

The following lists have been compiled as a reference tool. The *Chapter number* and (colon) *Equation number* (or '*Fig*' number) are listed on the right. Underlined are the locations of definitions. Not listed are symbols used only in a local context.

Index of Latin Symbols

| | | |
|--|---|--------------------------|
| \mathbb{A}, A_{ijkl} | accommodation tensor, components | <u>7:91b</u> ;8:82;11:10 |
| \mathbf{a} | unit cell base vector (length a) | 2:1a,b |
| $\mathbf{a}_1, \mathbf{a}_2, \mathbf{a}_3$ | base vectors in hexagonal plane | <u>2:Fig2</u> |
| $a_2(\mathbf{h})$ | axis distribution function | <u>2:18</u> |
| \mathbb{B}^c | localization tensor | <u>7:92b</u> ;11:13b |
| B | bulk modulus | 7:45 |
| $B^R; B^V$ | Reuss; Voigt averages of bulk modulus | 7:47;7:52 |
| $\mathbf{b}^{(\lambda)}$ | basis for symmetric second-rank tensors | <u>7:11-13</u> ;8:27 |
| | eigentensors for fourth-rank tensors (cubic/hexagonal) | 7:19/21 |
| \mathbf{b} | unit cell base vector (length b) | 2:1a,b |
| | Burgers vector (length b) | 8:1 |
| $\hat{\mathbf{b}}$ | slip direction (unit vector) | 8:8 |
| $\mathbb{C}; C_{ijkl}; C_{\lambda\mu}$ | elastic stiffness; tensor components; matrix components | 1:3,17,18;7:9; <u>A1</u> |
| \mathbb{C}' | a particular shear stiffness | 1:20 |
| $\bar{\mathbb{C}}; \tilde{\mathbb{C}}$ | average and deviation of \mathbb{C} | A22 |
| $\mathbb{C}^H; \mathbb{C}^R; \mathbb{C}^V$ | Hill; Reuss; Voigt averages of \mathbb{C} | 7:35-38 |
| $C^{(\lambda)}$ | eigenvalues of \mathbb{C} | 7:15 |
| \mathbf{c} | unit cell base vector (length c) | 2:1a,b |
| $C_1^{\mu\nu}$ | OD coefficients (Bunge) | 3:6B |
| c (superscript): | crystal | |

| | Notation | 607 |
|-----------------------------|---|--|
| D | diffusivity tensor (D when scalar) | 1:15,22,23 |
| | plastic strain rate tensor (deviatoric) | <u>1:13</u> ;7:69,73;8:11,29;11:1;12:1;13:10 |
| \hat{D} | straining direction | 8:15,21 |
| \tilde{D} | local deviation in strain rate | 11:10 |
| d | grain size | 8:80 |
| | plane spacings (twinning d_t ; lattice d_{hkl}) | 1:12e;2:Fig.12;4:1 |
| E | Eshelby tensor | 7:57,91;11:10c;A18 |
| E | Young's modulus | 1:24;7:63 |
| \mathcal{E} | evolution function | 8:35 |
| F | deformation gradient (matrix) | 8:85-87,97;14:5,8 |
| F_i | diffraction form factor | 3:17 |
| F_1^V | coefficients of pole distribution (Bunge) | 3:4B |
| f | body force, per unit volume | 11:28;A2 |
| | resulting force on element interface | 12:7-8 |
| $f(\mathbf{g})$ | orientation distribution function (OD) | 3:5,5B |
| \tilde{f}, \bar{f} : | even and odd part of $f(\mathbf{g})$ | 3:10 |
| \mathcal{F} | function symbol | 8:31,32 |
| G | symmetric derivative of the Green tensor \mathbf{G} | 11:31;A25b |
| G | the elastic Green tensor | A3,4 |
| ΔG | activation energy (free enthalpy) | 1:23 |
| g | crystal orientation (in sample frame): set of angles or rotation matrix | 2:6 |
| \mathbf{g}^E | orientation of stretch ellipsoid (grain shape) | 8:89, Fig.30 |
| $d\mathbf{g}$ | element in orientation space ($\Delta\mathbf{g}$ when finite) | 2:14(15) |
| $\Delta\mathbf{g}$ | misorientation | 2:8,9a |
| \mathbf{g} (superscript): | grain (referring to morphology not orientation) | 8:91,93 |
| | also: index of cell in orientation space | (p.479) |

| 608 | TEXTURE AND ANISOTROPY | |
|----------------------------------|--|----------------------------|
| H | symmetry operator (matrix) | 1:6;8:31' |
| h, hkl | Miller indices | 2:1b,18;3:17 |
| hst | hardening matrix | 8:39 |
| h(t) | Heaviside step function | 7:74,82 |
| h | trace operator | 12:7;13:17 |
| H | hardening function | 8:74 |
| | unit tensor of fourth (or arbitrary) rank | 7:57,62a |
| I | unit matrix | 8:79 |
| Ī | inversion operator | 1:8 |
| I | intensity | 4:2 |
| I^{bg} | background intensity | 4:5 |
| I^{norm} | normalized intensity | 4:11 |
| J_i | tensor invariants | 1:14 |
| K, K^c | linear creep compliance tensor (polycrystal; single crystal) | 7:69,98 |
| K₁ | habit plane in twinning | 2:12a,2:Fig.20 |
| K^(λ) | eigenvalues of K ^c | 7:104 |
| k | wave vector | 7:65 |
| k | Miller index | 2:1b |
| | Boltzmann constant | 8:51 |
| k_y | Hall–Petch constant | 8:80 |
| K_l^m | coefficients of inverse pole figure (Bunge) | 2:Fig.38 |
| k_lⁿ | symmetrized harmonic functions (Bunge) | 3:3B |
| K | kinetic function | 8:51',58,62 |
| L | velocity gradient (plastic) | 1:12 ;8:13 |
| l | Miller index | 2:1b |

