Precise Data for Technical Applications: from Measurements to Equations of State

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Over the last 10 years, the Laboratory for Thermophysical Properties (LTP) has provided experimental determinations of phase equilibria (e.g., vapor pressures, critical data, VLE, VLLE, or SLE), volumetric data including densities and density changes, caloric data such as enthalpy changes and heat capacities, and transport properties like viscosities, thermal conductivities, and surface tensions. LTP provides, where possible, correlations of the experimental results to enable easy and reliable usage. In cooperation with NIST, high-pressure liquid and supercritical densities, vapor pressures, and critical data were measured and short fundamental equations of state were developed and published for pure compounds [1, 2, 3]. All of these equations for important bulk chemicals like dimethyl ether, the butane isomers, or sulfur dioxide are implemented in NIST REFPROP.
As a continuation of these projects, new measurements and equations of state for pentene isomers will be presented as an integrated approach. Data for these compounds are of importance for the production of isoprene, pentanole, TAME, and polymers. There is a significant lack in the availability of thermodynamic data for these compounds in the literature. The experimental setup for the measurement of high-pressure and high temperature densities, vapor pressures, critical data, and caloric properties will be shown, and the new precise equations of state for technical applications will be presented.

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2. E.W. Lemmon and E.C. Ihmels, Fluid Phase Equilibria, 228-229 (2005) 173-187
3. E.C. Ihmels and E.W. Lemmon, Fluid Phase Equilibria, 260 (2007) 36-48