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Densities, Viscosities and Viscosity Deviations of Binary Liquid Mixtures with Non-Polar Solvent

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Abstract

For binary liquid mixtures of 2-butanol, the densities and viscosity were calculated at 303.15K, for example Benzene, toluene, xylene, hexane and carbon tetrachloride, for certain non-polar solvents.The viscosity deviation ($\Delta\eta$)values of binary mixtures were calculated at 303.15 K from the density and viscosity results. Depending on the molecular interactions and the form of liquid mixture, excess properties are found to be negative.

Keywords: *Binary liquid mixture, Non-polar solvent, densities, viscosities.*

Introduction:

In under-standing the essence of the molecular interactions in binary liquid mixtures, studies of thermodynamic and transport properties are relevant. These characteristics are extremely useful for the design of various kinds of chemical industry transport and process equipment.The thermodynamic properties of binary liquid mixtures have been studied by a recent increase of interest[1,2]. The knowledge on intermolecular interaction in those systems was extensively used to obtain.

This article records density (σ) and viscosity (θ) experimental data for the following 303.15k mixtures: 2-butanol with certain non-polar solvents, e.g., benzene, toluene, xylene, hexane and carbon tetrachloride, viscosity deviations ($\Delta\theta$) measured using these values.

Methodology:

The research was based on all of the organic liquids used in the study. Merck Minimal was used to produce 2-butanol benzene, toluene, xylene, hexane and carbon tetrachloride. As literature shows, organic fluids have been purified for purity more than 99 %.Masses in a 30 cm3 flask is prepared for liquid mixing of different structures. The average uncertainty was determined to be less than ± 0.0001 in the mole fraction of the mixtures. In order to preserve the temperature, density and viscosity measurements were made using a thermostatically controlled water bath (Zenith).

In stopper measurement flasks, binary liquid mixtures from various known composites have been produced. The composition of the binary Liquid Mixture was calculated as its density and viscosity at 303.15 K.The density was measured by a pyknometer at 0.00001 × 103 K g-3. Sample weight was calculated via the analytical balance of the single electrical pan (K-Roy).

A viscometer from Ostwald was used for calculating the viscosity. A precision electrical stopwatch ± 0.015 was used to calculate the flow time. For each liquid mixture an average of 4 or 5 flow times is taken. All measurements were monitored to ± 0.01 K.

For binary liquid mixtures of 2-butanol with non-polar solvent, an experimentally determined viscosity deviation ($\Delta\theta$) was consistent with the following relation.

$$\Delta\eta = \eta - \sum_{i=1}^{1}(X_i\eta_i) \qquad \text{…….(1)}$$

Where the altern is mixture dynamic viscosities and X_i, then the mole fraction and itsh viscosity are respectively the mole fraction in the mixture. In the case of viscosity deviation (as the approximate uncertainty is ± 0.004 m Pa. S.

Result and Discussion:

In terms of the composition of the corrosions binary liquid mixtures, the density (σ) and the viscosation (θ) of 2-butanol binary liquid mixtures with some non-polar solvents e.g. at 303.15 K, tetrachloride is calculated in benzene, toluene, xylene, hexane and carbon.

The non-interaction part can be comparable with the interaction part and can be adequate to reverse the pattern set by the interaction part. The negative values usually mean that the dispersion forces are present in 3 mixtures.

The figure shows the plot of viscosity deviation ($\Delta\theta$) in different binary mixtures of mole fraction (Xi) with benzene, toluene, xylene, hexane and carbon tetrachloride. 1-5 respectively.

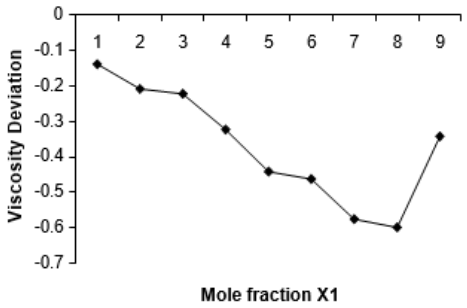

Figure 1:Experimental deviation in viscosity ($\Delta\theta$) of 2-butanol (1) + 304.15 K benzene (2)

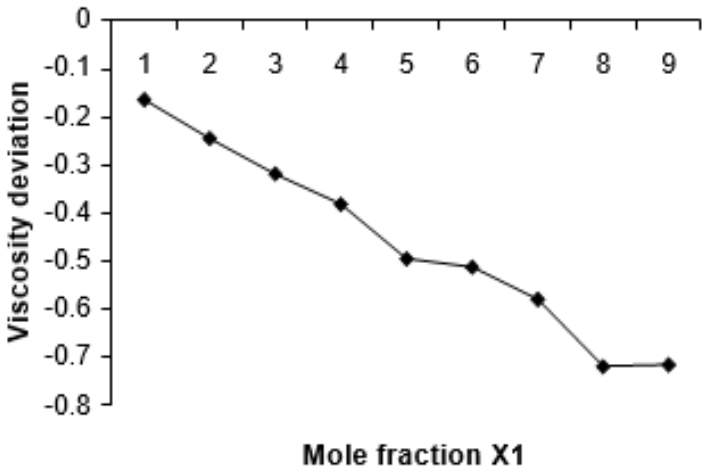

Figure.2. Experimental viscosity deviation (Δθ) in mixtures of 2-butanol (1) + hexane (2) at 303.15 K.

Conclusion:

The analysis of the molecular interact between polar 2-butanol and non-polar benzene, toluene, xylene, hexane and carbon tetrachloride solvents may also be appropriate for Viscosity measuring of binary fluid mixtures. A negative viscosity deviation (TI) value increases as the 2-butanol mole fraction increases.

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