

29th Annual Technical Conference of the American Society for Composites 2014

**Held with the 16th US-Japan Conference on Composite
Materials, ASTM-D30 Meeting**

**La Jolla, California, USA
8-10 September 2014**

Volume 1 of 4

Editors:

**Hyonny Kim
Z. M. Chen
M. Kawai**

**D. Whisler
C. Bisagni
R. Krueger**

ISBN: 978-1-63439-415-4

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2014) by DEStech Publications, Inc.
All rights reserved.

Printed by Curran Associates, Inc. (2014)

For permission requests, please contact DEStech Publications, Inc.
at the address below.

DEStech Publications, Inc.
439 North Duke Street
Lancaster PA 17602-4967

Phone: (717) 290-1660
Fax: (717) 509-6100

info@destechpub.com

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

VOLUME 1

AVIATION SAFETY AND AIRCRAFT STRUCTURES

Industry and Regulatory Interface in Developing Composite Airframe Certification Guidance	1
<i>Cindy Ashforth, Larry Ilcewicz, Rusty Jones</i>	
Applying a Stiffened Stitched Concept to Shear-Loaded Structure	28
<i>Dawn Jegley</i>	
Mode I Cohesive Law Characterization of Through-Crack Propagation in a Multidirectional Laminate	46
<i>Andrew C. Bergan, Carlos G. Dávila, Frank A. Leone, Jonathan Awerbuch, Tein-Min Tan</i>	
Development of a High Fidelity Test Database for Failure Prediction	67
<i>Jordan J. Handler, Joshua S. Dustin, Salvatore Liguore, Andrew Parrish, Steven Wanthal</i>	
Design Sensitivity of Hat-Stiffened Composite Panels	85
<i>Bo Cheng Jin, Shiv Joshi, Adarsh Pun, Steven Nutt</i>	
Flight Test Results of CFRP Speed Brake Structure Fabricated by VPH Molding Technique	99
<i>Yutaka Iwahori, Sunao Sugimoto, Brooke Smith, Naoki Yamada</i>	
Effect of R-Ratio on Simulation Performance of Fatigue Debond Propagation in Laminated Composite Structure	116
<i>Gang Li, Chun Li</i>	

STRENGTH

Multi-Axial Yielding, Plastic Flow and Failure Strength of PTFE/PEEK Composites	133
<i>Gang Liu, Su Su Wang</i>	
Modification of Fiber-Matrix Bond Strength through Surface Treatments	155
<i>Nicholas E. Holsman, Brent A. Holford, Jerald A. Wesley, Kevin W. Wynn, William T. Riddell</i>	
A Study of Compression and Shear Behavior of Two Types of Thermoplastic Composites	168
<i>Yunfa Zhang</i>	
Statistical Prediction of Tensile Creep Failure Time for Unidirectional CFRP	176
<i>Masayuki Nakada, Tsugiyuki Okuya, Yasushi Miyano</i>	

CYTEC STUDENT PAPER

Carbon Nanotube-Reinforced Hybrid Composites Enabled by the PopTube Approach	188
<i>Will Guin, Jialai Wang, Xinyu Zhang, Jim Smith</i>	
Open Microwave Heating of Polymer Resin Using Interdigital Electrode Film and Dispersed Carbon Nanotubes	202
<i>Shinya Hatori, Ryosuke Matsuzaki</i>	
Computational Modeling of Curing Induced Damage Due to Compaction on Woven Fabric Composite	215
<i>Md Shariful Islam, Pavana Prabhakar</i>	
Investigation into Temperature Dependence on the Mechanical Behavior of a Thermoplastic Fabric for Deep-Draw Forming Applications	230
<i>Lisa M. Dangora, James A. Sherwood, Jennifer L. Gorczyca</i>	

ARMOR AND PROTECTION

Projectile Impact on Kevlar Fabric Including Scaling Effects	248
<i>M. Pankow</i>	
Experimental Study of Shear Behavior of Kevlar 49 Fabrics	254
<i>Deju Zhu, Barzin Mobasher, Subramaniam D. Rajan</i>	
Design of Ballistic Resistant Fibre Reinforced Nano-Ceramic-Plastic Composites	267
<i>Bose R. Nripati, Bose Papia</i>	
State of the Art in the Deterministic and Probabilistic Ballistic Impact Modeling of Soft Body Armor: Filaments to Fabrics	276
<i>Gaurav Nilakantan, Steven Nutt</i>	
Metacomposites Protection System against Primary Blast Injury	297
<i>K. T. Tan, C. T. Sun</i>	

Influence of Hot Rolling on Microstructure and Properties of Short Fiber Reinforced Metal Matrix Composite.....	310
<i>Eric Klier, Brandon Mcwilliams, Bradley Klotz, Jian Yu, Jonathan Montgomery, Jim Sorensen, Rich Adams</i>	

NANOCOMPOSITES

Predicting Mechanical Response of Crosslinked Epoxy Using ReaxFF.....	320
<i>G. M. Odegard, B. D. Jensen, S. Gowtham, J. Wu, J. He, Z. Zhang</i>	
Multi-Scale Modeling of Fracture Properties in Nano-Particle Reinforced Polymers.....	329
<i>Samit Roy, Avinash Reddy Akepati, Vinu Unnikrishnan</i>	
Development Study of Ultra Thin Fiber Reinforced Plastics Using Unidirectionally Aligned Carbon Nanotube Sheet.....	343
<i>Takashi Kajinuma, Ken Goto, Tran Huu Nam, Satoru Yoneyama, Shuichi Arikawa, Yoshinobu Shimamura, Yoku Inoue, Kimiyoshi Naito</i>	
Nanostructure Control and Thermal Properties of Organic-Silica Nanocomposites by Using Perhydropolysilazane and Organic Polymers.....	350
<i>Hiroshi Nakaseko, Reiko Saito</i>	
Study the Effect of Nano-Clay Filled Carbon Fibre/Polypropylene Composite on Mechanical Properties.....	358
<i>Mohamed H. Gabr, Kiyoshi Uzawa, Isao Kimpura</i>	
Improved Mechanical Properties of Poly(Styrene-Block-Isobutylene-Block-Styrene) Due to Nanoclay Reinforcement.....	371
<i>Mauro Fittipaldi, Landon Grace, David T. Tse</i>	
Mechanical and Thermal Properties of Cellulose Nanofibers Reinforced Epoxy Polymer Nanocomposites.....	385
<i>Md. Nuruddin, T. H. Mahdi, M. Hosur, S. Jeelani</i>	
A Synergetic Coupling between Graphene and Carbon Nanotubes for Hybrid Carbon Fiber Composites.....	395
<i>Gláucio Carley, Antonio Ávila</i>	
Fracture Toughness and Delamination Crack Growth Rate of Graphene-Epoxy and Carbon-Graphene/Epoxy Nanocomposites.....	410
<i>David Alan Hawkins Jr., Anwarul Haque</i>	
Multi-Layer Graphene as Defect Inhibitor to Bonded Joints: The Environmental Effects Investigation.....	420
<i>Hermano Nascimento Jr., Antonio Ávila</i>	
Molecular Modeling of Thermo-Physical Properties of BMI Matrix and Its Interface with Amorphous Carbon Fiber.....	432
<i>Vikas Varshney, Ajit K. Roy, Jeff Baur</i>	
Effect of Rigid Segment Content on the Piezoresistive Properties of Carbon Nanotube/Polyurethane Composites.....	452
<i>Celín Lozano-Pérez, Angel Rosado-Dzib, Gabriel Jesús Pool-Balam, Rossana F. Vargas-Coronado, A. May-Pat, Juan Valerio Cauich-Rodríguez, Francis Avilés</i>	
Processing and Properties of Epoxy-Impregnated Boron Nitride Nanotube Buckypaper.....	465
<i>B. Ashrafi, Y. Martinez-Rubi, M. B. Jakubinek, K. S. Kim, A. Hrdina, C. T. Kingston, A. Yousefpour, A. Johnston, B. Simard</i>	

