

Preliminary Program

SAMPE 2004

May 16-20, 2004

**Long Beach Convention Center,
Long Beach, CA**



Celebrating
60 *Years*
1944-2004



**Materials and Processing Technology—
60 Years of SAMPE Progress**

Sponsored by SAMPE Utah Chapter



In The Early Days

of mankind's technical growth, whole ages of human development were summed up by the materials that characterized their progress. Names like "Stone Age", "Iron Age" or "Bronze Age" are scattered liberally throughout the text books.

More recently, we have named our ages after products like the "Space Age" or the "Information Age" and now the "Internet Age". Yet behind these advancements lie the achievements of the materials scientists. There has never been a greater period of change in the face of advanced materials, and never have they enabled a more awe-inspiring array of capabilities.

The exploration of space. The world-wide web. Miracle fabrics. GPS. Cellular phones. LASER-guided weapons. Fuel cells. Nanocomposites. ALL of these technologies owe their very existence to newly-developed specialty materials. For the last 60 years, SAMPE has been at the heart of this development – creating, sharing and reporting on the creation, development and use of these increasingly exotic materials. A clearinghouse for the advancement of information, SAMPE has played a pivotal role in the unprecedented rate of technical development for 60 years. Whatever the technical challenge, SAMPE has been there to meet it head-on.



*Celebrating
60 Years
1944-2004*

Come join us in Long Beach for the 49th International SAMPE Symposium and Exhibition, May 16-20, 2004, and celebrate the first 60 years of SAMPE. Then become a part of the next 60 years of materials and process development. Help define your age.

*Steven R. Rodgers and John E. Green
Co-General Chairmen
SAMPE 2004/Long Beach*



General Information



REGISTRATION

- The pre-registration form is on page 49 of this Program. Your pre-registration is to be received by April 26, to qualify for the pre-registration price. Payment must be made at time of registration as your registration will not be processed unless payment accompanies registration.
- Your badge will be ready for pick up at the SAMPE Pre-Registration station at the Long Beach Convention Center.
- It is recommended that if your registration form and fee cannot be received at the SAMPE Office by April 26, to avoid problems for you at the registration counter, plan to register and pay on site.



EASY TO REGISTER



- Phone (U.S.) 800/562-7360 (outside U.S. 626/331-0616) ext 610, 7:00 a.m. to 4:00 p.m., Pacific Time, Monday through Friday (using credit card).
- Fax the completed registration form to SAMPE 626/332-8929, 24 hours a day (using credit card).
- Mail the completed registration form, with applicable funds, to SAMPE, PO Box 2459, Covina, CA 91722-8459.
- On-line at www.sampe.org

Secured Registration Process

CANCELLATION/REFUND/ SUBSTITUTION POLICY



- If you must cancel your registration for any reason, notify SAMPE in writing by April 26. No cancellations can be accepted after that date. All registrations are subject to the cancellation policy. No telephone cancellations can be accepted.
- Registrations cancelled prior to April 26 are subject to a \$50 service charge. Fees are refundable minus the \$50 service charge.
- Registrants who fail to attend, and have not cancelled as noted above are liable for the entire fee.
- No refund will be given for failure to attend, late arrival, unattended events or early departure from the meeting.
- **Refunds are processed only after the meeting.**
- 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.



REGISTRATION HOURS

Registration will be open at the Long Beach Convention Center:	
Sunday, May 16	1:00 p.m. - 6:00 p.m.
Monday, May 17	7:30 a.m. - 5:00 p.m.
Tuesday, May 18	7:15 a.m. - 6:00 p.m.
Wednesday, May 19	7:15 a.m. - 5:00 p.m.
Thursday, May 20	7:30 a.m. - 2:30 p.m.

EXHIBIT HOURS



No Exhibits on Monday	
Tuesday, May 18	10:00 a.m. - 5:00 p.m.
Welcome Reception and Anniversary Celebration	
	5:00 p.m. - 6:00 p.m.
Wednesday, May 19	10:00 a.m. - 5:00 p.m.
Thursday, May 20	10:00 a.m. - 2:00 p.m.



EXHIBIT HALL ADMISSION

- All Conference registrants will automatically be admitted to the exhibits with their badges. There will be a \$75 admission fee for anyone without a complimentary pass and wanting admittance to the exhibits only. This fee allows entrance any or all days exhibits are open. Registration for the exhibits only and payment of admission fee can be done at the SAMPE Registration area at the Convention Center. Those attendees with complimentary passes must register in the same area to obtain a badge.
- All Must be Registered and Have a Badge to Enter the Exhibit Area.

HOUSING



- See page 43 for housing information. Your reservation is to be made directly with the hotel of your choice. Be sure to mention that you are with the SAMPE Group to receive the negotiated group rate.



GROUND TRANSPORTATION

- Los Angeles International Airport (LAX), 18 miles north of Long Beach; John Wayne/Orange County Airport, 25 miles south of Long Beach; and Long Beach Airport, only 15 minutes away, are the most convenient airports to use when flying in.
- Ground Transportation – special arrangements have been made with:
Prime Time Shuttle, 1-800-RED-VANS or 1-800-733-8267 Press "1" for reservations.
Book Online: www.primetimeshuttle.com or www.redvans.com. \$13 one way, when you mention the SAMPE Conference (round trip group rate \$26).
Pick up service from all Long Beach Hotels to LAX – Confirm your pick up time one day before departure.





SAMPE's 60th Anniversary Celebration

1944-2004

The history of a remarkable organization—the history of our industry.

On March 17, 1944, nine material and process engineers, representing five aircraft companies in the Los Angeles area, assembled at the Northrop Aircraft Company in Hawthorne, California, and discussed forming an organization that would meet periodically for the exchange of ideas and solutions for the technical challenges that were facing the U.S. aircraft industry. From its origins as a strictly U.S.-based local club the organization grew first to a regional organization and then in 1960 to a national Society. By the end of the 1970s the Society began to become international, with strong chapters in Europe, Japan and Canada by the mid-1980s, and chapters in Australia, Taiwan, Far East (Hong Kong), Beijing and Korea by 1990. Today



our small local club is a strong international Society but nonetheless has many of the same goals—to discuss technical challenges in material and process engineering and to exchange information, ideas and solutions.

The history of our Society is the history of our industry—the most remarkable people in our industry have been SAMPE members, and the most remarkable events in our

industry have been produced by those members. We have much history to celebrate, and much still to make!

Come to SAMPE 2004/Long Beach and be prepared to help us celebrate with a combination of fun, reflection, history, remembrance, and celebration of the remarkable accomplishments of our Society and its members. We will be emphasizing not only the history of our Society and industry, but in particular the people that made this history.

We invite and need your participation! We will be documenting and celebrating our history; we will be recognizing our Past Presidents and International Vice Presidents, Fellows, Award Winners, Founders, Charter Members and others; we will be honoring SAMPE's distinguished deceased members; we will invite our exhibitors to recognize and display their own history; we will review some of the historical achievements of our industry.

We will be celebrating the anniversary throughout SAMPE 2004/Long Beach, and throughout 2004. However, our “official” 60th Birthday Party will be the Welcome Reception in the Convention Center on Tuesday afternoon. Prepare to return for a while to the atmosphere of 1944—the Big Band Era. Come enjoy a piece of birthday cake, and prepare to share the fun of the 1940s and an appreciation of how far we've come in 2004. Bring a memory to share—we will be collecting them and publishing them in the SAMPE Journal throughout 2004.



Be proud;

Be happy;

BE THERE!

SAMPE 2004



special SAMPE *Thank You* to the following for their participation/support at SAMPE 2004:

THANK YOU



Lockheed Martin Aeronautics Company
Supplying our Keynote Speaker Mr. Michael L. Fortson



NASA

Sponsoring our SAMPE Luncheon and Luncheon Speaker Mr. Frederick D. Gregory



MIL-17-Handbook Group
Providing a tutorial and a panel

Interagency Working Group on Fire and Materials (IWGM)
Sessions on Fire Safe Materials and IWGM Business Meeting



IWGM



National Center for Advanced Manufacturing
Session on Advanced Composites Manufacturing Technology

American Ceramic Society

Endorsing and promoting our conference to their members



Congratulations

In recognition of their distinguished accomplishments, SAMPE is proud to announce the following members have been selected to be inducted as SAMPE Fellows:



Dr. James A. Harvey

Dr. Jude Iroh

Dr. Jesa Kreiner

Ms. Pamela K. Strong

Plan to join SAMPE in honoring these individuals for their outstanding achievements, Monday evening, May 17, at the Renaissance Hotel in Long Beach.

Material and Process Engineering is the technology by which materials are developed or selected and manufacturing processes chosen to convert those materials into products which meet the design, performance, producibility, quality, and cost effectivity criteria required. The Society for the Advancement of Material and Process Engineering (SAMPE), an international professional member society, provides information on new materials and processing technology via technical forums, journal publications, or books in which professionals in this field can exchange ideas and air their views. As the only technical society encompassing all fields of endeavor in materials and processes, SAMPE provides a unique and valuable forum for scientists, engineers, and academicians.

S P E A K E R

Keynote Address

Tuesday, May 18, 8:00 a.m.

Mr. Michael L. Fortson, Lockheed Martin Aeronautics Company, Fort Worth, TX
Joint Strike Fighter (JSF) Deputy Air Vehicle Development Team Lead
“F-35: 21st Century Fighter Design and Materials Technology”



It seems we've come full circle from the early 1900's when the Wright Brothers utilized fibrous materials (wood and fabric). They were very aware of the high strength vs. weight advantages, how easy they were to work with, and how no special tooling or equipment was required. But these materials weren't very "robust", and as metallics came onto the scene, they became the material of choice instead. But as these aircraft became Weapons Systems, we needed the structure to be much less of the flying weight, so that systems and weapons could be maximized.

About the time that SAMPE was founded, man developed a means of making a robust fibrous material, composites, that once again displayed the high strength-to-weight ratios, essential to modern fighter aircraft design. But the need for "special" equipment raised its ugly head with this innovation in the form of large autoclaves, presses, etc. needed to cure or consolidate the raw material into usable aircraft structures.

The F-35 JSF is being designed to replace a large number of legacy aircraft for the USAF, USN, USMC and the UK. The F-35 must not only have superior performance to legacy aircraft, it must also be affordable. The performance, weight, and low observable goals necessitate using composite materials and processes. However, the affordability requirements mandate that we find a way to build the structure more efficiently than in the past and avoid risk. In addition, this will be the first Low Observables aircraft that will field 1000's vs. 100's; not only for the U.S. government customer, but also for the UK, and a number of potential International partners. This presentation describes the JSF's challenge to meet these sometimes-competing requirements, and how the F-35's approach is truly revolutionary in developing superior performance in an affordable product. Mr. Fortson is currently Director, JSF Deputy Air Vehicle Development Team Lead at Lockheed Martin Aeronautics Company in Fort Worth, TX. He is responsible for the design, development, and the manufacture of the F-35 Joint Strike Fighter. He had previously led the multi-company JSF Enterprise, as its Affordability and Continuous Improvement Director, ensuring that the Air System was designed to be affordable throughout its life cycle.

He had a short tour in a company staff organization, Enterprise Productivity, which helped develop the new Company ConOPs (when 3 Aero companies merged to one), and applied lean concepts to "Above the Floor" company functional organizations. Prior to that, most of his LM experience resided with the F-22, managing several aspects including materials & processes, edge/empennage design, composites manufacturing, final finishes and RCS evaluation, and finally all manufacturing support of the assembly line. He just retired from a second career in the AF Reserves where he was a Lt. Col. Assigned to the B-2 SPO's Low Observables Directorate, with extensive experience in aircraft battle damage repair, resulting in his deployment to every major conflict.

In February 2002, he was awarded the National Black Engineer of the Year Award for Career Achievement. He was also honored in March by the National Society of Black Engineers, receiving their top award, Distinguished Engineer, at their 2002 Golden Torch Awards Ceremony.



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S P E A K E R

Luncheon Speaker Sponsored by NASA

Wednesday, May 19, 12:00 noon

Mr. Frederick D. Gregory, NASA Deputy Administrator, NASA Headquarters, Washington, DC

“NASA’s Plans for Future Space Exploration”



Frederick Gregory is NASA’s Deputy Administrator and a veteran astronaut who flew on three Space Shuttle missions. He is responsible for directing and managing many of NASA’s programs, including its program to develop technology options for future human and robotic exploration beyond low Earth orbit, as well as NASA’s day-to-day operations and activities. Mr. Gregory will outline the space agency’s new vision and mission objectives, its plans for future space exploration activities, and its efforts to transfer cutting-edge technologies to industry.

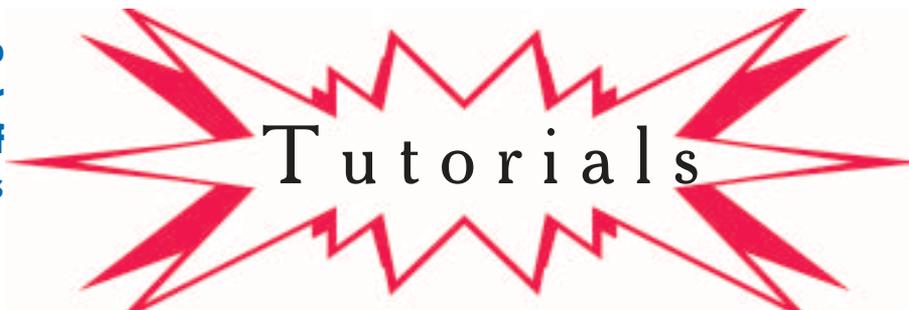
Mr. Gregory will also give an overview of NASA’s Innovative Technology Transfer Partnerships Program, established to catalyze partnerships with industry, academia and others to develop and transfer technology in support of NASA missions. This program has facilitated the development of hundreds of “spin-off” products and processes for the materials, manufacturing, medical and numerous other industries.

He assumed the position of NASA Deputy Administrator in August 2002. He serves as the chief operating officer for the Agency and reports directly to NASA’s Administrator. Prior to becoming the Deputy Administrator, he served as the Associate Administrator for Space Flight responsible for overseeing the management of the International Space Station; Space Shuttle operations, Space Access using Expendable Launch Vehicles for Commercial Launch Services; Space Communications; and Advanced Programs.

Mr. Gregory has extensive experience as an astronaut, test pilot, and manager of flight safety programs and launch support operations. As a NASA astronaut, he logged 455 hours in space: as pilot for the Orbiter Challenger (STS-51B) in 1985, as spacecraft commander aboard Discovery (STS-33) in 1989, and as spacecraft commander aboard Atlantis (STS-44) in 1991. Mr. Gregory served in several key positions as an astronaut, including Astronaut Office Representatives at the Kennedy Space Center, for the first Space Shuttle flights (STS-1 and STS-2); lead Capsule Communicator (CAPCOM); Chief, Operational Safety at NASA Headquarters; and Chief, Astronaut Training. He also served on the Orbiter Configuration Control Board and Space Shuttle Program Control Board.

Mr. Gregory holds a Bachelor of Science degree from the United States Air Force Academy and a Master’s degree in Information Systems from George Washington University.

A Great Way to Advance your knowledge of Materials



and Process Engineering from the Experts

Educational opportunity knocks at your door!

- 10 Great Educational Tutorials to Expand your Knowledge Base
- SAMPE Provides Opportunity to learn About Advanced M&P
- Tutorials Instructed by Experts in their Field of Technology
- Technology Coverage from the “Basics” to the more “Advanced”
- Tutorial Handouts Covering the Topic Presentation
- Special MIL-17 Handbook tutorial



SAMPE is offering conference attendees the unique opportunity to expand their knowledge base by taking advantage of carefully prepared technology tutorials.

Engineers, managers, technicians, students, sales personnel, shop floor personnel, and sales/business development specialists will find that all of these tutorials are instructive and practical in the advancement of their education of the technology field. Tutorial attendees will find that a number of the Instructors now offer a Power Point CD-ROM handout of the tutorial. For a small investment of your time, and at a fraction of the cost of a full short course, attendees can obtain significant information packed into a very intensive session. Company training needs are often filled by SAMPE’s excellent tutorial offerings. Since class size is limited, early sign-up is highly recommended.

Tutorials

Separate fee for each tutorial

**Full package registrants—\$150 • Full time student registrants—\$100 • All other registrants—\$175
All tutorial course attendees will receive a course handout.**

Tutorial sponsored by MIL-17 (Thursday Morning) Separate fee - \$200

Composite Materials: Introduction and Overview, Dr. Linda L. Clements, C& C Technologies and 2Phase Technologies, Dayton, NV

Sunday Afternoon, May 16 • 2:00 p.m. - 5:00 p.m.

This popular tutorial provides a basic understanding of composites, of their component fibers and resins, and of their advantages and limitations. It will give participants an overview of properties, performance and typical applications. Upon completion of this tutorial the participants will have the basic understanding of composites that will allow them both to profit from attending the SAMPE Symposium and Exhibition and to apply their understanding to their jobs. The tutorial is appropriate not only for those having little or no experience with high-performance composites but also for anyone desiring a more complete understanding of composites. Past attendees have included designers, M&P engineers, shop personnel, technicians, students, managers, and sales and business development specialists. Some of the topics covered in this educational tutorial are:

- Basic definitions and types of composites
- Overview of when composites should—and should not—be used
- Means for achieving outstanding performance with composites
- Overview of fiber reinforcements for routine composite applications
- Overview of fiber reinforcements for exotic applications
- Overview of resin matrix materials for common environments
- Overview of resin matrix materials for extreme environments
- Overview of resin matrix materials used in composites
- Applications and usage of composites
- Composite limitations and methods of overcoming them



Dr. Clements is President of C&C Technologies, where she offers educational, editorial and consulting services in composite materials. She is also Director of Materials R&D for 2Phase Technologies, a company that has pioneered low cost, rapid, reconfigurable tooling systems. An active SAMPE member for over 20 years, she currently is SAMPE International Secretary and writes a regular column for the *SAMPE Journal*. She is a contributing editor for several international trade publications and was formerly a Materials Engineering Professor at San Jose State University, and an engineer at NASA Ames Research Center and Lawrence Livermore National Laboratory.

Resin Infusion Processing Technology: RTM, VARTM and Other Primary Processes, Dr. Scott W. Beckwith, BTG Composites LLC, Murray, UT

Sunday Afternoon, May 16 • 2:00 p.m. - 5:00 p.m.

The subject of this tutorial, liquid molding (LM) and resin infusion processes, covers a wide range of today's LM and resin transfer molding, or RTM-type infusion, processes that have become quite popular for both advanced composites and FRP structures in recent years. While conventional RTM is the baseline, numerous related RTM and vacuum infusion processing (VIP) techniques have rapidly sprung up over the last five years. The basic LM processes, such as RIM, RRIM, and SRIM will be covered as the lead-in to the RTM-type processes. The so-called 'RTM alphabet soup' of related techniques will be discussed and differentiated in this tutorial. Some of those covered will be SCRIMP, VARTM, VRTM, TERTM, CRTM, UVRTM, BTRTM, and the list goes on to cover almost 25-30 techniques. Tooling methods associated with these processes, resin matrices currently available and preforming technologies will be addressed. Market applications examples will be discussed. Some of the topics covered in this tutorial are:

- Primary differences between RTM and VARTM processes
- Preform materials and various forms for resin infusion processes
- Overview of RTM, VARTM, RFI, SCRIMP and several of the newest processes available
- Important processing variables and their effects (fiber volume, orientation, pressure and vacuum levels, temperature, permeability, and tooling functions)
- Resin formulations of interest in today's applications
- Examples of numerous applications across various market segments

Dr. Beckwith, an active manufacturing consultant specializing in filament winding, resin infusion processes, and composites

processing, is President of BTG Composites LLC. He is also SAMPE's International Technical Director and previously served on SAMPE's Executive Cabinet. He is a SAMPE Fellow, the 1999 recipient of the SACMA Materials Leadership Award, and the 1996 SME "Jud" Hall Composites Manufacturing Award. He has over 250 technical publications and has actively provided composites design, processing, manufacturing, testing and training services for over 35 years to the advanced composites and FRP industry. He has served extensively as an Expert Witness in numerous technology cases.

Composite Tooling Fundamentals and Re-Usable Elastomeric Bagging

Jon P. Grigson, The Advanced Composite Group, Inc., Tulsa, OK

Monday Morning, May 17 • 9:00 a.m. – 12:00 noon

This tooling tutorial concentrates on the practical aspects of tooling fundamentals and the use of re-usable elastomeric bagging materials to fabricate composite products. Of particular interest to attendees, the use of live demonstrations of various tooling processes and bagging techniques makes this tutorial quite interesting to those desiring to actually watch tooling processes in action. Differences between tooling methods, materials, and project phases (prototyping, development, and production) are covered in this tutorial. Past attendees have found this tooling tutorial unique in terms of the extensive information made available in handout notes and the practical demonstrations performed by the presenter. Some of the topics covered in this tutorial are:

- Tools processed for autoclaves and high aerospace accuracies
- Practical, live, real tooling demonstrations
- Hands-on sessions with the new "Z-Preg Tooling Systems"
- Low temperature cure composites tooling concepts
- Techniques for producing re-usable elastomeric vacuum bags
- Frameless vacuum bags with automotive fender hands-on session
- Utilization of real tooling and bagging materials
- Making tools without autoclaves and without gel coats
- Correct use of gel coats for high surface esthetically polished tools/lower temperatures
- Assessing complex tooling/materials selection factors
- Tooling methodology related to inserts and location points
- Tooling for prototyping and development phases

Jon Grigson is employed by The Advanced Composites Group, Inc., a company which has been actively involved in providing advanced composites tooling and tooling materials system for many years. Employed by ACG for over 12 years, Mr. Grigson is ACG's Technical Support Manager responsible for providing customer support, tooling demonstrations, and is heavily involved with new product R&D. He previously worked for British Aerospace and has taught this popular tooling tutorial at other SAMPE conferences.

Fire Performance of Composites

Usman Sorathia, Naval Surface Warfare Center/Carderock, West Bethesda, MD

Monday Morning, May 17 • 9:00 a.m. – 12:00 noon

This tutorial covers numerous aspects associated with the fire, flammability, and hazards characteristics of polymeric and composite materials performance under extreme heat and fire conditions. Composite materials offer the benefit of corrosion resistance, weight savings, and provide affordable alternatives to metallic components with lower life cycle costs. However, polymer matrix based composite systems are inherently combustible, and present fire, smoke and toxicity threat in field applications. Various agencies (U.S. Navy, FAA, USCG, NIST) have been addressing polymers and composites fire-related issues in collaboration with industry and universities for a number of years. A summary of material safety principles, important technical issues, small and full-scale fire test methods, current government guidelines will be presented. Flammability characteristics of conventional and advanced glass, carbon, graphite and aramid reinforced composites will be covered. Some of the topics covered in this tutorial are:

- Overview of polymer and composite fire performance characteristics
- Review of how various agencies address fire performance
- Current government guidelines for: marine, aircraft, ground transportation, infrastructure
- Presentation on fire hazard analysis tools and methodology
- Current test methods and their limitations
- Materials selection to maximize fire performance
- Overview of current research areas being pursued

Usman Sorathia is the Head of the Fire Protection and Sea Survival Branch at the Naval Surface Warfare Center, Carderock Division. He has been intimately involved in the selection, testing, evaluation and approval process for the use of various polymers and composite materials used in U.S. Navy ships and submarines within the Fleet.

Mr. Sorathia has been a SAMPE member for 15 years. He has been active in the Interagency Working Group on Fire and Materials (IWGFM) which involves the implementation of a long-range national plan for research into this particular area with regard to advanced composite materials and structures.

Non-Autoclave Composite Fabrication Processes

Dr. Jack Boyd, Cytec Engineered Materials, Anaheim, CA

Monday Morning, May 17 • 9:00 a.m. – 12:00 noon

This tutorial will give an overview of the basic science involved with all composite fabrication processes. Although the focus will be on non-autoclave processes, the tutorial will begin by describing how the vacuum-bag/autoclave process works and why it is the most commonly used process for making high quality parts in the aerospace industry. Then other processes will be explained as to how they work and the pros and cons of each. Some of the key topics in this educational tutorial are:

- Basic polymer chemistry overview for understanding process methods
- Polymer matrix and fiber characteristics necessary to understand fabrication systems
- How a vacuum bag system works and how autoclave cure cycles are developed
- Volatiles—using them to prevent void situations in the composite
- Bleed vs. no-bleed cure methods
- Wet lay-up and why it is used for carbon fiber
- Vacuum bagging and oven curing with prepreg materials
- Current methods: resin film infusion (RFI), RTM, VARTM, filament winding, fiber placement, shrink wrap processing, and other out-of-autoclave processing.

Dr. Jack Boyd is currently a Senior Principal Research Chemist and has been involved with Cytec R&D for over 20 years. He has developed many composites and adhesive products, with Cycom 5215 vacuum bag (only) as a recent prepreg material that has been of much interest to the industry. He graduated from the University of Utah and UCLA.

