

Pressure and temperature dependence of the deuteron spin-lattice relaxation times (T_1) in ionic liquids

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Ionic liquids (ILs) are receiving much attention as replacements of common solvents in chemical technology for applications in radioactive material handling, batteries, capacitors, and electrochemical solar cells. In this context, there is much interest in the molecular motions that control transport properties and chemical processes. In this work, a set of ILs based on the EMIM and BMIM cations and TFSI anion, in which the cation side chains are partially deuterated, was investigated by Nuclear Magnetic Resonance (NMR). The ^2H spin-lattice relaxation times (T_1) have been measured at 47 MHz in the temperature range from 240 to 370 K and under hydrostatic pressure from ambient to 250 MPa. The Arrhenius plots of T_1 exhibit T_1 minima, and analyzed assuming an exponential decaying correlation function (BPP model). The high pressure T_1 measurements were carried out to determine the activation volume of alkyl chain motion. The results will be correlated with the known hydrodynamic properties of these ILs.

Keywords: **Ionic Liquids**, **NMR**

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