MULTIFUNCTIONAL

Coupled Mechanical and Electrical Response of Carbon Nanotube Yarn Sensors for Self-Sensing Composite Materials.....	474
<i>J. L. Abot, T. Alesh, A. Bajar, D. Renner, E. Good, B. Sensale-Rodríguez, S. Arezoomandan, K. Belay</i>	
Selective Damage Sensing in Glass Fiber/Carbon Nanotubes/Vinyl Ester Smart Composites by Means of Electrical Resistance.....	485
<i>José De Jesús Ku-Herrera, Francis Avilés, A. May-Pat, Valeria La Saponara, R. H. Ribeiro De Castro, Brian Pinto</i>	
Printed Carbon Nanotube Sensors for in situ Damage Recognition.....	494
<i>Zachary R. Melrose, Rossiny Beaucejour, Erik T. Thostenson</i>	
Highly Conductive Heterogeneous Epoxy-Silver Composites by Phase Selective in situ Filler Synthesis.....	502
<i>Xavier Cauchy, Jolanta-Ewa Klemberg-Sapieha, Daniel Therriault</i>	
Predicting the Relative Permittivity of Water-Contaminated Glass/Epoxy Laminates at X-Band.....	513
<i>Landon Grace, Luis Rodriguez, Mauro Fittipaldi, Carla García</i>	
Multifunctional Properties of Multiwall Carbon Nanotube/Polyurethane Foams.....	530
<i>J. J. Espadas-Escalante, A. May-Pat, Francis Avilés</i>	

Innovation of Functionally Graded Carbon Nanotubes/Polymer Materials	545
<i>Qing-Qing Ni, Takuma Arai, Yi Wang, Hong Xia</i>	
Self-healing of Transverse Cracks in Cross-Ply Composites Using a Microencapsulated Solvent-Based Healing System	551
<i>Sang Yup Kim, Nancy R. Sottos, Scott R. White</i>	
Repeatable Self-Healing of an Epoxy Matrix Using Latent 2-Ethyl-4-Methylimidazole Catalyst	563
<i>Kevin R. Hart, Eric D. Wetzel, Nancy R. Sottos, Scott R. White</i>	
Active Cooling of Vascularized Composites for Application at Elevated Temperatures	572
<i>Anthony M. Coppola, Nancy R. Sottos, Scott R. White</i>	
Processing of Degradable Polymer Fibers for Microvascular Pathways	578
<i>Valentin Sitte, Richard A. Poillucci, Christopher J. Hansen</i>	
Electrowetting Actuation Methods for Surface Morphology Control of Multifunctional Composites	588
<i>Marriner H. Merrill, James P. Thomas, Raymond C. Y. Auyeung, Alberto Piqué</i>	
Manufacture and Characterization of Piezoelectric Broadband Energy Harvesters Based on Asymmetric Bistable Laminates	607
<i>Peter Harris, Chris Bowen, D. N. Betts, H. Alicia Kim</i>	
Bioinspired Functionally Graded Shells and Plates: Exact Solutions	623
<i>Victor Birman</i>	

EFFECTS OF DEFECTS

Simulation of Composite Manufacturing Variations to Determine Stiffness and Strength Reductions in Automotive and Aerospace Structure	637
<i>Lyle Deobald, Chul Y. Park, Nihar Desai, Madhavadas Ramnath, Ohchang Jin, Dirk Lukaszewicz, Stefan Kerscher</i>	
A Design and Analysis Method for Automotive and Aerospace Composite Structures Including Manufacturing Variations	655
<i>Dirk Lukaszewicz, Simon Hesse, Lavinia Graff, Stefan Kerscher, Lyle Deobald, Chul Y. Park, Nihar Desai</i>	
Matrix-Dominated Deformation and Failure of VARIM Glass-Fabric/Vinyl Ester Composite: In-Plane Transverse and Interlaminar Damage Modes and Strengths	669
<i>Akira Miyase, Ligu Li, Su Su Wang</i>	
On Using the Open Hole Tension and Compression Specimens for Evaluating the Waviness Effects in Laminated Composites	690
<i>Sayedmohammad Shams, Rani Elhajjar</i>	
X-ray CT Image-Based Measurement of Fiber Orientation Distribution in CFRP Laminates	700
<i>Ryohei Hosoya, Akinori Yoshimura, Jun Koyanagi, Satoru Yoneyama</i>	
Fatigue Behavior of Notched Out of Autoclave Woven Carbon Composite Laminates	712
<i>Mahdi Ghazizadeh, Ajit D. Kelkar</i>	
Effect of Voids on Microscopic Strain Distribution in CFRP Laminates	722
<i>Shigeki Aratama, Yusuke Tsumura, Masaaki Nishikawa, Masaki Hojo</i>	
The Coupled Effect of Microvoids and Hydraulic Fluid Absorption on Mechanical Properties of Quartz/BMI Laminates	736
<i>Keith R. Hurdelbrink II, Zahed Siddique, M. C. Altan</i>	
Characterization of Physical Properties and Morphology of PANI-Based Conductive Composites	750
<i>Vipin Kumar, T. Yokozeki, T. Goto, T. Takahashi</i>	
Evaluation of Out-of-Plane Properties of CFRP Laminates Obtained by 3-Point Bending and Direct Loading Tests	763
<i>Eiichi Hara, T. Yokozeki, Yutaka Iwahori, Hiroshi Hatta, Takashi Ishikawa</i>	
Evaluation of Impact Damage in Nonlinear Laminates Subjected to a Transverse Concentrated Load	776
<i>Hiroshi Suemasu, Makoto Ichiki, Michael R. Wisnom</i>	
High-Velocity Impact Characteristic of Stitched Carbon/Epoxy Composites	793
<i>Yasuhito Mikami, Akinori Yoshimura, Ryohei Tsuji, Naoyuki Watanabe</i>	
A Numerical and Experimental Study of Damage Growth in a Composite Laminate	805
<i>Mark Mcelroy, J. Ratcliffe, Michael Czabaj, John Wang, Fu-Hwo Yuan</i>	
Finite Strip Analysis of Cracked Laminate: Stress Based Plane Strain Approach	825
<i>Farrukh Hafeez, Fahad Almaskari</i>	

