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Single-ion conducting diblock terpolymers for lithium-ion batteries MELODY MORRIS, THOMAS H. EPPS, III, Univ of Delaware — Block polymer (BP) electrolytes provide an attractive route to overcome the competing constraints of high conductivity and mechanical/thermal stability in lithium-ion batteries through nanoscale self-assembly. For example, macromolecules can be engineered such that one domain conducts lithium ions and the other prevents lithium dendrite formation. Herein, we report on the behavior of a single-ion conducting BP electrolyte that was designed to facilitate the transport of lithium ions. These polymers differ from traditional salt-doped BP electrolytes, which require the addition of a lithium salt to bestow conductivity and typically suffer from substantial counterion motion that reduces efficiency. New single-ion BPs were synthesized, and the nanoscale morphologies were determined using small angle X-ray scattering and transmission electron microscopy. Electrolyte performance was measured using AC impedance spectroscopy and DC polarization, and the results were correlated to nanoscale morphology and ion content. Enhanced physical understanding of single-ion BPs was gained by connecting the ion mobility to the chemistry, chain structure, and ion content of the single-ion BP. These studies can be applied to other charged-neutral block polymers to elucidate the effects of ion content on self-assembly and macroscopic properties.

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