

Table of Contents

AVIATION SAFETY AND AIRCRAFT STRUCTURES

Industry and Regulatory Interface in Developing Composite Airframe Certification Guidance	103
CINDY ASHFORTH, LARRY ILCEWICZ and RUSTY JONES	
Applying a Stiffened Stitched Concept to Shear-Loaded Structure	101
DAWN JEGLEY	
Mode I Cohesive Law Characterization of Through-Crack Propagation in a Multidirectional Laminate	105
ANDREW C. BERGAN, CARLOS G. DÁVILA, FRANK A. LEONE, JONATHAN AWERBUCH and TEIN-MIN TAN	
Development of a High Fidelity Test Database for Failure Prediction	106
JORDAN J. HANDLER, JOSHUA S. DUSTIN, SALVATORE LIGUORE, ANDREW PARRISH and STEVEN WANTHAL	
Design Sensitivity of Hat-Stiffened Composite Panels	107
BO CHENG JIN, SHIV JOSHI, ADARSH PUN and STEVEN NUTT	
Flight Test Results of CFRP Speed Brake Structure Fabricated by VPH Molding Technique	801
YUTAKA IWAHORI, SUNAO SUGIMOTO, BROOKE SMITH and NAOKI YAMADA	
Effect of R-Ratio on Simulation Performance of Fatigue Debond Propagation in Laminated Composite Structure	651
GANG LI and CHUN LI	

STRENGTH

Multi-Axial Yielding, Plastic Flow and Failure Strength of PTFE/PEEK Composites	109
GANG LIU and SU SU WANG	

Modification of Fiber-Matrix Bond Strength through Surface Treatments 114
NICHOLAS E. HOLSMAN, BRENT A. HOLFORD, JERALD A. WESLEY,
KEVIN W. WYNN and WILLIAM T. RIDDELL

A Study of Compression and Shear Behavior of Two Types of Thermoplastic Composites 115
YUNFA ZHANG

Statistical Prediction of Tensile Creep Failure Time for Unidirectional CFRP. 761
MASAYUKI NAKADA, TSUGIYUKI OKUYA and YASUSHI MIYANO

CYTEC STUDENT PAPER

Carbon Nanotube-Reinforced Hybrid Composites Enabled by the PopTube Approach 171
WILL GUIN, JIALAI WANG, XINYU ZHANG and JIM SMITH

Open Microwave Heating of Polymer Resin Using Interdigital Electrode Film and Dispersed Carbon Nanotubes 175
SHINYA HATORI and RYOSUKE MATSUZAKI

Computational Modeling of Curing Induced Damage Due to Compaction on Woven Fabric Composite 221
MD SHARIFUL ISLAM and PAVANA PRABHAKAR

Investigation into Temperature Dependence on the Mechanical Behavior of a Thermoplastic Fabric for Deep-Draw Forming Applications 254
LISA M. DANGORA, JAMES A. SHERWOOD
and JENNIFER L. GORCZYCA

ARMOR AND PROTECTION

Projectile Impact on Kevlar Fabric Including Scaling Effects 154
M. PANKOW

Experimental Study of Shear Behavior of Kevlar 49 Fabrics. 151
DEJU ZHU, BARZIN MOBASHER and SUBRAMANIAM D. RAJAN

Design of Ballistic Resistant Fibre Reinforced Nano-Ceramic-Plastic Composites. 156
BOSE R. NRIPATI and BOSE PAPIA

State of the Art in the Deterministic and Probabilistic Ballistic Impact Modeling of Soft Body Armor: Filaments to Fabrics. 157
GAURAV NILAKANTAN and STEVEN NUTT

Metacomposites Protection System against Primary Blast Injury. 152
K. T. TAN and C. T. SUN

**Influence of Hot Rolling on Microstructure and Properties of Short
Fiber Reinforced Metal Matrix Composite 155**
ERIC KLIER, BRANDON MCWILLIAMS, BRADLEY KLOTZ, JIAN YU,
JONATHAN MONTGOMERY, JIM SORENSEN and RICH ADAMS

NANOCOMPOSITES

**Predicting Mechanical Response of Crosslinked Epoxy
Using ReaxFF. 173**
G. M. ODEGARD, B. D. JENSEN, S. GOWTHAM, J. WU, J. HE
and Z. ZHANG

**Multi-Scale Modeling of Fracture Properties in Nano-Particle
Reinforced Polymers 174**
SAMIT ROY, AVINASH REDDY AKEPATI and VINU UNNIKRISHNAN

**Development Study of Ultra Thin Fiber Reinforced Plastics
Using Unidirectionally Aligned Carbon Nanotube Sheet 183**
TAKASHI KAJINUMA, KEN GOTO, TRAN HUU NAM, SATORU YONEYAMA,
SHUICHI ARIKAWA, YOSHINOBU SHIMAMURA, YOKU INOUE
and KIMIYOSHI NAITO

**Nanostructure Control and Thermal Properties of Organic-Silica
Nanocomposites by Using Perhydropolysilazane and
Organic Polymers 177**
HIROSHI NAKASEKO and REIKO SAITO

**Study the Effect of Nano-Clay Filled Carbon Fibre/Polypropylene
Composite on Mechanical Properties. 184**
MOHAMED H. GABR, KIYOSHI UZAWA and ISAO KIMPARA

**Improved Mechanical Properties of
Poly(Styrene-Block-Isobutylene-Block-Styrene) Due to Nanoclay
Reinforcement 181**
MAURO FITTIPALDI, LANDON R. GRACE and DAVID T. TSE

**Mechanical and Thermal Properties of Cellulose Nanofibers
Reinforced Epoxy Polymer Nanocomposites 382**
MD. NURUDDIN, T. H. MAHDI, M. V. HOSUR and S. JEELANI

**A Synergetic Coupling between Graphene and Carbon
Nanotubes for Hybrid Carbon Fiber Composites 176**
GLÁUCIO CARLEY and ANTONIO ÁVILA

**Fracture Toughness and Delamination Crack Growth Rate of
Graphene-Epoxy and Carbon-Graphene/Epoxy Nanocomposites 186**
DAVID ALAN HAWKINS JR. and ANWARUL HAQUE

**Multi-Layer Graphene as Defect Inhibitor to Bonded Joints: The
Environmental Effects Investigation 180**
HERMANO NASCIMENTO JR. and ANTONIO ÁVILA

Molecular Modeling of Thermo-Physical Properties of BMI Matrix and Its Interface with Amorphous Carbon Fiber 803
VIKAS VARSHNEY, AJIT K. ROY and JEFF BAUR

Effect of Rigid Segment Content on the Piezoresistive Properties of Carbon Nanotube/Polyurethane Composites 182
CELÍN LOZANO-PÉREZ, ANGEL ROSADO-DZIB, GABRIEL JESÚS POOL-BALAM, ROSSANA FARIDE VARGAS-CORONADO, ALEJANDRO MAY-PAT, JUAN VALERIO CAUICH-RODRÍGUEZ and FRANCIS AVILÉS

