CAMBRIDGE

Cambridge University Press
978-1-108-42210-9 — Fundamentals of Rock Physics
Nikolai Bagdassarov
Index
More Information

Index

abrasive sliding wear, 163
acceptors, *314–315*, *326*
  deep, *315*
  shallow, *315*
acoustic limit, 269
activation volume, *321–323*
  electrical conductivity, 322
adhesion
  Bowden–Tabor model, *164–165*
  forces, *60*
  parameter, 164
adhesive friction, 164
adhesive wear, 163
age-dating, *2*, *5*, 525, 532, 534
  formula, 532
Amagat's law, 55
Amon–Coulomb law, *98*
Amott index, 47
Ampere law, 376
Anderson–Grüneisen parameter, 481
  thermal, 482
anelasticity, 155
Ångström method, *483*, *485*
angularity, 16, 17
anisotropy
  axis, *275*, *449*
  crystal, *125*
  degree, *281*
  dumbbell interstitial, 302
  elastic waves, 275
  electrical conductivity, *319*
  factor, 281
  flowage, *276*
  hexagonal, *280*
  hexagonal symmetry, *284*
  layering, *219*
  magnetic, *439–443*, *447*
    bulk, 440
    constant, 439, 440
    energy, 439, *442*, 442, *447*
    field, *449*, *450*
    uniaxial, *449*
  orthorhombic symmetry, 129, 276, 277, 279, *284–286*
  orthotropic, *136*
  parameters, *275*
  small-polaron mobility, 319
  stress field, *275*
  transversal, *121*
  weak, 275
anodic oxidation, 389, 391
antibonding, *430*, 435
antiferromagnetism, *433–437*, 448
aperture, 68
aquicludes, 68
aquifers, 68, *211*, 213, 496
aquitards, 68
Archie's exponent, *473–474*, 475
Archie's law, *346–348*
  modified, 349
  second, 351
Argand plots *Nyquist plot*
arithmetic mean, *28*, *38*, *68*, *72*, *137*, *138*, *196*, *259*, *334*, *335*, *345*, 346, *398*, 400, *449*
Arrhenian temperature dependence, 297, 314
Arrhenius equation, 297, 300, 305, 314, 325, 386
aspect ratio, 16, 123, 124, 147, 186, 192, 233, 235–238, 260, 270, 276, 473, 474
asperity
  basement area, 165
  contacts, 164
  curvature radius, 164
  mean lifetime, 165
Aston isotopic rule, 508
asymmetric function, *383*
asymmetrical super-exchange, *434*, 435
autorun analysis, 73
averaging
  scale, *183*
  volume, *142*
Avogadro constant, *37*, *51*, *420*, 462, *466*, 508

band diagram MgO, 315
band gap, 300, 307–315
  energy, 315
band parameter, 297
band structure, *309*
band tailing, *300*
band widening, *300*
Barenblatt model, 105
Barkhausen jumps, *438*
Barkhausen noise, *439*
Bayes' theorem, 73
bed of nails concept model, 189
BET (Brunauer, Emmett and Teller), 18, *49*, 51, 54
  theory, *51*
Bethe lattice, *76–80*
Bethe–Bloch equation, *529*
Bethe–Weizsäcker equation, 507
binding
  energy, *505–508*
    average, 506
    isobaric, 507
    nuclear, 507
    per nucleon, 506, 507
    small-polaron, 317
  forces, *60*, *93*, *114*
  potential, *175*
bioherms, *9*
Biot coefficient, 214, 216, 228, 255
  dynamic, 215
  static, 215
Biot–Gassmann poroelastic theory *see also* Biot–Gassmann theory

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-108-42210-9 — Fundamentals of Rock Physics
Nikolai Bagdassarov
Index
More Information

Biot–Gassmann theory, *255*
Biot–Savart law, *376*
Birch's law, *252*, *287*
Bloch (Néel) walls see Bloch walls
Bloch walls, *441–442*
blocking electrodes, 393
blocking temperature, *446–447*
Bode diagram, *330*
body-centered cubic (*bcc*)
  packing, 342
Bohr radius, *423*
Boltzmann's constant, 182, 297, 317, 420, 462
Boltzmann's law, 305
Boltzmann statistics, 157
bonding
  between Si and O, *386*
  Fe and O, 433
  hydrogen, 60, 324
  π-, *429*
  σ-, *429*
Boolean model, 197
Boolean spheres, *198*, *201*
bound charges, 329, 361, 362
bounds
  effective moduli, *141*
  permeability, *198*, *201*
  upper and lower, 67, *68*, *196–197*, 335
    dielectric constant, 401
    permeability, 196, 197
    transmissivity, 196
  Wiener upper and lower, *142*
Bragg's additivity principle, 530
Bragg–Kleeman rule, 517
branching ratio, 534
Brazilian test, 101
bremsstrahlung, *526*
Brewster angle, *398*
brick model, *344–346*
Bridgman equation, *466*
Bridgman parameter, *467*
bridgmanite, *494*, 494
Brillouin function, *424–426*
Brillouin zone, *307–311*
  boundary, *309–311*
  first, *307–311*
Brinkman equation, 180, 195, 198
Brinkman permeability equation, 197
brittle behavior, 94
brittle–ductile transformation, 160
Brooks and Corey permeability–saturation relationship, 183
Brooks–Corey empirical parameter, 183
Brouwer defect, 316
Brouwer isotherm, 322
Brouwer's diagram, 316, 322
  Mg_2SiO_4, 317
Bruggeman generalized equation, 339
Bruggeman mixing model
  asymmetrical (ABM), *401*
Bruggeman scheme, 473
Bruggeman symmetric mixing model (SBM), 402
bulk modulus, 121, *131–151*, 202, *213–223*, 235, 255, 260–269, 275, 457, 469, 481
  adiabatic, 466
  isothermic, 467
  single pore space, 235
Burgers vector, *94–158*
Burridge–Knopoff stick-slip model, 168, *169*
Butler–Volmer equations, 391