| | Notation | 609 |
|------------------------------------|--|---------------------------|
| l | order of harmonic function | 3:5,5B |
| $M;M^c$ | visco-elastic compliance (polycrystal; single crystal) | 7:72,70 |
| \hat{M} | Carson transform of M | 7:89 |
| M | Mirror plane operator | 1:9 |
| M^c | Taylor tensor: stress deviator scaled by yield surface size | 8:23 |
| M_ϵ | Taylor tensor defined by strains, not stresses | 8:42,49 |
| M^c | Taylor factor (normalized plastic work, regardless of model used) – especially for crystal c. (M is often used for the <i>average</i> .) | 2:24 10:Fig.30a |
| M_i | multiplicity of pole i | 3:12 |
| m | Schmid tensor (sym. part of unit distortion for slip, m when scalar) | 8:9:5:2,6 |
| m | physical relative rate sensitivity of flow stress | 8:52 |
| $\hat{N}^l, \tilde{N}^m, N^n$ | interpolation functions in FEM | 12:5;13:13 |
| N | upper limit for running index n | 7:102;12:5;13:13,14 |
| | number of counts | 4:10 |
| n | normal to a surface or to a slip plane (unit vector \hat{n}) | 8:8 |
| | axis of rotation in axis/angle description of misorientations | 2:9a |
| n | order of diffraction | 4:1 |
| | stress exponent in rate sensitive numerical kinetic relation | 8:55 |
| \mathbb{P} | plasticity tensor: visco-plastic compliance | 8:75,76;11:2–8;12:1;13:12 |
| \mathbb{P}^{eff} | effective plastic compliance | 8:82 |
| P | pole | 2:Fig.3 |
| p | the direction of a line | 8:86 |
| | a misorientation in quaternion description | 2:11d,e |
| p | pressure | 1:21;8:79;11:28;13:13 |
| P_l^m | Legendre polynomial | 3:3 |
| $p_h(\mathbf{y}), p(\alpha,\beta)$ | pole distribution function | 2:17;3:1,2,3,3B,17 |

| | | |
|----------------------------------|--|------------------------------|
| Q | visco-plastic stiffness tensor | 11:24;13:11 |
| Q | quaternion (four components) | 2:11 |
| Q | activation energy | 1:22;8:59 |
| q | heat flow (vector) | 1:1 |
| | vector part of quaternion | 2:11b |
| | normal to a plane | 8:86' |
| | skew part of unit distortion tensor for slip | 5:3,7;8:9' |
| q ($\bar{q}, \Delta q$) | contraction ratio (average and span) | 10:6-8 |
| q_0 | scalar part of quaternion | 2:11b |
| Q_{lm} | coefficients in pole figure series | 3:3,6 |
| R | elastic reaction tensor | 7:56, <u>A20</u> |
| R | rotation operator | 1:4, 11' |
| R | Rodrigues vector | 2:10a |
| R* | crystal orientation, identical to g (represented as matrix) | 13:20 |
| R | Lankford coefficient of strain anisotropy in sheet | 10:4 |
| r | same on differential basis | 10:5 |
| r | direction | 2:1a |
| $r(\alpha, \beta)$ | inverse pole figure density | 3:9 |
| R_{ln} | harmonic coefficients of inverse pole figure | 3:8 |
| $S, S_{ijkl}, S_{\lambda\mu}$ | elastic compliance tensor (components, matrix) | 1:18'; 7:10, 63 |
| S, S^c | stress deviator (c: in crystal) | 8:29, 79; 11:24; 12:1; 13:10 |
| S | plane of shear in twinning | 2:12a |
| $S^{(\lambda)}$ | eigenvalues of S | 7:26, 29 |
| s | Carson transform of time | 7:78 |
| s (superscript): | slip (or twinning) system | |

| Notation | | 611 |
|-------------------------------|--|-----------------|
| T | absolute temperature | 1:1 |
| \mathbf{t} | twinning transformation matrix | 2:12b |
| | surface tractions (a vector) | 12:3 |
| t | time | 7:64 |
| | thickness | 4:2 |
| $T_1^{\mu\nu}$ | generalized spherical harmonics (Bunge) | 3:5B;7:6 |
| T (superscript): | transpose | 1:5 |
| tr | sometimes used for Trace | 12:4 |
| \mathbf{u} | displacement vector (u : scalar displacement) | 7:64;A4 |
| | velocity vector in FEM | 13:12 |
| \mathbf{u}_1 | displacement in twinning | 2:12a |
| $\mathbf{u}_{k,l}$ | displacement gradient tensor | A1.5 |
| uvw | direction indices | 2:1a |
| \mathbf{V} | left stretch tensor | 8:87 |
| v | elastic wave velocity | 7:68 |
| \mathbf{W} | rotational Eshelby tensor | 11:11;A19 |
| \mathbf{W} | spin tensor (skew part of velocity gradient) | 1:13";8:84,94 |
| \mathbf{W}^g | same at grain level | |
| $\tilde{\mathbf{W}}$ | local deviation in rotation rate | 11:11 |
| $\mathbf{W}^c, \mathbf{W}^p$ | 'plastic spin' of crystal (due to slip) | 8:12,92;(13:21) |
| $\mathbf{W}^E (\mathbf{W}^e)$ | Euler spin (of grain) | 8:89-91;13:6 |
| \mathbf{W}^* | reorientation rate of crystal axes | 8:93-96 |
| w | work per unit volume (only used differentially or as rate) | 8:17,68 |
| w^c | statistical weight of a crystal | 7:2,3;13:4,11 |
| W_{lmn} | generalized harmonic coefficients (Roe) | 3:5;7:6 |

| 612 | TEXTURE AND ANISOTROPY | |
|-----------|--|--------------|
| X | sample axis (<i>X</i> : <i>current</i> sample coordinate) | 2:Fig.3 |
| x | crystal axis (<i>x</i> : current crystal coordinate) | 2:1b, Fig.4 |
| | position vector | Chaps.7,11,A |
| Y | sample axis (<i>Y</i> : <i>current</i> sample coordinate) | 2:Fig.3 |
| y | crystal axis (<i>y</i> : current crystal coordinate) | 2:Fig.4 |
| | location in pole figure (set { α, β }) | 2:16;3:17 |
| Z | sample axis (<i>Z</i> : <i>current</i> sample coordinate) | 2:Fig.3 |
| z | crystal axis (current crystal coordinate) | 2:Fig.4 |
| Z_{lmn} | Jacobi polynomials | 3:5 |

