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Effect of Morphology on Ion Transport in Polymerized Ionic Liquid Block Copolymers JAE-HONG CHOI, Department of Materials Science and Engineering, University of Pennsylvania, YUESHENG YE, YOSSEF ELABD, Department of Chemical and Biological Engineering, Drexel University, KAREN WINEY, Department of Materials Science and Engineering, University of Pennsylvania — We investigate the impact of morphology on ion transport in single-ion conductor polymerized ionic liquid (PIL) diblock copolymers. The morphology for two types of PIL block copolymers with different degrees of miscibility between blocks was studied using small angle X-ray scattering (SAXS) and transmission electron microscopy (TEM). For poly(methyl methacrylate-b-1-[(2-methacryloyloxy)ethyl]-3-butylimidazolium-bis(trifluoromethylsulfonyl)imide) (MMA-b-MEBIm-TFSI) PIL diblock copolymers, the partial miscibility between the MEBIm-TFSI and MMA blocks resulted in a weakly microphase-separated morphology without long-range order. In poly(styrene-b-1-[(2-acryloyloxy)ethyl]-3-butylimidazolium-TFSI) (S-b-AEBIm-TFSI) PIL block copolymers, a variety of self-assembled nanostructures including hexagonally packed cylinders, lamellae, and coexisting lamellae and network morphologies were observed by varying PIL composition. A comparison of ionic conductivity between PMMA- and PS-based PIL block copolymers suggests that strong microphase separation with well-defined structures can improve ionic conductivity. The local ion concentration and connectivity of the conducting microdomains also play an important role in ion conduction in these PIL block copolymers.

Jae-Hong Choi
Department of Chemistry, University of Minnesota

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