

National Institute of Advanced Industrial Science and Technology

## National Metrology Institute of Japan



## Reference Material Certificate

NMIJ CRM 1001-a  
 NMIJ CRM 1002-a  
 NMIJ CRM 1003-a  
 NMIJ CRM 1004-a  
 NMIJ CRM 1005-a

No. +++



## Fe-Cr alloy Reference Material

This certified reference material (CRM) is produced in accordance with the NMIJ's management system and is in compliance with ISO 17034 and ISO/IEC 17025. This CRM is intended for use in the calibration of the concentration of elements during the electron probe micro analyzer (EPMA) analysis of Cr in Fe-Cr alloy.

**Certified Values**

The certified values for Cr (CAS No. 7440-47-3) in these CRM are given in the table below. The uncertainty of the certified value is the expanded uncertainty obtained by multiplying the combined standard uncertainty by a coverage factor ( $k$ ) of 2, and it is the half-width of an interval estimated to have a level of confidence of approximately 95 %.

CRM No.	Certified value, Mass fraction (%)	Expanded uncertainty, Mass fraction (%)
NMIJ CRM 1001-a	5.00	0.02
NMIJ CRM 1002-a	14.96	0.04
NMIJ CRM 1003-a	19.87	0.04
NMIJ CRM 1004-a	29.84	0.08
NMIJ CRM 1005-a	39.69	0.13

**Analysis**

The certified values of this CRM were based on the results of the following analytical methods:

- (1) Titration analysis
- (2) EPMA analysis

(accelerating voltage: 20 kV, beam diameter: 1.1  $\mu\text{m}$ )

The characteristic value was determined by titration analysis. The standard uncertainty for the certified value of this CRM includes the uncertainty due to titration analysis, the uncertainty due to EPMA analysis and the homogeneity between specimens determined by titration analysis.

**Metrological Traceability**

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

**Expiration of Certification**

This certificate is valid for one year from the date of shipment, provided that the material is stored in accordance with the instructions given in this certificate.

Date of Shipment: XXXXX XX, 20XX

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### **Description of the material**

These CRMs are in the form of rectangular tip with 4 mm x 10 mm x 15 mm, kept in a plastic container.

### **Homogeneity**

The homogeneity of these CRM was determined by analyzing 6 specimens selected randomly from 130 specimens using the titration analysis and EPMA analysis (5 times at each 20 randomly selected points). The variance between specimens is reflected in the uncertainty of the certified values.

### **Instructions for Storage**

The CRM should be kept in dry and clean atmosphere such as desiccator at a temperature between 5 °C and 35 °C.

### **Instructions for Use**

When used for EPMA measurement, use mirror polished surface. From the viewpoint of homogeneity, the certified value of this standard substance is a value representing the whole sample. When using for EPMA measurement, point analysis should be performed for multiple positions and the average value should be used.

### **Precautions for Handling**

In order to avoid surface contamination of the CRM, appropriate tools such as clean gloves and tweezers should be used in handling. Refer to the safety data sheet (SDS) on this CRM before use.

### **Preparation**

This CRM was made by Sumitomo Metal Technology, Inc. High purity electrolytic chromium and iron were mixed. High purity graphite carbon was added to avoid a formation of oxide. The specimens were produced from several procedures (dissolution by induction furnace in vacuum, hot forging, hot rolling and annealing).

### **NMIJ Analysts**

The technical manager for this CRM is KOJIMA I., the production manager for this CRM is TERAUCHI S., and the analysts are HIOKI A., TERAUCHI S. and UMEHARA H.

### **Information**

If substantive technical changes occur that affect the certification before the expiration of this certificate, NMIJ will notify the registered customers. Customer registration on the NMIJ Website (given below) will facilitate notification. 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.

### **Note**

Development of this CRM is based on the results of the research "Development of reference material preparation technology for ferrous alloys used for Quantitative analysis method of EPMA (Fiscal Year 2000 - 2001)" conducted at the Osaka Science and Technology Center. This research was involved in the research and development of intellectual infrastructure and utilization technology entrusted by New Energy and Industrial Technology Development Organization (NEDO). In the production of this CRM, the EPMA standard substance preparation committee consisting of persons in charge of standard material development at NMIJ and experts in the field of steel analysis, etc. was established and technical issues on the certification of this CRM were studied. The external organizations participating in this committee were as follows. Sumitomo Metal Technology Co., Ltd., Kawatetsu Techno-Research Corporation, NK Techno Service Co., Ltd., Kokan Keisoku KK., ULVAC-PHI, Inc., New Material Center-Osaka Science and Technology Center, New Energy and Industrial Technology Development Organization (NEDO).

Date of Shipment: Xxxxx xx, 20xx

1001a00~1005a00-030324-211125

April 1, 2020

ISHIMURA Kazuhiko  
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,  
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Revision history

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

November 25, 2021: The description in "Expiration of Certification" was changed to "one year from the date of shipment."

The description in "Metrological Traceability" was added.