

INDEX

- (8 – N) rule 126
- activation volume 379
- activity 89
- allotropy 103
- alloy hardening 353
- amplitude phase diagram 11
- anelasticity 32, 116, 284, 366
- annealing 347
- antiphase boundary 43, 148, 160
 energy of 163
- aspect ratio 377
- atom probe 23
- atomic size 140, 142
- atomic size factor 128
- Ausforming* 349
- austenite 112
- austenitic steel 116, 350
- axial ratio 110, 137
- Bain distortion 338
- bainite 236, 346
- Bauschinger effect 316
- beta-tungsten structure 145
- body centred cubic structure 125
- Boltzmann–Matano analysis 182
- Bordoni maximum 276
- brass 110
- Bridgman method 62
- bright field 8
- Brillouin zone 131, 151
- brittle–ductile transition 321
- brittle fracture 321
- Burgers circuit 260
- Burgers vector 258
- CALPHAD method 90
- carbides 116
- carbon in iron 115, 179
- carbon steel 348
- cast iron 78
- cellular microstructure 74
- cementite 111, 147
- channelling 251
- chemical force 265
- chemical potential 84
- climb 262, 301
- climb force 265
- close packing 120
- coherence 55
- coherent interface 55
- coherent precipitate 15
- coincidence lattice 48
- component diffusion coefficient 186
- composite materials 375
- compressive test 31
- congruent melting 68, 103
- conode 66, 106
- Considère construction 30
- constitutional undercooling 65, 73
- constriction 279
- contrast 8
- cooling curve 26
- correlation 176
- Cottrell atmosphere 366
- covalent bond 126
- crack formation 317, 325
- crack propagation 318
- creep, stationary 301
- creep test 31, 289
- critical dispersion 374
- critical shear stress 277, 362
- critical undercooling 58
- cross-slip 276
- crowdion 251
- crystal growth 60
- crystallization 60
- cube texture 310, 400
- Curie temperature 115
- cyclic deformation 315
- Czochalski method 62
- D_0 theory 181
- dark field 8
- Darken equations 185
- Debye–Waller factor 17
- decomposition 210
 discontinuous 233
 eutectoid 233
- deformation band 310, 384

416 *Index*

- deformation mechanism diagram 313
- deformation texture 307
- degrees of order 153
- dendrite 61
- density functional method 119
- diamond structure 127
- dielastic interaction 355
- differential thermal analysis 27
- diffuse solid solution scattering 19
- diffusion 171
 - coefficient 171
 - grain boundary 392
 - interface 192
 - ternary 190
 - up-hill 190
- diffusion creep 313
- diffusion in glasses 181
- DIGM (diffusion-induced grain boundary motion) 396
- dislocation 258
 - climb of 262
 - damping of 284
 - density of 268
 - dissociation of 277
 - edge 15, 44, 258
 - elastic theory of 265
 - geometrically necessary 304, 374
 - interaction of 271
 - Lomer–Cottrell 280
 - multiplication of 271, 289
 - partial 277; Frank 281; Shockley 277, 327
 - rest mass of 283
 - screw 13, 46, 258
 - sessile 278
 - stair rod 280
- dislocation configuration 293
- dislocation core 274
- dislocation dipole 261
- dislocation energy 268
- dislocation forest 271, 295
- dislocation locking 365
- dislocation loop, prismatic 64, 256, 262, 281
- dislocation pile-up 274, 295
- dislocation unlocking 365
- dislocation velocity 282
- dispersion hardening 375
- displacement cascade 250
- distortion energy 212
- distortion enthalpy 142, 228
- distribution coefficient 70
- divacancies 242
- drift velocity 198
- dumb-bell 253
- duplex structure 233
- Duralumin[®] 221
- dynamic tensile test 291
- dynamical theory 11
- earing 311
- easy glide 294
- edge dislocation 15, 44, 258
- effective charge 198
- elastic instability 118
- electrochemical potential 198
- electrolytic transfer 91
- electromigration 197
- electron beam microprobe 6
- electron concentration 129, 150
- electron diffraction 8
- electron microscope 5
 - emission 5
 - high-resolution 11
 - interference 5
 - reflection 5
 - replica 7
 - scanning 5
 - transmission 7
- electron phases 129
- electronegativity 128
- energy of mixing 88
- enthalpy 84
- enthalpy of transformation 123
- entropy of mixing 87
- entropy of transformation 123
- entropy stabilization 125
- equation of state for plasticity 290
- equilibrium, thermodynamic 83
- etching 4
- Euler instability 31
- eutectic solidification 75
- eutectic system 68, 99
- eutectoid reaction 104, 233
- excess entropy 91
- excess vacancies 244
- exchange energy 88
- extinction distance 11
- fatigue 315
- Fermi body 131
- ferrite 112
- fibre-reinforcement 375
- field ion microscope 21
- flow stress 28, 271, 292
 - asymmetry of 279
- focusson 251
- Fourier solution 173
- fracture
 - brittle 321
 - surface of 321
 - toughness of 323
- fracture stress 323
- Frank partial dislocation 281
- Frank–Read source 271
- free energy 83
- free enthalpy 84
- Frenkel pair 250

