## Index

### a
- Abbe criterion 288
- absorption edge 214
- absorption spectra 184, 199, 221
- absorption spectrum 189
- acceleration voltage 289
- additive technology 3
- adiabatic 137
- adiabatic enclosure 138
- adsorbate 280
- agglomeration 39, 55, 111
- alphanes 85
- angular detector 300
- anisotropic structure 37
- antiferromagnetic 148
- antiferromagnetism 161
- antiparallel ordering 148
- Ashby–Verall “grain-switching” mechanism 262
- atomic resolution 288, 298, 300

### b
- ballistic conduction 232
- ballistic conductivity 230, 233
- ballistic electric conductivity 240
- bandgap 185, 190
- BET method 281
- bifunctional particle 9, 201
- binderless fiber 275
- biotechnology 169
- bistability 139
- bleached 224
- bleached state 221
- Bloch wall 149, 150
- blocking temperature 152, 168
- blueshift 183, 186, 189–191, 194
- Bohr radius 187
- bone 266
- boron nitride 90, 239
- bottom-up 2
- bremsstrahlung 293
- “brick and mortar” structure 267
- broadband emitter 213
- Brown’s superparamagnetism 114, 116, 153, 167
- Burgers vector 259, 260

### c
- carbon nanotubes 89, 95, 103, 104, 106, 274
- ceramic-coated ceramic nanoparticle 73
- characteristic X-ray 293
- characterization 279
- charge-carrier injection 216
- charged particle 46
- chemical vapor synthesis 50
- chemisorption 280
- chirality 95, 235
- chirality vector 94
- chromatic aberration 288
- closed path 241
- cluster 39
- coagulation 36, 39, 55
- coagulation process 35
- coated nanoparticle 13
- coated particles 72
- Coble mechanism 261
- coercivity 150, 152
- collision parameter 42, 43, 45
- collision probability 42
- colloid chemistry 4, 13
- colloid stabilization 13
- colloid stabilizer (surfactant) 111
- colored state 222, 224
- composite 103
- composite particle 9
- concave surface 34
- condensation 32, 39
conductivity quantum 231
constant of magnetic anisotropy $K_1$ 155
contact angle 5
convex surface 31, 34
core-shell type 9
corona discharge 71
correlation volume 174, 177
crossing temperature 123, 136
crystalline quasimelt 134, 135
crystallographic lattice 83
crystallographic structure 282
curie temperature 149, 158
curvature 30, 31, 34
dangling bond 85
dark-field imaging 291
dark-field microscopy 291
de Broglie 289
decoration 9
defoliated layer 270, 271
defoliation 97, 102
deformation mechanism 253
deformation mode 259
delaminated 270
delocalized 90
diamagnetic behavior 147
diamagnetism 147
diffraction contrast 297
diffraction line 283, 286
diffraction pattern 282
diffraction technique 282
diffusion barrier 12
diffusion controlled 221
diffusion scaling law 17
diffusive conductance 229, 230
dimer 193
dimer spectrum 192
dislocation process 257, 263
dislocation 257, 259
disordered state 170
distribution function 40
doping 185
dynamic viscosity 113, 115
easy direction 155
EDX 302
EELS spectrum 295, 296, 297, 301, 302
elastic deformation 250
elastic electron scattering 297
elastically scattered electron 292
electric conductance 232, 244
electric conductivity 90, 229, 231
electrical charging 45
electrical conductivity 236, 246
electrochromic cell 223–225
electrochromic effect 222
electrochromic material 219, 220, 222
electrodeless designs 63
electrodeless RF system 66
electroluminescence 215, 217
electroluminescence spectra 219
electromigration 35
electron density distribution 187
electron diffraction 283
electron energy loss spectrometry 295, 297
electron microscopy 287
electron monochromator 290
electron optical system 290
electron-hole combination 187
electron-hole recombination 216
electrostatic stabilization 111, 112
emission spectrum 189, 194, 195, 213
emission wavelength 217
energy bands 185, 186
energy gap 189, 190
energy level 165, 185
energy of anisotropy 155, 156
energy of formation 28
energy of magnetic anisotropy 157
energy product 150
energy transfer 56, 57
energy-dispersive systems 295
engineering stress–strain diagram 250
ensemble 137
enthalpy 121
enthalpy of melting 122
entropy 121, 170
ergodic theorem 137
evaporation and condensation 34
evaporation and condensation process 47
exchange-coupled magnetic material 176
exchange-coupled magnetically hard material 176
exchange-coupled particle 174
excimer 191, 192, 193, 203
excimer emission spectrum 204, 205
excimer formation 192
exciton 187
exciton radius 188

