

**EXPERIMENTAL STUDY OF THE DEPENDENCE OF
THERMODYNAMIC PROPERTIES OF THE (PROPANOL-1 + N-OCTANE)
SYSTEM IN LIQUID, GASEOUS, AND SUPERCRITICAL STATES**

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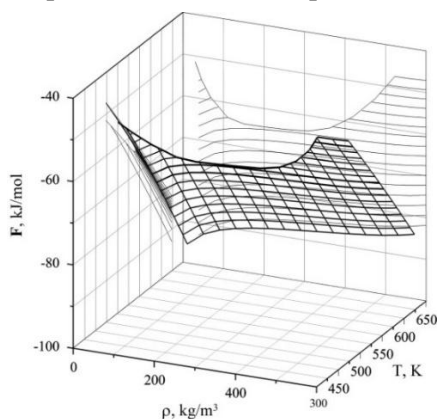
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Experimental data on the p, ρ, T, x - dependences of 1-propanol + n-octane mixtures at various compositions (0.2, 0.5, and 0.8 mole fractions of n-octane) in the temperature range of 373.15–623.15 K, density range of 1–680 kg/m³, and pressures up to 56 MPa, obtained using a constant-volume piezometer [1], are described by a virial-type thermal equation of state by expanding the compressibility factor $Z = p/RT\rho_m$ into series in terms of reduced density and temperature:

$$Z = p/RT\rho_m = 1 + \sum_{i=1}^m \sum_{j=0}^{n_i} a_{ij} \omega^i / \tau^j, \text{ and } p = RT\rho_m \left[1 + \sum_{i=1}^m \sum_{j=0}^{n_i} a_{ij} \omega^i / \tau^j \right]$$

Here, ρ_m is the molar density (mol/m³); $\omega = \rho/\rho_c$, $\tau = T/T_c$ are the reduced density and reduced temperature, respectively; ρ_c , T_c are the critical density and critical temperature; $R = 8.314$ J/(mol·K) is the universal (molar) gas constant. The mean relative deviation of the pressure values calculated using the equation from the experimental data is 0.8%.

Furthermore, based on this equation and thermodynamic relations [2], the principal thermodynamic properties of the investigated mixtures were calculated in the liquid, gaseous, and supercritical states. The figure illustrates the dependence of the Helmholtz energy F on density and temperature T for the composition $x = 0.5$.



1. E. A. Bazaev, A. R. Bazaev, T. A.-G. Dzhapparov, and B. K. Osmanova, "Phase Transformations and Critical Properties of the C₃H₇OH–C₈H₁₈ System," *High Temperature*, 2025, Vol. 63, No. 3, pp. 368–374.

2. E. E. Shpilrain and P. M. Kesselman, *Fundamentals of the Theory of Thermophysical Properties of Substances*, Moscow: Energiya, 1977, 248 p.