Index of Greek Symbols

| | | |
|----------------|---|-------------|
| α | thermal expansion tensor (α^V, α^R : Voigt and Reuss averages) | 7:31(35,36) |
| α | pole distance in pole figure | 3:1;4:12 |
| | anisotropy factor in hexagonal crystals | 7:22 |
| β | distortion tensor | 8:3;14:4-10 |
| β | azimuth in pole figure | 3:1;4:12 |
| Γ | fourth-order stiffness coupling tensor between volume elements | 11:33 |
| Γ | path through OD | 3:2 |
| Γ_V | surface of a body | 7:55c,87c |
| Γ_e | partial surface or interface of an element | 12:3;13:14 |
| $d\Gamma^c$ | shear sum in crystal <i>c</i> (magnitude, differential) | <u>8:41</u> |
| γ | shear strain (magnitude, usually differential) | 8:1 |
| $\dot{\gamma}$ | shear rate | 8:11,55 |

| | Notation | 613 |
|-----------------------|--|-----------------|
| $\dot{\gamma}_0$ | reference strain rate | 11:1 |
| γ_t | twinning shear | 2:12e;8:2 |
| δ | virtual variation | 8:1,2 |
| | azimuth angle in oblique section (Matthies) | 2:5 |
| | angle in Debye ring | 4:13 |
| δ_{ij} | Kronecker symbol (unit tensor) | |
| Δ | difference operator | 2:15 |
| ϵ | elastic strain tensor (<i>plastic</i> only as $d\epsilon$) | 7:9;(8:15) |
| $\tilde{\epsilon}$ | local deviation in ϵ | 7:56 |
| $\hat{\epsilon}(s)$ | Carson transform of $\epsilon(t)$ | 7:88 |
| ϵ^t | transformation strain tensor | A7 |
| ϵ^* | fictitious transformation strain | A27 |
| $\dot{\epsilon}$ | plastic strain rate (scalar) | 8:15,51,67' |
| η_i | twinning direction | 2:12a,2:Fig.20 |
| η | azimuth of axis in crystal coordinates | 3:6 |
| θ | (one-half of the) Bragg angle | 4:1 |
| θ | crystal hardening rate (sub-zero: initial, sub-one: for single slip) | 8:38,40 |
| | angle of twist | 10:2 |
| Θ | Euler angle (distance between z and Z poles) | 2:2,6,2:Fig.3,4 |
| | polycrystal hardening rate | 8:74 |
| κ, κ_{ij} | thermal conductivity (tensor, components) | 1:1 |
| ζ | elastic compressibility | 1:21;7:49 |
| | parameter in work-hardening relation | 8:37';13:22 |

| 614 | TEXTURE AND ANISOTROPY | |
|-----------------------------------|---|-------------------------------|
| λ_1 | eigenvalues | <i>1:14;8:88</i> |
| λ | wavelength of radiation | <i>4:1</i> |
| | diffusive jump distance | <i>1:23</i> |
| μ | shear modulus (relevant combination for dislocation problems) | <i>8:58,62</i> |
| | x-ray absorption coefficient | <i>4:2</i> |
| | Euler angle in oblique section | <i>2:4</i> |
| ν | Euler angle in oblique section | <i>2:3</i> |
| ν | Poisson's ratio | <i>10:9</i> |
| Ξ | radial distance of axis from Z in sample coordinate system | <i>3:8</i> |
| ξ | radial distance of pole from z in crystal coordinate system | <i>3:6</i> |
| ρ | material density | <i>4:3;7:64</i> |
| | dislocation density | <i>8:35</i> |
| | fractional radial distance | <i>2:2;13:7</i> |
| | angular density of rod axes | <i>14:1-3</i> |
| $\sigma, \sigma_{ij}, \sigma_\mu$ | Cauchy stress | <i><u>1:9;7:98,106;A1</u></i> |
| $\bar{\sigma}, \tilde{\sigma}$ | average and local deviation of σ | <i>7:56;A7</i> |
| $\hat{\sigma}(s)$ | Carson transform of $\sigma(t)$ | <i>7:88</i> |
| σ_f | flow stress (a scalar measure of the size of the yield surface) | <i>8:65,70</i> |
| σ_{vM} | equivalent stress according to von Mises | <i><u>8:68;10:10</u></i> |
| σ | Euler angle in oblique sections, according to Matthies | <i>2:5</i> |
| | standard deviation | <i>4:10</i> |
| Σ | sum | |
| τ | shear stress | <i>10:1</i> |

| | Notation | 615 |
|--------------------|--|-------------------------|
| τ | relaxation time | 7:100 |
| τ^c | scalar parameter of strength (measure of crystal yield surface size) | 8:26 |
| τ^s | critical resolved shear stress on system s (with hat: at 0 K) | 8:18,51;11:1 |
| τ_ε | part of flow stress due to strain hardening | 8:34 |
| τ_v | scaling stress in strain-hardening law ('Voce stress') | 8:35 |
| Υ | weighting function in FEM (a scalar) | 12:4 |
| Φ | weighting function in FEM (a 1-D array) | 12:3;13:8,9 |
| ϕ | tilting angle in goniometer | 4:Fig.1 |
| | Euler angle (azimuth in inverse pole figure) | 2:Fig.4 |
| ϕ_1 | Euler angle (azimuth in pole figure) | 2:Table I |
| ϕ_2 | Euler angle (azimuth in inverse pole figure) | 2:Table I |
| ϕ^+, ϕ^- | Euler angles in oblique section (Bunge) | 2:5,2:Fig.15 |
| Φ | Euler angle (Bunge: distance between z and Z poles) | 2:Table I |
| | (Roe: azimuth in inverse pole figure) | 2:Table I |
| | plastic potential | 8:21 |
| χ | goniometer azimuth | 4:Fig.1 |
| Ψ | weighting function in FEM (a 2-D array) | 12:2 |
| Ψ | Euler angle (azimuth in pole figure) | 2:Fig.3 |
| ω | skew part of distortion tensor (used only differentially) | 8:5 |
| $\tilde{\omega}$ | deviation in elastic rotation tensor | A19 |
| ω | angle of rotation in axis/angle description | 2:9b |
| | angle of rotation in goniometer (for rocking curves) | 4:12a |
| | wave frequency | 7:65 |
| Ω | volume in orientation space (or other space) | 2:13,19;12:3;13:14 |