Test Methods for Composite Materials

Dr. Donald F. Adams, Wyoming Test Fixtures, Laramie, WY

Monday Morning, May 17 • 9:00 a.m. – 12:00 noon

This tutorial provides a solid introduction to the novice but also is a good refresher for the experienced individual working with composite materials and structures. Emphasis is on establishing the guidelines for the selection of a proper and meaningful test method for each specific application. Although some test methods have been standardized by various agencies and groups, many have not yet and are evolving as ‘company standards’ in recent years. Since composite materials characterization and testing can often be expensive, picking the correct test method and conducting the test properly is important. This popular tutorial, and the handout, summarize test methods for composite materials and discusses the critical issues that are important to the composite end user. Some of the topics covered in this tutorial are:

- Proper test methods for specific applications
- Standard test methods — ASTM, SACMA, ISO, SAE, etc.
- Non-standard test methods discussion — where they fit
- Which composite properties are measured during testing
- Tests for sandwich structures vs. laminates
- Tests for random fiber, CSM, and unidirectional composites
- Tensile, compressive, shear, flexural, and other properties
- Special problems associated with fuels, temperature, water, long term, etc.

Dr. Adams, President of Wyoming Test Fixtures, and Professor of Mechanical Engineering at the University of Wyoming’s Composite Materials Research Group (where he recently retired as the Director), has been active in composites testing, materials analysis, design, and evaluation for over 35 years. Dr. Adams has been a SAMPE member for over 30 years and Wyoming Test Fixtures has been an exhibitor at SAMPE conferences several times. His company has led the way in developing international standards and testing fixtures/methods for mechanical test fixtures to support the composite materials community. Dr. Adams has been actively involved on the test methods subcommittees of ASTM and MIL-HDBK-17 to continuously develop, improve, and standardize test methods for advanced composite materials.

Composite Structures: Fabrication and Manufacturing Processes

Dr. James C. Leslie, Advanced Composite Products & Technology, Huntington Beach, CA

Monday Afternoon, May 18 • 1:00 p.m. – 4:00 p.m.

Always a popular tutorial, this course provides a comprehensive overview of the advantages offered by composite materials and the techniques by which they can be manufactured into useful structures and hardware components. An explanation of why composite materials are finding increased use in both commercial and aerospace applications is presented to the attendees. The attendees receive an in-depth review of the techniques used for the manufacture of composite structures. Some of the methods covered involve: filament winding, vacuum bagging, hand lay-up, pultrusion, resin transfer molding, compression molding, thermoforming, and various hybrid processes. Some of the topics covered in this tutorial are:

- Extensive coverage of composites and FRP processing methods
- What processes and applications best fit together
- Illustrating “how-to” manufacturing logic with composites

- What composite materials (resins, fibers, forms) work best and when
- Selection criteria for picking resins and fibers for applications
- Discussion of auxiliary equipment and materials for processing
- Open forum for questions concerning today's manufacturing methods
- Extensive presentation of composite manufacturing processes and applications

Dr. Leslie has been working with advanced composite materials and structures since 1964. He directed the manufacture of the first structural carbon fiber systems to fly on aircraft, and, the first component to be used on a satellite. Dr. Leslie has been a SAMPE member for over 30 years, and ACPT has exhibited at the SAMPE Show and Conferences for many years. He was the 1997 SME "Jud" Hall Composites Manufacturing Award recipient. Prior to working for ACPT he worked 13 years at Hercules where he was at the forefront of filament winding high performance solid rocket motor cases and developing advanced composite structures for numerous applications. He is the Chairman and CEO of ACPT, a company which designs and manufactures composite structures using all reinforcing fiber systems with a variety of manufacturing techniques.

High Resolution NDT Methods: Micro- and Nano-Materials Applications

Dr. Norbert Meyendorf, University of Dayton, Dayton, OH

Monday Afternoon, May 17 • 1:00 p.m. – 4:00 p.m.

This tutorial focuses on providing an in-depth overview of conventional high resolution NDE methods. The presentation includes micro-focus X-ray techniques where magnifications up to 100X and techniques resolving 1 mm using focal spot methods are discussed. X-ray tomography and ultrasonic methods will be presented. Acoustic techniques based on interferometric principles or air-coupled ultrasound methods will be discussed for non-contact NDE approaches currently being used today. Thermography, another very efficient non-contact method will be covered as well. Different methods such as through-transmission infrared imaging, pulsed thermography, fan thermography and thermal wave techniques will be reviewed. Finally, a short overview will be given of other high resolution microscopy techniques such as eddy current and Barkhausen noise microscopy. Some of the key topics covered in this educational tutorial are:

- Overview of high resolution NDE methods for establishing a baseline
- Ultrasonic techniques: advantages and limitations of the process
- X-ray tomography technique pros and cons with advanced materials
- Families of thermography methods and each distinct subsystem now available
- Limitations in NDE equipment, materials, inspection setup and defect size detection
- Resolution capability with today's NDE methods and fabrication methods

Dr. Meyendorf graduated with a Ph.D in Metal-Physics at the University of Halle/Germany and then served as a Welding Engineer for eight years. He also has an Sc.D. in Welding Technology. Since 1978 he has worked at several universities and research institutes in the field of NDE and materials characterization. Prior to coming to the University of Dayton in 1990, he worked as Department Head for Materials Characterization at the Fraunhofer Institute of NDT in Germany. He has published over 200 books, scientific papers and conference proceedings and his current interests are on high resolution NDE and nano-characterization methods.

Joining and Adhesives Technology: Gluing Structural Parts Together

Dr. James A. Harvey, Under-The-Bridge Consulting, Inc., Corvallis, OR

Monday Afternoon, May 17 • 1:00 p.m. – 4:00 p.m.

This tutorial is aimed at acquainting the attendee with adhesives technology. Adhesives are materials that join various substrates (also known as adherends) together. The total assembly of adhesive and adherends are known as joints. One of the major advantages of using adhesives eliminates the drilling of holes into the structural substrates. Examples of different types of adhesives include, glue, hot melt adhesives, pressure sensitive adhesives, film adhesives and structural adhesives. These can be processed using various techniques including thermal, electron beam, UV and microwave curing. Adhesives chemistry for these types of adhesives will be discussed. The reasons why things stick together and why they sometimes fail will be presented. Bondline test methods and critical issues associated with obtaining "good" bonded joints will also be covered in detail. Cleanliness of substrates, silane coupling agents and matching coefficients of thermal expansion (CTE) are all important parameters for bond quality. Some of the topics covered in this educational tutorial are:

- The basic definitions used in adhesion science
- Advantages and disadvantages of using adhesive bonding
- Different types and usage of commercially available adhesives
- Fundamental understanding why things stick together with adhesives
- Why adhesives fail
- The protocol for testing adhesive bonds
- Insight into the practical aspects of adhesives and adhesion

Dr. Harvey is the Instructor for the SAMPE tutorial on Joining and Adhesive Technology. He earned a BS in Chemistry from the University of Denver and a PhD from Virginia Tech. He has over 30 years of a combination of industrial and academic experiences. He has dealt with all aspects of adhesion including teaching, material selection, testing, product development, and failure analysis.

Nanocomposites Technology

Dr. Joseph H. Koo, University of Texas, Austin, TX and Dr. Louis Pilato, Pilato Consulting, Bound Brook, NJ
Monday Afternoon, May 17 • 1:00 p.m. – 4:00 p.m.

An introductory overview will define nanotechnology and its uniqueness/capabilities as an “enabling” technology allowing the introduction of unusually small amounts of nanomaterials in polymer systems resulting in the formation of a “nanocomposite” exhibiting multifunctional performance characteristics. The discovery of new nanoscaled materials such as nanoclays, carbon nanofibers, Polyhedral Oligomeric Silsesquioxanes (POSS®), carbon nanotubes, and others offer the promise of a variety of new composite, adhesive, coating, and sealant materials with unique properties not necessarily available with conventional materials. The creation of the U.S. government sponsored “National Nanotechnology Initiative” has been the platform for promoting many programs within academic, industrial, and government laboratories.

Some of the topics to be discussed in this tutorial are:

- Types of nanoparticles used in polymeric matrices
- Polymer matrices consisting of thermoset, thermoplastic, and elastomer resins
- Use of XRD, TEM, and SEM analyses to assess dispersibility
- Characteristics that polymer nanocomposites (PNC) exhibit:
 - ✧ Enhanced multi-functional characteristics of high strength, modulus
 - ✧ Improved T_g , fire resistance, moisture resistance, selective permeability
 - ✧ Selective electrical charge dissipation, thermal conductivity, clarity
- Description of various nanoparticles: nanoclays, carbon nanofibers, POSS®, carbon nanotubes, silica, alumina, TiO_2 , others
- Transformation of polymer matrix resins into PNCs: ablatives, coatings, fiber-reinforced composites, electronics, C-C composites, fire resistant materials, etc.
- Technology: Current status, Trends, New Developments, Economics, Commercial applications

Dr. Joseph H. Koo has 26 years of industrial and academic experience in program and engineering management. Currently, he is a Research Scientist in the Department of Mechanical Engineering at The University of Texas, Austin, TX. He is the Chairman of the newly established SAMPE Nanotechnology Committee. He specializes in polymer nanostructured materials: processing, characterization, and applications; flammability of polymeric materials; modeling of high-temperature composites and fire protective polymers; and qualification of materials for thermal and fire protection applications. Dr. Koo has published over 140 papers in materials, thermal, and optical science disciplines in various journals. Dr. Koo received his Sc.D. degree in Mechanical Engineering from George Washington University in 1987.

Dr. Pilato is President of Pilato Consulting and has been involved in TS and TP resin matrix systems for over 30 years in the advanced composites and FRP industry. He actively consults with international and domestic clients in the areas pertaining to these high performance and advanced composite materials with various processes. He is the author of *Advanced Composite Materials* (1994) and *Phenolic Resins* (2000). He is actively involved in several business and technical areas: fire resistant composites, aircraft interiors/cargo, abrasives, carbon-carbon brake composites, ballistic materials, friction products and closed/open cell foams.

Today’s Standard Has Changed

Sponsored and presented by the MIL-17 Handbook Group

Thursday Morning, May 20 • 8:00 a.m. – 12:00 noon

Composite Material Handbooks (MIL-17 Handbook) have had many changes and updates in recent years. Our mission is to continue developing world-class engineering handbooks, which contain databases, standards and guidelines for structural applications of composite materials. In our efforts to make these advances visible to candidate users, the organization has developed a tutorial. This tutorial starts with an introduction to the six volumes and, then, highlights some of the newest chapters of the handbook and areas where significant changes have occurred. Focused research performed by the FAA has helped accelerate the developments in several areas of practical interest. Industry and government experts that are part of the leadership for MIL-17 Handbook will make presentations in the tutorial.

- Introduction to MIL-17, including highlights from new volumes on metal matrix (Vol. 4), ceramic matrix (Vol. 5) and sandwich composites (Vol. 6)
- Statistics for material equivalency based on the AGATE process and FAA research on building block statistics
- New chapter on the building block approach
- New chapter on damage tolerance and FAA research on sandwich damage tolerance
- Progress by debond and delamination task group
- Supportability chapter and FAA sandwich repair research

Cost: \$200 (includes handouts and a MIL-17 membership fee for 16 months, allowing access to the members only website that contains the updated DOD-approved version {Rev. F} and most recent drafts of the handbooks, which have been fully approved through MIL-17 coordination groups: a \$150 value.

Preliminary Program

Tutorials

Sunday Afternoon, May 16
2:00 p.m. - 5:00 p.m.

Composite Materials: Introduction and Overview, Dr. Linda L. Clements, C & C Technologies and 2Phase Technologies, Dayton, NV

Resin Infusion Processes: RTM, VARTM, and Other Primary Processes, Dr. Scott W. Beckwith, BTG Composites LLC, Murray, UT

Tutorials

Monday Morning, May 17
9:00 a.m. - 12:00 noon

Composite Tooling Fundamentals and Re-Usable Elastomeric Bagging, Jon P. Grigson, The Advanced Composite Group, Inc., Tulsa, OK

Fire Performance of Composites, Usman Sorathia, Naval Surface Warfare Center/Carderock, West Bethesda, MD

Non-Autoclave Composite Fabrication Processes, Dr. Jack Boyd, Cytec Engineered Materials, Anaheim, CA

Test Methods for Composite Materials, Dr. Donald F. Adams, Wyoming Test Fixtures, Laramie, WY

Session 1A

Monday Morning, May 17
9:00 a.m.

Affordability, Sustainability and Recyclability

Chair: Dr. Frances Abrams, Air Force Research Laboratory/LBP, WPAFB, OH

VARTM of P-3 Integrated Secondary Aircraft Structure, J.M. Criss, M&P Technologies, Marietta, GA; S.C. Parsons, R.W. Koon, Lockheed Martin Aeronautics, Marietta, GA

Life Cycle Cost Benefits in Offshore Oil and Utilities Applications, J.D. Winkel, ASCG/MWE Inc, Thornton, CO

Avoiding the TQM Deathtrap; Lean Lessons from Six Sigma, M.T. Upton, George Group, Dallas, TX

Load-Bearing Structural Components from Natural Fiber and Unsaturated Polyester Biocomposites, R. Burguelo, M.J. Quagliata, A.K Mohanty, G. Mehta, M. Misra, L.T. Drzal, Michigan State University/Engineering, East Lansing, MI

Oil Palm Fruit Bunch Fibre Composite, A. Kalam, B. Sahari, Y. Khalid, W.S. Voon, University of Technology MARA, Shah Alam, Malaysia

Recycling of Natural- and Glass-Fiber Reinforced Thermoplastics, E. Schmachtenberg, A. Helpenstein, Aachen University/Institute of Plastics Processing, Aachen, Germany

A Process to Recover Carbon Fibers from Polymer Matrix Composites, B.J. Jody, J.A. Pomykala Jr, E.J. Daniels, Argonne National Laboratory, Argonne, IL; F. Paulauskas, Oak Ridge National Laboratory, Oak Ridge, TN; M.G. Abdallah, Hexcel Corporation

Session 1B

Monday Morning, May 17
9:00 a.m.

Commercial Aircraft

Chairs: Barbara McLean and Russell Maguire, The Boeing Company, Seattle, WA

Materials and Processing Technology for a CFRP Fuselage, L. Herbeck, H. Wilmes, M. Kleineberg, DLR German Aerospace Center/Structural Mechanics, Braunschweig, Germany

Comparison of Structural Concepts for the Design of Aeronautic Fuselages, G. Gatta, F. Romano, Italian Aerospace Research Center, Capua, Italy

CFRP And Advanced Aluminum Alloys in Aerospace: A Tough Competition, R. Muzzolini, Pechiney Aerospace, Kirkland, WA; J.C.

Ehrstrom, J.F. Begue, Pechiney Centrede Recherches, Voreppe, France; S. VanDerVeen, Pechiney, Issoire, France; A. Berges, Pechiney, Voreppe, France

Session 1C

Monday Morning, May 17
9:00 a.m.

E-Beam Processing—I

Chairs: James Sands, Army Research Laboratory, Aberdeen Proving Ground, MD and Dr. Giuseppe Palmese, Drexel University, Philadelphia, PA

Dark and Light Reactions in EB Cationic Polymerization of Epoxies, J. Lee, G.R. Palmese, Drexel University, Philadelphia, PA

Study of Reaction Kinetics of E-Beam Cured Cationic Epoxy Using Multiple Characterization Techniques, A.

Johnston, L. Petrescue, National Research Council Canada/Aerospace Research Institute, Ottawa, Canada; K.C. Cole, National Research Council of Canada/Industrial Materials Institute, Boucherville, Canada; C.W. Lee, D. Klosterman, University of Dayton Research Institute/Chemical Engineering, Dayton, OH; D.P. Anderson, J.M. Brown, A.F. Research Laboratory/MLBD, WPAFB, OH; G. Palmese, J. Lee, Drexel University, Philadelphia, PA

Electron Beam Curing Kinetics of Reactive Diluents Containing Bismaleimide, Y. Li, R.J. Morgan, F. Tschen, H-J. Sue, Texas A&M University/Polymer Technology, College Station, TX; V. Lopata, Acision Industries Inc, Pinawa, Canada

Structure/Property/Processing Relationships of E-Beam Cured Cationic Epoxy, D. Anderson, D.

Klosterman, University of Dayton Research Institute, Dayton, OH; J.M. Brown, A. Colleary, A.F. Research Laboratory/MLBC, WPAFB, OH; C.W. Lee, G. Palmese, Drexel University, Philadelphia, PA; J. Lee, A. Desai, A. Johnston, National Research Council Canada, Ottawa, Canada

The Use of E-Beam to Optimize the Properties of Fatty Acid-Based Polymers, J.J. LaScala, J.M. Sands, Army Research Laboratory, Aberdeen Proving Ground, MD; C. Lee, J-H. Lee, G.R. Palmese, Drexel University/Chemical Engineering, Philadelphia, PA

Session 1D
Monday Morning, May 17
9:00 a.m.

Fibers and Interfaces

Chair: *Chris Levan, Cytac Carbon Fibers, Alpharetta, GA*

Structure and Properties of Carbon Fibers Produced Using Microwave-Assisted Plasma Technology, Part I, F. L. Paulauskas, Oak Ridge National Laboratory/Engineering Technology, Oak Ridge, TN; E. Spruiell, University of Tennessee/Materials Science, Knoxville, TN

Improving the Fundamental Properties of Lignin-Based Carbon Fiber for Transportation Applications, A.L. Compere, W.L. Griffith, C.F. Leitten Jr, S. Petrovan, Oak Ridge National Laboratory/Metals and Ceramics, Oak Ridge, TN

Temperature-Dependent Dielectric Measurements of Polyacrylonitrile Fibers During Air Oxidation, F.L. Paulauskas, T.L. White, Oak Ridge National Laboratory, Oak Ridge, TN

Tailored Interphase Properties of Glass/Epoxy Composites, A.A. Obaid, M.E. Foley, A. Chatterjee, J.W. Gillespie Jr, University of Delaware/Composite Manufacturing Science Laboratory, Newark, DE

A New Way to Evaluate the Effects of Impregnants on the Pyrolytic Behaviors and the Yields of Rayon for Activated Carbon Fiber, F. Zeng, D. Pan, H. Chen, Dong Hua University/Carbon Fibers, Shanghai

The Outlook for the use of Basalt Continuous Fibers for Composite Reinforcement, O.O. Medvedyev, Y.L. Tsybulya, LLC 'BEIM', Kotsubinskoe, Ukraine

TG-DSC-MS Studies on Thermal Decomposition of Lyocell Fibers, Q. Wu, D. Fan, Y. Qiu, Donghua University/Materials Science and Engineering, Shanghai

Session 1E
Monday Morning, May 17
9:00 a.m.

Metals and Metal Composites—I

Chair: *Dr. Carl Zweben, Composites Consultant, Devon, PA*

Thermal Cycling and Creep Studies of AM50+Nd Magnesium Alloy Based Carbon Fiber, SiC Particulate and In-Situ Mg₂Si Reinforced Hybrid Composites, B.K. Dhindaw, S.K. Thakur, Indian Institute of Technology, Kharagpur, India; K.U. Kainer, N. Hort, H. Dieringe, GKSS Research Center/Magnesium Technology, Geesthacht, Germany

Hybrid Titanium Matrix Composite (TMC) Development and Status, W.M. Hanusiak, FMW Composite Systems Inc, Bridgeport, WV

Formability Prediction Tool for Fiber Metal Laminates, T.W. deJong, H.J.M. Woerden, P. vanNieuwkoop, Delft University of Technology/Aerospace Materials, Delft, The Netherlands

The Effect of Zirconium on the Microstructure and Mechanical Properties of a Super-High-Strength

Al-Zn-Mg-Cu Alloy, S. Yang, S. Dai, Y. Xie, M. Yan, Beijing Institute of Aeronautical Materials, Beijing, PRC

Production of Aluminum-Redmud Composites by Multi-Axis Random Rotation, S.C. Panigrahi, Indian Institute of Technology/Materials Engineering, Kharagpur, India; B. Sarangi, Bhadrakh Institute of Engineering, Orissa, India

Metallic Prepregs for the Composite Industry, B.L. Gordon, Touchstone Research Laboratory, Triadelphia, WV

Tutorials
Monday Afternoon, May 17
1:00 p.m. - 4:00 p.m.

Composite Structures: Fabrication and Manufacturing Processes, *Dr. James C. Leslie, Advanced Composite Products & Technology, Huntington Beach, CA*

High Resolution NDT Methods: Micro- and Nano-Materials Applications, *Dr. Norbert Meyendorf, University of Dayton, Dayton, OH*

Joining and Adhesives Technology: Gluing Structural Parts Together, *Dr. James A. Harvey, Under-the-Bridge Consulting, Inc., Covallis, OR*

Nanocomposites Technology, *Dr. Joseph H. Koo, University of Texas, Austin, TX and Dr. Louis Pilato, Pilato Consulting, Bound Brook, NJ*

SAMPE at Your Service

Once again the SAMPE Bookstore will be open during the Show. Take the time to browse and purchase new additions to your personal technical library of SAMPE books and proceedings at tremendous discounts. Many available on CD-ROM! Other selected publications will also be offered.



Panel
Monday Afternoon, May 17
1:00 p.m. – 3:00 p.m.

Oral Presentations Only
Accelerated Insertion of
Materials—Composites:
Phase I Program Review

Moderator: *Dr. Karl Nelson, Boeing Phantom Works, Seattle, WA*

The objective of Accelerated Insertion of Materials - Composites (AIM-C) was to demonstrate concepts, approach, and tools that can accelerate the insertion of new materials into Department of Defense products. The AIM-C System utilizes analysis techniques and experimentation to develop a designer's knowledge base (technical and production readiness information) from the outset, rather than the more traditional approach of sequential, unlinked research and development, sometimes locally optimized without a production readiness transition path.

During Phase I, the team worked on three primary emphases: (1) methodology development and documentation to develop maturity for insertion from knowledge, analyses, and tests, (2) product development and integration of a software tool that includes processing, producibility, structures, and durability assessments, and (3) demonstration/validation of the approach and tools.

The panel will discuss approaches to achieve up to 55% acceleration and reduction in rework. Successes and remaining challenges will be presented. The program was jointly accomplished by Boeing and the U.S. Government under the guidance of NAST. It was developed under the guidance of Dr. Leo Christodoulou of DARPA and the technical direction of Dr. Ray Meilunas of NAVAIR.

Panelists:

S. Eric Cregger, *The Boeing Company, Seattle, WA*

Pete George, *The Boeing Company, Seattle, WA*

Gail Hahn, *Boeing Phantom Works, St. Louis, MO*

Dr. Ray Meilunas, *NAVAIR/Aerospace Materials, Patuxent River, MD*

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Session 2A
Monday Afternoon, May 17
3:00 p.m.

Accelerated Insertion of Composite Materials

Chair: *Dr. Karl Nelson, Boeing Phantom Works, Seattle, WA*

Managing Error and Uncertainty in Structures, S.E. Cregger, R. Rajagopal, P. Pugliano, S. Uryasev, The Boeing Company, Seattle, WA

Characterization of the Interphase Formation Kinetics in Thermosetting-Matrix Composites, F. Yang, R. Pitchumani, University of Connecticut/Mechanical Engineering, Storrs, CT

Efficient Process Modelling of Composite Structures, N. Zobeiry, A. Rasekh, R. Vaziri, A. Poursartip, University of British Columbia/Metals and Materials Engineering, Vancouver, Canada

Accelerated Insertion of Materials—Manufacturing and Producibility of Hat Stiffened Structure, P.E. George, K. Rupel, The Boeing Company, Seattle,

WA; J. Griffith, The Boeing Company, St. Louis, MO

Session 2B
Monday Afternoon, May 17
1:00 p.m.

Metals and Metal Composites—II

Chair: *Dr. Carl Zweben, Composite Consultant, Devon, PA*

High-Temperature Deformation Characteristics of Martensitic Stainless Steels, A.K. Roy, S.R. Kukatla, B. Yarlagadda, University of Nevada/Mechanical Engineering, Las Vegas, NV

Secondary Recovery of Aluminium from Advanced Materials, M.A. Reuter, A. vanSchaik, Delft University/Applied Earth Sciences, Delft, The Netherlands; P. vanNieuwkoop, Delft University/Aerospace Materials, The Netherlands

The Processing, Manufacturing and Properties of Advanced Aluminum Alloys for Aerospace Applications, S. Dai, S. Yang, Beijing Institute of Aeronautical Materials, Beijing, China

Combustion Synthesis of ZnFe₂O₄ Ferrite Powders, Y. Li, J. Zhao, J. Jiang, Harbin Institute of Technology/Center for Composite Materials, Harbin, PRC

An EXAFS and EXELFS Characterization of TiN Thin Films Grown by PLD, C. Gonzales-Valenzuela, A. Duarte-Moller, W. DeLaCruz, F. Castillden, J.A. Decdaz, L.C. Araiza, Centro de Investigacion en Materiales Avanzados/Materiales Ceramicos, Chihuahua, Mexico

EXELFS Characterization of Gold Nanoparticles, Produced by Esterified Hop Biomass, Deposited on Si Substrates by the Spray Pyrolysis Technique, A. Duarte-Moller, M.A. Ramos, P. Sanchez-Santiago, Centro de Investigacion en Materiales Avanzados/Materiales Ceramicos, Chihuahua, Mexico; M.L. Lopez, J.L. Gardea-Torresdey, University of Texas/Chemistry, El Paso, TX; J.A. Lopez, W. Durrer, University of Texas/Physics, El Paso, TX

Strategy for Development and Processing of High Value Steels, S. Ghosh, K.N. Jha, L. Parthasarathy, S. Chakraborty, S. Jha, Steel Authority of India Ltd/Research and Development, Rourkela, India

Microstructures and Mechanical Properties of Ni-Cr-Al Superalloy, C. Guan, X. He, Y. Li, Y. Sun, Harbin Institute of Technology/Center for Composite Materials, Harbin, PRC

Plenary
Monday Afternoon, May 17
1:15 p.m.

