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Decoupling of ionic conductivity from the structural relaxation in ionic liquids PHILIP GRIFFIN, Dept. of Physics and Astronomy, Univ. of Tennessee, ALEXANDER AGAPOV, Dept. of Polymer Science, Univ. of Akron, ALEXANDER KISLIUK, ALEXEI SOKOLOV, Dept. of Chemistry, Univ. of Tennessee and Chemical Sciences Division, ORNL — In numerous technological applications, notably battery technology, the need for a highly conductive ionic material is critical. Ionic liquids are well suited for these applications, but the fundamentals of their physical properties are still not well understood. To investigate the temperature dependence of the conductivity and structural relaxation in these systems, a combination of light scattering techniques as well as dielectric spectroscopy measurements were performed on the ionic liquid [C4mim][NTf2]. Combining these measurement techniques enables us to characterize the dynamics in a time window that spans more than twelve decades. Detailed analysis of our results shows that the temperature dependence of the conductivity decouples from that of the structural relaxation. Furthermore, the structural relaxation exhibits a dynamical crossover similar to that observed in many glass forming liquids, while the conductivity exhibits no sign of the crossover. Contrary to the traditional theory, these observations suggest that the mechanism controlling ionic conductivity in this system is different from the mechanism controlling structural relaxation.

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