National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material® 1265a

Electrolytic Iron
(disk form)

This Standard Reference Material (SRM) is high-purity, electrolytic iron intended primarily for evaluation of methods for analysis of elements in steel alloys of similar composition. It can be used to validate value assignment of in-house reference materials. A unit of SRM 1265a consists of a disk that is 31 mm diameter and 19 mm thick.

Certified Mass Fraction Values: Certified values for constituents in SRM 1265a are provided in Table 1 as mass fractions of the total amounts of the elements in iron metal [1]. A NIST certified value is a value for which NIST has the highest confidence in its accuracy, in that all known or suspected sources of bias have been taken into account [2]. A certified value is the present best estimate of the true value. The certified values are metrologically traceable to the derived SI unit of mass fraction, expressed in percent (%). The uncertainty listed with each value is a combined standard uncertainty (not expanded), expressed at an approximate confidence level of 68 %, and calculated following the JCGM Guide [3]. Based on results of homogeneity testing, maximum variations within and among samples are estimated to be less than the uncertainty estimates given in Table 1.

Table 1. Certified Mass Fraction Values for SRM 1265a Electrolytic Iron

Elements	Mass Fraction (%)	Combined Standard Uncertainty (%)
Boron (B)	0.00013	0.00001
Carbon (C)	0.0067	0.0003
Chromium (Cr)	0.0072	0.0005
Cobalt (Co)	0.0070	0.0005
Copper (Cu)	0.0058	0.0001
Lead (Pb)	0.000015	0.000005
Manganese (Mn)	0.0057	0.0001
Molybdenum (Mo)	0.0050	0.0001
Nickel (Ni)	0.041	0.001
Phosphorus (P)	0.0011	0.0001
Silicon (Si)	0.0080	0.0005
Sulfur (S)	0.0055	0.0003
Vanadium (V)	0.0006	0.0001

Expiration of Certification: The certification of **SRM 1265a** is valid indefinitely, within the measurement uncertainties specified, provided the SRM is handled and stored in accordance with the instructions given in this certificate (see "Instructions for Handling, Storage, and Use"). Periodic recalibration or recertification of this SRM is not required. The certification is nullified if the SRM is damaged, contaminated or otherwise modified.

Maintenance of SRM Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate notification.

Carlos A. Gonzalez, Chief
Chemical Sciences Division

Gaithersburg, MD 20899
Certificate Revision Date: 26 July 2019
Certificate Revision History on Last Page

Steven J. Choquette, Director
Office of Reference Materials

Coordination of technical measurements leading to certification was performed by K.F.J. Heinrich, O. Menis, B.F. Scribner, J.I. Schultz, and J.L. Weber, Jr. Additional technical support was provided by J.R. Sieber of the NIST Chemical Sciences Division.

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

INSTRUCTIONS FOR HANDLING, STORAGE, AND USE

The test surface is the side opposite to the labeled surface, which has the SRM number. The entire thickness of the unit is certified. Each packaged disk has been prepared by finishing the test surface using a milling machine. The user must determine the correct surface preparation procedure for each analytical technique. The user is cautioned to use care when either resurfacing the disk or performing additional polishing as these processes may contaminate the surface. The material should be stored in its original container in a cool, dry location.

PREPARATION, TESTING, AND ANALYSIS[1]

The material for SRM 1265a was vacuum melted and cast at the Carpenter Technology Corp. (Reading, PA). The contract was made possible by a grant from the American Iron and Steel Institute (Washington, DC). The ingots were processed to provide material of the highest possible homogeneity and supplied to NIST in the form of rods. Following acceptance of the composition based on NIST analyses, selected portions of the ingot material were extensively tested for homogeneity at NIST. Only material meeting a critical evaluation was processed to the final size. Chemical analyses for certification were made on composite samples representative of the accepted lot of material.

Analytical measurements were performed by R. Alvarez, J.R. Baldwin, E. Belkas, D.M. Bouchette, D.E. Brown, B.S. Carpenter, M.M. Darr, E.R. Deardorff, B.I. Diamondstone, E.L. Garner, T.E. Gills, L.A. Machlan, L.T. McClendon, E.J. Maienthal, L.J. Moore, C.W. Mueller, T.J. Murphy, J.A. Norris, P.J. Paulson, P.A. Pella, S.D. Rasberry, K.M. Sappenfield, J.R. Sieber, B.A. Thompson, J.L. Weber, Jr., and S.A. Wicks of the NIST Chemical Sciences Division. Additional analyses were performed by R.L. LeRoy and J.F. Woodruff of collaborating laboratory Armco Steel.

Renewal SRMs 1261a through 1265a were prepared from the same ingots as the original series, but from adjacent positions within the ingots. Little or no change in elemental composition was observed by comparison analysis utilizing several analytical techniques: optical emission spectrometry, X-ray fluorescence spectrometry, and combustion with infrared detection.

