

Index

Numbers in **bold face** refer to the first page number of a section or chapter relating to the subject. Ranges of numbers (e.g. 15–20) are used when reference is made to each of this inclusive range of page numbers.

- absolute stability
 of planar interface **91**
 other morphologies 103, 104, 108
 adatoms 8, 41, 42
 adsorption 2
 alloys 17, 20, 38, **59**, 120
 aluminium 28, 29, 47, 107, 108, 133
 aluminium–silicon eutectic 144, 148
 Al–Al₃Ni eutectic 133
 antimony 28, 29, 47
 antimony–tin alloys 100
 atomic mismatch 32
 azobenzene–benzil eutectic 149
- Bené, N. P.** 35
 benzil 47
 Bethe, H. A. 8, 40, 49, 50, 51
 Biloni, H. 99, 107
 binary alloys 60, 77, **78**
 bismuth
 entropy of fusion of 47
 growth behaviour of 47, 61
 solid–liquid interfacial free energy of
 17, 19, 20, 28, 29, 30, 38
 bismuth–silver alloys 60, 61, 123
 bismuth–tin alloys 100
 bismuth–zinc alloys 146
 Blakely, J. N. 166
 Bolling, G. F. 70, 71, 99
 Botschwar, A. A. 140
 Bragg–Williams approximation 9, 40,
 49, 50, 52, 53
 bridging in eutectics 125
 Bright, M. W. A. 124, 134, 146
 broken lamellar eutectics 143, 145, 146,
 148
 Burton, W. K. 8, 10, 11, 40, 46, 48, 49,
 50, 52, 73
- Cabrera, N. 8, 10, 11, 40, 46, 48, 49, 50,
 52, 73
 cadmium 36, 47, 48, 172
 cadmium iodide 156
 Cahn, J. W. 2, 31, 72, 95, 106, 129, 159,
 161, 163, 166, 173
 capillarity 36, 86, 89, 114, 125
 carbon tetrabromide 47, 84
 carbon tetrabromide–hexachloroethane
 eutectic 131, 137
 Cech, R. E. 27
 cellular eutectic structure 133, 134, 135
 cellular structure 83, 84, **95**, 134, 135, 136
 Chadwick, G. A. 18, 21, 61, 70, 71, 72,
 133, 135, 149, 150
- Chalmers, B. 38, 70, 78, 83, 97, 100, 101,
 118, 120, 128, 149, 157
 chemical potential 2, 24, 54
 Chilton J. P. 132, 133, 135
 Cline, H. E. 141
 coarsening of dendrite structure 120
 cobalt 28, 29
 Cole, G. S. 99
 complex regular eutectics 143, **146**
 composite materials 121
 computer simulation 117
 configurational entropy 41, 65, 76
 constitutional supercooling **80**, 89, 92,
 97, 133, 136
 gradient of 92
 constitutional superheating **99**
 copper 28, 29, 47, 74
 Coriell, S. R. 102, 104, 105, 106, 109–12,
 114, 120
 Cottrell, A. H. 65, 78, 154
 coupled zone 138
 cubic structured materials 28, 29, 46,
 102, 106
 face-centred cubic 46, 63, 102
 simple cubic 50, 52, 54
 curved surface, change in melting point,
 25, 86
 cusps in the γ -plot 4, 6, 10, 16, 51
 cyclohexanol 47
 cyclohexanol–camphene eutectic 143,
 147
 cylindrical rod, stability of 108
- Danilov, V. I. 167
 Davies, G. J. 99
 Davies, I. G. 125
 decanting 17, 48
 Debye temperature 66
 dendrites 38, 61, 77, **101**, **136**
 arm spacing of 102, 115, 118, 119
 characteristic growth directions of
 101, 102, 106
 coarsening of 120
 stability of **113**, **115**
 tip shape of **113**, 115, 127
 diffusion 3, 11, 16, **80**, 89, **99**, 125
 thermal **80**, 103
 dihedral angle 18, 20
 dislocation 35, 169, 173
 core 65
 edge 18
 free energy of 18, 19, 65
 loop 65
 screw **154**

