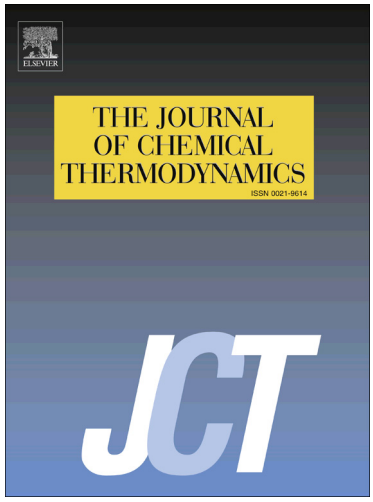

The molar surface Gibbs energy and its application to the binary mixtures of *N*-butylpyridinium dicyanamide [C_4py][DCA] with alcohols

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PII: S0021-9614(18)30351-3
DOI: https://doi.org/10.1016/j.jct.2018.08.004
Reference: YJCHT 5492

To appear in: *J. Chem. Thermodynamics*

Received Date: 14 December 2017
Revised Date: 2 August 2018
Accepted Date: 3 August 2018

Please cite this article as: N. Xing, K. Liang, D. Fang, W. Guan, J. Yang, The molar surface Gibbs energy and its application to the binary mixtures of *N*-butylpyridinium dicyanamide [C_4py][DCA] with alcohols, *J. Chem. Thermodynamics* (2018), doi: https://doi.org/10.1016/j.jct.2018.08.004

The molar surface Gibbs energy and its application to the binary mixtures of *N*-butylpyridinium dicyanamide [C_4py][DCA] with alcohols

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ABSTRACT:

The density and surface tension for the binary mixtures of ionic liquid (IL) [C_4py][DCA] with ethanol, 1-propanol and 2-propanol were measured across the entire range of mole fraction (x_1 = 0.0000 to 1.0000) at T = (288.15 to 318.15) K. The average molar volume and the thermal expansion coefficient of the binary mixtures were calculated from the experimental density. The excess molar volumes, V^E, of the binary mixtures were also calculated and well fitted by Redlich−Kister equation. The obtained V^E are negative values over the whole composition range. The values of V^E are related to the alcohol chain length and temperature. In order to predict the surface tension of the mixtures, the new function — the molar surface Gibbs energy of mixtures was obtained from Li's model improved by us in this work. So, the molar surface Gibbs energy, g_s, and its excess function, g_s^E, of mixtures for [C_4py][DCA] with ethanol, 1-propanol and 2-propanol were calculated. The excess molar surface Gibbs energy, g_s^E, was well fitted by Redlich−Kister equation. In terms of the Redlich−Kister's parameters, a new method for predicting the surface tension, γ, of the mixtures is proposed and the predicted values, γ (pre.), are in good agreement with the corresponding experimental ones, γ(exp.). On a basis of molar surface Gibbs energy of mixtures, a new Eötvös equation was obtained and applied to binary mixtures of [C_4py][DCA] with alcohols. The absolute value of the slope of the new Eötvös equation is the mole surface entropy, s, and the intercept is the molar surface enthalpy, h, which is temperature-independent.

Keywords: *N*-butylpyridinium dicyanamide; Ionic liquid; Binary mixture; Molar surface Gibbs energy; Excess function

1. Introduction

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