Processing and Properties of Epoxy-Impregnated Boron Nitride Nanotube Buckypaper 178
B. ASHRAFI, Y. MARTINEZ-RUBI, M. B. JAKUBINEK, K. S. KIM, A. HRDINA, C. T. KINGSTON, A. YOUSEFPOUR, A. JOHNSTON and B. SIMARD

MULTIFUNCTIONAL

Coupled Mechanical and Electrical Response of Carbon Nanotube Yarn Sensors for Self-Sensing Composite Materials 212
J. L. ABOT, T. ALOSH, A. BAJAR, D. RENNER, E. GOOD, B. SENSALÉ-RODRIGUEZ, S. AREZOOMANDAN and K. BELAY

Selective Damage Sensing in Glass Fiber/Carbon Nanotubes/Vinyl Ester Smart Composites by Means of Electrical Resistance 202
JOSÉ DE JESÚS KU-HERRERA, FRANCIS AVILÉS, ALEJANDRO MAY-PAT, VALERIA LA SAPONARA, RICARDO HAUCH RIBEIRO DE CASTRO and BRIAN PINTO

Printed Carbon Nanotube Sensors for *in situ* Damage Recognition 213
ZACHARY R. MELROSE, ROSSINY BEAUCEJOUR and ERIK T. THOSTENSON

Highly Conductive Heterogeneous Epoxy-Silver Composites by Phase Selective *in situ* Filler Synthesis 210
XAVIER CAUCHY, JOLANTA-EWA KLEMBERG-SAPIEHA and DANIEL THERRIAULT

Predicting the Relative Permittivity of Water-Contaminated Glass/Epoxy Laminates at X-Band 110
LONDON GRACE, LUIS RODRIGUEZ, MAURO FITTIPALDI and CARLA GARCÍA

Multifunctional Properties of Multiwall Carbon Nanotube/Polyurethane Foams 205
J. J. ESPADAS-ESCALANTE, A. MAY-PAT and F. AVILÉS

Innovation of Functionally Graded Carbon Nanotubes/Polymer Materials 207
QING-QING NI, TAKUMA ARAI, YI WANG and HONG XIA

Self-healing of Transverse Cracks in Cross-Ply Composites Using a Microencapsulated Solvent-Based Healing System	203
SANG YUP KIM, NANCY R. SOTTOS and SCOTT R. WHITE	
Repeatable Self-Healing of an Epoxy Matrix Using Latent 2-Ethyl-4-Methylimidazole Catalyst.	204
KEVIN R. HART, ERIC D. WETZEL, NANCY R. SOTTOS and SCOTT R. WHITE	
Active Cooling of Vascularized Composites for Application at Elevated Temperatures	206
ANTHONY M. COPPOLA, NANCY R. SOTTOS and SCOTT R. WHITE	
Processing of Degradable Polymer Fibers for Microvascular Pathways	209
VALENTIN SITTE, RICHARD A. POILLUCCI and CHRISTOPHER J. HANSEN	
Electrowetting Actuation Methods for Surface Morphology Control of Multifunctional Composites	215
MARRINER H. MERRILL, JAMES P. THOMAS, RAYMOND C. Y. AUYEUNG and ALBERTO PIQUÉ	
Manufacture and Characterization of Piezoelectric Broadband Energy Harvesters Based on Asymmetric Bistable Laminates	201
PETER HARRIS, CHRIS BOWEN, D. N. BETTS and H. ALICIA KIM	
Bioinspired Functionally Graded Shells and Plates: Exact Solutions	121
VICTOR BIRMAN	
 EFFECTS OF DEFECTS	
Simulation of Composite Manufacturing Variations to Determine Stiffness and Strength Reductions in Automotive and Aerospace Structure	223
LYLE DEOBALD, CHUL Y. PARK, NIHAR DESAI, MADHAVADAS RAMNATH, OHCHANG JIN, DIRK LUKASZEWICZ and STEFAN KERSCHER	
A Design and Analysis Method for Automotive and Aerospace Composite Structures Including Manufacturing Variations.	224
DIRK LUKASZEWICZ, SIMON HESSE, LAVINIA GRAFF, STEFAN KERSCHER, LYLE DEOBALD, CHUL Y. PARK and NIHAR DESAI	
Matrix-Dominated Deformation and Failure of VARIM Glass-Fabric/Vinyl Ester Composite: In-Plane Transverse and Interlaminar Damage Modes and Strengths	295
AKIRA MIYASE, LIGUO LI and SU SU WANG	

On Using the Open Hole Tension and Compression Specimens for Evaluating the Waviness Effects in Laminated Composites	222
SEYEDMOHAMMAD SHAMS and RANI ELHAJJAR	
X-ray CT Image-Based Measurement of Fiber Orientation Distribution in CFRP Laminates	708
RYOHEI HOSOYA, AKINORI YOSHIMURA, JUN KOYANAGI and SATORU YONEYAMA	
Fatigue Behavior of Notched Out of Autoclave Woven Carbon Composite Laminates	659
MAHDI GHAZIZADEH and AJIT D. KELKAR	
Effect of Voids on Microscopic Strain Distribution in CFRP Laminates	704
SHIGEKI ARATAMA, YUSUKE TSUMURA, MASAACKI NISHIKAWA and MASAKI HOJO	
The Coupled Effect of Microvoids and Hydraulic Fluid Absorption on Mechanical Properties of Quartz/BMI Laminates.	226
KEITH R. HURDELBRINK II, ZAHED SIDDIQUE and M. CENGIZ ALTAN	
Characterization of Physical Properties and Morphology of PANI-Based Conductive Composites	706
VIPIN KUMAR, T. YOKOZEKI, T. GOTO and T. TAKAHASHI	
Evaluation of Out-of-Plane Properties of CFRP Laminates Obtained by 3-Point Bending and Direct Loading Tests.	707
EIICHI HARA, TOMOHIRO YOKOZEKI, YUTAKA IWAHORI, HIROSHI HATTA and TAKASHI ISHIKAWA	
Evaluation of Impact Damage in Nonlinear Laminates Subjected to a Transverse Concentrated Load	709
HIROSHI SUEMASU, MAKOTO ICHIKI and MICHAEL R. WISNOM	
High-Velocity Impact Characteristic of Stitched Carbon/Epoxy Composites	710
YASUHITO MIKAMI, AKINORI YOSHIMURA, RYOHEI TSUJI and NAOYUKI WATANABE	
A Numerical and Experimental Study of Damage Growth in a Composite Laminate	281
MARK MCELROY, JAMES RATCLIFFE, MICHAEL CZABAJ, JOHN WANG and FUH-GWO YUAN	
Finite Strip Analysis of Cracked Laminate: Stress Based Plane Strain Approach	712
FARRUKH HAFEEZ and FAHAD ALMASKARI	

PROCESSING: OUT OF AUTOCLAVE

Vacuum Bag Only Processing of Complex Shapes: Effect of Corner Angle, Material Properties and Processing Conditions 242
YIJIA MA, TIMOTEI CENTEA, GAURAV NILAKANTAN
and STEVEN NUTT

Void Entrapment into Air Pathways in Partially Impregnated Prepregs in the Out-of-Autoclave Process 245
THOMAS A. CENDER, VOLKAN ESKIZEYBEK,
JOHN H. GANGLOFF JR. and SURESH G. ADVANI

