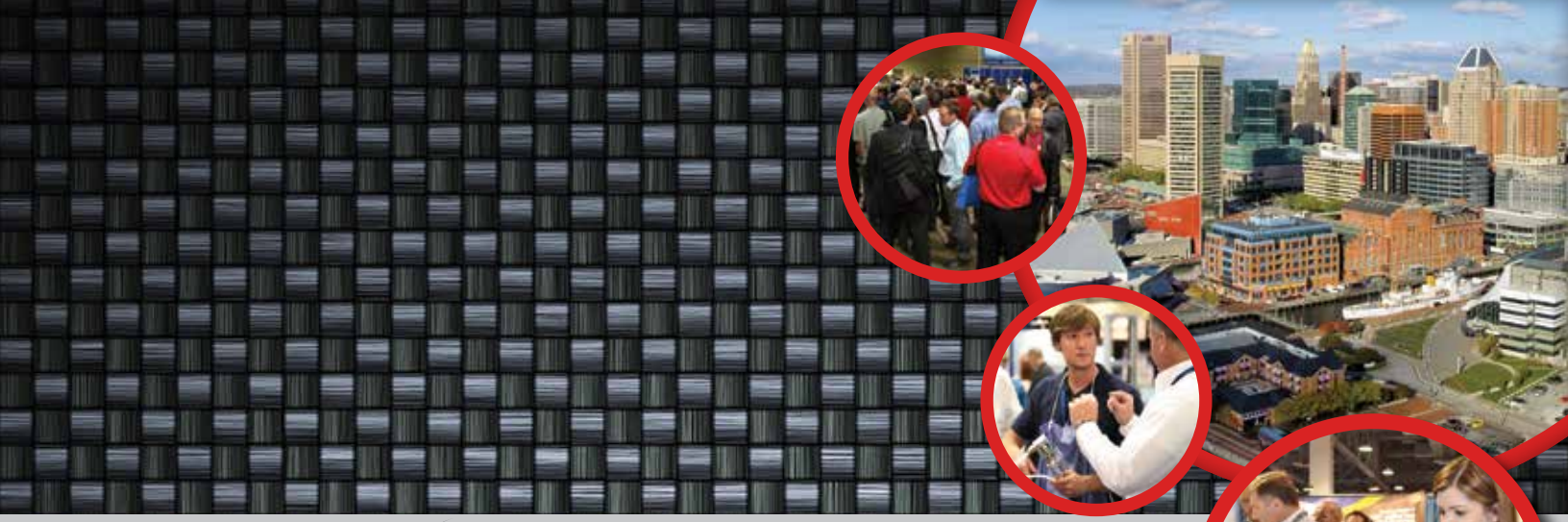


SAMPE BALTIMORE 2015

May 18-21, 2015: Conference | May 19-20, 2015: Exhibits

# Official Event Directory
## Annual Conference & Exhibition



Hosted by the SAMPE Baltimore/Washington and SAMPE Great Lakes Chapters.

# Celloxide® 8000 & 8200
## ~ High Tg, Low viscosity, High modulus Epoxy resin ~

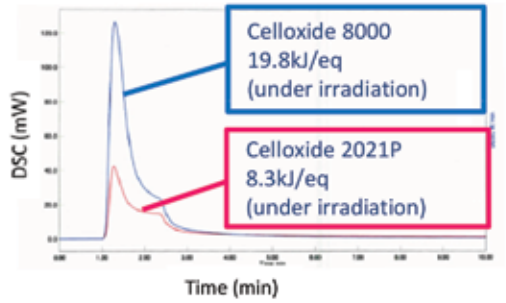
## Celloxide 8000 (60mPa・s/25℃)

### ●Heat resistance

| | Tg (℃-TMA) | Flexural modulus (Mpa) |
|---|---|---|
| **Celloxide 8000** | **354** | **3705** |
| Celloxide 2021P | 163 | 3128 |
| Bis-A type epoxy | 155 | 2532 |

Catalyst: Antimony aromatic sulfonium salt,
『Sanaid SI-100L』(Sanshin chemical)
Cure condition(CELLOXIDE 8000):
1st. 50 ℃ × 3hr, 2nd. 150 ℃ × 2hr

### ●UV reactivity




UV cationic cat.: CPI-100P (3phr)
DSC condition: temp. / 25℃, wavelength / 365nm
intensity of irradiation: 30mW/cm² (24mJ/mm²)
time of irradiation: 80sec

### ●Transparency

Celloxide 8000


Celloxide 2021P


Bis-A type epoxy


UV cationic cat.: CPI-101A
Celloxide 8000(0.5phr)
Celloxide 2021P(2.0phr)
Bis-A type epoxy(2.0phr)
intensity of irradiation:
Celloxide 8000(200mJ/cm²)
Celloxide 2021P(400mJ/cm²)
Bis-A type epoxy(400mJ/cm²)

### ●Hardness

| | Pensil Hardness |
|---|---|
| **Celloxide 8000** | **7H (4H)** |
| Celloxide 2021P | 3H (2H) |

UV cationic cat.: CPI-101A (1phr), base: PET, thickness:20μm
intensity of irradiation: 1000mJ/cm2
Post cure: 80 ℃ × 2hr
The values given in parentheses are value before post cure

## Celloxide 8200 (1500mPa・s/25℃)

| | | Celloxide8200 | Celloxide2021P | Bis-A type epoxy |
|---|---|---|---|---|
| Catalyst | BF3・MEA (phr) | 2.0 | 2.0 | - |
| Cure condition | 1st. cure<br>2nd. cure | 90℃×2hr<br>200℃×2hr | 80℃×2hr<br>200℃×2hr | 90℃×2hr<br>120℃×2hr |
| Heat resistance | Tg (℃-TMA) | **224** | 159 | 138 |
| Flexural modulus | Mpa | **4407** | 3476 | 2731 |

Amine : IPDA, [The amine active hydrogen equivalent] / [The epoxy equivalent] = 1.0


Contact info.

E – mail : mimura@us.daicel.com, maria@us.daicel.com
TEL : (201) 249 - 7112

Additional information visit us at booth **H29** !!

DAICEL CORPORATION

# Welcome to SAMPE Baltimore

We are pleased to welcome you to Baltimore, Maryland. We understand you might have had some concerns about your visit to SAMPE Baltimore. This is and has been a city who appreciates our business. We have been assured this SAMPE event will be as successful as all of our previous events.

SAMPE's Great Lakes Chapter and the Baltimore Washington Chapter have partnered to host this year's event. Representatives from each chapter form the Technical Committee, which is responsible for developing the SAMPE Baltimore Conference Program. We are proud of this year's Technical Conference Program focused on a diverse set of categories within the advanced materials and processes industry. The Technical Papers, Lectures, Tutorials, and Panels you will find at SAMPE Baltimore provide valuable information you can put to use without delay.

The Exhibit Hall is your direct connection to the M&P marketplace. The exhibit hall is open on Tuesday from 11:00 AM – 5:00 PM and Wednesday from 10:00 AM – 5:00 PM and features over 250 exhibiting companies. This is a great opportunity to meet with suppliers, manufacturers, and service providers to address your business needs.

Please be sure to attend our Welcome Reception on Tuesday at 5:00 PM. This is a valuable networking event which will be held on the Main Terrace. You are also encouraged to attend the Keynote presentation and Featured Lectures, which are open to all badged attendees.

Thank you for joining us this year. We hope that your experience this week is fun, valuable, and productive.

Best wishes on a successful event,
Michael Wilson, General Co-chair
Steve Scarborough, General Co-chair

## Thank You to Our Organizing Committee.

**General Co-chairs**
*Steve Scarborough, ILC Dover*
*Michael Wilson, Orchid Orthopedic Solutions*

**Technical Co-chairs**
*Michael Maher, DARPA*
*German Reyes, University of Michigan-Dearborn*
*Patrick Zimmerman, 3M*

**Publicity and Volunteers Chair**
*Allan Goldberg, That Video Guy*

**Publicity and Finance Chair**
*Kenan Wollborg, Innovate3D*

**Finance Co-Chair**
*Jim Harris, Masterworks Composite Solutions*

**AV Co-chairs**
*Chris Morin, Robert Bosch GmbH*
*Roy Glinecki, MRAS*

**Speakers Co-chairs**
*Paul Biermann, Johns Hopkins University*
*Ted Lynch, SMI*

**Advisors**
*Tony Vizzini, Wichita State University*
*Paul Wienhold, Johns Hopkins University*

**CCM**
*Steve Sauerbrunn, University of Delaware*

**Volunteers Co-Chair**
*Anshu Dxit, ILC Dover*

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TenCate — materials that make a difference
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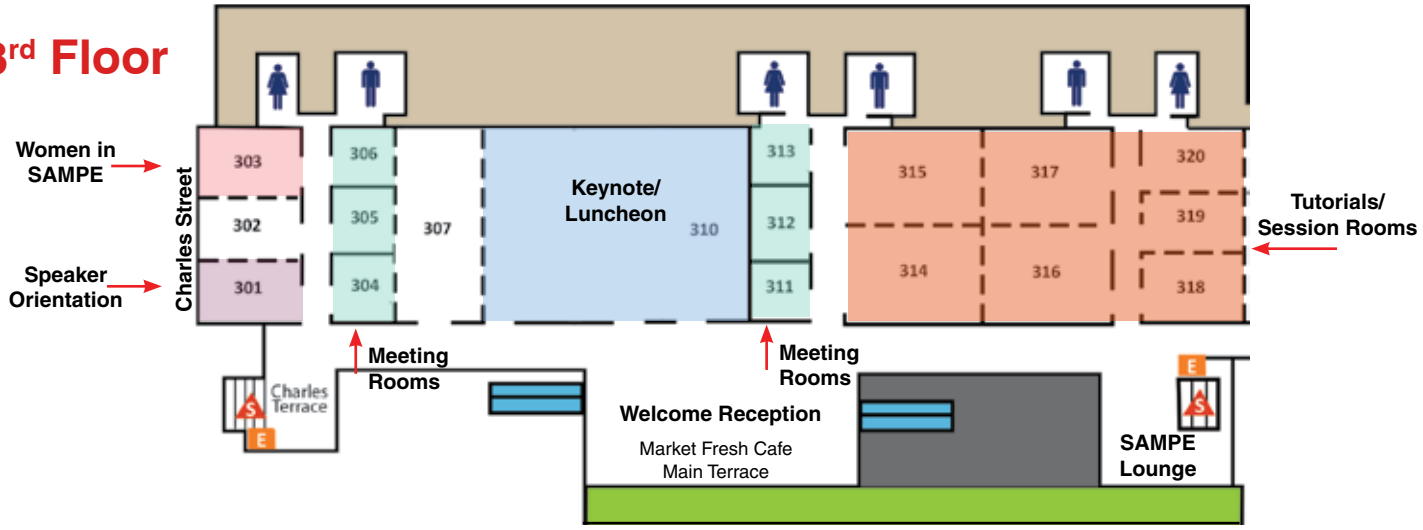
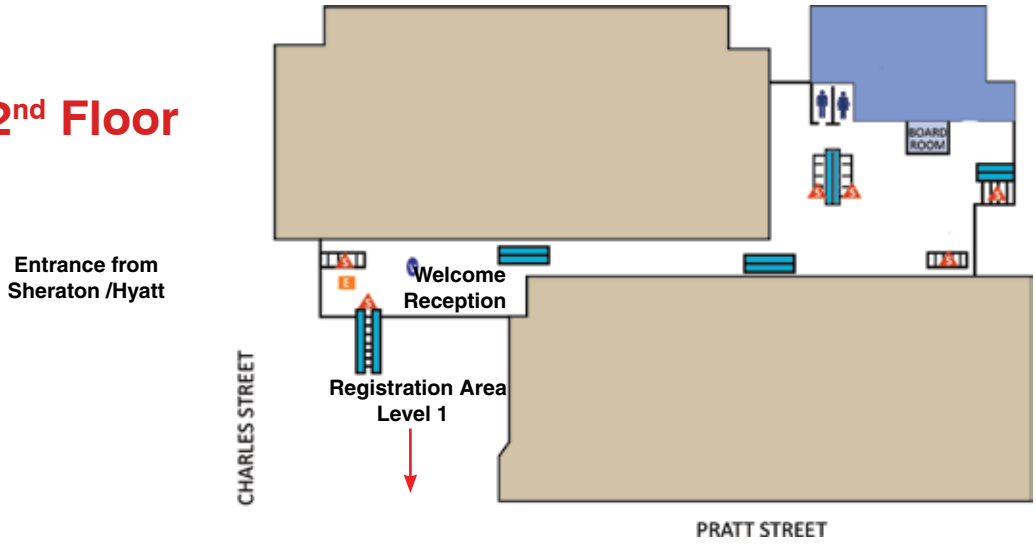
Surface Generation
WPT
Agilent Technologies
Composites One
Hitco Carbon Composites
ZEUS

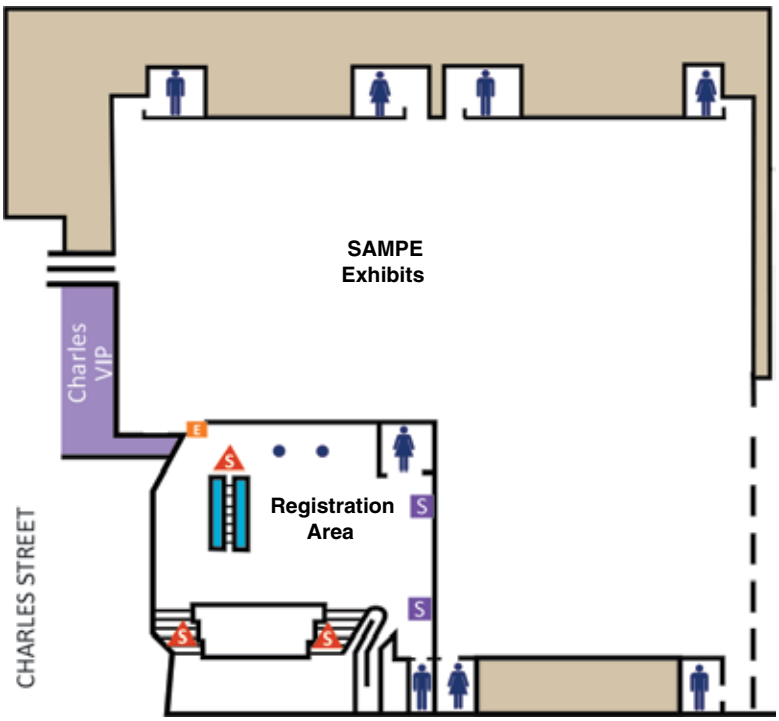
## 3rd Floor




## 2nd Floor




## 1st Floor




See page 34 for detailed exhibit hall map.

# FABRICS

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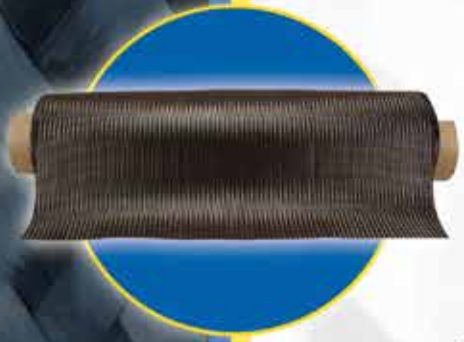
## QISO™

Brand Braided Triaxial Fabric

***0°, +/- 60° single layer balanced lamina.***

*QISO™ has equal amounts of material by weight in every direction providing equal properties regardless of ply orientation.*



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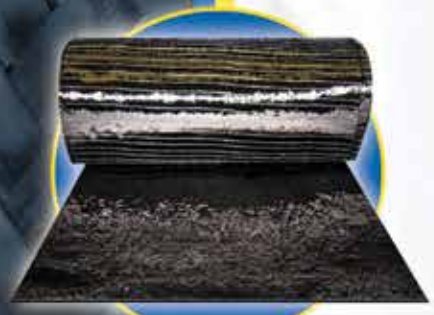

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*Ballistics / Armor / Modeling*

**Rob Adkinson, University of Delaware - CCM**
*Fiber Technologies: Carbon, Glass, Ceramic, Aligned Discontinuous Fiber*

**Suresh Advani, University of Delaware**
*Composite Process Modeling*

**Ever Barbero, West Virginia University**
*Multifunctional Composites*

**Kristopher Behler, ARL (TKC Global)**
*Nanomaterials, Nanocomposites and Nanomanufacturing*

**Libby Berger, General Motors R&D**
*Composite Applications in the Automotive Industry*

**Paul Biermann, Johns Hopkins University - Applied Physics Laboratory**
*Space Materials, Structures and Applications*

**Travis Bogetti, Army Research Laboratory**
*Composite Analysis*

**David Bowden, The Boeing Company**
*Open Manufacturing - Metals Additive Manufacturing*

**Sanjib C. Chowdhury, University of Delaware**
*Structure / Properties Relationships*

**Pierre-Henri Cadaux, Airbus**
*Composites Manufacturing*

**Scott Case, Virginia Tech**
*Composites Manufacturing*

**Timotei Centea, Univ of Southern California - M.C. Gill Composites Center**
*Out-of-Autoclave: Materials, Processes, Tooling, Structures, and Applications*

**Leslie Cohen, Hitco**
*Out-of-Autoclave: Materials, Processes, Tooling, Structures, and Applications*

**Roger Crane, Watson and Company**
*Structural Health Monitoring*

**Puttagounder Dhanasekaran Swaminathan, Kennesaw State University**
*Multi-Scale Modeling*

**Dave Dickson, The Boeing Company**
*Tooling*

**Louis Dorworth, Abaris Direct Services**
*Tooling*

**Ryan Emerson, PPG**
*Durability and Fatigue*

**Mark Griep, U.S. Army Research Laboratory**
*Nanomaterials, Nanocomposites and Nanomanufacturing*

**Lessa Grunenfelder, University of Southern California**
*High Temperature Systems and Structures*

**Brad Hanson, Lockheed Martin**
*Open Manufacturing - Bonded Composites*

**Mahmood Haq, Michigan State University**
*Composite/Hybrid Joints and Bonding*

**Dirk Heider, University of Delaware**
*Composite Applications in the Automotive Industry*

**Rikard Heslehurst, Abaris Training Resources**
*Damage Analysis and Repair*

**Larry Holmes, US Army Research Laboratory**
*Advanced and Innovative Manufacturing and Processing for Composites and Structures*

**Endel Iarve, University of Dayton Research Institute**
*Composites Fatigue and Fracture / Advanced Composites Analytics*

**Peter Joyce, United States Naval Academy**
*Metal Matrix Composites*

**Joseph Koo, University of Texas at Austin**
*Nanomaterials, Nanocomposites and Nanomanufacturing*

**David Leach, Henkel Aerospace**
*Liquid Molding Processes, Technologies, and Applications*

**Michael Maher, DARPA**
*Open Manufacturing Overview and Novel Technologies*

**Richard Martukanitz, Applied Research Laboratory, Pennsylvania State Univ**
*Open Manufacturing - Metals Additive Manufacturing*

**James Nelson, 3M**
*Composite Analysis*

**Jim Neumann, Honeywell**
*Open Manufacturing - Metals Additive Manufacturing*

**Frank Palmieri, NASA Langley Research Center**
*Composite/Hybrid Joints and Bonding*

**Young-Bin Park, Ulsan National Institute of Science and Technology (UNIST)**
*Structural Health Monitoring*

**Martin Pech-Canul, CINVESTAV-Saltillo**
*Metal Matrix Composites*

**Ignacio Perez, Office Naval Research**
*Structural Health Monitoring*

**James Pratte, CYTEC**
*Thermoplastics*

**Suraj Rawal, Lockheed Martin Space Systems**
*Space Materials, Structures and Applications*

**Nassif Rayess, University of Detroit Mercy**
*Composite Analysis*

**Rick Rickert, US Army - TARDEC**
*Armor and Ballistic Materials, Processing, Structures, and Applications*

**Susan Ruth, The Aerospace Corporation**
*Materials, Processes and Manufacturing in a Systems World*

**Dmitriy Salnikov, 3M Aerospace**
*Adhesives & Bonding*

**James Sands, U.S. Army Research Laboratory**
*Advanced & Innovative Manufacturing and Processing for Composites & Structures*

**Judy Schneider, Mississippi State University**
*Testing, Test Methods*

**Mark Seaver, Sotera Defense Solutions**
*Structural Health Monitoring*

**Nicholas Shevchenko, University of Delaware - CCM**
*Alternative Energy/Wind: Technologies, Material, Processes, & Manufacturing*

**James Stevenson, Stevenson PolyTech LLC**
*Composite Applications in the Automotive Industry*

**James Sutter, SCRA Applied R&D**
*Out-of-Autoclave: Materials, Processes, Tooling, Structures, and Applications*

**Erik Thostenson, University of Delaware**
*Multifunctional Composites*

**John Tierney, University of Delaware - CCM**
*Design and Analysis*

**Matt Trexler, Under Armour**
*Composites Manufacturing*

**Matt Trexler, Under Armour**
*Fiber Technologies: Carbon, Glass, Ceramic, Aligned Discontinuous Fiber*

**Thomas Tsotsis, The Boeing Company**
*High Temperature Systems and Structures*

**Jerome Tzeng, U.S. Army Research Laboratory**
*Design and Analysis*

**Chad Ulven, North Dakota State University**
*Natural, Green, Bio-Materials and Reinforcements Technology & Applications*

**Uday Vaidya, University of Alabama**
*Thermoplastics*

**Lionel Vargas, U.S. Army Research Laboratory**
*Armor and Ballistic Materials, Processing, Structures, and Applications*

**Eric Wetzel, U.S. Army Research Laboratory**
*Composite Process Modeling*

**Chuck Wilson, Gulfstream**
*Additive Manufacturing for Polymers*

**Shridhar Yarlagadda, University of Delaware**
*Multifunctional Composites*

**Ali Yousefpour, National Research Council Canada**
*Composites Manufacturing*

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# Monday May 18, 2015

| Time | Activity | Room |
|---|---|---|
| | **Exhibit Hall Closed** | |
| **7:00 AM – 5:00 PM** | **Registration Open** | Charles Street Lobby |
| **9:00 AM – 12:00 PM** | **Morning Tutorials** | |
| | Aerospace vs. Automotive: Perspective on Approach and Application of Composites | 317 |
| | Bio-Based Polymer Composites | 316 |
| | Manufacturing Technology Overview | 315 |
| | Thermal Analysis of Polymer Composites | 314 |
| **2:00 – 5:00 PM** | **Afternoon Tutorials** | |
| | Composite Materials Technology Overview | 316 |
| | Composites Failure Criteria Overview | 314 |
| | Defect Control in Composite Fabrication Using Out-of-Autoclave Prepregs | 317 |
| | Thermoplastic Composites: Aerospace, Automotive and Commercial Market Applications | 315 |

# Tuesday May 19, 2015

| Time | Activity | Room |
|---|---|---|
| **7:00 AM – 5:00 PM** | **Registration Open** | Charles Street Lobby |
| **8:00 – 9:30 AM** | **Conference Program** | |
| | Additive Manufacturing for Polymers - 1 | 318 |
| | Armor and Ballistic Materials, Processing, Structures, and Applications - 1 | 314 |
| | Ballistics / Armor / Modeling | 314 |
| | Fiber Technologies: Carbon, Glass, Ceramic, Aligned Discontinuous Fiber | 316 |
| | Liquid Molding Applications and Technologies | 319 |
| | Nanomaterials, Nanocomposites and Nanomanufacturing - 1 | 320 |
| | Open Manufacturing Overview and Novel Technologies | 317 |
| **10:00 – 11:00 AM** | **Keynote Presentation** | 310 |
| **11:00 AM – 5:00 PM** | **Exhibit Hall Open** | Halls A, B, C |
| **2:00 – 2:45 PM** | **Featured Lectures** | |
| | Threat-Based Flammability Requirements for Transport Airplanes | 319 |
| | Rapid Material Development | 316 |
| **2:00 – 4:00 PM** | **Panel** | |
| | Integrated Computational Materials Engineering | 315 |
| **2:00 – 5:00 PM** | **Conference Program** | |
| | Additive Manufacturing for Polymers - 2 | 318 |
| | Advanced and Innovative Technologies for Composites and Structures | 318 |
| | Armor and Ballistic Materials, Processing, Structures, and Applications - 2 ITAR | 314 |
| | Composites Fatigue and Fracture / Advanced Composites Analytics | 319 |
| | Natural, Green, Bio-Materials and Reinforcements Technology and Applications | 316 |
| | Open Manufacturing - Metals Additive Manufacturing | 317 |
| | Systems World Materials and Fabrication Technology | 320 |
| **5:00 – 6:00 PM** | **Welcome Reception** | 2nd/3rd Floor |

ITAR This category includes ITAR Restricted papers, see page 26 for details.