$CaCl_2$-type structure, 493
calcium-aluminum rich inclusions, CAI, 2
capacitor
  cation exchange, 350
  parallel plate, 327, 328, 379, 380
capillary
  bound water, 29
  channel, 45, 59
  filling, 46
  flow porosimetry, 18, 54
  forces, 29, 43, 45, 64
  hysteresis loop, 186
  meniscus, 45
  pore space, 45
  pressure, *45–47*, 57–60
  radius, 60, 353
  saturation, 45
  suction, 60
  wetting liquid, 59
Cartesian coordinates, 85, 151, *198–199*, 229, 373, 374, 458
Cartesian reference frame, 117
cataclase, 105, *169*
cathodic reduction, 391
cell
  body-centered cubic (*bcc*), 35, 38
  cylindrical, 192
  elementary, 30, 191, 307, 339, 344, 367
  face-centered cubic (*fcc*), 38, 308
  primitive cubic, 38
  reciprocal lattice, 308
  simple cubic (*sc*), 38, 308
cementation, 33, 60, 184, 189, 195, 258, 287, 346, 347, 398
  exponent, 347
  impact, *189*
Chapman model, 381
charge
  "magnetic," 376
  accumulation, 370, 406
  density, 375
  electric, 115, 292, 305, 310, 328, 350, 352, *363–372*, 394, 418
    transfer, 327, *388–393*
  ionic, 408
  point, 375
  point of zero (PZC), 387
  polarization, 327, 407
  probe, 362, 377
  relaxation time, 370, 408
  space, 367, 379, 380, 396, 405
  surface, *379–383*, 386–388
  unit, 377
  volume, 404
charge compensated reaction, 315
chargeability of rocks, 406, 408
  apparent, 404, 405
  Table, *406*
charged particles
  "friction force," 371
  bound nonfree, 329
  displacement, 371
  free electrically, 328, 329
  gradient of concentration, 305
  local concentrations, 60
chemical potential, *55–57*, 307, 315, 319, 386, 387, 466
  adsorbed particles, 55
  surface, 55
Chephren's Pyramid, 527
chondrules, 2, 3
Christoffel equations, 282
Christoffel matrix, *276–281*, 285
Clapeyron slope, 491
Clausius virial theorem, *480*
Clausius–Mossotti equation, 377
  generalized, 339
Clausius–Mossotti relationship, 378, *379*, 399
cleavage, 6, *96–98*, 104–106, 116–117
  plane, 94, 104–106, 116, 117
coarse-grained, 6
Coble creep, 159
coefficient
  diffusion, 158, 224, 303–307, 391, 464, 528
  effective pressure transfer, 202
  electric resistance thermal, 358
  emanation, 531
  friction static, 163
  heat exchange, 496
  reflection, 255
  thermal expansion, 12, 38, 144, 146, 203, 455, 457, 481, 482, 488, 495
coercive force, 439, *445–447*, 450
  Table, 440
coercivity, 443

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-108-42210-9 — Fundamentals of Rock Physics
Nikolai Bagdassarov
Index
More Information

coherent potential (CP) formula, 402
Cole–Cole equation, 363
Cole–Cole relaxation model, 393, 405, 406
compaction, 33, 60, 66, 184, 346, 347, 488
  coefficient, 33
  grain, 347
  mineral grain, 66
  pores, 346
compressibility, 15, *30–33*, 38, 125, 147, *186–188*, 203, 212, 213, 224, 235–237, 242
  bulk, 30, 31
  pore, 238
  pore volume, 33
  rock bulk, 33
  rock matrix, 33
compressive strength, 93, 95, 98
  unconfined, 93
concentration gradient, 305, 391
conduction
  effective-medium cell, 340
  heat, 455, 456, 461
    lattice, 461
  impurity, 297
  intrinsic, 297
  ionic, 373
  pore paths, 407
  protonic, *323*
conduction band, *296–300*, 312, *466*
  (LUMO), *298*
  DC, *315*, 317
conductivity
  hydraulic, 80, *178–179*, 207, 210, 224
  mechanism
    ionic, 303
conductivity electric
  limiting molar, 333–334
constant phase element (CPE), 330
contact angle, *44–47*, 52, 57, 59, 62
continuity
  conductive phase, 338
  normal component (EM field), 397
  tangential component (EM field), 397
  thermal energy, 459
  wetting phase, 57
continuity equation, *223*, 224, 459
convex
  hull, 16
  index, 16
  perimeter, 16
coordinate scale factors, 231
corner angle, 57
correlation length, 76, 79, 80, 343
cosmogenic source, 523
Coulomb attraction, *380*
Coulomb interaction, 507, 526
Coulomb per kilogram, *520*
Coulomb's field, 320, 432
  strong, *432*
  weak, 432
Coulomb's force, *377*, 529
Coulomb's friction concept, 163
Coulomb's law, 114, 368, 375
Coulomb's potential, *361*
counterions, 350, 354, 382
  concentration, 349, 351
creep, 154
  aseismic, 169
  diffusion, *157*
  dislocation climb, 157
  dislocation glide, 156
  logarithmic law, 156
  pressure-solution, 159
  primary, 154, 155
  secondary, 155
  steady-state, 154, 156
  strain rate, 154
  tertiary, 154
  transient, 155, 156
critical tip opening displacement concept (CTOD), 107
crowdion, 302, 304
crystal field
  splitting, *430–432*
  stabilization energy (CFSE), 432
crystallographic axes, 379, 439, 458
crystals
  allotriomorphic, 6
  anhedral, 6
  antiferromagnetic, 449
  cubic, 467
  euhedral, 6
  flowage, 275
  idiomorphic, 6, 10
  ionic, 297, 301, 317, 367
  magnetic, 445
  olivine, 276, 319
  preferred orientation, 10
  slip plane, 169
  symmetry group, 122
  xenomorphic, 6, 10
cumulative curve, 15
cumulative distribution function, 20
curie (Ci), 509
Curie constant, 422, 424, 448
Curie temperature
  Table, 423, *437–440*, *445–449*, 470
Curie–Weiß law, 422

