Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Charge transport and glassy dynamics of poly(ethylene oxide)-based single-ion conductors under geometrical confinement[1] JAMES RUNT, CIPRIAN IACOB, Materials Science and Engineering, Penn State University — Segmental and local dynamics as well as charge transport are investigated in a series of poly(ethylene oxide)-based single-ion conductors (ionomers) with varying counterions (Li+, Na+) confined in uni-directional nanoporous silica membranes. The dynamics are explored over a wide frequency and temperature range by broadband dielectric relaxation spectroscopy. Slowing of segmental dynamics and a decrease in dc conductivity (strongly coupled with segmental relaxation) of the confined ionomers are associated with surface effects – resulting from interfacial hydrogen bonding between the host nanoporous silica membrane and the guest ionomers. These effects are significantly reduced or eliminated upon pore surface modification through silanization. The primary transport properties for the confined ionomers decrease by about one decade compared to the bulk ionomer. A model assuming reduced mobility of an adsorbed layer at the pore wall/ionomer interface is shown to provide a quantitative explanation for the decrease in effective transport quantities in non-silanized porous silica membranes. Additionally, the effect of confinement on ion aggregation in ionomers by using X-ray scattering will also be discussed.

[1]Supported by the National Science Foundation, Polymers Program.

James Runt
Materials Science and Eng, Penn State University

Date submitted: 12 Nov 2014 Electronic form version 1.4