

Certificate
STANDARD REFERENCE MATERIAL 740
Zinc
Freezing Point on the
International Practical Temperature Scale (1968)
419.58 °C

The temperature given above is the value assigned to the freezing point of pure zinc as one of the defining fixed points on the International Practical Temperature Scale of 1968. The fixed point is realized as the plateau temperature (or liquidus point) on the freezing curve of slowly frozen high-purity zinc.

The zinc for this standard is of exceptional purity with the total of all other elements that affect the freezing point less than one part per million. Based on samples tested, the temperature range of melting for the bulk material is not expected to exceed 0.001 degree. Plateau temperatures for samples of this material are not expected to differ from one another by more than about 0.0002 degree, and by not more than 0.001 degree from the assigned temperature.

Further information on temperature scales and metal freezing points may be found in [1] "The International Practical Temperature Scale of 1968," *Metrologia*, Vol. 5, p. 35 (April 1969), and [2] McLaren, E. H., "The Freezing Points of High-Purity Metals and Precision Temperature Standards" *Temperature, its Measurement and Control in Science and Industry*, Vol. 3, Part 1, Reinhold Publishing Corp., New York, N. Y. (1962).

The zinc metal for the preparation of this standard reference material was obtained from Cominco American Incorporated of Spokane, Washington. Evaluation of purity and homogeneity were performed in the NBS Institute for Materials Research by Robert Powell of the Cryogenic Properties of Solids Section and by Robert Alvarez and Paul Paulsen of the Spectrochemical Analysis Section. Temperature studies were performed in the NBS Institute for Basic Standards by John P. Evans of the Temperature Section.

Washington, D. C. 20234
February 19, 1970

J. Paul Cali, Acting Chief
Office of Standard Reference Materials

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SUPPLEMENTARY INFORMATION
PREPARATION, TESTING, AND HANDLING OF HIGH-PURITY
ZINC FREEZING POINT MATERIAL

PREPARATION: The zinc was prepared to obtain material of the highest possible purity and homogeneity.

1. The starting material was a carefully selected lot of electrolytic special high-grade zinc (99.99+).
2. Processes included vacuum distillation, zone refining, and homogenization.
3. Analytical control was maintained throughout the entire preparation.
4. The final bars (about two feet long) were individually sealed in argon filled polyethylene bags.

TESTING: Selected samples were taken for testing which were representative of the entire lot.

1. Testing initially was performed by optical emission and spark source mass spectroscopic procedures and by resistivity ratio measurements. As a result of this testing the material tentatively was accepted both from the homogeneity and composition standpoints.
2. Finally thermal analysis of selected samples was performed to determine the suitability of the material for the freezing point standard. Based on the samples tested, the temperature range of melting for the bulk material is not expected to exceed 0.001 degree, and by not more than 0.001 degree from the assigned temperature of 419.58 °C.

HANDLING: Any handling procedures on ultra high-purity material are apt to introduce contamination. The procedures which follow were established to minimize contamination particularly with respect to the elements that could affect the freezing point measurements.

1. The zinc bars were cut dry with a carbide tipped cutter (to form 350g bar sections) in such a way that only the carbide tip touched the zinc metal. At no time were the zinc bars touched by hand (polyethylene gloves were used), and at no time were the bars in contact with any part of the milling machine other than through the polyethylene cover.
2. Following cutting, the samples were acid cleaned in high-purity dilute nitric acid, rinsed with distilled water, and then air dried.
3. Individual samples were bagged in polyethylene and sealed.

SHOULD ANY CUTTING OF THE SAMPLES BE REQUIRED OR SHOULD ANY CONTAMINATION BE SUSPECTED, IT IS RECOMMENDED THAT THE APPROPRIATE HANDLING PROCEDURES DESCRIBED ABOVE BE EMPLOYED JUST PRIOR TO USE.