dalton, 506
Dalton's law, 55
Darcy equation, 178, 197
Darcy flow, 181, 189, 196, 198, 206
Darcy law, 178–181, 192, 202, 212, 223
Darcy velocity, 178–181, 193, 196, 460
daughter isotope, 525, 532, 534
daughter nuclides, 511
de Moivre's theorem, 251
Debye approximation, 479
Debye distribution model phonons, 462
Debye frequency, 477, 479
Debye length, 380, 382
Debye model, 366, 393, 405, 465, 479
  truncated, 465, 466
Debye phonon density, 465
Debye relaxation law, 363, 364
Debye relaxation peak, 372
Debye temperature, 461, 462, 467, 469, 476, 477, 479, 482
decay branching, 515
decay law, *508–509*, 532, 534, 535
defect
  charged, 387
  electrically active, 314
  extrinsic Frenkel, 300
  Frenkel pair (FP), 301
  hydrogen, 326
  hydrogen neutral, 325
  intrinsic, 314
  intrinsic Schottky, 300
  lattice, 323, 461, 521
  point, 151, 301, 302, 315
  proton, 325
  Schottky, 301, 316
  structural, 98
deformation mechanism maps, 158
demagnetization factor, 443–446
density, 5, 9, 15, 17, *28–29*, 180, 375
  air, 223
  atomic, 464
  bulk, 28
  bulk electron, 37
  calculations, 42
  carrier, 320
  charge, 354, 368, 375, 381
    electrons, 310
    surface, 371, 380, 383, 386
    volume, 383
  charge carrier, 302
  charge carriers, 300, 307, 362, 363
  clay minerals, 60
  crack parameter, 237
  current, 292, 305, 306, 329, 332, 372, 390–392, 395
  depth, 30
  dislocation, 156
  dislocations, 157
  distribution normal, 20
  dry, 400
  effective, 66
  electric current, 336, 376

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-108-42210-9 — Fundamentals of Rock Physics
Nikolai Bagdassarov
Index
More Information

density (cont.)
electromagnetic field, 395
electron, 300, 429
states, 294–300
states effective, 300, 314, 315
energy, *250–252*, 442
elastic, 320–322
electromagnetic waves, 394
polarization, 320–322
fissure tracks, 525
fluid, 213, 220
flux, 391
fracture filling, 28
fractures, 69
granite, 144
hydrostatic pressure, 45
ice, 277
intrinsic charge carriers, 300
magnetic flux, 414, 415
mean, 38, 42
mineral mixture, 257
minerals, 37, 39, 122, 143
momentum, 251
Monte-Carlo, 40
muographic, 528
olivine, 279
percolation, 404
phonon
states, 462–463
phonons, 461, 479
states, 252, 294–295, 300, 306–307, 310, 320, 465, 477–479
porous rocks, 28, 31, 257
pressure dependence, 31
probability, 20
probability function, 71
relativistic, 529
rocks, 37–38, 143, 256, 261, 271, 350, 351, 518, 532
constituent, 28
pressure and temperature, 39
Table, 40
true, 28
vs longitudinal velocity, 252–254
vs mean atomic weight, 255
vs saturation, 269
water, 218, 495
wet, 28
density distribution
pores, 53
detector efficiency, 509
deviatoric stress matrix, 88
diamagnetism, 416, 420
dielectric constant, 5, 115, 292, 327, 328, 363, 372, 378
brine saturation, 367
complex, 327, 329, 364, 372, 403, 405
dielectric contact, 370
effective, 401
effective medium, 401
electrolyte, 380
EMT, 401
frequency dependence, 363, 364, 367
grain boundary (GB), 331
harmonic mean, 401
induced polarization, 406
mapping, 404
minerals, 365
mixing models, 398–403
percolation, 403
polarization, 373
real part, 363
upper and lower bounds, *400–403*
dielectric displacement field, 362
dielectrics, 297, 370, 378
heat transfer, 461
polarization, 361
Dietrich law, 165
Dietrich–Ruina friction law, *165*, 167
differential capacitance, 383, 384
diffusion
creep, 156, 157, 158
diffusive layer capacitor (DLC), 380
dihedral angle, *47–51*
dilatancy onset, 354
dipole moment, 5, 361, 362, 364, 367, 368
induced, 371
direct approach, *138*
direct method of effective moduli calculation, 139
dislocation, *94–98*, 150–152, 154–157, 442, 463, 471, 472
climb, 152, 157
climb mechanism, 156
curvature, 97
density, 472
displacement, 155
edge, 94, 98, 152
glide mechanism, 156
line, 94, 96
screw, 94
slip, 152
disordered structure, 465
displacement field, 170, 292, 363, 370
distance relaxation constant, 165
distribution curve, 15, 16
domain magnetization, 437
domain structure, 438, 441
donors, 314, 315, 326
double exchange, 434, 435
drainage, 28, 46, 47, 58, 59, *213–217*, 219
primary, 46
secondary, 46, 47
Drucker–Prager criterion (DP), 154
ductile behavior, 94
Dugdale model, 106
dumbbell, 302, 428
Dupuit–Theme formula, 210
Dvorkin model unconsolidated sediments, 269
dynamic equation, 282, 371, 478

Earth's shell structure, 2, 3
effective medium approximation (EMA), *336*
effective medium inclusion compliances, 140
effective medium theory (EMT)
thermal conductivity, 473
Einstein frequency, 477, 479
Einstein model, 465, 466, 479, 480
Einstein notation, 135
Einstein phonon density, 465
Einstein temperature, 480
elastic compliance matrix, 125, 126, 135, 137
elastic density constant, 320
elastic modulus, 1, *113–116*, 121, 123, 137–139, 143, 153, 161, 245–247, 250, 272, 274
elastic response, 92, 152, 155
elastic stiffness matrix, 125, 135, 138, 142
elastic wave
acoustic limit, 252
energy, 274
splitting, 12
velocities, 171, *245–262*, 263, 275–276, 280, 398
elasticity
tensor, 280, 281
electric charge
relaxation time, 363, 367
electric conductivity
Drude type, 469
temperature dependence, 302
electric diffuse layer, 379
electric double layer (EDL), 379
electric field strength, 306, 307, 332, 362, 383
electrical conductivity, *292*
electrical double layer (EDL), 60
electrolyte
asymmetric factor, *334*
hydration shell, 379
ionic atmosphere, 333
relaxation effect, *334*
slipping (shear) plane, 379
electromagnetic waves, 252, *393–398*
magnetic field, 398
polarization

