

Index

a

Advisory Council for Aerospace Research
in Europe (ACARE) 331

aero-engines 331, 337
for civil aircraft 337
metallic materials 338
SANS 339, 341
SAXS 339
TBCs 340

aircrafts 329, 331
aero-engine 337
airframe weight reduction 332
fatigue crack growth 335
residual stresses 333
stress modification 333

airframes
metal-based 332
weight reduction 332

algebraic reconstruction algorithm 300

alkaline batteries 276

alloys, chemical composition 379

angle-dispersive (AD) X-ray diffraction
107, 440

anomalous small-angle X-ray scattering
(ASAXS) 197

beamlines 223

catalyst nanoparticles 223

contrast variation 219

model-dependent 221

multicomponent systems 217

partial structure factor formalism 219

scattering power of elements 218

subtraction method 221

ANTARES 258, 262

apoferritin solution 200

area detector 317

artifacts
edge 284
image noise 284
motion 285
ring 282

atomic force microscope 18

atomic form factors 396, 397

attenuation-contrast projections 253

Au/Pd nanoparticles 223

austenite, volume fraction of 382

Australian Nuclear Science and Technology
Organization (ANSTO) 409

AZ61 alloys, crack formation in 345

AZ91 alloy, 3D microtomography 345

azimuthal angle-time (AT) plot 415

b

back-scattered electron (BSE) mode 399,
404, 405

ball milling 208

Beer's exponential attenuation law 165

bending magnet 97

beryllium 85

β/γ -alloys, phase evolution 399

Blackburn orientation relationship 408

Bragg edges 138

Bragg reflection 311

Bragg's condition 69, 426

Bragg's equation 108, 162

Bremsstrahlung spectrum 228

C

- charge-coupled device (CCD) detectors
 - 318, 398, 412, 428, 429
 - chemical vapor deposition (CVD) 43, 439, 441, 443, 444, 446
 - chip formation process 370
 - coarse grain effects 156
 - coatings, residual stresses in 43
 - coefficient of thermal expansion (CTE) 419
 - coincident site lattice (CSL) theory 319
 - cold extrusion residual stresses 34
 - cold reactor spectrum 228
 - collimators 207
 - columnar to equiaxed transition (CET) 344
 - commercial passenger aircrafts, *see also* aircrafts
 - compact-tension (CT) specimen 369
 - compliance tensor 22
 - computed tomography (CT) 275
 - conical slit
 - capabilities 149
 - example 151
 - working principle 149
 - continuous recrystallization 414, 416
 - contrast variation 198
 - conventional diffraction methods 396
 - coordinate measuring machine (CMM) 132
 - copper pillar, in situ deformation of 430
 - corrosive environments, residual stress in 49
 - Coulomb interaction 73
 - cross sections 228
 - crystal defects 7
 - crystal lattice 397
 - crystalline materials 3
 - Cu micro-pillar, fluorescence scan 429
 - cutting process
 - experiment 371
 - motivation 370
 - results 371
- d**
- Debye formula 219
 - Debye Waller factors 80
 - Debye-Scherrer rings 69, 151, 157, 186, 188, 412, 413
 - deep-rolling residual stresses 33
 - deformation behavior
 - and grain boundaries 319, 320
 - multi-phase alloy 415
 - single crystals 321
 - in situ μ Laue diffraction 433, 435
 - TiAl alloys 412, 414
 - DESY synchrotron 403
 - detectors 111
 - deuterium 85
 - deviatoric strains 430
 - differential aperture 314, 317
 - differential scanning dilatometry (DSC) 366
 - differential-aperture X-ray microscopy 293
 - diffraction contrast tomography (DCT) 304, 305
 - diffraction data, TiAl alloys 414
 - diffraction elastic constants (DEC) 115, 165
 - diffraction geometry 180
 - diffraction spots 296
 - diffractograms 403
 - diffractometer 108
 - dilatometry
 - FlexiTherm 366
 - motivation 366
 - results 367
 - direct imaging techniques 377
 - direct phase-contrast
 - projections 255
 - dislocation
 - densities 135
 - motion 413
 - tensor 313
 - DORIS III 217, 267, 270
 - double crystal diffractometer (DCD) 208, 209
 - dynamical scattering theory 80
- e**
- edge artifacts 284
 - elastic strain tensor 313
 - elasticity tensor 22, 23

