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Acoustic and Volumetric Studies of the Binary Mixtures of Furfuryl Alcohol with Ethylene-, Diethylene- and Triethylene-Glycols at 303.15K

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ABSTRACT

Ultrasonic velocities and densities of the binary mixtures of furfuryl alcohol and ethylene glycol, diethylene glycol and triethylene glycol are experimentally determined over the entire composition range at room temperature of 303.15K at local atmospheric pressure. Using this acoustic and volumetric data, various thermodynamic and thermoacoustic parameters viz., molar volume, isentropic compressibility and mean free length useful for interpreting the intermolecular interactions between the furfuryl alcohol with glycol molecules are computed using the theoretical relations. To account for the nature and strength of the interactions, the excess parameters of these quantities are also determined. In order to check the consistency of the computed excess parameters, these parameters are fitted to Redlich-Kister type polynomial. The obtained negative values of excess parameters indicate that the interactions between furfuryl alcohol and glycol molecules are strong due to the hydrogen bonding between the molecules of the component liquids. The trend in the excess values indicate that the interactions between the unlike molecules of the liquid mixtures under study at room temperature follow the order: Furfuryl Alcohol+ Ethylene Glycol>Furfuryl Alcohol+ Diethylene Glycol>Furfuryl Alcohol+ Triethylene Glycol.

Highlights

- Ultrasonic velocity and density of furfuryl alcohol with ethylene glycol, diethylene glycol and triethylene glycol mixtures are measured at 303.15 K.
- Thermodynamic and excess parameters are computed theoretically.
- Strong interactions exist between the molecules of furfuryl alcohol and glycols due to hydrogen bonding.
- Among the three mixtures studied, the interactions between furfuryl alcohol and ethylene glycol are the strongest and between the furfuryl alcohol and triethylene glycol are the weakest.

Keywords: Ultrasonics, Thermodynamic parameters, Excess parameters, Molecular interactions.