Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Effect of polymer mobility on conductivity of single-ion conductors KOKONAD SINHA, JANNA MARANAS, The Pennsylvania State University — Scientists are turning to the use of polymers as substitutes for liquid electrolytes in lithium ion batteries, because of their mechanical flexibility and non-toxic properties. Physical mixtures of lithium salt and poly(ethylene oxide) (PEO + LiClO4) are commonly chosen because they have potential for high ionic conductivities. However, high mobility of ions in these mixtures results in electrode polarization, which affects battery performance. To isolate the effect of the cation and to reduce the obstacle of concentration polarization, the anion is chemically incorporated into the backbone of the polymer, thereby rendering it immobile. These single-ion conductors are called ionomers. Neutron scattering experiments have been conducted on ionomers to observe the relation between ionomer mobility and ionic conductivity. Results show that with increasing ion content, there arises a new process at smaller length scales. Comparisons with PEO + LiClO4 systems hint at the formation of cation-PEO-anion complexes which are significantly slower in dynamics than the segmental motion of the polymer. This interaction between the cation and the polymer chain is of vital importance in understanding the fundamental mechanism of ion conduction in polymers.

Kokonad Sinha
The Pennsylvania State University

Date submitted: 16 Nov 2008 Electronic form version 1.4