

Index

- 3–30–300–3000 rule, 272
 4–4' dimethoxyazoxybenzene, 358
 8 – *N* rule, 36, 108, 163
- absorption coefficient
 GaAs, 499
 semiconductors, 498
 absorption coefficients, 497
 abundance of elements, 4
 acrylonitrile–butadiene–styrene, 197
 adamantane, 173
 adhesion, 387–388
 AFm phase, 377
 AFt phase, 376
 AgAsMg, 134
 AgI, 446
 AgNbO₃, 222
 akermanite, 332
 Al, 151
 Al avoidance rule, 339
 Al(OH)₃, 7, 322
 Al₂O₃, 136, 213, 238
 Al₂Si₂O₅(OH)₄, 7, 17, 309, 321, 323, 332
 Al₂Si₄O₁₀(OH)₂, 323
 Al₂SiO₄F₂, 213
 albite, 7, 247, 332, 339
 AlCl₃, 282
 alexandrite, 233
 alite, 367, 372, 378
 alkali halides, 282, 514
 bulk modulus, 571
 melting points, 279
 alkali metals, 153
 alloys, 161
 AlN, 105, 406, 536
 AlOOH, 7, 221
 AlPO₄, 503
 amorphous, 190, 289
 amphiboles, 4, 320, 580
 amphiphilic, 584
 anionic collectors, 390
 anisotropy, 401
 diffusion, 442
 elastic, 575
 ionic conductivity, 439, 444, 446
 refractive index, 502
 thermal conductivity, 425
 anorthite, 247, 339
 anthracene, 175–177
 antiferromagnet, 544
 antiphase boundaries, 269
 apatite, 7, 26
 aragonite, 11, 351
 aromatic, 174–175
 As₂O₃, 296, 299
 asbestos, 321
 aspirin, 173–174
 atactic, 192
 atmophile, 9
 atmosphere, 10
 AuAl₂, 134
 AuGa₂, 134
 Aurivillius phases, 528
 austenite, 156, 158
- B₂O₃, 299
 BaAl₂O₄, 220
 BaFe₁₂O₁₉, 65, 558
 bainite, 158
 band gap, 106, 110, 354, 463, 472, 507, 511
 bond length, 106
 direct gap, 112, 498
 III–V semiconductors, 114
 indirect gap, 112
 ionicity, 108
 basis, 75
 BaSO₄, 506
 BaTiO₃, 110, 138, 269, 497, 530, 534, 537
 pyroelectric response, 535
 batteries, 447, 451
 Li–MnO₂, 454
 lithium, 451
 nickel–metal–hydride, 451
 bauxite, 7
 BCC, 144, 152, 350, 417
 Be₃Al₂Si₆O₁₈, 309, 317
 Beer's law, 492
 belite, 368, 372, 378
 benitoite, 318
 benzene, 33, 175

- BeO, 105
 Bernal, 277
 beryl, 309, 317
 beryllia, 105
 BeSiO₄, 332
 Bi₂Ru₂O₇, 471
 Bi₂Te₃, 433
 Bi₄Ti₃O₁₂, 525, 528
 BiFeO₃, 528
 birefringence, 502, 515
 bixbyite, 231
 blast furnace, 155
 block copolymers, 202
 body-centered cubic, 144, 152, 350, 417
 boiling point, 28, 183, 274
 boiling points
 alkanes, 178
 bond angle, 66
 bond length, 66
 bond length–bond strength correlations, 19
 bond order, 150, 153
 bond valence, 216–217
 bonding in metals, 153
 borax, 296
 borosilicate glass, 296
 Bragg's law, 44
 branched chain, 191
 brass, 161
 Bravais lattices, 73–74
 brick, 329
 bridging oxygen, 294
 brittle fracture, 563
 bronze, 162
 brucite, 322
 buckyball, 116
 Burgers vector, 262
 butane, 179, 349
- (CF₂–CF₂)_n–, 193
 –(CH₂–CH₂)_n–, 189
 –(CH₂–CH₂O)_n–, 450
 –(CH₂–CHCl)_n–, 192
 –(CHCH₃–CH₂O)_n–, 450
 C₁₂H₂₂O₁₁, 171
 C₁₄H₁₀, 176
 C₁₇H₃₃COOH, 287
 C₂₂H₁₄, 175
 C₂O₃N₂H₆, 356
 C₆₀, 116
 C₆H₆, 286
 Ca(OH)₂, 7, 181
 Ca₂(Mg,Fe)₅Si₈O₂₂(OH)₂, 580
 Ca₂AlFeO₅, 369
 Ca₂FeSi₂O₇, 332
 Ca₂Mg₅(Si₄O₁₁)₂(OH)₂, 309
 Ca₂SiO₄, 367, 378
 Ca₃Al(OH)₆ · 12H₂O₁₂ (SO₄)₃ · 2H₂O, 376
 Ca₃Al₂O₆, 368
 Ca₃Al₂Si₃O₁₂, 247
 Ca₃SiO₅, 363, 378
 Ca₄Al₂Fe₂O₁₀, 369
 Ca₄Al_{2–x}Fe_xO₇](SO₃) · 12H₂O, 377
 Ca₅(PO₄)₃F, 235, 508
 Ca₅(PO₄)₃OH, 7
 Ca₅Si₆O₁₆(OH)₂ · 8H₂O, 372
 Ca₉(Si₆O₁₈)(OH)₆ · 8H₂O, 364, 374
 Ca₉Si₆O₁₈(OH)₆ · 8H₂O, 364
 CaAl₂Si₂O₈, 247, 339
 CaC₂, 132
 CaCO₃, 7, 132, 155, 247, 335, 351, 364
 calcite, 7, 11, 26, 132, 334, 351, 364, 502
 birefringence, 502
 CaMg(CO₃)₂, 7, 365
 CaMg(SiO₃)₂, 332
 CaO, 7, 131, 181, 247, 292, 363
 capacitance, 516
 capacitor, 517
 carbon, 98
 carbon nanotube, 117
 carnegieite, 314
 carotene, 508
 carrier scattering, 465
 CaSiO₃, 333, 378
 CaSO₄ · 2H₂O, 7, 17, 363, 368, 375, 578
 catalysis, 395
 CaTiO₃, 138
 cation collectors, 389
 CaWO₄, 508–509
 CCl₄, 100, 286
 CCP. *See* FCC
 CdS, 105, 510
 CdSe, 105, 510
 CdTe, 510
 cellulose, 204
 cement, 363
 cementite, 157
 CeO₂, 270
 CH₂NH₂COOH, 394
 CH₄, 181
 chain silicates, 318, 334
 chalcophile, 8–9
 chalcopyrite, 10, 104, 389
 chamosite, 332
 chemical bonds, 15
 chrysotile, 323
 cinnabar, 10, 503
 classification of ions, 122
 classification of silicates, 307, 309
 clay, 4, 7, 309, 321, 329
 cleavage, 101, 563, 576, 578
 clinker phases, 367
 close-packing, 62–63
 compounds, 65
 molecular crystals, 173
 stacking sequences, 144
 clustering, 247