- electron back scatter diffraction (EBSD)
 - 15
 - electron beam physical vapor deposition (EB-PVD) 340
 - electron diffraction 181
 - electron energy-loss near-edge structure (ELNES) 16
 - electron energy-loss spectroscopy (EELS) 16
 - electron-backscatter diffraction (EBSD) 416
 - electronic recording 227
 - energy bandwidth 296
 - energy dispersive radiography (EDR) 236
 - energy-dispersive powder diffraction
 - methods 412
 - energy-dispersive X-ray spectroscopy (EDXSA) 15, 16, 161, 441, 443, 446
 - application 164
 - basic equation of 162
 - comparison 173
 - diffraction geometry 164
 - dislocation densities 135
 - experimental setup 167
 - fast in-situ stress analysis by 171
 - intergranular stresses 134
 - near surface residual stress depth profiling 168
 - near-surface depth profiling in 162
 - neutron transmission 138
 - peak positions 124
 - strain scanning 131
 - counting times and resolution 128
 - neutron optics and time focusing 130
 - peak shape and data analysis packages 124
 - strain scanner 126
 - energy-filtered transmission electron microscopy (EFTEM) 383
 - engineering materials
 - atomic level 3
 - bonding behavior 4
 - crystalline materials 3
 - microscopic level 3
 - microstructure 3
 - atom probe image 18
 - atomic arrangement and microstructure 4
 - characterization 12
 - constituents 5, 6
 - constituting phases 15
 - conventional microstructure 10
 - crystal defects 7
 - deformed grains 9
 - grain boundaries and twins 7
 - information on 14
 - length scale 14
 - light optical microscopy 14
 - one-dimensional defects 3
 - particles 12
 - polycrystalline material with precipitates 9
 - polycrystalline single-phase material 9
 - precipitates and dispersions 8
 - and properties 10
 - single crystal 9
 - single-phase material 9
 - solid solution hardening 11
 - strengthening mechanisms 10, 11, 13
 - TEM image 16
 - temperatures 12
 - two-dimensional defects 3
 - two-phase material 9
 - work hardening phenomenon 10
 - yield strength of metal 11
 - ENGIN-X 124, 129, 131, 133
 - European Synchrotron Radiation Facility (ESRF) 95, 150, 155, 283, 296, 304, 305, 415
 - Ewald's sphere 311
 - extended energy-loss fine structure (EXELFS) 16
 - extinction 80
- f**
- far-field detectors 294, 295
 - fatigue crack growth, aircraft 335
 - fatigue-cracked specimens, single overload 368, 369

Fe–Co–Mo alloy 387
 fibre-reinforced composites 335
 field-ion microscope (FIM) 17, 18
 filtered backprojection (FBP) 243
 fine-grained material 11
 finite element models (FEM) 108, 370
 first Fresnel zone 239
 FlexiTherm 366, 367
 fluorescence detector system 429
 Fluorescence scans 429
 focused ion beam (FIB) microscopy 14,
 425, 426
 form factors 396, 397
 forming processes 32
 fossil fuel 329
 free electron laser 100
 friction stir welding (FSW) 116, 332
 friction-based injection clinching joining
 (FICJ) 271
 full electric vehicles (FEV) 347
 full width at half maximum (FWHM) 131,
 137, 138, 430–433

g

γ -phase fraction 406
 γ -TiAl alloys 338–340, 397
 gauge volume (GV) 112, 163
 Geesthacht Neutron Facility (GeNF) 209
 General Structure Analysis System (GSAS)
 126
 GENRA-3 258, 260, 262, 263
 geometrically necessary dislocations
 (GNDs) 427, 430, 432–436
 geometries 230
 grain
 average properties 296
 boundary 7, 319, 320
 statistics 68
 volumes 304
 grain growth 303
 anomalous 321
 on surfaces 321
 grain maps 295, 301
 deformed specimens 301
 and orientations 300
 by tomography 304
 undeformed specimens 300

