Comparing an Ionic Liquid with it Neutral Binary Homolog

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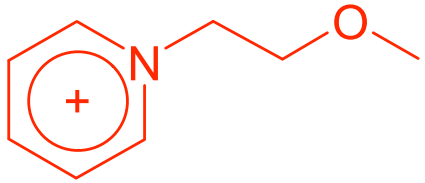
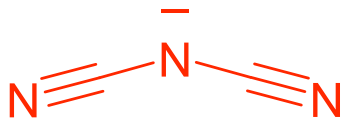
Room temperature ionic liquids (RTILs) such as the methoxyethyl-pyridinium/ dicyanamide (shown at left in red) are becoming widely used for electrochemical, enzymatic, and fuel cell applications.

One of the several questions we sought to address in our research on the physical chemistry of ionic liquids was to ask, "What fraction of the properties result from the fact one has a binary solution?" To address this question, we compared the ionic liquid with the homologous neutral pair (shown at right in blue). The density and viscosity of the ionic liquid are larger than for the homologous neutral pair by 20% and by a factor of 30, respectively.

Femtosecond nonlinear optical spectroscopy showed that the effective force constants for vibrations between the molecular ions of the ionic liquid are substantially stronger than between the molecules in the neutral solution.

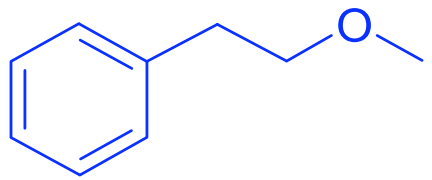
RTIL

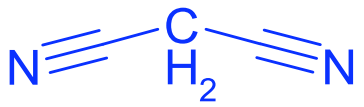




d: 1.17 g cm^{-3}
η: 65.1 cP

Neutral Pair





d: 0.98 g cm^{-3}
η: 2.24 cP