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Phase Behavior and Conductivity of Phosphonated Block Copolymers Containing Ionic Liquids HA YOUNG JUNG, SUNG YEON KIM, MOON JEONG PARK, Pohang Univ of Sci & Tech — As the focus on proton exchange fuel cells continues to escalate in the era of alternative energy systems, the rational design of sulfonated polymers has emerged as a key technique for enhancing device efficiency. While the sulfonic acid group guarantees high proton conductivity of membranes under humidified conditions, the growing need for high temperature operation has discouraged their practical uses in fuel cells. In this respect, phosphonated polymers have drawn intensive attention in recent years owing to their self-dissociation ability. In this study, we have synthesized a set of phosphonated block copolymers, poly(styrenephosphonate-methylbutylene) (PSP-*b*−PMB), by varying phosphonation level (PL). A wide variety of self-assembled morphologies, i.e., disordered, lamellar, hexagonally perforated lamellae and hexagonally packed cylindrical phases, were observed with PL. Remarkably, upon comparing the morphology of PSP-*b*-PMB and that of sulfonated analog, we found distinctly dissimilar domain sizes at the same molecular weight and composition. A range of ionic liquids (ILs) were incorporated into the PSP-*b*-PMB block copolymers and their ion transport properties were examined. It has been revealed that the degree of confinement of ionic phases (domain size) impacts the ion mobility and proton dissociation efficiency of IL-containing polymers.

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