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Study of Thermodynamic Parameters of Binary System

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Abstract

The estimation of physical and thermodynamic properties would provide reliable information regarding mixing properties with varying intermolecular interactions may be generated, for pure substance and mixtures at any temperature and composition. Excess and thermodynamic properties have been calculated from the experimental values of density and viscosity of binary liquid mixtures of bromobenzene with hexan-1-ol at different temperature. Densities and viscosities of liquid mixtures plays an important role in finding their heat content, mass transport, fluid flow and molecular structure etc. Excess molar volume (V^E), deviation in viscosity, excess molar enthalpy, entropy of activation and free energy of activation are useful in understanding the nature of intermolecular interactions, dispersion forces and the extent of hydrogen bonding between two liquids

Key words – Chlorobenzene, Bromobenzene, Pentan-1-ol, Hexan-1-ol.

Introduction

The chemical or process engineer in particular find knowledge of physical and thermodynamic properties of fluids essential for designing many kind of industrial processes. The physical properties of every substance depends directly on the nature of the molecule of the substance.

The investigation regarding the molecular association in organic binary mixtures having 1-alkanol group as one of the component is of particular interest. Since 1-alkanols group is highly polar and can associated with any other group having some degree of polar attractions. In view of the importance mentioned, an attempt has been made to elucidate the molecular interaction in mixture of bromobenzene with 1-hexanol at 298.15 and 308.15K. Further excess properties are used to explain intermolecular interactions in this binary mixtures. The transport and thermodynamic studies on the binary mixtures containing N-N dimethylacetamide, aniline, acetonitrile, ethyl acetate, toluene and benzonitrile have been reported previously by Ali et al,¹ Nikam et al,^{2,3} Gill et al⁴ and Mehdi Hasan et al.⁵

The calculated excess and thermodynamic 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 constituent binary mixtures.

Experimental

Hexan-1-ol (S.D. fine chemicals , purity 99%) and bromobenzene (S.D. fine chemicals, purity 99%) were used after single distillation. The purity of the solvents after purification, was ascertained by comparing their densities and viscosities with the corresponding literature values at 298.15 and 308.15 K. Binary mixtures were prepared by mixing known mass of each liquid in air