

Viscosity, Thermal Conductivity, and Surface Tension at High Pressures

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The determination of high-pressure phase equilibria (e.g., vapor pressures, critical data, VLE, VLLE, or SLE), volumetric data (such as densities or density changes), and caloric data (such as enthalpy changes and heat capacities) has been a core field of the Laboratory for Thermophysical Properties (LTP) for many years. Over the last few years several experimental facilities were developed and assembled at the LTP to serve for the increasing customer demands for transport properties at elevated pressures.

In addition to a high-pressure rotational viscometer for liquids, a capillary flow viscometer was developed for the determination of viscosities at elevated pressures. The capillary viscometer is applicable for liquids and gases and for pressures up to 10 MPa and temperatures between 180 and 350 K. The apparatus and some results for pure compounds and mixtures will be presented.

The pendant drop method is used for the determination of surface and interfacial tension. A commercial drop contour analysis system is combined with a high-pressure cell with sapphire windows at the front and back sides. The apparatus is used for pressures up to 10 MPa and temperatures between 180 K and 350 K. With this system, the surface tension of liquids under gas pressure can be measured. The apparatus, procedure of measurement, and some results will be presented. Moreover, a hot wire apparatus for the determination of thermal conductivity measurements will be presented. The apparatus can be employed for dense fluids at pressures up to 30 MPa and temperatures up to 570 K.