

Fundamental Equation of State for Deuterium

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World utilization of deuterium is anticipated to increase with the rise of fusion energy machines such as ITER and NIF. We present a new fundamental equation of state for the thermodynamic properties of fluid deuterium. The equation of state is valid from the melting line to a maximum pressure of 2000 MPa and an upper temperature limit of 600 K, corresponding to available experimental measurements. The uncertainties in predicted densities are 0.15% in the region between 100 and 400 K. The uncertainties of vapor pressures and saturated liquid densities vary from 1% to 2%, while speed-of-sound values are accurate to within 3% in the liquid phase.