

Reference Material 8173

Lead Freezing-Point Reference (327.453 °C)

REFERENCE MATERIAL INFORMATION SHEET

Purpose: Reference Material (RM) 8173 is intended primarily for use as a reference point to enable laboratories to compare their present realization of a temperature scale at the lead freezing point with NIST's historical realizations of the International Practical Temperature Scale of 1948 (IPTS-48) circa October 4, 1965, the International Practical Temperature Scale of 1968 (IPTS-68) [1] circa December 6, 1971, and the International Temperature Scale of 1990 (ITS-90) [2] circa April 5, 1990, where these dates correspond to the dates on the certificates initially provided with SRM 49e and when SRM 49e was updated for the transition from IPTS-48 to IPTS-68 and IPTS-68 to ITS-90.

Description: RM 8173 was previously offered as Standard Reference Material (SRM) 49e, initially made available in 1965, with the certificate updated once in 1971 and again in 1990 [3]. SRM 49e no longer meets international quality standards (ISO 17034) for serving as a certified reference material [4,5]. The remaining inventory of SRM 49e is being offered instead as RM 8173. A unit of RM 8173 consists of a 600 gram bar of a carefully selected lot of electrolytic special high-grade lead procured before SRM 49e was initially released around October 4, 1965.

Non-Certified Values: The freezing-point temperature of 327.453 °C is relative to the International Temperature Scale of 1990. It is estimated that the uncertainty does not exceed ± 0.005 °C.

The freezing-point temperature relative to the International Practical Temperature Scale of 1968 (IPTS-68) is 327.493 °C, with an uncertainty of ± 0.005 °C.

The freezing-point temperature relative to the International Practical Temperature Scale of 1948 (IPTS-48) is 327.417 °C, with an uncertainty of ± 0.005 °C.

Period of validity: The non-certified values are valid indefinitely within the measurement uncertainties specified, provided the RM is handled and stored in accordance with instructions given in this Reference Material Information Sheet (RMIS). This RMIS is nullified if the RM is stored or used improperly, damaged, contaminated, or otherwise modified.

Maintenance of Non-Certified Value: NIST will continue to monitor this material under the period of validity. NIST will notify the purchaser if substantive technical changes occur that affect the information in this information sheet. Registration (see attached sheet or register online) will facilitate notification.

Storage: The original unopened container should be stored and handled in a clean laboratory environment. Every effort should be made to maintain the purity of this RM through the minimization of handling. Any handling should be done while wearing polyethylene gloves and a face mask.

Use: The user of this material should be familiar with best practices in the operation and handling of metal freezing-point temperature standards and particularly lead freezing point standards [6–8].

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REFERENCES

- [1] Comité International de Poids et Mesures; *The International Practical Temperature Scale of 1968*; Metrologia, Vol. 5(2), pp. 35-44 (1969).
- [2] Preston-Thomas, H.; *The International Temperature Scale of 1990 (ITS-90)*; Metrologia, Vol. 27, pp. 3-10 (1990).
- [3] SRM 49e; *Lead (Melting Point or Freezing Point on the International Temperature Scale)*; National Institute of Standards and Technology; U.S. Department of Commerce: Gaithersburg, MD (05 April 1990) available at https://www-s.nist.gov/srmors/view_detail.cfm?srn=49E (accessed Mar 2021).
- [4] ISO 17034:2016; General Requirements for the Competence of Reference Material Producers; International Standards Organization (2016).
- [5] Beauchamp, C.R.; Camara, J.E.; Carney, J.; Choquette, S.J.; Cole, K.D.; DeRose, P.C.; Duewer, D.L.; Epstein, M.S.; Kline, M.C.; Lippa, K.A.; Lucon, E.; Phinney, K.W.; Polakoski, M.; Possolo, A.; Sharpless, K.E.; Sieber, J.R.; Toman, B.; Winchester, M.R.; Windover, D.; *Metrological Tools for the Reference Materials and Reference Instruments of the NIST Materials Measurement Laboratory*; NIST Special Publication (NIST SP) 260-136, 2020 Edition; U.S. Government Printing Office: Washington, DC (2020); available at <https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.260-136-2020.pdf> (accessed Mar 2021).
- [6] Furukawa, G.T.; Riddle, J.L.; Bigge, W.; Pfeiffer, E.R.; *Standard Reference Materials: Application of Some Metal SRM's as Thermometric Fixed Points*; NIST Special Publication 260-77 (1982); available at <https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nbsspecialpublication260-77.pdf> (accessed Feb 2021).
- [7] Evans, J.P.; Wood, S.D.; *An Intercomparison of High Temperature Platinum Resistance Thermometers and Standard Thermocouples*; Metrologia, Vol 7, pp. 108–130 (1971).
- [8] Mangum, B.W.; Furukawa, G.T.; *Guidelines for Realizing the International Temperature of 1990 (ITS-90)*; NIST Technical Note 1265 (1990) available at: <https://nvlpubs.nist.gov/nistpubs/Legacy/TN/nbstechnicalnote1265.pdf> (accessed Mar 2021).

Certain commercial equipment, instruments, or materials may be identified in this Reference Material Information Sheet to adequately specify the experimental procedure. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the materials or equipment identified are necessarily the best available for the purpose.

Users of this RM should ensure that the Reference Material Information Sheet in their possession is current. This can be accomplished by contacting the Office of Reference Materials 100 Bureau Drive, Stop 2300, Gaithersburg, Maryland 20899-2300; telephone (301) 975-2200; e-mail srminfo@nist.gov; or via the Internet at <https://www.nist.gov/srm>.

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