

National Institute of Advanced Industrial Science and Technology

## National Metrology Institute of Japan



## Reference Material Certificate

NMIJ CRM 7603-a

No. +++



## Seawater for Nutrients - High Concentration

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 controlling the precision of analysis, validation of analytical methods and calibration of instruments.

**Certified Values**

The certified values of this CRM are given in the table below. The uncertainty of each 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 %.

| Substance        | Certified value, *1<br>Mass fraction (mg/kg) | Expanded uncertainty,<br>Mass fraction (mg/kg) | Analytical methods *2 |
|------------------|----------------------------------------------|------------------------------------------------|-----------------------|
| Nitrate ions     | 2.745                                        | 0.050                                          | 1), 3), 4)            |
| Dissolved silica | 4.106                                        | 0.043                                          | 1), 2), 5)            |

\*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 certified values of this CRM were arithmetic mean of the results of the following analytical methods:

- 1) Colorimetric method
- 2) Ion exclusion chromatography/isotope dilution-inductively coupled plasma mass spectrometry
- 3) Ion chromatography by direct analysis
- 4) Ion chromatography after halogen-ion separation
- 5) Ion exclusion chromatography with post-column detection

**Metrological Traceability**

Each certified value was determined by more than one method with using one of NIST (National Institute of Standards and Technology) SRM 3150 of a silicon standard solution and an NMIJ primary standard solution of nitrate ions. The certified values, therefore, are traceable to the International System of Units (SI).

**Indicative Value**

The indicative value was determined with the NMIJ primary standard solution of phosphate ions. The indicative value of this CRM is given in the table below. The uncertainty of the indicative 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 %.

| Substance      | Indicative value,<br>Mass fraction (mg/kg) | Expanded uncertainty,<br>Mass fraction (mg/kg) | Analytical methods<br>(see the section “Analysis”<br>( <i>vide supra</i> )) |
|----------------|--------------------------------------------|------------------------------------------------|-----------------------------------------------------------------------------|
| Phosphate ions | 0.288                                      | 0.005                                          | 1)                                                                          |

**Expiration of Certification**

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

**Description of the Material**

This CRM is seawater collected from the nutrient maximum layer in the Pacific Ocean. This CRM is in the form of a colorless and transparent liquid at ordinary temperature, and *ca.* 90 mL is kept in a polypropylene bottle. The bottle is sealed in an aluminum-laminated plastic bag.

**Instructions for Storage**

This CRM should be kept in the polypropylene bottle sealed in the aluminum-laminated plastic bag. This CRM should be stored in a clean place at temperatures of 5 °C to 30 °C and protected from light.

**Instructions for Use**

The bottle should be allowed to warm to room temperature before opening. Prior to use, the bottle should be shaken thoroughly but gently at room temperature. This CRM is for laboratory use only.

**Precautions for Handling**

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

**Preparation**

The raw material seawater of this CRM was collected from the nutrient maximum layer in the Pacific Ocean with the cooperation of the Meteorological Research Institute, Japan Meteorological Agency (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 the aluminum-laminated plastic bags in a clean room. This bottling process was carried out with cooperation of the General Environmental Technos Co., Ltd.

**Technical Information**

The value 1.023 g/cm<sup>3</sup> (25 °C) can be used as the density of the seawater for the purpose of air-buoyancy correction. This CRM contained less than 0.03 mg/kg of a silicon compound which could not be detected by the colorimetric method using the molybdenum blue method or the molybdenum yellow method, but could be separated and detected by ion exclusion chromatography-inductively coupled plasma mass spectrometry. This CRM contains nitrite ions (0.0012 mg/kg), which was determined with the NMIJ primary standard solution of nitrite ions. Concentration of nitrite ions in this CRM was measured by colorimetric method. The technical information provided in this section represents the values measured when the certified values were determined.

**NMIJ Analysts**

The technical manager for this CRM is HIOKI A., the production manager is MIURA T., and the analysts are CHEONG C., NONOSE N., SUZUKI T., MIURA T., YAMAUCHI Y. and ISHIZAWA Y.

**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.

Date of Shipment: Xxxxx xx, 20xx

7603a00-140326-240530

### Reproduction of Certificate

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

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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#### 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.”  
Certified values of nitrate ions and dissolved silica were revised. Indicative value of phosphate ions was revised. Indicative value of nitrite ions was changed to information.  
August 24, 2018: “Indicative Value” the standard solution used for determination of phosphate ions was described.  
“Information” the standard solution used for determination of nitrite ions was described.  
January 21, 2021: “Sample Form” was changed to “Description of the material” and collection site of the seawater was added.  
“Certified values” the uncertainty of nitrate ion and dissolved silica were revised.