National Institute of Advanced Industrial Science and Technology

# National Metrology Institute of Japan

## Reference Material Certificate

NMIJ CRM 4036-a
No. +++

## Dibromochloromethane

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 calibrating analytical instruments. It is also intended for quality control of analytical instruments, and validation of analytical techniques and instruments.

**Certified Value**

The certified value 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 %.

| Substance | CAS No. | Certified Value, Amount-of-Substance Fraction (mol/mol) | Expanded Uncertainty, Amount-of-Substance Fraction (mol/mol) |
|---|---|---|---|
| Dibromochloromethane | 124-48-1 | 0.9997 | 0.0008 |

**Analysis**

The certified value of this CRM was determined by the freezing point depression method with a differential scanning calorimeter (DSC) by using stepwise scan method. Combined standard uncertainty of the certified value was estimated by the combination of standard uncertainties due to 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. Scales of temperature and enthalpy of the DSC were calibrated with NIST SRM 2225 (mercury) and NIST SRM 2232 (indium) and they were traceable to the International System of Units (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 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) |
|---|---|---|---|
| Dibromochloromethane | 124-48-1 | 0.9998 | 0.0006 |

**Mutual Recognition Arrangement under Metre 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 CRM 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 200 subdivided ampules with almost same intervals in order of subdivision for homogeneity tests by gas chromatography and Karl-Fischer titrimetry. Area percentages of dibromochloromethane by gas chromatography and water content by Karl-Fischer titrimetry were measured and evaluated as homogeneity tests. The evaluated variation of purity (amount of substance fraction) between the ampules due to inhomogeneity was taken into account for the uncertainty of the certified value. Thus, this CRM is homogeneous within the range of the uncertainty of the certified value.

**Instructions for Storage**

This CRM should be stored in a cold (around –20 °C) and shielded from light.

**Instructions for Use**

This CRM is for laboratory use only. The ampule of this CRM should be allowed to warm to room temperature before use, and then shaken well. This CRM should be used promptly once the ampule is opened.

**Precautions for Handling**

Keep away from heat and ignition sources. Avoid breathing vapor. The CRM should be used in a well-ventilated place. Wear protective equipment such as safety glasses, safety mask and safety gloves in handling. Refer to the safety data sheet (SDS) on this material before use.

**Preparation**

This CRM was purified and subdivided by KANTO CHEMICAL CO., INC. This CRM was purified by distillation and drying. 2-methyl-2-butene was put into the distillate as a stabilizer. Five milliliters each of dibromochloromethane was filled into amber glass ampule in argon atmosphere.

**NMIJ Analysts**

Technical manager for this CRM is NUMATA M. The person responsible for production is SHIMIZU Y. Production 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
National Institute of Advanced Industrial Science and Technology,
National Metrology Institute of Japan,
Center for Quality Management of Metrology, Reference Materials Office,
1-1-1 Umezono, Tsukuba, Ibaraki 305-8563, Japan
Phone: +81-29-861-4059; Fax: +81-29-861-4009, https://unit.aist.go.jp/nmij/english/refmate/

Revision history

March 16, 2011: The certified value was reassigned based on the reassessments of homogeneity and stability.

March 27, 2015: The description in "Expiration of Certification" was changed to "one year from the date of shipment."
The description on Mutual Recognition Arrangement under Metre Convention was added.

April 1, 2015: "Metrology Management Center" was renamed to "Center for Quality Management of Metrology."

December 19, 2017: Expanded uncertainties in "Certified Value" and "Indicative Value" were changed.