Oral Presentations Only

Resin Infusion Technology Advances Over the Past 15 years

Dr. Scott Beckwith, BTG Composites LLC, Murray, UT

Since the mid-1980's resin infusion technology has grown rapidly in the aerospace and commercial market place. The number of resin infusion process methods has grown from the traditional resin transfer molding (RTM) and

vacuum-assisted RTM (VARTM) into well over 50 distinct processes. This presentation will discuss the changes in available infusion resin systems, extent of structural preforms, and applications and entry into a rapidly growing market. The effects of environmental controls and the acceptance of large scale resin infusion processes have led to significant growth in niche techniques. RFI, SCRIMP™, and other techniques will be highlighted.

Session 2C
Monday Afternoon, May 17
2:00 p.m.

Resin Infusion Processes

Chairs: *Dr. Chuck Zhang, Florida A&M University/Florida State University/Industrial Engineering, Tallahassee, FL and Dr. Alfred Loos, Virginia Tech, Blacksburg, VA*

Processing Parameters of Aerospace VARTM Resins, A. Loff, J. Chase-Fielding, J. Borges, National Composite Center, Kettering, OH

Review of Intelligent Processing in Resin Transfer Molding and Vacuum Assisted Resin Transfer Molding, K-T. Hsiao, B. Minaie, J. Gou, S. Jiang, S.G. Advani, University of South Alabama/Mechanical Engineering, Mobile, AL

Effects of Processing of Parameters on the Mechanical Properties of Components Manufactured Using the Resin Infusion Between Double Flexible Tooling Process, L. Teemer, O.I. Okoli, Z. Liang, H-P. Wang, Florida Advanced Center for Composite Technologies/Industrial and Manufacturing, Tallahassee, FL

VARTM of Nano-Modified Epoxy Resins for Aerospace Applications, J. Chase-Fielding, A. Jacques, A.F. Research Laboratory/MLBC, WPAFB, OH

Void Formation During Infusion Molding, R.S. Parnas, C. Liu, S. Walsh, University of Connecticut/Materials Science, Storrs, CT

Modeling the VARTM Composite Manufacturing Process, A.C. Loos, Virginia Tech/Engineering Science and Mechanics, Blacksburg, VA; X. Song, B. Grimsley, R. Cano, NASA Langley Research Center, Hampton, VA; P. Hubert, McGill University/Mechanical Engineering, Montreal, Canada

Use of Mold Filling Simulations for Process Control and Automation in Liquid Composites Molding, J.M. Lawrence, P. Simacek, A. Gokce, V. Neacsu, S.G. Advani, University of Delaware/Mechanical Engineering, Newark, DE

Statistical Characterization of Fiber Preform Permeability and Its Application to Robust Design of RTM Process, J. Li, C. Zhang, Z. Liang, B. Wang, Florida A&M University/Florida State Univ/Engineering, Tallahassee, FL

Analysis of Filling Pattern in Resin Transfer Molding, R. Panitapu, S. Jiang, B. Minaie, University of South Alabama/Mechanical Engineering, Mobile, AL

Adaptive Control of Non-Isothermal Resin Transfer Molding Process, B. Minaie, S. Jiang, W. Li, J. Gou, K.T. Hsiao, University of South Alabama/Mechanical Engineering, Mobile, AL

Session 2D
Monday Afternoon, May 17
1:00 p.m.

Space Structures—I

Chair: *Paul Wienhold, Johns Hopkins University/Applied Physics Laboratory, Laurel, MD and Dr. Kent Watson, National Institute of Aerospace, Hampton, VA*

(CLOSED PAPER) Bonding of Silicone Impregnated Reusable Ceramic Ablator Thermal Protection System Tiles, S.E. Buck, Jet Propulsion Laboratory, Pasadena, CA

(CLOSED PAPER) Determination of Design Allowables for the Mars Exploration Rover Aeroshell, S.E. Buck, K.P. Makowski, Jet Propulsion Laboratory, Pasadena, CA

Space Durable Polyimide/Carbon Nanotube Composite Films for Electrostatic Charge Mitigation, K.A. Watson, D.M. Delozier, J.G. Smith Jr, J.W. Connell, NASA Langley Research Center/National Institute of Aerospace, Hampton, VA

The Development of a Light Baffle Assembly for the CRISM Instrument, P.D. Wienhold, E.D. Schaefer, Johns Hopkins University/Applied Physics Laboratory, Laurel, MD

Reflectivity Analysis on Pitch-Based Carbon Fiber Fabrics for High-Frequency Antennas and Reflectors, M. Saba, Nippon Graphite Fiber/Engineering, Montreal, Canada; G. Ishikawa, Nippon Graphite Fiber Corporation, Tokyo, Japan; P.A. Ilott, Jet Propulsion Laboratory, Pasadena, CA; N. Kiuchi, H. Mizuta, Nippon Oil Corporation, Yokohama, Japan; T. Sakai, O. Hashimoto, Aoyama Gakuin University/Electrical Engineering, Sagamihara, Japan

Multifunctional Spacecraft Structure Design Development, S. Hahn, R. Usami, T. Ozaki, Mitsubishi Electric Corporation, Sagamihara, Japan

Light-Weight Structural Material for Space Solar Power System, H. Ishii, T. Ozaki, S. Hahn, Mitsubishi Electric Corporation, Sagamihara, Japan

Space Environment Characteristics of MWNT/Epoxy Composites, Korea Advanced Institute of Science and Technology/Aerospace, ROK

Plan to Attend Closed Papers?



To avoid a problem on site, check credentials needed—see page 52.

Plenary
Monday Afternoon, May 17
1:15 p.m.

Oral Presentations Only
Taking Advantage of Modern Standard Test Methods for Composites

Richard Fields, Lockheed Martin Company, Orlando, FL

In the past dozen years, the 230+ international volunteer technical members of Committee D30 on Composite Materials of ASTM International have made great strides forward in open development of new and updated full-consensus standards for testing composite materials. More than fifty-five standards are now available, additional new standards are in the development pipeline, and existing standards continue to be improved and modernized. But with such standards now available, how does one know which test method standard to select for what use, and how to properly specify and reference that standard for a given material and application? The Chairman of Committee D30 will begin to address these and other questions on the selection and use of testing standards for composite materials.

Session 2E
Monday Afternoon, May 17
2:00 p.m.

Testing—I

Chairs: *Dr. Donald Adams, Wyoming Test Fixtures Inc, Laramie, WY and Waruna Seneviratne, Wichita State University/National Institute for Aviation Research, Wichita, KS*

Determination of Adhesive Properties, J.S. Tomblin, W.P. Seneviratne, S-L. Mah, Wichita State University/National Institute for Aviation Research, Wichita, KS

Bending Effects in Compression Specimens Tested in the Wyoming Combined Loading Compression (CLC) Test Fixture (ASTM D6641/

D6541M), P.M. Wegner, A.F. Research Laboratory/Space Vehicles Directorate, Kirtland AFB, NM; D.F. Adams, Wyoming Test Fixtures Inc, Laramie, WY

Compression Strength of Notched Composites, C.J. Martin, W.L. Hedges, Hexcel Corporation, Dublin, CA

Recent Biaxial Test Results of Laminated Composites and MCT Analytical Predictions, J.S. Welsh, A.F. Research Laboratory, Kirtland AFB, NM; J.S. Mayes, Alfred University/Mechanical Engineering, Alfred, NY

Residual Stress Effects on Behavior of Composites Under Transverse Loading, D.C. Foster, A.F. Research Laboratory/MLBCM, WPAFB, OH; G.P. Tandon, University of Dayton Research Institute, Dayton, OH; M. Zoghi, University of Dayton, Dayton, OH

Suggested Modifications of the Short Beam Shear Test Method, D.F. Adams, J.M. Busse, Wyoming Test Fixtures Inc, Laramie, WY

A New Specimen Design for Testing Composites Using Compression Split Hopkinson Pressure Bar (SHPB), B.A. Gama, J.W. Gillespie Jr, University of Delaware/Center for Composite Materials, Newark, DE

Session 2F
Monday Afternoon, May 17
1:00 p.m.

Tooling

Chair: *Steve Hanson, The Boeing Company, Wichita, KS*

Emerging Materials and Processes: CFOAM for Composite Tooling, R. Lucas, Touchstone Research Laboratory, Triadelphia, WV

Invar Tooling Cost Reduction, Boeing Commercial Aircraft Company, Wichita, KS

Rapid Prototyping Technology Applications for Advanced Composite Structures Assembly Tooling, C. Standish, Boeing Phantom Works, Huntington Beach, CA

The Curse of the Nylon Locator Pins: What Are the Alternatives?, L.C. Dorworth, Abaris Training Resources Inc, Reno, NV

Trapped Tooling for Integrated Structures, K. Goodno, International Design Technologies Inc, Sumner, WA

Advances in Tooling Solutions, E.V. Aversenti, General Magnaplate Corporation, Linden, NJ

Rapid, Low-Cost, Reformable, Multi-Use Tooling Systems for Composite Repair, B. Oliver, T.L. Jacobson, 2Phase Technologies, Santa Clara, CA; L.L. Clements, J.L. Crowley, 2Phase Technologies, Dayton, NV

Water Soluble Tooling Materials for Complex Polymer Composite Components—An Update, R. Vaidyanathan, J. Campbell, L. Studley, B. Hecht, Advanced Ceramics Research Inc, Tucson, AZ; S. Yarlagadda, J.W. Gillespie Jr, University of Delaware/Center for Composite Materials, Newark, DE; D. Duna, B. Guest, R. Saenz, Naval Air Warfare Center/Weapons, China Lake, CA

Engineering Design and Tooling Optimization to Achieve Pressure Integrity in Integrally Cured Complex Composite Assemblies, M. Gross, J. Bruno, EDO Corporation/Marine and Aircraft Systems, North Amityville, NY

Fellow Banquet
Monday Evening, May 17
7:00 p.m.

Reminder!
There is an additional charge for Tutorials. See pre-registration form on page 49.



Keynote Address
Tuesday Morning, May 18
8:00 a.m. - 9:00 a.m.

“F-35: 21st Century Fighter Design and Materials Technology



Michael L. Fortson, Joint Strike Fighter (JSF) Deputy Air Vehicle Development Team Lead, Lockheed Martin Aeronautics Company, Fort Worth, TX

Panel
Tuesday Morning, May 18
9:30 a.m. - 11:45 a.m.

Oral Presentations Only
M & P Technology: SAMPE’s Technical Committees
Report on Current Technology and Market Trends

Panel Presentations and Discussion with SAMPE Technical Committee Experts Hosted by Selected SAMPE Technical Committees

Moderators: *Tia Benson Tolle, SAMPE International Senior Vice President and Dr. Scott W. Beckwith, SAMPE International Technical Director*

Initiated for the first time at SAMPE 2003 at Long Beach on the first day of the 2003 Symposium, this panel provided an insight into the technology advances in M&P areas and was attended by over 125 people who heard the latest from SAMPE’s recognized experts. The SAMPE 2004 panel is made up from selected SAMPE Technical Committee experts to again provide the latest information in two key areas: Technologies and Applications. Because the SAMPE 2004 Organizing Committee

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has also added several Plenary overviews (Resin Infusion, Testing, Nanocomposites, Infrastructure and Fire Performance) within the Symposium structure, full coverage of all technology areas is provided to attendees.

SAMPE has long believed that its membership currently represents the M&P technology market and applications areas and that these technical experts have their finger on what’s happening internationally. The panel will address current technology by covering what advances have been made, what the challenges and issues are within the marketplace, what breakthroughs might soon be expected and what developments are necessary to open up the market further for potential applications.

The panelists will provide a brief Power Point overview and then be available for interaction among panel members, the media and the SAMPE 2004 attendees in the audience.

SAMPE Technical Committee Panelists:

Technologies:
Ceramics, Metal Matrix and Carbon-Carbon, *Dr. Wayne Steffier, Hyper-Therm Inc*

Electronics, *Robert Seibold, The Aerospace Corporation*

FRP Liaison, *Richard Caruso, Fiber Glass Industries Inc*

Tooling, *Robert Stratton, 2Phase Technologies Inc*

Applications:
Commercial Aircraft, *Barbara MacLean, The Boeing Company*

Energy Technology, *Anne Marie Sindal, Sindal Associates*

Ground Transportation, *Dr. Nicholas Gianaris, Visteon Chassis Systems*

Space and Space Manufacturing, *Paul Wienhold, The Johns Hopkins University/Applied Physics Laboratory*

Unmanned Systems, *Michael Kraemer, Foam Matrix Inc*

Plenary
Tuesday Morning, May 18
9:45 a.m.

Oral Presentation Only

Fire Performance of Materials for Commercial and Military Applications

Usman Sorathia, Naval Surface Warfare Center/Carderock, West Bethesda, MD; Dr. Richard Lyon, FAA, Atlantic City, NJ and Jeffrey Gilman, NIST, Gaithersburg, MD

Due to their inherent characteristics, advanced polymeric materials and composites have been making steady inroads into commercial and military systems for the last 40 years. Chief among their characteristics is the stiffness-to-weight ratio, endurance under cyclic loading and resistance to chemical attack (e.g. corrosion resistance). Aside from other mechanical and manufacturing advantages, polymeric systems used to manufacture most advanced composite materials in commercial aircraft, ships and submarines, and infrastructure are hydrocarbon-based and are combustible. It is an imperative requirement to improve the fire performance characteristics of these materials if we are to use them in commercial and military applications without compromising material fire safety. In this presentation, the overview will present some of the programs that the DOT and DOD are working to address this issue.

Session 3A
Tuesday Morning, May 18
10:30 a.m.

Fire Performance—I: Fire Safety of Materials

Sponsored by IWGFM

Chair: *Usman Sorathia, Naval Surface Warfare Center/Carderock, West Bethesda, MD*

BDPE Free Fire Retardant Adhesive, Tape, and Fasteners, P. Zimmerman, S. Subrahmaniann, J. Gagnon, J. Kobe, R. Pereyra, M. Daniels, T. Dietz, 3M, St. Paul, MN

Composite Open Face Deck Grating Development, P. VanDine, Electric Boat Corporation, Mystic, CT

Fire Protection of Flammable Materials Utilizing Geopolymer, J. Giancaspro, Rutgers University/Civil Engineering, Piscataway, NJ; P. Balaguru, National Science Foundation/Infrastructure Materials and Structural Mechanics, Arlington, VA; R. Lyon, FAA Technical Center/Fire Safety Section, Atlantic City, NJ

Session 3B
Tuesday Morning, May 18
9:30 a.m.

High Temperature Materials—I

Chairs: *Dr. Katie Thorp, Air Force Research Laboratory/MLBC, WPAFB, OH and Dr. John Connell, NASA Langley Research Center, Hampton, VA*

(CLOSED SESSION)

Characterizing Oxidative Degradation of PMR-15 Resin, E. Ripberger, G.P. Tandon, University of Dayton Research Institute, Dayton, OH; G.A. Schoeppner, A.F. Research Laboratory/MLBCM, WPAFB, OH

Quality Control in PMR-Type Processing Utilizing HPLC, M.E. Brow, A.F. Research Laboratory/MLBC, WPAFB, OH; S.A. Johnson, YLA Inc, Benicia, CA; L.R. McGrath, Maverick Corporation, Blue Ash, OH

Manufacturing of Combined Metal and PMC Facesheets-Ti Honeycomb Core Sandwich Structure for Aero-propulsion Application, E.E. Shin, J.C. Thesken, NASA Glenn Research Center/Ohio Aerospace Institute, Cleveland, OH; J.K. Sutter, J. Juhas, A. Veverka, NASA Glenn Research Center, Cleveland, OH; D. McCray, University of Dayton Research Institute, Dayton, OH; K. Blohowiak, Boeing Phantom Works, Seattle, WA; J.E. Fink, The Boeing Company/Rocketdyne, Canoga Park, CA

High Temperature Resin Transfer Molding Development and Characterization, F.E. Arnold, T. Storage, A.F. Research Laboratory/MLBCO, WPAFB, OH; L-S. Tan, A.F. Research Laboratory/MLBP, WPAFB, OH

Review of High Temperature Resin Transfer Molding for Aircraft Applications, T. Gibson, B. Rice, University of Dayton Research Institute, Dayton, OH

Design Analysis of a Composite Combustion Chamber Support, J.C. Thesken, E. Shin, NASA Glenn Research Center/Ohio Aerospace Institute, Cleveland, OH; M. Melis, J. Sutter, NASA Glenn Research Center, Cleveland, OH; M.R. Margolis, J. Fink, The Boeing Company/Rocketdyne, Canoga Park, CA

Session 3C
Tuesday Morning, May 18
9:30 a.m.

Marine Applications—I

Chairs: *John Laakso, Consultant, Normandy Park, WA and Harry Telegadas, Naval Surface Warfare Center/Carderock, West Bethesda, MD*

Composite Motor Canning Development, P. VanDine, Electric Boat Corporation, Mystic, CT

Durability of E-Glass/Vinyl Ester Composites in a Marine Environment, V.T. Nguyen, V.M. Karbhari, C. Stachowski, University of California/San Diego/Structural Engineering, LaJolla, CA; S. Deng, University of Sydney/Center for Advanced Materials Technology, Sydney, Australia

Bearing Strength of Thick Carbon Plates for Marine Applications, R. Downs-Honey, High Modulus, Auckland, New Zealand

Optimized Racing Boat Design Using Unique High Strength Fiberglass, D. Fecko, Advanced Glassfiber Yarns LLC, Huntingdon, PA; W. Chafin, J. Crain, Advanced Glassfiber Yarns LLC, Aiken, SC; S. Stepp, Velocity by Initial Marine Corporation, Sanford, FL



Marine Applications for CFOAM Carbon Foam Material, R. Lucas, Touchstone Research Laboratory, Triadelphia, WV

Salt-Fog Accelerated Testing of Glass Fiber Reinforced Polymer Composites, A. Caceres, University of Puerto Rico/Civil Engineering, Mayaguez, PR; R.M. Jamond, T.A. Hoffard, L.J. Malvar, Naval Facilities Engineering Service Center, Port Hueneme, CA

Transitioning from Conventional Fastening Methods to Structural Adhesives, P. Carbutt, R. Lemerise, T. Cudmore Jr, F. Rosselli, ITW Plexus, Danvers, MA

Session 3D
Tuesday Morning, May 18
9:30 a.m.

NDE and NDI Technology—I

Chairs: *Dr. Kirk Tackitt, Army Research Laboratory, Aberdeen Proving Ground, MD and Dr. Kirsten Lipetzky, Naval Surface Warfare Center/Carderock, West Bethesda, MD*

Real-Time Structural Health Monitoring—Is It Really This Simple?, L. Walker, Structural Monitoring Systems, Perth, Australia

Non-Destructive Evaluation of Aluminum Matrix Composites, W.S. deRosset, Army Research Laboratory, Aberdeen Proving Ground, MD

Boundary Edge Effects on the Correlation of Surface Displacement to Internal Flaw Geometry, P. Herrington, P. Schilling, M. Verges, University of New Orleans/Mechanical Engineering, New Orleans, LA

Nondestructive Interfacial Evaluation of Damage Sensing for Single Fiber/Epoxy Composites Using PZT, PVDF and P(VDF-TrEF) Copolymer Sensors, J-M. Park, D.S. Kim, J.K. Kim, Gyeongsang National University/Polymer Science and Engineering, Jinju, South Korea; J-W Kong, Korea Institute of Machinery and Materials/Composite Materials, Changwon, South Korea; D-

J. Yoon, Korea Research Institute of Standard and Science/Smart Measurements, Daejeon, South Korea

Damage Detection in Large-Scale Composite Structures via Vibration Technique Using MEMS Accelerometers, M.K. Yoon, C. Krauthauser, D. Heider, J.W. Gillespie Jr, University of Delaware/Composite Manufacturing Science Laboratory, Newark, DE; C.P. Ratcliffe, U.S. Naval Academy/Mechanical Engineering, Annapolis, MD; R.M. Crane, Naval Surface Warfare Center/Carderock, West Bethesda, MD

Embedded Fiber Optic Bragg Grating with System for High Speed, Sensitive Strain Detection, K.E. Froeschner, Martin, Froeschner and Associates; T.E. Bennett, P.M. Dentinger, Sandia National Laboratories, Livermore, CA; D. Nelson, Stanford University, Stanford, CA

Session 3E
Tuesday Morning, May 18
9:30 a.m.

Preforms and Textile Technology—I

Chairs: *Kory Abbitt, A&P Technology Inc, Cincinnati, OH and Dr. Frank Ko, Drexel University/Materials Science and Engineering, Philadelphia, PA*

Advances in Textile Preforms, C. Wilkinson, Bally Ribbon Mills, Bally, PA

Cost Effective, Flexible Preforming for Defense Applications, D. Sabol, B. Brannon, E. Spangler, National Composite Center, Dayton, OH; R. Rondeau, University of Dayton Research Institute, Dayton, OH

Development and Commercialization of Low Areal Weight 12k Carbon Fabrics for Cost Effective Structural Composites, D. Taylor, Hexcel Corporation, Seguin, TX; P. Henrat, Hexcel Fabrics and Composites, Les Nappes, France

Formability of Prepreg 2x2 Twill Fabrics, M.R. Garnich, University of Wyoming, Laramie, WY

Connecting Design and Manufacture of Complex Shape 3-D Braided Preforms, D. Mungalov, A. Bogdanovich, 3TEX Inc, Cary, NC

Latest Developments in Stitching and Braiding Technologies for Textile Preforming, K. Dreschsler, University of Stuttgart/Aircraft Design Institute, Stuttgart, Germany

Session 3F
Tuesday Morning, May 18
9:30 a.m.

Testing—II

Chair: *Dr. Peter Wegner, Air Force Research Laboratory/VSSV, Kirtland AFB, NM*

Testing Composite Pressure Vessels for Storage of High Pressure Hydrogen, S. Hogan, M. Olson, HyPerComp Engineering Inc, Brigham City, UT

Blunt Notch Behavior of Fiber Metal Laminates, G. Wu, J-M. Yang, UCLA/Materials Science and Engineering, Los Angeles, CA

Dynamic Punch Shear Characterization of Twill Weave Graphite/Epoxy Composites, M.V. Hosur, S.M.W. Islam, S. Jeelani, Tuskegee Univ/Center for Advanced Materials, Tuskegee, AL

In-Plane Shear Properties of High Modulus Graphite Fiber Reinforced/Polyimide Composites with Various Fiber Architectures, M. Gentz, D. Armentrout, L. Kumosa, M. Kumosa, University of Denver/Material Science, Denver, CO; E. Shin, J. Sutter, NASA Glenn Research Center, Cleveland, OH

Vibration Damping of Flexible and Rigid Polyurethane Composites, A. Sharma, L.D. Peel, Texas A&M University/Mechanical and Industrial Engineering, Kingsville, TX

Vibration Damping of Glass/Polypropylene Thermoplastic Composites, U.K. Vaidya, University of Alabama/Materials Science and Engineering, Birmingham, AL

Structural Qualification of Unique Aerospace Structures, G. Sanford, CSA Engineering, Albuquerque, NM; J. Welsh, A.F. Research Laboratory/VSSV, Kirtland AFB, NM

Measuring Transverse Shear Stiffness, T.W. deJong, H.J.M. Woerden, P. vanNieuwkoop, Delft University of Technology/Aerospace Engineering, Delft, The Netherlands

Session 3G
Tuesday Morning, May 18
9:30 a.m.

University Research—I

Chair: Prof. Anthony Saliba, University of Dayton, Dayton, OH

Papers from finalists in the graduate, senior and international student scholarship competition will be presented.

Session 4A
Tuesday Afternoon, May 18
1:00 p.m.

E-Beam Processing—II

Chairs: Dr. Giuseppe Palmese, Drexel University/Chemical Engineering, Philadelphia, PA and James Sands, Army Research Laboratory, Aberdeen Proving Ground, MD

E-Beam Curing of a Vinyl-Ester/Styrene Copolymer Resin System, D. Klosterman, A. Desai, University of Dayton Research Institute, Dayton, OH

Electron Beam Cured Resins and Composites: Improved Two-Step Curing Materials for Cryogenic Applications, L.G. Bykanova, C.A. Byrne, Science Research Laboratory Inc, Somerville, MA; G.R. Palmese, Drexel University/Chemical Engineering, Philadelphia, PA

Fabrication of Electron-Beam Processable Polyimide Tapes and Composites, A.E. Hoyt-Haight, J-M. Gosau, D.A. Babow, S.P. Wesson, Adherent Technologies Inc, Albuquerque, NM



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In-Situ Monitoring of Residual Stress Development During E-Beam Processing, P. Pazdzior, P. Hubert, A. Johnston, D. Djokic, McGill University/Mechanical Engineering, Montreal, Canada

Application Development: E-Beam Part Fabrication for Rotorcraft Secondary Structures, K. Bernetich, Boeing Helicopters, Ridley Park, PA; M.S. Wilenski, The Boeing Company Seattle, WA

Application of Electron Beam Curing of Composites to Advanced Aircraft Systems, M.S. Wilenski, The Boeing Company, Seattle, WA

Session 4B
Tuesday Afternoon, May 18
1:00 p.m.