Silicone Rubber Properties During Advanced Composites Consolidation/Curing Using Specialized Elastomeric Tooling (SET) 241
PAUL MALEK and DANIEL WALCZYK

The Effect of Curing Temperature on the Fracture Toughness of Fiberglass Epoxy Composites 243
THOMAS J. RYAN, AJIT D. KELKAR and EVAN KIMBRO

PROCESSING: SUSTAINABILITY/EFFICIENCY

Process Optimization for Compression Molding of Reused Prepreg Scrap 252
MING-SUNG WU, TIMOTEI CENTEA and STEVEN NUTT

CFRP Recycling Technology Using Depolymerization under Ordinary Pressure 253
MITSUTOSHI NAKAGAWA, KEIICHI KASUGA, KOUICHI AOYAGI,
KANAKO ISHIHARA, YUKARI IKEDA and KATSUJI SHIBATA

Permeability Model of a Woven Fabric Based on Micron Resolution Computed Tomography Data 251
HELGA KRIEGER, SCOTT STAPLETON, GUNNAR SEIDE
and THOMAS GRIES

Process Modeling for Resin Transfer Molding of a Modified Heterocyclic Phenolic/Epoxy Blended Resin 255
TIMOTEI CENTEA, JONATHAN LO, MARK ANDERS and STEVEN NUTT

PROCESSING

Evaluation of Mechanical Properties of VaRTM-Prepreg Hybrid Composite 721
MASATO IGARASHI, HISAYA KATOH, SUNAO SUGIMOTO
and YOSUKE NAGAO

Effect of Distribution Media on Resin Flow during VaRTM Process for FRPs 726
HAYATO NAKATANI, KENTAROU ADACHI and KATSUHIKO OSAKA

Resin Transfer Molding of Particle-Filled, Continuous-Fiber Reinforced Composites 728
TUGCE AYDIL, HAMED TANABI and MERVE ERDAL

Evaluation of the Mechanical Properties and Molding Techniques for the Composite Material Using Four-Axis Preforms by VaRTM 723
MASAYA KENJO, MASATO IGARASHI, SHINICHI TAKEDA and YOSUKE NAGAO

Evaluation of Residual Strain in Press Molding of CF/PPS Laminates Using FBG Sensors 722
TAKUHEI TSUKADA, SHIN-ICHI TAKEDA, YUTAKA IWAHORI, SHINYA HONDA, YOSHIHIRO NARITA, SHU MINAKUCHI and NOBUO TAKEDA

Comparison of Mechanical Properties of CFRTP with Those of CFRP Using Same CF Fabrics 725
GOICHI BEN and WATARU ISHIDA

Effect of Molding Condition on Flexural Strength of Textile Carbon Fiber Reinforced Polycarbonate Laminates 724
HIROAKI OZAKI, MASAYUKI NAKADA, KIYOSHI UZAWA and YASUSHI MIYANO

Effect of Welding Conditions on Ultrasonic Welding Properties for Continuous Fiber Reinforced Thermoplastic Composite 122
ASAMI NAKAI, AKIO OHTANI and KAZUHO TAKEUCHI

TEXTILE COMPOSITES

Comparison of Continuum and Cohesive Zone Damage Models for Laminated Composites under Uniaxial Loading. 262
M. KEITH BALLARD and JOHN D. WHITCOMB

Finite Element Models of 3D Woven Composites Based on Numerically Generated Micro-Geometry of Reinforcement 264
BORYS DRACH, ANDREW DRACH, IGOR TSUKROV, MARION PENVERNE and YURI LAPUSTA

Numerical Predictions of Damage Initiation in 3D Woven Composites under Various Loading Conditions 265
IGOR TSUKROV, ANDREW DRACH, BORYS DRACH, HARUN BAYRAKTAR, JON GOERING and TODD GROSS

An Enhanced Continuum Damage Mechanics Model for Crash Simulation of Composites 266
DANGHE SHI and XINRAN XIAO

Effect of Variable R-Ratio Loading on Fatigue Life and Damage Accumulation in Plain-Weave Fabric Carbon/Epoxy Laminates 762
MASAMICHI KAWAI, KYOUNG-MO YANG and SHIOKI OH

Locally Reinforced Woven Fabrics: Mechanical and Economical Evaluation	261
CHRISTOPHER LENZ, DOMINIK WIRMER, YVES-SIMON GLOY and THOMAS GRIES	
Fracture Properties of Glass/Carbon Intra-Hybrid Woven Fabric Composites	268
DAIKI ICHIKAWA, MASAYUKI KITAMURA, YUQIU YANG and HIROYUKI HAMADA	
The Creation of Super Lightweight CFRP Ablator and Evaluation of Its Thermal and Mechanical Properties	267
TOSHIHIRO KANAYA, HIDETAKA TOSHIMA, KEN GOTO, AKIO OTANI, SATORU YONEYAMA and SYUICHI ARIKAWA	
Finite Element Modeling to Predict the Formation of Out-of-Plane Defects During the Manufacture of Textile-Reinforced Composites	271
LISA M. DANGORA, JAMES A. SHERWOOD, JENNIFER L. GORCZYCA and CYNTHIA J. MITCHELL	
A Discrete Mesoscopic Finite Element Model Used as a Design Tool for Textile Composite Structures	273
CYNTHIA J. MITCHELL, JAMES A. SHERWOOD, LISA M. DANGORA and JENNIFER L. GORCZYCA	
Full-Field Strain Analysis of Compressively Loaded Flat Composite Laminates with Undulated Fibers	274
TODD C. HENRY, CHARLES E. BAKIS, JARET C. RIDDICK and EDWARD C. SMITH	
Fabrication of Non-Crimp CFRP Pipe by Braiding Technique	275
YASUYOSHI KAKITAL, MASAYA HIROSE, TADASHI UOZUMI, AKIO OHTANI and ASAMI NAKAI	
 COMPOSITES IN WIND ENERGY	
Structural Integrity of Large Composite Offshore Wind Turbine Rotor Blades	292
KING HIM LO, TUNG PEI YU and SU SU WANG	
Application of Structural Similitude Theory in Subcomponent Testing of Wind Turbine Blades	294
MOHAMAD EYDANI ASL, CHRISTOPHER NIEZRECKI, JAMES SHERWOOD and PETER AVITABILE	
Evaluation of the Thermal Damage in Glass Fiber Polymer-Matrix Composites in Wind Turbine Blades Subjected to Lightning Strike	291
YEQING WANG and OLESYA I. ZHUPANSKA	
Strength and Failure Modes of Thick-Adhesive Bonded Joints of Glass Fabric/Vinyl Ester Composite Laminates	293
BILL W. COLE, LIGUO LI and SU SU WANG	

DESIGN AND MANUFACTURING

Development of Fabrication Method and Burst Strength of CFRP Pressure Vessel Reinforced with Cylindrical Grid 305
KAZUHIRO SAKATA and GOICHI BEN

Monolithic Thermoplastic Composite Pressure Vessels (Type IV) for On-board Automotive Hydrogen Storage 311
MICHAEL RUBY, DAVID ALMOND, MATTHEW TURNER and ANDREW CLARKE