180 *Index*

- elastic constants 66, 72
 Elcock, E. W. 49, 62
 electron microscope 17, 19, 37, 38
 Elliott, R. 131, 148
 entropy, of fusion 46, 47, 48, 60
 surface 1, 30, 72, 76
 of vapourisation 49
 equilibrium shape 10, 17, 20
 etching 17
 eutectic growth 121
 classification of 122
 complex regular 143, 146
 irregular 143
 lamellar and broken lamellar 123, 135,
 145, 146
 rod 129, 132, 145
 range 137
- face-centred cubic structure 46, 63, 102
 faceting
 equilibrium 10, 16, 51
 growth 45, 46, 57, 61, 95, 169, 170
 Fidler, R. S. 60, 61
 field ion microscopy 70
 Fisher, J. C. 26
 Flemings, M. C. 140–3
 Forty, A. J. 59, 68, 156
 Fourier series 85
 Fourier transform 97
 Frank, F. C. 7, 8, 10, 11, 39, 40, 46, 48,
 49, 50, 52, 73, 154, 173
 free energy, *see* Gibbs free energy,
 Helmholtz free energy, interfacial
 free energy
 Frenkel, J. 157
- gallium, 28, 29, 47, 66, 169, 171, 172
 Geguzin, Ya. E. 38
 germanium 28, 29, 47
 Gibbs, J. W. 1, 2, 11
 Gibbs dividing plane 2
 Gibbs free energy 1, 21, 23, 24, 53
 Gibbs–Thomson relation 25
 Glicksman, M. E. 17, 19, 38, 115
 gold 28, 29, 74
 grain boundary 16, 38, 63, 66, 67
 melting at 68
 growth spirals 154
 Gruber, E. E. 9
- Hagelbarger, D. W. 108
 Hardy, S. C. 109–12, 114, 120
 healing scratch technique 112
 heat of solution 60
 Hellawell, A. 84, 148, 149, 150
 Helmholtz free energy 1, 53
 Herring, C. 11, 14, 16
 Herring torque terms 14
 hexagonal structured materials 36, 102
 hill-and-valley structure 10
 Hill, T. L. 49, 62
 Hilliard, J. E. 2, 30, 31, 72
 Hillig, W. B. 163, 173
- Hobbs, P. V. 170, 171
 Hogan, L. M. 149, 150
 Hollomon, J. H. 38
 hopper crystals 47
 Hunt, J. D. 46, 62, 84, 122, 125–8, 130–3,
 135–9, 141, 142, 144, 145, 147, 148,
 149, 161, 163, 167, 168, 170, 173
 Hunt, M. D. 99
 Hurle, D. T. J. 141, 144, 148
- ice, *see* water
 incubation time 79
 interface diffuseness 63, 160
 interface intersections 12
 interface kinetics 82, 85, 138, 151
 effect on morphological stability 93,
 104
 interface roughness 39, 63, 157
 interface structure 39 (*see also* two-,
 three- and *n*-level models)
 in alloy systems 59
 interface thickness 30, 31, 63, 64, 67
 interfacial free energy 1, 12, 73, 112, 114,
 132, 161
 anisotropy (γ -plot) of 3, 14, 37, 75, 95
 gram-atomic 28, 29
 theoretical calculations of 66, 67, 73
 values of for various materials 28, 29
 iron 28, 29
 irregular eutectics 143
 Ising model 49
 Ivantsov, G. P. 113, 114
- Jackson, K. A. 28, 38, 40, 46–50, 53, 54,
 57, 60, 62, 70, 75, 76, 83, 122, 125–8,
 130, 131, 135–9, 141–5, 147, 149,
 157, 158, 161, 162, 163, 167, 168,
 170, 173
 Jakeman, E. 141
 James, D. W. 165
 Jones, D. R. H. 18
 Jordan, R. M. 130
- Kaufmann, B. 51
 Kaykin, S. E. 35
 Kerr, H. W. 60, 133, 146, 149
 Ketcham, W. M. 170, 171
 kinetics of growth 82, 85, 93, 104, 138,
 151
 for continuous or normal growth 151,
 157
 experimental determinations of 163
 for screw dislocation mechanism 154
 for two-dimensional nucleation 151
 Kiss, F. S. 107
 Kofler A. 140
 Kotler, G. R. 109, 114–17, 120
 Kotzé, I. A. 66, 67, 72
 Kraft, R. W. 149, 150
 Kuhlmann-Wilsdorf, D. 65, 66, 67, 72
- lamellar eutectics 123, 135
 lamellar–rod transition 132

