Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Morphology effects on the ionic conductivity of PEO-containing block copolymers WEN-SHIUE YOUNG, THOMAS EPPS, University of Delaware — Salt-doped poly(ethylene oxide)-based block copolymers have attracted significant interest, as nanoscale ordered structures offer ideal platforms for the design of electrolytes for lithium battery membranes. Because the electrolyte conductivity is strongly dependent on the nature of the conducting pathways, it is important to understand how copolymer morphology affects electrolyte performance. We obtained different morphologies of lithium perchlorate-doped poly(styrene-b-ethylene oxide) by adjusting the amount of the lithium salt and the volume fractions of the copolymer blocks. A homemade ionic conductivity measurement cell allowed us to monitor the ionic conductivity changes while simultaneously using temperature-dependent small angle X-ray scattering to examine the electrolyte nanostructure. We compare the ionic conductivities of the copolymer electrolytes, which have the same salt concentrations ([Li]/[EO]) and similar molecular weight but different microstructures (lamellae, gyroid, and cylinders), to determine the morphology effects. Our results provide engineering parameters useful in the design of high-performance copolymer electrolytes.

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Date submitted: 20 Nov 2009 Electronic form version 1.4