

Subject Index

A

Acoustic emission, 293
 Acousto-ultrasonics, 278
 Adhesives, 190, 193
 Advanced materials
 alumina, 3, 82
 aluminum alloy composites, 241
 aluminum-lithium alloys, 224, 226
 ceramic matrix composites, 28, 52, 82
 nondestructive testing, 278
 cold rolled Cu-20Nb, 121
 composite systems, 205
 fabrication, 251
 graphite fiber reinforced composites, 171, 180
 metal matrix composites, 101
 aluminum, 251
 fabrication, 264, 271, 274
 metal to metal adhesive joints, 190
 Mg-PSZ ceramics, 69
 Nicalon/CAS ceramic composites, 312
 nondestructive evaluation, 251, 278
 polypropylene, 151
 superalloys, 136, 139
 titanium aluminide XD composite, 293
 zirconia, 69
 Aerospace applications, 28
 Aircraft turbine blade materials, 137
 Alloy chemistry, 251, 264, 271, 274
 Alumina
 crack growth resistance, 82
 cyclic fatigue, 3
 fatigue crack growth, 28
 Aluminum alloy composites
 chemical characteristics, 271, 274
 cyclic load fatigue damage, 241
 fabrication, 251
 instability, 224, 241
 SiC_p, 264, 271
 ASTM STANDARDS
 C 158-84, 278
 D 790-86, 278
 E 561-86, 225
 E 605-80, 5
 E 616-82, 29
 Automated crack size measurement, 323
 Automated testing technique, 323

B

Billets, 251
 Bonded joints, 190
 Bridging, 83
 Brittle matrix, 28

C

CDS (*See* Characteristic damage states)
 Ceramic materials and matrix composites
 alumina, 3
 composites, 28, 52, 69
 desirable properties for engineering applications, 3
 Mg-PSZ ceramics, 69
 Ceramic matrix composites (CMC), 28, 52
 nondestructive testing, 278, 285
 Nicalon/CAS, 312
 Ceramics
 alumina, 3, 82
 crack behavior, 69
 fatigue crack growth, 28
 and matrix composites, 82
 Characteristic damage states (CDS), 206
 CMC (*See* Ceramic matrix composites)
 Composite laminates, 205
 Composite materials
 aluminum alloy composites, 241
 ceramic matrix composites, 82, 278, 285, 312
 cold-rolled Cu-20Nb, 121
 laminates, 205
 metal matrix composites, 101
 Compounds, 251
 Compression behavior, 171
 Constant amplitude testing, 190
 Crack branching in alumina, 82
 Crack closure, 121
 Crack growth
 alumina, 4, 28
 ceramic matrix composites, 28
 cold-rolled Cu-20Nb, 121
 detectability, 323
 Mg-PSZ ceramics, 69
 resistance, 82
 titanium aluminides, 293
 zirconia, 69

Crack initiation detection, 323
 Crack resistance, 224, 236–238
 Creep, 205
 Creep rate, 190, 202
 Creep rupture, 205
 Creep tests, 151, 180
 Cyclic creep, 180, 202
 Cyclic deformation, 101
 Cyclic fatigue
 alumina, 3
 Mg-PSZ ceramics, 69
 zirconia, 69

D

Damage development, 206
 Damage tolerance, 28, 52, 224
 Deformation, 101
 Degradation, 69
 Density, 251
 Design criteria for cyclic fatigue in Mg-PSZ ceramics, 69
 Detectability of fatigue microcracks, 323
 Directionally solidified superalloys, 136

E

Eddy current, 251, 274
 Elastic wave, 293
 Elevated temperature (*See also* Temperature, ceramic testing), 28, 52
 Environmental effects, 190
 Exothermic dispersion (XD) composite, 293
 Extrusion, 251

F

Fabrication, nondestructive evaluation, metal-matrix composite, 251
 Failure, 172
 Fatigue behavior, 190
 Fatigue crack growth, testing at elevated temperatures, 28
 Fatigue damage, 241
 Fatigue crack initiation, 121
 Fatigue (materials)
 adhesive bonded joints, 190, 202
 alumina, 3, 82
 aluminum alloy composites, 241
 aluminum-lithium alloys, 224
 ceramic matrix composites, 28, 52, 82
 nondestructive testing, 278

 cold rolled Cu-20Nb, 121
 composite systems, 205
 graphite fiber reinforced composites, 171, 180
 metal-matrix composites, 101
 Mg-PSZ ceramics, 69
 nicalon/CAS ceramic composites, 312
 nondestructive evaluation, 251, 278
 superalloys, 136, 139
 titanium aluminides, 293
 zirconia, 69

