UNH Materials Science Seminar

11:10-12:00, Thursday, November 1, 2007
Kingsbury Hall S145, University of New Hampshire

Synthesis, Characterization and Modeling of Carbon Nanofiber/Phenolic Resin Nanocomposites

Dr. Mitra Yoonessi
Chemical Engineering Dept., UNH

Since the discovery of carbon nanofiber and single wall carbon nanotubes (SWNT), tremendous efforts have been made to investigate their potential applications. These attempts range from Pt-Ru catalyst supports for direct methanol fuel cells, efficient hydrogen storage media, remotely-actuated shape-memory characteristics, nanocomposite reinforcements, electromagnetic shielding, and highly conductive coatings. In all cases the final properties are dictated by the inherent properties, interfacial characteristics, three dimensional orientation and morphology of the fibers. Carbon nanofiber phenolic resin nanocomposites are of particular interest for high temperature applications such as rocket nozzles and precursor for carbon carbon composites. Carbon nanofiber (CNF) / resole phenolic resin (Hitco 134A) nanocomposites exhibited large increases of bending storage modulus above the glass transition temperature and had higher glass transition temperatures with increasing CNF weight percentage. The extent of CNF dispersion and the morphological parameters of in-situ CNF within the nanocomposites and in D_2O were obtained using small angle neutron scattering (SANS) and transmission electron microscopy. The scattering from dilute surface-oxidized CNF in D_2O exhibits a Guinier plateau in the q range examined, indicating that isolated scatterers exist. A simplified polydisperse hollow cylinder form factor was used to interpret the geometrical parameters of dilute dispersions of these oxidized carbon nanofibers in D_2O and carbon nanofibers within cured phenolic resin. The scattering from CNF/phenolic resin nanocomposites exhibited a q^{-4} power law

behavior, indicating the presence of sharp interfaces between fiber and phenolic resin.

Mitra Yoonessi received her B.S. (Chemical Engineering) and M.S. (Polymer Engineering) from Tehran University. She received her Ph.D. (Chemical Engineering) from Mississippi State University. She was a postdoc. at the Air Force Research Laboratory (National Research Council Awardee, 2004-2006). She worked at Michelin Research Corp. on nanocomposite projects (2006-2007). She recently joined the Chemical Engineering department, UNH.

Host: Prof. Donald Sundberg