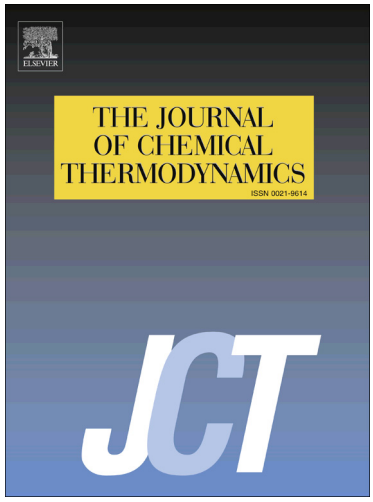

Volumetric properties of binary mixtures of ionic liquid with tributyl phosphate and dimethyl carbonate

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PII: S0021-9614(18)30275-1
DOI: https://doi.org/10.1016/j.jct.2018.04.005
Reference: YJCHT 5382

To appear in: *J. Chem. Thermodynamics*

Received Date: 9 November 2017
Revised Date: 4 April 2018
Accepted Date: 5 April 2018

Please cite this article as: Y. Chen, Y. Sun, Z. Li, R. Wang, A. Hou, F. Yang, Volumetric properties of binary mixtures of ionic liquid with tributyl phosphate and dimethyl carbonate, *J. Chem. Thermodynamics* (2018), doi: https://doi.org/10.1016/j.jct.2018.04.005

Volumetric properties of binary mixtures of ionic liquid with tributyl phosphate and dimethyl carbonate

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Abstract

In this work, the densities (ρ) were investigated for binary mixtures of ionic liquids (ILs) with molecular solvents, namely tributyl phosphate (TBP) and dimethyl carbonate (DMC), covering the entire concentrations over the temperature range from T = (293.15 to 323.15) K at 0.1 MPa. The involved ILs are 1-butyl-3-methylimidazolium hexafluorophosphate ([Bmim]PF_6), 1-butyl-3-methylimidazolium tetrafluoroborate ([Bmim]BF_4) and 1-butyl-3-methylimidazolium bis(trifluoromethylsulfonyl) imide ([Bmim]Tf_2N). From the experimental density values, molar volume (V_m), the thermal expansion coefficient (α_p) and excess molar volume (V^E) for binary mixtures were calculated. The V^E values ranging from (-2.1040 to 0.417) $cm^3 \cdot mol^{-1}$ were interpreted in terms of intermolecular interactions and structural characteristics in the binary mixtures. For {[Bmim]PF_6 + DMC, [Bmim]PF_6 + TBP and [Bmim]BF_4 + TBP} mixtures, the V^E values are negative due to the dominant electrostatic attraction between cation and anion in IL and hydrogen bonding between IL and TBP/DMC. While for the large molecular system, {[Bmim]Tf_2N + TBP}, steric hindrance leads to V^E values changing from negative to positive with the increasing of IL concentration. Additionally, the V^E values were correlated with Redlich-Kister polynomial equation.

Keywords: Ionic liquid, Binary mixtures, Density, Excess molar volume

1. Introduction

Ionic liquids (ILs) as potential environmentally friendly solvents are regarded as a promising

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