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Nanoscale Complexity in Room Temperature Ionic Liquid Mixtures: New Properties for Advanced Applications CARLOS CUELLAR, JOSE BANUELOS, Department of Physics, The University of Texas at El Paso, NANOMATERIALS, INTERFACES, AND CONFINEMENT FOR ENERGY AND THE ENVIRONMENT (NICE2) LAB TEAM — 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 mixtures of RTILs (e.g., BMIM+[TFSI]−) with organic solvents (e.g., acetonitrile, dichloromethane, benzene, toluene, and tetrahydrofuran) are currently under investigation. The mass % at which macroscopic phase separation is visible, in the BMIM+[TFSI]−/solvent mixtures, was determined by slowing increasing the solvent concentration. SAXS measurements at RTIL mass % lower than the phase separation concentration were carried out to determine whether nanoheterogeneity is present leading up to macroscopic phase separation, and to characterize its structural properties. We find an 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. Studies of the dependence in temperature of this properties in the studied system is currently under investigation. Results and analysis of the length scales of the heterogeneity, and changes in intermolecular coordination in these systems will be discussed.

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