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Acoustic and ¹H NMR responses of an acidic nuclear extractant with some polar liquids

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The ultrasonic velocity, density and viscosity of an acidic nuclear extractant namely di (2-ethylhexyl) phosphoric acid (D2EHPA) and its binary mixtures with three monocarboxylic acids viz., acetic, propionic and n-butyric were measured at temperature, $T = 303.15$ K and at pressure, $P = 0.1$ MPa. The experimental data were utilized to compute relaxation time, molecular association constant, deviations in intermolecular free length, acoustic impedance, free volume and change in entropy, excess Gibbs energy of activation of viscous flow, excess enthalpy in the entire mole fraction range of D2EHPA. The excess/deviation functions were fitted to Redlich-Kister type polynomial equation to estimate binary coefficients and standard errors between experimental and calculated data. The nature of these functions was utilized to speculate the nature of molecular interaction between component molecules of all studied binary mixtures. Furthermore, ¹H NMR spectra of pure D2EHPA and its binary mixtures with the monocarboxylic acids were used to assess molecular interactions between components of liquid mixtures at microscopic level and to corroborate with the results obtained from bulk properties.

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