

Full Paper

## Volumetric, Ultrasonic and Transport Properties of Binary Liquid Mixtures Containing Dimethyl Formamide at 303.15 K

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**摘要** Excess volumes ( $V^E$ ), ultrasonic velocities ( $u$ ), isentropic compressibility ( $\Delta K_s$ ) and viscosities ( $\eta$ ) for the binary mixtures of dimethyl formamide (DMF) with 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,2,4-trichlorobenzene, *o*-chlorotoluene, *m*-chlorotoluene, *p*-chlorotoluene, *o*-nitrotoluene and *m*-nitrotoluene at 303.15 K were studied. Excess volume data exhibit an inversion in sign for the mixtures of dimethyl formamide with 1,2- and 1,3-dichlorobenzenes and the property is completely positive over the entire composition range for the mixtures of dimethyl formamide with 1,2,4-trichlorobenzene, *o*-nitrotoluene and *m*-nitrotoluene. On the other hand, the quantity is negative for the mixtures of dimethyl formamide with chlorotoluenes. Isentropic compressibility ( $K_s$ ) has been computed for the same systems from precise sound velocity and density data. Further, deviation of isentropic compressibility ( $\Delta K_s$ ) from ideal behavior was also calculated.  $\Delta K_s$  values are negative over the entire volume fraction range in all the binary mixtures. The experimental sound velocity data were analysed in terms of Free Length Theory (FLT) and Collision Factor Theory (CFT). The viscosity data were analysed on the basis of corresponding state approach. The measured data were discussed on the basis of intermolecular interactions between unlike molecules.

**关键词** [excess volume](#) [dimethyl formamide](#) [interferometer](#) [sound velocity](#) [viscosity](#) [molecular interaction](#)

分类号

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**Abstract** Excess volumes ( $V^E$ ), ultrasonic velocities ( $u$ ), isentropic compressibility ( $\Delta K_s$ ) and viscosities ( $\eta$ ) for the binary mixtures of dimethyl formamide (DMF) with 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,2,4-trichlorobenzene, *o*-chlorotoluene, *m*-chlorotoluene, *p*-chlorotoluene, *o*-nitrotoluene and *m*-nitrotoluene at 303.15 K were studied. Excess volume data exhibit an inversion in sign for the mixtures of dimethyl formamide with 1,2- and 1,3-dichlorobenzenes and the property is completely positive over the entire composition range for the mixtures of dimethyl formamide with 1,2,4-trichlorobenzene, *o*-nitrotoluene and *m*-nitrotoluene. On the other hand, the quantity is negative for the mixtures of dimethyl formamide with chlorotoluenes. Isentropic compressibility ( $K_s$ ) has been computed for the same systems from precise sound velocity and density data. Further, deviation of isentropic compressibility ( $\Delta K_s$ ) from ideal behavior was also calculated.  $\Delta K_s$  values are negative over the entire volume fraction range in all the binary mixtures. The experimental sound velocity data were analysed in terms of Free Length Theory (FLT) and Collision Factor Theory (CFT). The viscosity data were analysed on the basis of corresponding state approach. The measured data were discussed on the basis of intermolecular interactions between unlike molecules.

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