High Temperature Materials—II

Chair: Dr. John Connell, NASA Langley Research Center, Hampton, VA

High Temperature Flexural Properties of a Structural, Fire-Proof Composite, M. Ware, Goodrich Aerospace, Jacksonville, FL

Screening of Potential Replacement Materials for Heatshield and Rocket Nozzle, S. Saterlie, E. Zabrensky, Northrop Grumman Mission Systems, San Bernardino, CA; W. Wong, R. Saterlie, Northrop Grumman, Redondo

Beach, CA; S. Bhe, Aerojet, Rancho Cordova, CA; K. Brunetto, Northrop Grumman, Kirtland AFB, NM; M. Gallogly, U.S. Air Force, Kirtland AFB, NM

Computer Generated Data for High Temperature Composite Design, C.C. Chamis, NASA Glenn Research Center, Cleveland, OH; G.H. Abumeri, QSS Group Inc, Cleveland, OH

Durable Erosion Coatings for Polymer Matrix Composites in Aerospace Applications, S.K. Naik, R. Cupp, Rolls Royce Corporation, Indianapolis, IN; J.K. Sutter, C.L. Bowman, K. Miyoshi, NASA Glenn Research Center, Cleveland, OH; R.G. Siefker, AADC, Indianapolis, IN; W. Tabakoff, University of Cincinnati/Aerospace Engineering, Cincinnati, OH; H.S. Haller, Harold S. Haller Corporation, Cleveland, OH

High Temperature Applique Films as Advanced Aircraft Coatings, N. Orbey, M. Cushman, N. Gilmanova, R. Kovar, Foster-Miller Inc, Waltham, MA

High Temperature Transfer Molding Resins: Composite Properties of PETI-375, J.W. Connell, J.G. Smith Jr, P.M. Hergenrother, NASA Langley Research Center, Hampton, VA; J.M. Criss, M&P Technologies Inc, Marietta, GA

Powder Towpreg Preforms for High Temperature Composites, R.E. Allred, S.P. Wesson, Adherent Technologies Inc, Albuquerque, NM

Plenary
Tuesday Afternoon, May 18
1:15 p.m.

Nanocomposites Technology: Rapidly Moving Forward in M&P Now

Moderator: *Dr. Joseph H. Koo, Senior Research Fellow, The University of Texas, Department of Mechanical Engineering, Austin, TX*

Nanocomposites technology has grown rapidly in just the past five years as evidenced by the number of nanotechnology related conferences, symposia, and publications. The unique capabilities of nanomaterials in polymeric systems have resulted in a large number of novel applications that improve performance in several composites areas. The transformation of polymer matrix resins into high performance abrasives, coatings, composites, fire-resistant materials, and sealants provides tremendous advantages and foreseen technology growth today. The Plenary will provide a historical review of nanocomposites along with a look into the foreseeable future.

Session 4C
Tuesday, May 18
2:00 p.m.

Nanocomposites—I: Synthesis of Nanocomposites

Chairs: *Shawn Phillips, Air Force Research Laboratory, Edwards AFB, CA and Dr. Joseph H. Koo, Univ of Texas/ Mechanical Engineering, Austin, TX*

Fabrication and Evaluation of Rice Hull Derived Nano Silica Composites, G. Ayalamayajula, A. Garg, S. Kapila, K. Chandrashekhara, V. Flanigan, Univ of Missouri/Environmental Science and Technology Center, Rolla, MO

Organic Functionalization of Carbon Nanofibers Followed by In-Situ Polymerization, M.R. Coleman, X. Li, R. Kindt, A. Brinkdopke, R. Premo, University of Toledo/Chemical and Environmental, Toledo, OH

Synthesis and Properties of Multi-Wall Carbon Nanotube-Epoxy Nanocomposites, H. Lu, H. Shen, S. Nutt, University of Southern California/ Materials Science, Los Angeles, CA

Noncovalent Functionalization of Carbon Nanotubes for Nanocomposite Applications, J. Chen, R. Rajagopal, S. Fang, Zyvex Corporation, Richardson, TX

Synthesis of Long and Well-Aligned Carbon Nanotubes, S. Zhou, S. Zuo, D. Grummon, X. Liang, J. Asmussen, M.C. Hawley, Y. Zhang, Michigan State University/Chemical Engineering and Materials Science, East Lansing, MI

Synthesis and Study of Polymer/Carbon Nanofiber Composites, J. Macossay, S. Salinas, K. Lozano, University of Texas/Pan American/ Mechanical Engineering, Edinburg, TX

Synthesis and Processing of Aligned Carbon Nanotube Based Fibers, J. Tyner, M. Jose, D. Dean, Tuskegee University, Advanced Materials Center, Tuskegee, AL; E. Nyairo, University of Alabama/Physical Science, Montgomery, AL

Session 4D
Tuesday Afternoon, May 18
1:00 p.m.

NDE and NDI Technology—II

Chairs: *Dr. Kirsten Lipetzky, Naval Surface Warfare Center/Carderock, West Bethesda, MD and Dr. Kirk Tackitt, Army Research Laboratory, Aberdeen Proving Ground, MD*

Thermographic Characterization of Composite Materials and Structures, S.M. Shepard, Y. Hou, D. Wang, T. Ahmed, J.R. Lhota, Thermal Wave Imaging Inc, Ferndale, MI

Composite Structural Integrity Assessment via High-Resolution Acoustic Microscope, S.E. Mouring, A. Mucciardi, G. Karpouzian, U.S. Naval Academy/Naval Architecture and Ocean Engineering, Annapolis, MD

Rapid, Sensitive Inspection of Marine Composites Using Laser Shearography, R. Gregory, Laser Technology (UK) Ltd, Stamford, UK

Latest Real-Time Composite Imaging Results Using a Novel Handheld Ultrasound Camera, B. Lasser, M. Lasser, J. Gurney, J. Kula, D. Rich, Imperium Inc, Silver Spring, MD

Improved Manufacturing of FRP Using an Ultrasonic Measuring Technique, E. Schmachtenberg, S. Quadflieg, J. Schulte zur Heide, Aachen University/Plastics Processing, Aachen, Germany

Ultrasonic Testing on Two-Dimensional Saddle-Like Weld via FEA Method, F.Y. Lin, City of Los Angeles/ Material Testing, Tarzana, CA

Application of Stress Waves to Bond Inspection, R. Bossi, K. Housen, W. Shepherd, Boeing Phantom Works, Seattle, WA

Ultrasonic Beam Models: A Simplification of Computational Approach, G. Raman, T. Lerch, Central Michigan Univ/ Industrial Engineering and Technology, Mount Pleasant, MI

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Session 4E
Tuesday Afternoon, May 18
1:00 p.m.

**Preforms and Textile
Technology—II**

Chairs: *Dr. Frank Ko, Drexel University/Materials Science and Engineering, Philadelphia, PA and Kory Abbitt, A&P Technology Inc, Cincinnati, OH*

Manufacture and Testing of Hybrid 2D Biaxial Braid/Plain Weave/Epoxy Resin Transfer Molded Composites, R.G. Albers, S.F. Hastings, Boeing Commercial Airplanes, Seattle, WA

Recent Developments in Liquid Molding Materials and Processes for Damage Tolerant Applications, M. Aldridge, C. LoFaro, Cytec, Wrexham, UK; R. Maskell, Cytec, Tempe, AZ; C. Pederson, B. Thai, Cytec Engineered Materials, Anaheim, CA

Methodology to Establish RTM Process Control Correlations to Final Quality, J.M. Griffith, The Boeing Company, St. Louis, MO

Effect of Reactive and Non-Reactive Binders on Preform and Composite Properties, J. Deitzel, D. Heider, A. Obaid, A. Paesano, A. Chatterjee, J.W. Gillespie Jr, University of Delaware/Composite Manufacturing Science Laboratory, Newark, DE; G. Robblee, V. Brachos, Diaphorm/Solectria, Wilmington, DE; S. Walsh, Army Research Laboratory, Aberdeen Proving Ground, MD

The Use of an Ultrasonic Welder to Consolidate Composite Preforms, T. Kruckenberg, L. Ye, University of Sydney/Centre for Advanced Materials Technology, Sydney, Australia; R. Paton, Cooperative Research Centre for Advanced Composite Structures, Fishermans Bend, Australia

Investigation of the Budd Slurry Process for the Production of Short Random Fiber Preforms, A.O. Fernandes, P.K. Mallick, University of

Michigan/Lightweighting Automotive Materials and Processing, Dearborn, MI; R. Boeman, Oak Ridge National Laboratory, Oak Ridge, TN

Session 4F
Tuesday Afternoon, May 18
1:00 p.m.

Space Structures—II

Chairs: *Dr. Kent Watson, National Institute of Aerospace, Hampton, VA and Paul Wienhold, Johns Hopkins University/Applied Physics Laboratory, Laurel, MD*

Determination of Dwell Times When Thermal Cycling Complex Assemblies, T.H. Sutherland, Boeing Satellite Systems, El Segundo, CA

Are There Microcracks in Cryogenics Future? B. Wilson, Wilson Composite Technologies Inc, Folsom, CA

Probabilistic Impact Analysis and Risk Assessment Supporting Shuttle Return-To-Flight Procedures, C. Godines, F. Abdi, R. Ragalini, Alpha Star Corporation, Long Beach, CA

An Overview of Technology Advancements in Composite Tanks for Liquid Hydrogen Storage, T. Delay, NASA Marshall Space Flight Center, Huntsville, AL

The Feasibility of Cryogenic Storage in Space, B. Wilson, Wilson Composite Technologies Inc, Folsom, CA

Prediction of Permeability of Cryogenic Composites, J. Noh, J. Whitcomb, B. Oh, D. Lagoudas, A. Ganpatye, V. Kinra, Texas A&M University/Aerospace Engineering, College Station, TX

Liquid Oxygen and Organic Matrix Composites—An Unusual Marriage, B. Wilson, Wilson Composite Technologies Inc, Folsom, CA

Session 4G
Tuesday Afternoon, May 18
1:00 p.m.

**Testing—III: Impact and
Damage**

Chair: *Dr. Jeff Welsh, Air Force Research Laboratory/VSSV, Kirtland AFB, NM*

Static Punch Shear Test of Composites for Impact Applications, Q. Zhu, S. Finn, GE Global Research, Niskayuna, NY, D. Crall, M. Xie, D. Bedel, GE Aircraft Engines, Cincinnati, OH

Impact Resistant Fiber Reinforced Elastomer Composite Materials, K.V. Rathnam, L.D. Peel, Texas A&M University/Mechanical and Industrial Engineering, Kingsville, TX; D.C. Prasad, University of Texas/Engineering, San Antonio, TX

Ballistic Damage Evaluation of Thick-Section S-2 Glass/SC15 Composites, B.A. Gama, M. Rahman, J.W. Gillespie Jr, University of Delaware/Center for Composite Materials, Newark, DE; C.P.R. Hoppel, Army Research Laboratory, Aberdeen Proving Ground, MD

Energy Absorbing Damage Mechanisms in Quasi-Static Punch Shear of Thick-Section Composites, B.A. Gama, J.W. Gillespie Jr, Univ of Delaware/Center for Composite Materials, Newark, DE

The Residual Strength of Composite Panels Damaged by Shock Loading, S.E. Mouring, U.S. Naval Academy/Naval Architecture and Ocean Engineering, Annapolis, MD; L. Louca, Imperial College of London, London, UK

Development of a Physical Human Surrogate Torso Model (HSTM) for Ballistic Impact and Blast, P.J. Biermann, E.M. Ward, R. Cain, B. Carkhuff, A. Merkle, J.C. Roberts, Johns Hopkins University/Applied Physics Laboratory, Laurel, MD





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Mechanical, Impact and Fracture Properties of TL700 Carbon/Vinyl Ester Composites, K. Shivakumar, A. Kelkar, G. Swaminathan, H. Chen, North Carolina A&T State University/Composite Materials Research Center, Greensboro, NC

Performance of Delaminated Stitched Composites Under Out-of-Plane Loading, J.K. Rich, A.F. Research Laboratory/MLS-OL, Hill AFB, UT; D.O. Adams, University of Utah/Mechanical Engineering, Salt Lake City, UT

Results of HyperTuff Damage Resistant VARTM Composites Impact Testing, M. Louderback, Vanguard Composites Group Inc, San Diego, CA; J. Moore, M. Thompson, V System Composites, Anaheim, CA; T. Wong, NGF, Cypress, CA

The Basic Parameters of the Dynamic Compression Loaded Lattice Structures, Y. Golfman, AdTech Systems Research, Sudbury, MA

Session 4H
Tuesday Afternoon, May 18
1:00 p.m.

University Research—II

Chair: Prof. Anthony Saliba, University of Dayton, Dayton, OH

Papers from finalists in the graduate, senior and international student scholarship competition will be presented.

Panel
Tuesday Afternoon, May 18
1:30 p.m.

Oral Presentations Only

Military Aircraft: The Role of Advanced Materials R&D in the Modern Military

Moderators: Leonard M. Poveromo, Northrop Grumman Corporation, Bethpage, NY and Sam Dastin, Dastin Associates Inc, Las Vegas, NV

This is a unique opportunity to hear our industries' key futurists identify the military's Advanced Material Technologies that will enable the Defense Department's next generation systems. The panel members have critical R&D decision making roles for the Air Force, Army, DARPA and NAVAIR and NAVSEA. They will give the audience guidance in making their future investment decisions. Each panel member will present a summary of ongoing R&D in advanced materials and processing (M&P) under their fields of study. Near-future DOD programs will be noted along with discussions of ongoing studies to attain the needed goals. All panel members will be available to answer questions from both the audience and other panel members.

Panelists:

Dr. Charles Browning, U.S. Air Force Research Laboratory, WPAFB, OH

Dale Moore, U.S. Naval Air Systems Command/Materials Division, Patuxent River, MD

Gene Camponeschi, U.S. Naval Surface Warfare Center, West Bethesda, MD

Jeff Hendrix, DARPA Consultant, Herndon, VA

Dana Granville, U.S. Army Research Laboratory, Aberdeen, MD

Panel
Tuesday Afternoon, May 18
1:30 p.m.

Oral Presentations Only

Marine Industry Applications: Materials, Process and Analysis Experience and Perspectives

Moderator: Craig Riley, Riley Composites Inc, Orinda, CA

Media coverage of the racing yachts of the America's Cup Race brings to main street news of advanced materials and composites and their high performance contributions in such competitions. At the same time, yet away from the media's eye, advanced materials and composites, and the unique processing techniques required for their use, are making their way into larger structures and more demanding applications in the marine industry. Fabricating large advanced structures and reliably predicting their performance present enormous challenges to the industry's marine designers, materials suppliers, and manufacturers. The scale of these structures and the level of international projects for military, commercial and recreational applications make this an exciting time.

The Marine Industry Applications panel session brings together this industry's top experts in materials, design and analysis, and manufacturing and processing to share their experience and perspectives in today's marine structures. The panel includes: William Seeman III, *SCRIMP™ process inventor and founder of Seeman Composites*; Paul Miller, U.S. Naval Academy, *failure and analysis of 2003 America's Cup Race yachts, Naval structures and perspective*; Bill Webb, Cytec Engineered Materials, *materials and non-autoclave fabrication processes*; David Cripps, SP Systems, *resin, reinforcement and core material systems and processing*.

The panel session will be interactive with brief presentations from each panel member and discussion between the audience and panelists throughout. The panel audience will take away a first-hand perspective on the successes and failures experienced by these marine industry experts, as well as the opportunities and issues being faced with advanced materials and composites within the marine industry.

Panelists:

William Seeman III, *Seeman Composites*

Paul Miller, *U.S. Naval Academy*

Bill Webb, *Cytec Engineered Materials*

David Cripps, *SP Systems*

NASA Technology Briefings
Wednesday Morning, May 19
8:00 a.m. – 12:00 noon

Oral Presentations Only

Collaborative R&D Opportunities with NASA's Advanced Materials Program

Introduction: *The Benefits of Collaborating with NASA, Michael Weingarten, NASA Headquarters*

NASA's Advanced Materials program will highlight its cutting-edge materials technology development through an engaging discussion by top innovators. NASA's objective is to create innovative partnerships with industry to jointly

develop technologies that benefit both parties. Businesses benefit by creating new products and markets to benefit our economy. NASA benefits by accessing capabilities and technologies which can impact future missions. This presentation will give an overview of the types of collaborations that are open to industry as well as some recent major success stories.

Mechanically Strong Polymer Cross-Linked Aerogels, *Dr. Nicholas Leventis, NASA Glenn Research Center*

Aerogels are attractive materials for some aerospace applications because of their extremely low density (less than 0.1g/cm³). However, their poor mechanical integrity and sensitivity to moisture has limited their use. A new approach to improving the strength and environmental stability of aerogels has been developed that involves cross-linking the individual aerogel particles with engineering polymers (isocyanates, epoxies, polyimides). The resulting materials have as much as 300X the mechanical strength and 10X the moisture resistance of the native aerogels. In addition to these improved properties, the polymer cross-linked aerogels are easier to fabricate and machine than conventional aerogels. Potential applications for these materials include lightweight insulation for cryogenic propellant tanks and structural materials for airframe and propulsion components.

Polymer Membranes for High Temperature Proton Exchange Membrane (PEM) Fuel Cells, *Dr. James D. Kinder, NASA Glenn Research Center*

Fuel cells are receiving considerable attention for use in aerospace, automotive and stationary power applications. NASA is currently exploring the use of fuel cells in all-electric aircraft and uninhabited air vehicles (UAVs). This would require fuel cells with significantly higher power densities than those currently under development for automotive applications. One way of achieving higher power densities is to increase the operating temperature of the fuel cell from 120 to 150°C. This would

also solve some of the catalyst poisoning problems currently encountered in PEM fuel cells operating at conventional temperatures. Current PEM fuel cells are limited to use at temperatures no higher than 80°C because the membrane material loses moisture at higher temperatures and cannot function as a proton conductor. New membrane materials have recently been developed with good proton conductivities at 120°C and 25% relative humidity. These membranes have an estimated cost 10-20 times lower than that of conventional PEM membranes (\$100/lb vs. \$2000/lb). Potential applications for these membrane materials include fuel cells for aerospace, automotive, personal electronics and stationary power applications.

Partners Needed for Development of Spaceport Cryogenic Handling and Storage Technologies, *Bill Notardonato and James Fesmire, Kennedy Space Center*

Cryogenic systems are essential for a variety of aerospace applications, including Earth based spaceports and extraterrestrial bases. Each application has unique performance requirements that need to be met. Sizes of these systems range from the small (0.1 cubic meters for Mars consumables) to very large (>3400 cubic meters for Earth based launch systems). KSC is looking for partners to develop advanced cryogenic technologies for all these applications. The technology development will offer enhanced safety, reliability, or economic efficiency over current state of the art, or will feature enabling technologies to allow NASA to meet goals of the Space Flight Enterprise. Earth based systems will focus on advanced materials development to enable cryogenic operations to become more energy efficient. Included in this topic area are better insulations, self healing materials, and uses of shape memory alloys. Extraterrestrial systems will focus on enabling materials development that maximizes efficiency and minimizes system mass and power, including research on composite storage tanks, efficient heat exchangers, and propellant production capabilities.

Development and Commercialization of Polyimide Foam, Erik S. Weiser, Dr. Brian J. Jensen, Roberto J. Cano and Terry L. St. Clair, NASA Langley Research Center

The NASA Langley Research Center has spent the last several years developing and commercializing novel polyimide foam technology. During this time, more than 20 different polyimides were synthesized and foamed into insulation. Three of these compositions were commercialized as foam, friable balloons or microspheres. This presentation will discuss the development and commercialization of the polyimide foam technology.

Advanced Composites Processing Technologies, Roberto J. Cano, Tan H. Hou, Erik S. Weiser, Brian W. Grimsley and Dr. Brian J. Jensen, NASA Langley Research Center

The NASA Langley Research Center is currently working on several different programs to develop advanced aerospace vehicles that require extensive use of composite materials to be successful. A common driving force of these programs is to process composites by non-autoclave methods that are more cost effective and not part size limiting. The processing concepts, capabilities and models currently under study will be discussed.

Overview of Thermal Protection Systems Challenges, Dr. Sylvia Johnson, NASA Ames Research Center

The NASA Ames Research Center develops thermal protection materials and systems for planetary exploration (Mars, Jupiter, etc.) and space transportation (earth to orbit and return). This talk will provide an overview of current missions, current material development programs, and the challenges presented by future missions.

Session 5A
Wednesday Morning, May 19
8:00 a.m.

Design and Analysis—I

Chair: Dr. Rick Hale, University of Kansas, Lawrence, KS

A New Generation of CAD Technology for Streamlining Composite Product Development, O. Guillermin, Vistagy Inc, Waltham, MA

Collaborative Virtual Testing Software for First Time Through Manufacturing—Life Cycle Management, E. Shroyer, Boeing Phantom Works, Huntington Beach, CA; F. Abdi, Alpha Star Corporation, Long Beach, CA

Computerized Calculation of Composite Laminates and Structures: Theory and Reality, M. Sonnen, C. Laval, A. Seifert, Material S.A., Brussels, Belgium

A Micromechanics Algorithm for Measuring the Residual Thermal Stresses in Fibrous Composites, G. Karami, North Dakota State University/Mechanical Engineering, Fargo, ND; M. Garnich, University of Wyoming/Mechanical Engineering, Laramie, WY

Improving the Damping of Fiber-Coated Polymer Composites Using Micromechanical Modeling, G. Raman, J. Finegan, Central Michigan University/Industrial Engineering and Technology, Mount Pleasant, MI

Mechanical Characterization of Interfaces in Laminated Composites, H. Sun, N. Pan, Univ of California/Biological and Agricultural Engineering, Davis, CA

Design of the Composite Laminates Using Failure Mechanism Based Failure Theory, G.N. Naik, A.V. Murthy, S. Gopalakrishnan, Indian Institute of Science/Aerospace Engineering, Bangalore, India

Session 5B
Wednesday Morning, May 19
8:00 a.m.

Fire Performance—II: Fire Safety of Materials

Sponsored by IWGFM

Chairs: Usman Sorathia, Naval Surface Warfare Center/Carderock, West Bethesda, MD; Dr. Richard Lyon, FAA/Fire Safety Section, Atlantic City, NJ and Jeffrey Gilman, NIST, Gaithersburg, MD

High Throughput Measurement of Flammability and Mechanical Properties of Polymers, J. Gilman, R. Davis, G. Linteris, J. Shields, I. Rafferty, A. Morgan, J-E. Zanetto, H. Stretz, D. Paul, NIST, Gaithersburg, MD; R. Lyon, FAA/Fire Safety Section, Atlantic City, NJ

Fire-Smart Chloral Polymers, R.E. Lyon, FAA/Fire Safety Section, Atlantic City, NJ



A Bonus

Long Beach—a visitor and pedestrian friendly community, offers many attractions—take the time to enjoy some of them.

- ◆ Experience the Long Beach Aquarium of the Pacific
- ◆ Visit the pride of the Queen Mary Seaport—The Queen Mary
- ◆ Walk along Shoreline Village—shops, dining, boating center
- ◆ Ride along the canals of Naples Island
- ◆ Shop and/or dine on historic Pine Avenue
- ◆ Shop on Belmont Shore's Second Street

◆ **and so much more!**

Flame Retardant Structural Epoxy Resins, C.M. Thompson, J.G. Smith Jr, P.M. Hergenrother, NASA Langley Research Center, Hampton, VA; R.E. Lyon, FAA/Fire Safety Section, Atlantic City, NJ

Flame Resistance of New and Old Thermoset Resin, J. Ayorinde, Shade Inc, Lincoln, NE

Flammability Properties of Clay-Nylon Nanocomposites, X. Liu, J.G. Quintiere, University of Maryland, College Park, MD

Qualification of Materials Requiring Fire Properties Certification, B.L. MacLean, S. Glicksberg, The Boeing Company, Seattle, WA

Vinyl Bisphenol C for Flame Retardant Polymers, J. Stephenson, Rice University, Houston, TX; J. Jurs, J.M. Tour, Rice University/Center for Nanoscale Science and Technology, Houston, TX

Composite Fire Hazard Analysis Tool for Predicting ISO 9705 Room-Corner Fire Test, B.Y. Lattimer, Hughes Associates Inc, Baltimore, MD; U. Sorathia, Naval Surface Warfare Center/Carderock, West Bethesda, MD

Fire Fighting Issues for Composite Materials, D. Baker, A.F. Research Laboratory/MLSS, Hill AFB, UT; Klerick, K. Erickson, Sandia National Laboratories; J. Farley, Naval Research Lab; E. Gogley, NAVAIR/Weapons; L. Gritz, Sandia National Laboratory/Fire Science and Technology; L. Nash, U.S. Coast Guard/R&D Center; D. Satterfield, NAVSEA Systems Command, U. Sorathia, Naval Surface Warfare Center/Carderock, West Bethesda, MD; T. Stempowski, HQ AFCEA/Fire Protection Operations

Session 5C
Wednesday Morning, May 19
8:00 a.m.

