National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan

Reference Material Certificate

NMIJ CRM 4019-a
No. +++

Bromoform (Tribromomethane)

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 primarily intended for use in calibration of analytical instruments. It is also intended to be used for quality control of analytical instruments as well as validation of analytical techniques and instruments.

Certified Value

The certified value of this CRM is purity (amount of substance fraction), 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 %.

	CAS No.	Certified Value, Amount-of-Substance Fraction (mol/mol)	Expanded Uncertainty, Amount-of-Substance Fraction (mol/mol)
Bromoform	75-25-2	0.9996	0.0004

Analysis

The certified value of this CRM was determined by the freezing point depression method with a differential scanning calorimeter (DSC) by using the stepwise scan method. The combined standard uncertainty was estimated by combining standard uncertainties derived from purity determination, homogeneity test and stability test.

Metrological Traceability

The certified value of this CRM was determined by a primary method of measurement, the freezing point depression method with a DSC and is traceable to the International System of Units (SI). Scales of temperature and enthalpy of the DSC were calibrated with NIST SRM 2225 (mercury) and NIST SRM 2232 (indium) and they are traceable to the SI. Therefore, the certified value is traceable to the SI.

Indicative Value

Purity in the mass fraction is given in the table below. Purity in the mass fraction was obtained by converting the purity in the amount-of-substance fraction using the average molecular weight of impurities. The uncertainty of the indicative 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 %.

Substance	CAS No.	Indicative value, Mass fraction (kg/kg)	Expanded uncertainty Mass fraction (kg/kg)
Bromoform	75-25-2	0.9998	0.0004

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

http://kcdb.bipm.org/AppendixC/default.asp).

Expiration of Certification

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

Sample Form

This CRM is in the form of a colorless and clear liquid at room temperature. This CRM of ca. 5 mL in net volume is kept in an amber glass ampule with argon gas.

Homogeneity

Ten ampules were sampled from the total of 200 subdivided ampules with almost the same intervals in order of subdivision for homogeneity tests by the gas chromatography. Another set of ten ampules were sampled in the same way for the homogeneity tests by the Karl-Fischer titrimetry. Area percentages of bromoform were measured by the gas chromatography while water content was measured by the Karl-Fischer titrimetry. The evaluated variation of purity among the ampules due to inhomogeneity has been incorporated into the uncertainty of the certified value. It is concluded, therefore, that this CRM is homogeneous within the range of the uncertainty of the certified value.

Instructions for Storage

This CRM should be stored around -20 °C in clean place and shielded from light.

Instructions for Use

This CRM is for laboratory use only. The ampoules of this CRM should be allowed to warm to room temperature before opening. Prior to use, the ampule should be shaken thoroughly but gently at room temperature. This CRM should be used promptly once the ampule is opened.

Precautions for Handling

Keep away from heat and ignition sources. Avoid breathing vapor. Use only with adequate ventilation. Wear personal protective equipment such as safety glasses, safety mask and safety gloves in handling. Refer to the safety data sheet (SDS) on this CRM before use.

Preparation

This CRM was prepared by KANTO CHEMICAL CO., INC. Raw material of this CRM was purified by drying and distillation processes. 2-methyl-2-butene was added to distillate as a stabilizer. Amber glass ampules were filled with the purified bromoform in the argon gas atmosphere.

NMIJ Analysts

Technical manager for this CRM is KATO K. The production manager is SHIMIZU Y. The analysts are SHIMIZU Y., ISHIKAWA K., KITAMAKI Y., OHTE Y., BAO X., YOSHIMURA E., HORIUCHI U. and FUJIKI N.

Collaborator

Stability tests until 2005 were performed by National Institute of Technology and Evaluation.

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.

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
March 16, 2011: The expiration of this certificate was extended from "March 31, 2012" to "March 31, 2019."
April 1, 2015: "Metrology Management Center" was renamed to "Center for Quality Management of Metrology."
November 20, 2017: Expanded uncertainties in "Certified Value" and "Indicative Value" was changed.
The description in "Expiration of Certification" was changed to "one year from the date of shipment."
The description on Mutual Recognition Arrangement under Meter Convention was added.