Study of thermophysical properties of 1-Bromohexane with 1-alkanole (C1-C5) in a temperature region and local atmospheric pressure

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Abstract

Understanding the physical properties of liquid mixtures is fundamental for elucidating the nature of molecular interactions between their components. Accordingly, experimental data across the full composition range and at various temperatures are critical from both theoretical and applied perspectives. This study presents measurements of density and speed of sound for binary mixtures of 1-bromohexane with five 1-alkanols—methanol, ethanol, 1-propanol, 1-butanol, and 1-pentanol—over the temperature range 283.15–333.15 K at atmospheric pressure. These measurements were obtained using the Anton Paar DSA 5000M density and sound velocity analyzer. From the measured data, thermodynamic excess properties such as excess molar volume (V^E) and excess isentropic compressibility (κ_s^E) were derived. The experimental results were fitted using the Redlich–Kister polynomial equation for binary mixtures. The observed trends provide insight into the influence of molecular structure on the strength and nature of intermolecular interactions within these mixtures. Notably, the variation of excess molar volume and excess isentropic compressibility with temperature and composition highlights the role of hydrogen bonding, dispersion forces, and steric effects introduced by different 1-alkanols. This research contributes to the thermodynamic database for the studied systems, offering essential novel data for validating and refining predictive models and equations of state.

Keywords: density, sound speed, binary mixtures, 1-bromohexane, temperature,

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