PROCESSING: OUT OF AUTOCLAVE

Vacuum Bag Only Processing of Complex Shapes: Effect of Corner Angle, Material Properties and Processing Conditions	845
<i>Yijia Ma, Timotei Centea, Gaurav Nilakantan, Steven Nutt</i>	

Void Entrapment into Air Pathways in Partially Impregnated Prepregs in the Out-of-Autoclave Process	861
<i>Thomas A. Cender, Volkan Eskizeybek, John H. Gangloff Jr., Suresh G. Advani</i>	
Silicone Rubber Properties During Advanced Composites Consolidation/Curing Using Specialized Elastomeric Tooling (SET)	874
<i>Paul Malek, Daniel Walczyk</i>	
The Effect of Curing Temperature on the Fracture Toughness of Fiberglass Epoxy Composites	890
<i>Thomas J. Ryan, Ajit D. Kelkar, Evan Kimbro</i>	

VOLUME 2

PROCESSING: SUSTAINABILITY/EFFICIENCY

Process Optimization for Compression Molding of Reused Prepreg Scrap	909
<i>Ming-Sung Wu, Timotei Centea, Steven Nutt</i>	
CFRP Recycling Technology Using Depolymerization under Ordinary Pressure	929
<i>Mitsutoshi Nakagawa, Keiichi Kasuga, Kouichi Aoyagi, Kanako Ishihara, Yukari Ikeda, Katsuji Shibata</i>	
Permeability Model of a Woven Fabric Based on Micron Resolution Computed Tomography Data	948
<i>Helga Krieger, Scott Stapleton, Gunnar Seide, Thomas Gries</i>	
Process Modeling for Resin Transfer Molding of a Modified Heterocyclic Phenolic/Epoxy Blended Resin	961
<i>Timotei Centea, Jonathan Lo, Mark Anders, Steven Nutt</i>	

PROCESSING

Evaluation of Mechanical Properties of VaRTM-Prepreg Hybrid Composite	981
<i>Masato Igarashi, Hisaya Katoh, Sunao Sugimoto, Yosuke Nagao</i>	
Effect of Distribution Media on Resin Flow during VaRTM Process for FRPs	993
<i>Hayato Nakatani, Kentarou Adachi, Katsuhiko Osaka</i>	
Resin Transfer Molding of Particle-Filled, Continuous-Fiber Reinforced Composites	1005
<i>Tugce Aydil, Hamed Tanabi, Merve Erdal</i>	
Evaluation of the Mechanical Properties and Molding Techniques for the Composite Material Using Four-Axis Preforms by VaRTM	1016
<i>Masaya Kenjo, Masato Igarashi, Shinichi Takeda, Yosuke Nagao</i>	
Evaluation of Residual Strain in Press Molding of CF/PPS Laminates Using FBG Sensors	1025
<i>Takuhei Tsukada, Shinichi Takeda, Yutaka Iwahori, Shinya Honda, Yoshihiro Narita, Shu Minakuchi, Nobuo Takeda</i>	
Comparison of Mechanical Properties of CF RTP with Those of CFRP Using Same CF Fabrics	1038
<i>Goichi Ben, Wataru Ishida</i>	
Effect of Molding Condition on Flexural Strength of Textile Carbon Fiber Reinforced Polycarbonate Laminates	1049
<i>Hiroaki Ozaki, Masayuki Nakada, Kiyoshi Uzawa, Yasushi Miyano</i>	
Effect of Welding Conditions on Ultrasonic Welding Properties for Continuous Fiber Reinforced Thermoplastic Composite	1061
<i>Asami Nakai, Akio Ohtani, Kazuho Takeuchi</i>	

TEXTILE COMPOSITES

Comparison of Continuum and Cohesive Zone Damage Models for Laminated Composites under Uniaxial Loading	1069
<i>M. Keith Ballard, John D. Whitcomb</i>	
Finite Element Models of 3D Woven Composites Based on Numerically Generated Micro-Geometry of Reinforcement	1087
<i>Borys Drach, Andrew Drach, Igor Tsukrov, Marion Penverne, Yuri Lapusta</i>	
Numerical Predictions of Damage Initiation in 3D Woven Composites under Various Loading Conditions	1097
<i>Igor Tsukrov, Andrew Drach, Borys Drach, Harun Bayraktar, Jon Goering, Todd Gross</i>	
An Enhanced Continuum Damage Mechanics Model for Crash Simulation of Composites	1107
<i>Danghe Shi, Xinran Xiao</i>	

Effect of Variable R-Ratio Loading on Fatigue Life and Damage Accumulation in Plain-Weave Fabric Carbon/Epoxy Laminates	1123
<i>Masamichi Kawai, Kyoung-Mo Yang, Shioki Oh</i>	
Locally Reinforced Woven Fabrics: Mechanical and Economical Evaluation	1135
<i>Christopher Lenz, Dominik Wirmer, Yves-Simon Gloy, Thomas Gries</i>	
Fracture Properties of Glass/Carbon Intra-Hybrid Woven Fabric Composites	1155
<i>Daiki Ichikawa, Masayuki Kitamura, Yuqiu Yang, Hiroyuki Hamada</i>	
The Creation of Super Lightweight CFRP Ablator and Evaluation of Its Thermal and Mechanical Properties	1168
<i>Toshihiro Kanaya, Hidetaka Toshima, Ken Goto, Akio Otani, Satoru Yoneyama, Syuichi Arikawa</i>	
Finite Element Modeling to Predict the Formation of Out-of-Plane Defects During the Manufacture of Textile-Reinforced Composites	1177
<i>Lisa M. Dangora, James A. Sherwood, Jennifer L. Gorczyca, Cynthia J. Mitchell</i>	
A Discrete Mesoscopic Finite Element Model Used as a Design Tool for Textile Composite Structures	1185
<i>Cynthia J. Mitchell, James A. Sherwood, Lisa M. Dangora, Jennifer L. Gorczyca</i>	
Full-Field Strain Analysis of Compressively Loaded Flat Composite Laminates with Undulated Fibers	1193
<i>Todd C. Henry, Charles E. Bakis, Jaret C. Riddick, Edward C. Smith</i>	
Fabrication of Non-Crimp CFRP Pipe by Braiding Technique.....	1212
<i>Yasuyoshi Kakital, Masaya Hirose, Tadashi Uozumi, Akio Ohtani, Asami Nakai</i>	

COMPOSITES IN WIND ENERGY

Structural Integrity of Large Composite Offshore Wind Turbine Rotor Blades	1224
<i>King Him Lo, Tung Pei Yu, Su Su Wang</i>	
Application of Structural Similitude Theory in Subcomponent Testing of Wind Turbine Blades	1244
<i>Mohamad Eydani Asl, Christopher Niezrecki, James A. Sherwood, Peter Avitabile</i>	
Evaluation of the Thermal Damage in Glass Fiber Polymer-Matrix Composites in Wind Turbine Blades Subjected to Lightning Strike.....	1257
<i>Yeqing Wang, Olesya I. Zhupanska</i>	
Strength and Failure Modes of Thick-Adhesive Bonded Joints of Glass Fabric/Vinyl Ester Composite Laminates.....	1277
<i>Bill W. Cole, Ligu Li, Su Su Wang</i>	