- CO_2 , 99, 111
 color, 232, 506
 CoMnSb , 134
 compound semiconductors, 108
 compressibility, 563
 concrete, 363, 379
 conducting polymers, 478
 conformation, 189
 conjugation, 478
 CoO , 251
 Cooper pair, 483, 486, 488
 coordination, 209–210, 219
 coordination polyhedra, 127
 copper, 145
 CoPt , 558
 cordierite, 249, 317
 corner-sharing, 130, 212, 292, 496
 corundum, 7, 26, 136, 222, 267, 496
 coupling agents, 186
 covalent bond lengths, 100
 covalent bonding, 18–19, 98, 571
 covalent bonds, 15
 Cr_2O_3 , 232
 CrF_2 , 232
 CrF_3 , 232
 cristobalite, 62, 141, 310, 314
 critical point, 275
 CrO_2 , 558
 cross-linking, 190
 crystal, 1
 crystal chemistry, 1
 crystal classes, 79
 crystal field, 506
 crystal field splitting, 227–228
 crystal field stabilization energy, 229
 crystal field theory, 224
 crystal growth, 46
 rocksalt, 48
 crystal structure
 cristobalite, idealized, 112
 sucrose, 171
 WC, 567
 crystal structures
 (111) surface in InSb, 384
 $(\text{Bi}_{1.7}\text{Pb}_{0.3})\text{Sr}_2(\text{Ca}_{1.7}\text{Bi}_{0.3})\text{Cu}_3\text{O}_{10}$, 486
 $(\text{La,Ba})_2\text{CuO}_{4-x}$, 486
 AFm phase, 377
 albite, $\text{NaAlSi}_3\text{O}_8$, 341
 anatase, TiO_2 , 72
 apatite, 86
 Au, 166
 B_2O_3 , 297
 baddelyite, ZrO_2 , 581
 barite, BaSO_4 , 70
 BaTiO_3 , 95
 Be, Cr, Cd, Co, Hf, La Mg, Os, Ru, Ti, Y, Zr, 147
 belite, 368
 benzene, 421
 beryl, $\text{Be}_3\text{Al}_2\text{Si}_6\text{O}_{18}$, 71, 318
 $\text{Bi}_2\text{Ru}_2\text{O}_7$, 471
 Bi_2Te_3 , 433
 $\text{Bi}_4\text{Ti}_3\text{O}_{12}$, 529, 539
 BN, 119
 body-centered cubic metal, 147–148
 boric acid, H_3BO_3 , 589
 boron nitride, 115
 brucite, $\text{Mg}(\text{OH})_2$, 323, 336
 $\text{C}_{36}\text{H}_{74}$, 180
 Ca_3SiO_5 , 367
 $\text{Ca}_5(\text{PO}_4)_3\text{F}$, 72, 234
 CaC_2 , 142
 calcite, CaCO_3 , 141, 365
 carnegeite, NaAlSiO_4 , 315
 CaWO_4 , 509
 cementite, 158
 chalcopyrite, 104
 CoPt , 559
 cordierite, $\text{Mg}_2\text{Al}_4\text{Si}_5\text{O}_{18}$, 423
 Cr, 148
 cristobalite, 117, 311, 336
 Cs, 148
 CsCl , 142, 163
 Cu, 166
 Cu (100) surface, 385
 Cu, Ag, Au, Pt, Pd, Ni, Al, 145
 Cu_2AlMn , 141
 Cu_2O , 356
 Cu_3Au , disordered, 163
 Cu_3Au , ordered, 163
 cubic perovskite, 342
 cubic ZrO_2 , 71
 diamond, 101, 104, 117
 enstatite, MgSiO_3 , 319
 ettringite, 376
 face-centered cubic metals, 145
 faujasite zeolite, 398
 Fe, 148, 167
 Fe_3C , 167
 FeTiO_3 , 137
 fluorite, CaF_2 , 132, 134
 forsterite, 316
 garnet, 555
 $\text{Gd}_2\text{O}_2\text{S}$, 509
 GdScO_3 , 361
 $\text{Ge}_2\text{Sb}_2\text{Te}_5$, 359
 gibbsite, $\text{Al}(\text{OH})_3$, 206
 graphite, 114, 117
 graphite fluoride, 589
 grey tin, 68
 gypsum, 375
 hexagonally close-packed metals, 146
 hollandite, 334
 ice, 183
 ilmenite, FeTiO_3 , 554
 isotactic polypropylene, 196
 jennite, 374