NOTICE TO USERS

NIST strives to maintain the SRM inventory supply, but NIST cannot guarantee the continued or continuous supply of any specific SRM. Accordingly, NIST encourages the use of this SRM as a primary benchmark for the quality and accuracy of the user's in-house reference materials and working standards. As such, the SRM should be used to validate the more routinely used reference materials in a laboratory. Comparisons between the SRM and in-house reference materials or working measurement standards should take place at intervals appropriate to the conservation of the SRM and the stability of relevant in-house materials. For further guidance on how this approach can be implemented, contact NIST by email at srms@nist.gov.

ADDITIONAL CONSTITUENTS: Noncertified values are provided for the following additional constituents in SRM 1265a.

Information Mass Fraction Values: Information values for constituents of SRM 1265a are reported in Table 2 as mass fractions of the total elements in a steel matrix. An information value is a value that may be of interest to the SRM user, but insufficient information is available to assess the uncertainty associated with the value [2]. Information values cannot be used to establish metrological traceability.

[1] Certain commercial equipment, instruments or materials are identified in this certificate 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.

Table 2. Information Values for SRM 1265a Electrolytic Iron

Elements	Mass Fraction (%)	Elements	Mass Fraction (%)
Aluminum (Al)	0.0007	Oxygen (O)	0.0063
Antimony (Sb)	< 0.00005	Silver (Ag)	0.000002
Arsenic (As)	0.0002	Tin (Sn)	0.0002
Germanium (Ge)	0.0014	Titanium (Ti)	0.0001
Hydrogen (H)	< 0.0005	Tungsten (W)	0.00004
Iron (Fe)	99.9	Zinc (Zn)	< 0.0001
Nitrogen (N)	0.0011		

Table 3 contains additional information for elements which were sought, but not detected using the listed test methods.

Table 3. Elements Sought in SRM 1265a, but not Detected by the Indicated Test Methods

Elements	Upper Limit (mg/kg)	Test Method
Bismuth (Bi)	< 0.1	Spark Source Mass Spectrometry
Calcium (Ca)	< 0.1	Atomic Absorption Spectrometry
Cerium (Ce)	< 0.05	Spark Source Mass Spectrometry
Gold (Au)	< 0.02	Neutron Activation Analysis
Hafnium (Hf)	< 0.2	Spark Source Mass Spectrometry
Lanthanum (La)	< 0.05	Spark Source Mass Spectrometry
Magnesium (Mg)	< 0.2	Atomic Absorption Spectrometry
Neodymium (Nd)	< 0.05	Spark Source Mass Spectrometry
Praseodymium (Pr)	< 0.05	Spark Source Mass Spectrometry
Selenium (Se)	< 0.1	Spark Source Mass Spectrometry
Tantalum (Ta)	< 0.5	Neutron Activation Analysis
Tellurium (Te)	< 0.1	Spark Source Mass Spectrometry
Zirconium (Zr)	< 0.1	Spark Source Mass Spectrometry

REFERENCES

[1] Thompson, A.; Taylor, B.N.; Guide for the Use of the International System of Units (SI); NIST Special Publication 811; U.S. Government Printing Office: Washington, DC (2008); available at https://www.nist.gov/pml/pubs/sp811/index.cfm (accessed July 2019).

[2] May, W.; Parris, R.; Beck II, C.; Fassett, J.; Greenberg, R.; Guenther, F.; Kramer, G.; Wise, S.; Gills, T.; Colbert, J.; Gettings, R.; MacDonald, B.; Definition of Terms and Modes Used at NIST for Value-Assignment of Reference Materials for Chemical Measurements; NIST Special Publication 260-136 U.S. Government Printing Office: Washington, DC (2000); available at https://www.nist.gov/srm/upload/SP260-136.PDF (accessed July 2019).

[3] JCGM 100:2008; Evaluation of Measurement Data - Guide to the Expression of Uncertainty in Measurement; (GUM 1995 with Minor Corrections), Joint Committee for Guides in Metrology (JCGM) (2008); available at https://www.bipm.org/utils/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed July 2019); see also Taylor, B.N.; Kuyatt, C.E.; Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results; NIST Technical Note 1297, U.S. Government Printing Office: Washington, DC (1994); available at https://www.nist.gov/pml/nist-technical-note-1297 (accessed July 2019).

Certificate Revision History: 26 July 2019 (Editorial changes); 12 June 1989 (Editorial changes); 24 February 1981 (Original certificate date).

Users of this SRM should ensure that the Certificate of Analysis in their possession is current. This can be accomplished by contacting the Office of Reference Materials: telephone (301) 975-2200; fax (301) 948-3730, email srminfo@nist.gov; or via the Internet at https://www.nist.gov/srm.