Using Ionic Interactions in the Synthesis of Functional Polymer Materials

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Supramolecular chemistry is a powerful tool to build complex molecules through non-covalent interactions under high yield, mild reaction conditions. Ionic interactions can be used to couple a wide range of oppositely charged molecules, such as hydrotropes, surfactants, ionomers and polyelectrolytes to build polymers with more complex architectures. The presence of ion pairs in these polymers can result in new physical properties due to the dissociation or aggregation under different environmental conditions. This talk will discuss the various types of ion-containing polymer systems currently under investigation in our laboratory including polyelectrolyte-surfactant complexes and telechelic ionomers. It will be shown that neutralization of sulfonated monomers with hydrophobic tertiary amines produces monomers that can be copolymerized with hydrophobic monomers to produce block copolymers that self-assemble into periodic nanostructures useful for material templating. Second, telechelic ionomers are used to generate diblock copolymers with ion-pair junction points. This ion-pair results in richer morphological behavior due to the interplay between block copolymer self-assembly and ionic aggregation/dissociation.

Short Biography

Kevin Cavicchi was born in Reading, MA. He received a B.S. in Materials Science and Engineering in 1998 from Cornell University. He received his PhD in Materials Science and Engineering from the University of Minnesota in 2003 where he studied the self-diffusion of asymmetric block copolymers. This was followed by a post-doctoral fellowship at the University of Massachusetts-Amherst in the Department of Polymer Science and Engineering where he studied the ordering and thermodynamics of block copolymer thin films. He joined the Department of Polymer Engineering at The University of Akron in 2006. His research group is interested in nanostructured soft materials. This includes the synthesis and characterization of well-defined block copolymers, ion-containing polymers, and low molecular mass organogelators.