SUBJECT INDEX

- | | | | |
|---------------------------------------|---|-------------------------|-----------------------------|
| absorption | 131 | centrosymmetry | 17, 26, 33 |
| accommodation tensor | 314-316, 473 | ceramics | |
| activity of systems | 8, 410, 482-98 | bulk | 262 |
| ADC algorithm | 116 | coatings and films | 271 |
| advantages | | chalcedony | 257 |
| direct methods | 118 | channel die | 424 |
| experimental methods | 176 | channeling pattern | 171 |
| harmonic method | 111 | chirality | 26 |
| Al | 4, 138, 181, 190, 433, 436, 446, 450, 461 | circular texture | 151 |
| alignment, pole figure diffractometer | 136 | clay minerals | 259, 576 |
| alkali halides | 265 | cluster scheme | 500-09 |
| Al-SiC whiskers composite | 216 | coatings | 2, 271 |
| alumina | 262, 274 | alumina | 274 |
| ambiguities | 411 | carbide | 273 |
| ambiguity of OD | 106 | nitride | 274 |
| anisotropy | | coaxial deformation | 6, 581 |
| and centrosymmetry | 17 | coiling | 216 |
| and symmetry | 16-18 | collocation method | 316 |
| degree | 15, 41 | compaction strain | 577 |
| kind | 16, 39 | comparison | |
| olivine | 308, 588 | experimental methods | 176 |
| aragonite | 245 | OD methods | 121 |
| aspect ratio of grains | 570, 571 | Taylor/self-consistent | 248, 568 |
| AVA | 176 | fcc/bcc | 191 |
| axis | 51 | component | |
| axis/angle description | 69 | brass | 80, 183, 185, 415, 523, 540 |
| | | copper | 79, 183, 185, 541 |
| background correction | 140, 143 | cube | 80, 225, 448 |
| backscatter pattern (EBSP) | 171 | Goss | 80, 185, 231, 430, 449, 551 |
| bands in microstructure | 231, 376, 412 | S | 80, 185, 451 |
| basis tensors | 340 | Taylor | 80, 185, 540 |
| Bauschinger effect | 432 | components | 78 |
| bcc textures | 191 | quartz | 257 |
| BEARTEX program | 140 | rolling texture | 185 |
| biaxial stretching | | composites | 36, 215 |
| cruciform specimens | 436 | Be-Al | 217 |
| strip specimens | 435 | Cu-Nb | 215 |
| biaxial stress | 438 | quartz-mica | 262, 500, 504, 572 |
| Bi-cuprates | 268 | compressibility modulus | 39, 295 |
| biological materials | 246 | compression | |
| bone | 246 | experiments | 423 |
| boundary conditions | 393 | calcite | 243, 563 |
| brass component | | channel die | 424 |
| 80, 183, 185, 415, 523, 540 | | dolomite | 247 |
| bulk modulus | 294 | fcc metals | 181, 402, 405, 484 |
| | | ice | 260 |
| calcite | 6, 164, 167, 242, 493, 562, 579 | knife-edge | 425 |
| calcium hydroxide | 270 | olivine | 257, 497 |
| Carson transform | 312-16 | quartz | 251 |
| cement minerals | 270 | quartz-mica | 504 |