DESIGN AND MANUFACTURING

Development of Fabrication Method and Burst Strength of CFRP Pressure Vessel Reinforced with Cylindrical Grid.....	1295
<i>Kazuhiro Sakata, Goichi Ben</i>	
Monolithic Thermoplastic Composite Pressure Vessels (Type IV) for On-board Automotive Hydrogen Storage.....	1306
<i>Michael Ruby, David Almond, Matthew Turner, Andrew Clarke</i>	
Development of Light Weight Composite Structural Guide Vane for Turbo Fan Engine	1322
<i>Takaomi Inada, Hiroyuki Yagi, Hideo Morita, Rintarou Kajiwara, Takehisa Yamada, Tsutomu Murakami, Koji Miyazawa, Takehiko Uchiyama, Katsuyoshi Moriya, Shinichi Tanaka</i>	
The Development of a Conical Composite Energy Absorber for Use in the Attenuation of Crash/Impact Loads	1331
<i>Justin D. Littell</i>	
Process Efficiency Improvements for a Structural Doorframe Support Panel Molded from Unidirectional E-Glass/Polypropylene Composite Tapes	1349
<i>David Eastep, Manfred Reif, Michael Begert, Mathias Gerster, Eric Schneider, Tobias Joppich, Sebastian Baumgärtner</i>	
Study on the Laser Beam Cutting of Carbon Preform by Several Laser Equipment of Various Properties	1368
<i>Hirohito Hira, Hiromitsu Itoh, Kodai Yamada, Tomoyuki Suzuki</i>	
Optimum Parameters on Electro Fusion Joining of CF/PPS Composites by Carbon Fiber Heating Elements	1382
<i>Daiki Tanabe, Kazuaki Nishiyabu, Tetsusei Kurashiki</i>	
ISAAC—A Testbed for Advanced Composites Research	1395
<i>K. Chauncey Wu, Brian K. Stewart, Robert A. Martin</i>	
Comparative Life Cycle Analysis of Tung Oil/Jute Fiber Bio-Composites to Synthetic Unsaturated Polyester Resins/E-Glass Composites.....	1405
<i>Eldon D. Triggs II, M. Hosur, Alfred Tcherbi-Narteh, S. Jeelani</i>	

Scaling Effects in Glass Reinforced Epoxy Filament Wound Tubes Subjected to Quasi Static Indentation	1417
<i>Farrukh Hafeez, Fahad Almaskari</i>	
Analysis of Residual Thermal Stresses in Metal/PMC Composite Systems	1434
<i>G. Newaz, A. Seyed Yaghoubi, G. S. Dhaliwal</i>	
Non-Fickian Moisture Absorption in Polymers Coated with a Thin Nanocomposite Layer	1447
<i>Gorkem E. Guloglu, M. C. Altan</i>	
Unit Cell Modeling to Predict Permeability for Composite Manufacturing	1458
<i>Timothy Luchini, Stephen Sommerlot, Alfred Loos</i>	
Effect of Humidity and Cyclic Heat on the Static and Dynamic Performance of Composite-Based Lightweight Materials	1469
<i>Sayed Nassar, Kaori Sakai</i>	
Effect of Fiber Content on the Aspect Ratio of Process-Induced Microvoids and the Implications to the Tensile Properties of Composite Laminates	1488
<i>J. P. Anderson, M. C. Altan</i>	
Mechanical Properties of CFRP in the Spray Up Fabrication Method	1499
<i>Tetsuo Kikuchi, Yuka Takai, Akihiko Goto, Hiroyuki Hamada</i>	
Analysis of Bi-Material “Thermostat” Strip Specimen for Predicting Cure Induced Shrinkage	1511
<i>Oleksandr G. Kravchenko, Sergii G. Kravchenko, R. Byron Pipes</i>	
Modeling Advancing Flow Fronts in Composite Manufacturing	1530
<i>Stephen Sommerlot, Timothy Luchini, Alfred Loos</i>	
Fatigue Performance of a Structural Reaction Injection Molded Composite	1541
<i>Siddharth Valluri, P. K. Mallick</i>	
Bending Stress and Deflection Analysis of Carbon Nanotube Reinforced Composite Skew Plates	1554
<i>Amin Joodaky, Anwarul Haque, Iman Joodaky</i>	
Hybrid Polymer Composites Based on Graphite Nanoplatelets and Glass Fibers	1570
<i>Diego Pedrazzoli, Alessandro Pegoretti, Kyriaki Kalaitzidou</i>	
Investigation of Stabilization Conditions of Electrospun Carbon Nanofibers for Improved Mechanical Performance	1582
<i>Bipul Barua, Mrinal C. Saha</i>	

STABILITY AND POSTBUCKLING

Experimental Evaluation of Fatigue Damage Progression in Postbuckled Single Stringer Composite Specimens	1591
<i>Chiara Bisagni, Carlos G. Dávila, Cheryl A. Rose, Joseph N. Zalameda</i>	
Postbuckling Analysis of Composite Stiffened Panel under Shear Load for Assessment of Delamination Propagation between Skin and Stringer	1603
<i>Keisuke Umezawa, Takahira Aoki</i>	
A New Inverse Hyperbolic Zigzag Theory for the Static and Buckling Analysis of Laminated Composite and Sandwich Plate	1618
<i>Rosalin Sahoo, Bhriugu Nath Singh</i>	
Buckling Behavior and Optimal Design of Cylindrical Lattice Structure	1637
<i>Shunsuke Yoshino, Takahira Aoki, T. Yokozeki, Keita Terashima, Toru Kamita</i>	

CRASHWORTHINESS

Dynamic Material Characterization of Laminated Composite Materials—A Path for Test Method Development	1653
<i>J. F. Acosta, G. Olivares, S. Keshavanarayana, M. T. Siddiqui, I. Echavarri</i>	
Axial Crushing Behavior of Braided Tubular CFRP	1670
<i>Ryo Iwasaki, Yoshio Aoki, Akihisa Tabata, Tatsuya Isono, Suguru Shimizu</i>	
Multiscale Simulation Strategy for Low-Velocity Impact on FRP	1678
<i>Cláudio S. Lopes, Sergio Sádaba, Fernando Naya, Carlos González</i>	
Deformation Mechanisms and Energy Absorption in the Crushing of Cellular Solids	1697
<i>Royan J. D’mello, Anthony M. Waas</i>	

IMPACT AND DYNAMIC RESPONSE

Evaluation on Impact Damage of Textile Carbon Fiber Reinforced Polycarbonate Composite	1719
<i>Hiroshi Saito, Hiroaki Ozaki, Masayuki Nakada, Yasushi Miyano</i>	

