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) was produced in accordance with the NMIJ’s management system and in compliance with ISO GUIDE 34:2009 and ISO/IEC 17025:2005. This CRM is intended for use in the standardization of ethylenediamine-N,N,N',N'-tetraacetic acid (EDTA) on chelometric titration and for use in the calibration of procedures for zinc determination.

Certified Values
The certified value for zinc in this CRM is given in the table below.

<table>
<thead>
<tr>
<th></th>
<th>Certified value, Mass fraction (%)</th>
<th>Expanded uncertainty, Mass fraction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zn</td>
<td>99.995</td>
<td>0.008</td>
</tr>
</tbody>
</table>

The molar mass 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.).

<table>
<thead>
<tr>
<th></th>
<th>Certified value, Molar mass (g/mol)</th>
<th>Expanded uncertainty, Molar mass (g/mol)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zn</td>
<td>65.3723</td>
<td>0.0012</td>
</tr>
</tbody>
</table>

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 standard 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).

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.
Sample Form
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.

Homogeneity
The homogeneity of this CRM was determined by analyzing 10 samples selected from 200 samples by stratified random sampling method. The homogeneity is reflected in the uncertainties of the certified value.

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 T. Miura, the production manager is T. Miura, and the analysts are M. Ohata, N. Nonose, and T. Miura.

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.

March 9, 2016
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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