Development of Light Weight Composite Structural Guide Vane for Turbo Fan Engine 304
TAKAOMI INADA, HIROYUKI YAGI, HIDEO MORITA, RINTAROU KAJIWARA, TAKEHISA YAMADA, TSUTOMU MURAKAMI, KOJI MIYAZAWA, TAKEHIKO UCHIYAMA, KATSUYOSHI MORIYA and SHINICHI TANAKA

The Development of a Conical Composite Energy Absorber for Use in the Attenuation of Crash/Impact Loads 322
JUSTIN D. LITTELL

Process Efficiency Improvements for a Structural Doorframe Support Panel Molded from Unidirectional E-Glass/Polypropylene Composite Tapes 310
DAVID EASTEP, MANFRED REIF, MICHAEL BEGERT, MATHIAS GERSTER, ERIC SCHNEIDER, TOBIAS JOPPICH and SEBASTIAN BAUMGÄRTNER

Study on the Laser Beam Cutting of Carbon Preform by Several Laser Equipment of Various Properties 317
HIROHITO HIRA, HIROMITSU ITOH, KODAI YAMADA and TOMOYUKI SUZUKI

Optimum Parameters on Electro Fusion Joining of CF/PPS Composites by Carbon Fiber Heating Elements 119
DAIKI TANABÉ, KAZUAKI NISHIYABU and TETSUSEI KURASHIKI

ISAAC—A Testbed for Advanced Composites Research 315
K. CHAUNCEY WU, BRIAN K. STEWART and ROBERT A. MARTIN

Comparative Life Cycle Analysis of Tung Oil/Jute Fiber Bio-Composites to Synthetic Unsaturated Polyester Resins/E-Glass Composites 301
ELDON D. TRIGGS II, MAHESH V. HOSUR, ALFRED TCHERBI-NARTEH and SHAIK JEELANI

Scaling Effects in Glass Reinforced Epoxy Filament Wound Tubes Subjected to Quasi Static Indentation 320
FARRUKH HAFEEZ and FAHAD ALMASKARI

Analysis of Residual Thermal Stresses in Metal/PMC Composite Systems 321
G. NEWAZ, A. SEYED YAGHOUBI and G. S. DHALIWAL

Non-Fickian Moisture Absorption in Polymers Coated with a Thin Nanocomposite Layer	307
GORKEM E. GULOGLU and M. CENGIZ ALTAN	
Unit Cell Modeling to Predict Permeability for Composite Manufacturing	318
TIMOTHY LUCHINI, STEPHEN SOMMERLOT and ALFRED LOOS	
Effect of Humidity and Cyclic Heat on the Static and Dynamic Performance of Composite-Based Lightweight Materials	309
SAYED NASSAR and KAORI SAKAI	
Effect of Fiber Content on the Aspect Ratio of Process-Induced Microvoids and the Implications to the Tensile Properties of Composite Laminates	306
J. P. ANDERSON and M. C. ALTAN	
Mechanical Properties of CFRP in the Spray Up Fabrication Method	308
TETSUO KIKUCHI, YUKA TAKAI, AKIHIKO GOTO and HIROYUKI HAMADA	
Analysis of Bi-Material “Thermostat” Strip Specimen for Predicting Cure Induced Shrinkage	316
OLEKSANDR G. KRAVCHENKO, SERGII G. KRAVCHENKO and R. BYRON PIPES	
Modeling Advancing Flow Fronts in Composite Manufacturing	319
STEPHEN SOMMERLOT, TIMOTHY LUCHINI and ALFRED LOOS	
Fatigue Performance of a Structural Reaction Injection Molded Composite	282
SIDDHARTH VALLURI and P. K. MALLICK	
Bending Stress and Deflection Analysis of Carbon Nanotube Reinforced Composite Skew Plates	314
AMIN JOODAKY, ANWARUL HAQUE and IMAN JOODAKY	
Hybrid Polymer Composites Based on Graphite Nanoplatelets and Glass Fibers	303
DIEGO PEDRAZZOLI, ALESSANDRO PEGORETTI and KYRIAKI KALAITZIDOU	
Investigation of Stabilization Conditions of Electrospun Carbon Nanofibers for Improved Mechanical Performance	302
BIPUL BARUA and MRINAL C. SAHA	

STABILITY AND POSTBUCKLING

Experimental Evaluation of Fatigue Damage Progression in Postbuckled Single Stringer Composite Specimens	333
CHIARA BISAGNI, CARLOS G. DÁVILA, CHERYL A. ROSE and JOSEPH N. ZALAMEDA	

Postbuckling Analysis of Composite Stiffened Panel under Shear Load for Assessment of Delamination Propagation between Skin and Stringer 711
KEISUKE UMEZAWA and TAKAHIRA AOKI

A New Inverse Hyperbolic Zigzag Theory for the Static and Buckling Analysis of Laminated Composite and Sandwich Plate 331
ROSALIN SAHOO and BHRIGU NATH SINGH

Buckling Behavior and Optimal Design of Cylindrical Lattice Structure 705
SHUNSUKE YOSHINO, TAKAHIRA AOKI, TOMOHIRO YOKOZEKI, KEITA TERASHIMA and TORU KAMITA

CRASHWORTHINESS

Dynamic Material Characterization of Laminated Composite Materials—A Path for Test Method Development 357
J. F. ACOSTA, G. OLIVARES, S. KESHAVANARAYANA, M. T. SIDDIQUI and I. ECHAVARRI

Axial Crushing Behavior of Braided Tubular CFRP 342
RYO IWASAKI, YOSHIO AOKI, AKIHISA TABATA, TATSUYA ISONO and SUGURU SHIMIZU

Multiscale Simulation Strategy for Low-Velocity Impact on FRP 124
CLÁUDIO S. LOPES, SERGIO SÁDABA, FERNANDO NAYA and CARLOS GONZÁLEZ

Deformation Mechanisms and Energy Absorption in the Crushing of Cellular Solids 355
ROYAN J. D'MELLO and ANTHONY M. WAAS

IMPACT AND DYNAMIC RESPONSE

Evaluation on Impact Damage of Textile Carbon Fiber Reinforced Polycarbonate Composite 359
HIROSHI SAITO, HIROAKI OZAKI, MASAYUKI NAKADA and YASUSHI MIYANO

Modeling the Behavior of Impact Induced Multiple Delaminations under Compressive Load 356
CHRISTOPH PAUL DIENEL

Modeling and Simulation of Impact and Perforation in Fiber Reinforced Composites 361
MEHRAN TEHRANI, AYOUB Y. BOROUJENI and MARWAN S. AL-HAIK

Stress Analysis in the Vicinity of the Impact Zone in the Transversely Isotropic Composite: An Exact Analytical Solution to the 3D Problem 351
OLESYA I. ZHUPANSKA

Use of a New Portable Instrumented Impactor on the NASA Composite Crew Module Damage Tolerance Program. 353
WADE C. JACKSON and DANIEL L. POLIS

Loading Rate Effects on Mode I Delamination of Z-Pinned Composite Laminates. 352
NIRANJAN D. PARAB, ANDREW SCHLUETER and WEINONG CHEN