GrainSweeper algorithm 303
 graphite heating element 191
 grazing diffraction techniques 441
 green surfactants 213
 grinding residual stresses 37
 growth curves 297, 298
 Guinier and Porod approximation 201

h

Hall-Petch effect 425
 hardening component stress formation 31
 HARWI II 265, 267, 366
 heat affected zone (HAZ) 40, 41, 117, 132,
 333
 heat treatment processes, residual stresses
 in 28
 Helmholtz-Zentrum Geesthacht (HZG)
 366, 372, 400
 Hertzian pressure 33
 high-energy ball milling 208
 high-energy X-rays diffraction (HEXRD)
 345, 378, 398
 lamellar microstructure 408
 and neutrons 396
 phases evolution 403
 under tensile loading 381
 Ti-44Al-3Mo-0.1B alloy 403
 high-resolution TEM (HRTEM) 16, 17
 Hooke's law 22–24
 hot isostatic pressing (HIP) process 27
 hybrid electric engine technology 331
 hydrogen 85
 storage, nanocrystalline metal hydrides
 350
 reversible storage 208

i

image degradation 235
 IMAT 140
 in situ μ Laue diffraction 426
 copper pillar 430
 data analysis 430
 deformation behavior of pillar 433
 experiment 429
 sample movements during deformation
 435
 straining device 427

- synchrotron beamline 428
 - tails of primary beam 433
 - in situ tomography 278
 - incoherent scattering contribution 75
 - indexing approach 301
 - indirect Fourier transformation (IFT) 385
 - indirect phase-contrast projections 255
 - inelastic neutron scattering (INS) 351, 352
 - instrumental gauge volume (IGV) 126, 127, 130
 - intergranular stresses 134
 - intermetallic γ -TiAl 395
 - intermetallic precipitates 383
 - internal combustion engine (ICE) 346, 347
 - interparticle interference effect 212
 - inverse pole figure (IPF) 62, 64
 - isothermal aging, SANS 386
- j**
- joining process
 - light-duty automotive vehicle 345
 - residual stresses in 39
- k**
- Kikuchi line formation 181
 - kinematical scattering theory 80
 - Kirkpatrick-Baez (KB) mirrors 429
 - Kramers–Kronig analysis 16
- l**
- Lambert's law 241
 - lamellar microstructure, formation 405
 - Larmor's classical treatment 91
 - laser beam welding (LBW) 332
 - lattice parameters 419
 - TiAl alloy 418
 - Laue diffraction 426
 - disadvantage of 426
 - modified Ewald's sphere description 311
 - qualitative information 312
 - technical developments for 313
 - white beam 412
 - L/D-ratio 231, 239
 - light microscopic image 279
 - light-duty automotive vehicle 341
 - hydrogen storage 350
 - joining processes 345
 - lightweight car bodies 343
 - PEMFC 349
 - residual stresses 347
 - wear and lubrication 348
 - light-optical microscopy (LOM) 14, 396
 - line spread function (LSF) 233
 - lognormal distribution 203
 - Lorentz factor 90
 - Lorentz force 90
 - low incident beam angle diffraction (LIBAD) method 440, 445
- m**
- macro and microstresses 115
 - macroscopic cross section 229
 - macroscopic differential scattering cross-section 202
 - macrostrain tensor components 151
 - macrotomography
 - beamline optics 265
 - experimental setup 267
 - using neutrons
 - experimental setup 258
 - measurements and results 260
 - magnesium hydride 208
 - magnetic structures 203
 - Maier-Leibnitz Zentrum (MLZ) 109
 - maraging steels 378
 - diffraction patterns 380
 - study of 383
 - matchstick-like gauge volume 110
 - maximum acceptable acquisition time 127
 - mechanical deformations 330
 - metal cutting manufacturing, residual stresses in 36
 - metal-based airframes 332
 - metallic foams 280
 - microbeam monochromator 315, 316
 - model-dependent ASAXS 221
 - modified multi-wavelength method 166
 - modulation transfer function (MTF) 234
 - monochromatic beam 398, 412, 310
 - monochromatic high-energy X-rays 440
 - coarse grain effectors 156
 - comparison and decision, matrix 158
 - conical slit 149

