Volumetric, Viscometric, and Ultrasonic Properties of Liquid Mixtures of Cyclohexane with Alkanols at Different Temperatures

Anwar Ali, Shadma Tasneem, and Firdosa Nabi

Department of Chemistry, Jamia Millia Islamia (Central University), New Delhi – 110025, India

Reprint requests to A. A.; E-mail: anwar_jmi@yahoo.co.in

The densities (ρ), viscosities (η), and ultrasonic speeds (u) of pure cyclohexane, 1-butanol, 2-butanol, and those of their binary mixtures, with cyclohexane as common component, covering the whole composition range have been measured at 293.15, 298.15, 303.15, 308.15, 313.15, and 318.15 K. From the experimental data the excess molar volume (V^{E}), deviations in isentropic compressibility (Δk_{s}), deviations in viscosity ($\Delta \eta$), deviations in ultrasonic speed (Δu), deviations in acoustic impedance (ΔZ), deviations in internal pressure (ΔP_{i}), excess Gibbs free energy of activation ($\Delta G^{*\mathrm{E}}$), entropies (ΔS^*), and enthalpies (ΔH^*) of activation of viscous flow have been determined. The sign and magnitude of these parameters were found to be sensitive towards interactions prevailing in the studied systems. Partial molar volumes ($\bar{V}^0_{\phi,2}$) and partial molar compressibilities ($\bar{K}^0_{\phi,2}$) of 1-butanol and 2-butanol in cyclohexane have also been evaluated. Moreover, V^{E} values were theoretically predicted by using Flory's statistical theory. The variations of derived parameters mentioned above with composition offer a convenient method to study the nature and extent of interactions between the component molecules of the liquid mixtures, not easily obtained by other means.

Key words: Cyclohexane; Alkanols; Partial Molar Volume; Partial Molar Compressibility; Flory's Statistical Theory; Interactions.