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-108-42210-9 — Fundamentals of Rock Physics
Nikolai Bagdassarov
Index
More Information

elliptic, 395
propagation, 402
reflectivity coefficient, 398
TE polarization, 398
time propagation (TP), 398
TM polarization, 398
transmittivity coefficient, 398
transverse, 398
electron
spin, 423
electron model
free, 294, 309, 310, 311
nearly free, 309, 311
electron positron pairs, 526
electron shells, 426
electronic semiconductors, 297
electron-positron pair production, 526
electrophoretic drag force, 334
elliptic crack, 236
elliptical coordinates, *229–233*
elongation ratio, 16
empty lattice approximation, 309
energy
free, 17, 42, 48, 157, 158, 219, 234, 301, 302, 480
potential, 107, 115, 116, 167, 168, 234, 250, 305, 310, 362, 365, 420, 421, 448, 478, *480–483*
surface, 43
energy band, *309–313*, 314, *315*
insulator, 311
structure, *312*
energy conservation principle, 258
enthalpy, 55, 300, 302, 323, 326, 455, 459, 480, 482, 489
melting, 491
entropy, 17, 55, 144, 147, 157, 301, 302, 307, 325, 456, 491, 497
equation of state, 42, 455, *480–483*
equivalent conductance, 350, 351
Eshelby solution, 140
Esin–Markov coefficient, 384
Euler constant, 487
Euler presentation, 251
exponent
cementation, 346, 352
critical, *79–81*, 343, 344, 403
oxygen fugacity, 322
porosity sensitivity, *184–187*
power law, 150, 187, 274, 470, 527
saturation, 351, 352
exponential law, 63, 190, 297
extrinsic percolation threshold, 150

fabrics, 5, 6, 8, 143, 172
cataclastic, 105
clay, 275
linear, 276
orientation, 8
failure
semi-brittle, 97, 98
Faradaic current, *390–391*
Faradaic impedance, 393
Faradaic reactions, 393
Faraday constant, 332, 386, 387, 389
Faraday's law, 377
Feret diameter, 17, 194
Fermi blurring zone, 466
Fermi boundary energy, 466
Fermi–Dirac integral, 466
Fermi energy, *293–300*, 308, 309, 311, 319, 466
Fermi gas model, 294
Fermi level, 297, 298, 300, 308, 314, 315, 318, 355
Fermi sphere, 466
Fermi statistic distribution, 298
ferrimagnetism, *433–436*
ferromagnetism, 416
Fick's law, 157, 305
field strength, 67, 360, 443
fine-grained, 24, 173, 348, 530
fissure tracks, 5, 524–525, 529, 530
flash diffusivity method, *486*
flatness, 8, 16, 17
flow band, 7
Forbes method, 475, 485
Forchheimer equation, 180
Forchheimer number, 180, 181
formation factor, 346–348, 352, 354, 358
Fourier coefficient, 310
Fourier law, 457
four-point bending, 102
fractionation, 514, 515
fractionation factor, 514
fracture
aperture, 69, 190, 196, 206
branching model approach, 161
hydraulic, *225*
ideal brittle, 234
opening parameter, 225
opening pressure, 228
penny-shaped, 193, 225
per unit volume, 69
permeability, 189–190
plane roughness, 189
porosity, 68, 351
slit, 193
slit flow, 193
surface, 103, 107, 169, 226
types, *103*
Frenkel defect, 301
Frenkel pairs, 302
Frenkel–Kontorova model (FK), 167, 168
frequency effect
percent (PFE), 404

friction, *163*
angle, 98, 99, 163
Bowden–Tabor model, 165
coefficient, 59, *163–167*, 169
high strain rate, 169
static, 169
coefficient anisotropic, 59
dynamic, 165
erosion, 163
force, 163, 164
internal, 151
Saint-Venant's element, 161
sliding, 106, 161
slip, 167
static, 169
surface, 98, 170
funicular distribution, 57, 58

gamma-quantum, 515
Gardner equations, 253
garnet structure, 437
gas
absorbate, 54
absorption, 18
bubbles, 8
constant, universal, 56, 223, 386, 389
droplet, 2
free electron, 469
giants, 2
ideal, 56, 222, 466, 481
mixture, 56
molecules, 49, 54
flow, 182
monolayer, 50
surface
absorbed, *49*, 54, 57
pores, 56
permeation *see also* gas permeability
phase pressure, 49
phonon, 461, 469
planets, 1
pockets, 261
porosimetry, 53
pycnometer, 18
radon, *527–531*
sorption *see also* gas porosimetry
Gassmann equation, *221–223*, *262*
gastropod shells, *9*
Gauss formula, *374*, 375
Gauss theorem, 383, 394
Gaussian curve, 20
Gaussian distribution, 16, 20
generalized effective medium equation (GEM), 149
geotherm, 32, 39, 42, 280, 494
mantle, *493–494*
prospecting, 404

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE
Cambridge University Press
978-1-108-42210-9 — Fundamentals of Rock Physics
Nikolai Bagdassarov
Index
More Information

geothermal gradient, 5, 42, 64, 169, 496
ghost conductivity, 339
ghost medium, 338, 339, 341, 345, 346
Gibbs adsorption isotherm equation, 55
Gibbs energy, 55, 57, 157, 158, 326
Gibbs free energy minimization, 42
Gouy–Chapman capacitor, 384
Gouy–Chapman equation, 382
Gouy–Chapman-Stern model, *380–384*
Graham equation, *9*, 383
grain binding, *9*
grain boundaries (GB), *16*, 94, 157, 470
grain size analysis, 15
Green formula, 373, 374, 375
Green integration, 373
Griffith's crack, 229
Griffith's failure criterion, 99, 234
Griffith's parabola, 99, 100
Grotthus mechanisms, 324
ground-penetrating radar (GPR), 399
groundwater borehole (GWB), 213
Grüneisen parameter, *480–483*
  anharmonic, 483
  effective, *326*
  lattice, 482
  thermal, *481*
  thermobaric, 481
  thermodynamic, *467*, *481*, 482