F
Faraday effect 225, 226
Faraday rotation 226
Fermi energy 186
ferrimagnetic material 148
ferrofluids 113–115, 117
ferromagnetic 148
ferromagnetism 201
field effect transistor 238, 239
field emission system 290
flame aerosol process 67
flame process 67, 69
flame synthesis 68
flammability 272
fluctuating particle 195
fluctuation 16, 132
formation of particle 33
fracture stress 269
Frank–Reed source 259, 260
free enthalpy 121, 123
fullerene-like particle 104
fullerene-like structure 100
fullerene 79, 89, 91

gas sensor 18, 19
gas-phase process 39
gate voltage 239
Gibbs-Thomson equation 124
global case 139
global enclosure 137
global property 279
gold ruby glass 12, 200, 214
good electron diffraction 285
grain-boundary 22, 121, 141, 144
grain-boundary process 257, 260, 261, 263
“grain-switching” mechanism 261
graphane 90
graphene 89–91, 97, 274, 277
graphene oxide 97, 277

h
HAADF 301
Hall–Petch 252
Hall–Petch plot 252, 256
Hall–Petch relation 251, 255
hard agglomerate 40
hard direction 155
hard magnetic particle 173
heat capacity 121, 141, 142
heat release 272, 273
heterogeneous nucleation 32
high-angle annular dark-field detector (HAADF) 300
high-resolution electron micrograph 299
high-resolution electron microscopy 297
hole 187
homogeneous nucleation 32
homogenization time 18
homogenous nucleation 130
Hooke’s law 250, 251
hydrostatic pressure 25, 28, 29
hyposoichiometric 220
hysteresis 140, 157

i
imogolite 86, 234
index of refraction 181, 182
inelastic scattered electron 292, 295
inelastic scattering 297
inert-gas condensation process 47
inflammability 270, 273
instantaneous alloying 18
interface energy 130
interface stress 26
interference pattern 283
inverse Hall–Petch 255, 256, 260
isotherm 137

k
Kelvin equation 31
Kerr effect 225
Klitzing constant 231
Köhler illumination system 291

l
Landau order parameter 126, 128
Langevin formula 153, 162
Langevin function 153, 157
Langmuir adsorption isotherm 280
Larmor frequency 166, 167
Larmor precession 166
laser-ablation process 52, 54
lattice constant 30
lattice expansion 30
lattice fringe 27, 35, 73, 133
lattice plane 283
lattice resolution 288
lattice vibration 121, 141
layered silicate 85, 101, 103, 270
layered structure 84
line broadening 283, 286
local case 138
local enclosure 137
local hyperthermia 177
local property 279
log-normal distribution 40
longitudinal mode 198, 199
longitudinal resonance 200
long-range ordering 147
Lorentz transformation 289
Lotus effect 4
luminescence intensity 208, 209
luminescent composite 201
luminescent magnetic particle 202
luminescent particle 181, 215
lumophore 201, 202, 203

