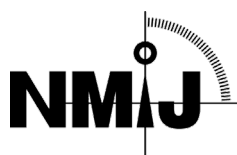


National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan



Reference Material Certificate

NMIJ CRM 4036-b

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 the calibration of analytical instruments. It is also intended for quality control of analytical instruments, and validation of analytical methods and instruments.

Certified Values

The certified values of this CRM are purities in amount-of-substance fraction and in mass fraction, given in the tables below. The uncertainties of the certified values are the expanded uncertainties obtained by multiplying the combined standard uncertainties by a coverage factor (k) of 2, and they are the half-width of an interval estimated to have 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	0.9991	0.0006

Substance	CAS No.	Certified value Mass fraction (kg/kg)	Expanded uncertainty Mass fraction (kg/kg)
Dibromochloromethane	124-48-1	0.9992	0.0006

Analysis

The purity in amount-of-substance fraction was determined by freezing point depression method with a differential scanning calorimeter (DSC) by using stepwise scan method. Combined standard uncertainty of the purity in amount-of-substance fraction was estimated by the combination of standard uncertainties due to purity determination, homogeneity and stability assessments. The purity in mass fraction was converted from the purity in amount-of-substance fraction by using molar mass of dibromochloromethane and an average molar mass of total impurities. Combined standard uncertainty of the purity in mass fraction was estimated by combination of standard uncertainties due to molar mass of dibromochloromethane, the average molar mass of impurities, the purity in amount-of-substance fraction, homogeneity and stability assessments.

Metrological Traceability

The purity in amount-of-substance fraction was determined by freezing point depression method, which was one of the primary methods of measurement using a DSC. Scales of temperature and enthalpy of the DSC were calibrated with NMIJ CRM 5401-a (cyclohexane). Purity in mass fraction was converted from the purity in amount-of-substance fraction based on the mass fractions of impurities with a gas chromatograph with a flame ionization detector calibrated using standard solutions prepared by NMIJ and validated Karl-Fischer titrator. The certified values, therefore, are traceable to the International System of Units (SI).

Mutual Recognition Arrangement under Metre Convention

The purity in amount-of-substance fraction of this CRM is recognized for international equivalence based on the Mutual Recognition Arrangement under the Metre Convention (CIPM MRA). The calibration measurement capability (CMC) of NMIJ related to this CRM is registered in the Key Comparison Database (KCDB) (see <https://www.bipm.org/kcdb/>) of the International Bureau of Weights and Measures (BIPM).

Date of Shipment: Xxxxx xx, 20xx

4036b00-231221-231221

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 in the form of a colorless and transparent liquid at ordinary temperature, and 5 mL of dibromochloromethane is kept in an amber glass ampoule with argon gas.

Instructions for Storage

This CRM should be stored at temperatures of $-15\text{ }^{\circ}\text{C}$ to $-25\text{ }^{\circ}\text{C}$ in a clean place and protected from light.

Instructions for Use

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

Precautions for Handling

Wear a mask, gloves, and other personal protective equipment when handling. Keep away from heat and ignition sources. Be careful of ventilation. Refer to the safety data sheet (SDS) on this CRM before use.

Preparation

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

Technical Information

This CRM contains 2-methyl-2-butene as a stabilizer, and bromodichloromethane and tetrachloroethylene as impurities. The mass fractions of bromodichloromethane and tetrachloroethylene determined by gas chromatography at the time of certification were 0.09 g/kg and 0.007 g/kg, respectively.

NMIJ Analysts

The technical manager for this CRM is ITOH N., the production manager is SHIMIZU Y., and the analysts are SHIMIZU Y., KITAMAKI Y. and BAO X.

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.

December 1, 2023

ISHIMURA Kazuhiko
President
National Institute of Advanced Industrial Science and Technology

Date of Shipment: Xxxxx xx, 20xx

4036b00-231221-231221

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, <https://unit.aist.go.jp/nmij/english/refmate/>

Sample