habitus, 6, 276
Hagen–Poiseuille's flow, 192, 193
Hagen–Poiseuille's law, 191, 192
half-life, *509–513*, 522, 527, 534, 539
Hall–Petch dependence
  GB strength, 98
  grain size, 97, 98
Hall–Petch equation, 97
harmonic mean, 68, 137, 196, 221, 223, 259, 262, 335, 345, 346, 398, 400, 462
harnesses, 169, 170
Harper–Dorn creep, 157
Hashin–Shtrikman bounds, *257–261*
  dielectric constant, 401
  electrical conductivity, 338–339
  modified lower, 269
  modified upper (MUHS), 259, 260, 263
  upper and lower, 68, 141
    thermal conductivity, *473–476*
Havriliak–Negami function, 363
heat capacity, 5, 144, 460, 466, 490–491, 495
  Einstein model, 480
  electrons, 466, 469
  high temperature, 479
  lattice, 461
  limestones, 490
  melting, 491
  minerals, 462
  phase transition, 488
  phonons, 462
  pore water, 460
  pressure dependence, 469
  quartz, 488
  rocks, *487–491*
  specific, *456–462*
heat convection, 460
heat flow, 457, 461, 472, 487, 494–496, 521
heat transfer equation, 458, 459
heat transport
  by electrons, 461
  by lattice, 461
heat transport equation, 458, 459, 483, 484
helicity
  negative, 395
  positive, 395, 396
Helmholtz capacitor, 380, 384
Helmholtz free energy, 55
Herring's equation, 48
Hertz contact theory, 188
Hertzean contact, 189
Hertzean pressure distribution, 265
Hertz–Mindlin model, 261, 269
Hertz–Mindlin relationships, *265*
Hertz–Mindlin theory, 263
hexagonal close-packed (*hcp*)
  lattice, 302
  packing, 342
hexagonal symmetry
  hexagonal, 488
highest occupied molecular orbital (HOMO), 293
Hill approximation, 142
Hoek and Brown failure criterion, *100*
holes
  heavy, 312
  light, 312
homologous temperature, 159
Hooke's law, 113–115, *130–136*, 137–139, 212, 245, 250, 272
hopping, *317*
  adiabatic, *317*
  antiadiabatic, *317*
  forward and reverse, *325*
  polaron, *317–319*
  proton, *326*
  site, 320
hornfels, 8
Hund's rules, *427–431*, 432
hybridization, 312, 368, 426, 429–431, 433–434
hydraulic embrittlement, 97
hydraulic fracturing technique, 226
hydraulic radius, 192, 194, 352, 353

imbibition, 46, 47, 57, 59
immiscible fluids, 58
index of flatness, 16
index of roundness/angularity, 16
induced polarization (IP), 404
inner Helmholtz plane (IHP), 379
insulators, 297
intact length persistence, 73
interlamellar hydration, 60
internal energy, 55
internal friction, 151, *272–275*
interstitials, 302
intrinsic percolation threshold, 150
ionic radius, 379
ionization
  energy, 293, 315, 325, 326, 529
  losses, 526
  potential, 529
  trace, 529
isochrone, 532, 534
isochrones method, 532, 534, 539
isostrain case, 258
isostress case, 258
isotropy
  transversal, 136, 219
ISRM standard test, 100

Jeffry's law, 156

Kapitza resistance, 471
K-Ar dating, 534
K-capture, 507, 511, 514, 515, 534
Kelvin equation, 57
Kirchoff's laws, 340
Klinkenberg effect, 181, 182, 207
Klinkenberg slip factor, 182
Koenigsberger quotient, 443
Kohlrausch method, *484*, 485, 486
Kohlrausch square root law, 333
Kohlrausch's law, 333
Kozeny–Carman equation, 184–185, *190–194*
Kozeny–Carman form factor, 194
Kröger–Vink diagrams, 316
Kröger–Vink notation (KV), 300
Kronecker symbol, 134
kurtosis, 15, 16, 21, 22

Lambert radiator, 461
Lamé parameter, 132, 281
  first, 134, 151, 212
  second, 134, 151
Lamé stress ellipsoid, 89, 90
laminated structure, 335
Landau's diamagnetism, 416
Landé factor, 423

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-108-42210-9 — Fundamentals of Rock Physics
Nikolai Bagdassarov
Index
More Information

Langevin diamagnetism, 416
Langevin function, *420–433*
Laplace equation, 43, 51, 58
Larmor frequency, 419
laser flash method, 485
lattice
  bcc, 64, 304
  reciprocal, 307, 312, 463
lattice preferred orientation (LPO), 276
lattice vibrations
  longitudinal, 317
Lennard–Jones potential, 481
Lenz's rule, 377, 416
Lindseth's equation, 254
lithophile elements, 3
lithostatic pressure, 42
log-normal distribution function, 21
Lomnitz law, 156
Lorentz
  equation, 400
  field, *377*
    solution, 337
  force, 378, 414, 419
Lorentz resonance peak, 372
Lorenz number, 469
lowest unoccupied molecular orbital (LUMO), 293

MacBeth's relationship, 270, 271
macro-scale, 5, 66, 139
maghemite, 365, 436, 437, 440, 452
magic proton number, 507
magmatic rocks, 1
magnetic density
  field lines, 414
magnetic field, 5, *376–377*, 393, 396, *414–426*, 435, 438–447, 450, 452, 453
  induction constant, 415
  lines, 376, 414, 418, 443
  strength, *414–416*, 438
magnetic moment, 294, 414, *417–433*, 436, 437, 441, 445, 446, 515
magnetic polarization, 415
magnetic structure, 440
magnetic susceptibility, 1, 397, 398, *415–433*, 443–449
magnetization, 5, 12, 414–433, *436–451*
  easy axis, 449
  hysteresis, 447
  single-domain particle, 450
mass action law, 300
Matthiessen's rule, 463, 470
Maxwell body, 175
Maxwell model, 473
  modified, 473, 474
Maxwell visco-elastic solid *see* Maxwell body
Maxwell's equation first, 375, 376
Maxwell's equation fourth, 377
Maxwell's equation second, 376
Maxwell's equation third, 376
Maxwell's equations, 373
Maxwell–Boltzmann statistics, 381, *424*
Maxwell–Eucken relations, 472
Maxwell–Garnett formalism, 403
Maxwell–Garnett mixing rule, 400
Maxwell–Garnett model, 404
Maxwell–Wagner effect, 366, 370
median, 15, 16, 22, 34, 36, 267
medium
  isotropic, 281
medium-grained, 143
meso-scale, 66
metal factor, 405
metallic conductor, *297*
metamorphic rocks, 1, 534
MgO_6 octahedra, 326
microlites, 6, 8
microporosity, 29
micro-scale, 5, 45, 53, 54, 66
micro-structure, 6, 121, 275, 287, 330, 331, 346, 472
mineral
  idioblastic, 6
  xenoblastic, 6
mixture law, 530
mobility, 292, 302–305, 314, 317, 318, 320, 324, 325, 332, 333, 351, 354, 380, 391
modulus
  Biot–Gassmann–Wood, *262*
Mohr transformation, 336
Mohr's circle, 85–92, 98, 99
Mohr–Coulomb
  failure criterion, *99*
Mohr–Coulomb law, *170*
Mohr's circle
  radius, *84*
molecular weight, 37, 223
Monte-Carlo simulation, *38*
Mori–Tanaka scheme, 236, 237
  differential, 236
Moscow puzzle matrix, *x*
moving phase boundary, 490
mylonitization, 66

