FAST CENTER – LIGHTWEIGHT COMPOSITE

Director: Dr. Paul Biney, TEL: 936-261-9842, Email: pobiney@pvamu.edu

Overview

The Future Aerospace Science & Technology (FAST) Center at Prairie View A&M University (PVAMU) was established with funds from the US Air Force Office of Scientific Research in 1995. The focus of the center is on development, processing and characterization of lightweight and high temperature structural materials. The center is based in the College of Engineering and managed by a director and two principal investigators. There are three thrust areas in the center: Research, Education, and Technology Transfer. The effort is to enable PVAMU to advance the processing, characterization, and environmental simulation of the state-of-the-art composites for use in both military and civilian applications.

Objectives:

- Maintain state-of-the-art infrastructure to conduct research and development of lightweight structural composites.
- Conduct research in the development of new methods in nanomaterial processing, fabrication & characterization with emphasis on developing understanding and controlling of processing factors that would lead to multifunctional nanomaterials tailored for improved (1) structural/mechanical properties, (2) electrical and thermal properties, (3) EMI and radiation shielding, (4) barrier properties, and (5) thin films for sensor and membrane applications
- Foster close research and subcontract relations with aerospace, material processing, oil and gas companies as well as private and government research labs to advance the properties and processing technology of polymeric composites.
- Provide opportunities for training graduate and undergraduate students in materials and processing technology and prepare them to assume leadership role in industry.
- Maintain our status as an independent research center through active acquisition of subcontracts from industry and government.
- Serve as a resource center for aerospace and other industries in the processing, characterization, and testing of polymeric composites.

FAST CENTER CAPABILITIES

Composite and Multifunctional Nanocomposite Processing

- Development of scalable methods for (1) purification and functionalization (surface modification) of the nanotubes to improve dispersion into polymeric resins during processing, (3) alternative approaches for introducing SWCNTs into nanocomposites during the fabrication process to mitigate processing problems associated with viscosity increase.
- Processing and fabrication of lightweight structural polymer matrix composites/nanocomposites using hand lay-up, vacuum bag molding, autoclave processing, compression molding, RTM and VARTM.
- Development of lower cost methods for processing composites.

Thermal Characterization of Composites and Neat Resins

- Capabilities for thermal characterization using DSC (with modulation, high pressure, & low temperature capabilities), TGA (with normal and high resolution capabilities), DMA (with cryogenic capabilities)
- Rheometric property determination for resins and composites.

Techniques for Optimizing Properties of Field Repaired Composites

- Development of methods for optimizing cure cycles of composites.
- Development of methods to improve shell life of prepregs.
- Development of field repair techniques for composite parts.
- Adhesives research

Environmental Simulation of Operational Envelopes of Composites

- Environmental simulation of service conditions and operational envelopes of composites (within a large range of temperatures, humidity, and pressures) using an advance auto cycling system.
- Hygrothermal and hydrolytic cycling of composites
- Screening of candidate composites for cryogenic tank application.
- Measure effects of highly concentrated oxygen on composite chemistry, and measurement of auto-ignition temperature

Mechanical Characterization of composites and neat resins

- Mechanical testing (Tension, compression, short-beam shear, flexural, and fatigue) for polymers, composites/nanomaterials, and adhesive bonding systems. Fatigue testing
- Testing at cryogenic conditions (down to -196 ^{o}C) and at high temperature (up to 600 ^{o}C).
- Measurement of permeability of films, neat resins & composites.
- Non-destructive evaluation of composites using C-Scan

THE FAST CENTER TEAM

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