Modeling the Behavior of Impact Induced Multiple Delaminations under Compressive Load	1733
<i>Christoph Paul Dienel</i>	
Modeling and Simulation of Impact and Perforation in Fiber Reinforced Composites	1753
<i>Mehran Tehrani, Ayoub Y. Boroujeni, Marwan S. Al-Haik</i>	
Stress Analysis in the Vicinity of the Impact Zone in the Transversely Isotropic Composite: An Exact Analytical Solution to the 3D Problem	1768
<i>Olesya I. Zhupanska</i>	
Use of a New Portable Instrumented Impactor on the NASA Composite Crew Module Damage Tolerance Program	1783
<i>Wade C. Jackson, Daniel L. Polis</i>	
Loading Rate Effects on Mode I Delamination of Z-Pinned Composite Laminates	1801
<i>Niranjan D. Parab, Andrew Schlueter, Weinong Chen</i>	

VOLUME 3

Strain Rate Strengthening and Failure Behavior of Filament Wound Composites	1813
<i>Amanda S. Wu, David Urabe, Victor Hepa, William Elmer, Michael J. King</i>	
Dynamic Hydrostatic Tension in Polyurea and Polyurea-Based Composites	1820
<i>Alireza V. Amirkhizi</i>	

KEITH KEDWARD SYMPOSIUM

Strength Prediction of Single Lap Joint Using CTOA	1830
<i>N. M. Rahman, H. Qian, C. T. Sun</i>	
Predictions of Delamination Growth for Quasi-Static Loading of Composite Laminates	1842
<i>Jiawen Xie, Anthony M. Waas</i>	
Failure of Curved Composites due to Through-Thickness Tensile Stresses	1862
<i>Michael R. Wisnom</i>	
The Inclusion of Arbitrary Load Histories in the Strength Decay Model for Stress Rupture	1864
<i>James R. Reeder</i>	
Damage Tolerant Sandwich Panel Core with Low Moisture Affinity	1881
<i>Keith R. Loss</i>	
A Unified Analysis from Composite Laminates to Composite Beam Structures	1892
<i>Wen S. Chan</i>	

NATURAL, BIO-BASED & GREEN COMPOSITES

A New Process for Manufacturing Biocomposite Laminate and Sandwich Parts Using Mycelium as a Binder	1908
<i>Lai Jiang, Daniel Walczyk, Gavin Mcintyre</i>	
Microstructure of Injected Natural Fiber-Polymer Composite	1924
<i>Ahmed Abdennadher, Tatiana Budtova, Michel Vincent</i>	
Effects of Surface Treatment on the Moisture Absorption of Short Fibre Nonwoven Kenaf Reinforced-Polypropylene Composites	1931
<i>Oscar Asumani, Robert Reid, Ratnam Paskaramoorthy</i>	
Mycology Matrix Sandwich Composites Flexural Characterization	1941
<i>Sonia Travaglini, C. K. H. Dharan, Philip G. Ross</i>	

INTEGRATED COMPUTATIONAL MATERIALS ENGINEERING (ICME)

In-situ Experiments with X-Ray Micro-Computed Tomography	1956
<i>Mark Kistner, Sirina Safriet, Kevin Hoos, David Mollenhauer, Chad Ryther</i>	
Three-dimensional Imaging and Numerical Reconstruction of Graphite/Epoxy Composite Microstructure Based on Ultra-High Resolution X-Ray Computed Tomography	1967
<i>Michael Czabaj, Mark L. Riccio, William W. Whitacre</i>	
Characterization of Strain Distribution in a Reinforced Rubber-Matrix Composite Using Digital Volume Correlation	1983
<i>David Mollenhauer, Sirina Safriet, Michael Sutton, Hubert Schreier, Mark Kistner, Eric Zhou</i>	
Hypervelocity Impacts on Metallic Foamcore Sandwich Panels Filled with Shear Thickening Fluid	1998
<i>Justin Warren, Sean Offenberger, Thomas Lacy, Santanu Kundu, Hossein Toghiani, Charles U. Pittman Jr.</i>	

Effect of Temperature on Shear Thickening Fluid Rheology	2004
<i>Justin Warren, Santanu Kundu, Sean Offenberger, Thomas Lacy, Hossein Toghiani, Charles U. Pittman Jr.</i>	
Wavelet Spectral Finite Element Modeling of Laminated Composite Beams with Complex Features	2012
<i>Ashkan Khalili, Dulip Samaratunga, Ratneshwar Jha, S. Gopalakrishnan</i>	
A New Multi-Physics Molecular Dynamics Finite Element Method for Designing Graphene Composite Nano-Structures to Target Property Specifications	2024
<i>André A. R. Wilmes, S. T. Pinho</i>	
Automated Microstructure-Properties Characterization and Simulation in Brittle Matrix Continuous Fiber Reinforced Composites	2042
<i>Craig P. Przybyla, Stephan Bricker, Jeff Simmons, Russell Hardie</i>	
Integration of Multi-Scale Modeling of Composites under High Strain Rate Impact with Surrogate	2060
<i>Shu Shang, Nam H. Kim, Minhyung Lee</i>	
A Mesh Superposition Technique for the Simulation of the Mechanical Response of Composite Materials at Multiple Length and Time-Scales	2078
<i>Luigi Gigliotti, S. T. Pinho</i>	
An Efficient, Adaptive Multiscale Modeling Methodology for Simulating the Progressive Failure of Composite Materials	2093
<i>Trenton M. Ricks, Thomas E. Lacy Jr., Brett A. Bednarczyk, Steven Arnold</i>	
Efficient Coupling of Micro/Macroscale Analyses with Stochastic Variations of Constituent Properties	2107
<i>Keith McWilliams, Trenton M. Ricks, Thomas E. Lacy Jr., Samit Roy, Ratneshwar Jha</i>	
Multiscale Investigation of Free Edge Effects in Laminated Composites	2125
<i>Christopher Cater, Xinran Xiao</i>	
Simulation of Micro-Scale Mode-I Fracture in a Composite Lamina	2143
<i>Timothy D. Breitzman, David Mollenhauer, Endel V. Iarve, Eric Zhou, Kevin Hoos</i>	
Durability of E-Glass Vinyl Ester Composite Structures and Their Modeling in ABAQUS	2155
<i>Shahram Eslami, Abbas Honarbakhsh Rauf, Shiva Eslami</i>	

STRUCTURAL OPTIMIZATION

Multi-Step Design Optimization of Variable Stiffness Composite Cylinders Made by Fiber Steering	2166
<i>Mohammad Rouhi, Hossein Ghayoor, Suong V. Hoa, Mehdi Hozjati</i>	
Analysis and Sizing of Composite Anisogrid Cylindrical Structures without Skin	2181
<i>James Ainsworth</i>	
Optimization of Sandwich Panel Parameters for Enhanced Structural Performance using Homogenization Methodology	2189
<i>Arun Garg, Vikram Yadama, William F. Cofer</i>	
Stacking Sequence Optimization of Stiffened Composite Plate with Constraints of Residual Deformation and Buckling	2201
<i>Akira Todoroki, Yoshiro Suzuki, Takumi Ozawa</i>	
Layup Optimization of Symmetrically Laminated Plates Considering Damping Characteristics using Lamination Parameters	2210
<i>Masaki Kameyama</i>	
Vibration Analysis of Laminated Composite Plates Having Rigid Body Attachments	2220
<i>Yoshihiro Marita, Shinya Hondal, Takahiro Funamizu</i>	