**Important Notice:**

The presentations listed in this Final Program are subject to change and cancellation due to circumstances beyond our control.

| Time | Activity | Room |
|---|---|---|
| 7:00 AM – 5:00 PM | **Registration Open** | Charles Street Lobby |
| 8:00 – 12:00 PM | **Conference Program** | |
| | Composite Analysis | 319 |
| | Composite Applications in the Automotive Industry - 1 | 314 |
| | Composites Manufacturing | 318 |
| | High Temperature Systems and Structures ITAR | 316 |
| | Multifunctional Composites - 1 | 320 |
| | Multi-Scale Modeling - 1 | 317 |
| | Open Manufacturing - Bonded Composites | 317 |
| | Structural Health Monitoring - 1 | 318 |
| | Structure / Properties Relationships | 314 |
| 8:00 – 10:00 AM | **Panel** | 315 |
| | Academia, Industry and Government | |
| 9:00 – 9:45 AM | **Featured Lecture** | 316 |
| | Hypersonic Materials and Structures | |
| 10:00 AM – 12:00 PM | **Panel** | 315 |
| | Hypersonic Material Development | |
| 10:00 AM – 5:00 PM | **Exhibit Hall Open** | Halls A, B, C |
| 11:00 AM – 4:00 PM | **Student Bridge Contest** | Hall C |
| | **Additive Manufacturing Contest** | Hall C |
| 12:30 – 1:30 PM | **Women in SAMPE Forum** | 303 |
| 2:00 – 2:45 PM | **Featured Lecture** | |
| | Material Informatics and ICME | 314 |
| 2:00 – 4:00 PM | **Panel** | |
| | Recent Federal Programs in Composites | 315 |
| 2:00 – 4:00 PM | **Conference Program** | |
| | Durability and Fatigue | 316 |
| | Metal Matrix Composites | 319 |
| | Multifunctional Composites - 2 | 314 |
| | Multi-Scale Modeling - 2 | 317 |
| | Structural Health Monitoring - 2 | 318 |
| | Tooling | 320 |
| 5:30 – 6:30 PM | **Student Social Reception** | Pratt Street Ale House |

ITAR This category includes ITAR Restricted papers, see page 26 for details.



# Outstanding Paper Award Winners

**First Place**
**Characterization of Electron Beam Additive Manufactured Ti-6al-4v**
*B. Hayes, I. Ghamarian, S. Joshi, R. Banerjee, N. Dahotre, and P. Collins, University of North Texas; V. Dixit, B. Welk, and H. Fraser, Ohio State University*

**Second Place**
**Role of Prepreg Interlayer Permeability on Void Reduction during Oven Vacuum Bag Processing of Thick Section Thermoplastic Composites**
*D. Zhang, D. Heider, J. W. Gillespie Jr., University of Delaware*

**Third Place**
**Multi-Physical Description of Material State Change in Composite Materials**
*P. K. Majumdar, Md. Y. Bhuiyan, J. Clifford, M. FaisalHaider, and K. Reifsnider, University of South Carolina*

Congratulations

| Time | Activity | Room |
|---|---|---|
| | **Exhibit Hall Closed** | |
| **7:00 AM – 5:00 PM** | **Registration Open** | Charles Street Lobby |
| **8:00 – 11:30 AM** | **Conference Program** | |
| | Alternative Energy/Wind: Technologies, Material, Processes, and Manufacturing | 319 |
| | Composite Applications in the Automotive Industry - 2 | 314 |
| | Design and Analysis | 318 |
| | Nanomaterials, Nanocomposites and Nanomanufacturing - 2 | 320 |
| | Out-of-Autoclave: Materials, Processes, Tooling, Structures, and Applications - 1 ITAR | 316 |
| | Space Materials, Structures and Applications | 319 |
| | Structural Health Monitoring - 3 | 317 |
| | Testing, Test Methods - 1 | 314 |
| **8:00 – 10:00 AM** | **Panel** | 315 |
| | Innovation in Material Development | |
| **8:30 – 9:15 AM** | **Featured Lecture** | 314 |
| | The Future of Defense Manufacturing – Rate Independent Production & Right the First Time | |
| **10:00 AM – 12:00 PM** | **Panel** | 315 |
| | Defense Manufacturing | |
| **11:00 AM – 11:45 PM** | **Featured Lecture** | 317 |
| | Structural Certification: The Air Force's Aircraft Structural Integrity Program Perspective | |
| **12:00 – 1:30 PM** | **Awards Luncheon** | 310 |
| | CIA's Supersonic Sky Spy: The A-12 OXCART Reconnaissance Aircraft | |
| **2:00 – 4:00 PM** | **Panel** | 315 |
| | Composites Structures Qualification, Substantiation, and Certification | |
| **2:00 – 5:00 PM** | **Conference Program** | |
| | Adhesives & Bonding | 316 |
| | Composite Process Modeling | 319 |
| | Composite/Hybrid Joints and Bonding | 318 |
| | Damage Analysis and Repair | 320 |
| | Out-of-Autoclave: Materials, Processes, Tooling, Structures, and Applications - 2 | 316 |
| | Structural Health Monitoring - 4 | 317 |
| | Testing, Test Methods - 2 | 314 |
| | Thermoplastics | 320 |

ITAR This category includes ITAR Restricted papers, see page 26 for details.

## Keynote Presentation

Tuesday May 19 • 10:00 – 11:00 AM • Room 310

**Dr. Thomas Russell, Director of the U.S. Army Research Lab**

ARL is the nation's premier laboratory for land forces and focuses a diverse research portfolio across eight science and technology campaigns. This presentation will provide an overview of the laboratory's activities with an emphasis on the Materials Research that is benefiting the American Soldier. To better accomplish its mission, ARL is piloting a new collaborative business model for the federal laboratory system known as Open Campus. The goal of ARL's Open Campus initiative is to create a science and technology ecosystem that will encourage groundbreaking advances in basic and applied research areas of relevance to the Army.

## Luncheon

Thursday May 21 • 12:00 – 1:30 PM • Room 310

**Dr. David Robarge, Chief Historian, Central Intelligence Agency**

The CIA developed the highly secret A-12 OXCART aircraft as the U-2's successor to meet the nation's need for a very fast, very high-flying reconnaissance platform that could avoid Soviet air defenses while taking photographs of strategic weapons sites behind the Iron Curtain. The Agency awarded the OXCART contract to Lockheed (builder of the U-2) in 1959. In meeting the aircraft's extreme speed and altitude requirements, Lockheed overcame many technical challenges with cutting-edge innovations.

## TUESDAY, MAY 19
### KEYNOTE PRESENTATION
10:00 – 11:00 AM

**Thomas Russell,**
Director of the U.S. Army Research Laboratory (ARL)

ROOM 310

**Army Research Laboratory: Accelerating Innovation and Discovery through the Open Campus Ecosystem**

## TUESDAY, MAY 19
### WELCOME RECEPTION
5:00 – 6:00 PM | 2nd/3rd Floor

Join us at this valuable, free networking event. All badged attendees are welcomed.

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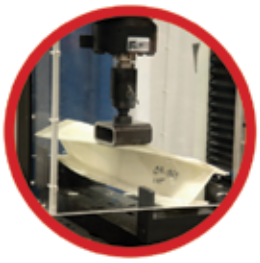
## WEDNESDAY, MAY 20
### WOMEN in SAMPE Forum
12:30 – 1:30 PM
Free for all badged attendees.

ROOM 303

The Women in SAMPE forum will discuss today's perception of women in engineering and technology careers and women in the workforce.

## WEDNESDAY, MAY 20
### STUDENT BRIDGE CONTEST
11:00 AM – 4:00 PM
Exhibit Hall

AISLE L



### ADDITIVE MANUFACTURING CONTEST
11:00 AM – 4:00 PM
Exhibit Hall

AISLE L

### STUDENT SOCIAL RECEPTION
5:30 – 6:30 PM | Pratt Street Ale House
206 W. Pratt St., Baltimore, MD 21201

All students are invited to attend the SAMPE Student Social Reception. Bridge contest winners will be announced and prizes will be raffled. Food and refreshments will be served, free of charge.

## THURSDAY, MAY 21
### LUNCHEON SPEAKER
12:00 – 1:30 PM

ROOM 310

**Dr. David Robarge,**
Chief Historian,
Central Intelligence Agency

**CIA's Supersonic Sky Spy:**
**The A-12 OXCART Reconnaissance Aircraft**

## Tuesday, May 19

### Integrated Computational Materials Engineering

2:00 – 4:00 PM • Room 315

**Moderator: Chuck Ward, Air Force Research Lab**

This panel will examine the state of implementing the discipline of integrated computational materials engineering (ICME) across the lifecycle of composite materials. Experts from academia, industry, and government will examine recent examples where ICME has been implemented for composite materials, lessons learned to date, and remaining challenges left to be overcome.

**Panelists:**

- *Jeff Baur, Air Force Research Laboratory*
- *Somnath Ghosh, Johns Hopkins University*
- *Gail Hahn, Boeing*
- *Lara Liou, GE Aviation*
- *Anoush Poursartip, University of British Columbia*
- *Anthony Waas, University of Michigan*

## Wednesday, May 20

### Academia, Industry and Government

8:00 AM – 10:00 AM • Room 315

**Moderator: Kenan Wollborg, Innovate3D**

Engineering materials are vital for the economic and technological development of our society. Therefore, it is imperative to promote the advancement of materials and process engineering from all possible angles, bridging boundaries between academia, industry and government. This panel will examine relevant trends and efforts towards the future of advanced materials and process engineering.

**Panelists:**

- *Joseph Koo, University of Texas at Austin*
- *Michael Maher, DARPA*
- *Jim Nokes, The Aerospace Corporation*
- *German Reyes, University of Michigan-Dearborn*
- *Lionel Vargas, ARL*
- *Patrick Zimmerman, 3M*

### Hypersonic Material Development

10:00 AM – 12:00 PM • Room 315

**Moderator: Eric Wuchina, Naval Surface Warfare Center**

Get insights into current government R&D efforts on high temperature materials for hypersonic applications. These include aerosurface TPS, structural aeroshell materials, and engine propulsion flowpaths for future system designs. The programs discussed range from basic and applied research at the laboratory level through component level testing and subscale testing in relevant environments.

**Panelists:**

- *Joe Conley, NASA Ames Research Center*
- *Ken Davidson, Air Force Research Laboratory*
- *Michael Maher, DARPA*
- *Mark Opeka, Naval Surface Warfare Center*

### Recent Federal Programs in Composites

2:00 PM – 4:00 PM • Room 315

**Moderator: Michael Maher, DARPA**

This panel assembles a group of key government officials, representing various agencies that have been developing and executing programs focused on developing new composite materials, new processing technologies, or methodologies to improve the adoptability of the technology. Discussion will focus on several key current efforts and future thrust areas.

**Panelists:**

- *Bill Nickerson, Office of Naval Research*
- *Carol Schutte, Department of Energy*
- *Jean-Louis Staudenmann, NIST*
- *Tara Storage, Air Force Research Laboratory*
- *James Sands, Army Research Lab*
- *LaNetra Tate, NASA*



## Thursday, May 21

### Innovation in Material Development

8:00 AM – 10:00 AM • Room 315

**Moderator: Jesse Margiotta, Strategic Analysis, Inc.**

Find new approaches & techniques for bringing immature materials to market faster & more affordably. This panel aims to address this topic by drawing on demonstrated successes in applied development of new materials and/or through their history of championing contemporary approaches to materials & process engineering.

**Panelists:**

- *Alex Cho, ATI Inc.*
- *Julie Christodoulou, U.S. Office of Naval Research*
- *Carmelo Lo Faro, Cytec Industries Inc.*
- *GV Srinivasan, United Technologies Research Center*

### Defense Manufacturing

10:00 AM – 12:00 PM • Room 315

**Moderator: Walter Roy, Keystone Innovation Solutions**

Approximately $200M dollars is invested by the DOD through the Manufacturing Technology programs within the individual services, Army, Navy, Air Force, Defense Logistic Agency. These investments are coordinated by the Joint Directors of Manufacturing Technology Panel (JDMTP). Organized under the JDMPT are 4 subpanels, Metals, Electronics, Composites, and Advanced Manufacturing Enterprise. These panels serve to coordinate technology investments and establish a vision for future investment.

**Panelists:**

- *Carrie Davis, US Navy ONR*
- *Neil Graf, US Navy ONR*
- *Greg Harris, US Army AMRDEC*
- *Dan Turner, US AF AFRL*

### Composites Structures Qualification, Substantiation, and Certification

2:00 – 4:00 PM • Room 315

**Moderator: Curtis Davies, Federal Aviation Administration**

The development of new materials and processes is filled with many risks. Some of those risks are inherent in the approval process. Experienced composite structures professionals will provide insight into the methodology of qualification, substantiation, and certification. They will explain the concerns and highlight the considerations that can be incorporated early in the development process that will increase the probability of successfully passing the final steps in the acceptance process.

**Panelists:**

- *Cindy Ashforth, Federal Aviation Administration*
- *Charles Babish, US Air Force*
- *Jeremy Jacobs, NASA*
- *William Nickerson, US Navy*
- *David Stone, US Army*
- *Rick Young, NASA*

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# Tuesday - May 19

## Threat-Based Flammability Requirements for Transport Airplanes

2:00 – 2:45 PM • Room 319

**Jeff Gardlin, Federal Aviation Administration**

The threat-based approach to research used to develop many improved standards for fire protection has also pointed out some shortcomings in the way the existing flammability requirements are structured. Knowing the threat(s) a component must withstand and defining the way the threat is measured, would have advantages for material manufacturers, installers and regulators. Requirements that are based on the threat, rather than on combinations of material type, application and threat, would both improve the level of safety and make the requirements simpler to understand and easier to meet.

## Rapid Material Development

2:00 – 2:45 PM • Room 316

**Jeff Zabinski, Army Research Laboratory**

Exploiting new materials, design space opens; using new designs, performance leaps are enabled compared to inefficient materials substitution approaches; and by integrating manufacturing at the beginning, low cost, small sized complex designs are possible. This lecture will discuss the integration of materials engineering, design, and manufacturing accelerated using multi-scale computational tools to permit rapid progression from discovery to delivery. Examples of where Integrated Computational Materials Engineering (ICME) is reducing the time required to develop new materials and bring them to bear in solving difficult problems will be provided.

# Wednesday - May 20

## Hypersonic Materials and Structures

9:00 – 9:45 AM • Room 316

**David Glass, NASA Langley Research Center**

Thermal protection systems (TPS) and hot structures are required for a range of hypersonic vehicles ranging from ballistic reentry to hypersonic cruise vehicles. This includes single-stage to orbit (SSTO), two-stage to orbit (TSTO) accelerators, access to space vehicles, and hypersonic cruise vehicles. The primary portion of this lecture will discuss issues and design options for CMC TPS and hot structure components, including leading edges, acreage TPS, and control surfaces.

## Material Informatics and ICME

2:00 – 2:45 PM • Room 314

**Krishna Rajan, Iowa State University**

This presentation will discuss how informatics methods

provide a framework to enable the "integration" objective in "Integrated Computational Materials Science and Engineering" (ICME). Informatics harnesses the tools of statistical and machine learning to the fundamentals of materials behavior and provides a mechanism to guide new materials discoveries in an accelerated but robust manner. We shall discuss the role of informatics in integrating computational (and experimental) information in the context of the "Big Data" paradigm and we will emphasize that term "Big Data" is more than just dealing with large volumes of data.

# Thursday - May 21

## The Future of Defense Manufacturing – Rate Independent Production & Right the First Time

8:30 – 9:15 AM • Room 314

**Rollie Dutton, Air Force Research Laboratory**

The high cost of development and the extended length of

time required to certify a new weapons system is limiting the DOD's ability to develop new systems. The extended times between major procurements, the small quantities purchased, and the low production rates of these systems make it difficult to affordably achieve high reliability and performance through traditional design methodologies. Going forward requires the development of a new approach to the design and certification of aircraft technology, processes and procedures.

## Structural Certification: The Air Force's Aircraft Structural Integrity Program Perspective

11:00 – 11:45 AM • Room 317

**Chuck Babish, US Air Force**

This presentation will provide an overview of the Air Force's Aircraft Structural Integrity Program perspective on structural certification with an emphasis on the requirements associated with the incorporation of advanced materials and processes in the aircraft design.

## Tutorials 9:00 AM - 12:00 PM

**Aerospace vs. Automotive: Perspective on Approach and Application of Composites**
Room 317
*Bob Yancey, Altair*

**Bio-Based Polymer Composites**
Room 316
*Louis Pilato, Pilato Consulting*

**Manufacturing Technology Overview**
Room 315
*Brent Strong, Brigham Young University*

**Thermal Analysis of Polymer Composites**
Room 314
*Steve Sauerbrunn, University of Delaware*

## Tutorials 2:00 PM - 5:00 PM

**Composite Materials Technology Overview**
Room 316
*Andrew George, Brigham Young University*

**Composites Failure Criteria Overview**
Room 314
*Rikard Heslehurst, Abaris Training Resources*

**Defect Control in Composite Fabrication Using Out-of- Autoclave Prepregs**
Room 317
*Steven Nutt, University Southern California*

**Thermoplastic Composites: Aerospace, Automotive and Commercial Market Applications**
Room 315
*Uday Vaidya, University of Alabama – Birmingham*

**Rates per tutorial:** Tutorial rates are in addition to any other conference registration charges, except for Premium Conference Registration. Premium Conference Registration includes two tutorials.
With conference registration: $175 • Full time student: $75 • Tutorial only/ one-day registration/ exhibits only: $225

## Additive Manufacturing for Polymers - 1

**Room 318**

**Category Chair:** *Chuck Wilson, Gulfstream*

8:00 AM

**Integration Between Structural Additive Manufacturing and Printed Electronics**
*Giovanni Nino, Quest Integrated, LLC (Qi2)*

8:30 AM

**Control-Oriented Model Verification for UV Processing of Composite Laminate**
*Adamu Yebi, Clemson University*

9:00 AM

**Additive Manufacturing and Characterization of Topology Optimized PLA Structures for Bone-Implant Applications**
*Sajith Anantharaman, University of Texas at Arlington*

## Armor and Ballistic Materials, Processing, Structures, and Applications - 1

**Room 314**

**Category Chairs:** *Lionel Vargas, U.S. Army Research Laboratory and Rick Rickert, U.S. Army - TARDEC*

9:00 AM

**Investigation into the Material Properties and Penetration-Resistant Behavior of Ultra-high Molecular Weight Polyethylene Composites Using A Novel Test Methodology and Correlation with Ballistic Performance**
*Jason Cain, TKC Global - contractor for US Army Research Laboratory*

## Ballistics / Armor / Modeling

**Room 314**

**Category Chair:** *Bazle (Gama) Haque, University of Delaware*

8:00 AM

**Modeling Constant Velocity Transverse Impact on UHMWPE Soft Ballistic Sub-Laminate**
*Bazle Haque, University of Delaware - CCM*

8:30 AM

**Modeling Kevlar Km2 Single Fiber Transverse Impact and the Effect of Compressive Kinking on Residual Tensile Strength**
*Subramani Sockalingam, University of Delaware*

## Fiber Technologies: Carbon, Glass, Ceramic, Aligned Discontinuous Fiber

**Room 316**

**Category Chairs:** *Matt Trexler, Under Armour and Rob Adkinson, University of Delaware - CCM*

8:00 AM

**Characterization of Technical Monofilament Textiles**
*Ozan Erol, University of Delaware*

8:30 AM

**Thermo, Chemical, Process Model of Non-Textile Reinforcing Fiber**
*Bruce Dover, Harper International*

9:00 AM

**Molecular Dynamics Modeling of Compression Kinking in Kevlar**
*Sanjib Chowdhury, University of Delaware - CCM*

## Liquid Molding Applications and Technologies

**Room 319**
**Category Chair:** *David Leach, Henkel Aerospace*

8:00 AM

**Integration of Composite Part Design and Processing Simulation in Liquid Composite Molding (LCM)**
*Jiayin Wang, University of Delaware*

8:30 AM

**Stretchlon Film-Enhanced RIDFT Process for Composite Manufacture**
*Divyesh Bhakta, High-Performance Materials Institute, FAMU-FSU College of Engineering*

9:00 AM

**LCM Processing of Nanoparticle Toughened High Temperature Epoxy Matrix Composites**
*Mario Danzi, Laboratory of Composite Materials and Adaptive Structures, ETH Zurich*

## Nanomaterials, Nanocomposites and Nanomanufacturing - 1

**Room 320**
**Category Chairs:** *Kristopher Behler, ARL (TKC Global); Mark Griep, U.S. Army Research Laboratory; and Joseph Koo, University of Texas at Austin*

8:00 AM

**Characterization of Carbon Fiber Composites Reinforced with Carbon Nanofiber Using an Automated Spray System**
*Yasmeen Qudsi, University of Louisiana at Lafayette Department of Mechanical Engineering*

8:30 AM

**Microwave Induced Welding of Carbon Nanotube-Thermoplastic Interfaces for Enhanced Mechanical Strength of 3D Printed Parts**
*Charles Sweeney, Texas A&M*

9:00 AM

**Moisture Absorption and Chemical Degradation Study of Modified Nanoclay Vinylester Nanocomposites**
*Florent Gauvin, University of Sherbrooke*

## Open Manufacturing Overview and Novel Technologies

**Room 317**
**Category Chair:** *Michael Maher, DARPA*

8:00 AM

**Open Manufacturing Overview**
*Michael Maher, DARPA*

8:30 AM

**Bridging the Implementation Gap - DOD Materials and Process Information Management**
*Wayne Ziegler, US Army Research Laboratory*

9:00 AM

**Design and Analysis of a Passive Dynamic Ankle-Foot Orthotic Device**
*Narinder Khattra, University of Delaware*

## Additive Manufacturing for Polymers - 2

**Room 318**
**Category Chair:** *Chuck Wilson, Gulfstream*

2:00 PM

**Brief Survey of the Implementation of Polymer Nanocomposites in Selective Laser Sintering**
*Rogelio Ortiz, University of Texas at Austin*

## Advanced and Innovative Technologies for Composites and Structures

**Room 318**
**Category Chairs:** *James Sands, U.S. Army Research Laboratory and Larry Holmes, U.S. Army Research Laboratory*

2:30 PM

**Development of a Testbed for Automated Ply Inspection of Composites**
*David Maass, Flightware Inc.*

3:00 PM

**Cutting Carbon Fiber Reinforced Polymer Using Multiple Laser Wavelengths**
*Joseph Hillman, Universal Laser Systems*

3:30 PM

**Design and FEA of a Wound Composite Hydroforming Machine Under High Pressure**
*Michael Ellis, Industrial Design*

4:00 PM

**Intelligent Automation: The Internet-of-Things (IoT) with RFID Sensors Push the Envelope of Production Efficiencies in Composites Part Manufacturing**
*Avner Ben-Bassat, Plataine Inc.*