- Friedel distance 357
 Friedel oscillations 135
 fugacity 208
- Gibbs–Duhem relationship 91, 96
 Gibbs Phase Rule 65, 85
 Gibbs–Thomson equation 196, 225
 glass, metallic 79
 glide 262
 glide force 265
 Goldschmidt radius 140
 Goss texture 402
 gradient energy 212, 228
 grain boundary 41, 44
 energy of 50
 low-angle 44
 migration of 387
 special 388
 structure of 47
 velocity of 388, 391
 grain boundary sliding 311
 grain growth 387
 anomalous 402
 grain shape
 change in 305
 factor 313
 Griffith fracture stress 323
 growth, selection by 390, 401
 growth of martensite 345
 growth spiral 60
 Guinier–Preston zone (GP zone) 60, 219
- habit plane 332
 Hadfield steel 350
 Hall–Petch relationship 305
 hardenability 235
 hardening
 alloy 353
 dispersion 375
 order 239
 precipitation 370
 solid solution 347, 353
 hardness 31
 heat of transport 199
 helix 262
 Henry's law 89
 Heusler alloy 148
 hexagonal structure 110
 high-angle grain boundary 47
 Huang scattering 18
 Hume-Rothery phases 128
 Hume-Rothery's rules 128
 hydrogen permeation 202
 hyperfine splitting 37
- ideal orientation 310
 image force 272
 impact test 321
- incoherent interface 55
 incompatibility stress 304
 incubation period 382
 interaction, electrostatic 356
 interaction of dislocations 271
 interdiffusion coefficient 183
 interfacial energy 59
 intermetallic compound 102
 intermetallic phase 145
 internal friction 32, 276
 interphase interfaces 54
 intersection stress 295
 interstices 115
 interstitial alloy 87
 interstitial compound 147
 interstitial mechanism 177
 irradiation damage 255
 irradiation with high-energy particles 250
 isomer shift 35
 isotope diffusion coefficient 175
- jogs in dislocations 262
 Johnson–Mehl kinetics 168, 382
 Jones zone 137
- Kasper polyhedron 145
 Kear–Wilsdorf lock 379
 kinematical theory 9
 kinetics of ordering 165
 kink bands 384
 kinks 262
 energy of 276
 pairs 276
 Kirkendall effect 183
 inverse 255
- Labusch's theory 361
 lamellae, distance between 78
 lamellar eutectics 76
 Landau theory 334
 lattice defect 42
 lattice invariant shear 333
 Laue-scattering 19, 231
 Laves phases 143
 lever rule 66, 107
 Lifshitz–Slyozov–Wagner law 226
 line energy 269
 line tension 268
 liquidus 67
 surface of 108
 logarithmic strain 28
 Lomer–Cottrell dislocation 280
 long-range order 153
 low-angle grain boundary 44
 Lüders band 292, 368
- maraging 349
 Marmem (martensite memory) 333

418 *Index*

- martensite phase boundary 343
- martensitic transformations 112, 327
- massive transformation 236
- Matano plane 182
- mean square displacement 173
- metallic glass 79
- metallography 3
- microcreep 370
- microdiffusion 254
- microstructure 3, 41
 - cellular 74
- miscibility gap 97
- modulus defect 364
- molten zone 63
- monotectic decomposition 103
- Mössbauer effect 34

- nominal strain 28
- nuclear fuel elements, swelling of 255
- nucleation 57, 166, 210
 - of martensite 345
 - oriented 398

- octahedral interstice 115
- ω -transformation 350
- ordering, spinodal 167
- ordered domains 160
- orientation distribution function 309
- orientation relationship 332
- Orowan relationship 289
- Orowan stress 270, 373
- Ostwald ripening 168, 225
- overageing 221, 370
- oxidation 200
 - internal 202

- pair binding energy 93
- pair potential 157
- parelastic interaction 354
- passing stress 268
- partial pressure 90
- Peach–Koehler force 265
- pearlite 112
 - growth of 234
- pearlite knee 239
- Peierls–Nabarro force 276
- Peierls potential 274
- periodic potential 274
- periodic system 121
- peritectic reaction 101
- peritectoid reaction 104
- persistent slip bands 317
- phase 41
 - intermetallic 145
 - Laves 143
- phase change 156
- phase diagram 57, 65
 - ternary 105

