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Neutron scattering studies of glassy solid state Li electrolytes
LEO ZELLA, New Mexico State University and the University of Missouri Research Reactor, ALI ZAIDI, Missouri State University, MUNESH RATHORE, ANSHUMAN DALVI, Birla Institute of Technology and Science, SAIBAL MITRA, Missouri State University, TOM HEITMANN, University of Missouri Research Reactor
— We present characterizations, performed using two different neutron scattering techniques, on superionic materials that are good candidates for use as solid state electrolytes in next generation Li^+ ion batteries. The materials are glassy in nature and composed of a complex network of the following sub-units: Li_2O, Li_2SO_4, and $2NH_4H_2PO_2$. This disordered structure is integral to its function in that it promotes Li^+ ion conduction while suppressing electron conduction, the necessary qualities of a good Li^+ electrolyte. We have implemented neutron diffraction to study the formation of crystallites upon heating of the material above 400° C. The crystallite formation is understood to be detrimental to the Li^+ ion mobility and, hence, is identified with a diminished performance in devices that require heating in their fabrication process. We have also used a triple-axis spectrometer to begin to separate out the diffuse scattering that results from the disordered structure of the material from the diffuse scattering that results from dynamic processes that occur in it. This is done by a comparative study of the energy resolved versus energy integrated scattering over the full available q-range.

Tom Heitmann
the Research Reactor Center, University of Missouri

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