

Formulation for the Viscosity of Water

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We present a correlating equation for the viscosity of pure water substance, H_2O , over an extensive range of fluid states, including the critical region. It was developed by using critically evaluated data that contains over 5000 experimental data points from 238 K to 1346 K at pressures up to 1 GPa. The viscosity equation is designed to be used with densities computed from the IAPWS Formulation 1995 for the Thermodynamic Properties of Ordinary Water Substance for General and Scientific Use. It contains contributions for the dilute gas limit, dense-fluid contributions, and a critical enhancement term. Recent new measurements were included in developing the viscosity equation in the dilute-gas limit. The functional form of the correlating equation for the dense fluid contribution contains 24 terms selected with the aid of a simulated annealing optimization algorithm. The critical enhancement term is based on the theory presented by Bhattacharjee, Ferrell, Basu and Sengers, using the most recent experimental and theoretical values of the critical exponent. The correlation, comparisons with experimental data, the range of applicability, and the uncertainties associated with the correlation will be discussed.