Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Local Ion Motion and Interactions in Single-Ion Polymer Electrolytes via Dielectric Spectroscopy ROBERT KLEIN, SHIHAI ZHANG, SHICHEN DOU, RALPH COLBY, JAMES RUNT, Materials Science and Engineering, Pennsylvania State University — A novel method is presented whereby the parameters quantifying the conductivity of polymer electrolytes can be extracted from the phenomenon of electrode polarization in dielectric spectroscopy. The validity of the model was confirmed by examining the effects of sample thickness and temperature, as well as by comparison of predicted and measured conductivities. Ion mobilities and mobile ion concentrations of neat and 'gel' forms are compared for poly(ethylene oxide)-based sulfonated ionomers. The mobile ion concentration of the neat ionomers was found to be a surprisingly low fraction of the total ion concentration, but increases substantially in the gel ionomers. Furthermore, the temperature dependence of mobility changes from VFT-like for the neat ionomers, to more Arrhenius-like for the gel ionomers. In addition, adding plasticizers to the ionomer significantly influences the local beta process, and the effects are quantified as a function of the dielectric constant and donor number of the plasticizer, and related to the conductivity.

Robert Klein
Materials Science and Engineering, Pennsylvania State University

Date submitted: 27 Nov 2005 Electronic form version 1.4