

## Subject Index

### A

Accelerator Production of Tritium, 1047  
 Accelerator Transmutation of Waste, 1047  
 Activation, 1109  
 Aluminum alloys, 1047, 1057  
 American Society of Mechanical Engineers codes, 320  
 Annealing, 3, 248, 277, 660, 1038  
     aluminum alloys, 1047  
     damage state differences, 86  
     embrittlement mitigation, 232  
     fracture toughness effects, 690  
     helium bubble, 1013  
     model alloys, 623  
     post-irradiation, 331  
     recovery, 86, 277  
 ASTM standards  
     A302B, 138, 637  
     A508, 320  
     A533B, 531  
     A588, 331  
     E8, 442

### B

Binary alloy, 3  
 Blanket structure, 945  
 BN-600, 842  
 BOR-60, 842  
 Boron-10 dope, 753  
 Brown modulus hardening model, 191

### C

Carbides, 220  
 Carbon, 623  
     surface layer, 1134  
 Cavity, 739, 831  
     growth, 531  
 Channel fracture, 933  
 Charpy data, 790

Charpy impact, 363, 375, 487, 531  
     test, 775  
 Charpy shift, 103, 331, 351, 637  
 Charpy specimen, 706  
     examination, 260  
 Charpy tensile specimens, 442  
 Charpy tests, 375, 761  
 Charpy transition temperature recovery, 232  
 Charpy-V notch  
     bars, 458, 670  
     shift, 351  
     specimens, 138, 294, 384  
     tests, 191, 320, 415, 761  
     transition temperature, 277  
     transition temperature shift, 68

Chromium, 721  
 Cladding, fuel, 858  
 Cleavage, 790, 1068  
 Cleavage fracture, 706  
 Cleavage initiation, 670  
 Cluster, 3, 547  
     helium influence on, 831  
     point defect, 25  
 Coarsening, 86  
 Composition effects, 547, 606  
 Concentration factor, elastic stress, 775  
 Constraint effects, 670  
 Copper, 547, 606  
     alloy, 220, 623  
     dependence, 637  
     embrittlement, 103  
     precipitates, 25, 59, 191, 220, 331, 569  
     steels, 351  
     welds, 68, 277, 294

Corrosion, 1088  
 Crack propagation, fatigue, 933  
 Crack tip opening displacement, 706  
 Creep properties, 995  
     creep-fatigue, 995  
 Creep tests, 1144  
 Crowdions, dynamic, 874  
 Curve fitting, 363

**D**

**Damage**, 103, 119, 945, 1088  
 black spot, 220  
 copper effect on, 59  
 cross sections, 68  
 displacement, 1068  
 ductile, evolution, 531  
 gamma ray, 547  
 low temperature, 331  
 matrix, 569  
 models, 138, 874  
 neutron displacement, 1077  
 states, differences, 86  
 structures, 220  
 studies, 206  
**Density**, 1038  
 change, 1077  
 dislocation, 1088  
**Detection analysis**, 1134  
**Deuterium uptake**, 1088  
**Dislocation density**, 1088  
**Dislocation loops**, 842  
**Dislocation structure**, 817, 858, 1038  
**Displacement damage**, 1068  
**Displacement rate**, 25, 591  
**DoeI I and DoeI II**, 294, 442  
**DoeI IV**, 531  
**Dose rate**, 191, 1109  
 dependency, 119  
 effect, 351  
**Dose use**, 569  
**Ductile brittle transition**  
 behavior, 1068  
 temperature, 721, 790  
**Ductile fracture**, 531, 637, 790  
**Ductility**, 637, 753, 919, 995  
 helium effects on, 1068  
 temperature effects on, 842  
**Dynamic Helium Charging**  
 Experiment, 1068, 1077

**E**

**Elastic Recoil Detection**  
 Analysis, 1134  
**Elastic stress concentration**  
 factor, 775  
**Electron beam welding**, 971, 980  
**Elongation**, 753

**Embrittlement**, 86, 294, 569, 637  
 evaluation by fracture  
 reconstruction, 706  
 ferritic-martensitic, 945  
 iron-based alloys, 3  
 irradiation, 68, 86, 103, 138, 320, 351  
 beltline materials, 522  
 steel, 606  
 phosphorus segregation and, 119  
 predictions, 25  
 radiation, 232, 500, 591  
**Erosion**, 487  
**Error analysis**, 487  
**European standards**, 458  
**Extensometer**, 1144

