# Initial Density Dependence of the Hydrogen Thermal Conductivity and Corresponding States Correlation for High Densities

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Based upon Rainwater-Friend (RF) theory, initial density dependence of the thermal conductivity of some gases was given using the realistic potentials. In this work hydrogen's thermal conductivity is predicted by using an accurate realistic Morse-Spline-Van der Waals (MSV) potential on the basis of RF theory. The internal state contribution is calculated using the Mason-Monchick and hard-sphere Enskog theories. The results show that validity range of hydrogen's thermal conductivity using this model extends to 5 mol dm-3. By the use of this model, for moderate densities in the temperature range 180-1500 K and pressure up to 15 MPa the hydrogen's thermal conductivity can be calculated with mean (maximum) deviation of 0.30% (1.04%).

At high densities, beyond the range of the RF theory, a residual function for hydrogen's thermal conductivity has been extracted according to the corresponding states function which where used to calculate the thermal conductivity of supercritical gases which is valid over a wide temperature and pressure ranges. The measured values are in good agreement with data given in the literature. It is worth nothing that the available thermal conductivity data of high accuracy cover the restricted temperature range up to 1500 K and pressure up to 100 MPa and our calculation of this property is limited to that range.