4:30 PM

**Porosity in Configured Structures**
*Martin Roy, University of British Columbia*

## Armor and Ballistic Materials, Processing, Structures, and Applications - 2

**Room 314**

**Category Chairs:** *Lionel Vargas, U.S. Army Research Laboratory and Rick Rickert, US Army - TARDEC*

2:00 PM

ITAR **Ballistic Modification of Ultra-High Molecular Weight Polyethylene Composites Through Processing**
*Lionel Vargas-Gonzalez, U.S. Army Research Lab*

2:30 PM

**Ballistic Perforation Mechanics of Single Layer Plain-Weave S-2 Glass/Sc15 Composites**
*Daniel O'Brien, U.S. Army Research Laboratory*

3:00 PM

**Statistical Comparisons for Tensile Properties of Aramid and Co-Polymer Aramid Fibers as a Function of Loading Rates**
*Jae Hyun Kim, NIST*

3:30 PM

**Natural Flexible Armor as an Inspiration for Body Armor Design**
*Susana Estrada, Eafit University*

4:00 PM

**Microstructural Characterization of Ultra High Molecular Weight Polyethylene**
*Jennifer Sietins, Army Research Laboratory*

4:30 PM

**Low Velocity Impact Behavior of VARTM Manufactured Plain-Woven E-Glass/Polyester Composites**
*Ömer Eksik, Tübitak Marmara Research Center*

## Composites Fatigue and Fracture / Advanced Composites Analytics

**Room 319**

**Category Chair:** *Endel Iarve, University of Dayton Research Institute*


3:00 PM

**Multi-Physical Description of Material State Change in Composite Materials**
*Prasun Majumdar, University of South Carolina*

3:30 PM

**Numerical and Experimental Investigations on the Influence of Creep Phenomena in Carbon Fibre Reinforced Plastics (CFRP) in High and Very High Cycle Fatigue**
*Christian Hopmann, Institute of Plastics Processing (IKV) at RWTH Aachen University*

4:00 PM

**Fatigue Response of Carbon Fiber Epoxy Laminates with Vertically-Aligned Carbon Nanotube Interfacial Reinforcement**
*Heather Conway, N12 Technologies, Inc.*

4:30 PM

**Finite Element Measurements, for Reality in Composites**
*John Tyson, Trilion Quality Systems*

## Natural, Green, Bio-Materials and Reinforcements Technology and Applications

**Room 316**

**Category Chair:** *Chad Ulven, North Dakota State University*

3:00 PM

**Coating of Flax Fibers: A Comparison of Zirconates and Silanes Treatments**
*Lina Boulos, University of Sherbrooke*

3:30 PM

**Properties and Curing Kinetics of Epoxy Resin Cured by Chitosan as an Environmentally Friendly Curing Agent**
*Praveen Kumar Balasubramani, University of Cincinnati*

4:00 PM

**Interfacial Characterization of Epoxy-Resin Reinforced with TiO2 Coated Flax Fibers Composites**
*Mohammadreza Foruzanmehr, University of Sherbrooke*

## Open Manufacturing - Metals Additive Manufacturing

**Room 317**

**Category Chairs:** *Richard Martukanitz, Applied Research Laboratory, Pennsylvania State University; Jim Neumann, Honeywell; and David Bowden, The Boeing Company*

2:00 PM

**Open Manufacturing tiFAB: Program Overview**
*David Bowden, The Boeing Company*

2:30 PM

**Large Melt Pool Electron Beam Additive Manufacturing of Titanium**
*Scott Stecker, Sciaky, Inc.*


3:00 PM

**Characterization of Electron Beam Additive Manufactured Ti-6al-4v**
*Peter Collins, University of North Texas*

3:30 PM

**Open Manufacturing TiFAB: Statistical Modeling of Process Variables**
*Gary Harlow, Lehigh University*

4:00 PM

**Rapid Low Cost Additive Manufacturing**
*Jim Neumann, Honeywell*

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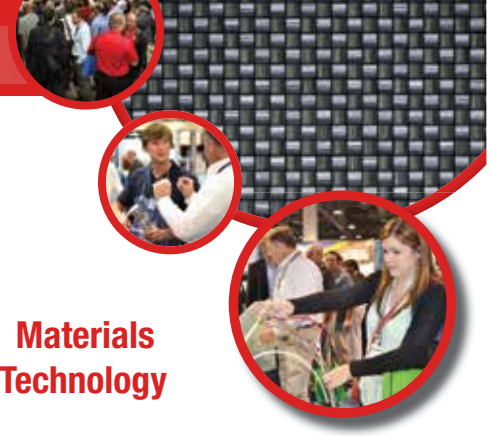


## Systems World Materials and Fabrication Technology

**Room 320**

**Category Chair:** *Susan Ruth, The Aerospace Corporation*

2:00 PM
**Manufacturing Implementation of a Thin Coating**
*Thomas Sutherland, Retired*

2:30 PM
**Bond Strength between Additively Manufactured Ti Alloys and Composites**
*Suraj Rawal, Lockheed Martin Space Systems Company*

3:00 PM
**Design Versus Manufacturing, Some Important Differences**
*Thomas Sutherland, Retired*

3:30 PM
**Development of an XML Framework for Materials, Processing and Testing of Composites**
*John Tierney, Center for Composite Materials*

4:00 PM
**Manufacturing Experiences with Extruding Variable-Viscosity Paste Adhesives**
*Thomas Sutherland, Retired*

## Composite Analysis

**Room 319**

**Category Chairs:** *James Nelson, 3M; Travis Bogetti, Army Research Laboratory; and Nassif Rayess, University of Detroit Mercy*

8:00 AM
**Static Compression Response of Syntactic Foam Under Hydrostatic Confinement**
*Rafid Kully, United States Air Force*

8:30 AM
**Wrinkling Analysis of Composite Sandwich Plates Under Thermal Loading**
*Shaher Abdallah, California State University*

9:00 AM
**Applying Finite Element Simulation to Predict Engineering Constant of Woven Composites**
*Dustin Souza, e-Xstream Engineering*

9:30 AM
**An Analysis Methodology to Predict Damage Propagation in Notched Composite Fuselage Structures**
*Andrew Bergan, NASA Langley*

10:00 AM
**Multi-Scale Measurement of Tensile Behavior of Glass Fiber Composites at High Strain Rate: Fiber Fragmentation in Epoxy Resin**
*Jae Hyun Kim, NIST*

10:30 AM
**Void Level in Composites by Thermal Diffusivity**
*Steve Sauerbrunn, University of Delaware - CCM*

11:00 AM
**Multiaxial Dynamic Constitutive Equation for Syntactic Foam**
*Rafid Kully, United States Air Force*

11:30 AM
**Analysis of a Woven Fiber Reinforced Composite Material Under Compressive Loading Conditions**
*German Reyes, University of Michigan-Dearborn*

## Composite Applications in the Automotive Industry - 1

**Room 314**

**Category Chairs:** *Libby Berger, General Motors R&D; James Stevenson, Stevenson PolyTech LLC; and Dirk Heider, University of Delaware*

10:30 AM
**Assessment of Induction Heating Methods for High-Volume Manufacturing of Carbon Thermoplastic Composites**
*Shridhar Yarlagadda, University of Delaware*

11:00 AM
**Breaking Barriers in Polymer Additive Manufacturing**
*Lonnie Love, Oak Ridge National Laboratory*

11:30 AM
**Compression Resin Transfer Molding Simulation for Net Shape Manufacturing of Composite Structures for Automotive Applications**
*Pavel Simacek, University of Delaware*

## Composites Manufacturing

**Room 318**

**Category Chairs:** *Pierre-Henri Cadaux, Airbus; Ali Yousefpour, National Research Council Canada; Matt Trexler, Under Armour; and Scott Case, Virginia Tech*

8:00 AM
**Introducing Thermal History Producibility Assessment at Conceptual Design**
*Janna Fabris, Composites Research Network*

8:30 AM
**Development of a Unique Bonded-Magnet Material**
*Paul Honka, Beacon Power*

9:00 AM
**Thermoplastic Materials Interest to Answer the Industrial Needs**
*Cyrille Collart, Airbus Operations SAS*

9:30 AM
**Three-Dimensional Textile Composites**
*Yao Chen, U.S. Army Armament Research, Development and Engineering Center*

10:00 AM
**3D Fiber Spraying – Development of an Automated High Volume Capable Preforming Technology for Structural RTM-Parts**
*Marc Linus Fecher, IKV Aachen*

10:30 AM
**Quality Controlled Induction Welding by Adapted Process Parameters**
*Peter Mitschang, Institut für Verbundwerkstoffe GmbH*

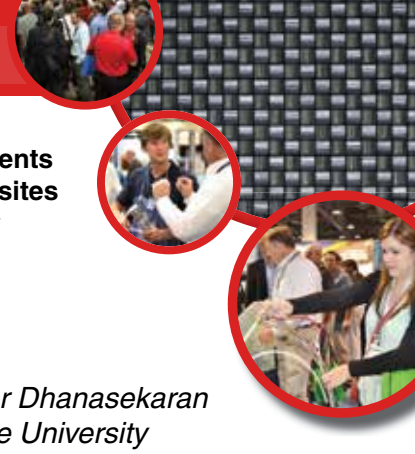
## High Temperature Systems and Structures

**Room 316**

**Category Chairs:** *Thomas Tsotsis, The Boeing Company and Lessa Grunenfelder, University of Southern California*

8:00 AM
ITAR **Multi-Mode Spectroscopic Investigation of Imidization Reactions in High-Temperature Polyimides**
*Jonathan Spowart, Air Force Research Laboratory*

8:30 AM
**Carbon-Reinforced Cyanate Ester Composites**
*Jitendra Tate, Texas State University, San Marcos*



10:00 AM
**Sulfone Based Phthalonitrile Resins for Advanced High Temperature Applications**
*Matthew Laskoski, Naval Research Laboratory*

10:30 AM
**DARPA Materials Development for Platforms (MDP)**
*Mick Maher, DARPA*

11:00 AM
**Second Generation PEEK-Like Phthalonitrile Resin for Advanced High Temperature Applications**
*Teddy Keller, Chemistry Division, Naval Research Laboratory*

11:30 AM
**Effect of In-Situ Cure on Measurement of Glass Transition Temperatures in High-Temperature Thermosetting Polymers**
*Andrew Guenthner, Air Force Research Laboratory*

## Multifunctional Composites - 1

**Room 320**

**Category Chairs:** *Erik Thostenson, University of Delaware; Shridhar Yarlagadda, University of Delaware; and Ever Barbero, West Virginia University*

8:00 AM
**Electro Structural Composites**
*Michel Bermudez, Airbus Group*

8:30 AM
**Damage Sensing of Nanocomposites for Smart Paste Applications**
*Joung-Man Park, Gyeongsang National University*

9:00 AM
**Measurement and Prediction of Electrical Response of Composite Materials**
*Mohammad Faisal Haider, University of South Carolina*

9:30 AM
**Novel Sensing Behavior of Carbon Nanotube Multifunctional Composites**
*Hao Liu, Center for Composite Materials; Department of Mechanical Engineering - University of Delaware*

10:00 AM
**Compressive Strain Sensing Using 3D Graphene Oxide Hydrogels**
*Young-Bin Park, Ulsan National Institute of Science and Technology*

10:30 AM
**Evaluation of Size Effect on Epoxy Resin Tensile Properties Using Micro-Scaled Specimens**
*Jun Misumi, Toray Industries, Inc.*

11:00 AM
**Novel Fiber Composites for Simultaneous Strengthening and Structural Health Monitoring of Steel Structures**
*Sagar Doshi, University of Delaware*

11:30 AM
**Extrinsic Response Coefficients for Magnetoelectric Composites**
*Tomas Muchenik Cena, West Virginia University*

## Multi-Scale Modeling - 1

**Room 317**

**Category Chair:** *Puttagounder Dhanasekaran Swaminathan, Kennesaw State University*

11:30 AM
**Modeling for Thermal Conductivities of CNT-Woven Fabric Hybrid Composites**
*Myungsoo Kim, Youngsan University*

## Open Manufacturing - Bonded Composites

**Room 317**

**Category Chair:** *Brad Hanson, Lockheed Martin*

8:00 AM
**TRUST Overview - Proving the Ability to Quantify Bonded Assembly Reliability**
*Brad Hanson, Lockheed Martin*

8:30 AM
**Materials and Processes for the Development of the TRUST Program Informatics Baseline**
*Michelle Palmer, Lockheed Martin*

9:00 AM
**TRUST Informatics Baseline Bond Process Double Cantilever Beam and Edge Notch Flexure Test Procedures and Results**
*Carl Popelar, Southwest Research Institute*

9:30 AM
**Modeling and Characterization of DCB Test Results for TRUST**
*Barron Bichon, Southwest Research Institute*

10:00 AM
**TRUST – A Novel Approach to Determining Effects of Archetype Contaminant Compounds on Adhesion of Structural Composites**
*Brietta Oakley, Brighton Technologies Group*

10:30 AM
**Atmospheric Pressure Plasma Treatment of Organic Matrix Composites for Structural Adhesive Bonding**
*Arshaluis Hogikyan, Aerospace Materials Processing*

11:00 AM
**Laser Surface Preparation of Epoxy Composites for Secondary Bonding: Optimization of Ablation Depth**
*Frank Palmieri, NASA Langley Research Center*

## Structural Health Monitoring - 1

**Room 318**

**Category Chairs:** *Ignacio Perez, Office Naval Research; Mark Seaver, Sotera Defense Solutions; Young-Bin Park, Ulsan National Institute of Science and Technology (UNIST); and Roger Crane, Watson and Company*

11:00 AM
**Integration of CdSe Nanocrystals for Damage Detection**
*Cole Brubaker, Vanderbilt*

11:30 AM
**S-Parameters for Ultrasound Inspection of Composite Lap Joints**
*Md Mazharul Islam, University of Texas at Arlington*

## Structure / Properties Relationships

**Room 314**

**Category Chair:** *Sanjib C. Chowdhury, Univ of Delaware*

8:00 AM
**In-Situ Ablation Recession and Thermal Sensor Based on Ultra-Fine Thermocouples**
*Joseph Koo, University of Texas at Austin*

8:30 AM
**A Structure Property Study of Epoxy Resins Reacted with Epoxy Silicones**
*Robert Ruckle, Siltech Corporation*

9:00 AM
**Environmental Effects on the Dielectric Response of Composite Materials During Damage Development**
*Rassel Raihan, University of South Carolina*

9:30 AM
**Heterogeneous Networks of Miscible Rubber Blends**
*Carl Giller, Leidos*

10:00 AM
**Tailoring the Morphology and Wettability of Polyethersulfone Surfaces via Surface Segregation of Functionalized Chain Ends**
*Katrina Knauer, University of Southern Mississippi*

## Durability and Fatigue

**Room 316**

**Category Chair:** *Ryan Emerson, PPG*

2:00 PM
**Low Velocity, Multi-Impact Durability Performance of 3-D Co-Mingled Glass-Carbon Hybrid Composites Toughened with Thermoplastic Polyurethane Inter-Layer Films**
*Steven Boyd, Army Research Laboratory*

2:30 PM
**Behaviour of a Thick Composite Hydrofoil Under Fatigue Loading**
*Asintha Nanayakkara, Fortburn Pty Ltd.*

3:00 PM
**Corrosion Resistance of Clay/Hybrid Silanized Epoxy Ester Composites Prepared By In-Situ**
*Yujie Zhang, University of Cincinnati*

## Metal Matrix Composites

**Room 319**

**Category Chairs:** *Martin Pech-Canul, CINVESTAV-Saltillo and Peter Joyce, U.S. Naval Academy*

2:00 PM
**HYSYCVD/DN Processing of Nitride Porous Composites**
*Jose Flores-Garcia, Cinvestav IPN-Saltillo*

2:30 PM
**Selective Reinforcement Using Metal Matrix Composite and Ultrasonic Additive Manufacturing**
*Brian Gordon, Touchstone Research Laboratory*

3:00 PM
**Contemporary Concepts and Applications in the Field of Composite Materials**
*Martin Pech-Canul, Cinvestav IPN Saltillo*

## Multifunctional Composites - 2

**Room 314**

**Category Chairs:** *Erik Thostenson, University of Delaware; Shridhar Yarlagadda, University of Delaware; and Ever Barbero, West Virginia University*

3:00 PM
**Mechanical Properties of Borosilicate Glass Hollow Particle Reinforced Epoxy Matrix Syntactic Foams**
*Steven Eric Zeltmann, New York University*

3:30 PM
**Characterization of Damage Sensing Capability of Carbon Nanotube Sheet Integrated Fiber-Reinforced Composites**
*Sinan Boztepe, University of Delaware*

## Multi-Scale Modeling - 2

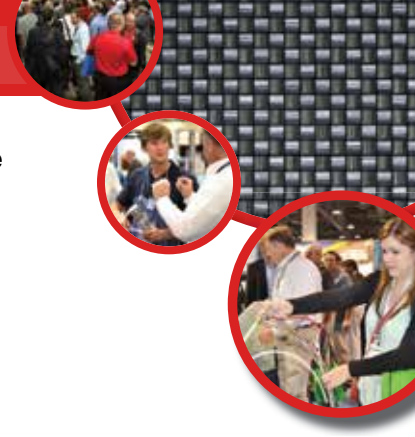
**Room 317**

**Category Chair:** *Puttagounder Dhanasekaran Swaminathan, Kennesaw State University*

2:00 PM
**Chopped Fiber Composite Progressive Failure Model Under Service Loading**
*Frank Abdi, AlphaSTAR Corporation*

2:30 PM
**Verification of Parameters for Cohesive Zone Method (CZM) Modelling of Fatigue Propagation in Laminated CFRP Composites**
*Naglaa ElAgamy, Carleton University*

3:00 PM
**Study of the Mechanical Properties of Kevlar Fibril Using Molecular Dynamics Simulations**
*Sanjib Chowdhury, University of Delaware Center for Composite Materials; University of Delaware - CCM*



3:30 PM
**Modeling Damage in Composite Materials Using an Enrichment Based Multi-Scale Method**
*Michael Macri, Benet Labs*

## Structural Health Monitoring - 2

**Room 318**

**Category Chairs:** *Ignacio Perez, Office Naval Research; Mark Seaver, Sotera Defense Solutions; Young-Bin Park, Ulsan National Inst of Science and Technology (UNIST); and Roger Crane, Watson and Co.*

2:00 PM
**Hybrid Sensing of Gearbox Spline Damage State: Acoustic Emission and Ultrasonics**
*Didem Ozevin, University of Illinois at Chicago*

2:30 PM
**Detection of CFRP Composite Manufacturing Defects Using a Guided Wave Approach**
*Tyler Hudson, National Institute of Aerospace and North Carolina State University*

3:00 PM
**Ultrasonic Studies of Nuclear Graphite for Structural Health Monitoring Applications**
*Lauren Olasov, Johns Hopkins University*

3:30 PM
**A Hybrid Model for Damage Localization and Prognosis Including Temperature Compensation**
*Rajesh Kumar Neerukatti, Arizona State University*

## Tooling

**Room 320**

**Category Chairs:** *Dave Dickson, The Boeing Company and Louis Dorworth, Abaris Direct Services*

2:00 PM
**Experimental Assessment of Elastomeric Tooling Longevity in Actual Service Conditions Through Material Characterization**
*Antonio Paesano, The Boeing Company*

2:30 PM
**Autoclave Equivalent Composites via Thermally Activated (Soluble) Mandrels**
*Zachary Wing, Advanced Ceramics Manufacturing*

3:00 PM
**Flexible Tooling System for the Manufacturing of a Passive Dynamic Ankle Foot Orthosis**
*Francis Fish, University of Delaware - CCM*

3:30 PM
**Patern-Less Casting of Thin Walled Invar Tooling**
*Simon Durham, Monmet Ltd.*

## Alternative Energy/Wind: Technologies, Material, Processes, and Manufacturing

**Room 319**

**Category Chair:** *Nicholas Shevchenko, University of Delaware - CCM*

8:30 AM
**Manufacturing and Testing of Liner-less All-Composite Tanks for Storage and Transportation of CNG**
*Ranji Vaidyanathan, Oklahoma State University*

9:00 AM
**Experimental Testing of a Wave Energy Conversion System**
*Sarah Mouring, United States Naval Academy*

## Composite Applications in the Automotive Industry - 2

**Room 314**

**Category Chairs:** *Libby Berger, General Motors R&D; James Stevenson, Stevenson PolyTech LLC; and Dirk Heider, University of Delaware*

8:00 AM
**Validation of Material Models for Crash of Carbon Fiber Composites: Setting Targets and Initial Design**
*Libby Berger, General Motors R&D*

9:30 AM
**New Epoxy Prepreg Resin Technology for High Volume Automotive Applications**
*Steve Greydanus, Hexion Inc.*

10:00 AM
**Wetlaid Nonwovens Made of Recycled Carbon Fiber for Automotive Applications**
*Tobias Harbers, Institute for Carbon Composites, Technische Universität München, Faculty of Mechanical Engineering*

10:30 AM
**Mechanics of Mechanical Bonding in Carbon Fiber Reinforced Thermoplastic Polymer Composite**
*Istemi B. Ozsoy, Clemson University*

11:00 AM
**High Volume Manufacturing of Lightweight Epoxy Automotive Crash Structures**
*Steve Greydanus, Hexion Inc.*

## Design and Analysis

**Room 318**

**Category Chairs:** *Jerome Tzeng, U.S. Army Research Laboratory and John Tierney, University of Delaware - CCM*

8:00 AM
**LS-DYNA Simulation for Dynamic Confined Compression Test of Syntactic Foam**
*Rafid Kully, United States Air Force*

8:30 AM
**Design and Manufacturing of the Vacuum Infused Fiberglass Hopper Car Body**
*Ivan Sergeichev, Skolkovo Institute of Science and Technology*

9:00 AM
**Design Optimization of Variable Stiffness Composite Cylinders for Axial Buckling**
*Mohammad Rouhi, Concordia Center for Composites (CONCOM), Concordia University*

9:30 AM
**Effects of Truncated Spherical Radome Position on Antenna Patterns and Boresight Error**
*Lili Tong, Harbin Engineering University*

10:00 AM
**Model Validation and Calibration of Low Velocity Impact of Carbon Fiber Laminates with Fiber Bridging Delamination**
*Stacy Nelson, Sandia National Laboratories*

10:30 AM
**Advanced Military Footwear System with Composite Orthotic**
*John Tierney, University of Delaware*

11:00 AM
**Design Optimization and Automation of Metal and Composite Bike Frame**
*Chin-Tang Chang, Advanced International Multitech*

11:30 AM
**Effect of Material Anisotropy on the Structural Response of Flexible Composite Hydrofoils**
*Andrew Phillips, Defence Science and Technology Organization*

## Nanomaterials, Nanocomposites and Nanomanufacturing - 2

**Room 320**

**Category Chairs:** *Kristopher Behler, ARL (TKC Global); Mark Griep, U.S. Army Research Laboratory; and Joseph Koo, University of Texas at Austin*

8:00 AM
**Axial and Transverse Air Permeability of Laminate of CFRP Prepregs Containing Z-Aligned Carbon Nanofibers**
*Kuang-Ting Hsiao, University of South Alabama*

8:30 AM
**Atomistic and Macro-Scale Mechanical Property Testing of POSS Nanocomposites for Space Applications**
*Jessica Piness, University of Southern Mississippi*

9:00 AM
**Characterization of Hybrid CNT Polymer Matrix Composites**
*Brian Grimsley, NASA Langley Research Center*

