National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan

Reference Material Certificate

NMJ CRM 7601-a
No. +++

Seawater for Nutrients - Extremely Low Concentration

This certified reference material (CRM) was produced in accordance with the NMJ’s management system, and in compliance with ISO GUIDE 34:2009 and ISO/IEC 17025:2005. This CRM is intended for use in controlling the precision of analysis and for confirming the validity of analytical methods and instruments during analysis of nutrients in seawater.

Certified Value
The certified value for the dissolved silica in this CRM is given in the table below. 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 %.

<table>
<thead>
<tr>
<th>Analytical methods</th>
<th>1), 2), 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissolved silica</td>
<td>0.036</td>
</tr>
<tr>
<td>Expanded uncertainty, Mass fraction (mg/kg)</td>
<td>0.004</td>
</tr>
</tbody>
</table>

*1 The certified value for dissolved silica is expressed as the mass fraction of silicon.
*2 Analytical methods: See the next section “Analysis”.

Analysis
The property values were arithmetic means of the results of the following analytical methods:
1) Colorimetric method (continuous flow mode and batch one) for nitrate ions, nitrite ions, phosphate ions and dissolved silica
2) Ion exclusion chromatography/isotope dilution-inductively coupled plasma mass spectrometry for dissolved silica
3) Ion exclusion chromatography with post-column detection for dissolved silica

Metrological Traceability
The certified value was determined by more than one method with using NIST (National Institute of Standards and Technology) SRM of a silicon standard solution. Each information value was determined with one of the NMJ primary standard solutions of nitrate ions, nitrite ions and phosphate ions. Those 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 remains unopened and stored in accordance with the instructions given in this certificate.

Sample Form
The net volume of this CRM is ca. 90 mL, kept in a polypropylene bottle which is sealed in an aluminum zip bag.

Homogeneity
The homogeneity of this CRM was determined by analyzing a set of 10 bottles several times by the colorimetric method. The homogeneity of each analyte is reflected in the uncertainty of the certified value or the indicative one.

Instructions for Storage
This CRM should be kept in a clean place at 5 °C to 30 °C and shielded from light.
Instructions for Use
After this CRM was kept in a temperature different from the room temperature, the bottle should be opened after the temperature reaches the room temperature. Prior to use, the bottle should be shaken well. This CRM is for laboratory use only.

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

Preparation Method
The raw material seawater of this CRM was collected from the surface layer in the Pacific Ocean with the cooperation of the Meteorological Research Institute (MRI) and the Japan Agency for Marine-Earth Science and Technology (JAMSTEC). The seawater was sterilized in an autoclave of stainless steel, followed by subdividing in polypropylene bottles and sealing by aluminum zip bags in a clean room. This bottling process was carried out with cooperation of the General Environmental Technos Co., Ltd. (KANSO Technos).

Information
The value 1.023 g/cm³ (25 °C) can be used as the density of the seawater for the purpose of air-buoyancy correction. This CRM contains a silicon compound which cannot be detected by the colorimetric method using the molybdenum blue method or the molybdenum yellow method, but can be separated and detected by ion exclusion chromatography-inductively coupled plasma mass spectrometry. This CRM contains nitrate ions (0.0013 mg/kg), nitrite ions (0.0016 mg/kg) and phosphate ions (0.002 mg/kg). Concentrations of these ions in this CRM were measured by colorimetric method (continuous flow mode) at August 2016.

NMJJ Analysts
The technical manager for this CRM is A. Hioki, the production manager is T. Miura and the analysts are C. Cheong, N. Nonose, T. Suzuki, T. Miura, Y. Yamauchi, and Y. Ishizawa.

Technical Information
Customer registration on the NMJJ Website (given below) will facilitate notification of any revision 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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Revision history
April 1, 2015: “Metrology Management Center” was renamed to “Center for Quality Management of Metrology.”
September 6, 2016: The description in “Expiration of Certification” was changed to “one year from the date of shipment.”
September 6, 2016: Certified value of dissolved silica was revised.
September 6, 2016: Indicative values of nitrate ions, nitrite ions and phosphate ions were changed to information.