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Nanoscale Heterogeneity in Ionic Liquid / Organic Solvent Mixtures CARLOS CUELLAR, The University of Texas at El Paso, NARESH OSTI, EUGENE MAMONTOV, Oak Ridge National Laboratory, JOSE L. BANUELOS, The University of Texas at El Paso — Room-temperature ionic liquid (RTIL) mixtures, as electrolytes in supercapacitors, have desirable properties including a good combination of wide thermal and electrochemical operation range and high conductivity in comparison to conventional electrolytes. The nanostructural properties of eutectic mixtures of RTILs (e.g., $BMIM^+[TFSI]^-$) and RTILs with solvents are currently under investigation. Recently our collaborators have found that $BMIM^+[TFSI]^-$) / acetonitrile mixtures exhibit a maximum in the conductivity as a function of RTIL concentration, with the maximum occurring at a 1:1 mass mixing ratio. Furthermore, results from quasi-elastic neutron scattering show the presence of two different translational diffusion coefficients for the RTIL, suggesting the presence of spatially distinct RTIL-rich and RTIL-poor nanodomains. SAXS measurements of $BMIM^+[TFSI]^-$ / acetonitrile mixtures at with RTIL at 0, 25, 75, and 100 mass% were carried out to determine whether nano-heterogeneity is present and to characterize its structural properties. We find a ˜3 fold increase in the scattering signal at low-Q compared to the expected scattering from a simple mixture of two liquids, suggesting long-range composition fluctuations. Results and analysis of this system will be discussed.

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