



MMAE SEMINAR

Wednesday, February 14, 2007
E-1 BUILDING – CRAWFORD AUDITORIUM
3:30 – 4:30 PM

Carbon Nanopapers and Nanocomposites: Manufacturing, Properties and Applications

Dr. Jan Gou
University of South Alabama
e-mail: jgou@jaguar1.usouthal.edu



Abstract

The research and development of nanocomposite materials has gained significant attention in recent years due to their potential applications in the engineering, medical, and defense fields. We recently explored a unique concept of manufacturing nanocomposites with carbon nanotube/nanofiber based nanopapers for structural and multifunctional applications. This approach involves making carbon nanopaper by the filtration of well-dispersed carbon nanotubes and carbon nanofibers under controlled processing conditions. The carbon nanopaper has excellent mechanical, electrical, and thermal transport properties close to the component individual carbon nanotubes and nanofibers. Therefore, the carbon nanopaper offers numerous potential applications including conductive and high strength composites, electronics, heat sinks, fuel cells, supercapacitors, sensors and actuators, and artificial muscles. In our research, carbon nanopapers are integrated into composite laminates using modified liquid composite molding processes such as and Resin Transfer Molding (RTM) and Vacuum Assisted Resin Transfer Molding (VARTM). The process and property analysis has been conducted using Control Volume Finite Element Method (CVFEM) and Molecular Dynamics (MD) simulation in an attempt to optimize the quality of carbon nanopapers and nanocomposites. Several applications of carbon nanopaper based nanocomposites are illustrated; in particular, structural and acoustic damping, lightning strike protection, low permeability, and fire retardancy are discussed. This interdisciplinary research combines manufacturing methodologies, nanomaterials science and engineering, process and property analysis to enhance our understanding of nanocomposites development. The future directions for process development and property analysis are also presented.

This work is funded by NSF Nanomanufacturing Program, NASA, and ACS Petroleum Research Fund.