- crystal structures (cont.)
 K, 148
 kalsilite, KAlSiO_4 , 315
 kaolinite, $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$, 325
 KDP, KH_2PO_4 , 529
 LaB_6 , 472
 LaNi_5 , 249, 452
 LaNi_5H_6 , 249
 LaOBr, 509
 Li, 148
 LiCoO_2 , 447, 457
 lime, CaO, 365
 LiNbO_3 , 137, 531
 Linde A, 398
 magnetic structure of BCC Fe, 547
 magnetic structure of FCC Ni, 547
 magnetic structure of FeO, 549
 magnetoplumbite, $\text{BaFe}_{12}\text{O}_{19}$, 554
 martensite, 159
 methane III, 187
 MgB_2 , 485
 MgCu_2 , 164
 MgNi_2 , 164
 MgO (100) surface, 386
 MgZn_2 , 164
 MnO_2 , 455
 Mo, 148
 molybdenite, MoS_2 , 71, 589
 Monazite, CePO_4 , 72
 MoS_2 , 410
 mullite, 330
 muscovite mica, $\text{KAl}_2(\text{AlSi}_3\text{O}_{10})(\text{OH})_2$, 326
 Na, 148
 NaCl, 132
 NaNO_2 , 526
 Nb, 148
 Nb_3Sn , 484
 $\text{Nd}_2\text{Fe}_{14}\text{B}$, 559
 nephrite jade, 580
 NH_4Cl , 346
 Ni, 75
 NiAs, 142, 222
 NiO, 75, 470
 NiTe, 251
 NiTe_2 , 251
 nylon-6, 200
 olivine, $(\text{Mg}_{1-x}\text{Fe}_x)_2\text{SiO}_4$, 336
 pentasil zeolite, 399
 perovskite, 138
 perovskite, CaTiO_3 , 370
 polyethylene, 194, 207
 polyethylene terephthalate, 199
 portlandite, $\text{Ca}(\text{OH})_2$, 373
 PVDF, 530
 pyrite, FeS_2 , 118
 quartz, 313, 335
 Rb, 148
 rhodonite, MnSiO_3 , 320
 rocksalt, 131
 RuO_2 , 471
 rutile, TiO_2 , 70, 75, 135
 scheelite, CaWO_4 , 96
 Se, 71
 selenium, 504
 serpentine, $\text{Mg}_3\text{Si}_2\text{O}_5(\text{OH})_4$, 324
 Si, 112
 Si (100) surfaces, 383
 skutterudite, 433
 SmCo_5 , 559
 sodalite zeolite, 397
 spinel, MgAl_2O_4 , 437
 $\text{Sr}_3\text{Ti}_2\text{O}_7$, 395
 SrTiO_3 , 342
 stabilized zirconia, 449
 stannite, 104
 syndiotactic polystyrene, 196
 Ta, 148
 talc, $\text{Mg}_3\text{Si}_4\text{O}_{10}(\text{OH})_2$, 326
 teflon, 195
 tetracalcium aluminoferrite, 370
 thorveitite, $\text{Sc}_2\text{Si}_2\text{O}_7$, 317
 Ti_5O_9 , 262
 TiO, 469
 tobermorite, 373
 V, 148
 V_2O_5 , 215
 VO_2 , 109, 481
 W, 148
 white tin, 68
 wurtzite, 118
 $\text{Y}_2\text{W}_3\text{O}_{12}$, 426
 $\text{YBa}_2\text{Cu}_3\text{O}_7$, 486
 YTbO_4 , 509
 zinblende, 104, 118
 zircon, ZrSiO_4 , 435
 ZrTiO_4 , 523
 $\beta\text{-Na}_x\text{CoO}_2$, 433
 α -quartz, 313
 α -AgI, 446
 α -Nd, 148
 α -Sm, 148
 β -eucryptite, LiAlSiO_4 , 315
 β -alumina, 448, 457
 β -quartz, 312, 335
 β - Si_3N_4 , 437, 580
 crystal, 39
 crystal systems, 54–55, 83
 distribution of crystals, 56
 crystallization temperature, 191
 CsCl, 163, 219, 352
 Cu
 critical shear stress, 568
 crystal structure, 166
 electrical resistivity, 466
 Cu_2AlMn , 134
 $\text{Cu}_2\text{FeSnS}_4$, 104

