

Index

A

Activation volume, 186
Ag domains, 231
All-inorganic solar cell, 78
Alloys, 175
Anisotropic magnetoresistance (AMR), 182
Anisotropy, 139
Anodic aluminum oxide templates, 106
Antenna efficiency, 123
Antiferromagnetism, 136
Antitumoral therapies, 154
Arrhenius plot, 231
Aspect ratio, 104, 153, 163, 170
Assembly, 156
Atomistic pseudopotential method, 65
Auger constant, 21
Auger effects, 21
Auger efficiency, 21, 23
Au-nanorod dumbbells, 70
Axial load, 259

B

Band edge transition, 31
Bernoulli–Euler pillar, 260
Biexciton, 26, 41
Biexcitonic Auger relaxation, 22
Bimetallic PtPb nanorods, 222
Bimodal switching effect, 27
Biology, 201
Biomedicine, 133, 149, 202
Bleach recovery, 113
Blocking temperature, 138, 139, 171
Bohr radius, 4, 8, 62
Boltzmann's constant, 109
Bose function, 17
Boundary element method, 101
Breathing mode, 113

Brittle failure, 259
Buckled zone, 261
Buckling, 141, 181, 189, 259
Burgers vector, 244

C

Capillary theory, 263
Carrier dynamics, 22
Carrier relaxation, 15
Catalytic reactions, 217
CdSe nanorods, 9, 66
CdSe nanowires, 69
CdSe/CdS core shell nanorods, 62
CdTe nanorods, 66
Charge delocalization, 73
Charge distribution mode, 105
Charged excitons, 24
Charging energy, 62
Chemical environment, 121
Chemical synthesis, 102
Classical electromagnetic theory, 118
CO, 160
CO adsorption, 224
CO oxidation reaction, 223
Coercive field, 135
Coercivity, 155, 166
Coffee stain effect, 44
Coherent rotation, 181
Coherent vibrational modes, 117
Collection efficiency, 122
Collinear heterostructures, 45
Collinear nanorods, 31
Confined photon, 118
Conjugate gradient method, 102
Contact capacitances, 62
Continuum mechanics, 115
Copper nanoparticles, 104

Copper oxide (CuO) nanostructures, 226
 CoPt, 178
 Coulomb blockade, 57
 Coulomb charging effects, 58
 Coulomb interaction, 57
 Coulomb interaction term, 62
 Critical radius, 137, 141
 Critical resolved shear stress, 254
 Crystal field (CF) splitting, 10
 Crystal phases, 228
 Cube, 105
 Curie temperature, 139
 Curling, 141, 181, 184, 185, 189
 Current-induced domain wall motion, 201
 Current-induced DW propagation, 200
 Cusp, 258
 Cyclic voltammetry, 223

D

Damping factor, 90
 Data storage industry, 177, 180
 Debye temperature, 42
 Decahedral shaped particles, 104
 Deformation potential, 17
 Delta function, 121
 Demagnetization factors, 143, 186, 189, 198
 Dephasing effects, 88
 Dephasing time, 107
 Dephasing time T_2 of the plasmon, 93
 Depolarization field, 97
 1D exciton, 9
 Diamagnet, 136
 Dielectric function, 89
 Dipolar interactions, 156
 Dipole mode, 92
 Dipole moment, 122
 Discrete dipole approximation, 101
 Disks, 141
 Dislocation density, 256
 Dislocation dynamics, 256
 Dislocation forest hardening, 256
 Dislocation junctions, 243
 Dislocation multiplication, 252
 Dislocation starvation, 252
 Domain wall, 141, 172, 191
 Dot/Rod heterostructures, 31
 Dot-in-a-rod structures, 31
 Double barrier tunnel junction, 57
 Drude model, 89
 Drug delivery, 202
 Drug vectors, 154
 Ductility, 244
 DW mobility, 191, 192

DW motion, 192
 DW propagation, 193
 DW velocity, 191, 192
 Dynamic depolarization, 97

