National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material® 1768

High-Purity Iron

(In Cooperation with ASTM International)

This Standard Reference Material (SRM) is a high-purity iron disk. SRM 1768 is intended for use in optical emission and X-ray spectrometric methods of analysis. A unit of SRM 1768 consists of a disk approximately 31 mm (l.2 in) in diameter and 19 mm (0.75 in) thick.

Certified Mass Fraction Values: Certified values for 10 elements are provided in Table 1. For all elements, values are reported as mass fractions [1]. Value assignment categories are based on the definition of terms and modes used at NIST for chemical reference materials [2]. 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 investigated or taken into account. A certified value is currently the best estimate of the true value based on the results of analyses performed at NIST and collaborating laboratories using instrumental and classical test methods.

Information Values: Information values for 21 elements are provided in Table 2. An information value is considered to be a value that will be of use to the SRM user, but insufficient information is available to assess the uncertainty associated with the value.

Expiration of Certification: The certification of **SRM 1768** is valid indefinitely, within the uncertainty specified, provided the SRM is handled and stored in accordance with the instructions given in this certificate (see "Instructions for Use"). However, the certification will be 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 before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet) will facilitate notification.

The overall coordination of the technical measurements leading to certification was performed under the direction of J.I. Shultz, Research Associate, ASTM/NIST Research Associate Program.

The material for this SRM was provided under a contract with T.R. Linde formally of NIST. Homogeneity testing was performed at NIST by J.A. Norris formally of National Bureau of Standards (NBS).

Support aspects involved in the issuance of this SRM were coordinated through the NIST Measurement Services Division.

Stephen A. Wise, Chief
Analytical Chemistry Division

Gaithersburg, MD 20899
Certificate Issue Date: 25 October 2011
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Robert L. Watters, Jr., Chief
Measurement Services Division

INSTRUCTIONS FOR USE

The test surface is the side opposite from the labeled surface, which includes the SRM number. The entire thickness of the unit is certified. However, the user is cautioned not to measure disks less than 2 mm thick when using X-ray fluorescence spectrometry. 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. It was found by NIST that abrasive paper must be changed frequently during surface grinding. Used paper loses its ability to remove contaminants from the surface of the steel. When not in use, the material should be stored in its original container in a cool, dry location. This material was tested using both the solid disks and chips prepared from the disks. The certified values are considered to be representative of the overall average composition of the material.

VALUE ASSIGNMENT

The analytical methods used for measurement of each element are listed in Table 3. The estimated uncertainty listed for an element is based on judgment and represents an evaluation of the combined effects of method imprecision, possible systematic errors among methods, and material variability. No attempt was made to derive exact statistical measures of imprecision because several methods were involved in the determination of most elements.

Table 1. Certified Values for SRM 1768

Element	Mass Fraction (%)
Aluminum	0.0024 ± 0.0003
Carbon	0.0010 ± 0.0002
Cobalt	0.0025 ± 0.0004
Copper	0.0006 ± 0.0001
Manganese	0.0014 ± 0.0005
Nickel	0.0014 ± 0.0004
Nitrogen	0.002 ± 0.001
Oxygen	0.036 ± 0.003
Phosphorus	0.0013 ± 0.0004
Sulfur	0.0003 ± 0.0001

Table 2. Information Mass Fraction Values for SRM 1768

Element	Concentration (in µg/g)	Element	Concentration (in µg/g)
Antimony	<1.0	Niobium	<5.0
Arsenic	<1.0	Selenium	<1.0
Bismuth	<4.0	Silicon	<10.0
Boron	<2.0	Tantalum	<1.0
Cadmium	<1.0	Tellurium	<1.0
Calcium	<1.0	Tin	<1.0
Chromium	<2.0	Titanium	<10.0
Lead	<1.0	Tungsten	<2.0
Magnesium	<6.0	Vanadium	<1.0
Molybdenum	<3.0	Zinc	<1.0
		Zirconium	<1.0

Table 3. Analytical Method Used for Value Assignment

Element	Method
Aluminum	Atomic Absorption Spectrometry, Inductively Coupled Plasma Spectrometry, DC Plasma Spectrometry, Spark Source Mass Spectrometry
Carbon	Combustion-Infrared Detection, Combustion-Conductimetry
Cobalt	Atomic Absorption Spectrometry, Inductively Coupled Plasma Spectrometry, DC Plasma Spectrometry, Spark Source Mass Spectrometry
Copper	Atomic Absorption Spectrometry, Inductively Coupled Plasma Spectrometry, DC Plasma Spectrometry, Spark Source Mass Spectrometry
Manganese	Atomic Absorption Spectrometry, Inductively Coupled Plasma Spectrometry, DC Plasma Spectrometry, Spark Source Mass Spectrometry
Nickel	Atomic Absorption Spectrometry, Inductively Coupled Plasma Spectrometry, DC Plasma Spectrometry, Spark Source Mass Spectrometry
Nitrogen	Spectrophotometry, Combustometric
Oxygen	Combustometric
Phosphorus	Atomic Absorption Spectrometry, Inductively Coupled Plasma Spectrometry, DC Plasma Spectrometry, Spark Source Mass Spectrometry, Spectrophotometry
Sulfur	Combustion-Infrared Detection, Spectrophotometry, Combustion-Titrimetry

Cooperating Laboratories

B. Berglund, AB Sandvik Steel, Sandviken, Sweden
C.K. Deak, Analytical Associates, Inc., Detroit, MI
F.A. Pennington, Jr., R.F. Eakin, J.E. Fickel, M.P. Royer, and S.M. Goldinger, Andrew S. McCreath & Son, Inc., Harrisburg, PA
C.C. Borland, D.E. Gillum, H.P. Vail, G.D. Smith, G.R. Doebler, and T.M. Minor, Armco Research & Technology, Middletown, OH
H. Umans, Hoogovens Groep BV, Ijmuiden, Netherlands
C.L. Maul, E.W. Hobart, and E.P. Kehoe, Ledoux & Co., Teaneck, NJ
L.W. Ollila, Luvak, Inc., Boylston, MA
S. Kasai and M. Saeki, Nippon Steel Corporation, Inspection & Analysis Department, Kimitsu Works, Kawasaki, Japan

REFERENCE

[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 http://www.nist.gov/pml/pubs/sp811/indexfull.cfm (accessed Oct 2011).
[2] May, W.; Parris, R.; Beck, C.; Fassett, J.; Greenberg, R.; Guenther, F.; Kramer, G.; Wise, S.; Gills, T.; Colbert, J.; Gettings, R.; MacDonald, B.; *Definitions 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: Gaithersburg, MD (2000); available at http://www.nist.gov/srm/publications.cfm (accessed Oct 2011)

Certificate Revision History: 25 October 2011 (Corrected units in table 2 from mg/g to µg/g; editorial changes); 05 October 2000 (This revision reflects a correction in disk diameter and editorial changes.); 06 December 1991 (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 SRM Program: telephone (301) 975-6776; fax (301) 926-4751; e-mail srminfo@nist.gov; or via the Internet at http://www.nist.gov/srm.