Nabarro–Herring creep, 158
nano-scale, 66, 67
narrow band semiconductors, *323*
natural decay series, 509, 511
natural nuclear reactor, 509, 534–536
natural reactor
  Oklo, 536
Navier–Stokes equation, 178, 198
Néel temperature, 436, 440, 441
Néel walls, 441
Neptunium series, 511
Nernst equation, 386, 389–392
Nernst–Einstein relationship, 305, 307
network structure, 75
Neumann solution, 491
Newton's law
  cooling, 460
Newtonian creep *see* Harper–Dorn creep
Newtonian law, 151
Newtonian viscous element, 151, 152
non-Darcy parameter, 181
non-Debye heat capacity, 461
nonellipticity parameter *see also* anisotropy parameters
normal processes, 464
N-process, 464
Nusselt number, 460
Nyquist diagram, 329
Nyquist plot, *330–331*, 388, 393, *404*

oceanic crust subducted, 13
Ohm's law, 292, 335, 340, 395
olivine structure, 300, 313, 318, 320
oncolites, 9
orbitals, 3, 294, 296, 312, 314, 368, 418, *420–433*
  electron, 515
  electron velocity, 419
  energy change, 432
  filling, 432
  hybrid, 368
  magnetic moment, 419, 420, 423
    angular, 423
  moment, 294
  occupancy, 433
  overlapping, 430
  shapes, 428
Orowan's equation, 156
orthorhombic structure, 319
orthotropic material, 135
osmotic pressure, 44, 45
outer Helmholtz plane (OHP), 379

packing
  atomic, 17
  close, 38, 187–189, 263, 269
    cubic, 30, 189, 190, 197
    hexagonal, 190–192
      2D, 188
      3D, 189
    quadratic, 188, 191–192
    spheres, 194, 346
    square, 190
  factor, 34
  fcc, 342, 435

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-108-42210-9 — Fundamentals of Rock Physics
Nikolai Bagdassarov
Index
More Information

packing (cont.)
random isotropic, 268
simple cubic, 30
square 2D, 29
paramagnetism, 420
after Weiss, 448
parent isotope, 510, 532, 534
parent nuclide, 511, 525
partial molar volume, 55, 56
partial pressure, 51, 55, 56
oxygen, 303, 315
partial slip conditions, 201
Pauli exclusion principle, 294–296, 428, 466
pelite, 11
Pelton model, 406, 407
pendular distribution, 57, 58
percolation
bond, 75
cluster, 75, 77, 78, 80, 81
infinite, *75–81*
correlated, 75, 80
explosive, 81
site, 75, 77, 150
strength, 78–79
theory, 75, 109, 123, 149, 403
threshold, 76, 77, 81, 147–150, 197, 346, 349, 403
conductance, *75–81*
percolation models, 75
permeability, *352*
coefficient, 178, 180
Darcy, 180
exponential decay, 187
gas, 182
hydraulic coefficient, 179
intrinsic, 180, 183
tensor, 180
magnetic, 415, 416
relative, 183, 204, 207, 411, 415
"stiff" pore, 187
perovskite structure, 494
peroxy bond, 385
Perzyna body, 175
phase velocity, *285–286*
phonons, 461, *476*, 478
collisions, 462, 463
concept, 477
excited, 462
mean free path, 463
number, 461, 464
scattering, 461, 494
velocity, 461, 494
photonuclear interaction, 526
photonuclear interactions, 526
physical medium, *12*
Planck's constant, 423, 509
planetesimals, 3
plastic deformation, 66, 93, 152, 159, 170, 275, 347
point defects, 357
Poisson–Boltzmann equation, *381*
Poisson distribution, 72, 73
Poisson medium, 274
Poisson's ratio, 117–147, 149, 171, 172, 174, 187, 202, 212, 220, 221, 225, 237, 238, 247, 255–257, 263, 264, 290
adiabatic, 146
areal, 122, *125–130*
minerals, 143
quartz, 268
undrained, 218
polarizability, 326, 366, 368, 370, 379
dipolar electric, 365
electric, 378
electron, 368
ionic, 367, 368
total, 367, 368
polarization, *361*
dielectric, 297, 404
electrodes, 329
electronic, 364, 366, *368*
elliptic, 395
interfacial, 366, *368–371*
ionic, 364, *366–369*
mechanism, 373
molecular, 328
orientation, *364*, 366, 367
resonance, *371*
vector, 362
polaron, 317–323
electrical conductivity, 321
pores
closed, 29, 183, 184, 204
connected, 46
dead-end channels, 75
open, 46, 353
poroelasticity, *211*
linear theory, 211
porosimetry, *51*
mercury, *51*, 52
intrusion, 18
porosity
closed, 29, 64, 184, 204, 347, 475
connected, 460
crossover, 348
effective, 28, 29, 66
fracture, 28
total, 28
porous space, 9, 16, 28, 33, 46, *51–54*, 56, 59, 60, 123, 180, 184, 188, 203, 212, 222, 388, 496
porphyroblasts, 6
potential energy, *294–296*
power law, 29, 46, 81, 115, 149, 156–159, 163, 182–190, 202, 274, 326, 347, 352, 398, 464, 470, 527
Poynting vector, *394–395*
Prandtl body, 152, 153
Prandtl elasto-plastic element, 152
Prandtl–Tomlinson model (PT), 168
preexponential factor, 297, 299, 302, 320, 322, 325, 326
pressure
ambient, 157, 201, 212, 215, 217
confining, 33, 201, 202, 213–219, 228, 268
differential, 202, 213–219
effective, 202, 203, 213, 216, 217, 270–271, 288
coefficient, *213–215*, 216
gradient, 45, 46, *178–181*, 191, 192, 195, 198
hydrostatic, 45, 46, 169, 178, 214, 225, 235, 266
inner, 226, 227
lithostatic, 202
pore principle, 32, *201–205*, *211–222*, 228
IP measurements, 405
linear elasticity, 211
quantum number, 515
superposition, 226
Terzaghi effective stress, 227
total spin maximization, 428
probability
collision, 529
density, 20
density function, 20–22
probability mass function (PMF), 72
protonic conductivity, 323
psammite, 11
psephite, 11
P-wave, 253, 255, 275, 276, 278, *284–286*
quasi, 284

quality
rock
mass, 70
rocks, 29
quality factor, 274
quantum number *n*, 296, 426

radiation
cosmic, 5, 524
cosmic primary, 505
cosmogenic part, 505
dose, 505
electromagnetic, 526
emitted, 5, 461
geogenic part, 505
heat, 460, 461
ionizing, 519
natural, 5, 505, 524
neutron, 535

