

Materials

Papers Presented at the AIAA SCITECH 2026 Forum

Orlando, Florida, USA
12-16 January 2026

ISBN: 979-8-3313-3505-2

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.

The contents of this work are copyrighted and additional reproduction in whole or in part are expressly prohibited without the prior written permission of the Publisher or copyright holder. The resale of the entire proceeding as received from CURRAN is permitted.

For reprint permission, please contact AIAA's Business Manager, Technical Papers. Contact by phone at 703-264-7500; fax at 703-264-7551 or by mail at 12700 Sunrise Valley Drive, Suite 200, Reston, VA 20191, USA.

TABLE OF CONTENTS

Preliminary Mechanical Analysis of Carbon-Carbon Composites Exposed to High-Temperature Flow.....	1
<i>Emil Alunno, Tim Wagner, Andrew La Sorsa, Spencer Smith, Justin D. Sprunger, Kareem A. Ahmed</i>	
Effect of Brief High-Enthalpy Exposure on Subsequent High-Temperature Mass Loss in a 3D Carbon–Carbon Composite	7
<i>Tim Wagner, Emil Alunno, Andrew La Sorsa, Spencer Smith, Zach Monem, Justin D. Sprunger, Kareem A. Ahmed</i>	
Modeling of the Resin Infusion Process using Multiphase Lattice Boltzmann for Predicting Voids in Textile Composites	16
<i>Deepak Kumar Patel, Rafael Salazar-Tio</i>	
Experimental Determination of Thermal Expansion Behavior in PBEs Using Digital Image Correlation Techniques.....	25
<i>Viswajit Talluru, Shivansh Shah, Arend Austria, Gary D. Seidel</i>	
Machine Learning-Driven Discovery of Stable Vanadium Oxide Compositions for Aerospace Applications.....	35
<i>Danial Ebrahimzadeh, Sarah S. Sharif, Yaser 'Mike' M. Banad</i>	
Performance Metrics for Structures-based Electrical Impedance Tomography Measurements	49
<i>John Wertz, Laura Homa</i>	
Review of Characterization Techniques for Multifunctional Polymer and Composite Piezoelectric Materials: A Poly (Vinylidene Fluoride) (PVDF).....	58
<i>Nadia Ahbab, Sidra Naz, Tian-Bing Xu</i>	
In-Situ Detection of Thermal Hot Spots in Polymer-Bonded Energetic Materials via Multiwalled Carbon Nanotube Networks	68
<i>Viswajit Talluru, Shivansh Shah, Arend Austria, Gary D. Seidel</i>	
Topology-Dependent Permeability in Lattice Structures: Simulation and Analysis.....	75
<i>Ossama Hafeez, Mostafa S. ElSayed, Padmassun Rajakareyar, Mackenzie J. Reid</i>	
Geometrical Accuracy Analysis of an Additively Manufactured Upper Arm Link for Space-Based Exoskeleton Applications	84
<i>Brendan Cyr, Yue Zhou</i>	
Directed Energy Deposition Additive Manufacturing of Stainless Steel with Spatially Variable Process Parameters	91
<i>Amir Yahyaeian, Amir Shakibi, Alberto W. Da Silva Mello, Yue Zhou</i>	
Effects of Thermal Annealing on the Flexural Properties of 3D-Printed Polyetherimide (PEI) and Carbon Black (CB)-Reinforced PEI Composites	104
<i>Mehlika A. Eldemir, Ramazan Yüksel, Merve Karabal, Alptekin Yıldız</i>	
Torsional Performance of 3D Printed Nylon Carbon Fiber Reinforced Composites.....	114
<i>Allyson Hicks, Sanna F. Siddiqui</i>	
Process Modeling of Additively Manufactured Semi-Crystalline Thermoplastics.....	122
<i>Manish Nagaraj, Marianna Maiaru</i>	

