Investigation of the P-V-T Behavior of Ternary Mixtures of Aliphatic Alcohols

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Aliphatic alcohols and their mixtures are widely used as working substances in chemical production process, heat and refrigerating machines, and in crystal hydrates used in power plants. The investigation of P-V-T behavior is one of the main problems of current research in thermal physics. Thermophysical data are necessary for realization of many practical and theoretical problems. A constant volume piezometer has been chosen to provide highly accurate values of thermal properties.

For studies of the thermal properties of ternary mixtures of aliphatic alcohols, “chemically pure" butyl, octyl and decyl alcohols are used. The experimental ranges are:

- for temperature, 298.15 - 548.15 K;
- for pressure, 0.1-60 MPa; and
- for concentration, 0-100%.

At temperatures to 348.15 K water is used in the liquid bath thermostat, from 348.15 - 448.15 K glycerin is used, and from 448.15 - 573.15 K melting saltpeter is used. The measurements of temperature and pressure were determined using a platinum resistance thermometer and a dead-weight pressure-gauge tester. Graphical displays of thermodynamic properties of p-ρ, T-ρ, P-T and ρ-X were generated and examined. The error in temperature was ΔT=0.01-0.03 K; for pressure ΔP = 0.05-0.06 MPa, for specific volume ΔV = 0.05 - 0.08%.

Various analytical equations have been used to represent the experimental data. The maximum uncertainties of the calculated values are 0.1%. Using these equations the coefficients of volume expansion, isothermal compressibility, and enthalpy of mixing could be calculated.