

Spring 2009 SEMINAR SERIES

F21C Bioprocessing & Biosensing Center

• DIVISION OF FOOD SYSTEMS & BIOENGINEERING •

PRESENTER: **Dr. Pinar Akcora, Assistant Professor**
Chemical Engineering
University of Missouri

TITLE: **Anisotropic Self-assembly of Spherical Polymer-Grafted Nanoparticles**

ABSTRACT:

It is easy to understand the self-assembly of particles having anisotropic shapes or interactions, such as Co nanoparticles or proteins, into highly extended structures. However, there is no experimentally established strategy for creating anisotropic structures from common spherical nanoparticles. We demonstrate that spherical nanoparticles, uniformly grafted with macromolecules, robustly self-assemble into a range of anisotropic superstructures when they are dispersed in the corresponding homopolymer matrix [Nature Materials, 8, 2009]. This phenomenon is driven by the microphase separation of the inorganic nanoparticles and the polymeric chains grafted on the particle surfaces that is akin to the microphase separation of block copolymers. Theory and simulations both suggest that this self-assembly process reflects a balance between the energy gain when particle cores approach and the entropy of distorting the grafted polymers. The effectively directional nature of the particle interactions is thus a many-body *emergent property*. Our experiments demonstrate that this approach to particle self-assembly allows for considerable control for the creation of polymer nanocomposites with enhanced mechanical properties. Grafted nanoparticles are thus versatile building blocks for creating tunable and functional particle superstructures with significant practical applications.

BIOGRAPHY:

Pinar Akcora received her Ph.D. from the University of Maryland, College Park in Chemical Engineering. She worked as a post-doctoral research assistant at the Columbia University. She has joined the Department of Chemical Engineering of University of Missouri-Columbia in November 2008. Her research interests are in exploring the structure-property relationships of polymer nanocomposites from nano to mesoscale. She has worked on the synthesis of novel diblock copolymer/metal oxide hybrids and on developing new strategies for the self-assembly of nanoparticles. She also focuses on studying the dynamics of polymeric materials and relating it to the structural information using various tools such as scattering, microscopy and rheological measurements.

DATE • TIME • LOCATION:

Tuesday, April 21, 2009, 4:00 pm • Ag Eng Bldg 105