

Comparing the Experimental Thermal Conductivity Results Using Transient Methods

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Abstract : The main scope of this work is to compare the experimental thermal conductivity results of fluids between devices using transient techniques. A range of different liquids within a range of viscosities was measured with two or more devices, and the results were compared between the different methods and the reference equations wherever it was available. The liquids selected are the most commonly used in academic or industrial laboratories to calibrate their thermal conductivity instruments having a variety of thermal conductivity, viscosity, and density. Three transient methods (Transient Hot Wire, Transient Plane Source, and Transient Line Source) were compared for the thermal conductivity measurements taken by using them. These methods have been chosen as the most accurate and because they all follow the same idea; as a function of the logarithm of time, the thermal conductivity is calculated from the slope of a plot of sensor temperature rise. For all measurements, the selected temperature range was at the atmospheric level from 10 to 40 ° C. Our results are coming with an agreement with the objections of several scientists over the reliability of the results of a few popular devices. The observation was surprising that the device used in many laboratories for fast measurements of liquid thermal conductivity display deviations of 500 percent which can be very poorly reproduced.

Keywords : accurate data, liquids, thermal conductivity, transient methods.

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