U. S. Department of Commerce
Frederick B. Dent
Secretary

National Bureau of Standards
Richard W. Roberts, Director

National Bureau of Standards Certificate

Standard Reference Material 734

Thermal Conductivity - Electrolytic Iron

J. G. Hust and P. J. Giarratano

Thermal Conductivity (λ) as a Function of Temperature
(6 to 1000 K)

T(K)	λ(W·m^{-1}·K^{-1})	T(K)	λ(W·m^{-1}·K^{-1})	T(K)	λ(W·m^{-1}·K^{-1})	T(K)	λ(W·m^{-1}·K^{-1})
6	38.8	55	160	160	92.0	600	53.7
7	45.3	60	153	170	90.3	650	50.2
8	51.8	65	145	180	88.9	700	47.2
9	58.2	70	139	190	87.5	750	44.5
10	64.7	75	132	200	86.2	800	42.1
12	77.4	80	127	220	84.0	850	39.5
14	89.7	85	122	240	82.3	900	37.2
16	101	90	117	260	80.8	950	34.8
18	113	95	114	280	79.3	1000	32.5
20	123	100	110	300	77.1		
25	146	110	105	350	72.0		
30	162	120	101	400	67.5		
35	171	130	98.3	450	63.9		
40	173	140	95.8	500	60.3		
45	171	150	93.8	550	57.0		
50	167						

The technical and support aspects involved in the preparation, certification and issuance of this Standard Reference Material were coordinated through the Office of Standard Reference Materials by R. E. Michaelis.

Washington, D. C. 20234
April 29, 1975

J. Paul Cali, Chief
Office of Standard Reference Materials

(Revision of certificate dated 6-14-71 to extend temperature range from 280 to 1000 K)

(over)

This SRM is available in the form of rods in several sizes. SRM 734-S is 0.64 cm in diameter and 30 cm long. SRM's 734 L1 and 734-L2 are 3.17 cm in diameter and 15 and 30 cm long, respectively Longer continuous lengths can be obtained by special order.

Measurements

Low temperature (below ambient) characterization data consist of thermal conductivity electrical resistivity, and thermopower measurements on one specimen; liquid helium and ice point electrical resistivity measurements on about 20 specimens in various states of heat treatment; and other characterization data such as hardness, grain size, density, and composition [1]. The homogeneity of this lot of electrolytic iron was determined to be excellent for an SRM of thermal conductivity. These measurements indicate that the effect of material variability on thermal conductivity is no larger than ±1%.

High temperature (above ambient) data presented by Fulkerson et al. [2] on an iron similar to this electrolytic iron, along with Lorenz ratio correlations with ingot iron were used as a basis for the recommended values above 300 K. The low temperature NBS data were correlated with the high-temperature data to produce the smoothed certified values of thermal conductivity.

The estimated uncertainties of the certified values, including material variability are: 2.5% below 280 K and 3% above 280 K.

[1] J. G. Hust and P. J. Giarratano, Standard Reference Materials: Thermal Conductivity and Electrical Resistivity Standard Reference Materials: Electrolytic Iron, SRM's 734 and 797 from 4 to 1000 K, Nat. Bur. Stand. Special Publication 260 60 (1975).

[2] W. Fulkerson J. P. Moore, and D. L. McElroy, Comparison of the Thermal Conductivity, Electrical Resistivity and Seebeck Coefficient of a High Purity Iron and an Armco Iron to 1000 °C, J. Appl. Phys. 37 No. 7, 2639-2653 (1966)