E

e-h pair annihilation, 21
 Easy axes, 141, 152, 158, 179, 180
 Easy magnetization axis, 170
 Easy magnetocrystalline axis, 147
 EBL overlay, 68
 Effective mass, 1
 Effective mass approximation, 10
 Electric multipoles, 93
 Electrical resistivity, 180, 201
 Electrochemical oxidation, 220
 Electro-deposition, 223
 Electroluminescence, 68
 Electron delocalization, 34
 Electron energy loss spectroscopy, 121
 Electron free path, 111
 Electron gas, 109
 Electron temperature, 113
 Electron-hole exchange interaction, 12, 13
 Electron-phonon coupling, 109
 Electron-phonon relaxation time, 110
 Electron-beam lithography, 64
 Electron-hole pairs, 106
 Electron-hole relaxation, 14
 Electronic fine structure, 13
 Electronic heat capacity, 109
 Electron-surface scattering cross section, 111
 Ellipsoid, 99, 167
 Ellipsoidal particles, 98
 Elongation direction, 245
 Energy barrier, 215
 Energy filter, 121
 Energy filtered TEM, 121
 Energy gap, 7
 Energy shift, 29
 Enthalpy of fusion, 263
 Envelope function approximation, 33
 Epitaxial overgrowth, 220
 Equilibrium electronic density, 119
 Euler buckling load, 261
 Euler-Bernoulli, 259
 Exchange interaction, 11, 139
 Exciton, 7
 Exciton fine structure, 24
 Exciton ionization, 76
 Extinction cross section, 89, 91

F

Far-field behavior, 89
Fast Fourier transforms, 102
Fe, 168
 ε -Fe₂O₃, 146, 155
Femtosecond laser pulse, 108
FePt, 178
Fermi function, 59
Fermi level, 59, 60, 120
Fermi velocity, 90
Ferrimagnetism, 136
Ferromagnetic resonance, 155
Ferromagnetism, 136
Field enhancement, 118
Field-ionization process, 76
Fluorophore, 122
Fowler–Nordheim formula, 68
Fröhlich interaction, 18
Fracture quantum, 249
Frank-Read source, 254
Free electrons, 87
Free-electron gas, 3
Froelich condition, 93
Fundamental breathing mode, 115
Fundamental extensional mode, 115

G

Gans' theory, 101
Geometrical factor, 98
Giant magnetoresistance (GMR), 192
Gilbert damping coefficient, 194
Gilbert damping parameter, 191, 197
Global energy splitting, 11
Gold nanoparticles, 88
Growth axis, 164
Growth direction, 152, 158, 179

H

Hall-Petch, 246
Hard disks, 177
Hard magnetic axis, 170
Hard magnets, 133, 200
Head actuators, 177
Head sensors, 180
Heavy hole, 10
Heisenberg model, 139
Hematite, 146, 149
Heterodimers, 48
Heterogeneous catalysis, 215
Heterostructures, 7
High curvature, 118
Highly oriented pyrolytic graphite, 60

Homogeneous broadening, 16
Homogeneous catalysis, 215
Homogeneous linewidth, 106
Hooke's law, 260
Hot electrons, 109
Hotoconductivity, 76
Huang-Rhys factor, 18
Hybrid solar cell, 79
Hydrogen evolution, 233
Hydrothermal method, 228
Hyperthermia, 202
Hysteresis loop, 135

I

In situ XRD analysis, 228
Incoherent reversal modes, 181
Indentation size effect, 252
Induced screening charge density, 120
Inelastic processes, 106
Inelastically scattered electrons, 121
Information storage devices, 164
Inhomogeneous broadening, 16
Interband electronic transitions, 87
Interband excitation, 106
Intermittent emission, 23
Internal crystal field, 10
Intraband excitation, 106
Intrinsic crystal field, 10
Iron oxides, 145

J

Jellium model, 95

L

Lattice defects, 243
Lattice phonons, 263
Light emitting devices, 73
Lightening rod effect, 118
Light hole, 10
Light-scattering spectra, 106
Linearly polarized light, 107
Lithium ion batteries, 236
LO phonons, 18
Local field enhancement factor, 126
Longitudinal plasmon resonance, 99

