

Thermodynamic Phase Behavior of Tosylate Ionic Liquids and Sulphur Extraction

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Isothermal vapor-liquid equilibrium data, (VLE) have been measured by an ebulliometric method for three binary mixtures containing ionic liquid (IL) 1-butyl-4-methylpyridinium tosylate [BMPy][TOS] with alcohols (ethanol, propan-1-ol, butan-1-ol) at $T = 373.15$ K. The experimental VLE results have been correlated using Wilson equation. Solid-liquid equilibria (SLE) and liquid-liquid equilibria (LLE) of binary systems containing ionic liquid 1-butyl-3-methylimidazolium tosylate [BMIM][TOS] with: aromatic hydrocarbons, alcohols and water were measured at normal pressure by a dynamic method from $T = 243$ K to the boiling point of solvent. Simple eutectic systems with complete immiscibility in the solid phase and complete miscibility in the liquid phase have been observed in most of the systems (alcohols, water). The solubility decreases with an increase of the number of carbon atoms in the alkan-1-ol, or alkyl chain at the benzene ring. The experimental results of LLE have been correlated using the binary parameters of the Non-Random Two Liquid (NRTL) equation. These results were compared to [BMPy][TOS]¹. The selectivity S_{12} for the thiophene / heptane separation problem was calculated from the experimental activity coefficients at infinite dilution for different solutes in many ionic liquids (i.e. [BMIM][CF₃SO₃]², [Et₃S][NTf₂]³, [BMPYR][CF₃SO₃]⁴) and compared to the other ionic liquids taken from the recent literature. The SLE and LLE of binary mixtures with thiophene were measured with many ionic liquids (i.e. [EMIM][SCN], [BMIM][SCN], [HMIM][SCN], [2,4,6-Collidine][TOS]). As expected the high solubility of thiophene was observed in cited ILs, mainly with LCSTs.

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