9:30 AM
**Mode-I Delamination Characterization of OOA-VBO cured Z-aligned Carbon Nanofiber Stitched CFRP Composites**
*Kuang-Ting Hsiao, University of South Alabama*

10:00 AM
**In Situ Process Monitoring of Carbon Nanotube/ Glass Fiber/Polyester Multiscale Hybrid Composites**
*Young-Bin Park, UNIST*

10:30 AM
**Functionalized Nafen™ Alumina Nanofiber (ANF) Reinforced Polyamide 6 Nanocomposites: Mechanical, Thermal and Flame Retardant Properties**
*Hao Wu, University of Texas at Austin*

11:00 AM
**Porous Graphene-Polyimide Nanocomposites for Energy Storage**
*Patricia Okafor, University of Cincinnati*

11:30 AM
**Formulating Low Surface Energy Nano-Composite Materials for Superior Ice-Phobicity Applications**
*Binoy (Ben) Bordoloi, Ames Rubber Corp.*

## Out-of-Autoclave: Materials, Processes, Tooling, Structures, and Applications - 1

**Room 316**

**Category Chairs:** *Leslie Cohen, Hitco; Timotei Centea, Univ. of Southern California - M.C. Gill Composites Center; and James Sutter, SCRA Applied R&D*

8:00 AM
ITAR **Inflatable Pressure Intensifier for Lower Cost Large Component Out-of-Autoclave Composite Processing**
*David Cadogan, ILC Dover*

8:30 AM
ITAR **Hydrogen Permeation Analysis and Testing of Composite Materials and Composite Cryogenic Tanks**
*Michael Robinson, Boeing*

9:00 AM
**Characterization of a Novel High Temperature Capable Thermoplastic Foam Core Material**
*Stephanie Williams, Composites Consulting Group*

9:30 AM
2 **Role of Prepreg Interlayer Permeability on Void Reduction During Oven Vacuum Bag Processing of Thick Section Thermoplastic Composites**
*Danning Zhang, University of Delaware*

10:00 AM
**The Influence of Prepreg Architecture on Part Quality for Vacuum Bag Only Processing**
*Lessa Grunenfelder, University of Southern California*

10:30 AM
**In-Plane Gas Evacuation of Partially Impregnated Pre-Preg Laminates in Out-of-Autoclave Processing**
*Thomas Cender, University of Delaware*

11:00 AM
**Porosity-Free Molded Surfaces for Out-of-Autoclave Composites**
*Mikhail Grigoriev, Aerospace Materials Processing*

11:30 AM
**Gold Nanorods for Thermal Accumulation Sensors and Cure Monitoring of Out-of-Autoclave Epoxy Resin**
*Gregory Ehlert, Air Force Research Laboratory*

## Space Materials, Structures and Applications

**Room 319**

**Category Chairs:** *Paul Biermann, Johns Hopkins University - Applied Physics Laboratory and Suraj Rawal, Lockheed Martin Space Systems*

9:30 AM
**Radiation Smart Structures and Materials With H-Rich Nanostructured Multifunctional Materials**
*Ranji Vaidyanathan, Oklahoma State University*

10:00 AM
**An Overview of Space Exploration Missions of ESA (European Space Agency) with a Focus on Materials, Processes and Structures**
*Christopher Semprimoschnig, ESA (European Space Agency)*

10:30 AM
**Effects of Core Orientation on Honeycomb Sandwich Structures Under Three Point Bending**
*Joshua Lister, California Polytechnic State University*

11:00 AM
**Composite Thermal Doublers for Spacecraft Bus Structures**
*Suraj Rawal, Lockheed Martin Space Systems Co.*

11:30 AM
**Effects of Unequal Face Thickness on Honeycomb Sandwich Structures Under Bending Loads**
*Joshua Lister, California Polytechnic State University*

## Structural Health Monitoring - 3

**Room 317**

**Category Chairs:** *Ignacio Perez, Office Naval Research; Mark Seaver, Sotera Defense Solutions; Young-Bin Park, Ulsan National Institute of Science and Technology (UNIST); and Roger Crane, Watson and Company*

8:00 AM
**Fiber Bragg Grating Sensors Wrapped with Carbon Nanotube Sheets**
*Kara Peters, North Carolina State University*

8:30 AM
**Spatially Continuous Fully Distributed Microwave and Photonic Sensors for Structural Health Monitoring**
*Liwei Hua, Clemson University*

9:00 AM
**A Fiber Laser Sensor for Direct Detection of Structural Ultrasonics**
*Mark Seaver, Sotera Defense Solutions, Inc.*

9:30 AM
**Phase-Shifted Fiber Bragg Grating for Ultrasonic SHM of Composites**
*Fengming Yu, University of Tokyo*

10:00 AM
**Intensity-Demodulated Distributed Bragg Resonator Fiber Laser Ultrasonic Sensor**
*Ming Han, University of Nebraska Lincoln*

10:30 AM
**Fundamental Detection Sensitivity of Fiber Optic Acoustic Emission Sensors**
*Geoffrey Cranch, Naval Research Laboratory*

## Testing, Test Methods - 1

**Room 314**
**Category Chair:** *Judy Schneider, Mississippi State University*

11:30 AM
**Failure Analysis of High-Strength Fiber Ropes**
*Annett Schmieder, Technische Universität Chemnitz*

## Adhesives & Bonding

**Room 316**
**Category Chair:** *Dmitriy Salnikov, 3M Aerospace*

3:00 PM
**Critical Bonding and Corrosion Protection of Metals with Atmospheric Plasma Deposited Nano-Coatings**
*Wally Hansen, Plasmatreat USA Inc.*

3:30 PM
**Modeling Glass Fiber Sizing Interphase Layer Using Molecular Dynamics Simulations**
*Sanjib Chowdhury, University of Delaware - CCM*

4:00 PM
**Rate Dependent Mechanical Behavior of Polymer Network Isomers with Controlled Topology**
*Majid Sharifi, Drexel University*

4:30 PM
**Development of a Water Based, Non-Chromated, Sol-Gel Compatible Adhesive Bonding Primer**
*Lance Chen, 3M Company*

## Composite Process Modeling

**Room 319**

**Category Chairs:** *Eric Wetzel, U.S. Army Research Laboratory and Suresh Advani, University of Delaware*

2:00 PM
**Mathematical Simulation of Residual Deformation of Complex Composite Profiles During Pultrusion**
*Alexander Safonov, Skolkovo Institute of Science and Technology*

2:30 PM
**A Methodology to Reduce Variability in VARTM with Optimized Distribution Media Design**
*Hatice S. Sas, University of Delaware*

3:00 PM
**Resin Flow into Fiber Tows: Role of Fiber Microstructure**
*Michael Yeager, University of Delaware*

3:30 PM
**OMC Processing Simulation Using an Elastic-Viscoplastic Model**
*Brent Volk, Air Force Research Laboratory*

4:00 PM
**Investigation of Rate-Effects in the Viscoelastic Compaction Behavior of Fiber Reinforcements**
*Mario Danzi, ETH Zürich*

## Composite/Hybrid Joints and Bonding

**Room 318**

**Category Chair:** *Mahmood Haq, Michigan State University and Frank Palmieri, NASA Langley Research Center*

2:00 PM
**Investigation into Hybrid Perforated Steel-To-Composite Joints**
*Sarah Mouring, United States Naval Academy*

2:30 PM
**Up-Scaling of the Ultrasonic Welding Process for Joining Thermoplastic Composites**
*Genevieve Palardy, Delft University of Technology*

3:00 PM
**Effect of Surface Treatment for Metallic Z-Reinforcements on Interlaminar Fracture Toughness of CFRP/CFRP Joints**
*Michael Juergens, Airbus Group Innovations*

3:30 PM
**Determining Bearing Strength in Advanced Composite Materials**
*Rikard Heslehurst, Abaris Training Resources*

4:00 PM
**Photoelastic Stress Evaluation and Mechanical Testing of Hybrids**
*Jyrki Vuorinen, Tampere University of Technology*

## Damage Analysis and Repair

**Room 320**

**Category Chair:** *Rikard Heslehurst, Abaris Training Resources*

2:00 PM
**Low Velocity Impact Behavior of Composite Sandwich Panels**
*German Reyes, University of Michigan-Dearborn*

2:30 PM
**Damage Tolerance and Recovery on Core-Shell Modified Vinyl Ester; Testing Observations and Application**
*Michael Mathews, PCCR USA*

## Out-of-Autoclave: Materials, Processes, Tooling, Structures, and Applications - 2

**Room 316**

**Category Chairs:** *Leslie Cohen, Hitco; Timotei Centea, Univ of Southern California - M.C. Gill Composites Center; and James Sutter, SCRA Applied R&D*

2:00 PM
**Thermal Gradients During Out-of-Autoclave Prepreg Cure: Case Study Using a Heated Tool**
*Timotei Centea, University of Southern California*

2:30 PM
**Out-of-Autoclave Surface Finish Investigation**
*Nicole Larson, Western Washington University*

## Thermoplastics

**Room 320**

**Category Chair:** *Uday Vaidya, University of Alabama*

3:00 PM
**Plasma Surface Treatment for Thermoplastic Composite Bonding**
*Xiaomei Fang, United Technologies Research Center*

3:30 PM
**Flash DSC: UHMWPE During Extremely Fast Heating and Cooling**
*Joe Deitzel, University of Delaware*

4:00 PM
**Novel Thermoplastic Composite Materials for High Performance, High Volume Applications**
*Michael Favaloro, CompositeTechs, LLC*

4:30 PM
**Inline-Impregnation – Individualized Production of Thermoplastic Continuous Fiber Reinforced Composite Parts**
*Markus Hildebrandt, IKV Aachen*

## Structural Health Monitoring - 4

**Room 317**

**Category Chairs:** *Ignacio Perez, Office Naval Research; Mark Seaver, Sotera Defense Solutions; Young-Bin Park, Ulsan National Institute of Science and Technology (UNIST); and Roger Crane, Watson and Company*

2:00 PM
**Broadband Fiber Bragg Grating Interrogation for Structural Health Monitoring**
*Richard J. Black, Intelligent Fiber Optic Systems Corporation (IFOS)*

2:30 PM
**Fiber Optic Acoustic Emission SHM System for Condition Management of Aircraft Structures**
*Edgar Mendoza, Redondo Optics*

3:00 PM
**Identification of Acoustic Emission Sources Using in Situ Microscopy**
*Brian Wisner, Drexel University*

3:30 PM
**Small Fatigue Crack Initiation and Sizing Using Acoustic Emission**
*Mohammad Modarres, University of Maryland*

4:00 PM
**Assessment of Oxidative Aging in Asphalt Concrete Pavements with Unknown Acoustic Properties**
*Henrique Reis, Univ of Illinois at Urbana-Champaign*

4:30 PM
**Estimation of Low-Temperature Cracking in Asphalt Concrete Pavements Using an Acoustic Emission Approach**
*Henrique Reis, Univ of Illinois at Urbana-Champaign*

## Testing, Test Methods - 2

**Room 314**

**Category Chair:** *Judy Schneider, Mississippi State Univ*

2:00 PM
**Biaxial Testing of a Composite Laminate with Matrix Damage Using Iosepescu Fixture**
*Mahdi Salavatian, Washington State University*

2:30 PM
**A Case Study of Composite Materials Characterization for Certification**
*Ho-Sung Lee, Korea Aerospace Research Institute*

3:00 PM
**Investigating the Effects of Turbine Engine Fuels on the Mechanical Properties of Carbon Fiber Aircraft Structures**
*Tyler Futch, Purdue University*

3:30 PM
**Optical Metrology, the Key to Lean Manufacturing**
*John Tyson, Trilion Quality Systems*

4:00 PM
**Ultrasonic Camera for Composite Inspection: A Simple Technique for Internal Defect Detection**
*Bob Lasser, Imperium Inc.*

ITAR

**ITAR Instructions–Important session information for all attendees.**
**SAMPE Restricted Papers—ITAR Regulations Session Admittance (REV. PROCEDURES 6/05)**

Several papers to be presented at this conference will be restricted papers governed by ITAR (International Traffic in Arms Regulations). The U.S. citizens SAMPE list used at previous conferences will not be available. If you plan to attend any presentations restricted by ITAR, you must bring proof of citizenship plus the other verification documents as shown below. Please note that only U.S. citizens & U.S. Resident Aliens can be considered for attendance at these restricted presentations.

Admittance to restricted sessions and access to restricted technical papers is implemented and controlled by U.S. International Traffic in Arms Regulations (ITAR). All restricted session attendees MUST abide by the procedures and submittal of verification documents as noted below – no exceptions:

**ATTENDEE CLASSIFICATION IDENTIFICATION & PROOF OF EMPLOYMENT REQUIREMENTS**

| | |
|---|---|
| U.S. Government Employees | **1.** Proof of Citizenship (for example, passport, birth certificate, voters registration card, naturalization papers), **and,**<br>**2.** Personal photographic identification (passport, driver's license, corporate ID, etc.) |
| U.S. Citizens | **1.** Proof of Citizenship (for example, passport, birth certificate, voters registration card, naturalization papers), **and,**<br>**2.** Personal photographic identification (passport, driver's license, corporate ID, etc.), **and**,<br>**3.** Certification credentials based on DD Form 2345 (see below for details) |
| Resident Aliens (U.S.) | **1.** Resident Alien Card, **and**,<br>**2.** Personal photographic identification (passport, driver's license, corporate ID, etc.), **and**,<br>**3.** Certification credentials based on DD Form 2345 (see below for details) |

DD Form 2345 individual certification credentials (required for U.S. & Resident Aliens) must be from one of the following:

1. Copy of an approved and active DD Form 2345 for the individual, or,
2. Copy of an approved and active DD Form 2345 for the individual's employer PLUS evidence of current employment status with that employer (corporate ID, business card, etc.), or,
3. A listing of the individual's employer in the most recent DoD quarterly Qualified U.S. Contractor Access List PLUS evidence of current employment status with that employer (corporate ID, business card, etc.).

DD Form 2345 may be downloaded and completed online in order to apply for approval to be listed on the Qualified U.S. Contractor List, www.dlis.dla.mil/jcp/. **How to get your ITAR Clearance:**

Bring all of the above listed identification, proof of employment and certification credentials to the to the ITAR Clearance counter at the SAMPE Registration area. Your documents will be verified and you will be provided with a stamp indicating your ITAR clearance. Photo ID will be checked against your ITAR badge before admittance is granted to any ITAR presentation.

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*Kirk Flannery*
*Maintenance Manager, AIM Aerospace*

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## Registration Hours

| | |
|---|---|
| Monday, May 18 | 7:00 a.m. – 5:00 p.m. |
| Tuesday, May 19 | 7:00 a.m. – 5:00 p.m. |
| Wednesday, May 20 | 7:00 a.m. – 5:00 p.m. |
| Thursday, May 21 | 7:00 a.m. – 5:00 p.m. |

## Exhibit Hall Hours

| | |
|---|---|
| Monday, May 18 | Closed |
| Tuesday, May 19 | 11:00 a.m. – 5:00 p.m. |
| Wednesday, May 20 | 10:00 a.m. – 5:00 p.m. |
| Thursday, May 21 | Closed |

## Cancellation/Substitution Policies

All registrations are subject to the following policies. Cancellations: Cancellations must have been made in writing or by e-mail by April 20.
Refunds: Refunds must have been requested by April 20. Refunds are not given for failure to attend, late arrival, unattended events or early departure from the meeting. Refunds are processed approximately 60 days after the meeting.
Substitutions: Substitutions can be made at any time, by letter, e-mail or fax. The appropriate member/non-member rate will apply to attending substitutions. There is no charge for making a substitution.

## Exhibit Hall Rules for Attendees

- No children under the age of 18 are permitted in the exhibit hall.
- All exhibit hall attendees must be badged.
- No photography is permitted without the consent of booth personnel.

## Recommended Attire

Recommended attire for all events is business casual.

## SAMPE Lounges/Charging Stations


Lounges: A54, H56, J20 & 3rd Floor Terrace.

## Food and Beverage

Market Fresh Café, 3rd level.

## Wifi Location

Available in Registration, at the Market Fresh Café and 3rd Floor Terrace Lounge.

## Photographic Images and Video Policies

- Photos and video during Conference Programs is strictly prohibited. Only the approved SAMPE Baltimore photographer may photograph Conference Programs.
- Registration and attendance at, or participation in, SAMPE meetings and other activities constitutes an agreement by the registrant to SAMPE's use and distribution (both now and in the future) of the registrant or attendee's image or voice in photographs, videotapes, electronic reproductions and audiotapes of such events and activities.

## Conference Program

Sessions are the only programs in which a full-length technical paper will be published on our proceedings. Conference registration is required for admittance to sessions and panels. Tutorial registration is required for admittance to tutorials.

## ITAR

Sessions listed in the program followed by and "(ITAR") note, are sessions that include ITAR restricted papers. These sessions are not necessarily fully closed sessions. Some open papers may be included in the session. For more details about the papers in the session, see page 26. Papers that are ITAR restricted include an (ITAR) notation.

ITAR

### Why Does SAMPE Offer ITAR Presentations?

SAMPE provides a forum for M&P professionals to share advancements of materials and processes with an engaged audience. We strive to be as inclusive as possible, as the sharing of technology is what drives advancement. However, a small portion of our conference programs contain information that is regulated by International Traffic in Arms Regulations. As a result, attendance to ITAR presentations is restricted to US Citizens who are employees of the US Government or of US Government contractors. We're proud that we can offer a forum for professionals to share ITAR restricted information. Furthermore, we are aware that not everyone can attend these ITAR sessions, so we ensure that there are plenty of open programs that our international and non-ITAR cleared conference attendees can attend instead.
If you plan to attend any sessions restricted by ITAR, you must bring proof of citizenship plus the other verification documents. Individuals can apply for clearance at the ITAR counter in the registration area during the conference. You will receive a special ITAR badge, which will have your picture on it. Only individuals who have ITAR clearance may enter an ITAR presentation.

## Lost and Found

Return lost and found items to the SAMPE Registration Area. Items not claimed by the close of the event will be handed over to the Baltimore Convention Center Security.

## Speaker Orientation

Speakers and session chairs are required to attend the speaker orientation meeting at 7:00 AM in Room 301 on the day of their session/presentation.

## Notice

The presentations listed in this Final Program are subject to change and cancellation due to circumstances beyond our control.

## Contact SAMPE

1161 Park View Drive, Suite 200, Covina, CA 91724-3759
Ph: +1 626.331.0616
E: info@sampe.org
www.sampe.org

# STUDENT ADDITIVE MANUFACTURING CONTEST

SAMPE's newest competition, the SAMPE Student Additive Manufacturing Contest, provides an opportunity for students to learn and expand their abilities in additive manufacturing and engineering design. Competitors have designed a rigid vertical support (column or tower) printed by the governing committee. Columns/towers will be tested in the Bridge Contest area on Wednesday, May 20, in the exhibition hall aisle "L" between 11:00 am to 4:00 pm.

**May 20, 2015**
**11:00 am – 4:00 pm**
**Exhibit Hall** AISLE L

**Governing Committee**
Rick Willardson, ELM Energy
Bob Green, ELM Energy
Matthew Morosoff, Stratyasys
Michael Block, Stratasys

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# SAMPE STUDENT BRIDGE CONTEST

The 18th annual SAMPE Bridge Contest will be held on Wednesday, May 20, in the exhibition hall aisle "L." Bridge testing will take place between 11:00 am to 4:00 pm. Broken bridges will be on display afterwards. Each of the university teams will submit a poster highlighting some aspect of their entry. These are on display on the second floor.

**May 20, 2015**
**11:00 am – 4:00 pm**
**Exhibit Hall** AISLE L

**Bridge Committee**
Dr. LaNetra C. Tate, NASA
T.J. Zimmerman, The Boeing Company
Sarah Cox, NASA

**Participating Schools**
Cal Poly Aerospace
Cal Poly San Luis Obispo
Chengdu Aeronautic Polytechnic
Cuesta College
FAMU-FSU College of Engineering
Harbin Engineering University
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FINAL CALL FOR PAPERS

# SAMPE EUROPE

## CONFERENCE 15 AMIENS

15th -17th September • Amiens, France

**LOCATION:** MÉGACITÉ - EXPO & CONFERENCE CENTER, AMIENS (1 HOUR NORTH OF PARIS)
**DATA**: Tuesday 15 – Thursday 17 September 2015

## AMIENS CALL FOR PAPERS!

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| Student Member Badge | € 200 | Student Member Badge | € 250 |
| Student Trial Member Badge | € 250** | Student Trial Member Badge | € 300** |
| Non Member Student Badge | € 300 | Non Member Student Badge | € 350 |

*** Free membership until 31 December 2016*

# CONFERENCE 15 AMIENS

## PRELIMINARY PROGRAM

### Tuesday 15 September

16.00 Registration
18.30 Welcome Reception

### Wednesday 16 September

08.00 Registration
09.00 Opening & Plenary session
10.30 Parallel Sessions & Coffee break
13.00 Lunch
14.00 Parallel Sessions & Tea break
16.00 Transfer to Stelia Méaulte
16.30 Plant visit Stelia Méaulte & adjacent NEW R&D Center

EXTRA PLANT VISIT STELIA AEROSPACE

19.00 Transfer to Dinner location
20.00 Conference Dinner

### Thursday 17 September

08.00 Registration
09.00 Parallel Sessions & Coffee break
12.00 Lunch
13.00 Parallel Sessions & Tea break
15.00 Plenary Session & Closure
16.30 Happy Hour & Farewell

### Additional

Students Conference & Tutorials
Location: IBIS Amiens Cathedrale

** 30th Students Conference Amiens
Sunday 13 -Tuesday 15 September

Pre-Conference Tutorial Program given by:
- Arnt Offringa, Fokker Aerostructures (NL)
- Scott Beckwith, BTG Composites Inc. (USA)

Tuesday 15 September 9.00- 15.00 Hrs.

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# Confidence Starts at Ground Level.

## Advanced Composite Solutions and Industry Leading Tooling Expertise.

When the world's most demanding aerospace organizations look for a partner to help design and produce their advanced composites and tooling needs that exceed their rigorous standards, they count on AIP Aerospace's Composites Horizons and Ascent Tooling Group to deliver.

CHI is a specialty manufacturer of high temperature composites used in the gas turbine engine and nacelle industry. Over the past five years, the company has grown significantly with a current backlog in excess of $330M and is planning for added expansion in new Ceramic Matrix Composites (CMC) products as well as its traditional carbon fiber Polyimide and carbon Bismaleimide (BMI) components for aero engines.

The Ascent Tooling Group (Coast Composites, Odyssey Industries, and Global Tooling Systems) specializes in small to large scale complex tooling for composites manufactured from a wide variety of materials, including Invar, steel, carbon Bismaleimide (BMI), carbon epoxy, carbon foam, and monolithic graphite.

