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**Thermodynamics and Phase Behavior of Phosphonated Block Copolymers Containing Ionic Liquids** HA YOUNG JUNG, Pohang Univ of Sci Tech, MOON JEONG PARK , Pohang Univ of Sci Tech — Charge-containing copolymers have drawn intensive attention in recent years for their uses in wide range of electrochemical devices such as fuel cells, lithium batteries and actuators. Particularly, the creation of microphase-separated morphologies in such materials by designing them in block and graft configurations has been the subject of extensive studies, in order to establish a synergistic means of optimizing ion transport properties and mechanical integrity. Interest in this topic has been further stimulated by intriguing phase behavior from charge-containing polymers, which was not projected from conventional phase diagrams of non-ionic polymers. Herein, we investigate thermodynamics and phase behavior of a set of phosphonated block copolymers. By synthesizing low-molecular weight samples with degree of polymerization (N) <35, we observed order-disorder transition that enabled us to estimate effective Flory-Huggins interaction parameters ($\chi$) by using random phase approximation. We further examined the systems by adding various ionic liquids, where noticeable increases in $\chi$ values and modulated microphase separation behavior were observed. The morphology–conductivity relationship has been elucidated by taking into account the segmental motion of polymer chains, volume of conducting phases, and the molecular interactions between phosphonated polymer chains and cations of ionic liquids.

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