monochromatic high-energy X-rays (*contd.*)
 diffraction data from area detectors
 analysis 157
 diffraction experiments 145
 simplest set-up 145
 slit imaging and data reconstruction
 148
 spiral slit 152
 monochromator 109, 265, 266
 monodisperse distribution 203
 Monte-Carlo-based algorithm 301, 302
 motion artifacts 285
 multilayered coatings 440
 multi-phase alloy, deformation 415

n

nanocomposites 335
 nanocrystalline magnesium hydride 208
 nanocrystalline materials, 3DXRD 299
 nanocrystalline metal hydrides, hydrogen
 storage 350
 National Synchrotron Radiation Research
 Center (NSRRC) 314, 315
 Nb₃Sn multi-filamentary superconductor
 wires 278
 near-edge X-ray absorption fine structure
 (NEXAFS) 349
 near-field detectors 294
 neutron computerised tomography (NCT)
 263, 352
 neutrons
 diffraction 182, 335, 348
 diffractometer 184
 experimental facilities 86
 fission process 84
 Flux Reactor FRM II 85, 86, 88
 fuel element 86
 HEXRD and 396
 imaging and analysis 89
 instrumentation 87
 interactions of 229
 large-scale structures 89
 moderator materials 83, 84
 particle physics 89
 physical properties 73, 74
 radiography 227, 352
 research reactors 83

 scattering 75, 78, 83
 spallation process 87
 spectroscopy 89
 structure research 89
 tomography 244
 nickel-based alloy 264
 nickel-based superalloys 118, 339, 395
 nondispersive focusing optics 316
 nuclear fission process 83
 nucleation, ferrite grains 298
 numerical models 297, 330

o

optical transfer function (OTF) 234
 orientation distribution function (ODF)
 56, 58, 59, 62, 64, 66, 67
 orientation maps 295
 out-of-plane strain 139
 oxide dispersion strengthened (ODS)
 superalloys 9

p

parallel-beam geometry 256
 parallel-beam tomography 256, 257
 data evaluation and visualization 258
 density resolution and detector quality
 258
 measurement and reconstruction 256
 particle reinforced wearresistant metal
 matrix composites (PMMCs) 28
 Peierls–Nabarro stress 10
 PETRA III 95, 150, 268, 270
 phase contrast radiography 239
 phase evolution
 in β/γ -alloys 399
 formation and identification 401
 general aspects 398
 lamellar microstructure 405
 phase fractions 396
 course of 401
 phase-contrast projections 254
 phase-enhanced projections 255
 photons, physical properties 74
 plane stress condition 24
 plasma-assisted physical vapor deposition
 (PVD) techniques 43
 plastic deformation 10, 37, 298

- plug-in hybrid electric vehicles (PHEV) 347
 - point spread function (PSF) 233
 - polar sphere intensity distribution 60
 - polarization 95
 - pole figure 60
 - coverage 68
 - measurement 59
 - window 68
 - polychromatic microdiffraction 319
 - need for 309
 - performance of 315
 - theoretical basis 311
 - polycrystalline indexing scheme 296
 - polycrystalline magnesium alloys 343
 - polycrystalline multiphase metallic material 4, 5
 - polymer coatings 336
 - polymer matrix, SiO₂ nanoparticles in 213
 - polymer matrix-based composites 335
 - polymeric membranes for fuel cells (PEMFC) 349
 - polymers 335
 - powder diffraction 410, 412
 - drawback 413
 - experiments 412, 413
 - two-dimensional pattern 413
 - powder neutron diffraction (PND) 351
 - power law 200
 - primary forming processes 26
- q**
- quasistatics 371
- r**
- radiation power 91
 - radiative energy loss 91
 - radiography 227
 - geometric parameter 232
 - geometries 230
 - image degradation 235
 - resolution functions 232
 - neutrons interactions 228
 - phase boundary 240
 - with polarized neutrons 249
 - scattering process 230
 - of spark 238
 - of wedges 238
 - real-time radiography 238
 - recrystallisation process 344, 415
 - continuous 414, 416
 - heat treatment 9
 - 3DXRD 302
 - refraction 246
 - residual stress analysis (RSA)
 - angle-dispersive diffractometers 107, 108
 - detectors 111
 - lattice plane families 115
 - monochromator 109
 - with neutrons 107
 - slit system 110
 - strain scanning 108, 111
 - in thick aluminum alloys 107
 - residual stresses
 - aircraft 333
 - by deep-rolling 34, 35
 - distribution 334, 340, 346
 - categorization 24
 - in chip forming processes 37
 - in coatings 43
 - cold extrusion residual stresses 34
 - in corrosive environments 49
 - crack growth and 47
 - crankshaft 33
 - crystallite group 36
 - deep-rolling residual stresses 33
 - due to Hertzian pressure 33
 - evolution of 335
 - on fatigue strength 48
 - FE model 119
 - formation 28, 32
 - forward extrusion process 35
 - in friction stir welded aluminum sheets 116
 - grinding processes 38
 - grinding residual stresses 37
 - ground materials 39
 - heat treatment and surface residual stresses 48
 - heat treatment processes 28, 30
 - in hollow forward extruded steel samples 35

