesion between 634
– amorphization 634
– characteristic of 606
– electrically charged 498
– failure mode 62
– interactions 601
– nanoscaled 635
solution
– of a “clean” problem 559
solvent recovery 110
sonic energy 493
sorting 24
sparger tubes 277
special applications
– other agglomeration technologies 469
special design criteria 6
specialized vendors 550
specific force 385
specific pressing 287
spheres
– hollow 647
spherical agglomeration 412
spherical crystallization 161
spherical dosage forms 140
spherical particles 412
– melt droplets 412
– powder 412
spheronization 140
spheronizer
– batch 582
– continuous (cascade) operation 582
– flow diagram 141
– friction plate 144
– modular components 145
– special features 145
sponge iron 388
spouted bed 155
spray dryer
– fluidized 102
– in the ceramic industry 307
– multi-nozzle 218
spray drying 79, 216
– different powder qualities 172
– forced agglomeration 218
– limitations of 172
spray drying and agglomeration
– food industry 226
spray nozzles 80
– manifold 354
spray systems
– coaters 156
spray towers 171
stabilization
– particulate solid wastes 499
standard shapes 599
starch
– binder pregelatinized 444
– gelatinization 255, 261
starch modification 263
starved feed 406
starved feeding 284
steam
– condensation of 277, 435
steam granulation 276
steel manufacturing
– regional 387
stochastic movement 601
stock piles
– slope of 533
stockpile agglomeration 500
storage
– intermediate 613
storage bin
– ventilated 510
strength
– bursting 56
stress raisers 62
structure
– brick 4
– ideal solid 61
– improved 15

Subject Index
sugar
– sprinkling 242
SUMICOAL 448
superphosphate 270
support laboratories 551
surface
– alterations 472
– chemical modifications 613
– hydrophobic 614
– mechanical modification 471
– modifications 601
– oxidation 613
– properties 601, 613
– roughness 600, 611
– smooth 600
– technical 76
– texture 76
– topography 611
– wetting 601
surface configuration
– microscopic 611
surface equivalent diameter 41, 597
– limit 602
surface tension 17
surface topography
– variations 600
surfactant 458, 614
– soap 171
– synthetic 171
surging 276, 355, 602
swarf 403
system
– commercialization 89
– duplication 574
– future purpose 590
– modification 563
– optimization 563
– variations 590

tablet
– functionalized 149
– number of 118
– off-specification 126
– pressed directly from powder blends 126
– quality 126
– rejected 130
– shape of 121
– two-layer 196
– variations in quality 132
tabletting
– early history 115
– research 547
tabletting die press
– invention 116
tabletting lines
– automated 126
– modular concept 126
tabletting machines 129
tabletting press 85
taconite 347
– concentrates 349
tailings 347, 486
tamper 409
technical problems
– analysis of 392
– industrial solutions 392
technologies
– particle-modification 61
technology of bread making 207
temperature
– monitoring 390
– rise 532
– self-ignition 390
test conditions 547, 587
test facilities 545, 588
– general purpose 553
– peripheral equipment 549
– requirements 545
test set-up
– equipment 551
– growth agglomeration in a pan 553
testing 89
– a balling drum 555
– aged materials 613
– clean 553
– clean environment 557
– dust free atmosphere 559
– easy cleaning 559
– facilities 549
– in a non-sanitary environment 559
– of fluidized bed 555
– of similar materials 545
– original bulk properties 548
– roller presses 555
tests
– evaluations 563
– many different locations 573
– peripheral equipment 588
– results 563, 573
– various equipment 573
thermal shock 359
thickener/clarifier 496
through-the-wall designs 88
through-the-wall installation 98
tolling 565
tolling companies
– development of a large project 573
– secondary raw materials 573
  toner particles
– microencapsulation of 206
  tooling
– dry-bag 325
– special 468
– wear 322
– wet-bag 325
  tools
– relative motions 323
  tower process 171
  toxic drugs 127
  tramp material 524
  transmission electron microscope (TEM) 492
transport
– hot 398
  traveling grate 336, 359
– changing ore compositions 362
– circular 364
– heating 362
– modifications 361
– straight 364
– traveling grate 382
– windboxes 362
trimming shear 406
troubleshooting 604
– fluid bed spray granulators 614
– tumble/growth agglomeration 614
  tube mills 27
tumble/growth agglomeration
– basic mechanism 39
– binding mechanisms 41
– drawbacks of 41
– in the chemical industry 169
– mining industry 349
– non-ferrous minerals 370
– of fine coal 417
– optimization 602
– scale-up factors 575
– selection 46
– similarity approach 575
– small scale equipment 546
– UFP 461
tumble/growth processes
– block diagram 79
– granulation 79
  tumble/growth technologies 596
tunnel kilns 344
turnings and borings 403
turret 119, 583

u
ultrafiltration 461
ultrafine particles (UFP) 460
undesirable 64
– parameters 606
  unwanted agglomeration
– agglomeration 30
– air classification 25
– avoid 35
– comminution 27
– during screening 25
– mixing 27
– particle size analysis 26
– pneumatic conveyors 30
– sorting 26
– storage 31, 34
– transportation 30
urea 267
US Bureau of Mines 349
used beverage cans (UBC) 403, 520
user-friendliness 658

v
vacuum technology 307
validation 89, 593
validation process 574
vertical pug mill 434
– mixing elements 435
veterinary medicine 248
void volume
– filled with a liquid 7

w
Waelz kiln 515
warehousing 570
wash cycle 196
waste
– bulky 527
– cellulosic 526
– historical review 502
– industrial 502
– plastic man-made 537
– segregation 522
– terminal 500
waste energy 533
waste minimization 593
waste paper 512
waste processing facilities 573
water-treatment
– municipal 496
  wet granulation 127
  wet granulation systems
– recirculating load 277
wet-bag process 325
wetting 44, 601
– chemical additives 456
– modifications 613
WIP (washing-in-place) 88, 93, 108, 123
wood chips
– artificial secondary 527
wood products
– engineered 526
worker protection 88

workplace contamination 134
Wyoming Powder River Basin (PRB) 452

y
yield 602

z
zeolites 171