

National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan



Reference Material Certificate

NMIJ CRM 1016-a

No. +++

Iron-chromium Alloy (Cr40%)



This certified reference material (CRM) was produced in accordance with the NMIJ's management system and in compliance with JIS Q 0034 (ISO GUIDE 34). This CRM is intended for use in the calibration of the concentration of elements during the fluorescent X-ray analysis (XRF) of Cr and Fe in Cr(40 %)-Fe alloys and the evaluation of effect of the secondary fluorescence excitation.

Certified Values

The certified values for Cr and Fe in this CRM are given in the following table. The uncertainty of the certified value is the half-width of the expanded uncertainty interval calculated using a coverage factor (k) of 2, which gives a level of confidence of approximately 95 %.

	Certified value (Mass Fraction)	Expanded uncertainty (Mass Fraction)
Cr	39.48 %	0.083 %
Fe	60.10 %	0.42 %

Analytical Methods

This standard substance (40 pieces) was cut out from a plate-like raw material, but at the same time, columnar samples was cut out separately from 6 points so as to represent the whole raw material. Sample pieces were taken from each of these six columnar samples, and six sample pieces were measured by the titration method, and four sample pieces were measured by isotope dilution mass spectrometry. The mass fraction (%) of chromium is based on the result of measuring 6 samples by the titration method (39.478 ± 0.072) and the result of measuring the 4 samples by isotope dilution mass spectrometry (39.48 ± 0.14). The mass fraction (%) of iron is based on the result of measuring 4 samples by isotope dilution mass spectrometry. For atomic weights, the values of IUPAC's atomic weight table (2001) were used. The extended uncertainties of the certified values include fluctuations based on homogeneity when measuring a range of 10 mm in diameter by X-ray fluorescence analysis.

Metrological Traceability

The certified values were determined by titration as a primary method of measurement with NMIJ primary standard solutions of Ni and Fe. It is traceable to the International System of Units (SI).

Expiration of Certification

The certification of this CRM is valid until July 27, 2018, provided that the CRM is stored in accordance with the instructions given in this certificate.

Sample Form

The form of this CRM is a metal disk with a diameter of 30 and a thickness of 6 mm and kept in a plastic container.

Homogeneity

The homogeneity of this standard was evaluated by measuring chromium by fluorescent X-ray analysis for all 40 pieces of this CRM. As a result, since the standard deviation of the mass fraction of chromium (in a single sample) in the measuring range of 10 mm in diameter was 0.014% (mass fraction), fluctuation based on homogeneity of this standard substance was sufficiently

smaller than the measurement uncertainty of the analytical method and the homogeneity of this standard was confirmed. The certified value and the expanded uncertainty of this standard is a value for the specimen surface wider than 0.8 cm². When the homogeneity is measured in the measurement range of 3 mm in diameter, the standard deviation of the mass fraction of chromium (relative to a single sample) is 0.021% (mass fraction). In this case, expanded uncertainty of the mass fraction of chromium is 0.090% (mass fraction), which is an uncertainty for the specimen surface wider than 0.07 cm².

Instructions for Storage

This CRM should be stored in a sealed state at room temperature, so that the CRM is not affected by acid or alkali.

Instructions for Use

When placing the disk so that the characters engraved on the side of the disk can be read in a natural orientation, the upper side can be used for fluorescent X-ray analysis as it is.

Precautions for Handling

Refer to the safety data sheet (SDS) on this CRM before use.

Preparation Method

This CRM was made by Sumitomo Metal Technology, Inc.

Information

Using monochromatic X-ray excited fluorescent X-ray analysis under development at our laboratory as a new SI-traceable analytical method; analytical results of mass fractions for chromium and iron are $(39.49 \pm 0.93) \%$ and $(59.99 \pm 0.79) \%$ respectively. The numerical values following the sign (\pm) are the extended uncertainties determined from the synthesis standard uncertainty and the inclusion factor $k = 2$. Uncertainty will be improved if more accurate mass absorption coefficient, fluorescence yield, etc. are actually measured.

NMIJ Analysts

Technical managers for this CRM are M. Kurahashi. The production manager is A. Hioki. The analysts are A. Hioki, N. Nonose and M. Kurahashi.

Technical Information

Customer registration on the NMIJ Website (given below) will facilitate notification of any revisions of the information given above. Technical reports regarding this CRM can be obtained from the contact details given below.

Reproduction of Certificate

In reproducing this certificate, it should be clearly indicated that the document is a copy.

April 1, 2015

Ryoji Chubachi
President

National Institute of Advanced Industrial Science and Technology

If you have any questions about this CRM, please contact:
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National Metrology Institute of Japan,
Center for Quality Management of Metrology, Reference Materials Office,
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Revision history

March 12, 2008: The limit of validity of the certificate was extended from “July 28, 2003” to “July 28, 2018.”

April 1, 2015: “Metrology Management Center” was renamed to “Center for Quality Management of Metrology.”

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