- lamellar termination 128, 129, 130
Laplace's equation 96, 103, 108
Laplace transform 86
latent heat 22, 28, 41, 49, 81, 86
lattice liquid model 53
layer spreading mechanism of crystal
 growth 152, 154, 158
lead 28, 29, 47, 74
lead iodide 156
ledges and ledge energy 3, 39, 152, 154,
 159
Lemkey, F. D. 149, 150
Lewis, M. H. 133, 146
Lindemann, F. A. 64, 66
lithium 74
LiF-CaF₂ eutectic 124, 134
long-range order 64
Lothe, J. 30
low energy electron diffraction 72
- Malin, V. I. 167
manganese 28, 29
maximum growth rate solutions 114,
 127, 128
mechanisms of growth and relation to
 interface structure 39, 48, 51, 151
Meiling, G. S. 164, 169
melting
 dislocation theories of 65
 faceting during 57
 grain boundary 35, 68
 interface morphologies of 57
 interface stability during 99
 internal 34, 35, 55, 59
 mechanisms and kinetics of 171
 nucleation of 32, 66, 75, 100
 phenomenological theories of 64, 76
melting point, effect of curvature on 25,
 36, 86
mercury 26, 28, 29, 47
metal analogues 47, 118, 131, 137
microscopic reversibility 58, 59
Micus, G. 167, 168
Mie potential 73
Miller, W. A. 21, 61, 70, 71, 72
Mollard, F. E. 140-3
Moore, A. 131, 148
morphological stability 77, 101, 141
 role of interface kinetics in 93, 104
Morris, L. R. 118
Morse potential 73
Muller, E. W. 70
Mullin, J. B. 59
Mullins, W. W. 9, 49, 50, 85, 86, 100,
 102, 141
multilayer model of interface 49, 51
Mutafschiev, B. 36, 37, 172
- n*-level model of interface 51
NaF-NaMgF₃ eutectic 143, 146
Nakaya, V. 34
Nason, D. 76
nearest neighbour bonding 40, 53, 73, 75
Neumann, K. 167, 168
Nicholas, J. F. 73
nickel 28, 29
non-linear effects 96, 98, 120
nuclear magnetic resonance 27
nucleation
 heterogeneous 27, 31
 homogeneous 21, 35
 of melting 32, 66, 75
 rate of 26, 27, 153
 two-dimensional 39, 45, 151, 169
- O'Hara, S. 165
Oldfield, W. 117
Onsager, L. 51
organic materials 28, 47 (*see also* metal
 analogues)
Orrok, G. T. 166
Ovsharenkov, N. N. 38
oxide films, surface 27, 29
- p*-toluidine 171, 172
pairwise bonding 5, 73
 nearest neighbour 40, 73, 75
palladium 28, 29
Papapetrou, A. 113
Parker, R. L. 102, 104, 105, 106
partition coefficient 78
partition function 49, 53, 54
Pennington, P. R. 66, 169, 171
Pfann, W. G. 108
platinum 28, 29, 74
Pollatschek, H. 167
potassium 47
potassium-sodium alloys 68, 69, 119
Pound, G. M. 30
'pox' 99
predendritic structure 107, 108
preferential growth directions 98, 101,
 102
pre-melting 68
pulsed growth in dendrites 117, 118
- quenching 17
- Read, W. T. Jr. 65, 154
recalescence 27
relative stability 103, 108
Rhines, F. N. 78
Rigney, D. A. 166
rod eutectics 129, 132, 145
Rutter, J. W. 83, 97
- salol 47, 106, 163, 166, 170, 172
Schaeffer, R. J. 115
Schmidt, O. 171
Sears, G. W. 156, 163, 171, 172, 173
Seidensticker, R. G. 93
Sekerka, R. F. 85, 86, 91, 92, 96, 97, 98,
 100, 102, 115, 141, 145
sessile drop 12, 13, 36
Seymour, E. F. W. 27
silicon 47