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SAMPE BALTIMORE 2015

BOOTH A43

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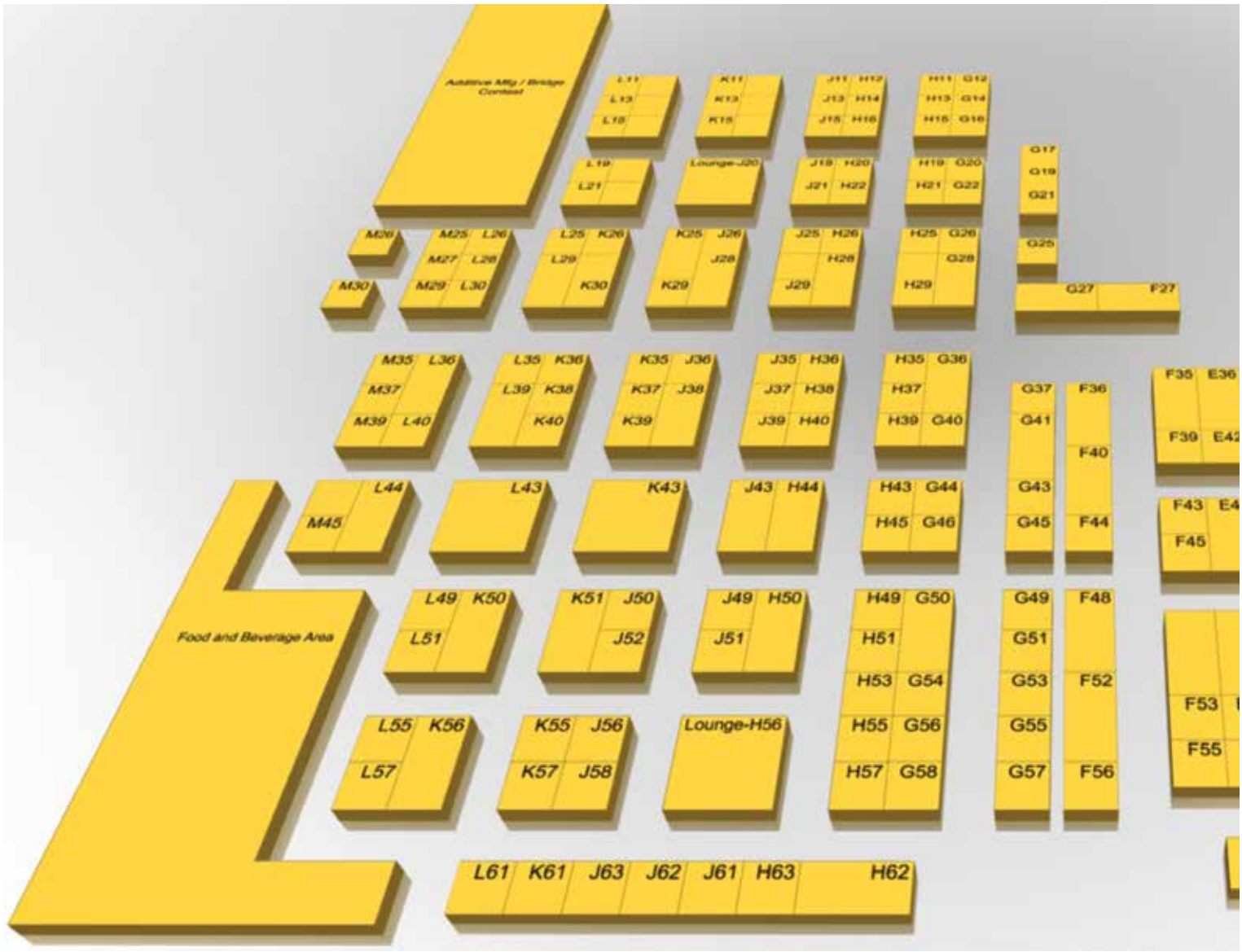


| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A&P Technology, Inc | B39 | Assembly Guidance Systems | F36 | Compotool | E61 | FARO Technologies | H20 |
| A.P.C.M. Manufacturing LLC | H44 | Associated Industries Inc. | C55 | CompuDAS | A52 | Fiber Dynamics, Inc. | K25 |
| ABARIS Training Resources Inc. | B35 | Astro Machine Works Inc. | K20 | Convergent Manufacturing Technologies | L29 | Fiber Materials Inc. | H27 |
| ACE - Applied Composites Eng. | L30 | Barrday Composite Solutions | K38 | ConQuip, Inc. | C61 | Fives Machining Systems | K50 |
| ACMOS Inc. | L49 | Bondtech Corporation | D56 | Cytec | C44 | FlackTek, Inc. | G51 |
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| Advanced Composites Inc. | J50 | C&D Zodiac dba Zodiac Advanced Composites & Engineered Materials | L43 | De-Comp Composites Inc. | J49 | General Plastics Manufacturing Co. | B37 |
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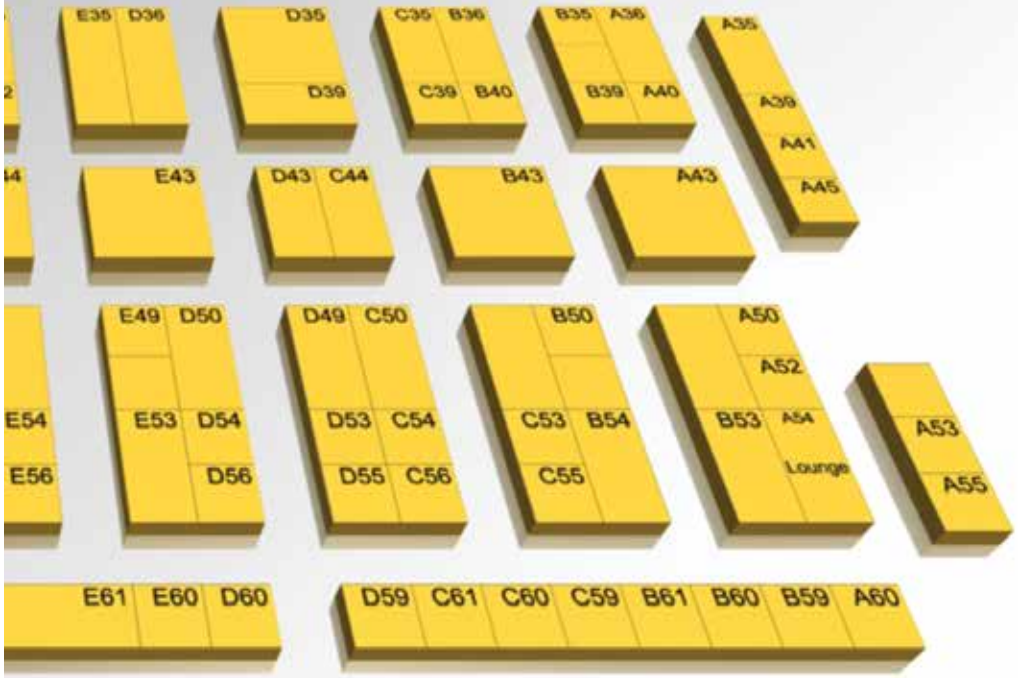
| Agilent Technologies | F55 | C.R. Onsrud Inc. | D53 | DIAB Americas LP | J39 | Harper International | J43 |
| AGY Holding Corp. | H21 | Carl Zeiss Microscopy, LLC | F44 | Dia-Stron Ltd. | H25 | HEATCON Composite Systems | B36 |
| AIP Aerospace | A43 | CGTech | A50 | Diversified Machine Systems | D50 | Henkel Corporation | D35 |
| Airtech International Inc. | D36 | Changzhou Sunlight Pharmaceutical Co. | E60 | Dunstone Company, Inc. | M39 | Hexagon Metrology | C59 |
| AlzChem LLC | L28 | Chem-Trend, LP | A40 | E.V. Roberts | E54 | Hexcel Corporation | B40 |
| American Composites Manufacturers Assoc. | A60 | Chomarat North America LLC | F49 | Elantas PDG, Inc. | B50 | Hexion Inc. | K51 |
| American GFM Corporation | D39 | CMS North America, Inc. | J38 | Element Materials Technology | C54 | Hisco | G28 |
| AMS Corehog | G46 | Coast-Line International | K56 | Ellsworth Adhesives | J25 | Hollingsworth & Vose Co. | K21 |
| Andantex USA Inc. | K55 | Composite Fabrics of America | C60 | Enfasco | G56 | Huntsman Advanced Materials | F27 |
| ANF Technology Limited | G22 | Composite Techs, LLC | L57 | Essex Brownell | G54 | Hyosung Corporation | G45 |
| Applied Aerospace Structures | H51 | Composites One | K43 | Euro-Composites Corp. | H50 | HyperSizer - Collier Research | J36 |
| Applied Graphene Materials | L61 | CompositesWorld | B59 | Evonik Corporation | E35 | Industrial Technologies, Inc. | A54/C61 |
| ASC Process Systems | B43 | | | Exelis | D59 | Ingersoll Machine Tools | D60 |
| | | | | Exova OCM | A55 | Innolab | L21 |
| | | | | Fabric Development, Inc. | J29 | | |

# & Exhibitor Alpha Listings

**Exhibit Hall Hours**

**Tuesday May 19 11:00 am - 5:00 pm**
**Wednesday May 20 10:00 am - 5:00 pm**




Innovative Composite Engineering (ICE) D43
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Intertek J61
J6 Polymers D54
Jiangsu Tetra New Material Technology M35
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McLube Division of McGee F39
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MTorres Disenos Industriales S.A.U. F52
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NASA / NASA Tech Briefs L39
NCSIMUL Solutions B60
NDT Systems A35
NETZSCH Instruments North America H26
Nordson Sealant Equipment H35
North Coast (The Companies of)
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OEM Press Systems F45
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ONExia, Inc. E51
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Pacific Coast Composites F56
Paragon D&E A41
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Permabond Engineering Adhesives G21
PFAFF Industriesystems und Maschinen GmgH - Branch KSL K61
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Prospect Mold & Die Company G40
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Radiant Energy Systems, Inc. A54
Regloplas USA H38
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Royal Engineered Composites J21
Rubbercraft J19
Rudolph Brothers & Company J37
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Sanders Composites J18
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Technology Marketing Inc. C50
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TeXtreme G25
The Gill Corporation B49
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Thermal Equipment Corp. E43
Thermal Wave Imaging, Inc. D55
Thermwood Corporation E50
THINKY USA, Inc. F35
Tinius Olsen G55
Toho Tenax America F43
Trelleborg AEM G57
Tri-Mack Plastics Manufacturing Corp. H53
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University of Delaware Center for Composite Materials L35
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Wabash MPI A53
Warm Industrial Nonwovens (WIN) M45
Web Industries A36
Weber Manufacturing Technologies Inc. L44
WichiTech Industries, Inc. G26
Wisconsin Oven Corporation L40
Wolff Industries, Inc. M30
Zeus E56

## Additives/Fire Retardants/Fillers

General Plastics Manufacturing Co. B37
Siltech Corporation G58

## Adhesives

A.P.C.M. Manufacturing LLC H44
AlzChem LLC L28
ANF Technology Limited G22
Elantas PDG, Inc. B50
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Hexion Inc. K51
Huntsman Advanced Materials F27
Krayden L25
Lucintel M26
Magnolia Advanced Materials, Inc. D49
Maverick Corporation E49
Miki Sangyo USA Inc. F53
Miller-Stephenson Chemical Co., Inc. H36
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Pro-Set Epoxy M29
PTM&W Industries, Inc. H22
Rudolph Brothers & Company J37
Synasia Inc. K28
TenCate Advanced Composites G43

## Aerospace Vehicle Protection

AGY Holding Corp. H21
Dexmet Corporation C35
JPS Composite Materials, Corp. E36

## Armor/Ballistic Materials

AGY Holding Corp. H21
Evonik Corporation E35
Fabric Development, Inc. J29
JPS Composite Materials, Corp. E36
Magnolia Advanced Materials, Inc. D49

## Assembly/Bonding Equipment

Ellsworth Adhesives J25
Innolab L21
MTorres Disenos Industriales S.A.U. F52
Nordson Sealant Equipment H35
OEM Press Systems F45
Surfx Technologies, LLC H19
WichiTech Industries, Inc. G26

## Association, Trade or Civic

American Composites Manufacturers Association A60
SAMPE H62

## Autoclaves & Autoclave Equipment

ASC Process Systems B43
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CompuDAS A52
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TE Wire & Cable H49
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## Automated Equipment

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Dia-Stron Ltd. H25
Ingersoll Machine Tools D60
Komo Machine, Inc. E42
Nordson Sealant Equipment H35
OEM Press Systems F45
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## Auxillary Processing Equipment

Wisconsin Oven Corporation L40

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FARO Technologies H20
MSC Software L51

## CAM/CAD

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FARO Technologies H20
MSC Software L51
NCSIMUL Solutions B60
Thermwood Corporation E50

## Ceramic Materials/Composites

Advanced Ceramics Manufacturing J62
Fabric Development, Inc. J29
Pacific Coast Composites F56
PMIC - Precision Measurements and Instruments Corporation G37
Trelleborg AEM G57

## Cleaning Products

Chem-Trend, LP A40
Miller-Stephenson Chemical Co., Inc. H36

## CNC Machining Equipment

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C.R. Onsrud Inc. D53
General Plastics Manufacturing Co. B37
Komo Machine, Inc. E42
Lucas Industries K36
MB Superabrasives B54
OMAX Corporation K39
Stiles Machinery Inc. G36
Thermwood Corporation E50

## Coating/Coating Removal

Applied Graphene Materials L61
Chem-Trend, LP A40
Elantas PDG, Inc. B50
Krayden L25
Magnolia Advanced Materials, Inc. D49
McLube Division of McGee Industries F39
Synasia Inc. K28

## Composite Structural Elements

ACE - Applied Composites Engineering L30
Advanced Ceramics Manufacturing J62
AIP Aerospace A43
Euro-Composites Corp. H50
Evonik Corporation E35
Exelis D59
Innovative Composite Engineering (ICE) D43
INTERMAS H57
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Trelleborg AEM G57

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# Listings

## Computer Hardware/Software


Advanced Processing Technology, Inc. (AvPro) H55
CGTech A50
Convergent Manufacturing Technologies L29
HyperSizer - Collier Research J36
NCSIMUL Solutions B60
United Testing Systems, Inc. L26


## Conductive Materials


A.P.C.M. Manufacturing LLC H44
Dexmet Corporation C35
Essex Brownell G54
Evonik Corporation E35
Rubbercraft J19
Weber Manufacturing Technologies Inc L44


## Consulting Services


ABARIS Training Resources Inc. B35
Andantex USA Inc. K55
Composite Techs, LLC L57
DIAB Americas LP J39
Element Materials Technology C54
Lucintel M26
Michigan Molecular Institute G53
Polymer Diagnostics Inc. J26
Thermwood Corporation E50


## Core Materials


Dexmet Corporation C35
DIAB Americas LP J39
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Hexcel Corporation B40
J6 Polymers D54
Plascore, Inc. K26
Revchem Composites, Inc. K29
Technology Marketing Inc. C50
The Gill Corporation B49
VerTechs Enterprises, Inc. J58


## Curing Equipment


ASC Process Systems B43
Bondtech Corporation D56
Surface Generation America G49
WichiTech Industries, Inc. G26
Wisconsin Oven Corporation L40
Wolff Industries, Inc. M30


## Cutting Equipment


MB Superabrasives B54
Stiles Machinery Inc. G36


## Cutting, Water Jet


AIP Aerospace A43
OMAX Corporation K39


## Design/Product Development Services


ACE - Applied Composites Engineering L30
Applied Aerospace Structures Corporation H51
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Convergent Manufacturing Technologies L29
Fiber Dynamics, Inc. K25
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INTERMAS H57
Michigan Molecular Institute G53
STELIA North America A51
TeXtreme G25
Vector Composites, Inc. K22


## Dimensional Photonics


Dia-Stron Ltd H25


## Education/Training/Associations


ABARIS Training Resources Inc. B35
SAMPE H62


## Fabricating Services


Advanced Composites Inc. J50
Applied Aerospace Structures Corporation H51
Astro Machine Works Inc. K20
Burnham Composite Structures, Inc. H40
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Innovative Composite Engineering (ICE) D43
Lucas Industries K36
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RMB Products Inc. K37
The Gill Corporation B49
Tri-Mack Plastics Manufacturing Corp. H53
VerTechs Enterprises, Inc. J58


## Fabricating Supplies (Breathers, Vacuum Bags, etc.)


Airtech International Inc. D36
De-Comp Composites Inc. J49
Northern Composites, Inc. E44
SWORL div of Prairie Technology Group K30
Technology Marketing Inc. C50
Warm Industrial Nonwovens (WIN) M45
Web Industries A36
Wolff Industries, Inc. M30
Zeus E56


## Fabrics, Unimpregnated (Woven, Nonwoven, Knit, Braided)


Barrday Composite Solutions K38
Chomarat North America LLC F49
De-Comp Composites Inc. J49
Fabric Development, Inc. J29
Hollingsworth & Vose Company K21
JPS Composite Materials, Corp. E36
SAERTEX USA, LLC C39
TeXtreme G25
Vectorply Corporation M37
Warm Industrial Nonwovens (WIN) M45


## Fasteners


Enfasco G56
Permabond Engineering Adhesives G21


## Fiber Handling/Mfg. Equipment


C.A. Litzler Co., Inc. F40
Harper International J43
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## Fiber, Carbon

Composites One K43
De-Comp Composites Inc. J49
Element Materials Technology C54
Hexcel Corporation B40
Hyosung Corporation G45
OSG USA, Inc. J56
Pacific Coast Composites F56
Praxair, Inc. K40
Stratasys Direct Manufacturing J28
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Toho Tenax America F43

## Fiber, Glass

AGY Holding Corp. H21
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## Fiber, Other

ANF Technology Limited G22
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## Laser Projection Equipment

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## Manufacturing Process Development

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Trelleborg AEM G57
University of Southern Mississippi C53
VerTechs Enterprises, Inc. J58
Warm Industrial Nonwovens (WIN) M45
Zeus E56

## Matrix Materials (Carbon, Ceramic, Metallic)

Praxair, Inc. K40

## Meter/Mix/Dispense Equipment

Ellsworth Adhesives J25
Nordson Sealant Equipment H35
THINKY USA, Inc. F35

## Microscope Systems

Carl Zeiss Microscopy, LLC F44

## Mold Design/Manufacturing

ACE - Applied Composites Engineering L30
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Compotool E61
Lucas Industries K36
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Weber Manufacturing Technologies Inc. L44

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Technology Marketing Inc. C50

## Nano Equipment (Materials/Machines)

Applied Graphene Materials L61
LMG M43
THINKY USA, Inc. F35

## Ovens/Dryers/Furnaces

ASC Process Systems B43
C.A. Litzler Co., Inc. F40
CompuDAS A52
Harper International J43
LEWCO, Inc. J51
Nabertherm J52
TE Wire & Cable H49
Wisconsin Oven Corporation L40

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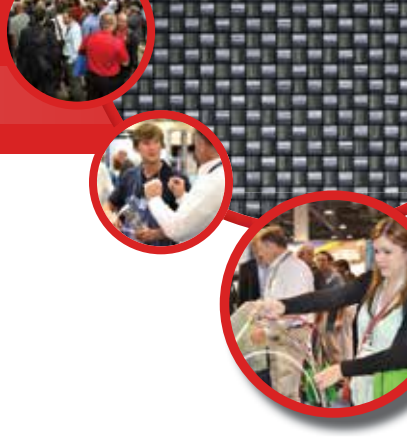

## Prepreg Manufacturing/Handling Equipment

C.A. Litzler Co., Inc. F40
HEATCON Composite Systems B36
ONExia, Inc. E51
THINKY USA, Inc. F35

## Prepregs, Thermoplastic

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Chomarat North America LLC F49
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Evonik Corporation E35
MTorres Disenos Industriales S.A.U. F52
TenCate Advanced Composites G43
Toho Tenax America F43
Web Industries A36

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AlzChem LLC L28
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Evonik Corporation E35
Hexcel Corporation B40
Hexion Inc. K51
Maverick Corporation E49
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Northern Composites, Inc. E44
Revchem Composites, Inc. K29
TCR Composites J35
TenCate Advanced Composites G43
University of Southern Mississippi C53
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## Presses, Compression/Laminating

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## Publications, Trades

CompositesWorld B59
NASA / NASA Tech Briefs L39
SAMPE H62

## Pultrusion, (Equipment/Services)

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## Rapid Prototyping

OMAX Corporation K39
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RMB Products Inc. K37
Stratasys Direct Manufacturing J28

## Release Liners

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WichiTech Industries, Inc. G26
Wolff Industries, Inc. M30

## Resin Transfer Molding Equipment

Changzhou Sunlight Pharmaceutical Co, Ltd. E60
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Elantas PDG, Inc. B50
Essex Brownell G54
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Hexion Inc. K51
Huntsman Advanced Materials F27
J6 Polymers D54
Jiangsu Tetra New Material Technology Co., Ltd. M35
Krayden L25
Maverick Corporation E49
Miki Sangyo USA Inc. F53
Pro-Set Epoxy M29
PTM&W Industries, Inc. H22
Revchem Composites, Inc. K29
Rudolph Brothers & Company J37
Shikoku Chemicals Corporation B61
Siltech Corporation G58
Synasia Inc. K28
TCR Composites J35
University of Southern Mississippi C53

## Reusable Vacuum Bags

Airtech International Inc. D36
SWORL div of Prairie Technology Group K30

## Rubber/Elastomers

Polymer Diagnostics Inc. J26
Rubbercraft J19
Stratasys Direct Manufacturing J28

## Tape Laying/Fiber Placement Equipment

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Magnum Venus Products B53

## Tooling

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Airtech International Inc. D36
MB Superabrasives B54
OSG USA, Inc. J56
Rubbercraft J19
Smart Tooling Division of Spintech, LLC H28
Surface Generation America G49

**A&P Technology, Inc.** **B39**
**4595 East Tech Drive**
**Cincinnati, OH 45245 United States**
**www.braider.com**

A&P Technology is a seventh generation, family-owned, world-leading producer of precision braided fabrics. A&P Technology's product line includes: QISO™, a single layer balanced fabric with equal properties in every direction, Bimax™, an off-the-shelf +/-45° fabric, ZERO™, a unidirectional fabric with no crimp and Sharx™ braided sleevings available in carbon, aramid, fiberglass or hybrids. All products can be tailored to specific widths & weights.

**A.P.C.M. Manufacturing LLC** **H44**
**PO Box 264**
**Plainfield, CT 06374 United States • www.prepregs.com**
Manufacturer of thermo-set epoxy prepregs with service temperatures of 180 degrees F to 400 degrees F. Film adhesives and two part epoxies with a specialty of lightning strike prepregs for the composite aircrafts and drones.

**ABARIS Training Resources Inc.** **B35**
**5401 Longley Lane, Suite 49**
**Reno, NV 89511 United States • www.abaris.com**
Abaris has been the leader in advanced composite training and related services since 1983. We specialize in packing a semester's worth of education into a 5-day class. We have over 26 courses to choose from. You come to us or we come to you! Visit booth B35 for more information.

**ACE - Applied Composites Engineering** **L30**
**705 S. Girls School Road**
**Indianapolis, IN 46231 United States**
**www.appliedcomposites.com**
ACE is a premier supplier of aviation and aerospace products and services. ACE specializes in advanced composite design, tooling, and manufacture. Engineering design services include composite structural design, FEA, reverse engineering, and material testing. Laser projections systems, autoclaves to 10', and 5-axis CNCs highlight manufacturing capabilities.

**ACMOS Inc.** **L49**
**1407 York Road, Suite 305**
**Lutherville, MD 21093 United States**
**http://www.acmosinc.com/**
ACMOS offers excellent semi-permanent release agents, – highest separation performance with negligible transfer of active substances – a wide spectrum of paste and liquid formulations, film-forming release agents, internal release agents, as well as standard products in aerosol form e.g. for model assembly.

**Advanced Ceramics Manufacturing** **J62**
**7800 A S. Nogales Highway**
**Tucson, AZ 85756 United States**
**www.acmtucson.com**
Advanced Ceramics Manufacturing designs and manufactures unique high performance ceramics including water soluble mandrel tooling materials and ceramic tooling for advanced composite structures. ACM offers customers finished water soluble mandrels and composite parts for a wide variety of composite applications. We are world wide supplier for aerospace and automotive companies.

