

Solubility of Organic Solvents in Room Temperature Ionic Liquids

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Abstract:

An experiment was designed to measure the solubility characteristics of room temperature ionic liquids. Room temperature ionic liquids are organic salts that remain liquid over a wide range of temperatures, including room temperature. Ionic liquids are capable of dissolving a wide array of compounds, and by choosing the appropriate anion and cation they can be tailored to dissolve specific compounds. They are being touted as 'green' designer solvents because they have no measurable vapor pressures. By determining the solubility of organic substances in ionic liquids, it is possible that they may replace many of the conventional volatile organic solvents that are conventionally used today. To detect the solubility, a Maxtek Research Quartz Microbalance was employed. The Quartz Microbalances utilizes the piezoelectric properties of a 5 MHz quartz crystal to detect frequency shifts, which can then be directly related to changes in mass. A thin layer of ionic liquid was introduced to the quartz crystal, and then the organic substance to be tested was introduced along with diatomic nitrogen. A frequency shift resulted due to the uptake of mass by the quartz crystal. The experiment was then repeated at various concentrations of the organic substance being tested. From the frequency shift, the solubility of the organic in the ionic liquid can be determined, and from the solubility a Henry's Law constant can be evaluated. Because of the multitude of organics that could be tested and the wide possibilities of ionic liquids available, data analysis is ongoing.