High Temperature Materials—III

Chair: *Dr. Katie Thorp, Air Force Research Laboratory/MLBC, WPAFB, OH*

(CLOSED PAPER) High Temperature Polymer Matrix Composites for Liquid Rocket Engine Applications, J.E. Fink, The Boeing Company/Rocketdyne, Canoga Park, CA; M.R. Margolin, J. Quaglino Jr, B. Shapey, E.E. Shin, J.K. Sutter, J. Thesken, NASA Glenn Research Center, Cleveland, OH

(CLOSED PAPER) RTM Resins for Affordable Hi Temperature Composite Frames, W.E. McCormack, GE Aircraft Engines, Cincinnati, OH

Processing and Properties of IM7/LARC™ PETI-8 Polyimide Composites, T.H. Hou, R.J. Cano, B.J. Jensen, NASA Langley Research Center, Hampton, VA; A.C. Chang, Lockheed Martin Engineering and Services Company, Hampton, VA

Composites for ‘A Journey to the Center of the Earth’, L. Crockford, General Plastics and Composites, Houston, TX

Synthesis and Properties of Hyperbranched Aromatic Polyamides with Terminal Phenylethynyl-phthalimide Groups, Y. Ishida, T. Ogasawara, Japan Aerospace Exploration Agency/Space Technology and Aeronautics, Tokyo, Japan

State of the Art in High Temperature, High Thermal Oxidative Stability Polyimides, W.R. Ronk, D. Han, Cytec Engineered Materials, Anaheim, CA

Thermomechanical Fatigue of Polyimide Composites in Reusable Propulsion Systems, J.C. Thesken, E.E. Shin, OAI/NASA Glenn Research Center, Hampton, VA; J.K. Sutter, NASA Glenn Research Center, Hampton, VA; C. Burke, QSS/NASA Glenn Research Center, Hampton, VA; J. Fink, The Boeing Company/Rocketdyne, Canoga Park, CA

Cyanate Ester Matrix Technology for Improved Thermal Performance of Filament Wound Structures, J.R. Esslinger Jr, O.C. Fruchtnicht, Army Aviation and Missile Research/Development and Engineering Center, Redstone Arsenal, AL

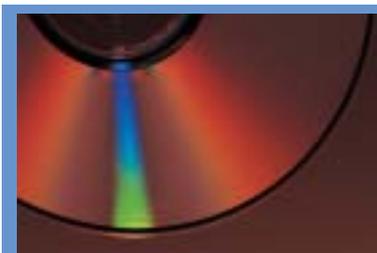
Awards for Bridge Building Contest
Wednesday Morning, May 19
8:00 a.m. – 8:45 a.m.

Plenary
Wednesday Morning, May 19
8:45 a.m. – 9:30 a.m.

Oral Presentation Only An Overview of Progress and Challenges for Composites in the Infrastructure Construction Market

John Busel, Executive Director, Market Development Alliance (MDA) of the FRP Composites Industry, and Chairman, Committee 440 (FRP), American Concrete Institute, Harrison, NY

The broad use of FRP Materials for infrastructure applications is presented. Construction areas include bridge decks, strengthening, seismic retrofit, blast mitigation, and others. Growth of the infrastructure market is heavily dependent on the acceptance of codes and standards. The American Concrete Institute, through Committee 440, has now published two design guidelines for the use of FRP materials with concrete. The Market Development Alliance (MDA) has organized industry wide development programs for the use of FRP in blast mitigation, bridge decks, and seismic damage control. The presentation will include a perspective of challenges and future efforts to continue the growth.



Second time for
SAMPE—Proceedings
will be available on
CD only.

Session 5D
Wednesday Morning, May 19
9:30 a.m.

Infrastructure Applications and Trends—I

Chairs: *Prof. Ayman Mosallam, California State University/Civil Engineering, Fullerton, CA and Dr. H. Toutanji, University of Alabama, Huntsville, AL*

Flexural Behavior of RC Beams Strengthened with High-Strength Fibers and Inorganic Matrix, H. Toutanji, University of Alabama, Huntsville, AL; Y. Deng, PBS&J, Henderson, NV

Structural Characterization of Hybrid Fiber Reinforced Polymer (FRP)—Autoclave Aerated Concrete (AAC) Panels, N. Uddin, F.H. Fouad, U.K. Vaidya, A. Khotpal, University of Alabama/Civil and Environmental Engineering, Birmingham, AL

Flexural Performance of Reinforced Concrete Beams Strengthened with Prestressed CFRP Sheets, P. Yu, P.F. Silva, A. Nanni, University of Missouri/Civil Engineering, Rolla, MO

Seismic Behavior of Composites-Strengthened Masonry Walls Subjected to Gravity and Cyclic Shear Forces, M. Haroun, American University, Cairo, Egypt; A. Mosallam, California State University, Fullerton, CA; K. Allam, University of California, Irvine, CA

Remote Structural Health Monitoring of a FRP Composite Bridge, H. Guan, V.M. Karbhari, University of California/San Diego/Structural Engineering, LaJolla, CA; C. Sikorsky, California Department of Transportation, Sacramento, CA

Structural Health Monitoring of Bridge Decks Reinforced with FRP Bars: Wotton Bridge, B. Benmokrane, R. Masmoudi, E. El-Salakawy, Universite de Sherbrooke/Civil Engineering, Sherbrooke, Canada; G.

Desgagne, Ministry of Transportation/Structures, Quebec, Canada; M. Quirion, Roctest Ltd, St. Lambert, Canada

Long-Term Durability of FRP Composites for Infrastructure Rehabilitation, N. Saenz, E. Walsh, C.P. Pantelides, University of Utah/Civil and Environmental Engineering, Salt Lake City, UT; D.O. Adams, University of Utah/Mechanical Engineering, Salt Lake City, UT

Session 5E
Wednesday Morning, May 19
8:00 a.m.

Marine Applications—II

Chairs: *Harry Telegadas, Naval Surface Warfare Center/Carderock, West Bethesda, MD and John Laakso, Consultant, Normandy Park, WA*

A Plan for Generating Static Material Design Properties for Composite Submarine Non-Pressure Hull Structures, A. Caiazzo, Materials Sciences Corporation, Fort Washington, PA; K. Koudela, Pennsylvania State University/Composite Materials, State College, PA; H. Telegadas, C. Williams, Naval Surface Warfare Center/Carderock, West Bethesda, MD

Composite Applications for Secondary Navy Structures, M. Bergen, Naval Surface Warfare Center/Carderock, West Bethesda, MD

Development of Composite Prototype Module for the Improved Navy Lighterage Systems (INLS), H. Garala, Naval Surface Warfare Center/Carderock, West Bethesda, MD

Parametric Testing of Scarf Joints for Navy Composite Structures, A. Caiazzo, Materials Sciences Corporation, Fort Washington, PA; D. Bonanni, H. Telegadas, Naval Surface Warfare Center/Carderock, West Bethesda, MD

Progress in Materials for Marine Composite Structures, C. Williams, Naval Surface Warfare Center/Carderock, West Bethesda, MD; T. Juska, Pennsylvania State University/Applied Research Laboratory, State

College, PA; C. Duer, Northrop Grumman, Newport News, VA

Rapid Non-Destructive Testing of Large Naval Structures Using the SIDER Technique, C.P. Ratcliffe, U.S. Naval Academy/Mechanical Engineering, Annapolis, MD; R. Crane, Naval Surface Warfare Center/Carderock, West Bethesda, MD

Stress Analysis of a Co-Cured Innovative Hybrid Joint for Marine Composites, S.M. Graham, U.S. Naval Academy/Mechanical Engineering, Annapolis, MD; R. Crane, Naval Surface Warfare Center/Carderock, West Bethesda, MD

Testing and Analysis of Hat-Stiffened Panel Details for Navy Composite Applications, D. Bonanni, H. Telegadas, Naval Surface Warfare Center/Carderock, West Bethesda, MD; A. Caiazzo, Materials Sciences Corporation, Fort Washington, PA

Session 5F
Wednesday Morning, May 19
8:00 a.m.

Nanocomposites—II: Processing

Chairs: *Prof. Thomas Hahn, UCLA/Mechanical and Aerospace Engineering, Los Angeles, CA and Prof. Kunigal Shivakumar, North Carolina A&T State University/Center for Composite Materials Research, Greensboro, NC*

Plasma Coating of Carbon Nanofibers for Enhanced Dispersion and Interfacial Bonding in Polymer Composites, D. Shi, P. He, M.J. Schulz, D.B. Mast, University of Cincinnati/Chemical and Materials Engineering, Cincinnati, OH; J. Lian, L.M. Wang, University of Michigan/Nuclear Engineering and Radiological Sciences, Ann Arbor, MI

Evaluation of Dispersion Methods and Their Impact on Properties of Nanocomposites, K. Shivakumar, S. Argade, R. Sadler, M. Sharpe, North Carolina A&T State University/Center for Composite Materials Research, Greensboro, NC

Nanomodified Carbon/Carbon Nanocomposites: Processing and Mechanical Properties, J.H. Koo, University of Texas/Mechanical Engineering, Austin, TX; L.A. Pilato, Pilato Consulting, Bound Brook, NJ; C.U. Pittman Jr, Mississippi State University, Mississippi State, MS; P. Winzek, Hitco Carbon Composites, Gardena, CA; Z.P. Luo; Texas A&M University/Microscopy and Imaging Center, College Station, TX; K. Shivakumar, North Carolina A&T State University/Center for Composite Materials Research, Greensboro, NC; G. Wissler, 21st Century Polymers, Fort Worth, TX

Processing and Properties of Carbon Nanofibre/Thermoplastic Composites, F.W.J. vanHattum, A. Gaspar-Cunha, C.A. Bernardo, University of Minho/Polymers and Composites Institute, Guimaraes, Portugal; M.L. Lake, Applied Sciences Inc, Cedarville, OH

Polymer/Carbon Nano Fiber Composite Fibers, S. Kumar, X. Zhang, Y-B. Park, Georgia Institute of Technology/Polymer, Textile and Fiber Engineering, Atlanta, GA; T. Uchida, Okayama University/Engineering, Okayama, Japan; T. Dang, A.F. Research Laboratory, WPAFB, OH

Surface Treatment of Carbon Nanofibers for Improved Composite Mechanical Properties, D.G. Glasgow, K.R. Walters, G.G. Tibbetts, M.L. Lake, Applied Sciences Inc, Cedarville, OH

Kevlar/Vinyl Ester Composites with SiC Nanoparticles, V. Yong, H.T. Hahn, UCLA/Aerospace Engineering, Los Angeles, CA

Extruded Polymer Composite with Aligned VGCF Fiber, M.K. Alam, J.W. Lee, A. Rasyani, Ohio University/Mechanical Engineering, Athens, OH

Magnetic Field Alignment and Curing of Nematic Liquid Crystalline Monomers Containing Carbon Fibers and Carbon Nanofibers, D. Klosterman, M. Hart, University of Dayton Research Institute, Dayton, OH

Microstructures and Thermal Performance of Polymer Nanocom-

posites, J.H. Koo, University of Texas/Mechanical Engineering, Austin, TX; Z.P. Luo, Texas A&M University/Microscopy and Imaging Center, College Station, TX; L.A. Pilato, Pilato Consulting, Bound Brook, NJ

Session 5G
Wednesday Morning, May 19
8:00 a.m.

Processing Advances—I

Chair: *Dr. Donald Klosterman, University of Dayton Research Institute, Dayton, OH*

(CLOSED PAPER) In-Situ Fiber Placement Development for Net Thickness Fabrication of Composite Laminates, R. Stevens, R. Biggs, Lockheed Martin Space Systems Company/Michoud, New Orleans, LA

Elimination of Core Crush in Sandwich Structures: Material and Autoclave Process Options, R. Buyny, C. Martin, Hexcel Corporation, Dublin, CA

Quality Control for Race Tracking and Shear in RTM Preforms, J.G. Opperer, S.K. Kim, I.M. Daniel, Northwestern University/Quality Engineering Center, Evanston, IL

Evaluation of Double-Vacuum-Bag Process for Composite Fabrication, T.H. Hou, B.J. Jensen, NASA Langley Research Center, Hampton, VA

Automatic Ply Verification for Hand Laid Composites, S. Blake, J. Talone, A.E. Trudeau, Assembly Guidance Systems Inc, Chelmsford, MA; J. Purse, Sikorsky Aircraft, Stratford, CT

PUSHTRUSION: Direct In-Line Compounding, S.T. Bowen, Plasti-Comp, Winona, MN; J.A. Harvey, Plasticomp, Corvallis, OR

Automation in the Production of Large Parts, J. Wittig, H. Kiefer, Consultant, Kleinmachnow, Germany

Process Optimization to Pultrusion Technique of Phenol Foam Composite,

M. Yun, W. Lee, Seoul National University/Mechanical and Aerospace Engineering, Seoul, South Korea

Pultrusion Resin Transfer Molding of Advanced Aerospace Structures, R.W. Hillermeier, L. Friedrich, Hexcel Corporation, Stade, Germany

Session 5H
Wednesday Morning, May 19
8:00 a.m.

Sensor Technologies **(Advancement of National Infrastructures)**

Chairs: *Dr. Felix Wu, National Institute of Standards and Technology, Gaithersburg, MD and Dr. Maria Feng, University of California/Civil and Environmental Engineering, Irvine, CA*

Sensors for Aircraft Structure Monitoring to Improve the National Aviation Infrastructure, M. Lin, S. Beard, A. Kumar, Acellent Technologies Inc, Sunnyvale, CA

SHIELD System Development, N. Chen, Caterpillar Inc, Mossville, IL

Optical Switches for Distributed Sensing, R.C. Gutierrez, T.K. Tang, SiWave Inc, Arcadia, CA

SAMPE Mission Statement

The Society for the Advancement of Material and Process Engineering is a global, member-governed, volunteer, not-for-profit organization. The organization is to supply:

- Information for the advancement of materials and processes.
- Opportunities for career development within the materials and processes community.
- Education in the fundamentals of materials and process technologies.

These shall be offered to the professional members, to the student members, and to the industry in a financially responsible manner and with professional integrity.

Verification of the Potential of an Intelligent Adaptive Wireless Sensing Network and MEMS for Infrastructure Health Monitoring, S.K. Ciloglu, Drexel University, Philadelphia, PA; A. Aktan, Drexel University/Intelligent Infrastructure Institute, Philadelphia, PA

Electromagnetic Properties of Fiber Reinforced Polymer and Concrete, Y.J. Kim, H.C. Rhim, M.Q. Feng, Newport Sensors Inc, Irvine, CA

Composite Drill Pipe Opens New Horizons for Drilling Operations, J.C. Leslie, J.C. Leslie II, J.T. Heard, L. Truong, Advanced Composite Products and Technology Inc, Huntington Beach, CA

Designer Nanoparticles for Multiplexed Bioassays, M.J. Natan, Nanoplex Technologies Inc, Mountain View, CA

NDE Sensors for Prognostic Structural Diagnostic, B.B. Djordjevic, Johns Hopkins University/Engineering, Baltimore, MD

Session 5I
Wednesday Morning, May 19
8:00 a.m.

Testing—IV:Durability

Chair: *Waruna Seneviratne, Wichita State University/National Institute for Aviation Research, Wichita, KS*

Investigation of the Tensile Strength Behavior of E-Glass/Vinyl-Ester Composite Under Synergistic Hygrothermal Exposure and Sustained Load, C.S. Helbling, V.M. Karbhari, University of California/San Diego/Structural Engineering, LaJolla, CA

Effect of Temperature, Width, and Fiber Angle on Tensile Behavior of a Fiber-Dominated Carbon/Epoxy Composite, A. Sharma, R.T. Paszkowski, C.E. Bakis, Penn State University/ESM, University Park, PA; K.M. Nelson, The Boeing Company, Seattle, WA

Flexure Creep in Three and Four Point Bending Tests of Unidirectional Glass/Urethane Composites, B. Abdel-Magid, G. Smith, K. Gass, Winona State University/Engineering, Winona, MN

Experimental In-Situ Characterization and Creep Modeling of Tin-Based Solder Joints on Commercial Area Array Packages, A.A. Obaid, A. Paesanol, J.W. Gillespie Jr, University of Delaware/Composite Manufacturing Laboratory, Newark, DE; J.G. Sloan, M.A. Lamontia, Dupont Engineering Technology, Wilmington, DE; S. Khan, DuPont Thermount, Richmond VA

Life Time Reducing Parameters of CFRP Laminates, P. Reinholdsson, CSM Materialteknik, Linkoping, Sweden

Tensile Fatigue Properties of Z-Pinned Carbon/Epoxy Composites, P. Chang, A.P. Mouritz, B.N. Cox, RMIT University/Aerospace, Mechanical and Manufacturing Engineering, Melbourne, Australia

SAMPE 2004 Luncheon
Wednesday, May 19
12:00 noon - 1:45 p.m.

Sponsored by NASA



NASA's Plans for Future Space Exploration

Frederick D. Gregory, NASA Deputy Administrator, NASA Headquarters, Washington, DC



Session 6A
Wednesday Afternoon, May 19
2:00 p.m.

Design and Analysis—II

Chairs: *Dr. Rick Hale, University of Kansas/Aerospace Engineering, Lawrence, KS and Jerome Tzeng, Army Research Laboratory/Weapons and Materials Research, Aberdeen Proving Ground, MD*

Equivalent Time Temperature Theory for Polymer Creep Modeling, E.J. Barbero, K.J. Ford, West Virginia University/Mechanical and Aerospace Engineering, Morgantown, WV

Response of Sandwich Plates to Transient Distributed Loads, S. Abrate, Southern Illinois University/Technology, Carbondale, IL

A Multilayered Composite Plates Formulation, J.P. Kai, E. Viola, University of Bologna/DISTART, Bologna, Italy

Optimum Design of Stiffened Composite Panel for Buckling Load Using a Multi-Subspace Response Surface Method, S.H. Oh, J.H. Kang, C.G. Kim, Korea Advanced Institute of Science and Technology/Aerospace, Daejeon, ROK

Optimization of Cutouts in Cylindrical Shells Subjected to Bending, D. Brestel, V.M. Karbhari, University of California/San Diego/Structural Engineering, LaJolla, CA

Flexural Analysis of an Laminated Cylindrical Shell with Variable Thickness, H. Estrada, Texas A&M Univ/Civil Engineering, Kingsville, TX

Mitigation of Internal Matrix Stresses in Composite Cylinders, M.R. Garnich, University of Wyoming, Laramie, WY; R.W. Six, Firehole Technologies Inc, Laramie, WY

Analysis of Functionally Graded Composites, S.R. Soni, J. Boatwright, H. Kilic, AdTech Systems Research Inc, Beavercreek, OH

Session 6B

Wednesday Afternoon, May 19
2:00 p.m.

Fire Performance—III: Materials

Sponsored by IWGFM

Chairs: *Usman Sorathia, Naval Surface Warfare Center/Carderock, West Bethesda, MD; Dr. Richard Lyon, FAA/Fire Safety Section, Atlantic City, NJ, and Piet VanDine, Electric Boat Corporation, Mystic, CT*

Improving the Fire Performance Characteristics of Composite Materials for Naval Applications, U. Sorathia, Naval Surface Warfare Center/Carderock, West Bethesda, MD; I. Perez, Office of Naval Research/Materials

Characterization of Qualified Fire Proof Composites, P. VanDine, Electric Boat Corporation, Mystic, CT

Fire Testing Inorganic Composite Structures, D. Hudson, J. Robinson, Goodrich Corporation/Engineering, Jacksonville, FL

Mechanical and Fire Resistance Properties of Eco-Core Material for Sandwich Structures, S.D. Argade, K.N. Shivakumar, R.L. Sadler, M.M. Sharpe, G. Swaminathan, North Carolina A&T State University/Composite Materials Research, Greensboro, NC

Ignition of Polymers in High-Pressure Oxygen by Pneumatic Impact, F-Y. Hshieh, D.B. Hirsch, J.H. Williams, Honeywell Technology Solutions Inc/White Sands Test Facility, Las Cruces, NM

Fire-Resistant High-Performance Epoxy-Phenolic Foam, M.L. Auad, L. Zhao, S. Nutt, UCLA/Composites, Los Angeles, CA; U. Sorathia, Naval Surface Warfare Center/Carderock, West Bethesda, MD

IWGFM Business Meeting

Wednesday Afternoon, May 18

Following end of Session 6B

Meeting is open to all federal employees and private sector personnel with interest in fire safety and materials.

Session 6C

Wednesday Afternoon, May 19
2:00 p.m.

Infrastructure Applications and Trends—II

Chairs: *Dr. Srinivasa L. Iyer, CES Inc, Anaheim Hills, CA and Prof. Radhouane Masmoudi, Universite de Sherbrooke/Civil Engineering, Sherbrooke, Canada*

Durability of Glass FRP Composite Bars for Concrete Structure Reinforcement Subjected to Tensile Sustained Load in Wet and Alkaline Environments, G. Nkurunziza, R. Masmoudi, B. Benmokrane, Universite de Sherbrooke/Civil Engineering, Sherbrooke, Canada

Testing and Evaluating the FRP Deck System for the Douglas County Bridge in Washington State, S.L. Iyer, CES Inc, Anaheim Hills, CA; G. Kollé, Washington DOT; J. Gosselin, Douglas County, Washington, R. Bharil, CES Inc, Olympia, WA

Fatigue Performance of RC Beams Strengthened with Inorganic Carbon Fiber Composites, Y. Deng, PBS&J, Henderson, NV; H. Toutanji, University of Alabama, Huntsville, AL

Health Monitoring of Carbon FRP Composites Used in Seismic Retrofit of a Reinforced Concrete Bridge, J. Reay, C.P. Pantelides, L.D. Reaveley, University of Utah/Civil and Environmental Engineering, Salt Lake City, UT; T.A. Ring, Chemical and Fuels Engineering

Progressive Damage and Capacity Evaluation of Bridge Decks Under Simulated Wheel Loads, K.K. Ghosh, L. Lee, V.M. Karbhari, University of California/San Diego/Structural Engineering, LaJolla, CA; C. Sikorsky, California DOT/Office of Earthquake Engineering, Sacramento, CA

FRP Bridge Decks and Superstructures; A Summary of U.S. Experience, J.S. O'Connor, State University of New York/Center for

Earthquake Engineering Research, Buffalo, NY; J. Hooks, Federal Highway Administration, McLean, VA

Local Response of Anchored and Unanchored CFRP Shear Stirrups to Crack Opening, P.M. Schuman, V.M. Karbhari, University of California/San Diego/Structural Engineering, LaJolla, CA

Reliability Based Assessment of FRP Strengthened Slabs, R.A. Atadero, V.M. Karbhari, University of California/San Diego/Structural Engineering, LaJolla, CA

Session 6D

Wednesday Afternoon, May 19
2:00 p.m.

Nanocomposites—III: Mechanical Properties

Chairs: *Dr. Ben Wang, Florida A&M University/Florida State University/Industrial and Manufacturing Engineering, Tallahassee, FL and Joseph Mabry, Air Force Research Laboratory, Edwards AFB, CA*

Strength Enhancement of Pultruded Thermoplastic Composites Using Nanoclay Reinforcement, S. Roy, F. Hussain, H. Lu, Oklahoma State University/Mechanical and Aerospace Engineering, Tulsa, OK

Molecular Dynamic Simulation and Experimental Investigation of Filling Chopped SWNTs with Resin Matrix Molecules to Enhance Interfacial Bonding and Loading Transfer in Nanocomposites, J. Tiehu, O. Marietta-Tondin, Z. Liang, C. Zhang, B. Wang, Florida A&M University/Florida State University/Engineering, Tallahassee, FL; L. Kramer, Lockheed Martin Missiles and Fire Control, Orlando, FL

Hierarchical Model of Stacked Cup Carbon Nanofiber (SCCNF) Structure, X. Xu, J.P. Dismukes, M.U. Afzal, University of Toledo/Chemical and Environmental Engineering, Toledo, OH; T.W. Hughes, Applied Sciences Inc, Cedaville, OH



THE INTERAGENCY WORKING GROUP ON FIRE AND MATERIALS (IWGFM)

In 1993 Federal scientists and engineers from over twenty agencies formed a new Interagency Working Group on Fire and Materials. The mission of the Group is:

To implement a coordinated, long-range national research effort to understand the fire thermal behavior of materials and develop advanced materials with improved performance. The agencies participating in the Working Group have mutual interest in fire and materials and will support cooperative research through the sharing of information and resources with the ultimate goal of improving human survivability and protecting property in severe thermal environments.

Within this mission, the IWGFM has five technical thrust areas.

