Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Counterion Effects on Ion Mobility and Mobile Ion Concentration of Doped Polyphosphazenes and Polyphosphazene Ionomers JIM RUNT, ROBERT KLEIN, Penn State University — Previous investigations have shed some light on the ion conduction process in polymer electrolytes, yet ion transport is still not well understood. Here, upon the application of a physical model of electrode polarization to two systems with nearly identical chemical structure, one composed of an ionomer (MI) with a single mobile cation, and the other a salt-doped polymer (M+S) with mobile cation and mobile anion, quantitative comparison of the conductivity parameters is achieved. The polymer electrolyte chemistries of both MI and M+S are based on poly(methoxyethoxy-ethoxy phosphazene) (MEEP). The glass transition was found to be an important factor governing the conductivity and ion mobility. However, even accounting for the glass transition, the mobility of ions in the M+S system is 10 times larger than that in the MI system, which must arise from faster diffusion of the anion than the cation. Values for mobile ion concentration are also approximately 10 times higher in M+S than MI. These differences originate from free volume available for diffusion and local environment surrounding the ion pairs, demonstrating that the location of the ion pairs in the polymer matrix has a crucial effect on both conductivity parameters. Research supported by NSF Polymers Program.

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Date submitted: 15 Nov 2006

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