

Subject Index

A

Adhesion test, 105
 Alloys (See also Steel)
 aluminum, 1151, 1168
 binary, 38
 carbon-boron-titanium, 1283
 chromium, 545
 concentrated, 38
 copper, 373, 444, 1003, 1013,
 1026, 1041
 GlidCop Al-15, 1026
 iron-chromium-nickel-phosphorus,
 951
 manganese-molybdenum-nickel,
 292
 model, 444, 462, 992
 nickel-base, 679, 838
 nickel-silicon, 940
 SA-508, 268
 SA-533, 268
 vanadium, 1185, 1201, 1215
 zirconium, 1077, 1111, 1129,
 1140
 Alpha-uranium phase, 1292
 Alumina, 1231, 1242, 1255
 Aluminum, 838, 1151
 Analytical electron microscopy,
 1077
 Annealing experiments, 130, 352
 Anisotropy
 growth, 1242
 hardness, 94
 Atom probe field ion microscopy,
 492
 Attenuation, 528
 Auger electron spectroscopy, 851
 Automated ball indentation test, 172

B

Beltline damage, 528
 Boron, 940, 1215, 1283
 Brazing, induction, 102

C

Carbon, 516, 816, 1283
 carbon/carbon composites,
 1266, 1304
 Carbon-boron-titanium, 1283
 Cascade damage, 27, 1003
 Cavities, 1292
 nucleation, 940, 992, 1003
 void swelling, 1292
 Ceramic insulator, 1231
 Ceramic materials, 1255
 Charpy specimens, 186, 283, 352
 A533B, 147
 impact toughness, 195, 591
 modeling, 172
 notch ductility, 306
 precracked, 156
 properties, 239
 stainless steel, 714
 Chromium, 575, 851, 870, 964
 alloys, 545
 coatings, 105
 depletion, 889, 902
 Cladding, 363, 646, 664, 824,
 1129
 Clusters, 492
 cascade vacancy, 373
 helium, 1215
 interstitials, 113, 130, 394
 point defect, 394
 vacancy, 394, 516
 Coatings, chromium, 105
 Cold work, 696, 747, 1026, 1140
 austenitic steel, 824
 effect on fracture properties,
 575
 Commercial Advanced
 Gas-Cooled Reactor, 679
 Composites, carbon-carbon,
 1266, 1304
 Computerized database
 embrittlement, 14
 Computer modeling, 38
 Conductivity, electrical, 1231
 Convergent beam diffraction, 292

Copper, 239, 352, 516, 1003, 1013
 alloys, 1026, 1041
 helium in, 1061
 precipitation, 292, 332, 424,
 444, 462, 493