- Health and Environmental Response
- Testing of Fire and Thermal Properties
- Advanced Materials and Processing
- Modeling of Fire and Thermal Response
- Establishing Data Base for Materials Fire and Thermal Properties

The IWGFM is sponsoring five technical sessions at SAMPE 2004. This is the 11th anniversary of the SAMPE and IWGFM co-location. In addition, it will hold its 17th general meeting on the afternoon of Wednesday, May 19 at the conclusion of the Fire Performance session. This general meeting will be chaired by Mr. Usman Sorathia.

This meeting is open to all federal employees and private sector personnel with interest in fire safety and materials. If you have any questions or need more information, contact: Usman Sorathia at 301/227-5588.

Load Transfer in Single-Walled Nanotube Rope/Polymer Composites,

J. Gou, S. Jiang, B. Minaie, K.T. Hsiao, University of South Alabama/Mechanical Engineering, Mobile, AL; Z.Y. Liang, C. Zhang, B. Wang, Florida A&M University/Florida State University/Industrial and Manufacturing Engineering, Tallahassee, FL

Prediction of Elastic Modulus in Polymer Clay Nanocomposites,

R.S. Fertig III, Cheyenne, WY; M.R. Garnich, University of Wyoming, Laramie, WY

Transient and Dynamic Viscoelastic Behavior of Polypropylene/Layered Silicate Nanocomposites,

S. Ganguli, G. Williams, D. Dean, Tuskegee University, Tuskegee, AL

Strain Rate Effects on Nanophased Polyurethane Foams,

M. Uddin, M. Saha, H. Mahfuz, V. Rangari, S. Jeelani, Tuskegee University/Mechanical Engineering, Tuskegee, AL

Electrical Resistivity and Mechanical Property of Magnetically Aligned SWNT Bucky Papers and Nanocomposites,

Z. Liang, R. Shankar, K. Barefield, C. Zhang, B. Wang, Florida A&M University/Florida State University/Engineering, Tallahassee, FL; L. Kramer, Lockheed Martin Missiles and Fire Control, Orlando, FL

Electrically Conductive Carbon Nanofiber Reinforced Polymer Composites,

K.L. Strong, M. Alexander, A.F. Research Laboratory/MLBCO, WPAFB, OH; K. Lafdi, University of Dayton Research Institute, Dayton, OH; D.G. Glasgow, R.L. Jacobsen, M.L. Lake, Applied Sciences Inc, Cedarville, OH

Fabrication, Characterization and Mechanical Properties of Nanophased Carbon Prepreg Laminates,

H. Mahfuz, M. Baseer, V. Rangari, S. Jeelani, Tuskegee University/Mechanical Engineering, Tuskegee, AL

Session 6E
Wednesday Afternoon, May 19
2:00 p.m.

Processing Advances—II

Chair: *Dr. Donald Klosterman, University of Dayton Research Institute, Dayton, OH*

Characterization of Flow and Mixing in a Configurable Twin-Screw Continuous Processor,

D. Klosterman, J. Magato, University of Dayton Research Institute, Dayton, OH

Process Optimization of Resistance Welding of Thermoplastic Composites Using Metal Mesh Heating Elements,

A. Yousefpour, M. Simard, M. Hojjati,

National Research Council of Canada/Aerospace Research Institute, Montreal, Canada

UV Cured FRP Joint Thickness Effect on Coupled Composite Pipes,

J.A. Peck, S-S. Pang, G. Li, Louisiana State University/Mechanical Engineering, Baton Rouge, LA; R.A. Jones, Edo Fiber Science/Commercial and Marine Products, Salt Lake City, UT; B.H. Smith, NASA Marshall Space Flight Center/Structure Materials, Huntsville, AL

Improved Moisture Permeability Performance of Hybrid Composites,

R. Kolozs, M. Thompson, Vanguard Composites Group Inc, San Diego, CA; E. Stokes, Southern Research Institute, Birmingham, AL

Influence of Processing Conditions on Porosity for the Autoclave Cure of Composites,

Z. Boming, L. Ling, W. Dianfu, Harbin Institute of Technology/Composite Materials Center, Harbin, PRC

Experimental and Analytical Investigation of Porosity in Carbon/Epoxy Composite Laminates,

L. Ling, Z. Boming, W. Dianfu, Harbin Institute of Technology/Composite Materials Center, Harbin, PRC

Tailored Long Fiber Reinforced Thermoplastics (Tailored LFTs)

Developed for Series Production, O. Geiger, W. Kraus, F. Henning, R. Bruessel, H. Ernst, Fraunhofer Institute for Chemical Technologies/Polymer Engineering, Pfingztal, Germany

Void Content in Polymeric Matrix Composites and Its Effects on Flexural Properties, L. Ling, Z. Boming, W. Dianfu, Harbin Institute of Technology/Composite Materials Center, Harbin, PRC

Session 6F
Wednesday Afternoon, May 19
2:00 p.m.

Repair Technology—I

Chair: *Russell Keller, Boeing Phantom Works, Seattle, WA*

(CLOSED PAPER) Rapid Non-Autoclave/Staged Bonded Repair Concepts for Fielded Composite Structures, A.M. Nolan, E.L. Rosenzweig, Naval Air Systems Command/Structures, Patuxent River, MD

Surface Preparation for Metallic Bonded Repair: A Comparison of Methods for Naval Fleet Deployment, M.S. Tillman, R.T. Manson, Naval Air Systems Command, Patuxent River, MD

Development of Smart Repair Kit for Field Repair of Military Composite Bridges using GENOA Modeling and Simulation, F. Abdi, R. Ragalini, Alpha Star Corporation, Long Beach, CA; R. Iyer, TARDEC, Warren, MI; A. Mosallam, California State University, Fullerton, CA; J. Wang, The Boeing Company, Huntington Beach, CA

Development of an Ablative Silicone Material for On-Orbit Repair of Ceramic Thermal Protection System Tiles, K.J. Courter, The Boeing Company, Huntington Beach, CA

Challenges in Composite Maintenance and Repair, R.L. Keller, Boeing Company Phantom Works, Seattle, WA



Session 6G
Wednesday Afternoon, May 19
2:00 p.m.

Resin Technology—I

Chair: *Dr. Will McCarvill, Commercial Chemistries LLC, Salt Lake City, UT*

Parmax® SRPs Are a Family of Processable Rigid Rod Polymers, N. Malkovich, R. Gagne, R. Chavers, Mississippi Polymer Technologies Inc, Bay St. Louis, MS

Poly-DCPD—The Promise Fulfilled, J.O. Frost, S.A.M. Toner, Cymetech LLC, Huntsville, TX

Fluorinated POSS Polymers, J.M. Mabry, ERC Inc/AFRL/PRSM, A. Vij, B.D. Viers, R.L. Blanski, P.N. Ruth, R.I. Gonzalez, Edwards AFB, CA

Preparation and Characterization of Poly(ethylene terephthalate-co-cyclohexanedimethylene terephthalate), A. Yu, H. Zou, W. Li, X. Huang, Dong Hua University/Material Science and Engineering, Shanghai, China

Reactive Finishes for Improving Interfacial Properties in Carbon/Vinyl Ester Laminates, R.E. Allred, S.P. Wesson, W. Whitehead, Adherent Technologies Inc, Albuquerque, NM

Synthesis of Crosslinked Siloxane Networks for Fiber-Matrix Interphase Applications, A. Chatterjee, J.W. Gillespie Jr, University of Delaware/Center for Composite Materials, Newark, DE

The Effect of Moisture on DGEBA Epoxy Resin Systems, A. Chatterjee, J.W. Gillespie Jr, University of Delaware/Center for Composite Materials, Newark, DE

Effect of Mixture Resin Finishing on the Whiteness and Stiffness of Cotton Fabrics, S.M. Mortazavi, Isfahan University of Technology/Textiles, Isfahan, Iran; P.E. Boukany, Sherman Oaks, CA

Session 6H
Wednesday Afternoon, May 19
2:00 p.m.

Sandwich Structures—I

Chairs: *Prof. Valaria LaSaponara, University of Utah/Mechanical Engineering, Salt Lake City, UT and Russell Elkin, Alcan Baltek Corporation, Northvale, NJ*

Low Velocity Impact Characterization of Hollow Integrated Core Sandwich Composites, M.V. Hosur, M. Abdullah, S. Jeelani, Tuskegee University/Advanced Materials Center, Tuskegee, AL

Damage Tolerance of Stitched Sandwich Composites, J.M. Butterfield, D.O. Adams, University of Utah/Mechanical Engineering, Salt Lake City, UT

Open-Hole Compression Behavior of Sandwich Panels with Thin-Facesheets, K.S. Raju, J.F. Acosta, J.S. Tomblin, Wichita State University/National Institute for Aviation Research, Wichita, KS

Buckling Analysis of Debonded Sandwich Columns, F. Aviles, L.A. Carlsson, Florida Atlantic University/Mechanical Engineering, Boca Raton, FL

Buckling and Face Wrinkling Analysis of Stitched Sandwich Panels, V. Ghate, V. LaSaponara, S. Kamaya, University of Utah/Mechanical Engineering, Salt Lake City, UT

Effect of Elevated Temperature on Wrinkling in Composite Sandwich Panels, V. Birman, University of Missouri/Engineering Education Center, St. Louis, MO

Combined Experimental-Analytical Characterization of Composite Sandwich Panels Based on a Hydromat Test Method, R. Lopez-Anido, P. Melrose, A. Brinks, K. Stephens, University of Maine/Civil and Environmental Engineering, Orono, ME

Failure Mechanisms in Composite Reinforced Aluminum Foam Sandwich Structures, G. Reyes-Villanueva, University of Michigan/Mechanical Engineering, Dearborn, MI; W.J. Cantwell, University of Liverpool/Engineering, Liverpool, UK

Finite Element Modelling of FRP Sandwich Panels Exposed to Heat, P. Krysl, W.T. Ramroth, L.K. Stewart, R.J. Asaro, University of California/San Diego/Structural Engineering, LaJolla, CA

Session 6I
Wednesday Afternoon, May 19
2:00 p.m.

Testing—V

Chair: *Ray Bowman, Oak Ridge National Laboratory, Oak Ridge, TN*

Determination of Forming Limit Curves Using 3D Differential Image Correlation and In-Situ Observation, A. Hijazi, N. Yardi, V. Madhavan, Wichita State University/Industrial and Manufacturing Engineering, Wichita, KS

Moire Interferometry Measurements on a Co-Bonded Pi-Preform Composite Tee Joint, D.H. Mollenhauer, A.J. Colleary, A.F. Research Laboratory, WPAFB, OH; S.P. Engelstad, O.T. Berry, Lockheed Martin Aeronautics, Marietta, GA; E.V. Iarve, University of Dayton Research Institute, Dayton, OH

Advanced Optical Methods for Understanding Composite Structures from Design to Production, J. Tyson II, T. Schmidt, Trillion Quality Systems, West Conshohocken, PA; K. Galanulis, Mittleweg, Braunschweig, Germany

Strain Monitoring of 3-D Woven Composite and Bonded Joint Using Integrated Bragg Grating Sensors, A. Bogdanovich, D.E. Wigent III, 3TEX Inc, Cary, NC; T.J. Whitney, Univ of Dayton Research Institute, Dayton, OH

CFRP Strengths Improvement by Carbon Fiber Stitching, Y. Iwahori, T. Ishikawa, Japan Aerospace Exploration Agency/Advanced Composite Evaluation Technology Center, Tokyo, Japan

Test Method Development to Quantify the In-Situ Elastic and Plastic Behavior of 62Sn-36Pb-2Ag Solder Ball Arrays in Commercial Area Array Packages at -40°C, 23°C and 125°C, A.A. Obaid, A. Paesano, J.W. Gillespie Jr, University of Delaware/Composite Manufacturing Science Laboratory, Newark, DE; J.G. Sloan, M. Lamontia, DuPont Engineering Technology, Wilmington, DE; S. Khan, DuPont Thermount, Richmond, VA

Rapid Performance Evaluation of the Flexural and Torsional Stiffness of Complex Pultruded Profiles, C. Hiel, Composite Support and Solutions Inc, Rancho Palos Verdes, CA

High Performance Laminated Composites: Design, Fabrication and Characterization, K. Muckley, Cornerstone Research Group, Dayton, OH

Tutorial – Sponsored by MIL-17 Handbook
Thursday Morning, May 20
8:00 a.m. – 12:00 noon

Today's Standard Has Changed

Session 7A
Thursday Morning, May 20
8:00 a.m.

Advanced Composites Manufacturing Technology Overview

Sponsored by National Center for Advanced Manufacturing (NCAM)

Chairs: *Bruce Brailsford, National Center for Advanced Manufacturing, New Orleans, LA and John Vickers, National Center for Advanced Manufacturing/NASA MSFC, Huntsville, AL*

(CLOSED PAPER) Porosity Studies in IM6/3501-6 Graphite-Epoxy Laminates, C.D. Wilson, S.J. Pardue, J.D. Richardson, C.M. Darvennes, D.E.P. Hoy, Tennessee Technical University/Mechanical Engineering, Cookeville, TN

If you need additional Lunch or Fellow Banquet tickets they can be purchased on site in the Registration area.
Lunch tickets \$25
Fellow Banquet Tickets \$45

Optimum Parameters for Nonautoclave Manufacturing of a Composite Ring, N. Hassan, J. Thompson, A.C. Loos, R. Batra, Virginia Tech/Engineering Science and Mechanics, Blacksburg, VA

NASA's Accomplishments in Design, Materials and Manufacturing of Composite Cryogenic Tank Structures, J. Vickers, M. Frazier, B. McMahon, NASA Marshall Space Flight Center/NCAM, Huntsville, AL

Thermoplastics for Use in Cryogenic Composite Fuel Tanks, J. Lee, R. Patton, J. Schneider, C. Pittman Jr, J. Ragsdale, L. Wang, Mississippi State University/Mechanical Engineering, Mississippi State, MS

Session 7B
Thursday Morning, May 20
8:00 a.m.

Design and Analysis—III

Chair: *Dr. Rick Hale, University of Kansas/Aerospace Engineering, Lawrence, KS*

(CLOSED PAPER) Fracture Mechanics Approach to Analytical Prediction of Composite Joints with Integrated Flex Circuit, Part 1, S. Senibi, L. Deobald, D. Banks, Boeing Phantom Works, Seattle, WA

A study of the Crush Response of Composite Conical Frustrum Under Off-Axis Loads, H. Yang, V.M. Karbhari, University of California/San Diego/Structural Engineering, LaJolla, CA

Impact, Damage, and Energy Absorption of a 3D Orthogonal Weave Composite Based on a Unit Cell Model, B.A. Gama, J.W. Gillespie Jr. University of Delaware/Center for Composite Materials, Newark, DE; A.E. Bogdanovich, 3TEX Inc, Cary, NC

A Priori Composite/Metal Corrosion-Fatigue Assessment, C.C. Chamis, NASA Glenn Research Center, Cleveland, OH

Stress Analysis of a Co-Cured Composite Stepped Scarf Joint, S.M. Graham, U.S. Naval Academy/Mechanical Engineering, Annapolis, MD

Continuum Damage Healing Mechanics for Modeling of Self-Healing Composites, E.J. Barbero, K.J. Ford, A.H. Stiller, West Virginia University/Mechanical and Aerospace Engineering, Morgantown, WV

In-Plane Compression Response of Steered Fiber Composites, R.S. Moon, R.D. Hale, University of Kansas/Aerospace Engineering, Lawrence, KS

Modeling of the Magnetostrictive Material and Analysis Its Dynamic Feature, Y. Zhang, L. Li, Beijing University of Aeronautics and Astronautics, Beijing, PRC

Smart Actuator for Aeronautical Application, L. DiPalma, Italian Aerospace Research Center, Capua, Italy

Hexagon Building Block Materials and FEA-Superelement Continuity Predictions, D. Zornes, HexaBlock Inc, Issaquah, WA

Session 7C
Thursday Morning, May 20
8:00 a.m.

Electronics and Electronic Materials—I

Chairs: *Bob Seibold, The Aerospace Corporation, Los Angeles, CA and Daniel Kovach, The Boeing Company, Seattle, WA*

(CLOSED PAPER) Carbon Nanofiber Reinforced EMI Shielding Aerospace Polymers, R.L. Jacobsen, M. Matuszewski, Applied Sciences Inc, Cedarville, OH; L. Becker, SMDC, Huntsville, AL

(CLOSED PAPER) Conductive Nanomaterials for Lightning Protection of Composites, A. Cooley, M. Alexander, T. Benson Tolle, J. Chase, A.F. Research Lab, WPAFB, OH; G Hansen, M. Petit, Metal Matrix Composites, Midway, UT; C-S. Wang, Univ of Dayton Research Institute, Dayton, OH

(CLOSED PAPER) Rapid Fabrication of Micro-Channel Devices for High Power Electronic Applications, R. Vaidyanathan, L. Studley, T. Phillips, B. Hecht, Advanced Ceramics Research Inc, Tucson, AZ; C. Bower, P. Skandakumaran, A. Ortega, University of Arizona/Aerospace and Mechanical Engineering, Tucson, AZ

Carbon Nanofiber Filled Conductive Polyimides, R.L. Jacobsen, K.R. Walters, M. Matuszewski, D.G. Glasgow, Applied Sciences Inc, Cedarville, OH; C-S. Wang, University of Dayton Research Institute, Dayton, OH

Transparent Conductive Nanocomposite Film Using Exfoliated Graphite Nanoplatelet (GNP), H. Kim, H.T. Hahn, UCLA/Mechanical and Aerospace Engineering, Los Angeles, CA; L. Viculis, J. Mack, R. Kaner, UCLA/Chemistry and Biochemistry, Los Angeles, CA

Non-Aqueous Polymer Gels for Use in High-K Dielectric Applications, P.J. Cole, J.L. Lenhart, J.A. Emerson, Sandia National Laboratories, Albuquerque, NM

Session 7D
Thursday Morning, May 20
8:00 a.m.

Fire Performance—IV: Structural Modeling

Sponsored by IWGFM

Chairs: *Usman Sorathia, Naval Surface Warfare Center/Carderock, West Bethesda, MD; Jack Lesko, Virginia Tech/Engineering Science and Mechanics, Blacksburg, VA; Patrick Potter, Office of Naval Research, Arlington, VA and Prof. Adrian P. Mouritz, RMIT University/Aerospace Engineering, Melbourne, Australia*

Modelling the Fire Reaction of Polymer Composites, A.P. Mouritz, A.G. Gibson, Y-S Wu, Z. Mathys, C.P. Gardiner, A. Kootsookos, RMIT University/Aerospace Engineering, Melbourne, Australia

Fire Integrity of Polymer Composites Using the Two Layer Model, A.G. Gibson, Y-S. Wu, University of Newcastle upon Tyne/Composite Materials Engineering, Newcastle upon Tyne, UK; A.P. Mouritz, RMIT University/Aerospace Engineering, Melbourne, Australia; Z. Mathys, C.P. Gardiner, DSTO/Aeronautical and Maritime Research Laboratory, Melbourne, Australia

Simulation of Structural Response of Composite Structures Under Fire Exposure, H. Halverson, J. Bausano, S. Case, J. Lesko, Virginia Tech/Engineering Science and Mechanics, Blacksburg, VA

Why
should you
Pre-Register
for tutorials?

SAMPE reserves the right to cancel any tutorial that does not have a minimum of 12 registrants two weeks before the conference.



A Dislocation Approach for the Thermal Stress Intensity Factors of a Crack in an Infinite Anisotropic Medium Under Uniform Heat Flow, L. Liu, G.A. Kardomateas, J.W. Holmes, Georgia Institute of Technology/ Aerospace Engineering, Atlanta, GA

Composite Life Under Sustained Compression and One Sided Simulated Fire Exposure: Characterization and Prediction, J. Bausano, S. Boyd, J. Lesko, S. Case, Virginia Tech/ Engineering Science and Mechanics, Blacksburg, VA

Laminate Analysis of Composites Under Load in Fire, A.G. Gibson, University of Newcastle upon Tyne/ Composite Materials Engineering, Newcastle upon Tyne, UK

Thermal Properties of Composites for Heat Transfer Modeling During Fires, B.Y. Lattimer, J. Ouellette, Hughes Associates Inc, Baltimore, MD

Numerical Simulation of Solid Material Decomposition and Combustion, V.F. Nicolette, Sandia National Laboratories, Baldwinsville, NY; B.E. Vembe, Computational Industry Technologies, Trondheim, Norway

Thermal-Mechanical Fire Damage Assessment Tool for Woven Fabric Composite Structures, J. Lua, C. Key, J. O'Brien, Anteon Corporation, Mystic, CT

A Small Scale Low Cost Technique for Fire Resistance of Composites Under Load, A.G. Gibson, P.N.H. Wright, Y-S. Wu, University of Newcastle upon Tyne/ Composite Materials Engineering, Newcastle upon Tyne, UK

Session 7E
Thursday Morning, May 20
8:00 a.m.

Infrastructure Applications and Trends—III

Chair: *Prof. Chris Pantelides, University of Utah/Civil and Environmental Engineering, Salt Lake City, UT*

Development of a FRP Composite Modular Bridge System, L. Cheng, V.M. Karbhari, University of California/ San Diego/Structural Engineering, LaJolla, CA

Temperature Effect on Bond Behaviour of FRP Rebars Embedded in Concrete, R. Masmoudi, A. Alvarez, Universite de Sherbrooke/Civil Engineering, Sherbrooke, Canada

Moment Redistribution in Continuous FRP-Strengthened Concrete Structures Strengthened with Prestressed CFRP Sheets, T. Ibell, University of Bath/Architectural and Civil Engineering, Bath, UK; P. Silva, University of Missouri/Architectural and Environmental Engineering, Rolla, MO

Long-Term Durability of Strengthened Concrete with Externally Applied FRP Composites, N. Saenz, C.P. Pantelides, L.D. Reaveley, University of Utah/Civil and Environmental Engineering, Salt Lake City, UT

Remaining Service Life of FRP Rehabilitated Structures, L.S. Lee, V.M. Karbhari, University of California/ San Diego/Structural Engineering, LaJolla, CA; C. Sikorsky, California Department of Transportation/Earthquake Engineering, Sacramento, CA

Investigation of Corrosion Damage in CFRP-Confined Reinforced Concrete Members, M.F. Herrador, V.M. Karbhari, University of California/San Diego/Structural Engineering, LaJolla, CA

Bond Characterization of Steel Reinforced Polymer (SRP) on Concrete, P. Silva, E. Wobbe, A. Nanni, University of Missouri/Civil Architectural and Environmental Engineering, Rolla, MO; L.B. Dharani, V. Birman, B.L. Barton, University of Missouri/ Mechanical and Aerospace Engineering, Rolla, MO; T. Alkhrdaji, J. Thomas, Structural Group, Hanover, MD; G. Tunis, Hardwire LLC, Pocomoke City, MD

Experimental Evaluation of Cyclic Behavior of Ordinary and Homopolymer-Polypropylene Fibrillated Fiber-Reinforced Concrete, M. Faruqi, H. Estrada, D. Chandra, Texas A&M University/Civil Engineering, Kingsville, TX

Application of MRI Tomography to Characterization of the Chloride Ion Permeability of Regular and High Performance Concretes, H. Estrada, A.K. Sen, M. Faruqi, Texas A&M University/Civil Engineering, Kingsville, TX

Session 7F
Thursday Morning, May 20
8:00 a.m.

Nanocomposites—IV: Applications

Chairs: Russell Maguire, The Boeing Company, Seattle, WA and Flake Campbell, Jr., The Boeing Company, St. Louis, MO

University Research Sessions

Graduate and International Student Scholarship papers will be presented at two special University Research Sessions on Tuesday. The opportunity to present papers will also be available to SAMPE Student Chapter members.

For more information contact Dr. Anthony Saliba, University of Dayton, phone: 937/229-2627; fax: 937/229-3433; e-mail: Tsaliba@udayton.edu.

Polymer/Carbon Nanotube Composites: Opportunities and Challenges, S. Kumar, T. Liu, T.V. Sreekumar, X. Zhang, Y-B. Park, Georgia Institute of Technology/Polymer, Textile and Fiber Engineering, Atlanta, GA; T. Uchida, Okayama University/Engineering, Okayama, Japan

Performance of Nano-Clay Modified Epoxies in Composites at Cryogenic Temperatures, J. Lee, R. Patton, J. Schneider, C. Pittman Jr, J. Ragsdale, L. Wang, Mississippi State University/Mechanical Engineering, Mississippi State, MS

Properties of Epoxy-Clay Nanocomposite Adhesives for Bonded Strap Joints, K. McCarrie, San Jose State University, Hayward, CA

Designing and Processing of Polymeric Nanomaterials, D.Y. Wu, S. Bateman, Commonwealth Scientific Industrial Research Organization/Manufacturing and Infrastructure Technology, Melbourne, Australia

Synthesis and Characterization of Thermoplastic Nanophased Structures, K. Kanny, V.K. Moodley, Durban Institute of Technology/Mechanical Engineering, Durban, South Africa

Characterization of Fatigue Behavior of Nanoparticles Modified Polymeric Matrix Composites, T. Karaki, J.C. Seferis, University of Washington/Polymeric Composites Laboratory, Seattle, WA

Development of Multifunctional Advanced Composites Using a VGNF Enhanced Matrix, B.P. Rice, T. Gibson, K. Lafdi, University of Dayton Research Institute, Dayton, OH

Process Modification of Expanded Polystyrene with a Polyanomeress Concept, J. Killgore, J.C. Seferis, University of Washington/Polymeric Composites Laboratory, Seattle, WA

Nanocomposite Rocket Ablative Materials: Subscale Motor Testing, J.H. Koo, University of Texas/Mechanical Engineering, Austin, TX; H. Stretz, Texas State University/Environmental and Industrial Science, San Marcos, TX; J. Weispfenning, Cytec Engineered Materials, Winona, MN; A. Bray, Systems and Materials Research Consultancy, Austin, TX; R. Blanski, H. Nguyen, J. Sherer, A.F. Research Laboratory/Propulsion Directorate, Edwards AFB, CA; Z.P. Luo, Texas A&M University/Microscopy and Imaging Center, College Station, TX

Session 7G
Thursday Morning, May 20
8:00 a.m.

