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Morphology-Conductivity Relationship in Salt-containing Diblock Copolymer/Homopolymer Mixtures MATTHEW IRWIN, ROBERT HICKEY, TIMOTHY P. LODGE, Univ of Minn - Minneapolis — In order to unravel how ion conductivity is affected by material morphology, a model system of polystyrene (PS), poly(ethylene oxide) (PEO), PS-*block*-PEO, and lithium bis(trifluoromethylsulfonyl)imide (LiTFSI) was fabricated and characterized. These pseudo-ternary polymer blends, in which the lithium salt associates nearly exclusively with the ethylene oxide, have the potential to form a variety of morphologies such as lamellae and the three-dimensionally interpenetrating bicontinuous microemulsion by simply changing blend composition. Similar to what has been observed in salt-containing diblock copolymers, both the order-disorder transition (ODT) temperature and the ODT temperature window of these blends increase sharply with salt loading. By modulating the relative volume fraction of the homopolymers in the blends, it was shown that, although less than order-of-magnitude changes in the domain spacing do not appreciably affect ion conductivity, some morphologies can result in significantly better conductivity than others. These results outline what factors matter most when designing polymer electrolytes for applications such as rechargeable lithium metal batteries and proton exchange membranes.

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