**F**

**Fast Flux Test Facility**, 831, 1038  
**Fatigue crack propagation**, 933  
**Fatigue**, 995  
 load, 933  
 low cycle, 980  
 tests, 721, 1144  
**Finite element**, 531  
 modeling, 670  
**First wall/blanket structure**, 945  
**Fisher model**, 68  
**Fitting functions**, 363, 375  
**Flow stress**, 637  
**Flow structure**, 248  
**Fluence**, 232, 1047, 1057, 1088  
 end-of-license, 637  
 monitors, 591  
**Flux**, 547  
 neutron flux, 351, 522  
**Fracture appearance transition**  
 temperature, 68  
**Fracture**, cleavage, 706  
**Fracture**, ductile, 790  
**Fracture energy**, 458  
**Fracture initiation**, 670  
**Fracture**, intergranular, 103, 260  
**Fracture reconstruction**, 670, 706, 790  
**Fracture toughness**, 138, 415, 458, 660, 690  
 temperature effects, 945  
 tests, 721

Frank loops, 831, 933

## G

Gamma rays, 547, 591  
 Gamma scanning, 522  
 Grain boundary, 995, 1077  
 segregation, 103, 119, 260

## H

Hardening, 25, 68, 191, 248,  
 351, 831  
 barrier, model, 902  
 composition influence on, 3  
 irradiation, 547, 606, 623,  
 902, 919  
 neutron irradiation, 331  
 radiation, 569, 1123

Hardness, 902  
 measurements, 294, 637, 761  
 micro-Vickers, 623

Heat affected zone, 294, 500  
 cracking, 980

Heat treatment effects, 606

Heavy Section Steel Irradiation Program, 384

Helium, 591, 753, 831, 902  
 bubble growth, 980  
 bubbles, 206  
 damage, 1077

Dynamic Helium Charging Experiment, 1068  
 implantation, 980

ion-implanted, 1013

High Flux Isotope Reactor, 547,  
 591, 753, 971

High Flux Reactor, 919

Hyperlogistic functions, 363

## I

Impact testing, 384, 775, 995  
 Charpy, 363, 375, 487

Intergranular failure, 190, 260,  
 1068

Intergranular fracture, 103, 260

International Thermonuclear Experimental Reactor, 933, 945

Interstitials, 874

Iron alloys, 3

iron-copper alloys, 220

## J

J-integral, 945

## L

Laser, 1144  
 Lateral expansion, 458  
 Lateral shift method, 232  
 Lattice parameters, 1088  
 Lead, 522  
 Linde 80 welds, 59, 68, 138, 660  
 Load-deflection response, 138  
 Low activation materials, 721

## M

Manganese, 547  
 Materials Open Test Assembly, 831  
 Metal inert gas welding, 971  
 Metallography, 248  
 Microscopy, 59  
 confocal, 670, 706  
 Microstructure, 86, 103, 874, 919  
 aluminum alloys, 1047  
 austenitic stainless steels, 902  
 characterization, 59  
 defect, weldments, 971  
 dislocation, 1038  
 effects, 547  
 evolution, 220, 637, 817,  
 831, 1013  
 support steel, 331  
 WWER-440, 248  
 Micro-void coalescence, 260  
 Modeling, 191  
 barrier hardening, 902  
 copper precipitation, 25  
 damage, 138  
 damage, radiation, 874  
 finite element, 670  
 irradiation embrittlement,  
 68, 86, 103  
 irradiation hardening, 220  
 mechanistic, 331  
 micromechanical, 531  
 one-interstitial model, 874  
 phosphorus segregation, 119  
 point defect clustering, 25  
 radiation embrittlement, 59

Modulus hardening model, 191  
Molybdenum, 547

**N**

Neutron activation dosimeters, thermal, 591  
Neutron displacement damage, 1077  
Neutron fluence, 232, 690  
Neutron flux, 351, 522  
Neutron-induced activation, 1109  
Neutron irradiation, 842  
Neutron scattering, 59, 191, 206  
Nickel, 547, 606, 831, 842, 1038 alloys, 1013  
Niobium, 1088  
Nitrogen implantation, 1134  
Notch depth, 775

**O**

Optical microscopy, 59  
Oxide-dispersion-strengthened ferritic steel, 739  
Oxygen, 1134

**P**

Particle-matrix interface, 817  
Phase stability, 858  
Phase transformation, 817  
Philippensburg, 442, 458  
Phosphorus, 103, 119, 547, 606, 831 segregation, 260  
Plant life management, 415  
Point defect concentrations, 874  
Positron annihilation, 623, 1134  
Power Reactor Embrittlement Data Base, 500  
Precipitates, 206, 1077 copper, 25, 59, 103, 331, 569 formation, 3 irradiation-induced, 1123 phosphide, 858 vanadium, 1123  
Proton irradiation, 220, 623