- Cu_2O , 223
 Cu_3Au , 163, 341, 468
 cubic close-packing, 64. *See* face-centered cubic
 CuF_2 , 232
 CuFeS_2 , 10, 104, 389
 Curie groups, 94, 357, 409
 Curie temperature, 525–526, 544, 555
- Dacron, 203
 dangling bonds, 101, 140–141, 382
 Darken–Gurry plots, 245–246
 Debye interactions, 170
 Debye temperature, 416
 density, 58, 351
 - alkali halides, 60
 - common oxides, 62
 - molecular solids, 61
 - transition metals, 61
 - trends, 59
 - vs. atomic weight, 60
 density of states, 468, 473
 depressants, 390
 derivative structures, 102
 diamond, 15, 26, 28, 98, 100, 472, 579
 - brilliant cut, 588, 590
 - morphology, 46
 - polishing, 590
 diaspore, 7, 221
 dicalcium silicate, 367, 378
 dielectric constant, 408
 dielectric loss tangent, 519
 dielectric permittivity, 516, 519
 - BaTiO_3 , 530
 dielectrics, 516–517, 524
 Dietzel's correlation, 242
 diffusion, 439–440
 diffusion coefficients, 439, 441
 - anisotropy, 442
 - ionically bonded materials, 442
 - PbI_2 , 443
 - Si, 441
 diopside, 319, 332
 dipolar polarizability, 518
 direct exchange, 545–546
 directions in crystals, 39
 - families of symmetry related directions, 39
 dislocation motion, 264
 dislocations, 255
 dispersants, 390
 dispersion, 496–497
 displacive phase transformations, 310, 312, 339
 - cooperative rotation, 340
 - feldspars, 339
 - ferroelectrics, 525–528
 dissolution, 331–332
 distillation, 8
 dolomite, 7, 365
 domain structure, 532–534, 556–558
- double bond, 100
 dry ice, 29
- e/a* ratios, 151
 earthenware, 331
 edge dislocations, 262
 - motion, 566
 edge-sharing, 130, 211, 496
 effective masses, 473
 Einstein equation, 444
 elastic compliance, 408, 563, 570
 elastic deformation, 563, 570
 elastic stiffness, 403, 563, 570, 572
 elasticity, 403
 elastomers, 204
 electrical conduction, 459
 electrical conductivity, 401, 459, 464
 electrical resistivity, 464
 - Cu, 466
 - Cu_3Au , 468
 - metals, 467
 - Si, Ge, 354
 electrochemical series, 453
 electromagnetic wave, 493
 electron density map
 - LiF, 120
 - Si, 99
 electron hopping, 110
 electron mobility, 110
 electron spin, 541
 electronegativity, 20
 electronic polarizability, 494–495, 497, 517
 electrostatic bond strength, 210, 302, 307, 339
 emerald, 317, 507
 energy band diagram, 473
 energy bands, 459, 463
 Engel, 152
 enstatite, 309, 332
 entropy, 290, 343, 345, 347–350, 561
 epitaxy, 391, 393–394
 ethylene, 100
 ettringite, 376
 extinction coefficient, 492
- face-centered cubic, 144, 350, 417
 face-sharing, 130, 211, 496
 fergusonite, 396
 fayalite, 243, 332
 FCC, 144, 350, 417
 F-center, 514
 Fe_2O_3 , 7, 155, 478
 Fe_2SiO_4 , 243, 332
 Fe_3C , 158
 Fe_3O_4 , 7, 155, 391, 507, 551
 $\text{Fe}_3\text{Si}_2\text{O}_5(\text{OH})_4$, 332
 Feldspar, 4–5, 333, 339
 FeNb_2O_6 , 105
 FeO , 131, 252, 392, 548

- FeOOH, 50
 FePt, 558
 Fermi energy, 467–468, 472, 474
 Fermi–Dirac distribution, 467, 489
 ferrimagnet, 545, 551
 ferrite, 156–157, 369
 ferroelectric, 516, 524–525
 ferroelectric domain walls, 532–533
 ferroelectric domains, 532
 ferromagnet, 544
 ferromagnetism, 153, 544
 FeS, 488
 FeS₂, 50, 131, 141
 FeTiO₃, 137, 553
 fiber toughening, 580
 flame-retardant polymers, 205
 flocculants, 390
 fluorescence, 508
 fluorescent lamps, 235
 fluorite, 26, 132, 135, 579
 forsterite, 243, 309, 316, 332
 fossil fuels, 12
 free energy, 343, 351
 freezing, 8
 Frenkel defects, 257, 444
 friction, 582–583, 590
 Friedrich–Mayer rules, 477
 frothing agents, 389
 fuel cells, 453
 proton-exchange membrane fuel cell, 454
 solid oxide fuel cell, 454

 GaAs, 113, 163, 393, 472, 495, 498
 galena, 131
 GaN, 112–113, 495
 garnet, 316, 554
 gas, 272
 gas storage, 248
 gasoline, 13
 Gd₂O₂S, 509
 Gd₃Fe₅O₁₂, 554
 GdScO₃, 138
 Ge, 472, 571
 Ge₂Sb₂Te₅, 360
 GeMg₂, 134
 GeO₂, 111, 298
 geometrical representations of the physical properties, 406
 germanium, 101, 111
 gibbsite, 7, 322
 glass, 289–290, 294
 glass transition temperature, 191, 289, 298, 300
 glaze, 303
 glucose, 291
 glycine, 394
 goethite, 50
 grain boundaries, 267

 graphene, 116
 graphite, 28–29, 99, 115, 578, 588
 gray tin, 108
 greenockite, 105
 grinding, 588
 Grotthus reaction, 480
 Group-subgroup relations, 89, 339
 gypsum, 7, 17, 26, 334, 363, 375, 578

