

Molar Heat Capacity at Constant Volume for Isobutane at Temperatures from (114 to 345) K and at Pressures to 35 MPa

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We used an adiabatic calorimeter to measure molar heat capacities at constant volume (C_v) for pure isobutane. The purity of the sample, 0.9999 mol fraction, was verified by chemical analysis. Temperatures ranged from the triple point of isobutane near 114 K to the upper temperature limit of the calorimeter at 345 K, while pressures ranged from (0 to 35) MPa. Measurements were conducted on liquid in equilibrium with its vapor and on compressed liquid samples along isochores. Heat capacity results are reported for two-phase ($C_v^{(2)}$), saturated liquid (C_s), and single-phase (C_v) isochores. Vapor pressure data are reported that are based on measurements of $C_v^{(2)}$ along a 2-phase isochore. Measurements were also made to determine the triple point temperature of (113.707 \pm 0.030) K and enthalpy of fusion of (4494 \pm 20) J·mol⁻¹ for isobutane near its triple point. The principal sources of uncertainty are the temperature rise measurement and the change-of-volume work adjustment. The expanded uncertainty (i.e., a coverage factor $k=2$ and thus a two-standard deviation estimate) for values of $C_v^{(2)}$ is estimated to be 0.5 %, for C_s it is 0.7 %, and for C_v it is 0.7 %. Deviations of both the present and published C_v , C_s , and vapor pressure results from those calculated with reference equations [1] are discussed.

[1] D. Bücker and W. Wagner, *J. Phys. Chem. Ref. Data* **35**, 929 (2006).