**R**

RCC-M, 320

Reconstitution, 415, 442, 458, 522  
Recovery, annealing, 86, 277

**S**

Sampling strategies, 375  
Scanning, 522  
Scanning electron microscopy, 706  
Scattering neutron, 59, 191, 206 small angle neutron, 1123 small angle X-ray, 1123  
Segregation grain boundary, 103, 119 phosphorus, 260 radiation-induced, 817 zone effects, 320  
Shear punch, 902, 1057  
Size distribution, 206  
Small angle neutron scattering, 191, 206, 1123  
Small angle X-ray scattering, 1123  
Solid solution, 3  
Spallation neutrons, 1047  
Standards (See also ASTM standards)  
European, 458  
Steel, 68, 375, 384, 547 A302B, 138 A508, 320 A533B, 351, 531 austenitic, 831, 842, 858, 971 austenitic stainless, 817, 902, 945, 980, 995 embrittlement evaluation, 706 Fe-C-Cu alloys, 220, 623 Fe-Ni-Cr, 831 ferritic, 591, 739, 775 ferritic/martensitic, 753, 945, 1109 ferritic stainless, 945 low alloy, 191 martensitic, 721, 761 martensitic stainless, 790 ODS ferritic, 739 plate, 569, 919 SA-508, 660 SA-533, 660 stainless, 817, 919, 933, 980 support structure, 331 tool, 1134

- VVER-440, 1123  
 WWER-440, 232, 248, 522
- Strain, 1144  
 Strain localization, 637  
 Stress concentration factor, elastic, 775  
 Stress intensity factor range, 933  
 Stress relief, 606  
 Support structures, 331  
 Surveillance program, 522  
 Swelling, 817, 842, 1038  
     resistance, 858  
     void, 739, 1077
- T**
- Tearing modulus, 945  
 Temperature dependence, 119, 606  
 Tensile tests, 531, 721, 761, 1144  
     ductility, 919  
     proof strength, 995  
     properties, 753, 919, 971  
     spallation neutron environment, 1047  
     specimens, 442  
     strength, 1068  
         ultimate, 753  
     tensile-shear correlation, 1057
- Test Reactor Embrittlement  
     Data Base, 500
- Thermal aging, 294, 320, 637, 660, 690  
 Thermal dependence, swelling, 1038
- Thermal desorption spectrometry, 1013  
 Thermomechanical treatment, 739
- Toughness, 670, 790, 995  
     ferritic-martensitic steel, 945  
     properties, 277  
     segregation zone effects, 320
- Transition curves, 458  
 Transition electron microscopy, 902  
 Transition temperature, 277, 458, 547  
     Charpy, 232  
     ductile to brittle, 384, 721  
     fracture appearance, 68  
     measurements, 375  
     nil ductility, 363  
     shift, 351, 487
- Transmission electron microscopy, 59, 248, 1068  
     aluminum alloys, 1057  
     helium bubble investigation, 1013  
     microstructure analysis, 971
- Trend curve, 103, 138  
     dose use, 569  
     validation, 260
- Tritium, 1057, 1068, 1077
- U**
- UK Magnox Embrittlement Model, 68
- Uncertainty evaluation, 375
- Upper shelf energy, 277, 363, 384, 487  
     fulfillment, 458  
     miniaturized vs. full-size specimens, 775  
     single cycle heat effect on, 637
- weld material, 531
- V**
- Vacancies, 874  
 Vanadium-based alloys, 1068, 1077, 1109, 1123
- Voids, 206, 637, 842, 1038  
     growth, 858  
     swelling, 739, 1077
- W**
- Wear resistance, 1134  
 Welds, 86, 248, 569, 971  
     copper, 277  
     cracking, 980  
     EB, 761  
     Linde 80, 59, 68, 138  
     materials, 500  
     metals, 995  
     nickel, 294  
     stud gun, 442  
     submerged arc, 59, 103, 119, 191, 260, 660  
     TIG, 761  
     upper shelf, 690

1164 EFFECTS OF RADIATION ON MATERIALS: 17TH VOLUME

- |  |   |
|--|---|
| upper shelf, low, 690<br>welding techniques, 415, 971<br>Wrappers, fuel assembly, 842<br>WWER-440 reactor vessel, 232,<br>248, 522 | Yield, 442<br>Yield strength, 25, 59, 68, 351,<br>384, 637<br>Yield stress, 706, 753, 902 |
| <b>X</b>   | <b>Z</b>  |
| X-ray diffraction, 1088<br>X-ray scattering, small angle,<br>1123  | Zirconium, 1088   |