 H₂O, 7, 19, 286
 hafnia, 134
 Hagg's rule, 156
 halite, 7, 17
 hard magnet, 558
 hardness, 25, 27, 101
 Mohs hardness scale, 25
 Hastelloy, 162
 hausmannite, 343
 HCP, 144, 153, 350
 heat capacity, 414
 heat of combustion, 178
 heat of evaporation, 281
 heat of fusion, 281
 heat of vaporization, 35, 178
 hematite, 7
 hemimorphite, 332
 Hermann–Mauguin notation, 79–80
 hexagonal close-packing, 64, 144, 153, 350
 HfO₂, 134
 HgS, 10, 503
 high spin, 228, 355
 hollandite, 455
 HOOC)C₆H₄–OC(O)CH₃, 174
 Hume-Rothery, 151–153, 164, 245
 Hund's rules, 542
 hydration of cement, 372
 hydrides, 181
 hydrogen, 180
 hydrogen bond, 17, 19, 169, 172, 182, 188, 323, 364
 hydrolysate, 335
 hydronium ion, 181
 hydrophilic, 287, 389, 585
 hydrophobic, 287, 389, 585
 hydroxyl, 181

 I. David Brown, 216
 ice, 7, 17, 19, 181–182, 184, 284, 288, 346, 356, 528
 entropy, 347
 ilmenite, 137, 553
 incongruent dissolution, 332
 indigo, 508
 infrared vibration, 500
 insulators, 459, 471
 interaxial angles, 39
 intermetallic compounds, 162
 interstitial, 256
 interstitial solid solutions, 248
 Invar, 424

- ion
 - d¹⁰ ions, 123
 - lanthanide ions, 122
 - noble gas core ions, 122
 - Rydberg ions, 123
 - transition metal ions, 123
- ionic bond, 15, 18–19, 120, 571
 - attractive force, 120
- ionic bonding, 571
- ionic conductivity, 439, 444, 446
 - oxides, 443
 - polymers, 450
- ionic polarizability, 501, 518
- ionic potential, 335
- ionic radii, 123
- ionization potentials, 21
- ionomers, 454
- iron, 7, 144, 154, 245, 392
 - diffusion coefficients, 441
 - magnetic hysteresis loop, 558
 - magnetization, 548
 - pressure–temperature phase diagram, 149
- isolated silicates, 316
- isomorph, 45, 51
- isotactic, 192

- jadeite, 378
- Jahn–Teller, 231, 343
- jennite, 364, 374

- K₂O, 7, 134
- K₂PtCl₆, 135
- KAl₂(AlSi₃O₁₀)(OH)₂, 7, 309, 323, 332, 578
- KAlSi₃O₈, 7, 309, 333, 339
- kalsilite, 314
- KAlSiO₄, 314
- kaolinite, 7, 17, 309, 321, 323, 332, 334
- KCl, 7, 131, 496
- keatite, 304
- Keesom energy, 188
- Keesom forces, 170
- Kempster–Lipson rule, 62
- KH₂PO₄, 528
- Kier’s rule, 46, 171
- KMg₃(AlSi₃O₁₀)(OH)₂, 323
- KNa₃Al₄Si₄O₁₆, 314
- Koch clusters, 261
- krauskopfite, 319
- Kröger–Vink notation, 255, 257
- kyanite, 316

- LaB₆, 471
- LaFe₃CoSb₁₂, 433
- LaNi₅, 249, 451
- LaNi₅H₆, 249
- LaOBr, 509
- lasers, 112, 393, 508
- latent heat, 274–275

- lattice, 73
- lattice parameters, 39
- Laves phases, 164, 560
- layer silicates, 321, 503
- leaching, 332
- lead, 252
- Li_{0.5}Fe_{2.5}O₄, 562
- Li₂O, 134
- LiAl(SiO₃)₂, 332
- LiAlSiO₄, 314
- LiBr, 274
- LiCl, 274
- LiClO₄, 450
- LiCO₂, 447
- light-emitting diodes, 112
- LiI, 274
- like wets like, 364, 387–388
- lime, 7, 131, 363
- limestone, 155
- LiNbO₃, 137, 531
- Linde A, 396
- Lindemann, 35
- line defects, 255
- liquid, 277
- liquid crystal, 356, 504
- liquid crystal display, 504
- lithia, 134
- lithophile, 8–9
- London forces, 169
- lonsdalite, 164
- low spin, 229, 355
- lubricant, 586–587
- lubrication, 583

- MACOR, 581
- Madelung constant, 121–122
- Magneli phases, 262
- magnesia, 7
- magnesite, 7, 365
- magnesium, 150, 246
 - diffusion coefficients, 442
 - slip, 565
- magnetic dipole, 541
- magnetic domain walls, 541, 556–557
- magnetic domains, 541, 556
- magnetic spin, 349
- magnetism, 541
- magnetite, 7, 391, 477, 507
- magnetization
 - Fe, Ni, 544
- magnetocaloric materials, 560
- magnetoplumbite, 65
- magnetostriction, 557, 560
- martensite, 157
- matlockite, 394
- mean free path, 272
- mechanical stiffness, 190
- Meissner effect, 482

