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Volumetric, acoustic and optical properties for binary mixtures of nitroethane with chloroalkane at temperatures between 298.15 K and 318.15 K.

Comparison with theories.

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Abstract

In a continuation from a previous work, experimental densities, speeds of sound, and refractive indices data, for eight binary liquid mixtures of nitroethane with 1,1,2,2-tetrachloroethane, 1,1,1-trichloroethane, trichloromethane, 1,2-dichloroethane, 1,3-dichloropropane, 1,4-dichlorobutane, 1-chlorobutane and 1-chloropentane were measured in the temperature range of (298.15 - 318.15) K and at atmospheric pressure. From the measured data the derived properties, such as the excess molar volumes, the isentropic compressibility, the deviations in isentropic compressibility, the deviations in refractive indices, the molar refractions and the deviations in molar refractions data have been calculated. The excess properties of the binary mixtures were correlated by the Redlich–Kister type polynomials using a robust regression along the gnostic influence function. Speed of sound and isentropic compressibility data have been compared with calculated values from Jacobson free length theory (FLT), Nomoto’s relation (NR), Zhang Junjie’s relation (JR), Van Deal’s ideal mixing relation (IMR), Impedance dependence relation (IDR) and Schaaff’s collision factor theory (CFT). The ability of different theoretical (n, ρ) mixing rules (Lorentz–Lorenz, Gladstone–Dale, Arago–Biot, Edwards and Eykman) to predict the refractive indices was evaluated. The experimental and calculated results are discussed in terms of molecular interactions and structural effects between components of mixtures.

KEYWORDS: Densities; Excess Molar Volumes; Speeds of sound; Refractive indices; Nitroethane; Chloroalkanes.

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