Impact of Ironing on Structural Integrity and Piezoresistive Properties of 3D Printed Sensor	129
<i>Ramazan Yüksel, Merve Karabal, Mehlika A. Eldemir, Alptekin Yildiz</i>	
A Coupled Multiphysics and CFD based Curing Model for Predicting Warpage and Residual Stress in Fiber-Reinforced Composites.....	140
<i>Deepak Kumar Patel, Tyler Dodge</i>	
A Shallow U-Net for Enhancement of Multi-Scale Localization in Fiber Reinforced Polymer Matrix Composite Representative Unit Cells	153
<i>Joao G. Brites Rei, Peter A. Gustafson</i>	
Multi-Scale ICME to Optimize the Bondline Performance of Adhesive Joints	186
<i>Stephanie C. TerMaath, Marcias Martinez, Kinan Bezem, Nilanjan Mitra, Marcus Stanfield, Todd C. Mull, John Erdman, Corey Arndt, Hiren Balsara, Daniel Hart</i>	
A Mesoscale Modeling Framework for Progressive Damage and Failure Mechanism Analysis of Ceramic Matrix Composites.....	217
<i>Dianyun Zhang, James T. Roach</i>	
A Unified Generative-Predictive Framework for Deterministic Inverse Design.....	226
<i>Reza T. Batley, Sourav Saha</i>	
Micro-CT Based Automated Reconstruction of 3D Textile Composite Microgeometry Using Segmentation-Based Machine Learning.....	243
<i>Yigitcan Comlek, Meg Obispo, Anindya Bhaduri, Agniprobho Mazumder, Bharath Pidaparthi, Rachel Rose, Liping Wang, Li Zheng</i>	
Inverse Design of Composite Laminates Using Neural Networks and Material Informatics.....	256
<i>Keegan Scott, Simon Miller</i>	
An Efficient Physics-Constrained Data-Driven Surrogate Model for Anisotropic Damage.....	266
<i>Liam Mackin, Rudy Geelen, Alicia A. Kim</i>	
Adaptive Neural Network for Real-World Dynamic Learning Environment	287
<i>Yulun Wu, Yuhan Chi, Ryan Zi, Yumeng Li</i>	
Interfacial Debonding of Embedded Particles in Nanocomposite Systems Using Atomic Force Microscopy and Finite Element.....	297
<i>Maximillian Westby, William Bruner, Masoud Yekani Fard</i>	
Atomistic Simulation of Mode-I and Mode-II Fracture and Fatigue in Amorphous Carbon.....	307
<i>Samit Roy, Sankha S. Aditya</i>	
Computational Insights into the Conformational Behaviors and Structure-Property Relationships of Functional Polymers via Coarse-Grained Modeling	320
<i>Liujing Wang, Wenjie Xia</i>	
Analytical Expression for the J-Integral in Ramberg-Osgood Materials via Symbolic Regression	330
<i>Cole Zachry, Xing Liu, Christos Athanasiou</i>	
Cryogenic Characterisation of Structural Materials for Liquid Hydrogen Conveyancing Systems	335
<i>Nouf Sameh, Song Yang, Jiraphant Srisuriyachot, Chanel Fallon, Kei Takashina, Andrew Rhead, Carl Sangan</i>	
Peridynamic Analysis of Damage and Failure in Composite Laminates During Open-Hole Compression Test	355
<i>Riza Kaan Gonuleri, Ibrahim Guven</i>	