| TEXTURE AND ANISOTROPY | | 669 | |
|--|----------------------------|-------------------------------------|----------------------------|
| TiAl | 214 | direct methods for OD | 114, 118, 119 |
| U | 211 | advantages and disadvantages | 118-19 |
| Zr and alloys | 204, 492 | directions | 46, 48 |
| computational parameters | 394 | dislocations | 329 |
| constitutive relations | 358, 470, 601 | discrete grains file | 88 |
| linearization | 363 | discretized aggregate | 518 |
| constrained hybrid model | 468, 529 | dislocations | 329 |
| constriction | 581 | accumulation | 348 |
| continuous distributions | 94 | climb | 339 |
| contouring of pole densities | 57 | glide | 328 |
| contraction ratio | 428-30 | displacement gradient | 34, 330 |
| convection, mantle of Earth | 591 | distortion | 330 |
| copper component | 79, 183, 185, 541 | dolomite | 169, 563 |
| correspondence principle | 313 | drainage volume | 408 |
| counting statistics | 148 | dynamic recrystallization | 252, 405, 572 |
| crack propagation | 5 | | |
| creep tensor | | earing | 3, 451, 550 |
| of polycrystal | 316 | eigentensors | 286-88 |
| of single crystal | 310 | eigenvalues | 35 |
| of Zr-Nb | 320 | cubic symmetry | 287, 289 |
| critical resolved shear stress (CRSS) | 333 | hexagonal symmetry | 288, 290 |
| crystal directions and planes | 46 | elastic inclusion | 597 |
| index notation | 46 | elastic inhomogeneity | 601 |
| Miller-Bravais indices | 48 | elastic properties | 36, 42, 285 |
| Miller indices | 46 | bulk modulus | 294 |
| poles and unit vectors | 49 | compressibility modulus | 39, 295 |
| signed and unsigned directions | 48 | geometric mean | 293 |
| crystal orientation | 27 | lower bounds | 291, 302, 305 |
| crystal orientation distribution (COD) | 81, 92, 544 | polycrystals | 290, 299, 589 |
| crystal structure analysis | 154 | single crystals | 285, 300 |
| crystal symmetries | 21 | hexagonal crystals | 289 |
| Cu | 81, 86, 123, 175, 182, 224 | incompressible crystals | 289 |
| cube component | 80, 225, 448 | olivine | 307, 589 |
| cubic sample symmetry | 87 | Poisson's ratio | 42 |
| Cu-Nb composite | 215 | self-consistent averages | 296-98, 302-15 |
| curling effect | 216, 563 | upper bounds | 291, 302, 305 |
| Cu-Zn alloys | 183 | wave velocities | 306, 590, 594 |
| cyclic (cylindrical) texture | 151, 227 | Young's modulus | 304 |
| | | Zr | 289, 319, 320 |
| | | elasticity | 365 |
| data requirements | 119, 140 | elastic rotation | 603 |
| Dauphiné twinning | 75, 174, 176, 250 | elasto-plastic transition | 347, 367 |
| defocusing correction | 144 | electrical conductivity | 6, 267, 276 |
| deformation gradient matrix | 384-87, 581 | electrodeposition | 237 |
| deformation history | 6, 576 | electron backscatter pattern (EBSP) | 171 |
| deformation mode maps | 346 | electron diffraction | 167 |
| calcite | 495 | enantiomorphism | 26, 112, 249 |
| hcp metals | 487 | energy and work principles | 378 |
| γ -TiAl | 346 | environmental stages | 160 |
| zircaloy | 487, 490 | epitaxial films, measurements | 152 |
| detectors | | equal-area pole figure coverage | 138 |
| energy dispersive | 149 | equal-area mapping | 52 |
| position sensitive | 149, 162, 164 | equilibrium equation | 472, 501, 597, 601-2 |
| diagonalization | 35 | errors in OD calculation | 120 |
| difference OD | 85 | Eshelby inclusion | 599 |
| difference plots | 85, 91, 175 | Eshelby tensor | 297, 314-16, 473, 599, 603 |
| diffusivity | 36, 41 | Euler angles | 60-64, 104 |

| 670 | TEXTURE AND ANISOTROPY | | |
|--------------------------------------|-----------------------------|--|-----------------------|
| Euler spin | 384 | grain shape | 395, 570 |
| Euler stretch ellipsoid | 395 | effect on elastic and thermal properties | 301, 303 |
| Eulerian formulation | 534 | effect on plastic properties | 370, 522 |
| evolution | 359 | rigid rotation | 478, 569 |
| experimental methods, comparison | 176 | updating | 383 |
| extrusion textures | | grain size effects | 368 |
| Al-SiC composite | 217 | green body pressing | 242 |
| NiAl | 213 | Green function | 501, 597 |
| Ti | 203 | | |
| halite | 568 | | |
| | | habit plane in twinning | 75 |
| fabric | 12, 241 | halite | 265, 567 |
| fcc textures | 181, 391 | Hall-Petch relation | 368 |
| Fe | 4, 228 | handedness | 26, 67, 96, 249 |
| FEM-based models | 468, 513, 533, 592 | hardening | 359, 432, 458-62 |
| Fe-Ni alloy | 156 | isotropic | 351 |
| ferroelectrics | 275 | latent | 351, 452 |
| fiber representation | 83, 185, 409, 414 | matrix | 350 |
| fiber texture | 29, 181 | proportional | 350 |
| field variables | | harmonic method for OD | 94, 107, 284 |
| displacement gradient | 34 | advantages and disadvantages | 111 |
| representation ellipsoid | 36 | hcp textures | 203 |
| spin | 34 | hematite | 264 |
| strain rate | 34 | hereditary integral | 310 |
| stress | 32 | heterogeneous deformation | |
| velocity gradient | 33 | 31, 226, 369, 412, 467, 513 | |
| films | | calcite | 562 |
| data correction | 147 | halite | 567 |
| diamond | 273 | hcp metals | 203 |
| epitaxial | 276 | quartz | 571 |
| ferro-electric | 275 | quartz-mica | 508 |
| measurements | 152 | high-temperature superconductors | |
| metals | 231 | 5, 267, 276 | |
| silicon | 271 | Hill average | 292 |
| finite element method (FEM) | 515, 553 | homogeneous effective medium (HEM) | 503 |
| finite element polycrystal | 520, 525 | Hough transform | 158, 174 |
| flattening | 581 | hybrid formulation | 516 |
| flow fields | 369 | hydraulic bulge test | 436 |
| flow stress | 348, 352 | hydroforming | 548 |
| flow surface | 355 | hydroxy-apatite | 246 |
| forging of cubes | 437 | | |
| formability | 551 | ice | 160, 260, 574 |
| fracture toughness | 267 | incomplete pole figures | 140 |
| fractures, oriented | 587 | incompressibility | 501 |
| frame indifference | 383 | incompressibility constraint | 555 |
| full constraints | 396, 488, 491 | individual orientations | 127 |
| | | inhomogeneous inclusion | 602 |
| geological materials | 241, 561 | initial texture effects | |
| geometrically necessary dislocations | 373 | 181, 407, 413, 492, 518, 543-51 | |
| ghost correction | 114 | instabilities, plastic | 412, 433, 438, 453-54 |
| ghost problem | 106, 112 | intensity corrections | 143 |
| Goss component | 80, 185, 231, 430, 449, 551 | interaction equation | 297, 314, 503, 603 |
| gradients of texture | 227, 540-47 | intermetallics | 213 |
| grain averages | 284 | interpolation functions | 553 |
| grain axes | 382 | inverse pole figures | 55, 110 |
| grain curling | 194, 216, 403, 563 | harmonic representation | 110 |
| grain interaction | 365, 411, 482, 523 | measurements | 153 |
| models | 372, 474 | inversion operator | 17 |