UNCERTAINTY QUANTIFICATION

Effects of Architectural Variability on the In-Plane Strength of a Woven Ceramic Matrix Composite	2228
<i>Marlana B. Goldsmith, Bhavani V. Sankar, Raphael T. Haftka</i>	
A Robust Modeling Approach for Fatigue Damage in Composites Based on Bayesian Model Class Selection	2248
<i>J. Chiachio, M. Chiachio, S. Sankararaman, A. Saxena, K. Goebel</i>	
Identification under Uncertainty of Material Properties of Composite Sandwich Panels	2266
<i>Sylvain Lacaze, Samy Missoum, Farbod Alijani, Marco Amabili</i>	

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

Monitoring Fatigue Damage Propagation in GFRP Using Carbon Nanotubes	2278
<i>Mahmoud Reda Taha, Eman Omar Taha, Moneeb Genedy</i>	
Damage Detection with Carbon Nanotube-Based Sensing Composites	2288
<i>Thomas Schumacher, Erik T. Thostenson, Hongbo Dai, Gerard Gallo</i>	

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	2295
<i>Ali Naghashpour, Suong Van Hoa</i>	
Full-Spectral Measurements of Fiber Bragg Grating Sensors Embedded in Composites for Damage Monitoring	2309
<i>Sean Webb, Kyle Oman, Kara Peters, Mohammed Zikry, Richard Selfridge, Stephen Schultz</i>	
Detection of Defects in Composites by Limited-Angle Tomography	2316
<i>Yuri Nikishkov, Ekaterina Bostaph, Andrew Makeev</i>	
Fiber Bragg-Grating Sensors for SHM and FEM of In-Service Bonded Multi-Material Pi-Joints	2334
<i>Anton Khomenko, Ermias G. Koricho, Mahmoodul Haq</i>	
High Temperature-Measurement Using Fiber Bragg Grating Sensor for SHM Applications on Composites	2346
<i>Dae-Hyun Kim, Donghoon Kang, Heon-Young Kim</i>	
New Perspectives for Material Characterization and Structural Diagnostics of Composites	2355
<i>Andrew Makeev, Yuri Nikishkov, Guillaume Seon, Erian Armanios</i>	
Quantification of Memory Effect in Composites under Fatigue for Precursor Damage Analysis	2370
<i>Sourav Banerjee, Subir Patra, Agbasi Chijioke</i>	
Identification of Debonding in CFRP Stiffened Panels using Pattern Recognition	2381
<i>Prashanth A. Vanniamparambil, Rami Carmi, Fuad Khan, Ivan Bartoli, Antonios Kotsos</i>	
Structural Health Monitoring of Composite Wind Turbine Blades Using Diffuse Ultrasonic Fields and Reciprocity	2391
<i>Jeffery D. Tippmann, Francesco Lanza Di Scalea</i>	
NDE and SHM Simulation for CFRP Composites	2402
<i>Cara A. C. Leckey, F. Raymond Parker</i>	
Predicting Remaining Useful Life in CRFP Laminates under Fatigue Loads: A New Efficient Logarithm	2414
<i>M. Chiachio, J. Chiachio, S. Sankararaman, A. Saxena, K. Goebel</i>	
Acoustic Emission as a Tool in Monitoring Fatigue Damage Accumulation in Fiber Reinforced Metal Laminate	2427
<i>Rami Carmi, Arie Bussiba, Igal Alon, Prashanth A. Vanniamparambil, Jefferson Cuadra, Utku Guklu, Antonios Kotsos</i>	
Damage Accumulation Profile and Fracture Event Sequence of Particulate Metal Matrix Composite Monitored by Acoustic Emission	2443
<i>Arie Bussiba, Rami Carmi, Shlomo Haroush, Igal Alon, Roni Shneck</i>	
A Multispectral Nondestructive Approach for Image-Based Damage Monitoring	2462
<i>Satish Rajaram, Prashanth A. Vanniamparambil, Jefferson Cuadra, Aditi Ramadurgakar, Ivan Bartoli, Antonios Kotsos</i>	
Vibration Attenuation of Composite Moving Beams Using Active Vibration Control	2477
<i>Gouthami Polina, Nithi Ti Sivaneri</i>	
Development and Evaluation of Residual Stress/Strain Reduction Method in Thick CFRP Pipes	2496
<i>Kazunori Takagaki, Shu Minakuchi, Nobuo Takeda</i>	
VaRTM and Cure Process Monitoring by Fiber Optic Strain and Cure-Index Sensors	2512
<i>Tatsuro Kosaka, Tomohiro Teramachi, Kazuhiro Kusukawa</i>	

PROGRESSIVE DAMAGE MODELING

Predicting Crippling Failure in Composites Using Progressive Failure Analysis	2524
<i>Alex Selvarathinam, Lori Flansburg, Scott Norwood, Stephen Engelstad</i>	
Experimental and Numerical Determination of Notched Composite Strength	2544
<i>Bilel Aidi, Scott W. Case</i>	
Quantitative Assessment of Progressive Damage Tools for Composites	2562
<i>Stephen Clay, Richard Holzwarth</i>	
Evolution of Surface Oxide Layer and Oxidation-Induced Dimensional Changes during Passive Oxidation of Silicon Carbide	2570
<i>Padmalatha Kakanuru, Jianguyong Liang, Kishore Pochiraju</i>	
Finite Element Analysis of Thermo-Mechanical and Failure Properties of Hybrid Fiber Composites	2583
<i>Sayan Banerjee, Bhavani V. Sankar</i>	
Application of the Embedded Element Technique to Predict Interlaminar Failure	2596
<i>Mathew W. Joosten, Chun H. Wang, Adrian Mouritz, Akbar Afaghi Khatibi, Steven Agius, Matthew Dingle, Barry Trippit, Brian Cox</i>	

Three-Dimensional Modeling of Unidirectional Composites with Fiber Fracture: Role of Matrix Properties	2610
<i>Raja Ganesh, Subramani Sockalingam, Jun Misumi, Ahmad Abu-Obaid, John W. Gillespie Jr.</i>	
Prediction of Failure Behavior of Pin Loaded Glass Fiber Reinforced Polymer Straps	2622
<i>Melek Esra Erdem, Betül Pelin Ergül, Yusuf Ulu, Gökhan Tursun, Levend Parnas</i>	
Damage Simulation in Non-Crimp Fabric Composite Plates Subjected to Impact Loads	2642
<i>Arunkumar Satyanarayana, Philip B. Bogert, Venkat Aitharaju, Satvir Aashat, Hamid Kia</i>	
A Promising Way to Model Damage in Composite and Dry Fabrics Using a Discrete Element Method (DEM)	2662
<i>Frédéric Dau, Laurent Mahéo, Ba Danh Le, Jérémie Girardot</i>	
A Technique for Mapping Characteristic Lengths to Preserve Energy Dissipated via Strain Softening in a Multiscale Analysis	2681
<i>Evan J. Pineda, Brett A. Bednarczyk, Steven Arnold</i>	

