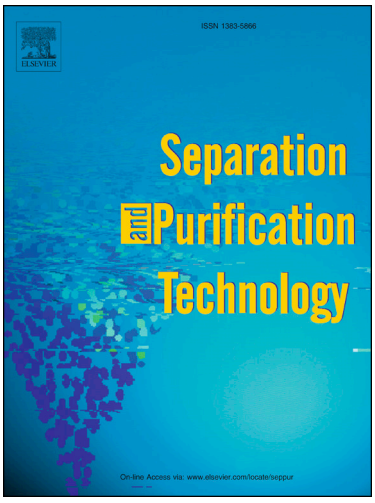

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PII: S1383-5866(17)33966-7
DOI: https://doi.org/10.1016/j.seppur.2018.02.029
Reference: SEPPUR 14393

To appear in: *Separation and Purification Technology*

Received Date: 3 December 2017
Revised Date: 9 February 2018
Accepted Date: 13 February 2018

Please cite this article as: F. Oliveira Farias, H. Passos, M. Gomes Sanglard, L. Igarashi-Mafra, J.A.P. Coutinho, M.R. Mafra, Designer solvent ability of alcohols in aqueous biphasic systems composed of deep eutectic solvents and potassium phosphate, *Separation and Purification Technology* (2018), doi: https://doi.org/10.1016/j.seppur.2018.02.029

Designer solvent ability of alcohols in aqueous biphasic systems composed of deep eutectic solvents and potassium phosphate

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Abstract

Deep eutectic solvents (DES) have been proposed as phase forming components of aqueous biphasic systems (ABS). However, the DES hydrogen bonding complexes are not stable in the high concentrations of water present in this type of systems. Therefore, as previously shown, DES-based ABS should be treated as quaternary systems. This confers DES-based ABS with an extra degree of freedom for the design of separation processes since while one of the DES components acts as a phase forming component, the other could induce the modification of the ABS phase properties and, consequently, the control of the partition of various biomolecules. In this context, the designer solvent effect of the hydrogen bond donor (HBD), using four different alcohols – ethanol, *n*-propanol 1,2-propanediol and ethylene glycol – mixed at three different molar fractions (2:1; 1:1 and 1:2) with cholinium chloride (the hydrogen bond acceptor, HBA) in quaternary systems composed of K_2HPO_4 and water, was evaluated in this work. The results show that the presence of the HBD has an impact upon the liquid-liquid equilibrium, and these changes are dependent on the alcohol nature. The NRTL model was correlated to the tie-line experimental data with a low mean deviation. Moreover, several biomolecules (phenolic compounds, alkaloids, and amino acids) were use as molecular probes to evaluate the ability of alcohols to tune the partition in the studied systems. The alcohol presence changes the properties of the ABS's phases and it is here shown that the HBD of the DES can indeed be used to modulate the partition behavior of target molecules.

Keywords: aqueous biphasic system, quaternary systems, deep eutectic solvents, designer solvents, partition, biomolecules.

1. INTRODUCTION