

National Institute of Advanced Industrial Science and Technology

## National Metrology Institute of Japan



## Reference Material Certificate

NMIJ CRM 4006-a  
No. +++

## Carbon Tetrachloride

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 of this CRM is purity (in 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)
Carbon Tetrachloride	56-23-5	0.9999	0.0001

**Analysis**

The certified value of this CRM was determined by the freezing point depression method based on the fractional melting method using an adiabatic calorimeter. The combined standard uncertainty was estimated by combining standard uncertainties derived from purity determination, homogeneity test, and stability test.

**Metrological Traceability**

The certified value is determined by the freezing point depression method using the adiabatic calorimeter. Temperature (platinum resistance thermometer), voltage (digital multi-meter), resistance (standard resistor) and heating duration (universal counter) of the adiabatic calorimeter are calibrated and they are 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. It 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 %.

	CAS No.	Indicative value, Mass fraction (kg/kg)	Expanded uncertainty Mass fraction (kg/kg)
Carbon Tetrachloride	56-23-5	1.0000	0.0001

**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 15 mL in net volume is kept in an amber glass ampoule with argon gas.

### Homogeneity

Ten ampoules were sampled from the total of 500 subdivided ampoules with almost the same intervals in order of subdivision for homogeneity tests by the gas chromatography. Another set of ten ampoules were sampled in the same way for the homogeneity tests by the Karl-Fischer titrimetry. Area percentages of carbon tetrachloride were measured by the gas chromatography while water content was measured by the Karl-Fischer titrimetry. The evaluated variation of purity among the ampoules 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 at a temperature between  $-15\text{ }^{\circ}\text{C}$  and  $-25\text{ }^{\circ}\text{C}$  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. The CRM should be used promptly once the ampule is opened.

### Precautions for Handling

Keep away from heat and ignition sources. Wear personal protective equipment such as safety glasses, safety mask, and safety gloves in handling. This material should be handled cautiously as it is deleterious. Refer to the safety data sheet (SDS) on this CRM before use.

### Preparation

This CRM was prepared by KANTO CHEMICAL CO., INC. The raw material of this CRM was purified through drying and distillation processes. Amber glass ampoules were filled with the purified carbon tetrachloride in the argon gas atmosphere.

### Technical Information

This CRM contains chloroform and trichloroethylene as impurities. The mass fraction of chloroform and trichloroethylene determined by gas chromatography were 7 mg/kg and 3 mg/kg, respectively at the time of certification.

### NMIJ Analysts

The technical manager for this CRM is KATO K. The production manager is SHIMIZU Y. The analysts are SHIMIZU Y., IHARA T., ISHIKAWA K., KITAMAKI Y., OHTE Y., OTSUKA S., BAO X., YOSHIMURA E. and FUJIKI N.

### Collaborator

Impurity analysis and stability monitoring 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

April 1, 2015: "Metrology Management Center" was renamed to "Center for Quality Management of Metrology."  
November 16, 2018: 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.  
The descriptions in "Precautions for Handling", "Instructions for Storage" and "Technical Information" were changed.