

National Institute of Advanced Industrial Science and Technology

## National Metrology Institute of Japan



## Reference Material Certificate

NMIJ CRM 3011-a

No. +++

Ammonium Chloride



This certified reference material (CRM) is ammonium chloride 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 the calibration of instruments, and validation of analytical methods and instruments used for the quantification of ammonium ions or chloride ions.

**Certified Values**

The certified values of this CRM are 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 %.

	Certified value, Mass fraction (%)	Expanded uncertainty, Mass fraction (%)
Ammonium ions (Ammonium ions expressed as ammonium chloride)	33.716 (99.977)	0.026 (0.075)
Chloride ions (Chloride ions expressed as ammonium chloride)	66.264 (99.981)	0.053 (0.078)

**Analysis**

The certified value of the mass fraction of ammonium ions was determined by coulometric titration, and that of chloride ions was determined by gravimetric titration with NMIJ CRM sodium chloride (NMIJ CRM 3008-a). The molar mass of ammonium chloride (53.4903) was calculated from the IUPAC atomic weight table (2009). The value  $96\,485.336\,5\text{ C mol}^{-1}$  was used for the Faraday constant (CODATA: 2010). The value  $1.519\text{ g cm}^{-3}$  (25 °C) was used as the density of ammonium chloride for air-buoyancy correction.

**Metrological Traceability**

Each certified value of this CRM was determined by coulometric titration or gravimetric titration as a primary method of measurements. The certified value, therefore, is traceable to the International System of Units (SI).

**Mutual Recognition Arrangement under Meter Convention**

This certificate is consistent with the calibration and measurement capabilities (CMCs) that are included in Appendix C of the Mutual Recognition Arrangement (MRA) drawn up by the International Committee for Weights and Measures (CIPM). Under the MRA, all participating institutes recognize the validity of each other's calibration and measurement certificates for the quantities, ranges and measurement uncertainties specified in Appendix C (as for Appendix C of MRA, see <https://www.bipm.org/kcdb/>).

**Expiration of Certification**

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

**Description of the material**

This CRM is high purity ammonium chloride. This CRM is in the form of a white powder at ordinary temperature, and 25 g is kept in a plastic bottle.

**Homogeneity**

The homogeneity of the CRM was assessed by coulometric titration and gravimetric titration analyzing ammonium chloride in 10 bottles which were chosen by a stratified random sampling with the order of bottling. The uncertainties of homogeneity, 0.0070 % (relative) for the mass fraction of ammonium ions and 0.0057 % (relative) for that of chloride ions as a standard uncertainty, has been incorporated in the uncertainty of the certified values from analysis of variance (ANOVA).

**Instructions for Storage**

This CRM should be stored at temperature of 15 °C to 30 °C, at a relative humidity of 60 % or less and protected from light.

**Instructions for Use**

Prior to use, the material should be placed for 6 hours to 48 hours in a desiccator with silica gel without crushing. Considering the homogeneity, minimum sample masses of 0.1 g for ammonium ion analysis or 0.18 g for chloride ion analysis should be used to ensure valid results. The material dried should not be dried again, and promptly used after the treatment.

**Precautions for Handling**

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

**Preparation**

The source material of this CRM was purchased from Wako Pure Chemical Industries, Ltd (currently, FUJIFILM Wako Pure Chemical Corporation).

**Technical Information**

Bromide ions and iodide ions as an impurity were not observed by ion chromatography. The detection limits of the measurements with ion chromatography were 2.7 mg kg<sup>-1</sup> (bromide ions) and 2.0 mg kg<sup>-1</sup> (iodide ions). Amines as an impurity were not observed by HPLC-*o*-phthalaldehyde derivatization with a fluorescence detector as well. The detection limit of the measurement with HPLC was 10 mg kg<sup>-1</sup> (amines).

**NMIJ Analysts**

The technical manager for this CRM is MIURA T., the production manager is ASAKAI T., and the analysts are ASAKAI T. and SUZUKI T.

**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.

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

November 12, 2014: The limit of validity of the certificate was extended from “March 31, 2016” to “March 31, 2018.”  
The description on “Mutual Recognition Arrangement under Meter Convention” was added.  
April 1, 2015: “Metrology Management Center” was renamed to “Center for Quality Management of Metrology.”  
June 21, 2017: The description in “Expiration of Certification” was changed to “one year from the date of shipment.”  
Expanded uncertainties of certified values for ammonium ions were changed to 0.022 % (0.067 %).  
Expanded uncertainties of certified values for chloride ions were changed to 0.053 % (0.078 %).  
December 3, 2020: The expanded uncertainties were changed.

Sample