Strain Rate Strengthening and Failure Behavior of Filament Wound Composites. 802
AMANDA S. WU, DAVID URABE, VICTOR HEPA, WILLIAM ELMER and MICHAEL J. KING

Dynamic Hydrostatic Tension in Polyurea and Polyurea-Based Composites. 354
ALIREZA V. AMIRKHIZI

KEITH KEDWARD SYMPOSIUM

Strength Prediction of Single Lap Joint Using CTOA 376
N. M. RAHMAN, H. QIAN and C. T. SUN

Predictions of Delamination Growth for Quasi-Static Loading of Composite Laminates 372
JIAWEN XIE and ANTHONY M. WAAS

Failure of Curved Composites due to Through-Thickness Tensile Stresses. 374
MICHAEL R. WISNOM

The Inclusion of Arbitrary Load Histories in the Strength Decay Model for Stress Rupture 371
JAMES R. REEDER

Damage Tolerant Sandwich Panel Core with Low Moisture Affinity 629
KEITH R. LOSS

A Unified Analysis from Composite Laminates to Composite Beam Structures. 373
WEN S. CHAN

NATURAL, BIO-BASED & GREEN COMPOSITES

A New Process for Manufacturing Biocomposite Laminate and Sandwich Parts Using Mycelium as a Binder 381
LAI JIANG, DANIEL WALCZYK and GAVIN MCINTYRE

Microstructure of Injected Natural Fiber-Polymer Composite 383
AHMED ABDENNADHER, TATIANA BUDTOVA and MICHEL VINCENT

Effects of Surface Treatment on the Moisture Absorption of Short Fibre Nonwoven Kenaf Reinforced-Polypropylene Composites 385
OSCAR ASUMANI, ROBERT REID and RATNAM PASKARAMOORTHY

Mycology Matrix Sandwich Composites Flexural Characterization 384
SONIA TRAVAGLINI, C. K. H. DHARAN and PHILIP G. ROSS

INTEGRATED COMPUTATIONAL MATERIALS ENGINEERING (ICME)

***In-situ* Experiments with X-Ray Micro-Computed Tomography 401**
MARK KISTNER, SIRINA SAFRIET, KEVIN HOOS, DAVID MOLLENHAUER
and CHAD RYTHER

Three-dimensional Imaging and Numerical Reconstruction of Graphite/Epoxy Composite Microstructure Based on Ultra-High Resolution X-Ray Computed Tomography 402
MICHAEL W. CZABAJ, MARK L. RICCIO and WILLIAM W. WHITACRE

Characterization of Strain Distribution in a Reinforced Rubber-Matrix Composite Using Digital Volume Correlation 408
DAVID MOLLENHAUER, SIRINA SAFRIET, MICHAEL SUTTON,
HUBERT SCHREIER, MARK KISTNER and ERIC ZHOU

Hypervelocity Impacts on Metallic Foam core Sandwich Panels Filled with Shear Thickening Fluid 413
JUSTIN WARREN, SEAN OFFENBERGER, THOMAS LACY,
SANTANU KUNDU, HOSSEIN TOGHIANI
and CHARLES U. PITTMAN JR.

Effect of Temperature on Shear Thickening Fluid Rheology 414
JUSTIN WARREN, SANTANU KUNDU, SEAN OFFENBERGER,
THOMAS LACY, HOSSEIN TOGHIANI and CHARLES U. PITTMAN JR.

Wavelet Spectral Finite Element Modeling of Laminated Composite Beams with Complex Features. 404
ASHKAN KHALILI, DULIP SAMARATUNGA, RATNESHWAR JHA
and S. GOPALAKRISHNAN

A New Multi-Physics Molecular Dynamics Finite Element Method for Designing Graphene Composite Nano-Structures to Target Property Specifications 405
ANDRÉ A. R. WILMES and SILVESTRE T. PINHO

Automated Microstructure-Properties Characterization and Simulation in Brittle Matrix Continuous Fiber Reinforced Composites 416
CRAIG P. PRZYBYLA, STEPHAN BRICKER, JEFF SIMMONS
and RUSSELL HARDIE

Integration of Multi-Scale Modeling of Composites under High Strain Rate Impact with Surrogate 403
SHU SHANG, NAM H. KIM and MINHYUNG LEE

A Mesh Superposition Technique for the Simulation of the Mechanical Response of Composite Materials at Multiple Length and Time-Scales 746
LUIGI GIGLIOTTI and SILVESTRE T. PINHO

An Efficient, Adaptive Multiscale Modeling Methodology for Simulating the Progressive Failure of Composite Materials. 410
TRENTON M. RICKS, THOMAS E. LACY, JR. BRETT A. BEDNARCYK and STEVEN M. ARNOLD

Efficient Coupling of Micro/Macroscale Analyses with Stochastic Variations of Constituent Properties 411
KEITH MCWILLIAMS, TRENTON M. RICKS, THOMAS E. LACY JR., SAMIT ROY and RATNESHWAR JHA

Multiscale Investigation of Free Edge Effects in Laminated Composites. 409
CHRISTOPHER CATER and XINRAN XIAO

Simulation of Micro-Scale Mode-I Fracture in a Composite Lamina 412
TIMOTHY D. BREITZMAN, DAVID H. MOLLENHAUER, ENDEL V. IARVE, ERIC G. ZHOU and KEVIN H. HOOS

Durability of E-Glass Vinyl Ester Composite Structures and Their Modeling in ABAQUS. 284
SHAHRAM ESLAMI, ABBAS HONARBAKHS RAUF and SHIVA ESLAMI

STRUCTURAL OPTIMIZATION

Multi-Step Design Optimization of Variable Stiffness Composite Cylinders Made by Fiber Steering 421
MOHAMMAD ROUHI, HOSSEIN GHAYOOR, SUONG V. HOA and MEHDI HOJJATI

Analysis and Sizing of Composite Anisogrid Cylindrical Structures without Skin 425
JAMES AINSWORTH

Optimization of Sandwich Panel Parameters for Enhanced Structural Performance using Homogenization Methodology 424
ARUN GARG, VIKRAM YADAMA and WILLIAM F. COFER

Stacking Sequence Optimization of Stiffened Composite Plate with Constraints of Residual Deformation and Buckling 422
AKIRA TODOROKI, YOSHIRO SUZUKI and TAKUMI OZAWA

Layup Optimization of Symmetrically Laminated Plates Considering Damping Characteristics using Lamination Parameters 423
MASAKI KAMEYAMA

Vibration Analysis of Laminated Composite Plates Having Rigid Body Attachments	426
YOSHIHIRO MARITA, SHINYA HONDAL and TAKAHIRO FUNAMIZU	

UNCERTAINTY QUANTIFICATION

Effects of Architectural Variability on the In-Plane Strength of a Woven Ceramic Matrix Composite	431
MARLANA B. GOLDSMITH, BHAVANI V. SANKAR and RAPHAEL T. HAFTKA	

A Robust Modeling Approach for Fatigue Damage in Composites Based on Bayesian Model Class Selection	432
JUAN CHIACHIO, MANUEL CHIACHIO, SHANKAR SANKARARAMAN, ABHINAV SAXENA and KAI GOEBEL	