- melting point, 28, 32, 183, 440
 alkanes, 178
 ionic crystals, 29
 metals, 30
 semiconductors, 31
 small molecules, 30
 thermal expansion, 35
- meso diads, 192
- metakaolin, 328
- metal, 460
- metal-to-semiconductor transitions, 108
- metal-insulator transitions, 481
- metallic bond, 17–19, 144
- metallic glass, 303
- metallic radii, 245
- metals, 462
 conducting oxides, 470
 electron configurations, 151
 habit planes, 160
- methane, 13, 181
- Mg(OH)₂, 322
- Mg₂Al₄Si₅O₁₈, 249, 317, 422
- Mg₂Pb, 134
- Mg₂Si, 134
- Mg₂SiO₄, 243, 309, 316, 332
 pressure, 333
- Mg₂Sn, 134
- Mg₃(Si₄O₁₀)(OH)₂, 332
- Mg₃Al₂Si₃O₁₂, 247
- Mg₃Si₂O₅(OH)₄, 323
- Mg₃Si₄O₁₀(OH)₂, 323
- MgAl₂O₄, 139, 238, 250, 551
- MgB₂, 482, 484
- MgCO₃, 7, 247, 365
- MgFe₂O₄, 551
- MgO, 7, 29, 108, 122, 131, 238, 247, 575
- MgSiO₃, 213, 309, 332, 353
 pressure, 333
- MgTe, 105
- mica, 4, 7, 309, 324, 578
- microwave absorption, 520
- Miller indices, 41
- miscibility, 238
- Mn₂O₃, 231
- Mn₃O₄, 343
- MnFe₂O₄, 551, 562
- MnO, 562
- mobility, 465
- modifier, 296
- molecular crystals, 169
- molecular packing, 172
- molecular weight, 189
- molybdenite, 588
- monomers, 189
- montmorillonite, 334
- Mooser and Pearson, 108
- morphology, 39, 45, 321
 crystal growth, 47
 diamond, 101
 rutile, 49
 snowflake, 51
- MoS₂, 588
- mullite, 329
- muscovite, 7, 309, 323, 332, 578
- (NH(CH₂)₅CO)_n–, 199
- Na_{1/2}Bi_{1/2}TiO₃, 528
- Na₂B₄O₅(OH)₄ · 8H₂O, 296
- Na₂O, 7, 134, 292
- Na₂O · 11Al₂O₃, 448
- Na₃(CO₃)(HCO₃) · 2H₂O, 7
- NaAlSi₃O₈, 7, 247, 332, 339
- NaCl, 7, 17, 213, 220, 496, 579
 X-ray diffraction pattern, 45
- NaF, 571
- nafion, 456
- NaH, 181
- NaNO₂, 525
- naphthalene, 175
- narsarsukite, 320
- NaZr₂(PO₄)₃, 423
- Nd₂Fe₁₄B, 558
- Néel temperature, 555
- neoprene, 203
- nepheline, 314
- nephrite, 378, 580
- network former, 295
- Neumann's Law, 401, 403, 409
- NH₄Cl, 346
- Ni₃Al, 163
- NiAs, 58, 211, 220
- nichrome, 162
- nickel, 144
- NiFe₂O₄, 551
- NiMgBi, 134
- NiMnO₃, 553
- NiMnSb, 134
- NiO, 211, 478
- NiOOH, 451
- non-bridging oxygen, 294
- nonlinear optics, 510
- Nordheim's rule, 465
- ocean, 8
- octahedral layer, 322
- octahedral site preference energy, 552
- oleic acid, 287
- olivine, 316, 334
- optical activity, 503
- optical indicatrix, 502
- optical properties, 492
 metals, 497
- optical rotatory power, 504
- orbital shape, 224

- orbitals, 225
 order–disorder, 341, 345, 466, 525
 organometallic molecules, 185
 orthoclase, 7, 26, 309, 339
 oxidation of metals, 390
- P_2O_5 , 298–299
 packing efficiency, 176
 paint, 505
 pair silicates, 317
 paraffins, 494
 paramagnet, 544
 Pauli exclusion principle, 542, 549
 Pauling, 152, 172
 Pauling's rules, 208, 215
 p-azoxyanisole, 356
 PbFCl, 394
 PbI_2 , 442
 PbO, 29, 221
 PbS, 131
 $PbTiO_3$, 525
 $PbZr_{1-x}Ti_xO_3$. *See* PZT
 pearlite, 157–158
 pentacene, 175–176, 479
 pentane, 179
 periodic table, 3
 permeability, 204
 perovskite, 137, 525, 530, 536–537
 phase change memories, 359
 phase diagrams, 237
 BaO–NiO, 239
 CaO–MgO, 239
 Fe–Ge, 240
 Fe–C, 158
 KCl, 361
 Li_2MoO_4 – MoO_3 , 239
 MgO– Al_2O_3 , 250
 MgO–NiO, 239
 Pb–Sn, 252
 PZT, 537
 SiO_2 , 310
 SrO–BeO, 239
 SrO–MgO, 239
 phase transformations, 338, 343, 571
 $BaTiO_3$, 530
 heat capacity, 416
 martensitic, 340
 phenacite, 220, 332
 phenakite, 220, 332
 phenanthrene, 177
 phenolic resins, 198
 phlogopite, 323
 phonons, 426, 464–465
 phosphate glass, 298
 phosphors, 233, 235, 508–509
 photoconductivity, 510–511
 photon, 431, 495, 498
- piezoelectricity, 403, 409, 516, 524, 534
 ZnO, 536
 pigments, 506
 Pilling–Bedworth ratio, 392
 pizza, 417
 planar defects, 255, 267
 planes, 41
 family of symmetry-related planes, 41
 Plaster of Paris, 375
 plastic crystal, 356, 358
 plastic deformation, 267, 563–564
 polymers, 574
 plasticity, 327
 point defects, 255, 347
 point groups, 79
 space group to point group conversion, 87
 Poisson's ratio, 563, 570
 Polarization–electric field hysteresis loop, 532–533
 polarization mechanisms, 517
 polaron, 476
 polishing, 588
 poly(3-hexyl thiophene), P3HT, 480
 poly(vinylidene fluoride), 197
 polyacetylene, 478
 polyaniline, 479
 polyethylene, 189, 191, 193, 478
 polyethylene oxide, 450
 polyethylene terephthalate
 birefringence, 503
 polyethylene terephthalate, 193, 198
 polyfuran, 479
 polyisobutylene, 285
 polyisoprene, 201
 polymers, 169, 189, 347
 polymorph, 45, 51, 312, 314, 343, 351
 pressure, 333
 polypeptide, 199
 polypropylene, 192, 194
 specific heat, 418
 polypropylene oxide, 450
 polypyrrole, 479
 polystyrene
 elastic modulus, 574
 polytetrafluoroethylene, 193
 polythiophene, 479
 polytype, 51
 polyvinylchloride, 192
 porcelain, 331
 Portland cement, 335, 363–364, 366, 371, 375, 378
 portlandite, 7, 181
 potash, 7, 134
 precipitation hardening, 265
 pressure, 351–352, 354
 pseudomorph, 50
 PVDF, 197, 530
 PYREX, 302
 pyrite, 50, 131, 141

