# Thermal Conductivity Measurement of Hydrogen Gas using the Transient Short Hot-Wire Method

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Accurate thermophysical properties of hydrogen have been requested as fundamental data for development and maintenance of the coming hydrogen society. They are expected to be indispensable for construction of high-quality, safe, reliable and accurate instruments and equipment for the infrastructure of the society. With the view of developing an expanded database of high reliability, it is considered that the existing thermophysical data for hydrogen are insufficient, and new measurement data are desired. The purpose of our study is the acquisition of measured thermal conductivity data for hydrogen with high accuracy and high reliability. Measurement of the thermal conductivity of hydrogen with state-of-the-art transient hot wire instruments, particularly at pressures below 1 MPa, is very difficult due to the large thermal diffusivity of hydrogen. Because of this, virtually all of the hydrogen thermal conductivity data measured with the transient hot wire method is for pressures above 1 MPa. Moreover, at higher pressures it is desirable to have a small pressure vessel. Therefore we developed a new transient short-hot-wire apparatus with a refined procedure for the measurement of the thermal conductivity of hydrogen gas. The transient short-hot-wire method differs from the conventional transient hot wire method in that only one short hot wire is used and end effects are accounted for by numerical calculation. In the present work, the length of the platinum wire is about 15 mm and the diameter about 10 mm. The thermal conductivity of hydrogen was measured in the range of temperature less than 373.15 K and pressure from 0.1 MPa to 1 MPa. Thermal conductivity measurements showed good reproducibility and agreed with an existing correlation for hydrogen gas based on Enskog theory to within a deviation of ±1 %.