Identification under Uncertainty of Material Properties of Composite Sandwich Panels	435
SYLVAIN LACAZE, SAMY MISSOUM, FARBOD ALIJANI and MARCO AMABILI	

NON-DESTRUCTIVE EVALUATION AND STRUCTURAL HEALTH MONITORING (NDE & SHM)

Monitoring Fatigue Damage Propagation in GFRP Using Carbon Nanotubes.	451
MAHMOUD REDA TAHA, EMAN OMAR TAHA and MONEEB GENEDY	

Damage Detection with Carbon Nanotube-Based Sensing Composites.	457
THOMAS SCHUMACHER, ERIK T. THOSTENSON, HONGBO DAI and GERARD GALLO	

Comparison between Grid Points and Grid Lines for Detecting, Locating and Quantifying Damage in Large Polymer Composite Structures Made of Electrically Non-Conductive Fibers and Carbon Nanotube Networks.	458
ALI NAGHASHPOUR and SUONG VAN HOA	

Full-Spectral Measurements of Fiber Bragg Grating Sensors Embedded in Composites for Damage Monitoring.	452
SEAN WEBB, KYLE OMAN, KARA PETERS, MOHAMMED ZIKRY, RICHARD SELFRIDGE and STEPHEN SCHULTZ	

Detection of Defects in Composites by Limited-Angle Tomography	464
YURI NIKISHKOV, EKATERINA BOSTAPH and ANDREW MAKEEV	

Fiber Bragg-Grating Sensors for SHM and FEM of In-Service Bonded Multi-Material Pi-Joints	474
ANTON KHOMENKO, ERMIAS G. KORICHO and MAHMOODUL HAQ	

High Temperature-Measurement Using Fiber Bragg Grating Sensor for SHM Applications on Composites	804
DAE-HYUN KIM, DONGHOON KANG and HEON-YOUNG KIM	
New Perspectives for Material Characterization and Structural Diagnostics of Composites.	466
ANDREW MAKEEV, YURI NIKISHKOV, GUILLAUME SEON and ERIAN ARMANIOS	
Quantification of Memory Effect in Composites under Fatigue for Precursor Damage Analysis	469
SOURAV BANERJEE, SUBIR PATRA and AGBASI CHIJOKE	
Identification of Debonding in CFRP Stiffened Panels using Pattern Recognition	473
PRASHANTH ABRAHAM VANNIAMPARAMBIL, RAMI CARMİ, FUAD KHAN, IVAN BARTOLI and ANTONIOS KONTOSOS	
Structural Health Monitoring of Composite Wind Turbine Blades Using Diffuse Ultrasonic Fields and Reciprocity	463
JEFFERY D. TIPPMANN and FRANCESCO LANZA DI SCALEA	
NDE and SHM Simulation for CFRP Composites	454
CARA A. C. LECKEY and F. RAYMOND PARKER	
Predicting Remaining Useful Life in CRFP Laminates under Fatigue Loads: A New Efficient Logarithm.	459
M. CHIACHIO, J. CHIACHIO, S. SANKARARAMAN, A. SAXENA and K. GOEBEL	
Acoustic Emission as a Tool in Monitoring Fatigue Damage Accumulation in Fiber Reinforced Metal Laminate	478
RAMI CARMİ, ARIE BUSSIBA, IGAL ALON, PRASHANTH ABRAHAM VANNIAMPARAMBIL, JEFFERSON CUADRA, UTKU GUKLU and ANTONIOS KONTOSOS	
Damage Accumulation Profile and Fracture Event Sequence of Particulate Metal Matrix Composite Monitored by Acoustic Emission	472
ARIE BUSSIBA, RAMI CARMİ, SHLOMO HAROUSH, IGAL ALON and RONI SHNECK	
A Multispectral Nondestructive Approach for Image-Based Damage Monitoring	471
SATISH RAJARAM, PRASHANTH ABRAHAM VANNIAMPARAMBIL, JEFFERSON CUADRA, ADITI RAMADURGAKAR, IVAN BARTOLI and ANTONIOS KONTOSOS	
Vibration Attenuation of Composite Moving Beams Using Active Vibration Control	462
GOUTHAMI POLINA and NITHI TI SIVANERI	

**Development and Evaluation of Residual Stress/Strain Reduction
Method in Thick CFRP Pipes 701**
KAZUNORI TAKAGAKI, SHU MINAKUCHI and NOBUO TAKEDA

**VaRTM and Cure Process Monitoring by Fiber Optic Strain and
Cure-Index Sensors 702**
TATSURO KOSAKA, TOMOHIRO TERAMACHI
and KAZUHIRO KUSUKAWA

PROGRESSIVE DAMAGE MODELING

**Predicting Crippling Failure in Composites Using Progressive
Failure Analysis 501**
ALEX SELVARATHINAM, LORI FLANSBURG, SCOTT NORWOOD
and STEPHEN ENGELSTAD

**Experimental and Numerical Determination of Notched Composite
Strength 502**
BILEL AIDI and SCOTT W. CASE

**Quantitative Assessment of Progressive Damage Tools for
Composites 503**
STEPHEN CLAY and RICHARD HOLZWARTH

**Evolution of Surface Oxide Layer and Oxidation-Induced
Dimensional Changes during Passive Oxidation of
Silicon Carbide 504**
PADMALATHA KAKANURU, JIANGYONG LIANG
and KISHORE POCHIRAJU

**Finite Element Analysis of Thermo-Mechanical and Failure
Properties of Hybrid Fiber Composites 511**
SAYAN BANERJEE and BHAVANI V. SANKAR

**Application of the Embedded Element Technique to Predict
Interlaminar Failure 655**
MATHEW W. JOOSTEN, CHUN H. WANG, ADRIAN MOURITZ,
AKBAR AFAGHI KHATIBI, STEVEN AGIUS, MATTHEW DINGLE,
BARRY TRIPPIT and BRIAN COX

**Three-Dimensional Modeling of Unidirectional Composites with
Fiber Fracture: Role of Matrix Properties 283**
RAJA GANESH, SUBRAMANI SOCKALINGAM, JUN MISUMI,
AHMAD ABU-OBAID and JOHN W. GILLESPIE JR.