- pyrochlore, 449
 pyroelectricity, 402, 404, 407, 516, 524, 534
 pyrolusite, 455
 pyrophyllite, 323
 pyroxene, 4, 318
 pyroxenoid, 319
 pyroxferroite, 319
 pyrrhotite, 254
 PZT, 537
- quantum mechanics, 459
 quartz, 4, 7, 26, 309–310, 314, 332, 334, 423,
 536–537
 morphology, 46
 quinquiphenyl, 358
- racemic, 192
 radii, 69
 covalent radii, 69
 ionic radii, 70
 metallic radii, 69
 van der Waals radii, 70
 Ramberg's rules, 140
 ramsdellite, 455
 reconstructive phase transformations, 310, 312,
 338–339
 Cu₃Au, 341
 feldspars, 339
 refractive index, 492–493, 503
 refractory, 329
 relations between zone axes and planes, 42
 intersecting planes, 43
 orthogonality, 42
 parallelism, 43
 resistates, 335
 Retger's law, 244
 reverse osmosis, 8
 ring silicates, 317
 rocksalt, 7, 16
 hardness, 27
 Madelung constant, 121
 morphology, 46
 substitutional solid solution, 244
 roofing tiles, 329
 rubber, 192, 200
 ruby, 232, 514
 Ruddlesden–Popper, 486
 rules of thumb, xi
 RuO₂, 471
 rutile, 86–87, 105, 212, 506
 morphology, 46
- sanitary ware, 331
 sapphire, 394
 Sb₂O₃, 506
 Sc₂Si₂O₇, 309, 317
 scapolite, 52
 scattering, 464
- scheelite, 508
 Schoenflies notation, 79–80
 Schottky defect, 257, 444
 screw dislocations, 262, 265
 Se, 503
 sedimentary minerals, 334–335
 Seebeck coefficient, 432
 selection rules, 234
 semiconductors, 106, 459–460, 471, 474, 510
 controlled valence, 478
 electron hopping, 476–477
 extrinsic, 474–475
 intrinsic, 474
 n-type, 474
 organic, 479
 p-type, 474
 sensors, 480
 serpentine, 323
 Shannon–Prewitt radii, 124, 209, 335
 shear modulus, 570
 shear thinning, 586
 sheet resistance, 471
 short-range order, 247, 277
 Si, 151, 472
 optical properties, 501
 SiC, 112
 siderophile, 8–9
 silica, 308, 592
 silica glass, 292
 silicates, 4, 307
 silicon, 101, 110
 band structure, 107
 diffusion coefficients, 441
 electron density map, 99
 surface reconstruction, 50
 siloxane polymers, 199
 single bond, 100
 SiO₂, 111, 291, 299, 307–309, 332
 optical properties, 501
 site occupancy, 551
 slip, 154, 264, 565
 directions, 566
 ionically bonded solids, 569
 slip system, 154
 small molecule crystallography, 172
 SmCo₅, 558
 SmSe, 355
 snowflakes, 50
 soda, 7, 134
 sodalite, 396
 sodium, 144
 soft magnet, 558
 solar cells, 113
 solder, 252
 solubility, 203
 sorensonite, 319
 space charge polarizability, 518
 space groups, 85, 87, 131

