

R&D Opportunity

The University of Mississippi Composite Materials Research Group (CMRG) is currently seeking to develop collaborative relationships with companies who are in a position to utilize and benefit from CMRG's pultrusion and composite material characterization/manufacturing research. The CMRG seeks to transfer innovative pultrusion & other composite materials manufacturing technology to companies seeking improvements in the quality and efficiency of their manufacturing processes.

Introduction

Since its inception in 1987, the Composite Materials Research Group (CMRG) at the University of Mississippi has been actively involved in composite materials research and has developed a nationally and internationally recognized program in pultrusion research.

The CMRG emphasizes an interdisciplinary research approach. Presently, the research is divided into four main areas:

- mechanical, physical, and electrical property testing and analysis
- determination of the effects of various composite system additives
- thermal and kinetic process modeling
- experimental characterization and optimization of composite manufacturing processes

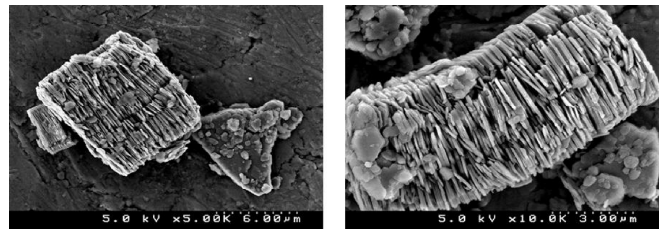


Examples of various reinforcement materials used in polymeric composites

Research and Development

The primary research interests within the CMRG include:

- the optimization of manufacturing process parameters
- the development of natural fiber reinforcements (NFR) for the pultrusion of composites
- the development of new resins for pultrusion including phenolics and polyurethanes
- the effects of fillers and other additives on the processing and properties of pultruded composites
- high frequency electromagnetic (EM) characterization of materials including sandwich composites and attachments
- computational modeling of the pultrusion resin injection process



SEM photograph of mineral fillers used in polymeric composites

Development Capabilities

Current research areas include experimental characterization of composites including physical, electrical, and mechanical properties; thermal and kinetic modeling including resin injection; process optimization; and natural materials processing.

Research projects completed include photoinitiated resin curing for filament winding and pultrusion; computer modeling and experimental evaluation of pressure, temperature, and degree of cure within a pultrusion die; optimization of pultrusion die geometry including location of resin injection ports and degree of taper; evaluation and optimization of fiber/resin wet-out techniques including open-bath and resin injection; evaluation of environmental effects (temperature and humidity) on composite materials; testing and evaluation of structural composites including the examination of fatigue properties of composites; evaluation of high-frequency (X-Band) electromagnetic properties of composites; and pultrusion development for natural fiber reinforcements.

For more information contact:



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at the University of Mississippi

Funding

CMRG engages in sponsored research supported by federal agencies, private companies, and small businesses. Recent sponsors include:

- National Science Foundation (NSF)
- United States Air Force (USAF), Army, and Navy
- National Aeronautics and Space Administration (NASA)
- United States Department of Agriculture (USDA)
- Lockheed Martin
- Northrop Grumman, and numerous other companies within the composite materials industry.

The CMRG also has ongoing working relationships with all major resin suppliers.



Pultrusion machine in the composite materials manufacturing lab

Facilities and Resources

The CMRG's commercial pultrusion machine, located in the most recognized academic pultrusion research facility in the world, is equipped with a computer controlled data acquisition system which provides the unique opportunity for researchers at the University of Mississippi to be involved in both theoretical and experimental pultrusion process development and to perform tests on pultruded product produced under carefully controlled processing conditions. Complementing its commercial-scale pultrusion capabilities, the CMRG also has a small development pultruder for those cases where limited amounts of developmental resins are available. The CMRG also has numerous mechanical, physical, and electrical property test facilities available for use in the characterization of materials.

Visit our website at <http://www.olemiss.edu/depts/matisci/research/facilities.html> for more details.

CMRG pultrusion research equipment include:

- PTI Pulstar 804 commercial-scale pultruder with enhanced pull speed (120"/min) and pull and clamp pressure capacity (10,000 lbs.); data acquisition of all process conditions.
- McLean Anderson Little Hornet computer controlled filament winder capable of parts up to 24" in diameter and 40" in length.
- Four MTS fatigue-rated material test systems (110, 55, 22, and 5 kip) with digital control and acquisition packages along with fixtures for standard mechanical property tests including tension, compression, flex (3 and 4 point), short-beam shear, Iosipescu shear, grate and structural shape testing, and fatigue testing. Temperature chamber also available.
- Biaxial loading test capability (55 kip with 10 inch stroke and 10 kip with 6 inch stroke) in a free form test frame for full-scale section testing.
- TA modulated DSC, TGA, Rheometer.
- Nikon optical microscopes with image analysis and mounting/polishing equipment.
- JEOL 6100 SEM with Oxford-Link EDS and image analysis software.
- Extensive computer acquisition and analysis.
- Electromagnetic testing facilities with a HP vector network analyzer.
- Thermotron SE-300-2-2 and SE-600-5-5 temperature and humidity control environmental chambers.



Student standing in the biaxial free form mechanical test frame

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