**Advanced Composites Inc.** **J50**
**2575 South 3270 West**
**Salt Lake City, UT 84119 United States**
**www.advancedcomposites.com**
From filament winding to molding and lay-up, Advanced Composites, Inc. uses a variety of processes to produce sophisticated composite structures to meet the specific cost, performance and weight criteria of a very diverse customer base. ACI has a registered AS9100 Rev. C quality program for composite design and manufacturing.

**Advanced Processing Technology, Inc. (AvPro)** **H55**
**PO Box 1696**
**Norman, OK 73070 United States • www.avproinc.com**
Process control software system, CSS300, uses the principles of Material State Management™ to measure and manage the part properties at all stages, and tracks legacy parameters - equipment, pressure, temperature and vacuum levels. ThermoPulse Microwire offers real-time temperature feedback from within a composite interior or bond line.

**Agilent Technologies** **F55**
**2850 Centerville Road**
**Wilmington, DE 19808 United States • www.agilent.com**

**AGY Holding Corp.** **H21**
**2556 Wagener Road**
**Aiken, SC 29801 United States • www.agy.com**
AGY Holding Corp. is a manufacturer of high-tech glass fiber yarn, roving, and chopped materials for todays most demanding applications.

**AIP Aerospace** **A43**
**1395 South Lyon Street**
**Santa Ana, CA 92705 United States**
**www.aipaerospace.com**

AIP Aerospace leads critical, industry-leading aerospace businesses. Current businesses include Ascent Aerospace, the world's largest aerospace tooling supplier and most innovative integrator of turn-key assembly systems, Composite Horizons, a providers of high temperature composites for demanding applications, and Texstars, which provides aircraft transparencies, coatings, engineered thermoplastics and other components.

**Airtech International Inc.** **D36**
**5700 Skylab Road**
**Huntington Beach, CA 92647 United States**
**www.airtechonline.com**

Airtech is the largest privately owned manufacturer of vacuum bagging and tooling materials. Airtech's product line consists of: vacuum bagging films, release films, pressure sensitive tapes, peel plies, breathers, bleeders, vacuum bag sealant tapes, vacuum bag connectors, hoses, rubber, tooling materials, carbon and fiber reinforcements.

**AlzChem LLC** **L28**
**680 Village Trace Bldg 20, Suite A**
**Marietta, GA 30067 United States**
**www.alzchem.com**
Micronized dicyandiamide is used worldwide as an effective hardener for epoxy resins. The hardeners, accelerators, and modifiers in the DYHARD (TM) product portfolio, particularly when applied in products with high performance requirements, play an important role for the safe manufacture of high quality and sophisticated end products.

**American Composites Manufacturers Association** **A60**
**3033 Wilson Blvd., Suite 420**
**Arlington, VA 22201 United States**
**www.acmanet.org**
The American Composites Manufacturing Association (ACMA) is the world's largest composites industry trade group. We are manufacturers, material and equipment suppliers, distributors, academia and end users. ACMA offers educational resources including our CAMX show, and Certified Composites Technician (CCT®) program, and lobby Congress and federal agencies for the composites industry.

**American GFM Corporation** **D39**
**1200 Cavalier Blvd.**
**Chesapeake, VA 23323 United States**
**www.agfm.com**
Machine tool builder of 3 and 6 axis ultrasonic cutting machines and routers, capable of cutting prepreg and advanced composite materials; 6-axis combination US-cutter/router capable of dust free, high precision, honeycomb core sculpting. We also offer the COMPFORM pre-forming process capable of creating complex preforms using materials such as fiberglass and Kevlar. The process uses an ultraviolet-curable binder and vacuum forming tools. Nesting and other software products are available.

**AMS Corehog** **G46**
**28130 Avenue Crocker Suite 313**
**Valencia, CA 91355 United States**
**www.corehog.com**
AMS CoreHog is the leading manufacturer and distributor of cutting tools for Honeycomb core, Composites and the entire advanced materials field. At CoreHog we provide state of the art, high quality tools coupled with industry leading support and customer service all at a competitive price. Application specific (custom) tools and special requests are also available upon request.

**Andantex USA Inc.** **K55**
**1705 Valley Road**
**Wanamassa, NJ 07712 United States**
**www.andantex.com**
Andantex, USA, Inc. supplies precision components to world class machine manufacturers. Products include tension control systems consisting of Merobel magnetic particle brakes and digital controllers, Precision Rack & Pinion linear and rotary axis drives, and automatic lubrication systems. High quality products are combined with top-notch engineering and after market support.

**ANF Technology Limited** **G22**
**1021 Monterey Avenue**
**Foster City, CA 94404 United States**
**www.anftechnology.com**
ANF Technology produces NAFEN™ Dynamic Polymer Enhancers. These dispersion products (based on NAFEN™ alumina nanofibers) deliver increased mechanical performance in adhesives, composite bonding systems, engineered thermoplastic and coatings. ANF develops tailored solutions to improve these products in close cooperation with our valued customers.

**Applied Aerospace Structures Corporation** **H51**
**3437 South Airport Way**
**Stockton, CA 95206 United States**
**www.aascworld.com**
AASC has over 50 years' experience providing advanced composite and metal bonded aerospace structures. Specializing in design, fabrication and testing of lightweight, high performance engineered structures. Serving military and commercial customers for space, aircraft and ground systems. Advanced engineering and manufacturing capabilities including CATIA, Pro-E, FiberSim, Virtek, CompositePro, NASTRAN.

**Applied Graphene Materials** **L61**
**The Wilton Centre, Redcar**
**Cleveland, UK, TS10 4RF United Kingdom**
**http://www.appliedgraphenematerials.com/**
Applied Graphene Materials uses "bottom up" processing to manufacture high-specification graphene. We provide dispersions and product integration expertise, delivering solutions for wide ranging applications. We have established our first large scale production facility for manufacturing tonnes of graphene per year and are engaging global customers to develop application-specific graphene-enhanced materials.

**ASC Process Systems** **B43**
**28402 Livingston Avenue**
**Valencia, CA 91355 United States**
**www.aschome.com**
ASC Process Systems is the world's leading manufacturer of autoclave and oven systems for the aerospace, composites, nuclear, vulcanizing, and glass industries. In business since 1988, ASC Process Systems has become the recognized leader in autoclave and autoclave control system technology.

**Assembly Guidance Systems, Inc.** **F36**
**27 Industrial Avenue**
**Chelmsford, MA 01824 United States**
**www.assemblyguide.com**

ASSEMBLY GUIDANCE

LASERGUIDEs automatically generate "templates of light" that guide operators to precise locations where processes are carried out. LASERGUIDEs perform data collection and process control. Operating either as a stand-alone system or integrated into large manufacturing cells with our SDK, LASERGUIDEs pay for themselves through reduced cycle time and tooling elimination.

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**Associated Industries Inc.** C55
225 Wabash
Wichita, KS 67214 United States
www.associatedindustriesinc.com
Associated Industries Inc. is a stocking distributor for the composites industry and is ISO 9001 and AS9120 approved. Our product lines are, but not limited to: vacuum bagging materials, aircraft sealants, sealant dispensing equipment, fiberglass/carbon, core materials, adhesives, polyester/epoxy resins,and tooling materials. Our Partners are Henkel Aerospace, CYTEC Process Materials, 3A Composites, Hexcel, PRC, Axson, Endurance and many more leading manufactures.

**Astro Machine Works Inc.** K20
PO Box 328
Ephrata, PA 17522 United States
www.astromachineworks.com
Astro Machine Works, Inc., an ISO 9001 and AS9100 certified small business is a full service products and solutions provider of custom automation machinery, components and fabrications to a variety of industries including pharmaceutical, medical, energy production, food processing, defense and government projects.

**Barrday Composite Solutions** K38
86 Providence Road
Millbury, MA 01527 United States
www.barrday.com
Barrday is a leading advanced material solutions company whose product lines encompass applications for the composite, and protective markets. Our composite growth strategies are based on developing technologically advanced fiber reinforcement, prepreg and other material solutions for our customers in the aerospace, military/defense, transportation and energy markets.

**Bondtech Corporation** D56
1278 Highway 461
Somerset, KY 42503 United States
www.bondtech.net
Bondtech specializes in the designing, engineering, manufacturing, and sales of autoclave vessels and complete systems for aerospace composites and bonding. Bondtech Corporation manufactures the most reliable autoclaves in the market, providing you with many years of safe service. Bondtech will work with you to meet your complete composite autoclave requirements.

**Burnham Composite Structures, Inc.** H40
6262 W. 34th Street South
Wichita, KS 67215 United States
www.burnhamcs.com
Burnham is a composites parts, assemblies, & tooling supplier. Capabilities include design & fabrication of composite bond tools, prototype tooling, Fiber-Lok reinforcement materials & eggcrate kits. We can support your tool string with Catia V5, 5-axis milling, autoclave, laser inspection capabilities. Burnham is registered ISO 9001:2008, AS9100C and Nadcap AC7118c.

**C&D Zodiac dba Zodiac Advanced Composites & Engineered Materials** L43
12810 State Avenue
Marysville, WA 98271 United States
www.zodiacaerospace.com

**C.A. Litzler Co., Inc.** F40
4800 W. 160th Street
Cleveland, OH 44135 United States
www.calitzler.com
Litzler designs and builds continuous process equipment for structural composites, carbon fiber production, and industrial textiles. Litzler designs Oxidation Ovens with the patented G5 End-Seal and manufactures Hot Melt, Solution and Thermoplastic Systems & Tape Lines including ovens, unwinds, metering rolls, compaction stations, winders, accumulators, and drive & control systems.

**C.R. Onsrud Inc.** D53
120 Technology Drive
Troutman, NC 28166 United States
www.cronsrud.com
C.R. Onsrud, Inc. is a proud, American CNC manufacturer specializing in high quality, 3 and 5 axis CNC machinery, designed and built for the aerospace, woodworking, plastics, metal and composites industries. Our pledge to provide the industry with the best products, service, and customer support available!

**Carl Zeiss Microscopy, LLC** F44
One Zeiss Drive
Thornwood, NY 10594 United States
www.zeiss.com/microscopy
As the world's only manufacturer of light, X-ray and electron/ion microscopes, ZEISS offers tailor-made microscope systems for industry, materials research and academia. A well-trained sales force, an extensive support infrastructure and a responsive service team enable customers to use their ZEISS microscope systems to their full potential.

**CGTech** A50
9000 Research Drive
Irvine, CA 92618 United States • www.cgtech.com
CGTech specializes in numerical control (NC/CNC) simulation, verification, optimization, and analysis software for manufacturing. Since 1988 CGTech's product, VERICUT® software, has become the industry standard for simulating CNC machining in order to detect errors, potential collisions, or areas of inefficiency. For more information please visit the CGTech website at www.cgtech.com.

**Changzhou Sunlight Pharmaceutical Co, Ltd.** E60
Jiuli Street, Benniu Town, Wujin District
Changzhou, Jiangsu 213134 China
www.sunlightchem.com
We have two manufacturing facilities in Changzhou and Yancheng. US FDA, EDQM and CFDA approved. Potent capability of technology and production, highly skilled and experienced R&D team. Take highly responsibility for environmental protection and sustainable development, equipped with modern sewage treatment plant. 80% of the products exported to overseas markets.

**Chem-Trend, LP** A40
1445 West McPherson Park Drive
Howell, MI 48843 United States
www.chemtrend.com
Chem-Trend is a global leader in developing and producing specialized process chemicals. We produce release agent systems for molding, casting and curing operations in a range of industries. Within the composites industry, Chem-Trend's customers rely on our specialized mold release systems to protect their investments and keep production running efficiently.

**Chomarat North America LLC** F49
**160 AAlliance Boulevard**
**Williamston, SC 29697 United States**
**www.chomarat.com**
Chomarat is a 116 year old privately held global enterprise specializing in fiberglass and carbon reinforcements for a wide range of composite applications including automotive, aerospace, marine, transportation and construction. Our Innovative products include: C-ply, C-weave, G-flow, G-ply, Rovicore, Rotatex and Oflex.

**CMS North America, Inc.** J38
**4095 Karona Court**
**Caledonia, MI 49316 United States**
**www.cmsna.com**
CMS North America, located in Grand Rapids, Michigan, and incorporated in 1987, is a subsidiary of its parent company, CMS SpA with worldwide operations based in Zogno, Italy, and dedicated to the sales, support and service of its customers, their CMS machines, staff training, and long term interests for the efficient usage of that technology and CMS' continuing communication of its technological developments.

**Coast-Line International** K56
**200 Dixon Avenue**
**Amityville, NY 11701 United States**
**www.coast-lineintl.com**

**Composite Fabrics of America** C60
**130 River Bluff Lane**
**Advance, NC 27006 United States • www.cfamills.com**

**Composite Techs, LLC** L57
**64 South Hampton Road**
**Amesbury, MA 01913 United States**
**www.compositetechs.com**
CompositeTechs is composed of expert professionals in the plastics and composites industries providing technical, sales and business development resources when you need them. We provide part time experts as a low cost alternative to full time personnel. "Selective Reinforcements...When You Need Them!"

**Composites One** K43
**85 West Algonquin Road, Suite 600**
**Arlington Heights, IL 60005 United States**
**www.compositesone.com**

COMPOSITES ONE ®

Composites One is the leading distributor of composites materials in North America. With over 35 locations nationwide and our own fleet of trucks, you can always count on Composites One for reliable, on-time service. We are ISO9001:2008 with AS9120:2009 Rev A Standard and capable of handling all your composites needs.

**CompositesWorld** B59
**6915 Valley Avenue**
**Cincinnati, OH 45244 United States • www.compositesworld.com**
CompositesWorld - the industry's leading technical information resource. CompositesWorld publishes: CompositesWorld monthly magazine, SOURCEBOOK annual directory, CompositesWorld.com, CompositesWorld Weekly and CompositesWorld EXTRA e-newsletters, and CompositesWorld Conferences.

**Compotool** E61
**14582 172nd Drive SE, Suite 7**
**Monroe, WA 98272 United States**
**http://www.compotool.com/**
Compotool is a radical mold tooling system. Compotool board has very high thermal stability and excellent machining characteristics and can be used as a pattern material or for short run direct tooling. High accuracy composite tooling can be produced in a single combined cur post-cure cycle reducing demand on autoclave time.

**CompuDAS** A52
**1350 East Shelton Springs Road**
**Shelton, WA 98584 United States • www.compudas.com**
CompuDAS produces control & data acquisition systems for composite curing ovens, autoclaves, & presses. We will be happy to discuss how we can upgrade your systems to automate your processes.

**Conquip Inc.**
**11255 Pyrites Way**
**Rancho Cordova, CA 95670 • www.conquipinc.com**
ConQuip, Inc. designs and manufactures the most advanced R2R web process handling equipment in the industry. Whether you are looking for a filmer, coater, printer, winder or more, we have the equipment that will meet your needs. ConQuip, Inc. partners with Fortune 100 companies, as well as start-ups. We specialize in R2R process equipment for membrane, composites, optical quality films, printed electronics, and other cutting edge technologies.

ConQuip, Inc.

**Convergent Manufacturing Technologies** L29
**6190 Agronomy Road, Suite 403**
**Vancouver, BC V6T 1Z3 Canada • www.convergent.ca**
Convergent offers customers dimensional control with in-depth understanding of thermal management & its effect on process and tooling design. The company's software/hardware (COMPRO, RAVEN, COHO) & services are designed to yield robust, cost-effective processes via computer simulation, process monitoring during air evacuation, & evaluation of manufacturing risk for complex structures.

**Cytec** C44
**Composites House, Sinclair Close, Heanor**
**Derby, DE75 7SP United Kingdom • www.cytec.com**
Cytec is a global provider of advanced composite and process materials for aerospace, automotive, wind energy, motorsport, marine, mass transportation and other demanding applications. Our product portfolio supports the end-to-end manufacturing of composite parts and includes tooling, fiber, prepregs, resin systems, vacuum bagging, and adhesive, resin and surfacing films.

**Daicel (USA) Inc.** H29
**400 Kelby Street**
**Fort Lee, NJ 07024 United States • www.daicel.com**

DAICEL
DAICEL CORPORATION

Daicel USA, Inc. is a wholy owned subsidiary of Daicel Corporation in Japan. DUI's main function is to sell and market DC's products. These being the complete Epoxy line Celloxide as well as the Caprolactones Placcels. Celloxide 2021P is an epoxy resin manufactured by Daicel's very own technique achieved by an oxidation reaction with paracetic acid. The Caprolactone series consist of Placcel M Caprolactone monomer, Polycaprolactone-diol-Placcel200 series, Polycaprolactone-triol-Placcel300 series.

**De-Comp Composites Inc.** **J49**
**1519 Eastgate Drive**
**Cleveland, OK 74020 United States**
**www.decomp.com**
De-Comp Composites Inc. is a rapidly growing distributor of all types of composite manufacturing support materials. We distribute for several major manufacturers, these products include but are not limited to bag films; release films, liquids, and fabrics; adhesive and sealant tapes; autoclave valves and hoses; resins, and tool support structures.

**Dexmet Corporation** **C35**
**22 Barnes Industrial Road South**
**Wallingford, CT 06492 United States**
**www.dexmet.com**
Dexmet offers MicroGrid® foil gauge precision expanded metals to manufacturers of composite and carbon fiber materials for lightning strike protection. Dexmet is the preferred vendor and supplier of lightning strike protection material to most major aircraft manufacturers today and is joint AS9100C and ISO 9001:2008 certified.

**DIAB Americas LP** **J39**
**315 Seahawk Drive**
**DeSoto, TX 75115 United States**
**www.diabgroup.com**
DIAB is a global supplier of core materials and composite solutions, serving a wide range of markets including marine, wind energy, transportation, aerospace, architectural and industrial. DIAB's Divinycell polymer foam cores, end-grain Pro-Balsa, and Divilette Core Bedding Adhesives are designed for demanding applications. Services available include analysis, testing, training, kitting.

**Dia-Stron Ltd.** **H25**
**888 Sussex Blvd.**
**Broomall, PA 19008 United States**
**www.diastron.com**
Dia-Stron manufactures innovative and automated fiber testing systems. Measurements range from dimensional to mechanical properties including tensile, IFSS, fatigue and bending. Metrology modules are designed for fibers used in composites (carbon/ceramic/glass) and bio-composites (natural fibers). Other fibers include nylon/aramid/PE, metallic wires, etc. Dia-Stron, Passionate about fiber testing and automation.

**Diversified Machine Systems** **D50**
**1068 Elkton Drive**
**Colorado Springs, CO 80907 United States**
**www.dmscncrouters.com**
A leading designer & manufacturer of 3 & 5 axis CNC routers & machining centers, Diversified Machine Systems is synonymous with quality, precision and reliability. We offer a full range of standard products & custom machining solutions, ideal for a variety of materials, including composites & carbon fiber products, fiberglass, aluminum, honeycomb & more. Our high performance routers improve efficiency & production, resulting in increased profits.

**Dunstone Company, Inc.** **M39**
**2104 Crown View Drive**
**Charlotte, NC 28227 United States**
**www.shrinktape.com**
From Hi-Shrink Tape, to Hi-Shrink Tubing, to shrinkable and non-shrink release films, Dunstone has a focused product line, designed to make your composite processing easier. Our Hi-Shrink Tapes are used to apply external compaction to a curing composite part. Hi-Shrink Tubing can be made from FEP, ETFE, or PET for tool sealing and compacting. If your need is ply compaction, release, bondable surface finish, or something else, visit booth M39 and talk to us about your material concerns.

**E.V. Roberts** **E54**
**18027 Bishop Avenue**
**Carson, CA 90746 United States**
**www.evroberts.com**
E.V. Roberts, an ISO9001:2008, AS9120 Rev. A and AS9100 Rev. C company, serves the aerospace, composites, electronics and specialty industrial markets with distribution, custom formulation and specialized packaging. We represent Henkel, Momentive, 3M, and others with comprehensive accuracy verification. We manufacture an extensive line of specialty materials (Resin Formulators).

**Elantas PDG, Inc.** **B50**
**5200 North Second Street**
**St. Louis, MO 63147 United States**
**www.elantas.com/pdg**
Premier manufacturer of electrical insulation products. Potting compounds, conformal coatings, adhesives, hi-temp epoxies, and insulating resins offering heat, chemical, shock, and moisture resistance as well as good thermal conductivity and dielectric protection. Epoxylite®, ELAN-Tron®, ELAN-Cast®, Pedigree®, and Sterling® brands are used for coating, sealing and potting electronic components, sensors, PCBs.

**Element Materials Technology** **C54**
**1024 Grand Central Avenue**
**Glendale, CA 91201 United States**
**www.delsen.com**
Element Materials Technology is a global network of laboratories with experts specializing in materials testing, product qualification testing and failure analysis. Element has a global team of over 1,000 scientists, engineers and technicians working in world class laboratories operating as the single go-to partner for expertise, quality and materials technology solutions.

**Ellsworth Adhesives** **J25**
**W129 N10825 Washington Drive**
**Germantown, WI 53022 United States**
**www.ellsworth.com**
Ellsworth Adhesives is a global distributor of specialty chemicals offering a wide range of adhesives, sealants, coatings, encapsulants, tapes, soldering products and dispensing equipment from top manufacturers including 3M, Dow Corning, Dymax, Fisnar, Henkel, Lord, Permabond and Humiseal. ISO 9001:2008 and AS9120A certified.

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**Enfasco** G56
**1675 Hylton Road**
**Pennsauken, NJ 08110 United States**
**www.enfasco.com**
Master distributor for Click Bond Adhesively Bonded Fasteners, Witten Performance Inserts, Atlas Brand Rivet-Nuts and Installation tooling, and Alcoa Fastening Systems.

**Essex Brownell** G54
**1601 Wall Street**
**Fort Wayne, IN 46802 United States**
**http://www.essexbrownell.com**
Essex Brownell is a leading distributor of conformal coatings, adhesives and sealants, encapsulants and pottants, gels, optical materials, thermal management products, tapes, and other related products used for protecting electronic applications.

**Euro-Composites Corp.** H50
**13213 Airpark Drive**
**Elkwood, VA 22718 United States**
**www.euro-composites.com**
ECC is a global player in the field of advanced composite products. ECC stands for optimum solutions with advanced composites. We offer thermal forming 5 axis CNC core detail machining, honeycomb core kit & panel part kit production. ECC is one of the leading producers of complex composites parts.

**Evonik Corporation** E35
**299 Jefferson Road**
**Parsippany, NJ 07054 United States**
**www.evonik.com/composites**

Evonik Industries, a global chemical company, develops and manufactures specialty chemicals, semifinished products and even net shape parts used in diverse composite products and markets worldwide. ROHACELL (PMI) Foam Sheets & Shapes are a structural core for FRP sandwich applications and thermoplastic matrices for composites. ROHACELL® Foams offer outstanding thermal and mechanical properties, offering the highest strength-to-weight ratio when compared to all other cellular plastic foam cores. Thermoplastic matrices for composites can be customized as thermoset additives and offer short cycle times; they include: VESTAKEEP® PEEK, VESTAMID® HTplus, VESTAMID® Terra, VESTAMID® L PA 12 and TROGAMID® CX. VESTAMIN curing agents are ideal for liquid infused thermoset epoxy composites with higher performance. PU prepregs based on VESTANAT® PP matrix allow highly automated processing. Evonik works closely with customers to develop innovative, custom designed products and solutions.

**Exelis** D59
**400 Initiative Drive**
**Rochester, NY 14606 United States**
**www.exelisinc.com**
Exelis is a diversified, top-tier global aerospace, defense, information and services company that leverages our deep customer knowledge and technical expertise to deliver affordable, mission-critical solutions for customers. We provide highly-engineered space and ground-based composite solutions, parts and assemblies that are lightweight and perform under the most extreme operating environments.

