Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Does filler surface chemistry impact filler dispersion, polymer dynamics and conductivity in nanofilled solid polymer electrolytes?

LALITHA GANAPATIBHOTLA, JANNA MARANAS, The Pennsylvania State University — We study the impact of nanofiller surface chemistry on filler dispersion, polymer dynamics and ionic conductivity in acidic α-Al_2O_3 filled PEO+$LiClO_4$ solid polymer electrolytes (SPEs).SPEs are the key to light-weight and high energy density rechargeable Li ion batteries but suffer from low room temperature ionic conductivity. Addition of ceramic nanofillers improves conductivity of SPEs and their surface chemistry influences extent of conductivity enhancement. The ionic conductivity of acidic α-Al_2O_3 filled SPE is enhanced for salt concentrations at and below eutectic, while neutral γ-Al_2O_3 filler enhances conductivity only at eutectic composition. Li ion motion is coupled to segmental mobility of polymer and we study how this is affected by addition of α-Al_2O_3 using quasi-elastic neutron scattering. Aggregation extent of nanoparticles in SPE matrix, a less explored factor in filled SPEs, can affect segmental mobility of polymer. This can vary with surface chemistry of particles and we quantify this using small angle neutron scattering. All measurements are performed as a function of Li concentration, nanoparticle loading and temperature.

Lalitha Ganapatibhotla
The Pennsylvania State University

Date submitted: 22 Nov 2011 Electronic form version 1.4