- residual stresses (*contd.*)
 - ion bombardment 44
 - in joining processes 39
 - in laser welds 346
 - light-duty automotive vehicle 347
 - in mantle 30, 31
 - in material with phase transformation 30
 - in material without phase transformation 29
 - in metal cutting manufacturing 36
 - near-surface residual stresses 39
 - during nitriding 32
 - origin of 25
 - in primary forming processes 26
 - relevance of 45
 - static and dynamic mechanical loads 47
 - stress equilibrium 23
 - in surface hardening processes 32
 - and temperature changes 46
 - in thin sheet fusion welds 40
 - through-thickness scan 120
 - in water-quenched turbine discs 117
 - on wear 49, 50
 - with/without phase transformation 40–41
- resolution functions 232
- restoration approach 301
- Rietveld method 126, 166, 175
- ring artifacts 282
- rotary friction welding (RFW) 189
- rotation axis 286
- Rouse dynamics 337
- S**
 - sample positioning 111
 - SAS, *see* small-angle scattering (SAS)
 - scanning electron microscopy (SEM) 14, 396, 425
 - scanning tunneling microscope 18
 - scattering curve 198
 - scattering length 74
 - scattering length density (SLD) 212
 - scattering length density difference (SLDD) 198
 - scattering techniques 330, 336
 - Schmid factor 433
 - secondary hardening carbides 382
 - secondary ion mass spectroscopy (SIMS) 15
 - self-amplification of spontaneous emission (SASE) 101
 - semiconductors 3
 - Shannon theorem 241
 - shear stresses 21
 - silica particles 335
 - simultaneous strain measurements 155
 - SiO₂ nanoparticles, in polymer matrix 213
 - Slice theorem 241
 - slit system 110
 - small-angle neutron scattering (SANS) 197, 207, 217, 332, 336, 366
 - aero-engines 339, 341
 - analysis of magnetic structures 207
 - during continuous aging 386
 - curves 214, 215
 - experimental details 372
 - features 208
 - green surfactants 213
 - intensities 373
 - intermetallic precipitates 383
 - during isothermal aging 386
 - motivation 372
 - nanocrystalline magnesium hydride 208
 - precipitates in steel 210
 - results 373
 - secondary hardening carbides 382
 - SiO₂ nanoparticles 213
 - size distributions 211
 - two-dimensional scattering pattern 211
 - USANS-SANS scattering 209
 - variable magnetic field 388
 - velocity selector 207
 - volume fraction distributions 210
 - small-angle scattering (SAS) 197, 336
 - apoferritin 200
 - components 198
 - contrast 198
 - features 197
 - by fractal systems 200
 - Guinier and Porod approximations 201
 - macroscopic differential scattering cross-section 202