| TEXTURE AND ANISOTROPY | | 671 |
|--|------------------|--|
| Jacobi polynomials | 108 | neutron diffraction 159 |
| Kikuchi pattern | 170 | optical methods 127 |
| kinematic hardening | 341 | pole figures 127 |
| kinematics | | x-ray diffraction 129 |
| in polycrystals | 380 | melt, partial 587 |
| of slip and twinning | 328 | melt-textured growth 268 |
| kinetic relation | 356, 392 | mesh distortion 526 |
| kinetics of slip | 352 | Mg 206 |
| Kurdjumov-Sachs relationship | 218 | mica 12, 259, 270, 576 |
| Lagrangian formulation | 534 | micro-macro linking 592 |
| Lambert projection | 52 | Miller indices 46 |
| Lankford coefficient | 427 | Miller-Bravais indices 48 |
| Laplace transform | 312 | minerals 241, 561 |
| Lapp (Los Alamos polycrystal plasticity) | | misorientation distribution (MDF) 97, 76 |
| 392, 399, 441-47 | | misorientations 68 |
| laser ablation | 277 | axis-angle description 69 |
| latent hardening | 405, 415 | Rodrigues vector description 69 |
| lattice orientation | 26 | quaternion description 73 |
| lattice preferred orientation | 127 | modeling 379 |
| lattice spin | 386 | calcite 245, 493, 562, 579 |
| Laue groups | 19, 24 | cubic metals 391, 482, 520 |
| Laue orientation | 26 | dolomite 248, 465, 504, 573, 584 |
| Laue patterns | 157 | halite 567 |
| layered structure | 13 | hcp metals 484, 525 |
| Legendre polynomials | 108 | ice 574 |
| length scales | 513, 533 | mantle convection 592 |
| limestone | 243, 579 | olivine 258, 497, 589 |
| limiting dome height (LDH) test | 548, 551 | quartz 248, 504, 565, 573, 584 |
| liquid crystals | 278 | mollusc shells 246 |
| localization | 332 | monochromator 152 |
| localization tensor | 315, 474 | morphological texture 576 |
| lower bound in plasticity | 371, 526 | muscovite 13 |
| lower bound in visco-elasticity | 322 | mylonites 260 |
| Lüders band | 366 | neighborhood effects 523 |
| macroscopic spin | 537 | Neumann's principle 40 |
| magnetic field alignment | 268 | neutron diffraction 159 |
| magnetic scattering | 161 | Newtonian creep 308 |
| magnetite | 264 | NiAl 213 |
| mantle of Earth | 587 | nitrides 2, 265, 267, 274 |
| mapping, stereographic and equal-area | 52 | non-centrosymmetric properties 39 |
| marble | 243, 579 | non-coaxial deformation 581 |
| March model | 259, 266-68, 576 | nonlinear optical materials 278 |
| material dependence of fcc textures | 413 | non-Schmid effects 337 |
| material element | 18 | non-tensor properties 39 |
| material frames | 380 | normality rule 333, 439 |
| material properties | 12 | normalization, pole figures 57, 122, 148 |
| material state | 12 | nuclear scattering 161 |
| matrix composites | 266 | oblique sections 62, 85 |
| matrix notation | 340, 604 | olivine 257, 306, 497, 588 |
| maximum work principle | 335, 392 | one-site scheme 506 |
| Maxwellian response | 309-16 | orientation 26-27, 58 |
| measurements of texture | | 'boat' description 60 |
| electron diffraction | 167 | density 94 |
| individual orientations | 127, 167 | jumping 388 |
| | | matrix representation 65 |
| | | pole triplet 59 |

| | | | |
|--|--------------------|--|----------------------------------|
| orientation (cont'd.) | | projection | |
| representation | 57 | equal-area | 52 |
| streaming | 388 | of OD | 105 |
| symmetric Euler angles | 60 | operator | 529 |
| symmetrically equivalent | 66 | stereographic | 52 |
| versus rotation | 383 | properties | 12, 32, 282 |
| orientation distribution (OD) | 81, 91, 104 | Pu | 184 |
| crystal orientation distribution (COD) | 81 | pure shear | 328, 580 |
| function (ODF) | 82, 94, 104 | calcite | 243, 496, 563, 579 |
| sample orientation distribution (SOD) | 81 | quartz | 566 |
| orientation imaging microscopy (OIM) | 173 | pyroelectricity | 39 |
| orthotropy | 29 | | |
| | | quartz | 75, 142, 174, 249, 564, 571, 583 |
| pattern formation model | 416 | quartz-mica composite | 262, 504, 572 |
| Pd | 234 | quartz, natural fabric types | 254 |
| pencil glide | 191, 405, 408, 456 | quaternion description | 73 |
| percolation threshold | 348 | | |
| perovskite | 258, 275 | rate-independent limit | 358 |
| phyllosilicate measurements | 141 | rate-sensitive materials | 352, 564 |
| phyllosilicates | 259, 270, 576 | rate sensitivity | 353, 356, 404, 497, 526, 564 |
| piezoelectricity | 39, 113, 249 | reaction tensor | 297, 600 |
| plane of shear | 75 | recommendations | |
| plane-strain compression | 580 | OD calculation | 121 |
| calcite | 243, 495, 564, 579 | representation | 90 |
| experiments | 423 | recrystallization | 222, 413, 572 |
| fcc | 520 | Al | 222 |
| hcp | 488, 525 | Al-Mn composite | 222 |
| quartz | 566 | brass | 222 |
| simulation | 441 | Cu | 222, 224 |
| plasticity and microstructure | 375 | heterogeneities | 231 |
| plasticity modulus | 363 | ice | 574 |
| plastic potential | 332, 336, 355, 431 | model | 572 |
| point groups | 19 | quartz | 252, 573 |
| Poisson's ratio | 42, 429 | steel | 223 |
| polar crystals | 112 | reference frames | 380 |
| pole | 49 | reflection geometry | 137 |
| pole distribution function | 95, 104 | relaxed constraints | |
| pole figure diffractometer | 134 | 304, 370, 396, 442, 468, 520, 538, 564 | |
| pole figures | 55, 90, 104 | reorientation | 385, 478 |
| contouring, normalization | 57, 122, 148 | representation | 45 |
| coverage | 138 | directions | 46 |
| discrete | 55 | misorientations | 68 |
| incomplete | 109, 118, 140 | orientations | 57 |
| inverse pole figures | 55, 90, 110 | planes | 46 |
| measurements | 127 | recommendations | 90 |
| superimposed poles | 110, 118 | textures | 77 |
| polycrystal property | 40, 282 | representative material element | 18 |
| polymineralic rocks | 260 | residual stress | 158 |
| polyphase materials | 498 | resolved shear stress | 333 |
| Be-Al | 217 | restricted glide | 191 |
| Cu-Nb | 215 | Reuss average | 292, 295 |
| quartz-mica | 262, 500, 504, 572 | Rietveld method | 165 |
| pressing | 242, 268 | rigid-body spin | 386 |
| principal axes | | rocks | 241, 561 |
| of grain shape | 384 | rocks, naturally deformed | 576 |
| of tensors | 35 | Rodrigues space | 70 |
| of anisotropy | 382 | Rodrigues updating scheme | 386 |