**Prediction of Failure Behavior of Pin Loaded Glass Fiber Reinforced
Polymer Straps 512**
MELEK ESRA ERDEM, BETÜL PELIN ERGÜL, YUSUF ULU,
GÖKHAN TURSUN and LEVEND PARNAS

Damage Simulation in Non-Crimp Fabric Composite Plates Subjected to Impact Loads	505
ARUNKUMAR SATYANARAYANA, PHILIP B. BOGERT, VENKAT AITHARAJU, SATVIR AASHAT and HAMID KIA	
A Promising Way to Model Damage in Composite and Dry Fabrics Using a Discrete Element Method (DEM)	507
FRÉDÉRIC DAU, LAURENT MAHÉO, BA DANH LE and JÉRÉMIE GIRARDOT	
A Technique for Mapping Characteristic Lengths to Preserve Energy Dissipated via Strain Softening in a Multiscale Analysis.	510
EVAN J. PINEDA, BRETT A. BEDNARCYK and STEVEN M. ARNOLD	
Damage Analysis of Composites Using a Three-Dimensional Damage Model: Micro-Scale Architectural Effects	513
BRETT A. BEDNARCYK, BERTRAM STIER, JAAN-W. SIMON, STEFANIE REESE, EVAN J. PINEDA and STEVEN M. ARNOLD	
Challenges in Modelling of Lightning-Induced Delamination: Effect of Temperature-Dependent Interfacial Properties	508
PARIA NAGHIPOUR, EVAN J. PINEDA and STEVEN ARNOLD	

COMPUTATIONAL COMPOSITE ENGINEERING

Data Assimilation for Integration of Electrical Measurements and Stochastic Flow Simulation of VaRTM	741
RYOSUKE MATSUZAKI, MASAYUKI MURATA, AKIRA TODOROKI and YOSHIHIRO MIZUTANI	
New Analytical Method of Electric Voltage Change of Delaminated CFRP Using Anisotropic Electric Potential Function	743
AKIRA TODOROKI	
Multi-Disciplinary Design Approach and Structural Sizing on Composite Wing	753
YOSHIYASU HIRANO, JUNICHI KATSUMI, TOMONAGA OKABE and KEISUKE SAWADA	
Numerical Simulation of Out-of-Plane Impact and Compression after Impact Test on CFRP Laminates.	742
RYO HIGUCHI, TOMONAGA OKABE and KENICHI YOSHIOKA	
Prediction of Shear-Cutting Process of CFRP Cross-Ply Laminates Using Smoothed Particle Hydrodynamics	747
SHIGEKI YASHIRO, RYUJI ONO, KEIJI OGI and YOSHIHISA SAKAIDA	
Molding Simulation of Prepreg with Slits by Particle Method.	752
HIROAKI MATSUTANI, ICHIRO TAKETA and KIYOSHI ENOMOTO	

Multiscale Simulation of CFRP Plate Structure by Using Homogenization Method. 748
AKINORI YOSHIMURA, YUICHIRO TAJIMA, TOMONAGA OKABE
and YOSHIKI MORINO

A Novel Strength Model with Increased Flexibility for Predicting Failure of Unidirectional Fiber-Reinforced Composites. 749
Y. SWOLFS, R. M. MCMEEKING, L. GORBATIKH and I. VERPOEST

MOLECULAR MODELING OF MATERIALS

Study of the Interaction of Silica Glass Surface with Water and Silane Coupling Agent. 521
SANJIB C. CHOWDHURY, BAZLE Z. (GAMA) HAQUE
and JOHN W. GILLESPIE, JR.

Molecular Dynamics Simulations of Nanoporous Iron to Evaluate the Influence of Porosity on the Mechanical Strength. 525
MARTIN HUMMEL, CONSTANTIN BÖHM, PETER BINKELE
and SIEGFRIED SCHMAUDER

Tailoring Fracture Toughness of Silicon Carbide Ceramics Film via Nanoscale Multi-Layering with Diamond 523
SHIEKH F. FERDOUS and ASHFAQ ADNAN

Multiscale Analysis for Characterizing Fracture Toughness of Trabecular Bone-Like Materials 524
MD FARZAD SARKER and ASHFAQ ADNAN

Molecular Dynamics Simulation Study of Reactive Encapsulation of Solvent in Epoxy Curing. 522
CHANGWOON JANG, MAJID SHARIFI, GIUSEPPE R. PALMESE
and CAMERON F. ABRAMS

Elastic-Plastic Fracture Simulation in Thermoset Resins. 526
TIMOTHY D. BREITZMAN, JAMES C. MOLLER, STEPHEN A. BARR
and RAJIV J. BERRY

ONR MARINE COMPOSITES

Response of Carbon-Fiber/PVC Foam Composite Structures Subjected to Oblique Underwater Impulsive Loads 538
SIDDHARTH AVACHAT and MIN ZHOU

***In-situ* Determination of the Fiber/Matrix Interface Tensile Strength. . . 533**
KYLE TOTTEN, BENDER KUTUB and LEIF A. CARLSSON

Comparison of Low Velocity Impact Properties of MMT, MWCNT and MMT/MWCNT Binary Nanoparticles Modified Carbon/Epoxy Composites Subjected to Marine Environmental Conditioning. 532
MD EKRAMUL ISLAM, TANJHEEL H. MAHDI, MAHESH V. HOSUR,
ALFRED TCHERBI-NARTEH and SHAIK JEELANI

Seawater Absorption in Unidirectional Carbon/Vinylester 534
LEIF A. CARLSSON and MARYANN FICHERA

**Effect of Water Absorption on Time-Temperature Dependent
Strength of Unidirectional CFRP 531**
YASUSHI MIYANO, MASAYUKI NAKADA and YUKI YAMAKITA

**Durability of Glass/Epoxy Nanocomposites Subjected to Synergistic
Elevated Temperature and Moisture Conditions 535**
SHAIK ZAINUDDIN, MAHESH HOSUR, CHUKWUMA NWEKE,
DAVID PRICE, SHAIK JEELANI and ASHOK KUMAR

**Composites with Tunable Electrical, Thermal and Mechanical
Properties: An Approach to Multifunctionality 539**
VASANTH CHAKRAVARTHY SHUNMUGASAMY, DINESH PINISETTY
and NIKHIL GUPTA

Constitutive Equation of Syntactic Foam under Lateral Constraint 536
RAFID KULLY and KUNIGAL SHIVAKUMAR

**Size Effects in Testing of Carbon Fiber Vinyl Ester Laminate for
Marine Application and Damage Evolution 537**
AKAWUT SIRIRUK, ROBIN WORACEK, STEPHEN B. PUPLAMPU,
DAYAKAR PENUMADU, PHILIP J. WITHERS, TRISTAN LOWE,
NIKOLAY KARDJILOV, INGO MANKE and ANDRE HILGER

**Models for Analysis of the Effective Properties of Hybrid
Composites 127**
ANDREY BEYLE, DAVID L. COCKE and ANDREW GREEN

SIMULATION TOOLS FOR COMPOSITES

**Development of a Workflow for the Design of Liquid Composite
Moulding Processes 552**
PASCAL HUBERT, CRISTIAN DEMARIA, CASEY KEULEN,
CHRISTOPHE MOBUCHON and ANOUSH POURSAITIP

**Through 3D Numerical Simulation and Experimental Visualization
to Study the Resin Transfer Molding 806**
HUA ZHAN CHOU, HSUN YANG, CHIH-CHUNG HSU, BAI-JIAN WEI,
YUAN YAO and RONG-YEU CHANG

INTERLAMINAR PROPERTIES—D30

**Assessment of Mode II Fracture Tests for Fiber Reinforced Composite
Laminates 609**
KUNIGAL N. SHIVAKUMAR, RAGHU PANDURANGA,
SIDHARTH K. REDDY, JOHN SKUJINS and SANDI MILLER

**Study of Delamination Onset under Mode-II Loading in Translaminar
Reinforced Composites Using Acoustic Emission Techniques 601**
VIPUL RANATUNGA and STEPHEN CLAY

