Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Design of superionic polymers for energy storage applications YANGYANG WANG, FEI FAN, ALEXANDER AGAPOV, University of Tennessee, Knoxville, KUNLUN HONG, TOMONORI SAITO, Oak Ridge National Laboratory, JIMMY MAYS, ALEXEI SOKOLOV, University of Tennessee, Knoxville — Replacing traditional liquid electrolytes by polymers will significantly improve electrical energy storage technologies. Despite the significant advantages for applications in electrochemical devices, the use of solid polymer electrolytes has been impeded by their poor ionic conductivity. By analyzing the relationship between ionic conductivity and segmental relaxation, we demonstrate that polyether-based solid electrolytes have intrinsic limitations for ionic transport at ambient and low temperatures, due to strongly coupled segmental and ion dynamics. On the other hand, the ionic conductivity in rigid polymer can be strongly decoupled from segmental relaxation, in terms of both temperature dependence and relative transport rate, thus providing a significant advantage over traditional polyether-based electrolytes. Our analysis emphasizes that decoupling of ionic transport from segmental dynamics is the key for macromolecular design of superionic polymers.

Yangyang Wang
University of Tennessee, Knoxville

Date submitted: 11 Nov 2013 Electronic form version 1.4