Corrosion, 1077

tests, 889, 902

Cracks and cracking

arrest, 14

delayed hydride, 1077

growth, 679, 1201

heat-affected zone, 779, 789

initiation, 147, 211

microcracking, 1242

stress corrosion

intergranular, 851, 870

crevice-assisted, 902

irradiation-assisted, 889,
 902

Creep, 747, 824, 978

austenitic steels, 816

core components, 1077

dislocation effects on, 1111

irradiation, 978, 1111

pressurized tubes, 631

rupture, 696

stress-induced preferred

absorption, 27

texture effects on, 1111

thermal, 1242

Cyclotron implantation, 1215

D

Damage rate, 113, 528, 1013

Defect recovery behavior, 130

Defect/solute interaction, 964

Deformation, postirradiation, 545

Degradation, 363

Dislocation barrier model, 394

Dislocation loops, 992, 1013

basal plane, 1077

Frank loops, 394, 978

nucleation, 38

Dislocations, 54, 528

structure, 66, 591, 1111

Displacement rate, 394

per atom, 528

Drop weight tests, 156, 172, 195, 352

Ductile-brittle transition

temperature, 575, 591, 622

Ductility

aluminum, 1151, 1168

ferritic steel, 186

irradiation effects on, 622, 646

nil ductility transition

temperature, 195

notch, 306

uniform, 1129

vanadium-based alloys, 1185

E

Electrical conductivity, 1041, 1231

Electrical resistance, 838

Electron irradiation, 964, 1010

Elongation, 558, 921, 1151

Embrittlement, 492, 503, 516, 1185

accelerated, 394

creep-like, 646

hardening, 373

impact properties, 283

irradiation, 156, 186, 332,
 424, 462

neutron radiation, 3, 14, 503

pressure vessel steels, 172

radiation, 306

reactor plate material, 147

steel, 444

Energy dispersive X-ray

technique, 292

Energy partition, 147, 283

Erosion resistance, 1283

Experimental Breeder Reactor,

575

Extraction technique, 292

F

Face-center cubic, 38

Fast Flux Test Facility tests,
 1041

Charpy, 591

Knoop hardness, 94

microchemical evolution

results, 940

microstructural evolution

results, 940, 951, 992

precipitation, 1185

tensile, 921

Fatigue crack growth, 558, 1201

Fatigue properties, 747

Fatigue strength, 1026

Fatigue threshold, 679
 Field emission gun scanning
 transmission electron
 microscopy, 462
 Films, chromium, 105
 Finite element method, 1242
 Fission-fusion correlation, 130
 Fission-gas bubbles, 1292
 Flaw distribution, 223
 Fluence, 172, 444, 462, 516, 816
 effect on ferrite, 870
 effect on growth strains, 1140
 effect on tensile properties,
 1168
 dimensional changes, function
 of, 1266
 neutron, 186, 195, 575, 1041,
 1304
 relation to grain boundary
 composition, 902
 normalization, 239
 range, 1304
 relative anisotropy, 94
 transition temperature shift,
 352
 Forging, 268
 Fracture mechanics, 156, 223
 Fracture resistance, 575
 Fracture toughness, 14, 211
 cladding, stainless steel,
 363
 core components, 1077
 elastic plastic, 714
 irradiation effects on, 239,
 1151
 loading rate effects on, 156
 martensitic steels, 558, 575
 Frank loops, 394, 978
 Fuel adjacency effect, 664
 Fuel pin, 824
 cladding, 646

G

Gas tungsten arc, 789
 Grain boundary, 1003, 1061
 composition, 902
 depletion, 851
 interaction stresses, 1111
 segregation, 492, 851, 889

Graphite, 1283
 fine-grained, 1304
 Growth, zirconium alloy, 1140

H

Hardening, irradiation, 130, 444
 effect of flux on, 373
 modeling, 394, 424
 strain, 1129
 work hardening coefficient, 545
 Hardness measurements, micro,
 838
 Heat treatment, effects of, 575,
 591
 Helium
 bubble growth, 779, 789, 838
 doping, 1215
 effects, 940
 embrittlement, 1215
 flux, 101
 generation, 1201
 generation rates, 921
 implantation rate, 1061
 production, 1003
 High Fluence Radiation
 Facility, 978
 High Flux Beam Reactor, 1168
 High Flux Isotope Reactor,
 394, 714, 1151
 Hollomon's equation, 1129
 Hydrogen-retention properties,
 1283

I

Impact tests, 622, 1168
 Charpy, 239, 268, 352, 363
 toughness, 591
 instrumented, 156, 186, 195,
 211
 Implantation, helium in copper,
 1061
 Implantation temperature,
 helium, 1061
 Impurities, effect on cracking,
 889
 Incubation dose, 1292
 Induction brazing, 1026
 In-service inspection, 223
 Insulators