M

Mössbauer spectroscopy, 139
Maghemite, 146, 154, 155
Magnetic anisotropy, 140

- Magnetic dipoles, 140
 Magnetic field-induced DW propagation, 200
 Magnetic force microscopy (MFM), 161
 Magnetic permeability, 180
 Magnetic recording, 169
 Magnetic recording media, 177
 Magnetic resonance imaging (MRI), 177, 200, 201
 Magnetic storage devices, 133
 Magnetite, 145, 147
 Magnetization reversal, 168, 172, 181, 184, 189
 Magnetocrystalline anisotropy, 141, 147, 155, 159, 167
 Magnetometry, 139
 Magneto-optical Kerr effect, 169
 Magneto-optic Kerr effect measurements (MOKE), 192
 Magnetoresistance, 189
 Magnetoresistive, 182, 185
 Magnetostriction, 140, 173, 180
 Magnetostrictive, 159
 Maxwell's equations, 90
 Mechanical stability, 219
 Melting, 262
 Metal nanostructures, 87
 Metal/metal oxide supported catalytic systems, 225
 Metal-doped semiconductor nanorods, 231
 Metals, 160
 Metal-tipped nanorods, 48
 Methyl orange, 232
 Micro electro-mechanical devices, 241
 Micro-electromechanical systems, 265
 Micro-strain measurements, 228
 Microwave radiation, 118
 Mini-band formation, 73
 Modified long wavelength approximation, 97
 Modified quantum efficiency, 123
 Morin temperature, 146
 Morin transition, 150, 153
 Multidomain, 151, 161
 Multiexciton generation, 37
 Multifunctional nanorods, 47
 Multiple domains, 141
 Multiple-twinned structure, 102
- N**
- Néel temperature, 139
 Nano/micropillars, 250
 Nanobarbells, 31, 46
 Nanobelts, 226
 Nano-catalyst surfaces, 218
 Nanocones, 123
 Nanodevices, 261
 Nano-electromechanical systems, 265
 Nano-indentation, 241
 Nanoindenter, 261
 Nanonets, 231
 Nanoplatelets, 226
 Nanorod, 134, 141, 165, 171
 Nanorod arrays, 75
 Nanorod heterostructures, 31
 Nanorod networks, 71
 Nanorod tracks, 74
 Nanoscale Weibull statistics, 249
 Nanotubes, 154
 Nanowires, 141, 158, 169
 Nd₂Fe₁₄B, 177
 Near-field optical properties, 117
 Near-field properties, 89
 Negative transient absorption, 111
 Net surface-charge density, 23
 Neutral exciton, 24
 Nickel, 172
 Non-coherent magnetization reversal, 168
 Non-radiative decay, 108
 Non-retarded regime, 92
 Numerical approximation methods, 101
- O**
- Octupolar modes, 95
 One-dimensional density of states, 65
 One-dimensional nanosystems, 134
 Optical antenna, 118
 Optical microscopy, 102
 Optical pump-probe experiments, 63
 Oriented attachment, 159
 Out-of-plane anisotropy, 175
 Oxidation-state, 146
- P**
- Paramagnets, 136
 Pentagonally twinned crystals, 220
 Permalloy, 180, 189, 196, 201
 Permanent magnets, 175, 200
 Permeability, 172, 201
 Phase retardation, 96
 Phonon-phonon coupling, 111
 Photo catalytic reactions, 219
 Photobleaching, 34
 Photodegradation, 233
 Photoexcitation, 233
 Photoluminescence, 76
 Photoluminescence excitation, 33
 Photon bunching, 39