**Exova OCM** A55
**3883 East Eagle Drive**
**Anaheim CA 92807**
**www.exova.com**
Exova OCM Exova OCM of Anaheim CA, formerly OCM Test Labs, was founded in 1976 and is associated with 120 Exova Labs worldwide. We specialize in testing mechanical & physical properties of advanced composites for Aerospace Industry and supplier Static tests up to 600KIP with 7 frames, fatigue test with 19 frames up to 220KIP. Other tests HPLC, GC, FTIR, TGA, DSC, TMA, DMA & others. Exova OCM is ISO 17025 and NADCAP approved for non-metallic's by most aerospace primes including Airbus.

**Fabric Development, Inc.** J29
**1217 Mill Street**
**Quakertown, PA 18951 United States**
**www.fabricdevelopment.com**
Fabric Development, Inc. offers the unique combination of design and development combined with production capabilities. We can supply all forms of woven textile structures. Reinforcements can be produced from all fiber types including standard,ultrahigh modulus, carbon, Kevlar, Fiberglass, Spectra, Nicalon, Tyranno, Quartz, and Ceramics. Quality system is registered to AS9100C.

**FARO Technologies** H20
**250 Technology Park**
**Lake Mary, FL 32746 United States • www.faro.com**
FARO develops and markets portable CMMs (coordinate measuring machines) and 3D imaging devices to solve dimensional metrology problems.

**Fiber Dynamics, Inc.** K25
**3730 Midco**
**Wichita, KS 67215 United States**
**www.fiberdynamics.net**
Fiber Dynamics is a leading provider of out-of-autoclave processed components, specializing in RTM, for over 20 years. Our capabilities include turn-key production solutions with design, tooling, machining, fabrication and assembly processes. These capabilities, plus world-class operational management, AS9100 / NADCAP accreditation make FDI an outstanding solutions partner for our customers.

**Fiber Materials Inc.** H27
**5 Morin Street**
**Biddeford, ME 04005 United States**
**www.fibermaterialsinc.com**

**Fives Machining Systems** K50
**2200 Linton Lane**
**Hebron, KY 41048 United States • www.fivesgroup.com**

**FlackTek, Inc.** G51
**1708 Highway 11, Bldg G**
**Landrum, SC 29356 United States • www.speedmixer.com**
The FlackTek SpeedMixer is an advanced tool for mixing, grinding/milling and dispersing. This Non-Invasive Mixin™ technology removes air bubbles while homogenizing the sample in a matter of seconds, and there is ABSOLUTELY NO CLEANUP! The SpeedMixer can be used to process any combination of powders, pastes, putties, and liquids in batches ranging from 1g to 5Kg. Please visit our booth to learn how a SpeedMixer can benefit your R&D, quality control and specialty productions.

**Flight Safety International** H63
**Marine Air Terminal, LaGuardia Airport**
**Flushing, NY 11371 United States**
**www.flightsafety.com**

**General Plastics Manufacturing Co.** B37
**4910 Burlington Way**
**Tacoma, WA 98409 United States**
**www.generalplastics.com**
Aerospace original equipment manufacturers and Tier 1 companies look to General Plastics for chemistry-based solutions, centered on our signature polyurethane foams. We support engineer and design teams in industries such as composite core, aerospace, and tooling. We are certified to ISO 9001:2008 and AS9100C, and meet NQA-1 and Mil-I-45208A requirements.

**Genesis Systems Group** C49
**8900 Harrison Street**
**Davenport, IA 52806 United States**
**www.genesis-systems.com**
Genesis Systems Group, Advanced Materials Processing (AMP) division will be conducting live demonstrations of CFRP Processing Systems for Robotic Non-Destructive Inspection (NSpect™) & Abrasive Water Jet Cutting (RazorJet™). Our approach to processing CFRP parts improves thruput & quality while reducing overall cost per part, reducing labor & defects. Genesis Systems Group is recognized as one of North America's leading robotics system integrators with over 4,300 systems installed worldwide.

**Harper International** J43
**4455 Genesee Street, Suite 123**
**Buffalo, NY 14225 United States**
**www.harperintl.com**
As a complete thermal processing partner, Harper develops full lines for carbon fiber from feed to product collection and everything in between. Harper's unique value as a technology leader includes our ability to help our clients scale up and link the process steps for a more seamless and efficient line.

**HEATCON Composite Systems** B36
**600 Andover Park East**
**Seattle, WA 98188 United States**
**www.heatcon.com**
HEATCON Composite Systems is a leading manufacturer and supplier of composite repair equipment, accessories, technical services, and composite materials. We offer hot bonders, heat blankets, repair tools and systems, prepregs, resins, honeycomb, and bagging materials. Our customer base includes commercial and military aerospace, automobile, marine and wind energy industries.

**Henkel Corporation** D35
**One Henkel Way**
**Rocky Hill, CT 06067 United States**
**www.henkelna.com**

Henkel

Henkel's aerospace group provides innovative structural adhesives and metal surface treatments that serve the aircraft OEM and MRO markets. For the manufacture of composite aircraft structures, Henkel solutions include film and paste structural adhesives, and benzoxazine resins. Additionally Henkel offers metal surface treatments, mold release chemicals and conversion coatings.

**Hexagon Metrology** C59
**250 Circuit Drive**
**North Kingstown, RI 02852 United States**
**www.hexagonmetrology.us**

**Hexcel Corporation** B40
**P.O. Box 18748**
**Salt Lake City, UT 84118 United States**
**www.hexcel.com**

HEXCEL

Hexcel Corporation is a leading advanced composites company. It develops, manufactures and markets lightweight, high-performance structural materials, including carbon fibers, reinforcements for composites, prepregs, honeycomb, matrix systems, adhesives and composites structures, used in commercial aerospace, space and defense and industrial applications.

**Hexion Inc.** K51
**180 East Broad Street**
**Columbus, OH 43215 United States**
**http://www.hexion.com**
The Epoxy, Phenolic and Coating Resins Division of Hexion is a leading global producer of epoxy specialty resins, modifiers and curing agents serving the automotive, oilfield, electronics, architectural and industrial coatings, wind energy, paint, packaging, power generation and distribution, aerospace, rail, marine and construction industries.

**Hisco** G28
**6650 Concord Park Drive**
**Houston, TX 77040 United States**
**www.hiscoinc.com**
Hisco, America's premier supplier of mission-critical materials, serves the aerospace & defense markets, and many others. With 35 stocking locations throughout the US, Mexico, and Canada, we offer local inventory for a variety of materials including paste adhesives, specialty resins, films, dispensing systems, syntac products, core splice adhesives, mold release products, cleanroom materials and more. Our team of application engineers can improve your manufacturing process and lower your costs.

**Hollingsworth & Vose Company** K21
**112 Washington Street**
**East Walpole, MA 02032 United States**
**www.hollingsworth-vose.com**
The AFN (Advanced Fiber Nonwovens) Group of Hollingsworth & Vose Company manufactures surfacing veils composed of high performance fibers such as aramid, carbon, nickel/carbon, glass, polyester, blends. AFN nonwovens are preferred for composites applications requiring corrosion resistance, surface smoothness, impact resistance, static dissipation, lightning strike protection, stealth tecnology, EMI Shielding.

**Huntsman Advanced Materials** F27
**10003 Woodloch Forest Drive**
**The Woodlands, TX 77380 United States**
**www.huntsman.com/advanced_materials**
Huntsman Advanced Materials has a long heritage of providing engineered solutions for our customers using high-performance thermoset chemistries and formulations. We work with designers and engineers to help bring lightweight, high-strength products to market. Our products serve the aerospace, automotive, coatings, electronics, energy and industrial composite markets.

**Hyosung Corporation** G45
**119, Mapo-daero, Mapo-gu**
**Seoul, 121720 Korea, South • www.tansome.co.kr**
Hyosung Carbon Fiber-Strength of Hyosung Carbon Fiber 1. Produces own precursor – Hyosung's own Technology 2. Fully controlled continuous process from raw material to carbon fiber 3. Technology development capability 4. Customer technical support 5. High Strength carbon fiber 6. Compatible with all types of resin system resulting high translation.

**HyperSizer - Collier Research** J36
**760 Pilot House Drive, Suite A**
**Newport News, VA 23606 United States • www.hypersizer.com**
What began at NASA 20 years ago has continuously developed into today's HyperSizer software solution. As Collier Research Corporation's flagship product, HyperSizer performs design, stress analysis, and detail sizing optimization for aircraft or other structures fabricated with composite/metallic materials. On average, the software reduces the weight of structures by 20-40%.

**Industrial Technologies, Inc.** A54/C61
**PO Box 875 • Norfolk, MA 02056**
**www.industrialtechnologiesinc.com**
Manufacturer's representation & consultation company specializing in R2R web handling machinery and auxiliaries like coating slot dies, industrial dryers and ovens, thermal oxidizers, materials sales and distribution includes film and hotmelt resins. Assistance in solving manufacturing related problems and challenges. 25+ years experience in various manufacturing industries.

**Ingersoll Machine Tools** D60
**707 Fulton Avenue**
**Rockford, IL 61103 United States • www.ingersoll.com**
Producer of Automated Fiber Placement (AFP) machines, Automated Tape Laying (ATL) modules & machining centers for the composites industry. Ingersoll's Mongoose & Lynx machines layup simple to very complex male & female structures. Turn-key solutions provide Ingersoll's customers with guaranteed success & support.

**Innolab** L21
**3930 Rosewood Road**
**Monrovia, MD 21770 United States • www.acxys.com**
Innolab and AcXys Technologies offer a full range of atmospheric pressure plasma tools to clean and activate nearly all surfaces. Spot-treaters or linear applicators of up to 500 mm are easy to integrate in production lines. Plasma treatment improves considerably the bonding strength between fibers and polymers.

**Innovative Composite Engineering (ICE)** D43
**PO Box 1218 • White Salmon, WA 98672 United States**
**www.innovativecomposite.com**
Design/Manufacture a wide variety of structural composite tubes and shapes for the aerospace, industrial, automotive, recreational, defense and oil & gas industries. Specializing in out-of-autoclave processing of a wide range of prepreg materials with cure temps to 500°F. ICE takes complex engineering problems and turns them into manufacturing realities.

**INTERMAS** H57
**Ronda de Collsabadell, 11 (Pl Collsabadell)**
**Llinars del Vallès, Barcelona 08450 Spain**
**http://www.intermasgroup.com/**
INTERMAS offers the widest range of extruded thermoplastic nets made of Polyolefins & of high temperature resistant engineered plastics (Polyamide and Polyester). We adapt our standard meshes and custom-develop new products in order to meet specific performances. We supply solutions for many sectors such as filtration, protection & separation, composites,etc.

**Intertek** J6
**50 Pearl Street**
**Pittsfield, MA 01201 United States • www.intertek.com**

**J6 Polymers** D54
**633 Enterprise Dr., Suite #3**
**DeKalb, IL 60115 United States • www.j6polymers.com**
Engineered specialty polyurethane systems and kits.

**Jiangsu Tetra New Material Technology Co., Ltd.** M35
**No.6-2, Zhonggang Road, Taixing Economic Development Zone, Taixing, Jiangsu 225-400 China**
**www.tetrachem.com.cn**
Jiangsu Tetra New Material Technology Co., Ltd. is one of the biggest cycloaliphatic epoxy resin monomer manufacturers in China; its main products include epoxy resins and functional intermediates. We offer solutions of high-temperature-resistance, toughening modification and UV curing technique, and provide customized processing service based on strict internal control system.

**JPS Composite Materials, Corp.** E36
**2200 South Murray Avenue • Anderson, SC 29624 United States**
**www.jpscompositematerials.com**
JPS is a leading producer of mechanically formed substrates for composite applications. Our E-glass, S-glass, quartz, UHMWPE, aramid, carbon and thermoplastic substrates provide design opportunities for existing products and/or the development of new ones. Our fabrics are used in raydomes, aircraft, circuit boards, construction, surf/boat, ballistics and personal protection.

**Komo Machine, Inc.** E42
**1 Komo Dr. • Lakewood, NJ 08701 United States • www.komo.com**
Komo manufactures large work envelope, high speed 3, 4 & 5 axis CNC routers for composites, metals and wood. Komo meets or exceeds critical requirements for cut quality and precision. Komo is the American workhorse CNC router, featuring the industry's highest acceleration/deceleration rates for maximum output.

**Krayden** L25
**1491 West 124th Avenue**
**Denver, CO 80234 United States • www.krayden.com**
Krayden, Inc. is a technical problem solving distributor specializing in adhesives, sealants, coatings, solvents, numerous types of chemicals and solder. Krayden carries Dow Corning, Henkel, Huntsman, 3M, Bostik, Royal product lines and more.

**Laser Technology, Inc.** G27
**1055 West Germantown Pike**
**Norristown, PA 19403 United States • www.laserndt.com**
Laser Technology, Inc. manufactures laser-based Shearography, Holography and NDT systems and provides NDT testing services and training. Shearography is non-contact NDT inspection method used for the detection of subsurface defects. The laser shearography NDT method offers a unique engineering solution for advanced materials and processes.

**Laufenberg GmbH** **G41**
**Krueserstrasse 2**
**Krefeld, 47839 Germany**
**www.laufenberg.info**
With over 60 years of experience in the industry, Laufenberg GmbH is one of Europe´s leading manufacturers of silicone coated release papers and films. In the field of composites, Laufenberg offers a wide range of customized release liners used as processing liners for prepregs or as carriers for ATL application.

**LEWCO, Inc.** **J51**
**706 Lane Street**
**Sandusky, OH 44870 United States**
**www.lewcoinc.com**

For decades, LEWCO has been a leader in Industrial oven design and innovation. Our line of industrial ovens includes a full range of batch ovens, conveyor ovens, field assembled ovens and drum heating cabinets. We are a ISO 9001:2008 registered company bringing quality products to market at a competitive price!

**Lingol Corporation** **L55**
**415 South Cherry Street**
**Wallingford, CT 06492 United States**
**www.lingolcorp.com**
Manufacturer of thermoplastic prepreg, laminates, and preforms. Principle prepreg fabrics are carbon, glass, and aramid. Principle resins are PEEK ,PPS, PEI, PA 6,66,11.12, PPSU, PES, PP, and HDPE. Laminates are made with long and continuous fiber and can be make with combinations of unidirectional, woven and nonwoven fibers. Laminate gauge range is .005"-.625" (.13-15 mm), width to 25"(635 mm), length to 50 M. We can work with any thermoplastic resin.

**LMG** **M43**
**1733 Suburban Drive**
**De Pere, WI 54115 United States**
**www.lmgpresses.com**
LMG is an industry leader in the design and manufacture of hydraulic presses (compression, transfer, vacuum, preform, and injection) and auxiliary equipment.

**Lucas Industries** **K36**
**10 Precision Drive**
**North Springfield, VT 05150 United States**
**www.lucasindustries.com**
An ISO 9001:2008/AS9100C certified company, specializing in the design and fabrication of composite and metal tools, molds and production parts. We work with our customers from concept to finish product. Our engineers have unsurpassed expertise in the most advanced levels of Catia and Surfcam. We service aerospace, aircraft and commercial industries.

**Lucintel** **M26**
**222 Las Colinas Blvd. West, Suite 1650**
**Irving, TX 75039 United States**
**www.lucintel.com**
Lucintel, the premier global management consulting and market research firm creates winning strategy for growth—whether you need to understand market dynamics, identify new opportunities, or increase your profitability.

**Magnolia Advanced Materials, Inc.** **D49**
**4360 Northeast Expressway**
**Atlanta, GA 30340 United States**
**www.magnolia-adv-mat.com**
Custom formulator/manufacturer of high-performance adhesives and roadway marking systems serving diverse industries including: aerospace, defense, electronics/electrical, communications, civil engineering/roadway, marine, energy, transportation, general industry and recreation. Products include adhesives (aerospace, structural, general purpose), syntactics, liquid shims, composite repair resins, RTM resins, potting/encapsulating epoxies, and tooling/casting resins, pavement markings. AS9100 certified.

**Magnum Venus Products** **B53**
**1862 Ives Avenue**
**Kent, WA 98032 United States**
**www.mvpind.com**
Magnum Venus Products (MVP) has been a world leading supplier of composites fabrication equipment for over 50 years. The MVP product line covers composites manufacturing needs from simple Chop/Gelcoat systems to customized, automated, multiple-axis filament winding systems. MVP offers complete solutions with proven customer support to meet your production needs.

**Matec Instrument Companies, Inc.** **H37**
**56 Hudson Street**
**Northborough, MA 01532 United States**
**www.matec.com**

**Matrix Composites, Inc.** **G44**
**275 Barnes Blvd.**
**Rockledge, FL 32955 United States**
**www.matrixcomp.com**
Matrix Composites was established in 1993 with a focus on precision molding of complex composite structures. The Company offers a comprehensive range of high performance composite manufacturing services including design, development, tooling and testing. Matrix swiftly solves the toughest composite challenges across multiple industries including aerospace, defense and commercial/general aviation.

**Maverick Corporation** **E49**
**11379 Grooms Road**
**Blue Ash, OH 45242 United States**
**www.maverickcorp.com**
Maverick is the leader in development and production of advanced high-temperature polymer materials. Maverick's portfolio includes a family of aerospace-qualified polymide resins capable of withstanding environments over 700°F that can be processed using RTM, autoclave & compression molding. Maverick is also an aerospace qualified source for compression molded composite components.

**MB Superabrasives** **B54**
**1404 Old Dairy Drive**
**Columbia, SC 29201 United States**
**www.slmunson.com**
Vacuum brazed, single-layer diamond & CBN Superabrasive tools.

**McLube Division of McGee Industries** **F39**
**9 Crozerville Road, PO Box 2425**
**Aston, PA 19014 United States**
**www.mclube.com**

McLube
Mold Release, Anti-Tack and Lubrication

Worldwide manufacturer & supplier of mold release, mold sealers, cleaners, and mandrel lubricants for all composite materials. Semi-permanent water & solvent based systems available. Products are recommended for SMC, BMC, lay-up, RIM, prepreg, RTM, filament winding, injection & compression molding. They have supplied the composite industry for than 50 years.

**Michigan Molecular Institute** **G53**
**1910 West Saint Andrews Road**
**Midland, MI 48640 United States**
**www.mmi.org**

Michigan Molecular Institute is a Contract Research & Development company specializing in polymer science. As a strategic commercialization partner our focus is on advanced technologies including specialty coatings, bio-based materials, and polymer materials development.

**Miki Sangyo USA Inc.** **F53**
**400 Interpace Parkway**
**Parsippany, NJ 07054 United States**
**http://www.mikisangyo.com/**

**Miller-Stephenson Chemical Co., Inc.** **H36**
**55 Backus Avenue**
**Danbury, CT 06810 United States**
**www.miller-stephenson.com**

Miller-Stephenson Chemical offers a full line of PTFE Release Agents/Dry Lubricants, EPON™ epoxy resins and curing agents, Quik-Freeze®, Krytox® fluorinated oils and greases, Aero-Duster®, precision cleaning solvents, solvent cleaners, flux removers, contact cleaners, protective/conformal coatings, and Vertrel® solvents. Specialize in small and custom packaging. Available in aerosols and bulk liquids.

**MISTRAS Group, Inc.** **G20**
**195 Clarksville Road**
**Princeton Junction, NJ 08550 United States**
**www.mistrasgroup.com**

MISTRAS is a leading “one source” global provider of technology-enabled asset protection solutions used to evaluate the structural integrity of critical energy, industrial and public infrastructure.

**MSC Software** **L51**
**4675 MacArthur Court, Suite 900**
**Newport Beach, CA 92660 United States**
**www.mscsoftware.com**

MSC Software makes products that enable engineers to validate and optimize their designs using virtual prototypes. Customers in almost every part of manufacturing use our software to complement, and in some cases even replace the physical prototype “build and test” process that has traditionally been used in product design.

**MTorres Disenos Industriales S.A.U.** **F52**
**Carretera Pamplona - Huesca, Km 9**
**Torres de Elorz, Navarra 31119 Spain**
**www.mtorres.es**

**Nabertherm** **J52**
**54 Reads Way**
**New Castle, DE 19720 United States**
**www.nabertherm.com**

Nabertherm with 450 employees worldwide have been developing and producing industrial furnaces for many different applications for over 60 years. Nabertherm offers the widest and deepest range of furnaces worldwide. 150,000 satisfied customers in mo than 100 countries offer proof of our commitment to excellent design, quality and cost efficiency.

**NASA / NASA Tech Briefs** **L39**
**261 Fifth Avenue, Suite 1901**
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**www.techbriefs.com**

NASA researchers work on the fringes of what’s possible in material science. Through partnerships, our patented innovations are helping companies solve real-world problems. NASA Tech Briefs is NASA’s official magazine of new technology dedicated to engineers and managers in OEM industries. For a free subscription, go to www.techbriefs.com/subscribe.

**NCSIMUL Solutions** **B60**
**50 Milk Street, 16th Floor**
**Boston, MA 02109 United States**
**www.ncsimul.com**

Spring Technologies helps its customers in manufacturing to run their machines at optimal performance levels and maximize their productivity. Its smart solutions are integrated, intelligent, instrumented. Its portfolio, NCSIMUL Solutions, ensures real-time support of the complete machining process including tool management, post-processing, NC simulation, technical content publishing, and DNC.

**NDT Systems** **A35**
**5542 Buckingham Drive**
**Huntington Beach, CA 92649 United States**
**www.ndtsystems.com**

**NETZSCH Instruments North America, LLC** **H26**
**129 Middlesex Turnpike**
**Burlington, MA 01803 United States**
**www.netzsch-thermal-analysis.com**

Instruments for thermal analysis & thermal properties measurement plus contract testing services; DSC for heat of curing and glass transition, DEA - Dielectric Analysis for thermoset cure monitoring, DMA - Dynamic Mechanical Analysis, TGA, coupling to MS, FTIR, and GC-MS, Thermal Conductivity, Dilatometers and TMA for CTE / thermal expansion.

**Nordson Sealant Equipment** **H35**
**45677 Helm Street**
**Plymouth, MI 48170 United States**
**www.sealantequipment.com**

Nordson
SEALANT EQUIPMENT

Nordson Sealant Equipment manufactures precision dispensing systems for product assembly using adhesives and sealants. Our systems dispense a wide variety of 1-part and 2-part materials such as epoxy, polysulfide, urethane, silicone and acrylic. Engineered systems are available for bonding, sealing, encapsulating, gasketing and potting applications in manual and robotic processes.

**North Coast (The Companies of) North Coast Tool & Mold Corp & North Coast Composites, Inc.** **K57**
**4605 Spring Road**
**Cleveland, OH 44131 United States**
**www.thecompaniesofnorthcoast.com**

**Northern Composites, Inc.** **E44**
**102 Tide Mill Road**
**Hampton, NH 03842 United States**
**www.northerncomposites.com**
Currently celebrating our 50th anniversary, Northern Composites is your source for premium quality composite materials. Serving the composites, metal bonding and tooling industries since 1965 with leading brands including Mitsubishi Rayon Carbon Fiber and Composites; Cytec Process Materials; Precision Fabrics Group; Henkel Aerospace adhesives; BGF; DIAB and BCC products.

**OEM Press Systems** **F45**
**311 S. Highland Avenue**
**Fullerton, CA 92832 United States**
**www.oempresssystems.com**
OEM Press Systems, Inc. is a leading hydraulic press manufacturer providing application driven, engineered solutions for composite molding and lamination applications. Vacuum enclosed and non-vacuum hydraulic presses designed for even pressure application and uniform temperature distribution across the platen. Reliable and repeatable process control with OEM's "Advantage Next Generation" HMI.

