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Volumetric, viscometric, optical, acoustical and spectral investigations of intermolecular interactions in ternary mixtures of terpinolene and α-terpineol with cresols

Paras Patel*[a] & Sangita Sharma[b]

[a] Department of Chemistry, Indus Institute of Sciences, Humanities and Liberal Studies, Indus University, Ahmedabad 382 115, Gujarat, India

[b] Department of Chemistry, Hemchandracharya North Gujarat University, Patan 384 265, Gujarat, India

E-mail: paras12patel@yahoo.com, paraspatel.gd@indusuni.ac.in

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Densities (ρ), viscosities (η), refractive indexes (n_D) and speed of sound (u) have been measured experimentally for ternary mixtures of terpinolene, α-terpineol with cresols (*o*-cresol, *m*-cresol, *p*-cresol) at three different temperatures 303.15, 308.15 and 313.15 K at atmospheric pressure. From primary physical properties, some secondary properties like molar volume (V_m), excess molar volume (V_m^E), deviation in viscosities ($\Delta\eta$), excess Gibbs' free energy of activation of viscous flow (ΔG^{*E}) deviation in refractive index (Δn_D), deviation in speed of sound (Δu), isentropic compressibility (κ_s), deviation in isentropic compressibility ($\Delta\kappa_s$), acoustical impedance (z), deviation in acoustical impedances (Δz), and intermolecular free length (L_f) have been calculated. All the calculated values of excess/deviation properties have been fitted with the fourth order Redlich-Kister polynomial equation and their standard deviation (σ) values have also been calculated. FT-IR spectral analysis of ternary mixtures at 1:1:1, 2:1:1, 1:2:1 and 1:1:2 composition ratios have been carried out at 298.15 K. The results have been discussed in term of presence of intermolecular interactions, their types, strength and behavior change with change in temperatures and change in ratio of components in ternary mixtures.

Keywords: Density, Viscosity, Refractive index, Speed of sound, FT-IR, Intermolecular interactions, Deviation properties