| TEXTURE AND ANISOTROPY | | 673 | |
|---------------------------------------|----------------------------------|--|-------------------------|
| rolling of plates | 30 | shear bands | 226, 231, 412 |
| rolling textures | 182 | shear spin | 385 |
| Al alloys | 430, 538, 540, 549, 552 | sheet forming | 548 |
| bcc metals | 195, 405 | sheet silicates | 259, 576 |
| Be-Al composite | 217 | shells | 246 |
| components | 78, 185 | silicon nitride | 5, 265, 267 |
| Cu | 81, 123, 182, 193, 399, 429, 450 | simple shear | 328, 425, 580 |
| Cu-Zn (brass) | 183, 414 | olivine | 257, 307, 589 |
| fcc | 182, 398, 405, 482, 537 | quartz | 253 |
| Fe-Si | 193, 227, 231 | sheet silicates | 260 |
| hcp | 204, 488, 525 | simulation | 379, 392 |
| Hf | 204 | single-crystal yield surface of | |
| Pt | 184 | γ -TiAl | 345 |
| steel | 195, 406, 544-547 | quartz | 566 |
| Ta | 195 | Zr alloys | 487 |
| Ti | 204 | slate | 259, 577 |
| U | 211 | slip | |
| Zn | 204 | in single crystals | 328 |
| Zr and alloys | 204, 488 | reorientation by | 478 |
| rotation | 16 | slip systems | |
| rotation fields | 388, 407 | calcite | 495, 505, 563 |
| rotation groups | 24 | dolomite | 247, 563 |
| rotation rate | 331 | halite | 567 |
| rotation versus orientation | 383 | hcp | 525 |
| R-value | 427, 447, 552 | mica | 505 |
| S component | 80, 185, 451 | olivine | 497, 588 |
| Sachs model | 468 | quartz | 250, 505, 565 |
| salt | 265, 567 | temperature effects | 404, 493, 563-68 |
| sample frame | 380 | Zr alloys | 487 |
| sample orientation distribution (SOD) | | solidification textures | 2, 232-35 |
| | 81, 93 | spectrum deconvolution | 165 |
| sample | | spherical harmonics | 94, 107, 284 |
| definition | 18 | spin | 34 |
| heterogeneous | 31 | and rotation rate | 383 |
| isotropic | 28 | fcc versus bcc | 192 |
| preparation | 133 | lattice reorientation rate | 386 |
| symmetry | 28 | local | 385, 503, 537 |
| San Andreas fault | 587 | of principal axes (Euler spin) | 384, 537 |
| scalars | 39 | plastic | 332, 386, 537 |
| scaling of stress and strain-rate | 360 | relative | 389 |
| scanning electron microscope (SEM) | 171 | stacking-fault energy | 180, 413, 460 |
| Schmid law | 333 | standard sample (round robin) | 163 |
| Schmid tensor | 336 | state parameter | 348 |
| secant modulus | 363 | steady-state deformation | 358 |
| seismic anisotropy | 308, 587 | steel | 195, 198, 220, 223, 233 |
| inner core | 591 | stereographic mapping | 52 |
| upper mantle | 587, 591 | Stieltjes convolution | 310, 312 |
| selected area diffraction (SAD) | 167 | stochastic effects | 410 |
| self-consistent averages | 296 | strain anisotropy | 427 |
| self-consistent model | | strain deviation | 377, 602 |
| elastic | 296 | strain hardening (<i>see</i> hardening) | |
| visco-elastic | 315 | strain increment | 332 |
| visco-plastic | 467 | strain partitioning | 582 |
| sense of shear (from texture) | 579 | strain path | 579 |
| sense of shear for slip and twinning | | change | 434, 438 |
| | 328, 562 | strain rate | 34, 332 |
| shape preferred orientation | 127 | deviation | 323, 475, 482, 484, 489 |
| | | distribution | 522 |