- magnetic scattering pattern 204
 - magnetic structures 203
 - model calculation of size distributions 202
 - rod-like structure 201
 - scattering curve 198
 - silver behenate 199
 - small-angle X-ray scattering (SAXS) 222, 197, 336, 380
 - aero-engines 339
 - curve 349
 - integrated intensity 381
 - softly stretched Cu wires 190
 - solid solution hardening 11
 - spinodal decomposition 373
 - spiral slit
 - capabilities 152
 - example 153
 - experimental set-up 153
 - functional principle 152
 - SSCANSS 131
 - statistical stored dislocations (SSDs) 427
 - steel
 - microstructure 389
 - precipitates in 210
 - stiffness tensor 22
 - strain mapping 134
 - strain scanning 111, 126, 131
 - diffractometer for 108
 - strain tensor 22
 - straining device 427–428
 - stress equilibrium 23
 - stress modification, aircraft 333
 - stress tensor 21, 22
 - components 371
 - stress vector 21, 22
 - stresses
 - calculation 114
 - data reduction and peak fitting 113
 - distributions 119
 - macro and microstresses 115
 - positioning errors 113
 - stress-free reference 116
 - stress-free reference 116
 - stress-strain curve 431
 - subgrain, 3DXRD 299
 - superalloys 338
 - Ni-based 339
 - superstructure reflections 396, 397, 409, 410, 412
 - surface hardening processes, residual stresses in 32
 - synchrotron beamline, in situ μ Laue diffraction 428
 - synchrotron radiation (SR) 204, 377
 - angular distribution 91
 - application of 330
 - bending magnet 97
 - clean environment 96
 - free electron laser 100
 - HE-XRD 378, 381
 - intensities 94
 - length and wavelength scales 93
 - with nominal energy 380
 - periodic motion of electrons 99
 - photon flux 93
 - polarization 95
 - quantitative description 96
 - SAXS 380
 - source size and collimation 95
 - spectrum 92
 - time structure 96
 - use of 377
 - wigglers and undulators 98
 - X-ray tubes 94
 - synchrotron tomography, advantage 275
 - synchrotron X-rays 185
- t**
- tensile residual stresses 42, 47
 - tensile stresses 31
 - texture measurements
 - in Cu wire 190
 - electron diffraction 181
 - friction welded rod 189
 - mechanical loading 192
 - neutron diffraction 182
 - steel at elevated temperature 191
 - synchrotron X-rays 185
 - X-ray diffraction 179
 - textures
 - aging 56
 - analysis 55

- textures (*contd.*)
- beam 58
 - crystallographic structure 56
 - crystallographic texture 55, 56
 - definitions 56
 - errors 67
 - Eulerian cradle 60
 - evolution 55
 - grain statistics 68
 - ideal components 66
 - ideal texture components 66
 - individual grain 56
 - intensity distribution 59
 - interpretation of 62
 - inverse pole figure 62, 64
 - laboratory X-rays 59
 - large-scale facilities 57
 - mapping 59
 - multi-dimensional texture analyses 56
 - orientation distribution function 56, 59, 62, 64, 66, 67
 - orientation stereology 56
 - penetration power 58, 59
 - plain strain deformation 65
 - polar sphere 59
 - polar sphere intensity distribution 60
 - pole figure 60
 - pole figure coverage 68–70
 - pole figure symmetry 65
 - quality of 65
 - random distribution 61
 - sample coordinate system 55
 - single crystal methods 58
 - single crystal orientation 66
 - single grain methods 58
 - stereographic projection 61
 - thermo-mechanical processing 57
 - thermo-mechanical treatments 55, 56
 - volume methods 59
- thermal barrier coatings (TBCs) 340, 342
- thermal expansion, TiAl alloy 418
- thermally grown oxide (TGO) 341, 342
- thin polycrystalline films 439
- Thomson scattering 77, 78
- 3D FE analysis 370
- 3D grain boundary networks 319
- 3D image analysis application
- in alkaline cells 276
 - human carotid arteries 281
 - metallic foams 280
 - Nb₃n multi-filamentary superconductor wires 278
- three-dimensional maps of atom positions (3DAP) 330
- 3D micron-resolution Laue diffraction 309
- polychromatic microdiffraction, *see* polychromatic microdiffraction
 - research examples 318
- 3D microtomography 345
- 3D phase-contrast image 283
- three-dimensional X-ray diffraction (3DXRD) microscopy 293, 413, 344
- coarse-grained undeformed polycrystal 295
 - crystal microscope 314, 318
 - differential-aperture X-ray microscopy 293
 - far-field detectors 294, 295
 - grains mapping and orientations 300
 - microscope 296
 - modes of operation 296
 - nanocrystalline materials studies 299
 - near-field detectors 294
 - nucleation and growth phenomena 297
 - plastic deformation 298
 - principles 293, 294
 - recrystallization 302
 - setup and strategy 294
 - strategies 293
 - and tomography 304
- through-hardening component 30
- through-thickness scan 120
- thrust-to-weight ratio, aero-engines
- TBCs 340
 - metallic materials 338
- TiAl alloys 395
- aspects 412
 - atomic order and disorder 409
 - deformation 412, 414
 - diffraction data 414
 - hot-deformation of 414

