National Institute of Standards & Technology

Certificate

Standard Reference Material 2221a

Temperature and Enthalpy of Fusion - Zinc

Standard Reference Material (SRM) 2221a is intended for use in calibrating differential scanning calorimeters, differential thermal analyzers, and similar instruments. This SRM consists of a foil sample of high purity (99.9999+ percent) zinc, (relative atomic mass = 65.38). The fusion temperature and enthalpy of fusion of SRM 2221a were measured by an absolute enthalpic technique using a high-precision, method-of-mixtures, phase-change calorimeter [1,2,3]. The certified fusion temperature and enthalpy of fusion for SRM 2221a are:

Fusion Temperature[a]	Enthalpy of Fusion
692.74 ± 0.01 K	**7026 ± 40 J/mol**

[a]Premelting was observed to start at a temperature approximately 0.06 K below the fusion temperature. This observed temperature, **692.68 ± 0.01 K**, corresponding to the onset of premelting is recommended to be used as the **DSC Calibrating Temperature** for use with precision equipment capable of resolving temperatures to 0.01 K. Temperatures are given on ITPS-68.

The certified values are derived from 29 enthalpy measurements in the temperature range from 594 to 743 K, spaced to adequately define the solid and liquid enthalpy functions of zinc as well as the fusion temperature. Measurements were made on two specimens of zinc foil of mass 15.4 and 22.1 grams, chosen from the analyzed lot of SRM 2221a. The uncertainties assigned are three times the estimated standard error of the certified quantities and are derived from estimated temperature and heat-measurement errors.

The absolute enthalpic measurements and data analysis were performed by D.A. Ditmars of the NIST Chemical Thermodynamics Division.

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

Gaithersburg, MD 20899
September 15, 1989

Stanley D. Rasberry, Chief
Office of Standard Reference Materials

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Materials Specifications: SRM 2221a is made from zinc foil (2.5 cm wide × 609.6 cm long × 0.127 mm thick). The supplier (Cominco Electronic Materials, Spokane, WA) processed this foil from CEMI Lot No. F23846, for which a purity of 99.9999+ percent was documented. The SRM consists of a 25.5-mm square of the foil from which specimens can be easily cut. The SRM unit supplied will provide approximately sixty-four 8-mg test samples.

References:

1. Ditmars, D.A., "Phase-change calorimeter for measuring relative enthalpy in the temperature range 273.15 to 1200 K," in Compendium of Thermophysical Property Measurement Methods, Volume II, Plenum, NY, 1989.
2. Ditmars, D.A., "Heat-capacity calorimetry by the method of mixtures," in Compendium of Thermophysical Property Measurement Methods, Volume I, Plenum, NY, 1984.
3. Douglas, T.B., and King, E.G., "High-temperature drop calorimetry", Chapter 8 in Experimental Thermodynamics, Volume I, Calorimetry of Non-Reacting Systems, p. 293, J.P. McCullough and D.W. Scott, Eds. (Butterworths, London, 1968). See also NBS Special Publication No. 300, Volume 6, p. 181 (1970).