Torsional Fatigue Performance of Material Extruded Additively Manufactured Inconel 718.....	368
<i>Erica Kozak, Sanna F. Siddiqui</i>	
A Peridynamic Evaluation of Protective Coating Effects on Glass Bead Impact Damage in Zinc Sulfide	377
<i>Alysa M. Howard, Ugur Can, Ibrahim Guven</i>	
Thermal Performance Analysis of Lattice Structures Using Interface-Based CFD Metrics.....	389
<i>Ossama Hafeez, Mostafa S. ElSayed, Padmassun Rajakareyar, Mackenzie J. Reid</i>	
Self-Sensing Structural Health Monitoring Capabilities of Lunar Regolith Simulant Polymer Concretes Incorporating Epoxy Nanocomposite Binders.....	400
<i>Joseph E. Cunningham, Gary D. Seidel</i>	
Simulating Microgravity Additive Manufacturing Using Neutral Buoyancy for Space-Based Structural Fabrication	406
<i>Laura Molina, Sabina Arroyo, Andrew Kwas, Anthony DeCicco, Bill Tseng, Yirong Lin</i>	
Multi-Material Lithography-Based Printing of 3YSZ-SiC for Regolith Wear Resistance	413
<i>Ashley Tirado-Pujols, Erik Förster, Valerie Wiesner, Seetha Raghavan</i>	
AQUASHIELD: Multifunctional Fluid-Filled Cellular Composites for Space Radiation Protection – Comprehensive Experimental, Computational, and Developmental Investigations.....	427
<i>Ashok K. Ghosh, Gabriel Maestas</i>	
From Anisotropy to Efficiency: A Lamination Parameter Approach to Composite Lattices.....	436
<i>Jagan Selvaraj, Sondipon Adhikari, Shuvajit Mukherjee</i>	
Dual-Cure Frontal Polymerization for Rapid Manufacturing of Fiber Reinforced Composites.....	453
<i>Sakshar Chowdhury, S M Mohaimenul Islam, Martin Mangwiro, A B M Tahidul Haque, Easir Arafat Papon</i>	
Energetic Characterization of Thermoplastic Fuels for Hybrid Rocket Propulsion Applications	470
<i>Ava Wilkey, Stephen A. Whitmore</i>	
Coupled Effect of Angle of Incidence and Temperature on the High-speed Particle Impact Cratering and Erosion of Graphite.....	478
<i>Jamshid Ochilov, Suraj Ravindran</i>	
Comparative Study of High-Temperature Polymer Composites Under Varying Simulated Re-Entry Conditions	488
<i>Bastian Treiber, Marcel Sticher, Holger Ruckdaeschel, Remy M. Feru, Joseph H. Koo</i>	
Atomistic Simulation of the Impact of Water Droplet on Carbon-Carbon Composite at Hypersonic Velocit.....	507
<i>Samit Roy, Mohammad Al Amin</i>	
Evaluation of Ablation and Mechanical Behavior in Needle-Punched High Silica-Phenolic Composites With Comparison to Laminated Structures.....	519
<i>Zeynep N. Akyazici, Burak Selamet, Muhammed E. Kilinc, Mustafa Baysal, Seher Eken, Ceyhun Tola, Mehmet Kahraman</i>	
Hypersonic Weather Encounter Damage Predictions in Carbon-Carbon Composites.....	537
<i>Ugur Can, Ibrahim Guven</i>	

