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Thermodynamic Properties of Binary Liquid Mixtures at Different Temperature.

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Abstract

The thermodynamic parameters and excess molar volumes have been calculated from the experimental value of densities and viscosities of binary mixtures of propyl acetate with alkan-1-ols at 298.15, 303.15, 308.15 and 313.15 K. All the mixtures exhibited endothermic enthalpies which decreased with increasing concentration of propyl acetate .

The density and viscosity of liquid mixtures plays an important role in finding their heat content, mass transport, fluid flow and molecular structure etc. The thermodynamic and transport properties generally yield a valuable information regarding the molecular interactions in pure liquid as well as in liquid mixtures. The excess molar volumes are fitted to Jouyban - Acree model for correlating the density and viscosity of liquid mixtures at various temperatures. Excess properties considered, and yielded acceptable results.

Key words - Propyl acetate, Alkan-1-ol, Thermodynamic properties, Excess molar volume,

Introduction

Thermodynamic and transport properties of binary liquid mixtures containing protic, aprotic and associated liquids have been studied previously[1-8]. The calculated excess quantities from such data have been interpreted in terms of differences in size of the molecules and strength of the specific and nonspecific interactions taking place between the components of the mixtures. When propyl acetate is mixed with different alkan-1-ols, mixing properties with varying intermolecular interactions may be generated. In the present study interactions of propyl acetate with methanol, ethanol, propan-1-ol, butan-1-ol and pentan-1-ol at different temperatures have been reported. The transport and thermodynamic studies on the binary mixtures containing aniline, and benzonitrile have been reported previously by Nikam et al[2-6] and Gill et al.[7]

The variations of the excess molar volumes and thermodynamic properties of liquid mixtures of propyl acetate and alkan-1-ols, with concentration have been interpreted on the basis of molecular interactions. The studies carried out more precise understanding of intermolecular interactions of the esters with alkan-1-ols and the relationship between the thermodynamic properties of mixing.

Experimental

Methanol (E.merck, purity 99.5%),ethanol (S.D. fine chemicals , purity 99%), propan-1-ol (S.D. fine chemicals, purity 99%), butan-1-ol (S.D. fine chemicals, purity 99%), pentan-1-ol (S.D. fine chemicals, purity 99%) and propyl acetate (S.D. fine chemicals, purity 99%) were used after single distillation. The purity of the solvent after purification, was ascertained by compairing their densities and viscosities with corresponding literature value at 298.15, 303.15, 308.15and 313.15 K. Binary mixtures were prepared by mixing known mass of each liquid in an airtight