

Fitting Equations of State, with Application to Ammonia

Eric Lemmon^{C, S}

Applied Chemicals and Materials Division, NIST, Boulder, CO, U.S.A.

Eric.Lemmon@nist.gov

The latest fitting techniques used in the development of equations of state for the thermodynamic properties of fluids will be presented. The techniques are applied through nonlinear fitting of experimental data and multiple constraints to control the slope, curvature, and other values of an isoproperty line. Two new parameters have recently become key tools for evaluating equations of state; these are the Gruneisen parameter and the phase identification parameter (PIP). They are more sensitive than other properties, and can highlight areas that need improvement. With a significant number of constraints for the derivatives of these two properties and of heat capacities, speeds of sound, pressures, and so on, an equation of state can be developed that meets the characteristics expected in modern work. The application of these fitting techniques will be demonstrated by the performance of a new equation of state for ammonia.