- specific heat
 Fe, 415
 iron oxides, 415
 polymers, 417
 sphalerite, 118. *See* zincblende
 spinel, 139, 316
 ferrites, 550
 inverse, 551
 magnetization, 553
 normal, 551
 random, 551
 vacancy, 551
 spodumene, 332
 spontaneous polarization, 516, 525
 SrRuO₃, 561
 SrTiO₃, 137, 573
 stabilized zirconia, 449
 stacking fault, 268
 stannite, 104
 steel, 7, 154, 248
 processing regimes, 159
 time–temperature–transformation curve, 160
 stereographic projection, 88, 90, 524, 538
 stiffness surface, 576
 stishovite, 310
 stoichiometric defects, 257
 stoneware, 331
 straight chain, 191
 straight-chain hydrocarbons, 173
 stranded phases, 314
 structure-field map, 219
 A₂BX₄, 220
 AX, 220
 stuffed derivatives, 314
 styrene–butadiene rubber, 201–202
 sublimation, 274
 substitutional solid solution, 238, 243, 247
 coupled solid solution, 247
 sucrose, 46, 170
 superconductivity, 482, 487
 superconductor, 483
 superexchange, 548, 550, 553, 557
 superionic conductors, 445
 surface energy, 385
 surface reconstruction, 382, 384
 surface tension, 286
 surfaces, 382
 surfactants, 287, 389, 584, 586
 Swalin's rule, 442
 sweetness, 46, 171
 sylvite, 7, 131
 symmetry, 73, 403–404, 545
 symmetry elements
 center of symmetry, 76, 83, 88, 404
 diamond glide, 78
 glide plane, 78
 inversion center, 76, 84
 mirror plane, reflection, 75
 net plane, 78
 rotation, 54, 75, 81, 83
 rotoinversion axis, 78
 screw axis, 77, 503
 time reversal, 545
 translation, 73
 syndiotactic, 192
 tacticity, 192
 talc, 26, 323, 332
 taramellite, 318
 Tb_{1-x}Dy_xFe₂, 164
 Teflon, 193
 tensile strength, 300
 tensor properties, 402, 404
 Terfenol-D, 164, 560
 tetracalcium aluminoferrite, 369
 tetraethylorthosilicate, 185
 tetrahedral layer, 322
 thermal conductivity, 425
 C, Si, Ge, 428
 glass, 429
 inorganic materials, 428
 KCl, 436
 mechanisms, 426
 metals, 432
 polymers, 430
 thermal expansion, 300, 418
 Au, W, 420
 metals, 424
 spinel, 437
 thermal expansion coefficient, 403–404
 bond strength, 421
 ionic polyhedra, 422
 negative, 425
 open crystal structures, 422
 polymers, 421
 quartz, 424
 thermal shock, 423
 thermal vibration, 348, 412
 thermistors, 481
 thermoelectricity, 432
 thermoplastics, 192
 thermosets, 192
 ThO₂, 134
 thoria, 134
 thorveitite, 309, 317
 Ti₂O₃, 469
 Tin, 68
 TiO, 251
 TiO₂, 212, 497, 506
 tobermorite, 372
 toluene, 291
 topaz, 26, 316
 topotaxy, 394
 toughness, 576–577, 579
 tourmaline, 534

- transformations between cells, 56
 transition metals, 152–153, 469
 traskite, 318
 tremolite, 309, 320
 tricalcium aluminate, 368
 tricalcium silicate, 363, 378
 tridymite, 62, 288, 310, 346
 triphenylene, 358
 triple point, 275
 trona, 7
 Trouton's rule, 351
 tuhualite, 320
 tungsten carbide, 567
 twins, 268
- unit cell, 39, 55
 volume, 44, 58
 UO₂, 134
 uraninite, 134
 Urbach tail, 499
- V₂O₃, 109
 V₂O₅, 217
 vacancy, 256
 vacancy solid solutions, 250
 van der Waals bonds, 18–19, 169, 173, 179, 182,
 282, 578
 van der Waals radii, 172, 176–177, 195
 vapor pressure, 274
 Vegard's law, 244
 Verwey transition, 476
 vibration amplitude, 413
 viscoelasticity, 575
 viscosity, 284, 289, 299
 vitreloy, 304
 VO₂, 109, 469, 481
 volume, 43, 57, 344
 volume defects, 255
 von Mises criterion, 154, 566
 vulcanization, 202
 VYCOR, 302
- Waller's rule, 286
 water, 181–182, 185, 522
 dielectric permittivity, 539
 WC, 567
- wear, 582
 weathering, 592
 Weidemann–Franz law, 430
 wetting, 387
 white tin, 108
 willemite, 332
 wollastonite, 333, 378
 work hardening, 264
 wurtzite, 51, 105, 181, 268, 353
 wustite, 131, 251, 391, 548
- xonotlite, 320
- Young's modulus, 563, 570
- Zachariasen's rules, 291, 294
 zeolites, 396, 399
 Linde A, 396
 molecular sieves, 397
 sodalite, 396
 zinblende, 51, 102–103, 268
 zincite, 105
 zircon, 52, 290, 316, 332
 thermal expansion, 435
 zirconia, 134
 Zn₂SiO₄, 332
 Zn₄Si₂O₇(OH)₂ · H₂O, 332
 ZnFe₂O₄, 551, 553
 ZnO, 105, 506
 ZnS, 102, 163, 389
 ZrO₂, 134
 ZrSiO₄, 290, 332
- β-quartz, 304
 β-spodumene, 304
 α-Al₂O₃, 7, 267
 α-NaAlSiO₄, 314
 α-NaFeO₂, 222
 α-quartz, 136, 536
 β'-CuZn, 163
 β-AlNi, 163
 β-alumina, 448
 β-eucryptite, 314
 β-Ni(OH)₂, 451
 β-NiZn, 163
 γ-Fe₂O₃, 551, 558, 562