VOLUME 4

Damage Analysis of Composites Using a Three-Dimensional Damage Model: Micro-Scale Architectural Effects	2700
<i>Brett A. Bednarczyk, Bertram Stier, Jaan-W. Simon, Stefanie Reese, Evan J. Pineda, Steven Arnold</i>	
Challenges in Modelling of Lightning-Induced Delamination: Effect of Temperature-Dependent Interfacial Properties	2718
<i>Paria Naghipour, Evan J. Pineda, Steven Arnold</i>	

COMPUTATIONAL COMPOSITE ENGINEERING

Data Assimilation for Integration of Electrical Measurements and Stochastic Flow Simulation of VaRTM	2730
<i>Ryosuke Matsuzaki, Masayuki Murata, Akira Todoroki, Yoshihiro Mizutani</i>	
New Analytical Method of Electric Voltage Change of Delaminated CFRP Using Anisotropic Electric Potential Function	2737
<i>Akira Todoroki</i>	
Multi-Disciplinary Design Approach and Structural Sizing on Composite Wing	2744
<i>Yoshiyasu Hirano, Junichi Katsumi, Tomonaga Okabe, Keisuke Sawada</i>	
Numerical Simulation of Out-of-Plane Impact and Compression after Impact Test on CFRP Laminates	2756
<i>Ryo Higuchi, Tomonaga Okabe, Kenichi Yoshioka</i>	
Prediction of Shear-Cutting Process of CFRP Cross-Ply Laminates Using Smoothed Particle Hydrodynamics	2771
<i>Shigeki Yashiro, Ryuji Ono, Keiji Ogi, Yoshihisa Sakaida</i>	
Molding Simulation of Prepreg with Slits by Particle Method	2784
<i>Hiroaki Matsutani, Ichiro Taketa, Kiyoshi Enomoto</i>	
Multiscale Simulation of CFRP Plate Structure by Using Homogenization Method	2790
<i>Akinori Yoshimura, Yuichiro Tajima, Tomonaga Okabe, Yoshiki Morino</i>	
A Novel Strength Model with Increased Flexibility for Predicting Failure of Unidirectional Fiber-Reinforced Composites	2799
<i>Y. Swolfs, R. M. Mcmeeking, L. Gorbatikh, I. Verpoest</i>	

MOLECULAR MODELING OF MATERIALS

Study of the Interaction of Silica Glass Surface with Water and Silane Coupling Agent	2811
<i>Sanjib C. Chowdhury, Bazle Z. (Gama) Haque, John W. Gillespie Jr.</i>	
Molecular Dynamics Simulations of Nanopore Iron to Evaluate the Influence of Porosity on the Mechanical Strength	2824
<i>Martin Hummel, Constantin Böhm, Peter Binkele, Siegfried Schmauder</i>	
Tailoring Fracture Toughness of Silicon Carbide Ceramics Film via Nanoscale Multi-Layering with Diamond	2844
<i>Shiekh F. Ferdous, Ashfaq Adnan</i>	
Multiscale Analysis for Characterizing Fracture Toughness of Trabecular Bone-Like Materials	2855
<i>Md Farzad Sarker, Ashfaq Adnan</i>	
Molecular Dynamics Simulation Study of Reactive Encapsulation of Solvent in Epoxy Curing	2870
<i>Changwoon Jang, Majid Sharifi, Giuseppe R. Palmese, Cameron F. Abrams</i>	

Elastic-Plastic Fracture Simulation in Thermoset Resins	2888
<i>Timothy D. Breitzman, James C. Moller, Stephen A. Barr, Rajiv J. Berry</i>	

ONR MARINE COMPOSITES

Response of Carbon-Fiber/PVC Foam Composite Structures Subjected to Oblique Underwater Impulsive Loads	2902
<i>Siddharth Avachat, Min Zhou</i>	
In-situ Determination of the Fiber/Matrix Interface Tensile Strength.....	2917
<i>Kyle Totten, Bender Kutub, Leif A. Carlsson</i>	
Comparison of Low Velocity Impact Properties of MMT, MWCNT and MMT/MWCNT Binary Nanoparticles Modified Carbon/Epoxy Composites Subjected to Marine Environmental Conditioning.....	2933
<i>Md Ekramul Islam, T. H. Mahdi, M. Hosur, Alfred Tcherbi-Narteh, S. Jeelani</i>	
Seawater Absorption in Unidirectional Carbon/Vinylester	2946
<i>Leif A. Carlsson, Maryann Fichera</i>	
Effect of Water Absorption on Time-Temperature Dependent Strength of Unidirectional CFRP	2957
<i>Yasushi Miyano, Masayuki Nakada, Yuki Yamakita</i>	
Durability of Glass/Epoxy Nanocomposites Subjected to Synergistic Elevated Temperature and Moisture Conditions	2971
<i>Shaik Zainuddin, M. Hosur, Chukwuma Nweke, David Price, S. Jeelani, Ashok Kumar</i>	
Composites with Tunable Electrical, Thermal and Mechanical Properties: An Approach to Multifunctionality	2991
<i>Vasanth Chakravarthy Shunmugasamy, Dinesh Pinisetty, Nikhil Gupta</i>	
Constitutive Equation of Syntactic Foam under Lateral Constraint	3002
<i>Rafid Kully, Kunigal Shivakumar</i>	
Size Effects in Testing of Carbon Fiber Vinyl Ester Laminate for Marine Application and Damage Evolution	3022
<i>Akawut Siriruk, Robin Woracek, Stephen B. Puplampu, Dayakar Penumadu, Philip J. Withers, Tristan Lowe, Nikolay Kardjilov, Ingo Manke, Andre Hilger</i>	
Models for Analysis of the Effective Properties of Hybrid Composites	3035
<i>Andrey Beyle, David L. Cocke, Andrew Green</i>	

SIMULATION TOOLS FOR COMPOSITES

Development of a Workflow for the Design of Liquid Composite Moulding Processes.....	3055
<i>Pascal Hubert, Cristian Demaria, Casey Keulen, Christophe Mobuchon, Anoush Poursartip</i>	
Through 3D Numerical Simulation and Experimental Visualization to Study the Resin Transfer Molding.....	3072
<i>Hua Zhan Chou, Hsun Yang, Chih-Chung Hsu, Bai-Jian Wei, Yuan Yao, Rong-Yeu Chang</i>	

