SCHOOL OF
CHEMICAL ENGINEERING
College of Engineering, Architecture and Technology

CHE SEMINAR SERIES

Structure-Dependent Ion Conductivity in Poly (ionic liquid)-based Hybrid Electrolytes

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Pinar Akcora received her Ph.D. in Chemical Engineering at the University of Maryland-College Park in 2005. She completed her post-doctoral work at Columbia University between 2005-2008. She joined the University of Missouri-Columbia, Chemical Engineering as an assistant professor in 2008 and moved to Stevens in 2010. She is the recipient of the 2010 NSF-CAREER award and has received several grants from NSF-DMR, -CMMI and ACS PRF. She currently serves as the coordinator of the Nanotechnology Graduate Program at Stevens.

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Dispersion and self-assembly of polymer-grafted nanoparticles have been utilized for diverse applications requiring enhanced thermo-mechanical properties, solute transport in membrane separations, or enhanced conductivity in hybrid electrolytes. The interfacial resistance to ion transport between the filler and polymer generally limits the conductivity in polymer nanocomposites. We aim to overcome this limitation by designing hybrid electrolytes based on single ion conducting polymers grafted on nanoparticles. I will present how chain length and assembled structures are used to explain ion conductivity compared to that of particle-free poly (ionic liquid) homopolymer. In addition, I will present the new poly (ionic liquid)-b-poly (methyl methacrylate) (PIL-b-PMMA) copolymer-grafted system. Our results indicate that the copolymer hybrid design achieves significantly higher molar conductivity than PIL-grafted nanoparticles. The PIL block length, diblock sequence and the ionic liquid addition into copolymer morphologies change the net repulsion between nanoparticles causing pathways of different morphologies and thicknesses for ionic conduction. Lastly, I will present the results on polarizability of chains with the application of electric fields.