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Morphology and Ionic Conductivity of Block Copolymer Electrolytes Containing Ionic Liquids

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The global energy crisis and an increase in environmental pollution in the recent years have drawn the attention of the scientific community towards the development of efficient electrochemical devices. Polymers containing charged species have the potential to serve as electrolytes in next-generation devices and achieving high ion transport properties in these electrolytes is the key to improving their efficiency. Although the synthesis and characterization of a wide variety of ion-containing polymers have been extensively reported over the last decade, quantitative understanding of the factors governing the ion transport properties of these materials is in its infancy. In this talk, I will present the current understanding of the diverse factors affecting the thermodynamics, morphologies and ion transport of ion-containing polymers by focusing on the use of ionic liquids (ILs). Various strategies for accessing improved transport properties of IL-containing polymers are elucidated by focusing on the role of IL-polymer interactions. The major accomplishment of obtaining well-defined morphologies for these IL-containing polymers by the use of block copolymer is particularly emphasized as a novel means of controlling the transport properties. The application of IL-incorporated polymer electrolytes in high temperature fuel cells and electro-active actuators is also enclosed.