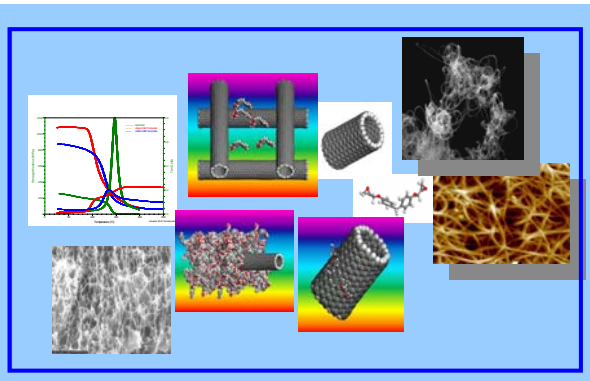
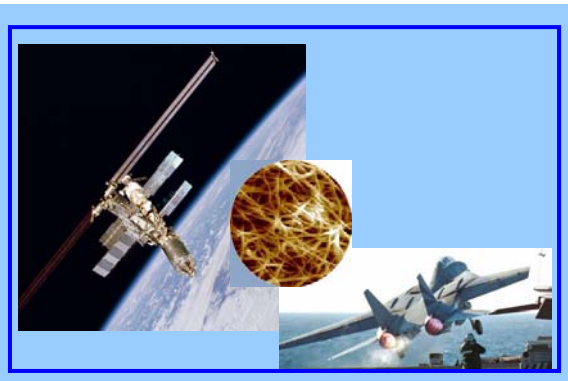
Synopsis:
NOLES — Nanotubes Optimized for Lightweight Exceptional Strength



Carbon nanotube composite processing



Potential applications of nanocomposites

Background

Early evaluations of single-walled carbon nanotubes (SWNTs) indicate they possess amazing mechanical properties – greater than those of IM-7, a fiber commonly employed in military aerospace applications. Their extremely high elastic modulus and fierce resistance to failure, coupled with a tensile strength an order of magnitude higher than that of conventional carbon fibers, qualify carbon nanotubes as the ultimate reinforcement in polymer composite materials. However, nanotube reinforced composite materials have yet to demonstrate their much-anticipated success due to non-uniform dispersion, lack of nanotube orientation, and weak interface between nanotubes and the matrix. This project utilizes an innovative processing method to improve nanotube-reinforced polymer composites using buckypaper/resin infusion techniques.

Goals

- Prepare and test nanotube reinforced composites using a high magnetic field to realize nanotube alignment
- Establish a comprehensive database for producing and deploying innovative buckypaper/resin infusion composite materials

Projects/Research Highlights

- Prepare/characterize buckypaper nanotube films
- Model and simulate process-structure property
- Design and control composite nanostructures with well-dispersed, aligned, and high-tube loading
- Establish theoretical and experimental models of processing and interfacial bonding based on molecular dynamic simulations
- Study results of composite material's nanostructures and property characterizations

Benefits to Industry

- Dramatically enhance mechanical, electrical, and thermal properties
- Reduce weight and size, while increasing strength
- High fidelity processing models and property prediction