

Date : 08 June 2009 (Monday)

Time : 11.00am – 12.00nn

Venue : EA#06-04 Seminar room, Faculty of Engineering

Speaker: Prof. Anup K. Ghosh

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Abstract

The dispersion of fillers into polymer matrix at nanoscale and the understanding of structure-property relationships of the resulting nanocomposites present great challenges in processing of such materials. The carbon nanofibre (CNF) composites were prepared with different melt flow index (MFI) grades of polypropylene (PP). Dispersion of CNF in PP matrix during processing was studied with respect to CNF content, MFI of PP and processing conditions. The extent of dispersion was determined from the torque versus time data obtained from micro-twin screw extruder. Improved mechanical and thermal properties were observed in the composites developed using low MFI grade PP. High conductivity were achieved with minimum filler content by controlling dispersion through processing.

The melt rheological analysis of the PP/CNF composites was performed in a parallel plate rheometer at different temperatures and a frequency range of 0.05 to 50 Hz. The influence of frequency, temperature and nanofiber content on complex viscosity, storage and loss moduli and damping behavior was investigated. A shear thinning behaviour at high frequencies was observed for all compositions. Both the viscosity and modulus increased significantly at low frequencies for CNF loading more than 2 wt%, suggesting an onset of pseudo-solid-like behavior due to the formation of interconnected network of CNFs (rheological percolation). The crossover frequency approached to lower value with CNF loading, which indicated higher relaxation time for the composites due to restrictions imposed by CNFs on the matrix flow behavior. Lower rheological percolation threshold as compared to electrical percolation threshold is due to the fact that denser CNF network is required for electrical conductivity, while a less dense CNF network can impede the motion of polypropylene chain.

About the Speaker

Prof. A. K. Ghosh is a distinguished Professor in the field of Polymer Science & Engineering. Currently Prof. Ghosh holds the position of *Reliance Chair Professor* and Head of the Centre for Polymer Science & Engineering at IIT Delhi. Prof. Ghosh obtained his M.Tech. degree in Chemical Engineering from the Indian Institute of Technology, Kanpur and Ph.D. in Chemical Engineering from the State University of New York at Buffalo, NY, USA. Prior to his joining IIT Delhi as Assistant Professor in 1991, he worked as a Post Doctoral Research Fellow and Research Assistant Professor at the University of Pittsburgh, USA. He was selected to the position of Associate Professor in 1997 and was elevated to the position of full Professor in 2005.

Prof. Ghosh has twenty years of teaching and research experience with initial three years in University of Pittsburgh, USA. His research interests include Rheology and Processing of Polymers, Reactive Processing, Polymer Blends and Alloys, Mixing and compounding, Nanocomposites, Modelling and Simulation.

Prof. Ghosh has to his credits a large number of sponsored research and consultancy projects. Prof. Ghosh has to his credit over 80 papers published in international journal. He also has six patents to his credit. Ten students have completed their Ph.D. under his supervision and he has supervised 45 M.Tech. thesis. He is a recipient of *Young Alumnus Award* of Chemical Engineering Department, Calcutta University and *Meritorious Service Award* of Indian Plastics Institute, Mumbai.