m
magnetic anisotropy 152, 155, 174
magnetic crystal field 167, 168
magnetic dipole 148
magnetic domain 149
magnetic resonance tomography (MRT) 169
magnetic susceptibility 163
magnetization 162, 202
magnetization curve 150, 161
magnetocaloric cooling 171, 172
magnetocaloric effect 170, 171
magnetocaloric material 172
magnetocaloric refrigerator 172
magnetoeception 4
magneto-optical material 224
maximal frequency 162
mechanical property 249
medicine 169
melting enthalpy 130
metallic luster 197
mica 85
microwave frequency 56
microwave plasma 56, 60, 62
microwave plasma process 55, 72
microwave plasma system 58
Miller indices 83, 84, 283, 284, 298
mobile dislocation 257
molecule spectrum 203, 204
monoclinic-tetragonal transformation 28
monolayer 280
monomer 192, 193
montmorillonite 101, 102, 270, 271
Moseley’s law 293, 294
Mößbauer effect 164
Mößbauer spectrum 166–168
multicolor screen 217
multifunctional particle 72
multiwall carbon 106
multiwall fullerene 92
multiwall nanotube 93
mutual solubility 11

n
Nabarro–Herring mechanism 261
nacre (mother-of-pearl) 266, 267, 268, 270
nanocomposite 204, 207, 208, 242, 244, 246, 247
nanocomposite particle 9
nanocomposite 11, 72, 213, 269, 274
nanofluid 11, 169
nanomotor 35–38
nanoplate 79
nanorod 79, 88, 108
nanotubes 79, 88
narrow-band emitter 213
needle electrodes 71
Néel temperature 149
Néel’s superparamagnetism 116, 154, 163, 167
NMR 118
NMR tomograph 119
non-Ohmic 229
nuclear magnetic resonance imaging 118
nucleation 39, 107, 108
numerical aperture 288, 289

O
Ohm’s law 229
Ohmic conductor 229
one-dimensional 7
one-dimensional nanocomposite 11
onion crystal 92
optical absorption 184
optical property 181
optical transmittance 96
optomagnetic device 226
ordered state 170
organic lumophore 214
oscillating system 36

p
paramagnetic behavior 147, 148
paramagnetism 147
particle 39
particle coagulation 27
particle in a box 188
particle-filled polymer 266
particle-size distribution 59, 63
particle-size distribution function 43
Pauli’s principle 184
percolating system 241
percolation 242, 243
percolation path 242
percolation threshold 242–245
phase diagram 134
phase transformation 122, 123, 132
phase-transformation temperature 125
phonons 141
photochromic behavior 221
<table>
<thead>
<tr>
<th><strong>Index</strong></th>
<th>309</th>
</tr>
</thead>
<tbody>
<tr>
<td>photochromic material</td>
<td>219, 220</td>
</tr>
<tr>
<td>photoluminescence spectra</td>
<td>208</td>
</tr>
<tr>
<td>phyllosilicate filler</td>
<td>272</td>
</tr>
<tr>
<td>phyllosilicate</td>
<td>101, 270</td>
</tr>
<tr>
<td>physical vapor synthesis</td>
<td>49</td>
</tr>
<tr>
<td>physisorption</td>
<td>280</td>
</tr>
<tr>
<td>pigment</td>
<td>214</td>
</tr>
<tr>
<td>Planck's equation</td>
<td>231</td>
</tr>
<tr>
<td>plasma process</td>
<td>55</td>
</tr>
<tr>
<td>plasmon resonance frequency</td>
<td>199</td>
</tr>
<tr>
<td>plasmon resonance peak</td>
<td>214</td>
</tr>
<tr>
<td>plasmon resonance</td>
<td>197</td>
</tr>
<tr>
<td>plasmon</td>
<td>187, 197, 295</td>
</tr>
<tr>
<td>plastic deformation</td>
<td>250</td>
</tr>
<tr>
<td>plate electrodes</td>
<td>71</td>
</tr>
<tr>
<td>Poisson distribution</td>
<td>40</td>
</tr>
<tr>
<td>Poisson process</td>
<td>39</td>
</tr>
<tr>
<td>polarization plane</td>
<td>225</td>
</tr>
<tr>
<td>polymer coating</td>
<td>75</td>
</tr>
<tr>
<td>polymer matrix</td>
<td>274</td>
</tr>
<tr>
<td>polypyrrole coating</td>
<td>234</td>
</tr>
<tr>
<td>porosity</td>
<td>253, 254</td>
</tr>
<tr>
<td>pseudo crystalline</td>
<td>135</td>
</tr>
<tr>
<td>pseudocrystalline</td>
<td>134</td>
</tr>
<tr>
<td>pseudohydrogen</td>
<td>187</td>
</tr>
</tbody>
</table>

