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## Thermodynamic study of the soluting effect in aqueous ionic liquid - monosaccharide solutions by the vapor pressure osmometry

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### Abstract

In this work, to study vapor-liquid equilibria of several ternary ionic liquid + carbohydrate + water and binary ionic liquid + water systems, water activity measurements have been made using the vapor pressure osmometry (VPO) technique at 308.15 K. Three imidazolium-based ionic liquids (ILs) 1-butyl-3-methylimidazolium tetrafluoroborate ([Bmim][BF<sub>4</sub>]), 1-butyl-3-methylimidazolium bromide ([Bmim][Br]), and 1-butyl-3-methylimidazolium hydrogen sulfate ([Bmim][HSO<sub>4</sub>]) and four monosaccharide carbohydrates L-(+)-arabinose, D-(+)-xylose, D-(+)-glucose, and D-(-)-fructose were selected. The hydrophilicities of the investigated ILs follow the order: [Bmim][HSO<sub>4</sub>] > [Bmim][Br] >> [Bmim][BF<sub>4</sub>]. Our results showed that the unfavorable IL-carbohydrate interactions can be lead to reducing the water activity and vapor pressure of ternary solution relative to the semi-ideal solution model ( $\Delta a_w < 0$  and  $\Delta p - (\Delta p^\circ_{IL} + \Delta p^\circ_C) < 0$ ). For the systems that had extreme negative departure from the semi-ideal behavior ([Bmim][BF<sub>4</sub>]/carbohydrate) aqueous biphasic system (ABS) is formed in the concentrations higher than the critical values. For these systems, magnitudes of the negative departures from the

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