INTERLAMINAR PROPERTIES—D30

Assessment of Mode II Fracture Tests for Fiber Reinforced Composite Laminates	3085
<i>Kunigal Shivakumar, Raghu Panduranga, Sidharth K. Reddy, John Skujins, Sandi Miller</i>	
Study of Delamination Onset under Mode-II Loading in Translaminar Reinforced Composites Using Acoustic Emission Techniques.....	3103
<i>Vipul Ranatunga, Stephen Clay</i>	
Standardization of the End-Notched Flexure Test for Mode II Delamination Toughness Determination of Unidirectional Laminated Composites.....	3113
<i>Barry D. Davidson</i>	
Three-Dimensional Crack Surface Evolution in Mode III Delamination Toughness Tests	3133
<i>A. Johnston, Michael Czabaj, Barry D. Davidson, James G. Ratcliffe</i>	
Fracture Toughness of Carbon Fiber Laminates Including Carbon Nanotubes.....	3152
<i>Elisa Borowski, Sherif Aboubakr, Eslam Soliman, Mahmoud Reda Taha</i>	
Shear Properties of Carbon Fiber/Epoxy Composite	3162
<i>Kimiyoshi Naito</i>	
A Methodology for Realistic Delamination Growth Prediction Based on Fractographic Observations	3169
<i>Emile S. Greenhalgh, Carla Canturri, S. T. Pinho</i>	
Validation of Material Models for Inter- and Intra-Laminar Damage in Laminated Composites.....	3190
<i>Michael Bruyneel, Jean-Pierre Delsemme, Anne-Charlotte Goupil, Philippe Jetteur, Cédric Lequesne, Tadashi Naito, Yuta Urushiyama</i>	

SANDWICH PANELS—D30

Response of 3D Fiber Reinforced Foam Core Sandwich Structures at Cold Temperatures	3205
<i>Zachary T. Kier, Dhruv N. Patel, Vinay K. Goyal, J. Rome, Gary L. Steckel, Anthony M. Waas</i>	
Foam Heat Treatment and Its Effects on Strength of Sandwich Composites	3217
<i>J. Rome, Vinay K. Goyal, Dhruv N. Patel, Zachary T. Kier</i>	
Failure Analysis of Unvented Honeycomb Structures	3228
<i>Vinay K. Goyal, James P. Tuck-Lee, J. Rome, Eric Lundgren</i>	
Fiber Optic Strain Measurement in Design of Sandwich Beam Flexure Specimens	3247
<i>Juddson Frost, Maricruz Carrillo</i>	

CIVIL STRUCTURES—D30

Testing and Evaluation of GFRP Sandwich Bridge Deck Panels Filled with Polyurethane Foam	3266
<i>Hesham Tuwair, Jeffery Volz, Mohamed Elgwady, Mohaned Mohamed, K. Chandrashekhara, Victor Birman</i>	
Lateral Load-Displacement Response Analysis of RC Columns Wrapped by FRP Composites	3277
<i>Chung-Sheng Lee, Chung-Chen Chou, Hao-Hsiang Teng</i>	
Structural Testing of Dual-Core Self-Centering Braces with FRP Bars and FRP Wide-Flange Beams	3293
<i>Chung-Che Chou, Pi-Fan Sun, Ying-Chuan Chen</i>	
Assessing Effectiveness of FRP in Corrosion Repair	3303
<i>Chandra Khoe, Rajan Sen, Venkat R. Bhethanabotla</i>	
Engineering FRP-to-Concrete Bonded Joints for Better Durability	3314
<i>Shahrooz Amidi, Jialai Wang</i>	
Upgrading GFRP Bolted Lap Joint Capacity Using Carbon Nanotubes	3331
<i>Moneeb Genedy, Michelle Begaye, Mahmoud Reda Taha</i>	
Deformation of CRFP Rods with Different Surface Profiles under Transverse Compressive Loading	3340
<i>Jonathon D. Tanks, Stephen R. Sharp</i>	

FATIGUE AND FRACTURE—D30

Improved Composite Fatigue Testing using Adaptive Frequency Control	3355
<i>Peter B. S. Bailey, Christian Hoehl, Payam Jamshidi, Chris Cowan, Lorenzo Majno</i>	
A Novel Method for Characterizing Fatigue Delamination Growth under Mode I Using the Double Cantilever Beam Specimen	3363
<i>N. V. De Carvalho, G. Murri</i>	
Characterization of the Fibre Bridging Contribution in Mode I Fatigue Delamination in Composite Laminates	3381
<i>Liaojun Yao, R. C. Alderliesten, Meiyang Zhao, Rinze Benedictus</i>	
Influence of Mixed Mode I-Mode II Loading on Fatigue Delamination Growth Characteristics of a Graphite Epoxy Tape Laminate	3396
<i>James G. Ratcliffe, William M. Johnston Jr.</i>	
Extracting Interlaminar Cohesive Laws from Displacement Field Measurements	3415
<i>Meisam Jalalvand, Gergely Czel, Michael R. Wisnom</i>	
Fracture of Composite Laminates with Integrated XFEM-CE	3424
<i>T. E. Tay, Xiu-Shan Sun, Vincent Beng Chye Tan</i>	
Damage Initiation and Propagation Modeling in Laminated Composites under Fatigue Loading	3440
<i>Endel V. Iarve, Kevin Hoos, David Mollenhauer</i>	
The Multi-Scale Modeling of Fatigue and Failure of Continuous Fiber Composites	3457
<i>Benoit Bidaine, Laurent Adam, Jean-Sébastien Gérard, Thierry Malo, Roger Assaker</i>	
Modeling Quasi-Static and Fatigue-Driven Delamination Migration	3471
<i>N. V. De Carvalho, J. Ratcliffe, B. Y. Chen, S. T. Pinho, P. M. Baiz, T. E. Tay</i>	
Fatigue Behavior of 3D Woven Pi-Preform Joints	3491
<i>Ermias G. Koricho, Anton Khomeiko, Mahmoodul Haq</i>	
Failure Analysis of a Star Segment	3500
<i>Rene Roos, Douglas Weber-Steinhaus, Mayuran S. Muttulingam</i>	

TEMPERATURE EFFECTS—D30

Elevated-Temperature Thermal Expansion Coefficients of PTFE/PEEK Composites: Experiments and Modeling	3510
<i>Gang Liu, Su Su Wang</i>	
Thermal Stresses in Composites Induced by Heat Flow	3522
<i>Seiichi Nomura</i>	

Novel Computational Framework for Thermal Shock Resistance Design of Carbon Composites	3530
<i>Alma Leanos, Md Shariful Islam, Pavana Prabhakar</i>	
Evaluation of Electrical and Thermal Properties of Titanium Boride Dispersed Aluminum Composites by Spark Plasma Sintering Process	3541
<i>Gen Sasaki, Okyong Lee, Takaaki Hirose, Kota Ishikawa, Kenjiro Sugio, Yongbum Choi, Kazuhiro Matsugi</i>	
Synthesis and Properties of Multi-Functional Epoxy Resins Containing Naphthalene Units	3548
<i>Yutaka Sato, Koji Hayashi, Kazuo Arita</i>	
Thermal Resistant Polymers for Microelectronic Applications	3559
<i>Xi Min Law, Alex Brewer, Jared M. Pettit, Ronald Joven, John C. Moore</i>	
Effects of Sizing on Thermal Conductivity of Single Carbon Fibers in Longitudinal and Radial Directions.....	3573
<i>Jordan A. Whetsell, Junfeng Liang, Mrinal C. Saha, M. C. Altan</i>	
Author Index	