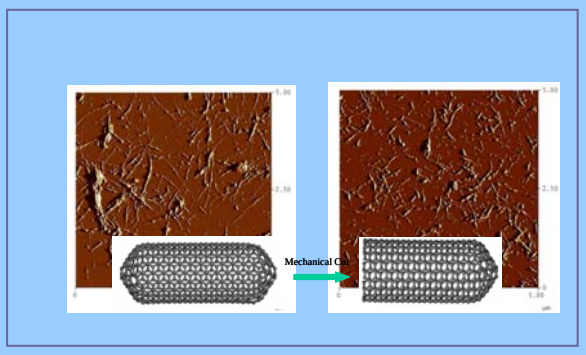
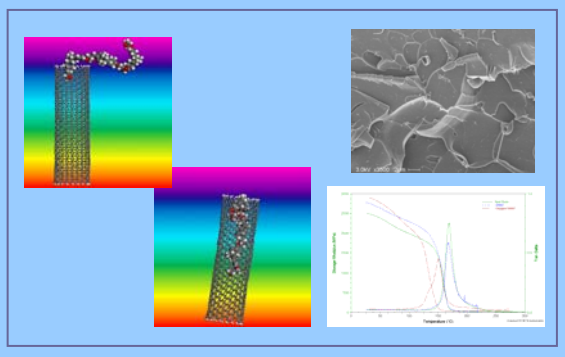
Synopsis:
Functionalization of SWNTs: Mechanically Chopping and Molecular Filling



Mechanically chopped SWNTs



Enhanced dispersion and bonding

Background

The research team has developed an innovative, patent pending method to mechanically chop single walled nanotubes (SWNTs) to open the ends for effectively enhancing tube dispersion and interfacial bonding in nanocomposites. The chopped tubes have more active carbon atoms at the ends, which allow for the possibility of filling the SWNTs with molecules and selectively functionalizing SWNTs at their open ends to avoid sidewall damage. HPMI is focusing on optimizing the tube chopping process to produce SWNTs of specific lengths.

Goals

- Demonstrate molecular filling into open ends of chopped tubes
- Selectively functionalize carbon atoms at open ends, both theoretically and experimentally
- Enhance tube dispersion and interfacial bonding in nanocomposites without damaging nanotube sidewalls

Projects/Research Highlights

- Characterize tube geometries using an atomic force microscope and image processing techniques
- Develop process models for producing SWNT materials with desirable length and open ends
- Investigate highly selective methods for functionalizing carbon atoms at open ends of tube
- Use molecular dynamics simulation to explore the possibilities of filling selected molecules into SWNTs
- Develop high performance nanocomposites with chopped SWNT materials

Benefits to Industry

- Provide dramatically enhanced mechanical, electrical, and thermal properties for nanotube reinforced composites
- Provide unique functionalization methods for enhancing tube dispersion and interfacial bonding