#### Index

#### а

activated dislocation segments -length 95,96 activation energy of creep - apparent 101 – in pure metals 6, 7 - in refractory metals 146, 147, 150 - in superalloys 101 activation volume - equation 7 alloys – Ir–Nb, Ir–Zr 155 – Ni–Cr, Ni–Al, Ni–W 55 - of refractory metals 143, 149, 151, 152, 153 - W-Re, W-Hf 153 amplitudes of atomic vibrations  $- \text{ in } \gamma' \text{ phases of superalloys } 102,$ 103 - in nickel base solid solutions 54, 55 - measurements 21-23, 102

## С

creep - curve 5, 6 - dislocation theories 8, 9 - in refractory alloys 151, 152 - in refractory metals 143-145, 147-150, 152

- in solid solutions 54 - in superalloys 86, 87, 95, 96, 116-120, 124, 125 - at higher temperatures 124 - at lower temperatures 116 - dislocation splitting 112, 120-122, 129 - equations 99, 100 - influence of orientation, temperature and stress 111-120 - primary stage 118, 119 - tertiary stage 118 - physical mechanism 43-45, 67, 68 - steady-state stage 51, 77 - calculation for pure metals 51-53 - equations 49, 51-53, 95, 96, 100, 137–140 - structural peculiarities 40 d

deformation map - iron 64 - molybdenum 150 - nickel 63 – niobium 145 density of dislocations - differential equation 49-51, 77, 78

#### 169

#### 170 Index

- in metals 38 - in superalloys 100, 101 diffraction electron microscopy 20 dislocation networks 30-33, 89, 132-135 dislocations - annihilation 49-51 - coefficients of multiplication 50, 73, 75  $-in \gamma'$  phase 90, 92, 94, 97 - in crept metals 35-38 -interactions with particles 89-94 - jogged 35, 36 - mobile 35, 36 - partial 112, 160 - ribbons 120-122 - screw components 36, 161 - splitting 121, 129 - subgrains 35 - theory 157

#### e

evolution of structural parameters – in matrix of superalloys 88, 89 – in metals 25–33

## g

 $\gamma/\gamma'$  misfit - influence of temperature 136  $\gamma'$  phase - amplitude of atomic vibrations 102, 103 - coarsening 104, 105 - composition 83, 103 - crystal lattice 84 - lattice parameter 136 - rafting 130, 131 - solubility 85

#### h

high-temperature strain rate – physical model for metals 43–45, 67, 68
for superalloys 95–97
shear deformation 124, 125

#### i

interaction of dislocations with particles 89–94

## j

jogs in dislocations – formation 55, 56 – in crept metals 36–38

## m

metals - copper 27, 28, 30 - iron 31–35 - molybdenum 146–151 - nickel 26, 30, 32, 34–37 - niobium 144–147 - vanadium 29, 31 misfit 136

#### r

rafting 130, 131 refractory metals – molybdenum 146–151 – niobium 144–147 – refractory alloys 149, 151, 152 rupture life 86, 87, 114, 115

#### S

Schmid factor 112
simulation

by the system of differential equations 67–71
data for metals 71–77
of structural parameters evolution 67

single crystal superalloys

blades 113
creep curves 117–120, 123–125
influence of orientation on 114–119

- influence of stress on 120 - influence of temperature on 116-118, 120 - dislocation mechanisms of strain 119-127, 129 - properties 115 - shear strain 125, 126 solid solutions - Ni-based 55 stacking faults - energy 57 structural parameters - average values 30 - evolution 25-30 - measurements 17-20 structural peculiarities - of crept metals 40 - of superalloys 83, 88 sub-boundaries - as sources and obstacles for mobile dislocations 34, 35 - crystallography 55, 56 - distances between dislocations 31-35, 37, 38 - stability 58-62

superalloys
composition 129, 163
equations of strain rate 95–100, 137–140
physical mechanism of strain 96–98
prediction of properties 106–108
trends of development 129

# V

vacancies
energies of formation 46, 52
energy of diffusion 46, 47, 52
loops and helicoids 39
velocity of dislocations
with vacancy-absorbing jogs 46, 47
with vacancy-producing jogs 46–49, 72, 75

### x

X-ray in situ studies

- data 26–31
- equipment 13, 14
- technique 15
- measurement of structure parameters 17–20