

Surface Tension of Binary Liquid Mixtures Including Ionic Liquids and the Gibbs Surface Excess

Animesh Pan and Satya Priya Moulik*

Department of Chemistry, Centre for Surface Science, Jadavpur University, Kolkata - 700032, India;

Abstract

In this study binary mixtures of several organic solvents with water as well as with ionic liquids are considered to understand the interfacial adsorption of these organic liquids at the air/water, and the air/ionic liquid interfaces. Tensiometric method is used and the measured surface tensions of the organic solvents at different concentrations are processed in terms of Gibbs adsorption equation to evaluate the surface excess quantities of the organic solvents. The plots of surface tension versus partial pressure of the organic solvents at different mole fractions as well as their surface tension versus solvent concentrations in both water and in ionic liquids are processed in terms of suitable polynomial relations in the evaluation of the surface excess quantities. The results show new and conspicuous features which are attempted to address on the physicochemical basis. In this endeavor, the past literature results on the ethanol-water system are revisited and compared with the current repeat measurements for a comprehensive comparison of similarities and otherwise. The features of the aqueous systems are found to be much different from the IL systems. A physicochemical rationale of the varied nature of the adsorption processes is presented.

Keywords: Binary Solvent Mixtures, Gibbs Adsorption, Ionic Liquid-Water, Organic Solvent-Ionic Liquid, Organic Solvents-Water, Surface Excess, Surface Tension