- planar slip 371
- plastic deformation 285
- plastic stability 29
- plateau stress 362
- point obstacle 358
- pole figure 308
- pole mechanism 328
- polycrystal deformation 303
- polycrystal work hardening 307
- polygonization 384
- pores 183
- Portevin–Le Chatelier effect 370
- positron annihilation 242
- powder metallurgy 196
- precipitate, growth of 221
- precipitation 94, 209
 - coherent 210
 - continuous 209
 - discontinuous 233
- precipitation hardening 370
- primary recrystallization 382
- pseudo-potential method 119

- quadrupole interaction 37
- quasi-chemical ordering reaction 166
- quasi-chemical theory 94, 154
- quenching 244
 - rapid 79

- Raoult's law 89
- reaction front 233
- reactor materials 254
- recovery 244, 381
 - dynamic 284, 297
- recovery stages 244, 253
- recrystallization 381
 - of two-phase alloys 396
 - primary 382
 - secondary 401
- recrystallization diagram 382
- recrystallization kinetics 382
- recrystallization temperature 390
- recrystallization texture 382, 398
- replica 7
- residual austenite 347
- ring exchange mechanism 178
- rolling texture 308, 400

- scaling constant 202
- scanning electron microscope 5
- scanning tunneling microscope 23
- Schmid factor 287
- Schmid's law of critical resolved shear stress 277
- screening 135
- screw dislocation 13, 46, 258
- secondary recrystallization 401
- segregation 395

- Seitz radius 140
 self-diffusion coefficient 176
 semi-coherent interface 56, 213
 sessile dislocation 278
 shape change 331
 shape memory 333
 shear modulus defect 356
 shear strain 285
 shear strain rate 289
 shear stress 285
 Shockley partial dislocation 277
 short-range order 94
 coefficient of 88, 92, 153
 side bands 230
 σ -phase 145
 single crystals, growth of 62
 sintering 196
 sintering diagram 197
 slip direction 258
 slip force 265
 slip plane 258
 slip steps 277, 294
 slip system 277, 287
 small angle scattering 20
 SN-curve (Wöhler curve) 315
 Snoek atmosphere 369
 Snoek effect 116, 179
 solid solution 68
 solid solution hardening 347, 353
 solid solution scattering 19
 solidification 65
 solidus 67
 solubility 69, 92
 solute atom atmosphere 393
 solution
 ideal 86
 regular 87, 94
 special grain boundary 388
 sphalerite 127
 spinodal 98, 190
 coherent 229
 spinodal decomposition 227
 stacking fault 12, 43, 120, 277
 complex 379
 stacking fault energy 120, 277
 stacking fault tetrahedron 249, 281
 stacking sequence 120
 stainless steel 116, 350
 standard triangle 40
 steel 111
 austenitic 350
 Hadfield 350
 hardening of 347
 stainless 116
 stereographic net 39
 stereographic projection 37
 stored energy 383
 strain 28
 strain embryos 345
 strain rate sensitivity 30
 stress equivalence 364
 stress relaxation 31
 stress tensor 264
 structure map 128
 structural unit 47, 391
 subgrain 299, 384
 substitutional alloy 87
 superdislocation 371
 superjog 264
 superlattice 148
 superplasticity 313
 Suzuki atmosphere 357
 swelling 255
 symmetry boundary 387
 tangent construction 95
 tangent rule 85
 tarnishing 200
 Taylor factor 307
 tempering 347
 tensile test 28
 ternary phase diagram 105
 tetrahedral interstices 115
 texture 61, 307
 thermal analysis 26
 thermal expansion 240
 thermal spike 252
 thermal scattering 18
 thermochemistry 90
 thermodynamic factor 187, 190, 228
 thermodynamics 83
 thermoelastic martensite 333
 thermomigration 199
 thickness contour 10
 thin film solution 172
 Thompson tetrahedron 281
 tilt boundary 44
 TTT diagram 238
 twin boundary 48, 327
 twinning, mechanical 327
 twinning elements 330
 twist boundary 45
 undercooling
 constitutional 65
 up-hill diffusion 190
 vacancy
 chemical 42, 139
 energy of formation of 42
 excess 244
 in equilibrium 42
 migration energy of 174, 274
 supersaturation of 64
 thermal 42
 volume of formation of 243

420 *Index*

- vacancy mechanism 173
- vacancy pump 64, 249
- vacancy sink 244
- valency compound 147
- valence electron concentration 129
- Vegard's law 142
- vibrational entropy 125
- vibrational specific heat 113
- void 256
- void lattice 256
- volume, free 79
- volume size factor 140
- volume dilatation 267

- whisker 378
- Widmanstätten plates 209
- Wigner energy 250
- Wöhler curve 315

- work hardening 30, 271, 288, 293
- work-hardening curve 288
- work softening 297
- wurtzite 127

- X-ray scattering 16
- X-ray topography 15

- yield point 291, 368

- Z-contrast 9
- zone
 - Brillouin 128, 147
 - Guinier–Preston 219
 - Jones 137
 - molten 63
- zone of reduced density 252
- zone refining 72