**OMAX Corporation** **K39**
**21409 72nd Avenue South**
**Kent, WA 98032 United States**
**www.omax.com**
OMAX Corporation designs and manufactures the world's most advanced abrasive waterjet technology at its headquarters in Kent, Washington. Backed by unmatched support and powered by the company's intuitive control software, OMAX and MAXIEM® JetMachining® Centers bring high performance to a range of industries and materials.

**ONExia, Inc.** **E51**
**1220 American Blvd.**
**West Chester, PA 19380 United States**
**www.onexia.com**
ONExia specializes in custom machine building for the composites and general manufacturing industries. We have expertise in universal holding fixtures, pre-preg tape handling and layup machinery, laser templating towers, vacuum debulk tables and other composite part handling. Please contact us to solve your composite manufacturing application. info@onexia.com

**OSG USA, Inc.** **J56**
**676 East Fullerton Avenue**
**Glendale Heights, IL 60139 United States**
**www.osgtool.com/**
OSG USA, INC. offers an extensive line of advanced cutting tools. With innovative product development, outstanding services and total solutions that anticipate customers' needs, OSG is committed to the advancement of manufacturing by shaping your dreams into reality.

**Oxford Performance Materials - OPM** **A39**
**30 South Satellite Road**
**South Windsor, CT 06074 United States**
**www.oxfordpm.com**
OPM was founded with a simple purpose: to exploit Poly-Ether-Ketone-Ketone (PEKK). PEKK is an ultra high performance thermoplastic technology platform. Whether working to make planes lighter or develop medical polymers, our knowledge of PEKK has allowed us to create solutions for the challenges limiting human development and sustainability.

**Pacific Coast Composites** **F56**
**11302 Steele Street South, Suite B**
**Lakewood, WA 98499 United States • www.pccomposites.com**
Pacific Coast Composites enjoys a world-class reputation for advanced composite materials distribution, quality control and unsurpassed customer care. As an approved distributor and repackager for 3M Aerospace and Commercial Transportation Division (ACTD) and Hexcel, we can provide small to large quantities of the composite materials and accessories you need!

**Paragon D&E** **A41**
**5225 33rd Street SE**
**Grand Rapids, MI 49512 United States • www.paragonde.com**
Paragon D&E specializes in taking product from concept to production via prototype and production molds/tools. Paragon handles all phases from specialized machining, prototyping to steel/aluminum production molds with expertise in large parts. Paragon produces tooling and molds used to manufacture high-temperature tooling and parts.

**Park Electrochemical Corp.** **E53**
**48 South Service Road, Suite 300**
**Melville, NY 11747 United States • www.parkelectro.com**
Park Electrochemical Corp. is a global advanced materials company which develops and manufactures advanced composite materials, parts and assemblies for the aerospace markets and high-technology digital and RF/microwave printed circuit materials principally for the telecommunications and internet infrastructure and high-end computing markets. Park's core capabilities are in the areas of polymer chemistry formulation and coating technology.

**Permabond Engineering Adhesives** **G21**
**223 Churchill Avenue**
**Somerset, NJ 08873 United States • www.permabond.com**
Permabond products are expressly designed for the variable needs of manufacturing, assembly, repair and maintenance. We offer a complete line of adhesive technologies or will custom formulate to your specifications. Our ISO 9001:2008 certification highlights our commitment to quality and assures consistent and advanced solutions for the most demanding applications.

**PFAFF Industriesysteme und Mashinen GmbH – Branch KSL** **K61**
**Bensheimer Str. 101**
**Lorsch 64653 Germany**
**www.pfaff-industrial-ksl.com**
We are a supplier of automation systems for application specific preform processing technology. Our core competences are: - joining, stitching, fibre placement, tape laying, ultrasonic welding, binder placement, - ultrasonic cutting, - handling by sophisticated vacuum and needle gripper technology, draping, continuous 3D profile production, - engineering, simulation, laboratory process development and small scale production.

**Plascore, Inc.** **K26**
**615 North Fairview Street, PO Box 170**
**Zeeland, MI 49464 United States**
**www.plascore.com**
Manufacturer of metallic, aramid fiber and thermoplastic honeycomb. Custom composite panel manufacturing with value added capability of assembly, machining, forming, powder coating, testing and R&D. ISO 9001:2008, AS9100:2009, ISO 14001:2004 and ISO 9901:2008 certification approvals.

**PMIC - Precision Measurements and Instruments Corporation** **G37**
**3665 SW Deschutes Street**
**Corvallis, OR 97333 United States**
**www.pmiclab.com**
PMIC is an independent ISO Accredited Testing Laboratory that specializes in precision measurement of the thermal-physical properties of materials over temperatures from 20K to over 1,600K. Testing services include: •Coefficient of Thermal Expansion, •Coefficient of Moisture Expansion, •Thermal Conductivity (K). •Specific Heat •Thermal Cycling/Thermal Shock •Long Term Creep •Density

**Polymer Diagnostics Inc.** **J26**
**33587 Walker Road**
**Avon Lake, OH 44012 United States**
**www.polymerdiagnostics.com**
The staff of Polymer Diagnostics Inc. (PDI) can work with your technical staff to identify and resolve your issues. Whether it is in failure analysis, advanced rheology, deformulation, mechanical property testing, legal support or any other of our many capabilities, PDI can assist you in solving your problems.

**Praxair, Inc.** **K40**
**39 Old Ridgebury Road**
**Danbury, CT 06810 United States**
**www.praxair.com/heattreating**
Praxair is a supplier of atmospheric, process and specialty gases including oxygen, nitrogen, argon, carbon dioxide, helium and hydrogen. Praxair also supplies high performance coatings and related technologies. As a leader in the industrial gas market, Praxair's nitrogen, nitrogen supply systems and gas flow expertise provide optimized integration with autoclaves.

**Pro-Set Epoxy** **M29**
**707 Martin Street**
**Bay City, MI 48706 United States**
**www.prosetepoxy.com**
PRO-SET Epoxy systems offer enhanced performance with new laminating, infusion and adhesive formulations based on the latest in epoxy technology and raw materials. These versatile, adaptable resin/hardener combinations accommodate a wide range of processes. Uniform mix ratios provide versatility with resin/hardener combinations.

**Prospect Mold & Die Company** **G40**
**1100 Main Street**
**Cuyahoga Falls, OH 44221 United States**
**www.prospectmold.com**
Design and build of tight tolerance, complex, five-axis resin transfer and compression molds for composite parts. We also manufacture trim fixtures and do contract machining of composite parts.

**PTM&W Industries, Inc.** **H22**
**10640 South Painter Avenue**
**Santa Fe Springs, CA 90670**
**United States**
**www.ptm-w.com**
PTM&W Industries manufacturers epoxy and urethane resin systems for production composites, composite tooling and rapid-prototyping applications. Among the products we make are laminating, infusion surface coat, casting, and adhesive resin systems. We carry a large inventory for immediate shipping and have attractive pricing. We always answer the phone with a live person and have expert technical help awaiting your phone calls or emails.

**Radiant Energy Systems**
**175 North Ethel Avenue**
**Hawthorne, NJ 07506**
**www.radiantenergy.com**
Radiant Energy Systems offers Unique, Innovative and Customized Solutions for your Process Heating needs. We are Leaders in Hot Air & Infrared Drying Technologies. Our in-house lab and pilot line combined with over 100 years of collective experience allows Us to partner with You in developing or upgrading your product and process.

**Regloplas USA** **H38**
**1088 Miners Road**
**St. Joseph, MI 49085 United States • www.regloplasusa.com**

**Revchem Composites, Inc.** **K29**
**2720 S. Willow Avenue #B**
**Bloomington, CA 92316 United States**
**www.revchem.com**
The West Coast's premier provider of composite materials, supplies, and equipment. Six locations to provide fast, and flexible delivery. Ship products across the country and worldwide. Our technical expertise, sales support, customer service, and extensive product selection enable us to meet all of your composites needs. Raw materials, supplies, equipment.

**RMB Products Inc.** **K37**
**1201 RMB Court**
**Fountain, CO 80817 United States • www.rmbproducts.com**
RMB is an innovator in the use of the laser sintering and rotational molding processes. We manufacture to your stringent specifications. Our facility is AS 9100 Revision C and ISO 9001:2008 registered. As a qualified supplier for major aerospace OEMs, we specialize in non-metallic, non-structural components.

**Rolled Alloys Inc.** **B52**
**125 W. Sterns Road**
**Temperance, MI 48182 United States • www.rolledalloys.com**
Rolled Alloys is the global leader in specialty alloys. Our global inventories include a broad range of products including: nickel alloys, stainless steels, duplex stainless steels, titanium alloys & cobalt alloys.

**Royal Engineered Composites** **J21**
**1046 East 9th Street**
**Minden, NE 68959 United States • www.royalcomposites.com**
Since 1949, Royal's focus has been on challenging the status quo of performance in aerospace composites. Royal possesses the agility and capacity to help you design, develop and deliver aircraft to satisfied customers in your time frame and budget.

**Rubbercraft** J19
**3701 Conant Street**
**Long Beach, CA 90808 United States**
**www.rubbercraft.com**
Rubbercraft specializes in elastomeric tooling used in the fabrication of composite structures. Currently used in the manufacture many production platforms, Rubbercraft's solid and inflatable bladders are production proven, durable and reusable for multiple cure cycles, and also enable the manufacture of complex structures otherwise not possible with other tooling methods.

**Rudolph Brothers & Company** J37
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**www.saertex.com**
The SAERTEX Group is a global market leader in the development and production of composite reinforcement solutions made of glass, carbon, aramid and other fibers. SAERTEX products are used in many market segments including wind energy, aerospace, marine, automotive, sports and leisure, railway systems, pipe relining and civil infrastructure.

**Saint - Gobain ADFORS America, Inc.** G50
**1795 Baseline Road**
**Grand Island, NY 14072 United States**

**SAMPE** H62
**1161 Park View Drive**
**Covina, CA 91724 United States**
**www.nasampe.org**
The Society for the Advancement of Material and Process Engineering, SAMPE, an international professional member society, provides information on new materials and processing technologies through publications, conferences and tradeshows. SAMPE provides a unique forum for professionals as the only technical society encompassing all materials and processes fields.

**Sanders Composites** J18
**4075 Ruffin Road**
**San Diego, CA 92123 United States**

**Shikoku Chemicals Corporation** B61
**B16, 1-3 Nakase, Mihamaku**
**Chiba, Chiba 261-8501 Japan**
**www.shikoku.co.jp/eng/index.html**
Shikoku Chemicals manufactures imidazole hardeners and accelerators for epoxy formulations under our globally recognized Curezol™ brand. Cureduct™ additive allows formulators to achieve both snap cure and excellent pot-life in appropriate adduct-cured epoxy systems. Benzoxazine is a new class of thermosetting resins Shikoku has commercialized for over 10 years.

**Shimadzu Scientific Instruments** J63
**7102 Riverwood Drive**
**Columbia, MD 21046 United States**
**www.ssi.shimadzu.com**
Shimadzu offers an extensive selection of electromechanical and hydraulic universal testers and easy-to-use hardness testers for a variety of QA/QC and R&D applications. In addition, a wide range of accessories accommodate even the most difficult to test materials while intuitive software provides for efficient testing operations.

**Sigmatex** K35
**6001 Egret Court**
**Benicia, CA 94051 United States**

**Siltech Corporation** G58
**225 Wicksteed Avenue**
**Toronto, ON M4H 1G5 Canada**
**www.siltech.com**
Siltech is a manufacturer of modified and reactive silicones. Siltech works with our customers to optimize their silicone options. Our products improve slip, flexibility, hydrophobicity, hydrophilicity, foam control, resin modification ect. A presentation reviewing Siltech and our chemistry on request by emailing eugene@siltechcorp.com. Siltech Chemistry - Your Technology.

**SL-Laser Systems LP** H39
**8107 Arrowridge Blvd., Suite Q**
**Charlotte, NC 28273 United States**
**www.sl-laser.com**

**Smart Tooling Division of Spintech, LLC** H28
**1150 S. Patton Street**
**Xenia, OH 45385 United States**
**www.smarttooling.com**
Smart Tooling provides formable, reusable tooling solutions for manufacturing composite parts with complex geometries & trapped shapes that drastically reduce labor & consumable cost, while dramatically increasing through-put. Go to smarttooling.com for more information about our game changing technology.

**STELIA North America** A51
**71 Hall Street**
**Lunenburg, NS B0J 2C0 Canada**
**www.stelia-northamerica.com**
Services: Composite design and fabrication, hand-layup, press molding, thermal/vacuum forming, filament winding/AFP, CNC trimming, NDT, finishing/assembly; aerostructures: flaps, fairings, sponsons, cowl doors, empennage sub-assemblies; stringers and struts; ECS, anti-icing, and nacelle ducting; motor cases; water and helium tanks; satellite solar panels, bus systems, and reflectors/ antennas; Facilities: Nova Scotia, Mirabel, Seattle/Ellensburg

**Stiles Machinery Inc.** **G36**
**3965 44th Street SE**
**Grand Rapids, MI 49512 United States**
**www.stilesmachinery.com**

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**Stratasys** **L36**
**5 Fortune Drive**
**Billerica, MA 01821 United States**
**www.stratasys.com**

From affordable, desktop 3D printers, to large, 3D production systems, Stratasys® systems produce concept models, prototypes and low-volume finished goods. Its specially engineered materials include hundreds of photopolymers and thermoplastics. Stratasys Direct Manufacturing offers digital part services with the widest variety of advance manufacturing technologies. www.stratasys.com.

**Stratasys Direct Manufacturing** **J28**
**28309 Avenue Crocker**
**Valencia, CA 91355 United States**
**www.stratasysdirect.com**

Stratasys Direct Manufacturing offers proven 3D printing and advanced manufacturing solutions that allow organizations to innovate rapidly and move to market quickly. Services include additive manufacturing, cast urethanes, CNC machining, tooling, injection molding and professional finishing for high quality plastic and metal parts and prototypes. ISO 9001 and AS9100 certified.

**Surface Generation America** **G49**
**7 Brackenbury Court**
**Lyndon, Oakham, Rutland, LE15 8TW United Kingdom**
**www.surface-generation.com**

Suppliers of state-of-the-art out-of-autoclave & out-of-oven thermoset and thermoplastic self heated and cooled processing solutions for single sided and matched composite production.

**Surfx Technologies, LLC** **H19**
**2631 Manhattan Beach Blvd.**
**Redondo Beach, CA 90278 United States**
**www.surfxtechnologies.com**

Surface preparation is critical to bonding and coating. Surfx atmospheric plasma offer fast, safe, and reliable surface preparation of polymer and metals. With over 15 years of experience, Surfx plasma systems are able to prepare a surface for improved adhesion strengths than conventionally used methods such as mechanical abrasion.

**SWORL div of Prairie Technology Group** **K30**
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Specialty chemical manufacturer. Synthetic resin, additives/intermediates for composites, adhesives, electronics, power transmission, inks & coating industries. Synasia supplies multifunctional epoxy resins, ie 3,3'-DDS, etc; Polyimide additives/intermediates ie: 3,4'-ODA; BAPP,TPE-; Polyurethane Intermediates: PPDI, MCDEA, etc; Cycloaliphatic epoxy resins: S-21 (ERL- 4221/UVR 6110), etc. Partnership, joint venture toll and custom manufacturing welcome.

**TA Instruments** **A45**
**159 Lukens Drive**
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**Taricco Corporation** **H43**
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**Long Beach, CA 90813 United States • www.taricco.com**

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**TCR Composites** **J35**
**219 North 530 West**
**Ogden, UT 84404 United States • www.tcrcomposites.com**

TCR Composites supplies a unique epoxy prepreg tow/roving for filament winding, fabrics, uni-directional tape and braid. TCR™ prepregs include up to one-year outlife at room temperature (75°F/24°C), without changes in material properties. Refrigerated shipping and storage not required.

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**107 North 5th Street**
**Saddle Brook, NJ 07663 United States • www.tewire.com**

TE Wire & Cable LLC, a Marmon Wire & Cable/Berkshire Hathaway Company, is a premier thermocouple and specialty wire and cable manufacturer. Since 1941, the company has been manufacturing high-quality wire and cable solutions for the thermo-sensing and temperature measurement markets.

**Technical Fibre Products, Inc.** **F48**
**679 Mariaville Road**
**Schenectady, NY 12306 United States**
**www.techfibres.com**
At Technical Fibre Products we employ a proprietary wet-laid process to develop and manufacture advanced nonwoven materials for an array of challenging applications. We offer a diverse range of mats and veils based on an extensive portfolio of fiber and binder types. As a result, our products find application in a wide variety of fields from aerospace to sports application.

**Technology Marketing Inc.** **C50**
**6122 Stratler Street**
**Salt Lake City, UT 84107 United States**
**www.tmi-slc.com**
Technology Marketing, Inc. (TMI) has supplied innovative quality products to the composites industry for 37 years. We supply a comprehensive product line including; Cytec Process Materials, Rohacell Structural Foam, Chemtrend, Zyvax, SR Composites Sprayable Vacuum Bags, PTM&W, Amamco Tool and Sungold Abrasives.

**TenCate Advanced Composites** **G43**
**18410 Butterfield Blvd.**
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**www.tencateadvancedcomposites.com**
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**Textile Products, Inc.** **J27**
**2512 - 2520 W. Woodland Drive**
**Anahiem, CA 92801 United States • www.textileproducts.com**
Manufacturer of composite woven fabrics incorporating a variety of reinforcing yarns such as carbon, glass, aramid, ceramic and metallic wire. Uni directional, Bi directional, hybrids and custom fabrics.

**TeXtreme** **G25**
**150 North Michigan Avenue, Suite 1950**
**Chicago, IL 60601 United States • www.textreme.com**
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**4056 Easy Street**
**El Monte, CA 91731 United States • www.thegillcorp.com**
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**Thermacore Materials Technology** **C56**
**440 Jonathan Willey Road**
**Belle Vernon, PA 15012 United States**
**www.thermacore.com**

**Thermal Equipment Corporation** **E43**
**2030 East University Drive**
**Rancho Dominguez, CA 90220 United States**
**www.thermalequipment.com**
TEC is a Manufacturer of aerospace composite Autoclaves. We offer a full line of Autoclave sizes and shapes to fit your growing needs. TEC's builds a quality and reliable Autoclave which is why we have many repeat customers. TEC also provides a full range of spares and services.

**Thermal Wave Imaging, Inc.** **D55**
**845 Livernois Sreet**
**Ferndale, MI 48220 United States**
**www.thermalwave.com**
Thermal Wave Imaging is the leading innovator and provider of state-of-the-art thermographic NDT (non-destructive testing) solutions ranging from low-cost portable systems for field applications to highly sophisticated automated inspection equipment for manufacturing QA. Our products are designed to meet critical needs of aerospace, power generation and automotive OEMs and suppliers.

**Thermwood Corporation** **E50**
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**Dale, IN 47523 United States**
**www.thermwood.com**
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**Toho Tenax America** F43
**121 Cardiff Valley Road**
**Rockwood, TN 37854 United States**
**www.tohotenaxamerica.com**
Toho Tenax is a leading worldwide producer of PAN-based carbon fibers. Tenax® brand carbon fibers deliver reinforcing excellence for Aerospace, Pressure Vessels, Surface Transportation, Recreation and all composite applications. With manufacturing operations in the USA, Germany, & Japan, Toho Tenax provides a global network to support your carbon fiber needs.

**Trelleborg AEM** G57
**24 Teed Drive**
**Randolph, MA 02368 United States**
**www.trelleborg.com/aem**
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**Tri-Mack Plastics Manufacturing Corp.** H53
**66 Tupelo Street**
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**United Testing Systems, Inc.** L26
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**Huntington Beach, CA 92649 United States**
**www.unitedtesting.com**
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**University of Delaware Center for Composite Materials** L35
**101 Academy Street**
**Newark, DE 19716 United States**
**www.ccm.udel.edu**

**University of Southern Mississippi** C53
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**Vector Composites, Inc.** K22
**3251 McCall Street**
**Dayton, OH 45417 United States**
**www.vectorcomposites.com**
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**Vectorply Corporation** M37
**3500 Lakewood Drive**
**Phenix City, AL 36867 United States**
**www.vectorply.com**
Vectorply Corporation offers a range of reinforcements tailored to many applications. These products are engineered for particular end use such as VectorSports, for the snowboard and wakeboard industry, VectorFusion for infusion specific applications, LaborSaver for applications that demand thicker laminates and low labor content and VectorUltra for advanced composite applications.

**Venango Machine Company** H45
**14118 Route 8-89, PO Box 239**
**Wattsburg, PA 16442 United States**
**www.venangomachine.com**

**VerTechs Enterprises, Inc.** J58
**1071 Industrial Place**
**El Cajon, CA 92020 United States**
**www.vertechsusa.com**
VerTechs is the global leader in providing advanced lightweight sandwich structures to the aerospace industry. Our objective and goal is to seek and solve the issues and problems that our customers face today - for a better tomorrow. Although the company was not officially formed until 2007, many decades of aerospace research and development were incorporated to achieve its unique technologies.

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**Wabash, IN 46992 United States**
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**Warm Industrial Nonwovens (WIN)** M45
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**Web Industries** A36
**377 Simarano Drive, Suite 220**
**Marlborough, MA 01752 United States • www.webindustries.com**
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**Weber Manufacturing Technologies Inc.** L44
**16566 Highway 12**
**Midland, ON L4R 4L1 Canada • www.webermfg.ca**
Weber is a multi-market, world-class tooling supplier and operates a unique nickel vapor deposition facility for the additive production of molding surfaces. Experienced in many materials and processes; including Invar36 and self-heated out-of-autoclave tooling applications. Weber has ISO 9001:2008 and CCGP registered (ITAR), and is Boeing and Bell approved.

**WichiTech Industries, Inc.** G26
**1120 North Charles Street, Suite 103**
**Baltimore, MD 21201 United States • www.wichitech.com**
WichiTech Industries manufactures composite repair systems (which includes our standard 3-year warranty) as well as the RD3 electronic digital tap hammer, heating blankets, and accessories. WichiTech continues to add to their list of innovations with the most recent being our Explosion Proof Bonders in both single and dual zone.

**Wisconsin Oven Corporation** L40
**2675 Main Street, PO Box 873**
**East Troy, WI 53120 United States • www.wisoven.com**
Wisconsin Oven manufactures electrically heated, gas fired, and indirect gas fired composite curing batch ovens designed to meet customers' specific process requirements. Available options include data acquisition instruments, vacuum piping, pumps and transducers. Wisconsin Oven also supplies ovens for wide variety of applications including finishing, heat treating, and solution treating.

**Wolff Industries, Inc.** M30
**107 Interstate Park**
**Spartanburg, SC 29303 United States • www.wolffind.com**
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**Zeus** E56
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## Upcoming SAMPE Events

| Date | Event | Location | Details |
|---|---|---|---|
| May 27-29, 2015 | SAMPE China 2015 | Beijing, China | www.sampe.org.cn |
| June 16-17, 2015 | Composites Technologies & Applications Overview Seminar | Anaheim, CA, USA | www.nasampe.org |
| Sept. 15-17, 2015 | SAMPE Europe 2015 | Amiens, France | www.sampe-europe.org |
| Oct. 19-23, 2015 | SAMPE Brazil Congress 2015 | Sao Jose dos Campos, Brazil | www.sampe.com.br |
| Oct. 26-29, 2015 | CAMX 2015 | Dallas, TX, USA | www.theCAMX.org |
| May 23-26, 2016 | SAMPE Long Beach 2016 | Long Beach, CA, USA | www.sampelongbeach.org |
| Sept. 26-29, 2016 | CAMX 2016 | Anaheim, CA, USA | www.theCAMX.org |
| May 8-11, 2017 | SAMPE Seattle 2017 | Seattle, WA, USA | www.nasampe.org |

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