Standardization of the End-Notched Flexure Test for Mode II Delamination Toughness Determination of Unidirectional Laminated Composites	608
BARRY D. DAVIDSON	
Three-Dimensional Crack Surface Evolution in Mode III Delamination Toughness Tests	606
ALLISON L. JOHNSTON, MICHAEL W. CZABAJ, BARRY D. DAVIDSON and JAMES G. RATCLIFFE	
Fracture Toughness of Carbon Fiber Laminates Including Carbon Nanotubes	603
ELISA BOROWSKI, SHERIF ABOUBAKR, ESLAM SOLIMAN and MAHMOUD REDA TAHA	
Shear Properties of Carbon Fiber/Epoxy Composite	602
KIMIYOSHI NAITO	
A Methodology for Realistic Delamination Growth Prediction Based on Fractographic Observations	605
EMILE S. GREENHALGH, CARLA CANTURRI and SILVESTRE T. PINHO	
Validation of Material Models for Inter- and Intra-Laminar Damage in Laminated Composites	607
MICHAEL BRUYNEEL, JEAN-PIERRE DELSEMME, ANNE-CHARLOTTE GOUPIL, PHILIPPE JETTEUR, CÉDRIC LEQUESNE, TADASHI NAITO and YUTA URUSHIYAMA	
 SANDWICH PANELS—D30	
Response of 3D Fiber Reinforced Foam Core Sandwich Structures at Cold Temperatures	624
ZACHARY T. KIER, DHARUV N. PATEL, VINAY K. GOYAL, JACOB I. ROME, GARY L. STECKEL and ANTHONY M. WAAS	
Foam Heat Treatment and Its Effects on Strength of Sandwich Composites	627
JACOB I. ROME, VINAY K. GOYAL, DHARUV N. PATEL and ZACHARY T. KIER	
Failure Analysis of Unvented Honeycomb Structures	628
VINAY K. GOYAL, JAMES P. TUCK-LEE, JACOB ROME and ERIC LUNDGREN	
Fiber Optic Strain Measurement in Design of Sandwich Beam Flexure Specimens	621
JUDDSON FROST and MARICRUZ CARRILLO	

CIVIL STRUCTURES—D30

- Testing and Evaluation of GFRP Sandwich Bridge Deck Panels Filled with Polyurethane Foam. 622**
HESHAM TUWAIR, JEFFERY VOLZ, MOHAMED ELGWADY,
MOHANED MOHAMED, K. CHANDRASHEKHARA
and VICTOR BIRMAN
- Lateral Load-Displacement Response Analysis of RC Columns Wrapped by FRP Composites. 641**
CHUNG-SHENG LEE, CHUNG-CHEN CHOU and HAO-HSIANG TENG
- Structural Testing of Dual-Core Self-Centering Braces with FRP Bars and FRP Wide-Flange Beams 644**
CHUNG-CHE CHOU, PI-FAN SUN and YING-CHUAN CHEN
- Assessing Effectiveness of FRP in Corrosion Repair. 642**
CHANDRA KHOE, RAJAN SEN and VENKAT R. BHETHANABOTLA
- Engineering FRP-to-Concrete Bonded Joints for Better Durability. 643**
SHAHROOZ AMIDI and JIALAI WANG
- Upgrading GFRP Bolted Lap Joint Capacity Using Carbon Nanotubes. 647**
MONEEB GENEDY, MICHELLE BEGAYE and MAHMOUD REDA TAHA
- Deformation of CRFP Rods with Different Surface Profiles under Transverse Compressive Loading. 646**
JONATHON D. TANKS and STEPHEN R. SHARP

FATIGUE AND FRACTURE—D30

- Improved Composite Fatigue Testing using Adaptive Frequency Control 654**
PETER B. S. BAILEY, CHRISTIAN HOEHL, PAYAM JAMSHIDI,
CHRIS COWAN and LORENZO MAJNO
- A Novel Method for Characterizing Fatigue Delamination Growth under Mode I Using the Double Cantilever Beam Specimen 658**
N. V. DE CARVALHO and G. MURRI
- Characterization of the Fibre Bridging Contribution in Mode I Fatigue Delamination in Composite Laminates 653**
LIAOJUN YAO, R. C. ALDERLIESTEN, MEIYING ZHAO
and RINZE BENEDICTUS
- Influence of Mixed Mode I-Mode II Loading on Fatigue Delamination Growth Characteristics of a Graphite Epoxy Tape Laminate 663**
JAMES G. RATCLIFFE and WILLIAM M. JOHNSTON JR.

Extracting Interlaminar Cohesive Laws from Displacement Field Measurements	656
MEISAM JALALVAND, GERGELY CZEL and MICHAEL R. WISNOM	
Fracture of Composite Laminates with Integrated XFEM-CE	660
TONG-EARN TAY, XIU-SHAN SUN and VINCENT BENG CHYE TAN	
Damage Initiation and Propagation Modeling in Laminated Composites under Fatigue Loading	664
ENDEL V. IARVE, KEVIN H. HOOS and DAVID H. MOLLENHAUER	
The Multi-Scale Modeling of Fatigue and Failure of Continuous Fiber Composites.	665
BENOIT BIDAINE, LAURENT ADAM, JEAN-SÉBASTIEN GÉRARD, THIERRY MALO and ROGER ASSAKER	
Modeling Quasi-Static and Fatigue-Driven Delamination Migration	661
N. V. DE CARVALHO, J. G. RATCLIFFE, B. Y. CHEN, S. T. PINHO, P. M. BAIZ and T. E. TAY	
Fatigue Behavior of 3D Woven Pi-Preform Joints	657
ERMIAS G. KORICHO, ANTON KHOMENKO and MAHMOODUL HAQ	
Failure Analysis of a Star Segment.	667
RENE ROOS, DOUGLAS WEBER-STEINHAUS and MAYURAN S. MUTTULINGAM	
 TEMPERATURE EFFECTS—D30	
Elevated-Temperature Thermal Expansion Coefficients of PTFE/PEEK Composites: Experiments and Modeling	681
GANG LIU and SU SU WANG	
Thermal Stresses in Composites Induced by Heat Flow	129
SEIICHI NOMURA	
Novel Computational Framework for Thermal Shock Resistance Design of Carbon Composites.	682
ALMA LEANOS, MD SHARIFUL ISLAM and PAVANA PRABHAKAR	
Evaluation of Electrical and Thermal Properties of Titanium Boride Dispersed Aluminum Composites by Spark Plasma Sintering Process	116
GEN SASAKI, OKYONG LEE, TAKA AKI HIROSE, KOTA ISHIKAWA, KENJIRO SUGIO, YONGBUM CHOI and KAZUHIRO MATSUGI	
Synthesis and Properties of Multi-Functional Epoxy Resins Containing Naphthalene Units	684
YUTAKA SATO, KOJI HAYASHI and KAZUO ARITA	

Thermal Resistant Polymers for Microelectronic Applications 686
XI MIN LAW, ALEX BREWER, JARED M. PETTIT, RONALD JOVEN
and JOHN C. MOORE

**Effects of Sizing on Thermal Conductivity of Single Carbon
Fibers in Longitudinal and Radial Directions 112**
JORDAN A. WHETSELL, JUNFENG LIANG, MRINAL C. SAHA
and M. CENGIZ ALTAN