

Abstract Submitted
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Effect of lithium ion distribution on conductivity of block copolymer electrolytes ENRIQUE GOMEZ, NITASH BALSARA, University of California, Berkeley — Energy-filtered transmission electron microscopy (EFTEM) was used to determine the distribution of lithium ions in mixtures of bis(trifluoromethane)sulfonimide lithium salt and symmetric poly(styrene-*block*-ethylene oxide) copolymers (PS-PEO). EFTEM results show that the salt is increasingly localized to the middle of the PEO lamellae as the molecular weight of the copolymers is increased. Computer simulations by Borodin and Smith (Macromolecules, 1998, 31, 8396) demonstrate that coordination between lithium ions and PEO chains is diminished for chains that are stretched. Local stretching in block copolymers is modeled using self-consistent field theory (SCFT). Good agreement between EFTEM and SCFT is obtained by postulating a linear relationship between local chain stretching and lithium ion concentration. AC impedance spectroscopy experiments show an increase in the conductivity of PS-PEO/salt mixtures with increasing molecular weight of PS-PEO. The EFTEM/SCFT results suggest that the increase in ionic conductivity with increasing molecular weight is due to segregation of the lithium salt away from PS/PEO interfaces where segmental motion is retarded due to connectivity to slow-moving PS chains. These results may aid in developing all-solid state rechargeable lithium batteries with PS-PEO serving as a dry electrolyte.

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