Fatigue microcracks, initiation and behavior, 323

Fatigue resistance, 3
 Fatigue testing, 122
 Fiber bridging, 28
 Fiber microbuckling, 171
 Fiber pullout, 28
 Fiber reinforced ceramics, 82
 Fiber reinforced polymeric composites, 171
 Finite element analysis, 121
 Flexure tests, 312
 Fractography, 224, 228, 293
 Fracture (materials)
 alumina, 3
 aluminum-lithium alloys, 224–227
 ceramics, 28, 82
 Mg-PSZ ceramics, 69
 zirconia, 69
 Fracture toughness, 171, 224–227, 230, 233
 Fracture under cyclic loading (*See* Cyclic fatigue)

G

Graphite composites, 171
 Gripping system testing method, 54

H

High temperature, 3, 82

I

Impact, 171
 Interface, 171
 Intermetallics, 251

L

Laboratory test information, interpretation, 205

Life prediction, 136, 205
 Lifetime, fatigue stress/life testing, 69
 Linear superposition model, 251
 Loading, 102
 Long crack, 69

M

Manufacturing, metal matrix composites, 251
 Material processing, 251
 Material testing, 173–174, 180
 Matrix, 251, 293
 Matrix cracking, 52
 Mechanical degradation, under cyclic loading, 69
 Mechanical properties
 ceramics and composites, 82
 polypropylene, 151, 164–166
 Mechanical testing, 52
 Metal-matrix composites
 cyclic deformation, 101, 107–108
 nondestructive evaluation, 251
 chemical characteristics, 271, 274
 SiC_p, 264, 271
 Methodology, 52
 Mg-PSZ ceramics
 crack behavior, 69
 design criteria for cyclic fatigue, 69
 heat treatment and tensile properties, 72
 Microcracks, rayleigh wave signals for detection, 323
 Microcracking, 28, 82, 241
 Microstructure, 251, 293
 Minimum detectable crack size, 323
 Mix ratio, 251
 Mixtures, 251
 Modulus measurement, 151

N

Nicalon/CAS ceramic composites, 312
 Nondestructive evaluation
 ceramic matrix composite, 251, 278, 312
 load, 285
 Nicalon/CAS ceramic composites, 312
 Rayleigh wave signals, 323
 Nondestructive testing, 313, 323
 Notch effects, 3

O

Open hole/notch properties, 171
 Oriented polypropylene, 151, 164–166
 Orthotropic materials, 151
 Overlap joint, 190

P

Particle size, 251
 Performance simulation, 205
 Piezoelectric sensor, 293
 Plastic deformation, 293
 Plastic wake, 121
 Polycrystalline alloys, 136
 Polycrystalline alumina, 3
 Polycrystalline plasticity, 103
 Polymeric composites, 171
 Powder metallurgy, 251
 Powders, 251

Q

Quality control, 312

R

Rayleigh wave, 323
 Reinforced ceramics, 82–84
 Reinforcement, 293
 Residual strength, 205
 Resistivity, 251, 274
 Resonance tests, 151
 Roll drawn polypropylene, 151, 164–166

S

Shear, 171
 Silicon carbide fabrication, 251
 Silicon carbide whiskers, 241
 Single crystal superalloys, 136
 Small crack, 69
 Split spectrum processing, 323
 Static creep, 190
 Static fatigue, 3
 Strength
 decrease with temperature increase, 3
 nicalon/CAS ceramic composites, 312
 Stress intensity factor, 293
 Stress rupture (*See* Static fatigue)
 Stress-strain behavior, 101, 137, 206
 Structural adhesives, 190, 193

Superalloys, 136, 139
 Surface acoustic wave, 323

T

Temperature (*See also* Elevated temperature)
 humidity exposure, bonded joints, 190
 testing ceramic materials, 52
 Tensile mean stress, 137, 140, 142
 Tension testing, ceramics, 4
 Tests and testing (*See also* Mechanical testing)
 brittle materials, 28
 fatigue stress/life, 69
 nondestructive evaluation, 279
 Thermomechanical behavior, 101
 Titanium aluminides, 293
 Toughness
 ceramic matrix composites, 82–84
 graphite fiber reinforced composites, 171, 180

Transformation toughening, 69
 Turbine blade materials in aircraft, 137
 Turbomachinery, 137

U

Ultrasonic scattering, 323
 Ultrasonic time-of-flight, 151
 Ultrasonic wave technique, 241
 Ultrasonics, 251

V

Viscoelasticity, 151

Z

Zirconia, crack behavior, 69