Mechanical Property Testing of Thermoset and Thermoplastic Composites for Cryotank Applications.....	546
<i>Sandi G. Miller, Joseph Pinakidis, Vadim Lvovich, Paula Heimann, William Mulhearn, Kenneth Segal</i>	
Experimental Investigation of Electrical Discharge Machining Process in Aluminum Alloy 2024 Reinforced with SiC and B4C Metal Matrix Composite	556
<i>Provati Sutradhar, Chunu Rai, Sushmita Sharma, Dr. P Karunakaran, Tanya Krishna Kumar</i>	
Shear Lag in High-Throughput Testing of Thin-Ply Composites	568
<i>Vivek Khare, Steven Coltharp, Kawai Kwok</i>	
Comparison of Interfacial Mechanical Behavior of Continuous Carbon Fiber Composites Manufactured using Autoclave and 3D Printing Approach	580
<i>Rahul Kumar Arram, Yizhou Jiang, Sirish Namilae</i>	
In-situ Characterization of High Temperature Ceramic Coating Degradation within a Replicated Aeroengine Environment using Synchrotron X-ray Diffraction.....	587
<i>Zachary Stein, Peter Kenesei, Jun-Sang Park, Jonathan Almer, Janine Wischek, Marion Bartsch, Uwe Schulz, Ravisankar Naraparaju, Seetha Raghavan</i>	
Validating a Two-Point Displacement Method for Strain Measurement in Accelerated Fatigue Testing	596
<i>Onome E. Scott-Emuakpor, Philip Johnson, Harshith Vadrevu</i>	
Black-Tipped Wing Alignment in V-Formation: Aerodynamic Implications for Avian Flight Efficiency	606
<i>Gifty Nekuba Quayson, Matteo Orlando, Mostafa Hassanalian</i>	
Fatigue and Static Damage Behavior of Hybrid Re-Entrant Active Link-Based Auxetic	614
<i>Jose D. Villegas Hernandez, Eric Lee, April Nguyen, Connor Lo, Masoud Yekani Fard</i>	
Modelling of Damage and Failure in Multi-Phase Microstructures through Phase Field Fracture	624
<i>Can Erdogan, Tuncay Yalçinkaya</i>	
Can Anisotropy Play a Role in Tuning Thermal Expansion of Titanium Alloy Structures?	633
<i>Md Maruf Billah, Pinar Acar</i>	
CMC Material Analysis Under Deflagration Conditions of Hydrogen Combustion.....	650
<i>Luis C. Longas, Khaoula Chougag, Fahim Faysal, Jihua Gou, Kareem A. Ahmed</i>	
Application of a Constitutive Model for Simulating Thermo-Mechanical Fatigue for Austenitic Stainless Steel.....	656
<i>Noah H. Al-Shaer, Navindra Wijeyeratne, Ali P. Gordon</i>	
Design Optimization and Structural Evaluation of a Fully Composite Type V Hydrogen Tank for Use in Aviation	667
<i>Yasin B. Sen, Mehmet Y. Demirbas, Suleyman Sert, Ceren Meral, Merve Sümer, Mete Bakir, Ahmet Salih Yiğit</i>	
An Experimental Investigation of Graphene Nanoplatelet Size Effect on the Mechanical Performance of Graphene/PEKK Composites.....	686
<i>Sadjad Pariafsai, Sara Amirahmadi, Samit Roy</i>	
Static and Fatigue Analysis of a Novel Bending and Stretch-Dominated Star Arrowhead Auxetic Structure	702
<i>Eric Lee, Jose D. Villegas Hernandez, Masoud Yekani Fard</i>	

Ignition and Combustion of Steels in Hypersonic Flows: A Coupled Formulation.....	714
<i>Hillel Dei, Mauricio Bautista Aguilar, Wesley L. Harris</i>	
Study of C-C Composite Recession under Hypersonic Airflow Conditions	739
<i>Alin Stoica, Ryan Bencivengo, Sergey B. Leonov, Richard Gulotty</i>	
Design Evaluation and Oxidation Behavior of Tungsten Alloy Heat Pipes for Lunar Applications	756
<i>Abhilash M. Prasad, Elena Torres, Augusto Delavald Marques, Andrew Dean, Micah Boudreau, Marcel Otto, Erik Fernandez, Paula do Vale Pereira, Zachariah Koyn, Jayanta Kapat</i>	
Aerothermal Finite Difference Analysis of Hypersonic Leading Edges.....	771
<i>Andrew La Sorsa, Thomas Jaycard, Jacob Bernard, Kareem A. Ahmed</i>	
Deep Learning Multiclass Segmentation of Intra- and Interlaminar Microdamage in Synchrotron CT of Advanced Composites	779
<i>Reed Kopp, Brian L. Wardle</i>	
Microstructural Analysis of Novel Low-Density Flexible Ablators Based on Polysiloxane Resin	796
<i>Samantha Bernstein, Steven D. Kim, Wei Li, Joseph H. Koo, Fernando Alvarez-Borges, Mark Mavrogordato</i>	
Discrete Element Modeling of Nanoscratch Interface Testing for Functionalized Carbon Fibers	806
<i>Alexander Skoppe, Foram Madiyar, Sirish Namilae</i>	
Finite Element Modeling of Frequency-Dependent Scattering in 3D Polycrystalline Media With a Microvoid	814
<i>Anuj Yadav, Mira Mitra</i>	

Author Index