alumina, 1242
ceramic, 1231

Integral fast reactor, 1292

International Thermonuclear
Experimental Reactor,
1041, 1304

Interstitials, 113, 130, 394, 803,
1013

Isochronal annealing, 130

Isotopic tailoring, 921

J

Japan Materials Testing Reactor,
130

J-integral test, 156

K

Knoop hardness, 94

L

Licensing space, 3

Loading, 156

Load shedding tests, 679

M

Magnesia, 1255

Manganese, 66, 492, 516

Material performance, 3

Mechanical properties, 130, 714,
1151, 1185

degradation, 363, 664

GlidCop Al-15, 1026

temperature effects on, 306
vanadium, 1215

Mechanical stresses, 1242

Metal fuels, 1292

Microhardness, 94, 444, 747

Microstructure, 679, 747, 921

bubble, 1061

change characterization,
607, 1077

defect, 503

deformation, 545

evolution, 747, 940, 992,
1013, 1140

helium bubble in nickel, 838

helium effect on, 492

phosphorus effects on, 951

solute effects on, 66

stress effects on, 978

weld metal, 292

Modeling, 373, 1111

displacement rate, 394

hardening, 424

mechanisms, 332

mechanistic, 992

rate theory based, 38

reactor wall attenuation, 528

Molybdenum, 94, 492, 516, 803

N

Neutron fluence, 186

Neutron scattering, 503

Nickel, 940, 964

alloys, 940

damage rate, 113

defect behavior, role in, 1013

solute segregation, 492, 870

weldment with, 607

Nickel-silicon, 940

Nil ductility transition

temperature, 195

Nimonic PE16, 679

Niobium, 964, 1077, 1111, 1140,
1242

Nitrogen, 462

Notch ductility, 306, 622

O

Optical microscopy, 292

P

Phosphorus, 54, 424, 492, 803

Plasma-facing applications, 1266

Plastic deformation, 646

Plate materials, reactor, 147,
186, 268

ferritic-martensitic, 607

high tensile strength, 186

irradiation effects on, 622

martensitic, 591

mechanical properties, 714

Point defects, 964

clusters, 394

products, 38

sinks, 54

Positron annihilation, 462, 516,
1061
Power law work hardening
exponent, 545
Precipitates, 66
amorphous, 1168
formation, 113
copper, 292, 332, 424, 462,
492
irradiation-induced, 444,
607, 1185
Pyrocarbon, 1304

R

Radiation sensitivity, 306
Rate theory, 38
Reactors, 186, 714
Advanced Neutron Source,
1151
boiling water, 851, 902, 1077
BOR-60, 816
Bulk Shielding, 239
commercial, 268, 292
Commercial Advanced
Gas-Cooled, 679
core components, 1077
Experimental Breeder, 575
fast, 54, 94, 607, 664, 824, 921
fast breeder, 646, 824
Fast Flux Test Facility
anisotropy, 94
Charpy, 591
copper alloys, 1041
isotopic doping, 921, 940
microstructure, 951, 992
precipitation, 1185
fission, 1255
Ford nuclear, 306
FRJ research, 195
fusion, 789, 1013, 1185, 1215
gas-cooled, 679
heavy water, 1140
High Fluence Radiation
Facility, 978
High Flux Beam, 1168
High Flux Isotope, 394, 714,
1151
high-temperature,
gas-cooled, 172
in-reactor measurement,
1231

integrity, 223
International Thermonuclear
Experimental Reactor,
1041, 1304
Japan Materials Testing
Reactor, 130
light water, 223, 239
microstructural
characterization, 292
plate material
A533B: 147
pressure vessels, 14
pressurized heavy water, 211
pressurized water, 747, 851,
1077
Soviet-type, 503
swimming pool, 622
testing, 130
thermal, 54
University of Buffalo, 172
water, 851

S

Sandvik HT-9, 789
Scanning electron microscopy, 292
Scanning transmission electron
microscopy, 902
Scattering, 444, 503
Segregation
grain boundary, 492, 851, 889
irradiation-induced, 54, 607
radiation-induced, 902, 940, 964
solute, 66, 870
Shear strength, 1026
SIPA-induced growth, 27
Silicon, 66, 113, 803, 1168
Silicon nitride, 1231
Size, effects on creep, 631
Solute defect interaction, 964
Solute diffusion, 373
Solutes, effect on swelling, 803
Solute segregation, 66, 870
Spinel, alumina-magnesia, 1255
Steels, 14, 172, 195, 444
A533B: 147, 211, 283
advanced pressure vessel, 186
austenitic, 646, 664, 696, 747,
816
evolution and swelling, 992
Fe-Cr-Ni, 803, 921
modified, 964