Processing Advances—III

Chairs: *Jerome Berg, HST, San Diego, CA and Doug Roberts, Quatro Composites, Poway, CA*

Bladder Molding in the Recreational Industry—Lessons Learned, D. Rebard, LTI, San Marcos, CA

Hybrid Composite/Metal Co-Molding Techniques for Joining Tube Type Structures, H.A. Lindsay, VyaTek Sports, Scottsdale, AZ

Development of Extruded Door Edge Protection for the F/A-22, R.W. Koon, J.M. Criss, Lockheed Martin Aeronautics Company, Marietta, GA

Materials Development for a Heated Radome Application, L.J. Kao, R.P.

Willardson, Raytheon/Advanced Products Center, McKinney, TX

Development of a Next Generation Surfacing Film for Composite Structures. Surface Master 905 System, D.K. Kohli, Cytec Engineered Materials, Havre de Grace, MD

Production and Properties of Carbon Nanofiber-Reinforced Bulk Molding Compound, D. Klosterman, T. Gibson, J. Magato, M. Galaska, N. Gagliardi, University of Dayton Research Institute/Basic and Applied Polymer Research, Dayton, OH

Pigmented Prepreg to Replace Tedlar as Decorative Layer for Phenolic Panels in Interior Applications, F.D. Blair, Hexcel, Duxford, UK

Session 7H
Thursday Morning, May 20
8:00 a.m.

Resins Technology—II

Chair: *Dr. Will McCarvill, Commercial Chemistries LLC, Salt Lake City, UT*

Thermoplastic Resin Transfer Molding—Based on Cyclic Butylene Terephthalate, S.J. Winckler, Cyclics Corporation, Schenectady, NY

New High Performance RTM System, A. Tontisakis, Y. Blyakhman, A. Chaudhari, Huntsman Advanced Materials, Brewster, NY

Toughening of Epoxy-Amine Resin Systems for VARTM and Filament Winding Applications, E.J. Robinette, G.R. Palmese, Drexel University/Chemical Engineering, Philadelphia, PA; P. Weinhold, Johns Hopkins University/Applied Physics Laboratory, Laurel, MD

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Drop by with questions, comments, to introduce yourself, to say hello!



Commercial Products for VARTM Structural Aerospace Applications, D. Dixon, B. Hayes, R. Moulton, Applied Poceramic Inc, Benicia, CA; C. Martin, Hexcel Corporation, Dublin, CA; S. Mortimer, Hexcel, Duxford, UK

Novel Use of Cyanate Esters: VARTM and Pultrusion, S. Das, Lonza Inc, Fairlawn, NJ; L. Castelli, Lonza Inc, Annandale, NJ; A. Falchetto, Lonza AG, Switzerland

Semi-Solid Anhydride Cured Epoxy Resin Systems for Resin Infusion Applications, J.A. Ernst, T.J. Robinson, Lindau Chemicals Inc, Columbia, SC

Mold Release Technologies for Advanced Composites Manufacturing, D. Shaw, Henkel Loctite, Rocky Hill, CT

Session 7I
Thursday Morning, May 20
8:00 a.m.

Sandwich Structures—II

Chairs: *Russell Elkin, Alcan Baltek Corporation, Northvale, NJ and Prof. Valaria LaSaponara, Univ of Utah/Mechanical Engineering, Salt Lake City, UT*

High Performance, Low-Cost Infusion Cores for Structural Sandwich Panels, F. Stoll, M. Sheppard, S. Campbell, S. Day, WebCore Technologies Inc, Kettering, OH

Evaluation of Sandwich Composites for Automotive Applications, A.L. VanOttten, N.S. Ellerbeck, D.O. Adams, University of Utah/Mechanical Engineering, Salt Lake City, UT; C. Nailadi, DaimlerChrysler/Scientific Labs, Dearborn, MI

High Strain Rate Compression Behavior of Integrated Core Sandwich Composites, M.V. Hosur, M. Abdullah, S. Jeelani, Tuskegee University/Center for Advanced Materials, Tuskegee, AL

Core-to-Skin Bond Performance of Para-Aramid Paper Honeycomb Core Sandwich Panels, M. Caldwell, Y. Wang, Hexcel Corporation, Dublin, CA

Development of a Self-Adhesive Prepreg System for Sandwich Panel Applications, W. Hedges, R. Buyny, Maureen Boyle, K. McVicker, C. Martin, Hexcel Corporation, Dublin, CA

Stitching Near Inserts in Composite Sandwich Panels, T.J. Skelton, D.O. Adams, University of Utah/Mechanical Engineering, Salt Lake City, UT

The Case Against Honeycomb Core, F. Campbell, The Boeing Company, Berkeley, MO

Noise Transmission Loss Measurements on Composite Sandwich Panels, S. Rajaram, T. Wong, S. Nutt, UCLA/Materials Science and Engineering, Los Angeles, CA

Session 8A
Thursday Afternoon, May 20
1:00 p.m.

Adhesion and Adhesives Bonding

Chair: *Dr. Charles Yang, Wichita State University, Wichita, KS*

Development of New High Performance Epoxy and BMI Structural Adhesive Films for Co-Cure Over Honeycomb Core Bonding Applications, Prepreg Flow Management, D.K. Kohli, B. Trzaskos, T. McDaniel, Cytec Engineered Materials, Havre de Grace, MD

Low Outgas Silicone Pressure Sensitive Adhesive for Aerospace Applications, B. Riegler, J. Meyer, NuSil Technology, Carpinteria, CA

Epoxy Adhesives: Film Performance from a Cartridge, P. Webb, D.A. Bugg, A. Brownhill, Duxford Cambridge/Research and Technology, Cambridge, UK

Qualification of Sol-Gel Surface Treatments for Adhesive Bonding of Titanium Alloys, J.W. Grob, K.Y. Blohowiak, K.S. Preedy, R.R. Stephenson, R.A. Anderson, The Boeing Company, Seattle, WA

Non-Chromate Coating for Aluminum Honeycomb, Y-S Wang, M. Caldwell, Hexcel Corporation, Dublin, CA; C. Rouille, R. Morrison, Hexcel Corporation, Casa Grande, AZ

Test and Analysis of Bonded Joint Configurations for Pultruded E-Glass in a Thermosetting Resin Matrix, A.R. Cowin, St. Louis University/Aerospace Technology St. Louis, MO

Strength of Bonded Joints of Aluminum Foams, P. vanNieuwkoop, Delft University of Technology/Aerospace Engineering, Delft, The Netherlands; M.S. Rizam, A. Majid, Queen's University of Belfast/Aeronautical Engineering, Belfast, Northern Ireland

Fractural Analysis of Adhesive-Bonded Single-Lap Composite Joints, W. Sun, C. Yang, Wichita State University/Mechanical Engineering, Wichita, KS

Fracture Characteristics of Composite Adhesive Bonded Single-Lap Joints, K-S. Kim, J-S. Park, Y-S. Jang, Y-M. Yi, Korea Aerospace Research Institute, Daejeon, Korea

Hybrid Joining in Automotive Applications, D. Erdman, L. Klett, V. Kunc, Oak Ridge National Laboratory, Oak Ridge, TN

Density Functional Study of Aluminum—Ceramic Adhesion, N.E. Ooi, Arizona State University/Chemical and Materials Science, Tempe, AZ

Session 8B
Thursday Afternoon, May 20
1:00 p.m.

Ceramics and Ceramic Composites

Chair: *Todd Steyer, The Boeing Company, Huntington Beach, CA*

(CLOSED PAPER) Design and Fabrication of Aircraft Components with Ceramic Composite Materials, D.E. Daws, Northrop Grumman Corporation, El Segundo, CA

(CLOSED PAPER) Airborne Laser Bulkhead Window Manufacturing Program, V.A. McMillan, A.F. Research Laboratory/MLME, WPAFB, OH; T.M. Weeks, Universal Technology Corporation, Dayton, OH; H.R. Hiddleston, Science Applications International Corporation, Escondido, CA; F.H. White, Science Applications International Corp, Moorpark, CA; R.J. Korniski, Science Applications International Corporation, Thousand Oaks, CA

(CLOSED PAPER) Production Scale-Up of Transparent Spinel Components, B. Leever, A.F. Research Laboratory/MLME, WPAFB, OH; A. DiGiovanni, M.C.L. Patterson, L. Fehrenbacher, Technology Assessment and Transfer, Annapolis, MD

Durable Ceramic Composites for Applications, J.B. Davis, D.B. Marshall, O. Sudre, B.N. Cox, Rockwell Scientific/Composite Materials, Thousand Oaks, CA

Thermal Shock Behavior of Nicalon Fiber/SiCN Ceramic Matrix Composite, S. Salekeen, J.A. Nana, H. Mahfuz, S. Jeelani, Tuskegee University/Mechanical Engineering, Tuskegee, AL

Anisotropic Mechanical Properties of a Porous-Matrix, Oxide Ceramic Composite, M.A. Mattoni, F.W. Zok, University of California/Materials Department, Santa Barbara, CA

FEM Analysis of Stress Distribution in Metal/Ceramic Multi-Layer Composites Preparing by EBPVD Technique, L. Shi, X. He, Y. Li, Harbin Institute of Technology/Center for Composite Materials and Structure, Harbin, PRC

Preparation and Complex Permittivity of 3D Textile C/SiC Composites, D. Zhao, X. Liu, H. Yin, F. Luo, W. Zhou, Beijing University of Chemical Technology/Carbon Fiber and Composites Institute, Beijing, PRC

A New Zirconium Hydroxide, G-Y. Guo, Shanghai Jian Tong University/Material Science and Engineering, Shanghai, China; Y-L. Chen, Shanghai Jian Tong University/Chemistry and Chemical Engineering, Shanghai, China

Session 8C
Thursday Afternoon, May 20
1:00 p.m.

Design and Analysis—IV

Chair: *Dr. Clem Hiel, Composite Support and Solutions Inc, Rancho Palos Verdes, CA*

Super Robust and Ultra-Light Pressure Vessels Using New Technology, M.A. Olson, HyPerComp Engineering Inc, Brigham City, UT

Optimized Filament Winding of Composites for Overwrap Applications, R.P. Emerson, D.M. Spagnuolo, J.T. Tzeng, Army Research Laboratory/Weapons and Materials Research, Aberdeen Proving Ground, MD

Composite Gun Tube Support, A. Littlefield, Army Benet Labs/Modeling and Simulation, Watervliet, NY

Evaluation of Structural Performance of a Continuous-Fiber Reinforced Ceramic Composite Gas Turbine Combustor Liner, S. Kiefer, F. Abdi, R. Ragalini, Alpha Star Corporation, Long Beach, CA; A. Bhattacharya, Solar Turbines Inc, San Diego, CA

The Development of a Subscale Armor Target Fabrication System, S.M. Walsh, J. Campbell, Army Research Laboratory, Aberdeen Proving Ground, MD

Finite Element Analysis Applied to the Design of a Lightweight Fiberglass Ladder, M. Miles, R. Whatcott, B. Strong, Brigham Young University, Provo, UT

Design and Development of Below the Knee Composite Endoskeleton Artificial Limb, V. Baskar, P. Baskaran, R. Nagappa, Anna University/Madras Institute of Technology, Aeronautical Engineering, Chennai, India

Conceptual Design, Analysis and Optimization of Laminated Hybrid Composite E-Springs, S.A. Elmoselhy,

B.S. Azzam, S.M. Metwalli, Cairo University/Design and Production, Giza, Egypt; H.H. Dadoura, Helwan University/Automotive Engineering, Cairo, Egypt

Session 8D
Thursday Afternoon, May 20
1:00 p.m.

Electronics and Electronic Materials—II

Chairs: *Daniel Kovach, The Boeing Company, Seattle, WA and Bob Seibold, The Aerospace Corporation, Los Angeles, CA*

Apparent Electrical Conductivities of Nanoparticles, M. Levy, H.T. Hahn, UCLA/Mechanical and Aerospace Engineering, Los Angeles, CA

Manufacturing Study of Structurally Embedded High Voltage Conductors in Primary Load Carrying Composite Laminates, J.A. Marshall, D.M. Anderson, D. McCarville, K.D. Pinyan, M.A. Gamble, Boeing Phantom Works, Seattle, WA

Via Reliability and the Role of VIAS in BGA Reliability, R.L. Ternes, Boeing Integrated Defense Systems, Seattle, WA

Failure Analysis on the Micro-electronic Components, S.X. Xia, J. Chiang, R. Parr, R.A. Griese, Northrop Grumman Space Technology/Electronic Production Technology Center, Redondo Beach, CA

Issues Using Adhesive Bonding for Assembling Small Electronic Structures, J.A. Emerson, R.K. Giunta, Sandia National Laboratories/Organic Materials, Albuquerque, NM; N.R. Moody, Sandia National Laboratories/Microsystems and Materials Mechanics, Albuquerque, NM

Pyrolytic Graphite Applications for Advanced Satellite Electronic Systems, M.A. Ali, Raytheon Space and Airborne Systems, El Segundo, CA

Session 8E
Thursday Afternoon, May 20
1:00 p.m.

Fire Performance—V: Test Methods

Sponsored by IWGFM

Chairs: *Usman Sorathia, Naval Surface Warfare Center/Carderock, West Bethesda, MD and Patrick Potter, Office of Naval Research, Arlington, VA*

Development of Material-Based Combustion Measurement, X. Fang, P.D. Gandhi, J.T. Chapin, Underwriters Laboratories Inc/Fire Protection, Northbrook, IL

Methods to Evaluate the Fire Resistance of Carbon Fiber Reinforced Plastics, P.G.B. Seggewi, Bundeswehr Research Institute/Materials, Explosives, Fuels and Lubricants, Erding, Germany

Fire Properties of Carbon Foam Composite Structures, R.A. Guth, Touchstone Research Laboratory, Triadelphia, WV

Large-Scale Fire Resistance Tests on Sandwich Composites, R.Y. Lattimer, Hughes Associates Inc, Baltimore, MD

Structural Design and Fire Testing of CIRTMSandwich Panels for Top-Side Navy Applications, J. Tierney, A. Paesano, D. Heider, J.W. Gillespie Jr, Univ of Delaware/Center for Composite Materials, Newark, DE; D. Coppens, D. Harris, Anholt Technologies, Avondale, PA

Post-Fire Impact Response of VARTM Glass/Vinyl Ester Balsa Core Sandwich, U.K. Vaidya, C.A. Ulven, University of Alabama/Materials Science and Engineering, Birmingham, AL

Post-Fire Damage Assessment of a Composite Wing Box, S. Yarlagadda, A. Chatterjee, J.W. Gillespie Jr, University of Delaware/Center for Composite Materials, Newark, DE; J. Kiel, A.F. Research Laboratory, Tyndall AFB, FL; D. McGraw, D. Dierdorf, Applied Research Associates

Fire-Safe Composite to Steel Connections for Warship Structures, P.N.H. Wright, University of Newcastle upon Tyne, School of Marine Science and Technology, Newcastle upon Tyne, UK; A.G. Gibson, Y.W. Wu, University of Newcastle upon Tyne/Composite Materials Engineering, Newcastle upon Tyne, UK

Session 8F
Thursday Afternoon, May 20
1:00 p.m.

Processing Advances—IV

Chairs: *Craig Roberts, Quatro Composites, Poway, CA and Jerome Berg, HST, San Diego, CA*

Composite Heat Transfer Analysis in Contact with a Rigid Heater for Fiber Placement, M. Lee, R.H. Sturges, Virginia Tech/Mechanical Engineering, Blacksburg, VA

Numerical Modeling of Liquid Composite Molding Processes for Large Composite Part, J. Breard, Y. Guilligomarc, Universite de Havre/Laboratoire de Mechanique et Physics, Le Havre, France; Patrick deLuca, ESI Software, Rungis, France; O. Morisot, ESI North America, Bloomfield Hills, MI

Measurement of Process-Induced Stresses in Composite Laminates by FBG, Z-S. Guo, S. Du, B. Zhang, Harbin Institute of Technology/Center for Composite Materials, Harbin, PRC

Process-Induced Stresses in Autoclave-Cured Thick Composite Laminates, Z-S. Guo, S. Du, B. Zhang, Harbin Institute of Technology/Center for Composite Materials, Harbin, PRC

Temperature Field of Thick Thermoset Composites: Simulation and Experimental, Z-S. Guo, S. Du, B. Zhang, Harbin Institute of Technology/Center for Composite Materials, Harbin, PRC

Session 8G
Thursday Afternoon, May 20
1:00 p.m.

Repair Technologies—II

Chair: *Russell Keller, Boeing Phantom Works, Seattle, WA*

Scarf Repair of Heavily Loaded CFRP-to-Metal Joints, J.M. Emerson, A.J. Fawcett, Boeing Commercial Airplane, Seattle, WA

Heating Structures with Complex Geometry During Repair, E. Casterline, D. Kelsey, Heatcon Composite Systems, Seattle, WA

Thermal Stresses in Aircraft Structures Repaired with Bonded Patches, H.J.M. Woerden, R.M. VanDerMeija, Delft University of Technology/Aerospace Engineering, Delft, The Netherlands

Durability of Adhesively Bonded Patch Repairs, H.J.M. Woerden, R.M. VanDerMeija, R. Breninkmeijer, Delft University of Technology/Aerospace Engineering, Delft, The Netherlands

In Process Repair of Defects in a Large Composite Structure, M. Weiner, A. Wolfe, Goodrich Corporation, Jacksonville, FL; H. Schrader, K. Campbell, Geo-Centers, Clinton, MD

Session 8H
Thursday Afternoon, May 20
1:00 p.m.

Resins Technology—III

Chair: *Dr. Ronald E. Allred, Adhesives Technologies Inc, Albuquerque, NM*

Toughening Cashew Nut Phenolic Resin by Polyaryletherketone with Cardo, R. Wang, L. Chen, M. Sun, Northwestern Polytechnic University/Applied Chemistry, Beijing, PRC; J. Liu, Beijing Institute of Aeronautical Materials, Beijing, PRC

*Thank
you*

SAMPE would like to express its thanks to the members of the hardworking SAMPE 2004/Long Beach Conference Committee. They gave of their time and industry knowledge to develop this strong technical program.

Light Curing Resins for Rigidizing Inflatable Space Structures, A.E. Hoyt, L.A. Harrah, M.R. Sprouse, R.E. Allred, P.M. McElroy, S. Scarborough, D.P. Cadogan, Adherent Technologies Inc, Albuquerque, NM

Cure Reaction of Epoxy Resin Used for Composite Aircraft Structures, B. Zhang, Z-S. Guo, Z. Wu, S. Du, F. Li, Q. Fu, Harbin Institute of Technology/Center for Composite Materials, Harbin, PRC

Mechanical and Thermal Studies on Low Melting Phthalonitrile Polymers, D.D. Dominguez, T.M. Keller, Naval Research Laboratory, Washington, DC

Dynamic Mechanical Characterization of Soy-Based Epoxy Resin System, A. Ahamed, A. Garg, S. Sundararaman, K. Chandrashekhara, University of Missouri/Mechanical and Aerospace Engineering, Rolla, MO; V. Flanigan, S. Kapila, University of Missouri/Center for Environmental Science and Technology, Rolla, MO

Thermomechanical Analysis of 1,6 Hexanediol Diacrylate Cured by Layered Solid Freeform Deposition and Photoinitiation, B.J. McMorrow, R.P. Chartoff, University of Arizona/Materials Science and Engineering, Tucson, AZ

Synthesis and Characterization of Soyhull Glycerol Derived Rigid Polyurethane, R. Chalasani, K. Chandrashekhara, Univ of Missouri/Mechanical Engineering, Rolla, MO; A. Garg, S. Kapila, V. Flanigan, University of Missouri/Center for Environmental Science and Technology, Rolla, MO

Session 8I
Thursday Afternoon, May 20
1:00 p.m.

Thermal Management/C-C Composites and Foams

Chairs: *Chris Levan, Cytec Carbon Fibers, Alpharetta, GA; Dr. Howard Katzman, The Aerospace Corporation, Los Angeles, CA and Keith Bowman, Air Force Research Laboratory/MLBC, WPAFB, OH*

Development of Improved Thermal Control Coatings for Space Assets, J.A. Johnson, J.J. Heidenreich, M.J. Barbato, A.F. Research Laboratory, WPAFB, OH; C.A. Cerbus, A.I. Haines, University of Dayton Research Institute, Dayton, OH

High Performance Diamond/Al Composites for Thermal Management, S.M. Pickard, J.C. Withers, MER Corporation, Tucson, AZ

Emerging High-Volume Applications for Advanced Thermally Conductive Materials, C. Zweben, Zweben Consulting/Composites and Thermal Management, Devon, PA

Development of an Aluminum Clad Carbon Composite Doubler for Spacecraft Thermal Management, J.C. Calder, Material Innovations Inc, Huntington Beach, CA; E.M. Silverman, Northrop Grumman Space Technology, Redondo Beach, CA

Porous C/C Composites for Fuel Cell Electrode Substrate, X-J. Zhang, Z-M. Shen, X-L. Zhu, Beijing University of Chemical Technology/Carbon Fibers and Composites, Beijing, PRC

Properties of Rods in Carbon-Carbon Composite Reinforcing Frames, V.N. Kestelman, KVN International, King of Prussia, PA; G.E. Freger, D.G. Freger, East Ukrainian National University, Lugansk, Ukraine

Research of Carbon Polymer Properties of Rods Used at Assemblage of Reinforcing Frames Based on Carbon-Carbon Composite, V.N. Kestelman, KVN International, King of Prussia, PA; G.E. Freger, D.G. Freger, East Ukrainian National University, Lugansk, Ukraine

Panel
Thursday Afternoon, May 20
1:00 p.m.

Expert Panel Session on Today's MIL-17 Handbook

The MIL-17 Handbook organization has been developing Composite Material Handbooks based on user needs for the past forty years. In order to best serve the user community, the organization currently collects user inputs through the public website and in international forums. The FAA and NASA, who are the funding agents for MIL-17 Handbook have also been jointly working on related Composite Safety and Certification Initiatives (CS & CI) with the industry. These efforts have helped MIL-17 Handbook, ASTM and SAE advance their work to provide the industry with composite databases that are linked to material and process specifications. Goals of this expert panel workshop are to present the current status and plans for MIL-17 Handbook and collect insights from the SAMPE Symposium attendees to help guide future developments. Industry and government experts that are currently part of the MIL-17 Handbook leadership will conduct the workshop.

- Overview of the current MIL-17 Handbook and long-term plans, including relationships with Composites Safety & Certification Initiatives (CS & CI)
- Open forum to collect user input
- Social to meet MIL-17 leadership and provide advice

No Cost: Those that have registered with SAMPE are welcome to attend

Networking

M&P industry professionals will be at SAMPE 2004/ Long Beach—your co-workers, customers, suppliers, and yes, even competitors. An opportunity for networking is a very important part of being at a Conference—this represents a big networking opportunity for you, so plan to be there and participate.



Hotel Reservations/Information

Hotel Reservations for the SAMPE 2004 Symposium & Exhibition will be on an individual call in basis.

Be sure to mention that you are with the SAMPE Group to receive the group rate.



Rates are guaranteed based on availability until April 16, 2004. After this date rates are subject to the hotel's standard rate. A deposit equal to one night's stay is required to hold EACH reservation. Please note that cancellation and early departure fees may apply.

On-line Reservations: For all on-line reservations go to appropriate web site and follow the on-screen instructions, enter the appropriate group code to receive the SAMPE rate.

 **Renaissance Hotel**
111 East Ocean Blvd.
Long Beach, CA 90802
\$147 single/double occupancy
Hotel number: 562-437-5900
Toll free reservation: 800-468-3571
On-line reservation:
www.renaissancehotels.com/lgbrn
Go to Check Rates & Availability
(left side of the screen)
Group Code:
1-2 people "SAMSAMA";
3-4 people "SAMSAMB"
Marriott Rewards Honored

 **The Westin Hotel**
333 East Ocean Blvd.
Long Beach, CA 90802
\$147 single/double occupancy
Hotel number: 562-436-3000
Toll free reservation: 800-WESTIN1
or 800-937-8461
On-line reservation:
www.westin.com/longbeach
Click on Meeting Planner (bottom on the page);
click on Attending a Meeting (bottom of the page)
Group Code: "4027"
Starwood Preferred Guest Honored

 **Hyatt Regency Hotel**
200 Pine Avenue
Long Beach, CA 90802
\$157 single/double occupancy
Hotel number: 562-491-1234
Toll free reservation: 800-233-1234
On-line reservation:
www.longbeach.hyatt.com
Group Code: "G-SAMP" (no E at the end)
Hyatt Gold Passport Honored

 **The Courtyard, by Marriott**
500 East First Street
Long Beach, CA 90802
\$115 single/double occupancy
Hotel number: 562-435-8511
Toll free reservation: 800-321-2211
On-line reservation: www.marriott.com
Group Code: "SAMC"

Room rates are subject to all local, state, and occupancy taxes • Additional rates apply to triple and quad occupancy.

