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Effects of Confinement and Interface on Ion Transport Properties of Block Copolymer Electrolytes MOON JEONG PARK, ONNURI KIM, GYUHA JO, Pohang University of Science and Technology — There is growing interest in blending polymers and ionic liquids (ILs) as a simple route to obtain solid-state ion conductors for a wide variety of electrochemical devices such as lithium batteries and fuel cells. Since the ion transport and mechanical properties of these materials are generally coupled, the development of IL-impregnated polymer electrolytes with improved ionic conductivity and optimized mechanical stability has lately been the subject of extensive studies employing diverse combinations of polymers and ILs. In this work, we present fascinating experimental insights into confinement- and interface-driven modulation of ion transport properties for block copolymer electrolytes. By varying the type of ILs, qualitatively similar lamellar morphology was identified, however, the highest conductivity was only achieved when ILs were confined within ionic domains with a sharp interface. In contrast, a high degree of intermixing of ionic and non-ionic domains at the interface resulted in a reduction by one order of magnitude in the conductivity owing to the creation of tortuous ion conduction pathways. This work suggests the future prospects for designing desired nanostructures as efficient ion conductors.

Moon Jeong Park
Pohang University of Science and Technology

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