Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Tuning Ion Conducting Pathways Using Holographic Polymerization[1] DERRICK SMITH, CHRISTOPHER LI, BIN DONG, Drexel University, TIMOTHY BUNNING, Air Force Research Lab — While much research has demonstrated repeatable characteristics of electrolyte membranes, the fundamentals behind the interactions during ionic diffusion in solid polymer electrolyte membranes for battery applications are not well understood, specifically the role of nanostructures, which hold the key to improving performance of energy storage devices such as fuel cells and Lithium ion batteries. The challenges in fabricating highly controlled model systems are largely responsible for the interdependent ambiguities between nanostructures and the corresponding ion conducting behavior. In this work, Holographic Polymer Electrolyte Membranes (hPEM) volume gratings comprised of alternating layers of crosslinked polymer resin and lithium ion salt were fabricated using holographic polymerization with an average d-spacing of approximately 200 nm. These one-dimensional confinement structures were used to quantitatively study the anisotropic ionic conductivity between the directions of in-plane and normal to the layers, and the unique ion conducting behavior was correlated with nanoscale phase separation. These volume gratings also offer an exciting route to fabricate multifunctional gratings for optic and sensing applications.

[1]NSF DGE-0654313, CMMI-0900162 and DMR-0804838

Derrick Smith
Drexel University

Date submitted: 11 Nov 2011 Electronic form version 1.4