182 *Index*

- silicon carbide 156
 silver 28, 29, 60, 61
 simple cubic structure 50, 52, 54
 singular interface 8, 39, 45, 49, 51
 Skapski, A. S. 72, 73, 74
 Smith, R. M. 60, 61, 99
 sodium 74
 sodium disilicate 164, 169, 170, 171
 solid-solid interface 32, 121, 123, 127, 132
 solid-vapour transition 42, 49
 solidification, uniaxial 59, 77, 78, 97, 121
 solute rejection 79, 83
 source limited growth 46, 51
 Spittle, J. A. 99
 stability
 of cellular interface 83, 96, 98
 of cylindrical interface 108, 115
 of dendrite 113, 115
 of lamellar eutectic 141
 of planar interface 80, 85; during melting 99
 of spherical interface 78, 102
 standing wave solution for dendrite branching 116, 117
 steady-state growth 78, 85, 103
 Stowell, M. J. 27, 31
 succinonitrile 44, 47
 succinonitrile-borneol eutectic 145
 supercooling
 bath 110, 125, 164
 constitutional 80, 89, 92, 97, 133, 136
 critical for nucleation 21, 77
 kinetic 82, 93, 125, 151
 superheating 32, 66, 172
 constitutional 99
 surface entropy 1, 30, 72, 76
 free energy, *see* interfacial free energy
 mass 2
 melting 8, 48, 49, 51, 73
 roughness 39, 63
 tension 2, 12, 85
 vacancies 8
 volume 1
 Tammann, G. T. 58, 140
 Tarshis, L. A. 165
 Taylor, M. R. 60, 61
 Temkin, D. E. 51, 52, 54, 62, 64, 76, 114, 115, 116, 159, 161, 162, 167, 170
 temperature, effect on γ -plot 7
 temperature gradient 17, 78, 81, 139
 terrace-ledge-kink model 3
 thermal conductivity 81, 90
 thermal wave technique 165, 166
 three-level model of interface 49, 50, 52
 Tiller, W. A. 76, 83, 109, 114–17, 120, 127, 165, 166
 time evolution of instabilities 95
 tin 28, 29, 35, 47, 48, 106, 164, 166
 tin-lead alloys 140, 142
 transmission ultra-violet microscopy 68, 69
 travelling wave solution for dendrite branching 116, 117
 Tsong, T. T. 70
 Turnbull, D. 26–9, 32, 38, 70, 75, 114
 twin boundaries 157
 two-level model of interface 40, 51, 52, 55
 Tyndall, J. 34
 Tyndall stars 34
 Ubbelohde, A. R. 76
 Uhlmann, D. R. 38, 62, 70, 161, 163, 164, 167–70, 173
 undercooling, *see* supercooling
 vapour deposition 17
 Verhoeven, J. D. 100
 Verma, A. R. 156
 vibrational entropy 65
 Vold, C. 17, 19, 38
 Volmer, M. 171
 volume change on melting 29, 43, 74
 volume fraction, role in eutectic structures 127, 132, 143, 144
 Vonnegut, B. 27
 water 28, 29, 47, 48, 110, 111, 112, 114, 170, 171
 Weatherly, G. C. 125
 wedge technique for determination of interfacial free energy 36
 Wilson, H. A. 157
 Winegard, W. C. 60, 118, 149
 Woodruff, D. P. 59, 68, 99
 Wulff, G. 10
 Wulff construction 9, 10
 Zadumkin, S. N. 74, 75
 Zell, J. 36, 37, 172
 Zener, C. 127
 zinc 47, 172