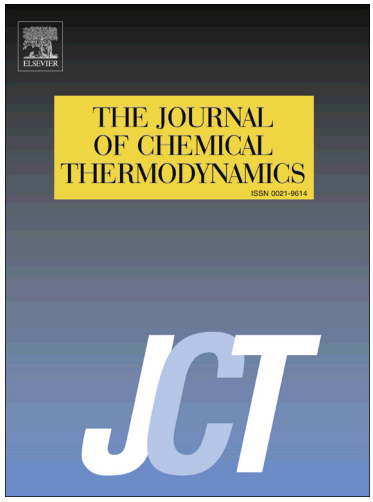

Intermolecular interactions in binary mixtures of 2-diethylethanolamine with 1-propanol and 1-butanol at different temperatures

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Intermolecular interactions in binary mixtures of 2-diethylethanolamine with 1-propanol and 1-butanol at different temperatures

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Abstract

The densities, ρ and ultrasonic speeds, u of binary mixtures of 2-diethylethanolamine (2-DEEA) with 1-propanol and 1-butanol, including those of pure liquids, are measured at 293.15, 303.15 and 313.15K, over the entire composition range. From the experimental values of ρ and u, molar volume, V_m, isentropic compressibility, κ_s, acoustic impedance, Z, excess molar volume, V_m^E, excess ultrasonic velocity, u^E, excess acoustic impedance, Z^E, excess isentropic compressibility, κ_S^E and excess molar isentropic compressibility, $K_{s,m}^E$ are calculated. Further, the partial molar isentropic compressibility $\overline{K}_{s,m,1}$ and $\overline{K}_{s,m,2}$, and excess partial molar isentropic compressibility $\overline{K}_{s,m,1}^E$ and $\overline{K}_{s,m,2}^E$ over the entire composition range, the partial molar isentropic compressibility $\overline{K}_{s,m,1}^0$ and $\overline{K}_{s,m,2}^0$, and excess partial molar isentropic compressibility $\overline{K}_{s,m,1}^{0E}$ and $\overline{K}_{s,m,2}^{0E}$ of the individual components at infinite dilution are also deduced. The variations of the consequent parameters indicate the presence of specific intermolecular interactions between the binary liquid systems. The infrared spectra are also recorded at room temperature (293.15 K).

Keywords: isentropic compressibility; excess properties; 2-diethylethanolamine; alkanols; molecular interaction

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1. Introduction

The physicochemical properties of binary liquid mixtures have significance in the field of theoretical modeling, applied research and recurrently used in the design procedures such as heat or mass transfer, in several chemical and industrial processes [1, 2]. The experimental thermophysical quantity encourages formulation of new analytical models which can be used in obtaining information about the intermolecular interactions existing within the liquid mixtures [3-5]. Intermolecular interactions help in understanding the structural configuration and orientation of the molecules leading to the formation of complexes and macroscopic properties of the fluids [6, 7]. The present work is focused on the study of intermolecular interaction in binary mixtures of 2-DEEA with 1-propanol/ 1-butanol over entire composition range at various temperatures.

2-diethylethanolamine is a bi-functional organic compound having two polar groups namely hydroxyl (-OH) and amino (-NH_2) groups, leading to complicated intermolecular interactions with alkanols. 2-DEEA molecules form self-associates through extensive hydrogen