| 674 | TEXTURE AND ANISOTROPY | | |
|--|----------------------------------|--------------------|--|
| strain-rate sensitivity | | 566 | |
| stress | | | |
| deviation | 323, 475, 482, 484, 489, 602 | | |
| exponent | | 356, 567 | |
| scaling | 349, 356, 360 | | |
| variations | | 377, 409 | |
| stress/strain curves | | 432, 458 | |
| stretch ellipsoid | | 384 | |
| swaging textures | | | |
| U | | 209 | |
| zircaloy-2 | | 491 | |
| Zr-Nb alloy | | 491 | |
| Swift effect | | 427 | |
| symmetry | | 11 | |
| effect on anisotropy | | 15 | |
| fiber | | 29 | |
| property | | 15, 32 | |
| sample | | 28 | |
| test | | 28 | |
| texture | | 6, 243, 580 | |
| symmetry operators | | 24, 343 | |
| synchrotron x-rays | | 154 | |
| system activity | 490, 493, 496, 498, 569 | | |
| Ta | 194, 202, 236 | | |
| tangent modulus | | 363 | |
| Taylor component | | 80, 185, 540 | |
| Taylor factor | 336, 351, 361, 459, 568 | | |
| Taylor hardening | | 395 | |
| Taylor model | | | |
| | 371, 468, 497, 520-26, 538, 569 | | |
| Taylor tensor | | 336 | |
| tensile experiments | | 422 | |
| tensile textures | | | |
| fcc metals | | 475, 484 | |
| Ta | | 194 | |
| tensor | | 13 | |
| averages | | 284 | |
| eigenvalues | | 35, 286 | |
| invariants | | 35, 286 | |
| tensor notation | | 604 | |
| tensor properties | | 36-43 | |
| test frame | | 387 | |
| test symmetry | | 28 | |
| texture | | 77, 561 | |
| components | | 78, 185 | |
| fibers | 185, 187, 195 | | |
| gradients | 227, 540-47 | | |
| representation | | 77 | |
| sharpness | | 453 | |
| strength | 121, 453 | | |
| transitions | | 585 | |
| texture index | | 121 | |
| thermal activation | | 352 | |
| thermal conductivity | | 12 | |
| thermal expansion | | | |
| lower bounds | | 291 | |
| of polycrystals | | 290, 299 | |
| of single crystals | | 300 | |
| self-consistent averages | | 296, 298 | |
| upper bounds | | 291 | |
| thin film | | | |
| metals | | 232 | |
| ceramics | | 271 | |
| thin-walled tube | | 425 | |
| Ti | | 203, 206, 457 | |
| TiAl | | 4, 8, 214 | |
| time-of-flight neutron diffraction | | 162 | |
| tomography | | 105 | |
| topological domains | 346, 487, 490, 495 | | |
| torsion experiments | | 425 | |
| fixed-ends test | | 401, 454 | |
| free-ends test | | 401, 454 | |
| instabilities | | 433 | |
| long tubes | | 433, 454 | |
| pre-twisted specimen | | 432 | |
| torsion textures | | 86, 187 | |
| Ag | | 189 | |
| Al | | 190 | |
| brass | | 189 | |
| Cu | | 86, 189 | |
| fcc metals | | 401 | |
| Fe | | 201 | |
| Ni and alloys | | 189, 402 | |
| Ta | | 201 | |
| U | | 212 | |
| transformation strain | | 598, 602 | |
| transformation textures | | 218, 263 | |
| transformer steel | | 200 | |
| transition bands | | 412 | |
| transmission electron microscope (TEM) | | | |
| | | 167 | |
| transmission geometry | | 141 | |
| Tresca yield surface | | 341, 440 | |
| trial functions | | 555 | |
| truncation of harmonic series | | 111 | |
| tube textures | | | |
| Zr and alloys | | 207, 230, 318 | |
| twinning | 73, 250, 328, 338, 479, 493, 562 | | |
| calcite | | 495, 562 | |
| Dauphiné twins | 75, 174, 176, 250 | | |
| elements | | 76 | |
| hcp | | 205, 489, 491, 525 | |
| plane of shear | | 75 | |
| shear | | 75 | |
| single crystals | | 328 | |
| Ti | | 456 | |
| γ -TiAl | | 346 | |
| Zr alloys | | 487 | |
| U | | 209 | |
| unit cell | | 20, 46 | |
| updating | | | |
| the state | | 395 | |
| the texture | | 385 | |
| upper bound in plasticity | | 371, 526 | |

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U. F. Kocks, C. N. Tome and H. -R. Wenk

Index

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| TEXTURE AND ANISOTROPY | | 675 | |
|---|---------------|--|--------------------|
| upper bound in visco-elasticity | 322 | wire-drawing textures | 3, 194 |
| vapor deposition | 2, 235 | Al | 229 |
| vector method | 115 | Al/Al ₂ O ₃ | 499 |
| vector notation | 340 | Cu-Nb | 215 |
| velocity gradient | 33, 332 | steel | 151 |
| visco-elasticity | | wires, measurements | 151 |
| constitutive equations | 310 | work hardening (<i>see</i> hardening) | |
| in pressure tubes | 318-21 | work rate | 360 |
| properties of polycrystals | 308 | x-ray diffraction | 129 |
| self-consistent polycrystal model | 315 | Y123 (YBCO) | 6, 153, 268, 277 |
| visco-plasticity | | yield strength | 348 |
| inclusion formalism | 472 | yield surface | 338 |
| incremental self-consistent formulation | 476 | contained (closed) | 338 |
| quartz | 566 | corners | 438 |
| secant formulation | 474, 476, 481 | facets | 333 |
| self-consistent polycrystal model | | isotropic | 341, 440 |
| tangent formulation | 474, 480, 497 | measurements | 431, 439 |
| tangent formulation | 474-500 | of single crystals | 332, 344 |
| visualization of OD | 45 | of polycrystals | 421, 445-456 |
| Voce hardening | 349, 520 | pencil glide | 456 |
| Voigt average | 292, 294 | predictions | 439 |
| volume fraction | 83, 225 | shape | 443 |
| volume fraction transfer (VFT) | 479, 488 | sign dependence | 341 |
| von Mises equivalent strain | 183, 581 | symmetry properties | 340, 343, 439 |
| von Mises equivalent stress | 360 | topology | 345 |
| von Mises yield criterion | 341, 440, 458 | twinning | 456 |
| Voronoi cells | 504 | vertices | 333, 335, 344, 431 |
| water weakening, quartz | 250 | Young's modulus | 42, 304 |
| wavelength, x-ray | 129 | zinc oxide | 275 |
| weighted residuals | 554 | zirconia | 263, 274 |
| weighting functions | 517, 554 | Zn | 206 |
| WIMV algorithm | 115 | Zr and alloys | 204, 207, 230, 484 |
| wire-drawing experiments | 422 | | |