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Brief 71-10105

AEC-NASA TECH BRIEF

Space Nuclear Systems Office

Thermal Conductivity of Gaseous and Liquid Hydrogen

Measurements have now been made of the thermal conductivity of both normal and parahydrogen at temperatures from 200° to 17°K (−99° to −429°F), at densities up to 2.6 times the critical density (ρc = 0.314 g/cm^3), and at pressures to 15 MN/m^2. The measurements were motivated by the need for comprehensive, accurate data on the properties of gaseous and liquid hydrogen, for nuclear rocket applications and for problems concerning the theory of dense fluid transport. There are large gaps in available knowledge on the thermal conductivity of fluids, especially at low temperatures and high densities; no absolute conductivity measurements were previously made on compressed fluid hydrogen at temperatures below 78°K (−319°F).

Using a newly developed calorimeter, the data were analyzed as a function of density at fixed temperatures, and as a function of temperature at fixed densities. The maximum uncertainty in the measurements is estimated to be less than 2%.

Outside the critical region, the thermal conductivity of both the gas and the liquid increases continuously with temperature and density. In the compressed liquid, the temperature derivative at fixed density is positive and unusually large compared to that for most other simple liquids. In the critical region, the thermal conductivity increases rapidly with both temperature and density as these parameters approach their critical values.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
AEC-NASA Space Nuclear Systems Office
U.S. Atomic Energy Commission
Washington, D.C. 20545
Reference: TSP71-10105

Patent status:

No patent action is contemplated by AEC or NASA.

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