SEVENTH ANNUAL SUPER LIGHT WEIGHT COMPOSITE BRIDGE BUILDING CONTEST

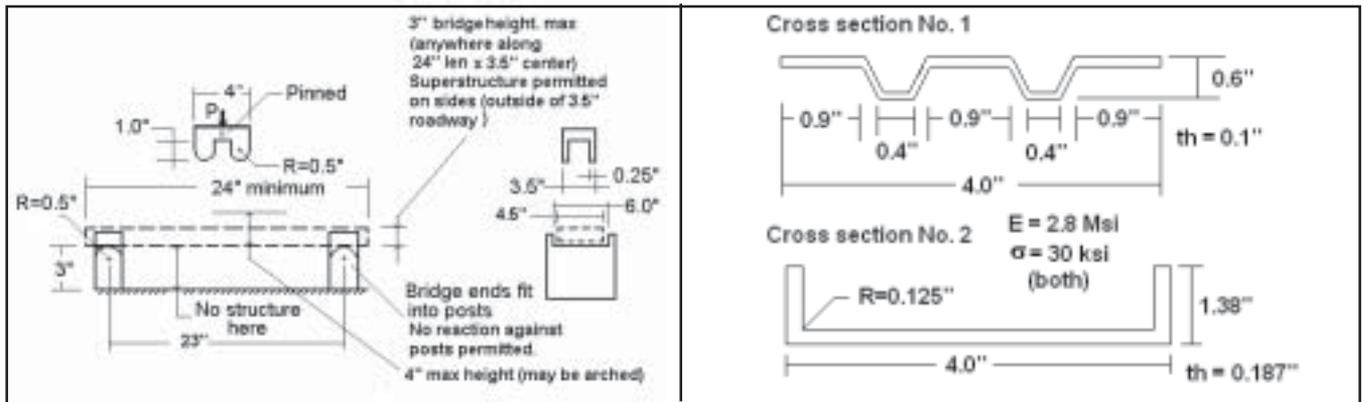


SAMPE 2004, May 18, 2004, Long Beach CA

RULES

1. The objective is to design and build a reinforcement for an existing bridge. The existing bridge in this case is an FRP pultrusion. Nominal bridge dimensions will be 24" long by 4" wide. It is supported by 2 posts placed 23" apart and will be center loaded. The most weight efficient bridges will be judged winner.
2. Two pultrusions, each 24x4 inches, will be supplied in the kit. One will be channel shaped and the other will be in the form of a flattened W. Two of each will be supplied in each kit.
3. The contest is open to all SAMPE members and students. There will be three categories: The CARBON bridge, the GLASS bridge, and the BORON bridge.
4. The contest is divided into professional and student classes. The contest is further divided into two material grades. Grade 1 will be limited to the materials supplied in the kit or "equivalent materials" as allowed by the judging committee. Grade 2 will include any other materials available to the competing team.
5. A kit consisting of the pultrusions and fibers, fabrics, honeycombs, adhesives, foam cores, and epoxy resin will be shipped to all participants by April 1, 2004. The kit will specifically contain uni-directional and bi-directional carbon and glass fabrics, a variety of glass and carbon braids, and pultruded boron-epoxy rods. It is anticipated that by mid-February, a list of all GLASS, CARBON, and BORON products to be shipped will be made available to all registrants. The list will contain information sufficient for preliminary design calculations.
6. Category: Teams may enter in any of the three categories (one category per entry). The categories are separated as follows:
 - The GLASS bridge cannot use any carbon or boron fiber.
 - The CARBON bridge cannot use any boron fiber.
 - The BORON bridge can use both glass and carbon fiber with the boron.
7. Materials: The use of any composite or non-composite material is permitted. "Equivalent materials" must be approved in advance of the testing by submittal of an equivalent materials list in writing. If the judging committee does not approve the equivalence, then the bridge becomes a Grade 2 entry.
8. Teams must declare their entry category and material class no later than Monday May 10.
9. Bridge Geometry: Minimum bridge dimensions must be 24.0" (length) and 4.0" (width). Roadway surface across a centered 3.5" width must be flat and continuous and opaque and must be constructed so as to support a 3.5" wide vehicle. The roadway surface may not rise more than 4" above the top of the end support posts. See figure on page 75.
10. Either pultrusion may be used. The pultrusion may be lightly sanded to improve adhesion to the composite reinforcement and holes may be drilled for the purpose of attachments, but in general, the basic pultrusion must remain intact. The pultrusion geometry must be visible at the two ends of the bridge. All reinforcement must be contained in a 3 x 4.5 inch envelope as shown in the figure, except for any superstructure that may be constructed on the sides (outside of the 3.5" center). The superstructure may also have cross bracing (from one side to the other) outside the center 4" where the load head fits. (Note – the load head is on the end of a 10-15 inch bar, so there is space for superstructure, however the center 4" have to be clear to allow the load head to reach the surface.)
11. The pultrusion weight in grams will be recorded prior to shipment. The bridge will be weighed immediately prior to test. The bridge will be mechanically loaded at center span. Deflection will be measured by crosshead motion. Maximum load P is defined as the load at failure or the load at 1" crosshead deflection, whichever event occurs first. Bridge efficiency is computed as P/W where W must be at least 10 percent more than the imbedded pultrusion. The bridge with the highest value of P/W in each category shall be judged the winner. A loading machine having a 20000 pound capacity will be used.
12. Load testing will be conducted on the exhibition floor during open exhibition hours on Tuesday, May 18. Each bridge will be loaded to failure once. No retests are permitted. A team may submit only one bridge for testing per entry fee. Multiple entries are permitted.
13. All student team entries must also submit a poster presentation highlighting some material, process and/or design aspect of their bridge. (Student bridges without posters will be tested but will not be eligible for prizes). The posters must be submitted by 10 AM Tuesday at the testing location or by prior arrangement. The posters will be displayed in the hall outside the Technical Session rooms on Tuesday afternoon and Wednesday. A committee will judge the posters, based on technical merit. General guidelines for poster presentations are available from the SAMPE Business Office, registration@sampe.org.
14. Multiple prizes will be awarded for the best efficiencies in each category and class. In addition, three prizes for best posters will be given out. All prizes will be awarded on Wednesday morning at a conference location to be determined.
15. The entry form along with a \$40 fee to defray contest costs must be received no later than March 19, 2004.
16. No helium or other artificial lifting devices are permitted. Psychic levitation is permitted.
17. A useful website has been developed by P. Joyce at USNA. Please note that it was developed for the 2003 contest and there are differences with the present contest.
http://web.ew.usna.edu/~pjoyce/composites/em436/bridge03/Bridge_Web.html
18. We expect to have flexure load deflection curves for both pultrusions. That data will be provided to each entrant when available.

(continued)



Entry Form

Please enter the following team into the SAMPE 2004/Long Beach Super Light Weight Bridge Building Contest.

Name _____

Address _____ E-Mail (Required) _____

City _____ State _____ Zip Code _____

Entry Class

Professional Student — School _____

\$40 Fee must accompany this form! Payment can be made by:

Check, payable to SAMPE New Jersey Chapter.

Mail to: J. Osterndorf, 20 Memorial Ct., #2C, Denville, NJ 07834

Note: You can register on-line and pay by credit card at the SAMPE website: www.sampe.org

Questions: hskliger@voicenet.com

SAMPE 2004 On-site Career Fair

The On-site Career Fair offers networking opportunities for job seekers, employers and recruiters. The chance to meet face-to-face complements the online offerings of the Virtual Career Fair.

- **Job seekers:** Submit your resume before the show for inclusion in the resume book. Employers and recruiters will have access to the book before, during and after the show.

- **Employers and recruiters:** Submit your job postings for inclusion on the jobs bulletin board. Potential candidates can browse the postings during the show.

Submit job postings and resumes to berenberg@alum.mit.edu in plain text or Microsoft Word format. All documents should be print-ready. The Career Committee will make a limited number of copies for the onsite fair. Job seekers should plan to bring additional hard copies of their resumes.

Job postings and resumes will be available for download from this page prior to the show (check back for updates). Job seekers should include a short (one paragraph) summary of their background, to be used as a description below their download link. If you do not want your resume posted online prior to the show, please note that in your message.

On-site Interviews - New This Year!

The Career Committee will be coordinating onsite interviews during exhibit hours. If you are an employer or recruiter and would like to set up on-site interviews, contact berenberg@alum.mit.edu, and include job descriptions and the times you would like to interview. Job descriptions will be posted here as soon as they are received, allowing candidates to sign up for interview slots prior to the show. Resumes will be made available to interviewers as slots are filled.

Career Planning

Opportunities are available for recruiters to offer short presentations on career planning topics, or one-on-one sessions to aid job seekers. Contact berenberg@alum.mit.edu if you are interested.

SAMPE 2004 AT-A-GLANCE

<p>Sunday—May 16 Registration 1:00 p.m. - 6:00 p.m.</p>	<p>Monday—May 17 Registration 7:30 a.m. - 5:00 p.m.</p>	<p>Tuesday—May 18 Registration 7:15 a.m. - 6:00 p.m.</p>
<p>Important Notice: The papers listed in this Preliminary Program have been accepted for presentation. Due to circumstances beyond our control, some papers may be withdrawn by the authors prior to the conference and preprinting publication.</p> <p><i>Panels and Plenarys are oral presentations only</i></p> <p><i>* Open and closed papers in this session</i> <i>** All closed</i></p>	<p>SAMPE Board of Directors Meeting 8:00 a.m.</p> <p>Tutorials 9:00 a.m. - 12:00 noon</p> <ul style="list-style-type: none"> • Composite Tooling Fundamentals and Re-Usable Elastomeric Bagging • Fire Performance of Composites • Non-Autoclave Composite Fabrication Processes • Test Methods for Composite Materials <p>Sessions 9:00 a.m.</p> <ul style="list-style-type: none"> • Affordability, Sustainability and Recyclability • Commercial Aircraft • E-Beam Processing—I • Fibers and Interfaces • Metals and Metal Composites—I 	<p>Keynote Address 8:00 a.m. - 9:00 a.m.</p> <ul style="list-style-type: none"> • Mr. Michael L. Fortson, Lockheed Martin Aeronautics Company, Fort Worth, TX “F-35: 21st Century Fighter Design and Materials Technology” <p>SAMPE’s Technical Committees Panel 9:30 a.m. – 11:45 a.m.</p> <ul style="list-style-type: none"> • “M&P Technology: SAMPE’s Technical Committees Report on Current Technology and Market Trends” <p>Sessions 9:30 a.m.</p> <ul style="list-style-type: none"> • **High Temperature Materials—I • Marine Applications—I • NDE and NDI Technology—I • Preforms and Textile Technology—I • Testing—II • University Research—I <p>Plenary 9:45 a.m.</p> <ul style="list-style-type: none"> • Fire Performance of Materials for Commercial and Military Applications <i>(followed by Session on Fire Performance—I: Fire Safety of Materials at 10:30 a.m.)</i>
<p>Tutorials 2:00 p.m. - 5:00 p.m.</p> <ul style="list-style-type: none"> • Composite Materials: Introduction and Overview • Resin Infusion Processes: RTM, VARTM and Other Primary Processes 	<p>Tutorials 1:00 – 4:00 p.m.</p> <ul style="list-style-type: none"> • Composite Structures: Fabrication and Manufacturing Processes • High Resolution NDT Methods: Micro- and Nano-Materials Applications • Joining and Adhesives Technology: Gluing Structural Parts Together • Nanocomposites Technology <p>Sessions 1:00 p.m.</p> <ul style="list-style-type: none"> • Metals and Metal Composites—II • *Space Structures—I • Tooling <p>Panel 1:00 p.m. – 3:00 p.m.</p> <ul style="list-style-type: none"> • “Accelerated Insertion of Materials—Composites: Phase I Program Review” <i>(followed by Session on Accelerated Insertion of Composite Materials at 3:00 p.m.)</i> <p>Plenarys 1:15 p.m.</p> <ul style="list-style-type: none"> • Resin Infusion Technology Advances over the Past 15 Years <i>(followed by Session on Resin Infusion Processes at 2:00 p.m.)</i> • Taking Advantage of Modern Standard Test Methods for Composites <i>(followed by Session on Testing—I at 2:00 p.m.)</i> <p>Fellow Banquet 7:00 p.m.</p>	<p>Bridge Building Contest</p> <ul style="list-style-type: none"> • Testing During Exhibit Hours on Exhibit Floor <p>Sessions 1:00 p.m.</p> <ul style="list-style-type: none"> • E-Beam Processing—II • High Temperature Materials—II • NDE and NDI Technology—II • Preforms and Textile Technology—II • Space Structures—II • Testing—III: Impact and Damage • University Research—II <p>Plenary 1:15 p.m.</p> <ul style="list-style-type: none"> • Nanocomposites Technology: Rapidly Moving Forward in M&P Now <i>(followed by Session on Nanocomposites—I: Synthesis of Nanocomposites at 2:00 p.m.)</i> <p>Panels 1:30 p.m.</p> <ul style="list-style-type: none"> • “Military Aircraft: The Role of Advanced Materials R&D in the Modern Military” • “Marine Industry Applications: Materials, Process and Analysis Experience and Perspectives”
	<p>No Exhibits</p>	<p>Exhibits 10:00 a.m. – 5:00 p.m. Welcome Reception and 60th Anniversary Party 5:00 p.m. – 6:00 p.m.</p>

SAMPE 2004 AT-A-GLANCE

Wednesday—May 19
Registration
7:15 a.m. - 5:00 p.m.

Thursday—May 20
Registration
7:30 a.m. - 2:30 p.m.

Sessions 8:00 a.m.

- Design and Analysis—I
- Fire Performance—II: Fire Safety of Materials
- *High Temperature Materials—III
- Marine Applications—II
- Nanocomposites—II: Processing
- *Processing Advances—I
- Sensor Technologies (Advancement of National Infrastructures)
- Testing—IV: Durability

NASA Technology Briefings
8:00 a.m. - 12:00 noon

Plenary 8:45 a.m. - 9:30 a.m.
• An Overview of Progress and Challenges for Composites in the Infrastructure Construction Market
(followed by Session on Infrastructure Applications and Trends—I at 9:30 a.m.)

SAMPE 2004 Luncheon 12:00 noon
• Mr. Frederick D. Gregory, NASA Headquarters, Washington, DC
“NASA’s Plans for Future Space Exploration”

- Sessions 2:00 p.m.**
- Design and Analysis—II
 - Fire Performance—III: Materials
 - Infrastructure Applications and Trends—II
 - Nanocomposites—III: Mechanical Properties
 - Processing Advances—II
 - *Repair Technology—I
 - Resin Technology—I
 - Sandwich Structures—I
 - Testing—V

IWGFM Business Meeting
4:00 p.m.

Exhibits 10:00 a.m. - 5:00 p.m.

Sessions 8:00 a.m.

- *Advanced Composites Manufacturing Technology Overview
- *Design and Analysis—III
- *Electronics and Electronic Materials—I
- Fire Performance—IV: Structural Modeling
- Infrastructure Applications and Trends—III
- Nanocomposites—IV: Applications
- Processing Advances—III
- Resins Technology—II
- Sandwich Structures—II

Tutorial 8:00 a.m. - 12:00 noon
(Sponsored by MIL-17 Handbook)

- Today’s Standard Has Changed

Sessions 1:00 p.m.

- Adhesion and Adhesives Bonding
- *Ceramics and Ceramic Composites
- Design and Analysis—IV
- Electronics and Electronic Materials—II
- Fire Performance—V: Test Methods
- Processing Advances—IV
- Repair Technologies—II
- Resins Technology—III
- Thermal Management/C-C Composites and Foams

Panel
• “Expert Panel on Today’s MIL-17 Handbook”

Exhibits 10:00 a.m. - 2:00 p.m.

Symposium Committee

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It is suggested that you apply for a Visa as early as possible, if you are an attendee from a country where Visa’s are required. It currently takes longer to get one processed than it did in previous years.





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Volunteer 1/2 day and get Complimentary registration for an additional 1/2 day

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**Please check as many dates, times, and areas as you are able to support.
Prior to final assignment you will be contacted for confirmation**

Available Dates/Times:

SUNDAY MAY 16	MONDAY MAY 17	TUESDAY MAY 18	WEDNESDAY MAY 19	THURSDAY MAY 20
<input type="checkbox"/> 12:00 noon - 6:00 p.m.	<input type="checkbox"/> 7:00 a.m. - 12:00 noon <input type="checkbox"/> 12:00 noon - 5:00 p.m.	<input type="checkbox"/> 7:00 a.m. - 12:00 noon <input type="checkbox"/> 12:00 noon - 5:00 p.m.	<input type="checkbox"/> 7:00 a.m. - 12:00 noon <input type="checkbox"/> 12:00 noon - 5:00 p.m.	<input type="checkbox"/> 7:00 a.m. - 12:00 noon <input type="checkbox"/> 12:00 noon - 5:00 p.m.

Areas willing to support (check all that apply):

Tutorials Sessions General

Prior SAMPE Conference experience or specific assignment requests:



Pre-Registration • SAMPE 2004

Long Beach, CA • May 16-20, 2004

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or **Register on-line! www.sampe.org (secured registration process)**

Pre-Registration Deadline: April 26, 2004

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A MEETING PRE-REGISTRATION

Check category and enter amount in Payment Options Section below.

➔ **FULL REGISTRATION** (sessions, exhibits, Mon Banquet, Tue reception, Wed Luncheon, proceedings, registration list)

Through April 26, 2004

- SAMPE Member \$550 (MA)
- SAMPE Member Presenter 505 (MB)
- SAMPE Non-Member 640 (NA)*
- SAMPE Non-Member Presenter 595 (NB)*
- Session Chair/Moderators
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After April 26, 2004

- SAMPE Member \$615 (MC)
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CHECK DAY: Mon Tue Wed Thurs

- SAMPE Member \$260 (ME)
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➔ **STUDENT REGISTRATION** (sessions, exhibits, Tue reception)

- SAMPE Member \$62 (MF)
- SAMPE Non-Member 103 (NF)

* Includes one year SAMPE membership/SAMPE Journal

SAMPE CANCELLATION POLICY— Registrations cancelled prior to April 26 are subject to a \$50 service charge. Full registration fee will be charged for cancellation after April 26.

B SAMPE TUTORIALS (FEES ARE EXTRA)

	Full Pkg Reg	Full Time Std	Other Regs
Composite Overview <i>Clements, Sun p.m.</i>	<input type="checkbox"/> \$150 (TA)	<input type="checkbox"/> \$100 (TB)	<input type="checkbox"/> \$175 (TC)
Resin Infusion Processes <i>Beckwith, Sun p.m.</i>	<input type="checkbox"/> 150 (TD)	<input type="checkbox"/> 100 (TE)	<input type="checkbox"/> 175 (TF)
Composite Tooling <i>Grigson, Mon a.m.</i>	<input type="checkbox"/> 150 (TG)	<input type="checkbox"/> 100 (TH)	<input type="checkbox"/> 175 (TI)
Fire Performance <i>Sorathia, Mon a.m.</i>	<input type="checkbox"/> 150 (TJ)	<input type="checkbox"/> 100 (TK)	<input type="checkbox"/> 175 (TL)
Non-Autoclave Fabrication <i>Boyd, Mon a.m.</i>	<input type="checkbox"/> 150 (TM)	<input type="checkbox"/> 100 (TN)	<input type="checkbox"/> 175 (TO)
Test Methods <i>Adams, Mon a.m.</i>	<input type="checkbox"/> 150 (TP)	<input type="checkbox"/> 100 (TQ)	<input type="checkbox"/> 175 (TR)
Composite Structures <i>Leslie, Mon p.m.</i>	<input type="checkbox"/> 150 (TS)	<input type="checkbox"/> 100 (TT)	<input type="checkbox"/> 175 (TU)
NDT Methods <i>Meyendorf, Mon p.m.</i>	<input type="checkbox"/> 150 (TV)	<input type="checkbox"/> 100 (TW)	<input type="checkbox"/> 175 (TX)
Joining/Adhesives <i>Harvey, Mon p.m.</i>	<input type="checkbox"/> 150 (AT)	<input type="checkbox"/> 100 (BT)	<input type="checkbox"/> 175 (CT)
Nanocomposites Technology <i>Koo, Mon p.m.</i>	<input type="checkbox"/> 150 (DT)	<input type="checkbox"/> 100 (ET)	<input type="checkbox"/> 175 (FT)

C TUTORIAL (FEE IS EXTRA)

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MIL-17 Handbook \$200 (GT)

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Primary Job Function (Check One Only)

- (10) Corporate or general management
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- (12) Engineering/scientific/QA/testing/R&D/
production staff
- (13) Consultant
- (14) Educator
- (15) Government official
- (16) Media/press
- (17) Sales/marketing staff
- (18) Student
- (19) Other (please specify) _____

Primary Company Function (Check One Only)

- (20) Consulting
- (21) Equipment/machine supplier and/or producer
- (22) Government agency/laboratory
- (23) Manufacturer/fabricator
- (24) Materials supplier/distributor
- (25) Media
- (26) Service provider (training, test, QA, repair,
design, etc.)

Business Focus Areas of Your Company (Check All That Apply)

- (27) Aerospace/aviation
- (28) Appliance/Business Equipment
- (29) Education
- (30) Energy (wind, oil, gas, power, electric, etc.)
- (31) Ground/rail transportation
- (32) Infrastructure/building/construction
- (33) Marine/ship building
- (34) Medical/orthopedic/dental
- (35) Recreational/sporting goods

Primary Reason for Attending SAMPE Function (Check All That Apply)

- (36) Participating with technical paper or panel
- (37) Attending Technical Program only
- (38) Attending Exhibits only
- (39) Attending both Technical Program and Exhibits

Please Note: Numbers in parentheses are internal codes.

Your input is needed—it will help SAMPE develop upcoming conferences that will most benefit you and others in the materials and processes industry.

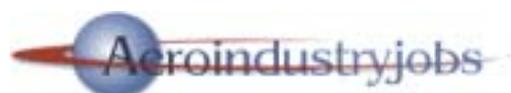
SAMPE 2004 Virtual Career Center Announcement!



SAMPE 2004 (49th ISSE) will include a Virtual Career Center from May 17-20, 2004, hosted by Aeroindustryjobs (www.aeroindustryjobs.com). This service is a **free** benefit for SAMPE members in need of hiring people or in need of finding a job. SAMPE members can benefit from the Virtual Career Center by:

- **Posting a resume** that Hiring Managers, Human Resources Managers and Recruiters can view online during the week of the conference.
- **Posting a job opening** that SAMPE members can view and apply for online during the conference

To submit a resume or job posting and to view resumes and job postings during the event, follow these instructions: *Go to www.aeroindustryjobs.com • Click on the “Alliances” button on the left of the screen •*



Click on the link for “SAMPE” • Scroll down the page to the Events—SAMPE 2004 • Click in the appropriate link to Submit or View Resumes and Job Postings.

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**Showcase your products and technology to the professionals
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✗ The 2004 Exhibition is held in conjunction with SAMPE's prestigious Symposium, and is co-located with: NASA; MIL-17 Handbook; IWGFM (Interagency Working Fire Materials; NCAM (National Center for Advanced Manufacturing) and supported by ACS (American Ceramics Society)

✗ We invite all industry related companies to exhibit!



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Exhibit Department

- Phone: 626-331-0616 ext. 601
- Fax: 626-332-8751
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1161 Parkview Drive, Covina, CA 91724

EXHIBIT HOURS

Tue, May 18, 10:00 a.m. - 5:00 p.m.

Wed, May 19, 10:00 a.m. - 5:00 p.m.

Thurs, May 20, 10:00 a.m. - 2:00 p.m.

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100-300 sq ft \$21/sq ft
400-600 sq ft \$20/sq ft
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2. Personal photographic identification (i.e., driver's license, passport, corporate ID, etc.) **PLUS**
3. Certification credentials based on DD Form 2345.

An Individual's certification credentials may be:

1. Copy of an approved DD Form 2345 for the individual, **or**
2. Copy of an approved DD Form 2345 for the individual's employer plus evidence of employment status with that employer (i.e., corporate ID, business card, etc.), **or**
3. A listing of the individual's employer in DoD's quarterly Qualified US Contractor Access List plus evidence of employment status with the listed employer.

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Persons who are not citizens or resident aliens of US or Canada and wish to attend closed papers must submit a request to the Foreign Liaison Office in the US Defense Intelligence Agency through their embassy in Washington, DC. The US Department of Defense may authorize the attendance of foreign nationals when their attendance advances intergovernmental programs.

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