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Quasielastic neutron backscattering studies of Li-ion dynamics in Li_2SO_4 substituted lithium modified phosphate glasses TOM HEITMANN, University of Missouri, GAVIN HESTER, Missouri State University, MADHU TYAGI, National Institute of Standards and Technology, MUNESH RATHORE, ANSHUMAN DALVI, Birla Institute of Technology and Science, Pilani, SAIBAL MITRA, Missouri State University — A solid with high Li ionic conductivity and a simultaneously low electronic conductivity is an attractive candidate for use as an electrolyte in an all solid-state Li ion battery. Solid state electrolytes would not only improve the reliability, safety, and the ability of the battery to be operated in harsher conditions, but also allow to be scaled for heavy duty industrial applications. We have studied a series of glassy electrolyte candidate materials using neutron scattering as a probe. Neutron backscattering spectroscopy is a useful probe of Li ion dynamics because their diffusion dynamics occur on the same timescales to which backscattering is sensitive and because neutrons are sensitive to nuclei and not electrons. Thus, the observed Li dynamics are naturally separated from any electronic motions. Our materials of interest are lithium modified phosphate glasses with a range of Li_2SO_4 substitution amounts: $xLi_2SO_4 \cdot (1\text{-}x)[0.5Li_2O \cdot 0.5P_2O_5]$, x=0.0 to 0.6. We demonstrate an enhancement of the Li ion diffusion as a function of Li_2SO_4 content via quasielastic neutron scattering performed on the High Flux Backscattering Spectrometer at the NIST Center for Neutron Scattering.

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