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE
Cambridge University Press
978-1-108-42210-9 — Fundamentals of Rock Physics
Nikolai Bagdassarov
Index
More Information

particle, 510, 517, 524
power, 461
pressure, 395
terrestrial, 524
α-, 510, 517
β−-, 509
β+-, 509
γ-, 509
radiation energy spectrum, 527
radioactive decay, 496, 510, 513, 517, 520, 525, 532, 533
radioactive equilibrium, 511
radioactive heat production, 532
radium equivalent, 521, 527
radon, 531 *see* gas radon
radon emanation *see also* gas radon
ray theory regime (RT), 399
reactor criticality, 536
redox electrolyte, 390
redox potential, 388, 389, 390
redox reaction, 388
reduced zone scheme, *309*
reference volume, 66, 113, 142
relative humidity (RH), *60*
relaxation time
diffusional, 392
remanent magnetization, 439, *443–446*, 451
chemical remanence (CRM), 445
isothermal remanence (IRM), 445
sedimentation remanence (SRM), 445
thermal remanence (TRM), 445, 446
remnant magnetization *see* remanent magnetization
renormalization group transformation, 343
representative elementary volume (REV), 182, 183
residual strength, 93, 160
resistivity, 1, 292, 327, 339, 349, 404, 406, 407
finite, 341
specific, *345–348*
vs permeability, *352–354*
resistor network model, 339–343, 360
resolution, 5
spatial scale, 12, 183
restoring evolution equation, 165
retardation
effect, 61
Reuss averaging, *137*
Reuss lower bound, 68
Reynolds equation, 195, 196
Reynolds number, 180
rock cycle, 9
rock quality designation index (RQD), *69*
roughness, 181, 189–190, 195, 196, 203
crack surface, 94
fracture surfaces, 105
index, 16, 195, 196
micro, 163
surface, 163, 190
wavelength, 163
roundness, 16, 17

S-wave
quasi, 284
Saint-Venant's compatibility condition
first, 120
second, 120
Saint-Venant's element, 152, 153
sand model (Dvorkin and Nur)
cemented, 261, 267
friable, 263
uncemented, 261, 268
sandstone
blastoporphyritic, 6
blastopsammitic, 6
sandstone models
Dvorkin and Nur, 263
saturation, 28
cement, 268
critical water, 29
degree, 28, 33, 59, 183, 223, 261, 269, 353
fluid, 204, 255, 257, 261
initial, 354
irreducible water, 29
magnetization, 422, 439, 446, 447
pore, *201–205*, 531
pore space, 46, 183
relative, 204
rest, 183
total, 46, 354
water, 29, 46–48, *59–61*, 258, 351, 352, 358, 399, 400, 475, 528
saturation pressure, 56
Sauter mean diameter, 16
sc packing *see* packing simple cubic
scale
wellbore, interwell, fieldwide, 66
Schottky defect, 301
Schottky pair, 321
Schrödinger's wave equation, 294
Schroeder (Colora) method, 487
sediments, 8, *10–13*, 15–16, 261
Seebeck's coefficient, 307, 317
selection rule parameter, 80
selenogradient, 42
self-consistent
approach (SCA), *67*, *138*, 338, 339, 346
grain deformation, 67, 137, 140
approximation, *140*, *197*, *198*
condition, *337*
deformations, *137*
field, *466*
method of effective moduli calculations, 138
scheme of permeability calculation, *197*
shape preferred orientation (SPO), 276
shear modulus, 117, 121, 131, 134, 140, 141, 156, 159, 186, 212, 218, 221, 236, 247, *259–262*, 264, 274, 281
adiabatic, 146
shear viscosity, 53, 151, 223
SH-wave
quasi, 285
siderophile elements, 3
silanol plane, 379
simple cubic lattice (sc), 302
single-domain (SD), 446
SiO_4 tetrahedra, 313, 326
Si-OH silanol group, 387
site
octahedral, 34, 320, *430–433*, 435, 437
interstitial, 35, 36, 302
tetrahedral, 34, 432, 435, 437
Skempton's coefficient, 203, *217–220*
skewness, 15, 21, 22
Slack formula, 467
slip plane, 97, 151, 156, 169
Snellius law, 397, 398
solenoidal field, 376
solid-state ionic conductor, 297
sound speed, 248
specific ionization potential, 529
specific weight, 28
sphericity index, 16
spinel structure, 437
Stanton number, 460
statistical continuum approach, *142*
statistical sum, *424–426*, 440, 476, 482
statistical weight, 15
Stefan numbers, 490
Stefan problem, 492
Stefan's solution, 490
Stefan–Boltzmann law, *461*
Stefan–Boltzmann's constant, 461
Sterling formula, 302
Stern layer, 379, 381, 387
stiffness
longitudinal, 101
tensor, 283
stiffness constant per length, 167
stiffness tensor, *282–284*
Stokes diameter, 15

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE
Cambridge University Press
978-1-108-42210-9 — Fundamentals of Rock Physics
Nikolai Bagdassarov
Index
More Information

