Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Multivalent Ion Transport in Polymers via Metal-Ligand Coordination[1] GABRIEL SANOJA, NICOLE SCHAUSER, CHRISTOPHER EVANS, SHUBHADITYA MAJUMDAR, RACHEL SEGALMAN, University of California, Santa Barbara — Elucidating design rules for multivalent ion conducting polymers is critical for developing novel high-performance materials for electrochemical devices. Herein, we molecularly engineer multivalent ion conducting polymers based on metal-ligand interactions and illustrate that both segmental dynamics and ion coordination kinetics are essential for ion transport through polymers. We present a novel statistical copolymer, poly(ethylene oxide-stat-imidazole glycidyl ether) (i.e., PEO-stat-PIGE), that synergistically combines the structural hierarchy of PEO with the Lewis basicity of tethered imidazole ligands (x_{IGE} =0.17) required to coordinate a series of transition metal salts containing bis(trifluoromethylsulfonyl)imide anions. Complexes of PEO-stat-PIGE with salts exhibit a nanostructure in which ion-enriched regions alternate with ion-deficient regions, and an ionic conductivity above 10^{-5} S/cm. Novel normalization schemes that account for ion solvation kinetics are presented to attain a universal scaling relationship for multivalent ion transport in polymers via metal-ligand coordination.

[1] AFOSR MURI program under FA9550-12-1

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Date submitted: 09 Nov 2016

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