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Structure Study on Microemulsion System with an Ionic Liquid (IL) by Small-Angle Neutron Scattering TAE HUI KANG, SHUO QIAN, GREGORY S. SMITH, CHANGWOO DO, WILLIAM T. HELLER, Oak Ridge National Laboratory — The self-assembly of IL with a long alkyl chains provides molecular level control on the structure enabling applications, including, creating microemulsion with dual functions of extractant and surfactant. The IL, C14MIMCl is not soluble in alkane solvents, even with the addition of octanol. However, with a small amount of water, a water-in-oil micromemulsion forms, that obeys the swelling law with water content. The mixed surfactant system, C14MIMCl/octanol, has different chemistry and molecular geometries depending on its composition. Through the use of SANS, it is possible to determine the impact of the surfactant system on the structure of the microemulsion, as well as to learn the composition of various regions in the structure. The microemulsion system was studied by dilution with octane from 10 to 70 wt%. A strong intensity peak was observed near 0.1 \AA^{-1} , and the stable phase shows a structural transition at 30 wt% octane. Contrast variation experiments were done with d-octane and h-octane to understand the structure of the microemulsion, as well as the structural transition. Further, systematic concentration studies of surfactant at constant water-to-oil molar ratio and of water at constant 30 wt% surfactant were performed.

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