



National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material[®] 937

Iron Metal

This Standard Reference Material (SRM) is a material of known purity intended for use as an assay standard for iron. SRM 937 consists of electrolytic grade iron to be used primarily for the calibration of instrumentation and standardization of procedures and for the routine evaluation of daily working standards used in these procedures. A unit of SRM 937 consists of 50 g of iron metal in the form of chips sized between 0.5 mm and 1.8 mm mesh.

Iron (Mass Fraction) [1] 99.90 % $\pm$ 0.02 %

The certified value shown is based on dissolution of representative samples in hydrochloric acid followed by reduction of the iron with stannous chloride and oxidation of the excess stannous chloride with mercuric chloride. Most of the iron was oxidized with a known mass of potassium dichromate and the remaining iron was titrated with potassium dichromate solution. The estimated uncertainty shown is based on judgement and includes allowances for known sources of possible error.

Chemical analyses made on representative samples showed the presence of the following elements at the indicated mass fraction (expressed as %): nickel, 0.041 %; silicon, 0.008 %; carbon, chromium, and cobalt, each 0.007 %; copper, manganese, oxygen, and sulfur, each 0.006 %; molybdenum, 0.005 %; phosphorus, 0.003 %; germanium and nitrogen, each 0.001 %; total of all other elements, < 0.003 %.

The iron mass fraction (expressed as %), by difference, is 99.89 + %. This is in agreement with the certified value.

Expiration of Certification: The certification of **SRM 937** is valid, within the measurement uncertainty specified, for ten years from the date of shipment from NIST, provided the SRM is handled and stored in accordance with the instructions given in this certificate (see "Instructions for Use"). The certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

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

The chemical assay was performed by B.I. Diamondstone; the elemental determinations by R. Alvarez, J.R. Baldwin, E. Belkas, B.S. Carpenter, M.M. Darr, E.R. Deardorff, T.E. Gills, L.A. Machlan, E.J. Maienthal, L.J. Moore, C.W. Mueller, T.J. Murphy, P.J. Paulsen, K.M. Sappenfield, B.A. Thompson, and S.A. Wicks, all formerly of NIST.

Overall direction and coordination of the technical measurements leading to certification was under the direction of I.L. Barnes, formerly of the NIST Inorganic Analytical Research Division.

Metrological Traceability: The measurand is the total mass fraction for iron. Metrological traceability is the SI derived unit for mass fraction (expressed as a percent).

This Certificate of Analysis has undergone editorial revision to reflect program and organizational changes at NIST and at the Department of Commerce. No attempt was made to reevaluate the certificate values or any technical data presented on this certificate.

Carlos A. Gonzalez, Chief
Chemical Sciences Division

Gaithersburg, MD 20899
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Certificate Revision History on Last Page

Steven J. Choquette, Acting Director
Office of Reference Materials

NOTICE AND WARNINGS TO USERS

This SRM is intended for research use.

Precautions: All volumetric glassware used should conform to the specification for Class A glassware and should be individually calibrated and used at the calibration temperature [2]. All glassware should be cleaned in hot dilute hydrochloric acid and rinsed in distilled water.

Storage: This SRM should be stored in the tightly closed original bottle under normal laboratory conditions.

INSTRUCTIONS FOR USE

Preparation of Stock Iron Standard Solution (0.02 mol/L): Weigh approximately 1 g of SRM 937 to the nearest 0.1 mg and transfer to a 1 L volumetric flask. Dissolve the metal in 100 mL of hydrochloric acid solution having an amount-of-substance concentration of 6 mol/L. Dilute to 1 L with distilled deionized water.

The amount-of-substance concentration (c_B) [1] of this stock solution, in moles per liter, is expressed by:

$$c(\text{Fe}) = \frac{\text{g}(\text{SRM 937}) \times 0.9990}{55.847} \text{ mol/L}$$

Preparation of Working Stock Iron Standard Solution (0.2 mmol/L): Transfer 10 mL of the stock iron standard solution to a 1 L volumetric flask and dilute to volume with hydrochloric acid solution having an amount-of-substance concentration of 0.2 mol/L.

Preparation of Working Iron Standard Solutions: Prepare more dilute solutions by pipetting known volumes of the working stock iron standard solution into volumetric flasks and diluting to volume with 0.2 mol/L hydrochloric acid. These solutions should be prepared daily. [Note: In the preparation of very dilute solutions, the 0.2 mol/L hydrochloric acid may contain sufficient iron, as an impurity, to affect the calculated iron concentrations of these dilute solutions.]

REFERENCES

- [1] Thompson, A.; Taylor, B.N.; Kuyatt, C.E.; *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/index.cfm> (accessed Feb 2016).
- [2] Lembeck, J.; *The Calibration of Small Volumetric Laboratory Glassware*; NBSIR 74-461, National Bureau of Standards, U.S. Government Printing Office: Washington, D.C.

Certificate Revision History: 10 February 2016 (Editorial changes); 28 September 1995 (Editorial changes); 09 June 1978 (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) 975-2200; fax (301) 948-3730; e-mail srminfo@nist.gov; or via the Internet at <http://www.nist.gov/srm>.