Thermodynamics and Volumetric Properties of Imidazolium Thiocyanate Ionic Liquids

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Activity coefficients at infinite dilution for solutes: alkanes, alkenes, alkynes, cycloalkanes, aromatic hydrocarbons, alcohols and water in the ionic liquid (IL): 1-hexyl-3-methylimidazolium thiocyanate ([HMIM][SCN]) have been determined by gas-liquid chromatography at the temperature from 298.15 K to 368.15 K and compared to those ILs with different cations: 1-ethyl-3-methylimidazolium thiocyanate, ([EMIM][SCN]) and 1-butyl-3-methylimidazolium thiocyanate ([BMIM][SCN]). The partial molar excess enthalpies at infinite dilution values were calculated from the experimental activity coefficients values obtained over the temperature range.[1,2.] Densities, excess molar volumes, and dynamic viscosities have been determined for [BMIM][SCN] with alcohol (methanol, ethanol, 1-propanol, 1-butanol, 1-pentanol, 1-hexanol, 1-heptanol, 1-octanol, 1-nonanol and 1- decanol) and water in wide range of temperatures from 298.15 K to 348.15 K and ambient pressure. The temperature dependence of density and viscosity for these systems can be described by an empirical second-order polynomial and by the Vogel-Fucher-Tammann equation, respectively. Excess molar volumes and viscosity deviations were calculated and correlated by the Redlich-Kister polynomial expansions. Comparison of the results for ten binary systems elucidates the influence of 1-alcohol carbon chain length on their physical properties.[3,4] The surface tensions have been measured at atmospheric pressure, with use of a ring tensiometer, of a series of alcoholic solutions of 1-butyl-3-methylimidazolium thiocyanate ([BMIM][SCN]) in alcohol (1-butanol, 1-pentanol and 1-hexanol) in wide range of temperatures from 298.15 K to 338.15 K. The influence of 1-alcohol carbon chain length was tested. The surface thermodynamics functions such as surface entropy and enthalpy were derived from the temperature dependence of the surface tension values. Solid-liquid (SLE) and liquid-liquid (LLE) phase equilibria in binary mixtures of [HMIM][SCN] with aliphatic and aromatic hydrocarbons, alcohols and water have been measured by dynamic method and compared to the experimental results for [EMIM][SCN] and [BMIM][SCN].

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[3] U. Domańska, M.Laskowska, J. Chem. Eng. Data, 2008 – submitted.
[4] U. Domańska, M.Laskowska, J. Sol. Chem., 2008 – submitted.