- Photothermal therapy, 108
 Photovoltaics, 57, 73, 78
 Piezoresistive effect, 265
 Pinning site, 248
 Pins, 254
 PL quantum yield (PL QY), 49
 Plasma frequency, 89
 Plasmon dynamics, 113
 Plastic deformation, 243
 Poisson's ratio, 115
 Polarizability, 29, 92
 Polarization, 29
 Polarization spectroscopy, 29
 Polarized emission, 29, 43
 Polarized light emitting diode, 44
 Porous magnetic nanoparticles, 171
 Postbuckled zone, 261
 Prebuckling zone, 261
 Preferential growth, 164
 Preferred orientation, 161
 Prism, 104
 Probability distribution, 60
 Pt nanoparticles, 233
 Pump-probe transient absorption, 34
 Purcell factor, 123
- Q**
- Quadrupole modes, 95
 Quality factor, 108
 Quantization energy, 8
 Quantum confined Stark effect, 28, 35
 Quantum confinement, 1, 18
 Quantum dot, 3
 Quantum mechanical calculations, 119
 Quantum resistance, 58
 Quantum wire, 3
 Quasi-particle, 4
 Quasi-static regime, 106
 Quasi-type-II structure, 39
- R**
- Radiation damping, 98
 Radiation scattering, 96
 Radiative processes, 108
 Raman photon, 124
 Recording heads, 201
 Recording media, 161, 181
 Reduced mass, 8
 Relaxation process, 17
 Relaxivity, 149
 Remanent magnetization, 135
 Resistivity, 182, 185
- Retardation effects, 96
 Rhodamine-B, 231
 Riccati-Bessel functions, 92
 Roughened metal surface, 124
- S**
- Saturation magnetization, 135, 165
 Scale coefficient, 260
 Scanning tunneling spectroscopy, 58, 60
 Scattering of light, 88
 Scattering quantum yield, 108
 Schottky barrier, 64
 Schrödinger equation, 1
 Screw dislocation, 258
 Seebeck coefficient, 80
 Seeded growth approach, 39
 Selectivity of a catalyst, 217
 Self assembled micro-lasers, 44
 Semiconductor nanowires, 65
 SERS amplification, 125
 Shape anisotropy, 142, 167, 215
 Shear deformation, 248
 Shear stress, 243
 Silver, 90
 Single domain, 137, 141, 163, 168, 181
 Single magnetic domain, 155, 161
 Single photon sources, 38
 Size parameter, 98
 Slip, 244
 Slips bands, 250
 SmCo₅, 177
 Soft magnets, 133, 200
 Solar cells, 79
 Source truncation hardening, 253
 Spatially resolved PL, 43
 Spectral diffusion, 23
 Spectral jitter, 35
 Spectral line shape, 24
 Spectral line width, 17
 Spectral overlap, 110
 Spectrometer, 121
 Spherical ellipsoids, 103
 Spill out of the electron density, 118
 Spin, 136, 181
 Spin-canting, 142
 Spin-glass, 142
 Spin-orbit, 140, 182
 Spintronics, 201
 Squareness, 161, 170, 173, 175, 179
 SrNb₂O₆ nanorod, 233
 Stacking faults, 247
 Stark effect, 26
 Stoner-Wohlfart, 181, 184, 189

- Strain burst, 248, 250, 259
 Strain hardening, 243
 Strain-softening, 258
 Stress, 242
 Superlattice effects, 74
 Superparamagnetic, 134, 201
 Superparamagnetic limit, 138, 164
 Superparamagnetism, 136
 Superparamagnets, 200
 Superstructure, 160
 Surface anisotropy, 141
 Surface charge fluctuations, 37
 Surface damping, 93
 Surface enhanced Raman scattering, 108
 Surface optical (SO) phonon modes, 19
 Surface plasmon resonance, 87
 Surface trap states, 28
 Surfactants, 164
 Suzuki coupling reaction, 221
 Switching field, 181, 184
- T**
 Temperature-dependent delocalization, 41
 Tensor, 254
 Tetrapod, 46
 Thermal conductivity losses, 109
 Thermal escape, 17
 Thermalization, 109
 Thermoelectric figure of merit, 81
 Thermoelectric materials, 80
 Thermoelectric power, 80
 Three-carrier relaxation, 22
 Three-way catalyst, 236
 Time-dependent density functional theory, 118
 Timoshenko models, 260
 Timoshenko pillar, 260
 Tips, 168
 Total angular momentum, 10
 Transmission electron microscopes, 121
 Transverse plasmon modes, 99
 Transverse polarizability, 99
 Triexciton, 41
 Tunneling matrix element, 59
 Tunneling rate, 58
 Turbulent regime, 195
 Twin boundaries, 247
 Two-dimensional electron gas, 3
 Two-photon excitation, 30
- Type-I heterostructures, 31
 Type-II band alignment, 31
 Type-II heterostructures, 31
 Type-II rod-like system, 45
- U**
 Ultrafast charge separation, 46
 Ultrafast techniques, 108
- V**
 Valence band-offset, 41
 Varshni equation, 68
 Verwey transition, 146
 Visible-light photocatalytic activity, 231
- W**
 Wüstite, 145
 Walker breakdown, 192, 195, 196
 Walker equation, 192
 Walker model, 191, 193
 Walker theory, 195
 Walker transition, 196
 Walker's theory, 191, 198
 Wannier-Mott exciton, 8
 Water splitting reaction, 231
 Wavefunction distributions, 36
 Wavefunction spreading, 49
 Weibull statistics, 249
 Whiskers, 248
 Wiedemann-Franz-law, 81
- X**
 X-ray Magnetic Circular Dichroism, 180
- Y**
 Young modulus, 115
 Young's modulus, 242
- Z**
 Zeeman energy, 140
 Zero Field Cooling—Field Cooling measurement, 138