stainless, 851, 870
 titanium-stabilized, 824
 chromium-molybdenum-vanadium, 503
 copper, 373, 444, 492
 ferrite phase, 870
 ferritic, 54, 147, 186, 211, 283
 Fe-Cr, 66, 545
 irradiation of, 575, 591
 Sandvik HT-9, 789
 vacancy defects, 516
 ferritic-martensitic, 664
 15MnTi, 622
 low alloy, 306, 352, 528
 martensitic, 558, 575, 591, 607, 664
 nickel alloy, 503
 Nimoni PE16, 679
 silicon-modified, 824
 stainless, 363, 631
 austenitic, 646, 816, 992
 Fe-Cr-Ni, 803, 921
 modified, 964
 titanium-modified, 696
 titanium-stabilized, 824
 Type 304, 714, 747, 851, 870, 902
 Type 304L, 747, 870
 Type 316, 664, 978
 structural, 306
 welds, 332
 Strain hardening, 1129
 Strain rate tests, slow, 889
 Strengthening mechanisms, 528
 Stress effects, on microstructure, 978
 Stress generation processes, 1242
 Stress-induced preferred absorption, 27
 Stress intensity factor range, 1201
 Stress relief, 1140
 Surveillance dosimetry, 14
 Swelling, 664, 696, 816, 824
 cavitation, 1283
 cavitation void, 1292
 gas, 838
 helium effects on, 940
 level, 66
 modeling, 992
 phosphorus effects on, 951

radiation-induced segregation and, 964
 rates, 27
 resistance, 1041
 solute effects on, 803, 870
 steels, 747, 824, 978
 void, 66, 631, 1003

T

Tantalum, 66
 Taylor factor, 94
 Tempering treatment, 591
 Tensile properties, 558, 747, 921
 apparatus, 978
 cladding, fuel pin, 646
 constant extension rate, 870
 copper alloys, 1041
 GlidCop Al-15, 1026
 strength, 239, 545, 714
 aluminum, 1151, 1168
 ultimate, 1129
 temperature effects on, 306
 tests, slow strain rate, 851
 Texture, effect on creep, 1111
 Thermal aging, 268, 363, 462, 591
 Thermal annealing, 14
 Thermal conductivity, 1266, 1304
 Thermal creep, 631
 Thermal desorption spectroscopy, 838
 Thermal diffusivity, 1283
 Thermal gradient, 824
 Thermal neutrons, 1168
 Thermal reactor, 679
 Thermal shock, 223
 Thermal transient, 664
 Thin foil technique, 292
 Titanium, 462, 696, 838, 964, 1185, 1283
 Toughness properties, 747
 curves, 14
 Transition temperature, 172
 curve, 195
 ductile-brittle, 575, 591, 622
 shift, 239, 332
 Transmission electron microscopy studies
 characterization, 462

helium implantation, 1061
microstructure, 292, 838,
1003
precipitation, 1185
solute segregation, 870
Transmutant, 1013
Tritium
doping, 789
trick, 1215
Tubes
neutron absorber, 851
pressure, 1129
pressurized, 27, 631, 696,
816
Tungsten, 66

U

Ultrasonics, 223
Upper shelf energy, 591
Charpy specimens, 147
drop, 239
ferritic steel, 186
thermal aging effects, 363
weld metals, 268, 283
Upper shelf fracture toughness,
211
Uranium fuels, 1292

V

Vacancy defects, 516, 951
Vacuum condition, dynamic,
1231
Vanadium, 66, 492, 1185, 1201,
1215
Voce's equation, 1129
Void formation, 964, 1185

Void swelling, 66, 631, 1003
cavitation, 1292
helium effects on, 940
phosphorus effects on, 951
radiation-induced segregation
and, 964
relationship, radiation creep,
27
solute effects on, 803, 870

W

Wear resistant coatings, 105
Welds, 172, 622
A533B: 283
annealing, 352
cladding, 363
cracking, helium induced,
779, 789
ferritic-martensitic, 607
mechanical properties, 306
metal, 352
stainless steel, 714
steel, 503
submerged arc, 239,
characterization, 292
evaluation, 268
mild steel, 332, 424
Wire cladding, 363
Work hardening coefficient, 545

Y

Yield strength, 172, 186, 211,
545, 714, 921
aluminum alloy, 1151
Yield stress, 130, 332

Z

Zinc, 1013
Zirconium, 66
Zircaloy, 1077, 1111, 1129,
1140