- individual phases in 402
 - lattice parameter 418
 - thermal expansion 418
 - Ti-43.5Al-4Nb-1Mo-0.1B alloy 407, 408, 410, 415, 417–419
 - Ti-44Al-3Mo-0.1B alloy 403
 - TiH₂ powder 280
 - time structure 96
 - time-of-flight neutron diffraction
 - time-involved small-angle neutron experiment (TISANE) 207
 - time-of-flight (TOF) technique 123, 184
 - counting times and resolution 128
 - ENGIN-X 124
 - ENGIN-X strain scanner 127
 - neutron optics and time focusing 130
 - peak shape 125
 - peak shape and data analysis packages 124
 - phase-specific axial strains 136
 - strain scanner 126
 - tomography 227
 - high-throughput 270
 - image reconstruction 243
 - mathematical introduction 240
 - neutron tomography 244
 - with polarized neutrons 249
 - reconstruction 293
 - Slice and Shannon theorem 241
 - 3DXRD and 304
 - tomography-driven diffraction 140
 - TOPAS 400
 - topo-tomography 305
 - tracking 294
 - transition phase, formation and identification 401
 - transmission electron microscopy (TEM) 15, 365, 383, 385, 387, 396, 399, 425, 426
 - lamellar colonies 408
 - specimen preparation 17
 - tomography 330, 336
 - two-dimensional projection 17
 - transportation vehicles, medium-term development of 329
 - triaxial residual stresses 114
 - TRIP steels 344, 345
 - tungsten inert gas (TIG) welding 42
 - 2D detector 294
 - 2D-ART
 - algorithm 300
 - experimental data for 300
 - two-entrance-slit-setup 173
- u**
- ultra-small angle neutron scattering (USANS) 247
 - ultra-small-angle X-ray scattering (USAXS) 341
 - undulators 97, 98
 - UNI55Cr3 steel 347
 - universal plot method 166
 - unpaired dislocations 427
 - unpaired/excess dislocations 435
 - Uranium-235 nucleus 83
- v**
- vacuum furnace, with glass wall 191
 - variable magnetic field, SANS 388
 - VGStudioMax 258, 263, 264
- w**
- water-quenched turbine discs 117
 - wavelength dispersive X-ray (WDX) spectroscopy 15
 - wear, residual stress on 49
 - weight-saving joining technologies 333
 - wide angle X-ray scattering (WAXS) 336
 - WIEN2k code 384
 - wigglers 97, 98
 - Williamson-Hall (WH) plot 136, 137
- x**
- X-ray beam 367
 - X-ray diffraction (XRD) 140, 179, 378
 - X-ray diffractograms 447
 - X-ray photons/neutrons
 - interaction 74, 75
 - scattering 79
 - X-ray radiography 227
 - X-ray reflectometry 336
 - X-ray stress analysis (XSA) 439
 - on diamond coating 444

X-ray stress analysis (XSA) (*contd.*)
 recommendations 447
 under grazing and glancing diffraction
 conditions 441

X-rays
 absorption 78
 physical properties 73
 scattering 76, 78, 336
 tomography 337

XMAS 318, 430

y

yttria–partially stabilised zirconia (Y-PSZ)
 340

z

Z-contrast images 16, 17
zero-background peak 128
zirconia 340