Stokes flow formula, 197
Stokes formula, 197, 198, *374–375*, 377
Stoner–Wohlfarth model, *450–451*
stopping energy, 529, 530
strain
  longitudinal, 121, 122, 125, 126, 132
  tensor, *119–121*, 125, 131, 132, 151, *280–282*
  transverse, 132
strength
  compressive, 100
  frictional, 170
  ratio of compressive to tensile, 100
stress
  tensor, *74–90*, 132, 154, 158, 217, 280, 282
    invariant, 158
stress-director surface, 88, 89
stress-hardening, 93
stress-softening, 93
strike–slip, 167
stromatolites, 9
structures
  amygdaloidal, 8
  basaltic dome, 445
  coarse-grained, 8
  defect, 368
  flaccid, 8
  fluidal, 8
  growth, 8
  layered, 14, 121, 275, 336
  oölitic, 8
  porphyric, 10
  pumiceous, 8
  random, 8, 12, 14, 197
    diffusion, *303–307*
    distribution, 473
    fracture, 70
    resistor network, 341
    walk, 464
  rocks, 7
  schistose, 8
  taxite, 7
supernova, 1
superplasticity, 156
surface
  activity, 518
  crust, 495
  Earth's, 1, 496, 505, 516
  energy, 43, 55, 56, 105, 107, 116, 117, *234–235*, 381, *387–388*, 442, 471, 507
  tension, *43–44*, *51–55*, 266
SV-wave
  quasi, 285
S-wave, 254, 262, *275–277*, 284, 286, 289
swelling pressure, 60
symmetry
  axis, 100, 121, 275, 276, *284–286*
  cubic, 122, *126*, 281, 283, 284, 435
  hexagonal, 127, *276–284*
  monoclinic, *130*
  orthorhombic, 129, 281
  rotational, 121, 127, 431
  tetragonal, *127*
  transversal, 276
  trigonal, *128*

taxite, 7
Taylor series, 78, 113, 115, 149, 165, 167, 230, 268, 298, 299, 343, 362, 382, 392, 417, 418, 424, 480, 482
Taylor's model, 137
tensile strength, 93, 99, 100, 164, 225, 226, 227, 235
  crack initiation (CI), 235
  Table, 95
  uniaxial, 100
tensor, 280
  deviatoric stress, 158
  electric conductivity, 292
  first invariant, 151
  metric, 230
  rank, 74, 180, 292, 335
  second invariant, 88, 154
  stiffness, 147, 275
  strain, 134, 282
  stress, 134
  stress and strain, 158
  symmetric, 119, 151, 219, 280, 365, 416
  thermal conductivity, 458
tensors, 9, 151
Terzaghi effective stress, 217, 227
texture, *5–9*, 66, 137, 142, 346
  aphanitic, 6
  equigranular, 6
  fine-grained, 6
  granoblastic, 6
  graphic, 6
  heteroblastic, 6
  holocrystalline, 6
  hyalopilitic, 6
  hypidiomorphic-granular, 6
  inequigranular, 6
  lepidoblastic, 6
  lepidogranoblastic, 6
  medium-grained, 6
  microlitic, 6
  panidiomorphic-granular, 6
  pegmatitic *see* texture graphic
  phaneritic, 6
  porphyroblastic, 6
  primary, 6
  very coarse-grained, 6
thermal conductivity, 9, *455–475*, 488
  anisotropy, 474
  crystal size, 470
  disordered materials, 464
  Earth, 493
  effective, 471
  electrons, 466
  ellipsoid, 459
  grain boundaries, 472
  high-pressure, 494
  iron, 470
  lattice, 466, 494
  limestone, 490
  methods, 475–485
  MgO, 468
  porous rocks, 475, 476
  pressure dependence, 467
  quartz, 488
  rocks, 475
  Stefan problem, 490
  transition zone (TZ), 493
  Wiener bounds, *472*
thermal diffusivity, 459, *475–486*
thermal fracturing, *105*
thermoelectric effect, 307
Thomsen's anisotropy parameters. *see also* anisotropy parameters
thorium series, 511
tight-binding model, *309*
tilt angle, 471, 472
  GB, 471
time domain reflectometry (TDR), 399
tortuosity, *192–194*, 353–354, 406
  electrical, *352–354*
  hydraulic, 353
track dating, 525
transmissivity, 194, 195
transverse and orthotropic isotropies, 135
transversely isotropic medium (TI), 275
Tresca yield criterion, 154
triple junction, *44–48*
triple line, 47, 48

ulvöspinel, 436
umklapp phonon–phonon scattering, 468
umklapp processes, 463
uniform strain approach *see* Voigt averaging
uniform stress approach *see* Reuss averaging

© in this web service Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-1-108-42210-9 — Fundamentals of Rock Physics
Nikolai Bagdassarov
Index
More Information

unit cell, *30–38*, 143, 326, 344, 367, 368, 435, 436, 464
U-process *see* umklapp processes
uranium minerals, 516, 531, 537
uranium series, 511
uranium-actinium series, 511
uranium-radium series, 511

vacancies
  oxygen, 315, 323, 324, 385, 386, 410
valence
  electrochemical, 332, 333
valence band, *296–300*
  lower, 312
  middle, *312*
van Genuchten equation, 204, 205
vector
  curl, 373
  displacement, 275
  gradient, 374
  ray path, 285
  spin momentum, 423
  units, 373
  wave propagation direction, 249, 250, 285, 395
vectors, 9, 43, 74, *86–90*, 280, 310, 374, 395, 415, 420
  electromagnetic waves, 394
  scalar product, 230
vehicle mechanism, 324
vertical transversely isotropic (VTI), 275
Voigt averaging, *138*
Voigt notation, 125
Voigt upper bound, 68
Voigt–Reuss bounds, 257
voltammogram, 390
von Mises criterion, 154
VR bounds *see* Voigt–Reuss bounds

Walden's rule, 333
Warburg impedance, 388, 390, *391–393*
Washburn equation, 51
water saturation, *46–47*
wave function, 294, 295, *307–310*, 311
wavenumber, 250, 271, 294–296, *309–312*
waves
  group velocity, 286
  harmonic plane, 250
  impedance, 394
  longitudinal, *247–250*, 462, 478
  phase velocity, 250, 282, 475
  transverse, 122, 131, 135, 139, 248, 250, 274–275, 462
Waxman–Smith equation, 351, 354
Waxman–Smith model, 352, 354
Weertman creep, 157
Weiss domains, 437, *440–445*
wetting angle, 44, 45, 54, 57, 59
White's model, 261, 262
Wiedemann–Franz law, 469
Wiener bounds, 138, *257*, *334*, *335*, *345*, *346*, 400, *475*
Wood's formula, 262
Wyllie time average, 257
Wyllie's equation, 257
Wyllie's model, 475

yield stress, 92, 93, 96, 106, *152–154*
Young's equation, 44, 45
Young's modulus, 113, 116, 133, 143, 146, 212, 218, 245, 270

zero wavelength approximation, 257

© in this web service Cambridge University Press www.cambridge.org