**q**
- quantum confinement | 187, 188, 190, 191, 213 |
- quantum dot | 201, 213, 217 |
- quantum selection rule | 193 |
- quasimelt | 134 |
- quenching | 45, 48 |
- quenching condition | 65, 66 |
- quenching step | 40, 43 |

**r**
- radio-frequency | 63 |
- random process | 39 |
- Rayleigh formula | 182 |
- relativistic correction | 288 |
- relativistic phenomena | 289 |
- relaxation time | 162, 163 |
- remanence | 150, 152 |
- resistance quantum | 231 |
- resolution power | 287 |
- Rosenzweig phenomenon | 114 |

**s**
- saturation magnetization | 150, 158–161 |
- scanning electron microscope | 292, 300 |
- scattering of electrons | 295 |
- Scherrer equation | 284 |
- Schrödinger equation | 186–188, 198 |
- selected-area diffraction | 287 |
- self cleaning | 4 |
- self-destruction | 183 |
- silicate filler | 272 |
- silicate platelets exhibit | 269 |
- single-wall carbon nanotube | 274 |
- single-wall nanotube | 93 |
- singularized | 270 |
- slip plane | 259 |
- soccer ball molecule | 91 |
- soft agglomerates | 40 |
- solid-state lubricant | 99 |
- specific surface | 158, 159, 279, 280, 282 |
- specific surface area | 15 |
- spherical aberration | 289, 290 |
- spider silk | 276 |
- spin canting | 160 |
- state | 224 |
- steric stabilization | 111, 112 |
- stoichiometry | 220 |
- strain at fracture | 269 |
- stress–strain diagram | 249, 251, 252, 263, 264, 266, 268, 274, 275, 276, 277 |
- sub-Ångström | 291 |
- subtractive | 3 |
- supercooling of liquid | 130 |
- superferromagnetism | 154 |
- superparamagnetic ferrite | 167 |
- superparamagnetic particle | 169, 170, 173 |
- superparamagnetic refrigerator | 170 |
- superparamagnetism | 152, 153, 154, 157, 159 |
- superplastic ceramic | 264 |
- superplasticity | 263, 264 |
- surface | 21 |
- surface energy | 10, 23, 25, 26, 28, 37, 39, 79, 83, 121, 122, 124, 132 |
- surface layer | 161 |
- surface over volume ratio | 14 |
- surface plasmon | 197, 198 |
- surface stress | 5, 24, 25, 26 |
- surface stretching | 25 |
- surface-active molecule | 83 |
- surface-influenced volume | 21, 22 |
- surfactant | 114 |
- susceptibility | 162 |
- suspension | 111 |
- synthesis | 32 |

**t**
- temperature compensated field | 153 |
- temperature flash | 27 |
- thermal conductivity | 112 |
- thermal energy | 15, 16 |
thermal fluctuation 166, 168
thermal instability 16, 17, 132, 135, 152
thermal ionization 69
thermodiffusion 47
thermophoresis 47
thin plasmas 69
Thomson equation 31, 124, 129, 131
threshold voltage 218
time response 224
top-down 2
transmission electron microscopy 292
transversal modes 198, 199
ture stress–strain diagram 250
two-dimensional 7
two-dimensional nanocomposite 11
two-zone model 160

u
unit cell volume 30

v
van der Waals bond 111
van der Waals force 84, 99
van-der-Waals 280
vapor pressure 30, 32

Verdet constant 225, 226
vibrations 88
viscosity 115, 116
volume dilation 31

w
wavelength-dispersive system 295
white soot 7
wide-gap semiconductor 239
work function 216

x
X-ray diffraction 285
X-ray fluorescence 284
X-ray photon 293
X-rays 282–284, 292, 294

y
yield stress 249, 251, 253, 255
Young’s modulus 250, 252–254, 269, 271–276

z
zero-dimensional 7
zero-dimensional particle 11