AEC-NASA TECH BRIEF

High Precision Cryogenic Thermal Conductivity Standards

Data on the low-temperature thermal and electrical properties of new materials are urgently needed. Thermal and electrical conductivity data in the temperature range from 4° to 300°K are currently available only to an accuracy of 5% for most technically important solids. For many materials, especially new or uncommon alloys, measured values cannot be found. However, technology in the near future will require that these properties be known to an accuracy of 1% or better.

A need also exists for established reference data for standard materials or specimens. Measurements reported from different sources often differ by large amounts.

Apparatus has been constructed which allows the simultaneous measurement of thermal conductivity, electrical resistivity, and thermopower with accuracies of 1 to 2%, 0.2%, and 0.5μ V/°K, respectively. The following materials have been investigated: titanium alloy A 110-AT, aluminum alloy 7039, Inconel 718, Hastelloy X, reactor grade beryllium, PO-3 graphite, and Armco iron. Details of the apparatus used in these measurements are presented in the first report cited below, and the data obtained are presented as basic reference tables and graphs for the first six materials. Detailed data for Armco iron are presented in the second referenced report.

References:

1. Thermal Conductivity, Electrical Resistivity, and Thermopower of Aerospace Alloys from 4° to 300°K, National Bureau of Standards, Report 9732, June 1969.
2. Thermal Conductivity Standard Reference Materials from 4° to 300°K. I. Armco Iron, National Bureau of Standards, Report 9740, August 1969.

Note:

Reprints of the above reports can be obtained from:

Technology Utilization Officer
AEC-NASA Space Nuclear
Propulsion Office
U.S. Atomic Energy Commission
Washington, D.C. 20545
Reference: B70-10310

Patent status:

No patent action is contemplated by the AEC or NASA.

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under contract to
Space Nuclear Propulsion Office
(NUC-10555 & -10556)

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