MIT PPST

Program in Polymer Science and Technology

POLYMER SEMINAR

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Materials, Physics and Applications
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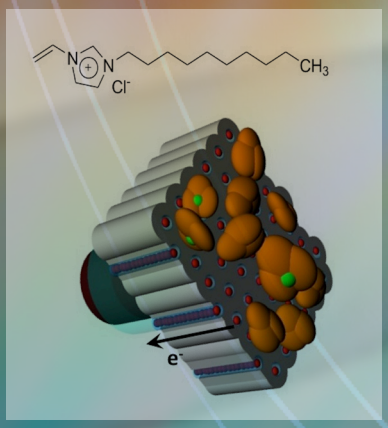
"Hierarchically-structured electronically conducting polyelectrolytes for bioelectronics"

Summary

There has been significant and ongoing interest in devising systems that self-assemble into higher order nano- or meso-structures. The self-assembly of amphiphilic molecules into discrete organized assemblies is not only fundamentally interesting, but provides a facile means by which to produce functional materials for energy storage and transduction. The exploitation of ionic liquid structural modularity coupled with chemical modification of the cation or anion is now an active area of research resulting in the development of ionic liquid-based materials. Chemical moieties can also be added to allow for capture of the self-assembled architectures in a durable form by polymerization and / or crosslinking, rendering the materials environmentally stable and mechanically durable. The current focus of our research is the preparation of ionic electroactive polymers for use as biocompatible materials for charge / electronic management between conventional materials (metal and semiconductor electrodes) and proteins. Specifically, two polymeric ILs that achieve direct electronic communication to recessed protein prosthetic groups and function as bulk electronic conductors will be presented. The first material is an Au-nanoparticle-poly(ionogel) composite that contains surface-exposed nanoparticles for facilitated direct electronic communication to buried redox centers of a protein. The second material is an electronically conductive pi-conjugated poly(ionogel) that contains a unique reactive moiety for site-specific electronic wiring to a protein. Ultimately, the ionic electroactive poly(IL)s will serve as a platform for the fabrication of a wide range of bioelectronic devices, including the construction of biofuel cells and photovoltaics.



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