

National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan



Reference Material Certificate

NMIJ CRM 3009-a
No. +++

Zinc

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 standardization of ethylenediamine-N,N,N',N'-tetraacetic acid (EDTA) on chelatometric titration and for use in the calibration of procedures for the quantification of zinc.

Certified Values

The certified value for mass fraction of Zn in this CRM is given in the table below.

	Certified value, Mass fraction (%)	Expanded uncertainty, Mass fraction (%)
Zn	100.00	0.04

The certified value of molar mass of Zn calculated from the isotopic ratios is given in the table below. The data for atomic mass of zinc isotopes required for the molar mass calculation was referred from "Atomic Weights of the Elements" (J.R.de.Laeter et al., *Pure Appl.Chem.* **75** (2003) 683.).

	Certified value, Molar mass (g/mol)	Expanded uncertainty, Molar mass (g/mol)
Zn	65.3723	0.0012

The uncertainties of the certified values are 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 %.

Analysis

The certified value for mass fraction of zinc was determined by subtraction method using inductively coupled plasma quadrupole mass spectrometer (ICP-QMS) for heavy metal analysis, inert gas fusion infrared detection for oxygen analysis, and combustion infrared detection for carbon analysis. The certified value for molar mass was determined by isotope ratio measurements of $^{66}\text{Zn}/^{64}\text{Zn}$, $^{67}\text{Zn}/^{64}\text{Zn}$, $^{68}\text{Zn}/^{64}\text{Zn}$, $^{70}\text{Zn}/^{64}\text{Zn}$ by inductively coupled plasma sector-field mass spectrometer (ICP-SFMS).

Metrological Traceability

In the subtraction method for the determination of mass fraction of zinc, the instruments used were calibrated by the certified reference materials from NIST or traceable to NIST. In the isotope ratio measurement of Zn, the mass discrimination effect of ICP-SFMS was corrected by a bracketing method with Zn isotopic standard solution IRMM 3702 whose isotope ratios are within natural abundances of Zn. Therefore, the certified values are traceable to the International System of Units (SI).

Mutual Recognition Arrangement under Metre Convention

The certified value of Zn mass fraction of this CRM is recognized for international equivalence based on the Mutual Recognition Arrangement under the Metre Convention (CIPM MRA). The calibration measurement capability (CMC) of

NMIJ related to this CRM is registered in the Key Comparison Database (KCDB) (see <https://www.bipm.org/kcdb/>) of the International Bureau of Weights and Measures (BIPM).

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.

Description of the material

This CRM consists of 2 mm cubic. The net mass is 50 g kept in high density polyethylene pouch vacuum sealed in an aluminum-laminated plastic bag.

Instructions for Storage

This CRM should be stored in the high-density polyethylene pouch sealed in an aluminum-laminated plastic bag at a temperature between 15 °C and 35 °C and at a relative humidity of 60 % or less.

Instructions for Use

Prior to use, the surface of the CRM should be cleaned by HCl (1+3), purified water and acetone in order. Then, it should be dried for at least 30 min at 55 °C and maintained at room temperature in a silica-gel desiccator. In order to ensure the sample homogeneity, the recommended sample mass is more than 0.13 g for one analysis.

Precautions for Handling

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

Preparation

The source material of this CRM was purchased from Nikko Kinzoku, Ltd.

Technical Information

The concentrations of 0.96 mg/kg and 1.2 mg/kg for thallium and lead, respectively, were determined by ICP-QMS. The total concentration estimated from other metals was 4.5 mg/kg. The 38 mg/kg of oxygen was determined by inert gas fusion infrared spectrometry. The 3.6 mg/kg of carbon was determined by combustion infrared spectrometry.

NMIJ Analysts

The technical manager for this CRM is MIURA T., the production manager is MIURA T., and the analysts are OHATA M., NONOSE N., and MIURA T.

Information

If substantive technical changes occur that affect the certification before the expiration of this certificate, NMIJ will notify the registered customer. 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.

July 30, 2021

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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Revision history

July 30, 2021: The description on “Mutual Recognition Arrangement under Meter Convention” was added.

The expanded uncertainty of certified value of Zn mass fraction was changed, and the significant figures of certified value was revised.

Sample