

National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan



Reference Material Certificate

NMIJ CRM 4057-a
No. +++

1,4-Dioxane

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. It is primarily intended for use in the calibration of analytical instruments, quality control of analytical instruments, and validation of analytical techniques and instruments.

Certified Values

The certified values are purities in the amount-of-substance fraction and in the mass fraction, given in the tables below. The uncertainties of the certified values are 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)
1,4-Dioxane	123-91-1	0.9993	0.0002

Substance	CAS No.	Certified Value, Mass Fraction (kg/kg)	Expanded Uncertainty, Mass Fraction (kg/kg)
1,4-Dioxane	123-91-1	0.9999	0.0001

Analysis

Purity in the amount-of-substance fraction was determined by the freezing point depression method with an adiabatic calorimeter by using a fractional melting method. Combined standard uncertainty of the purity in the amount-of-substance fraction was estimated by the combination of standard uncertainties due to the purity determination, homogeneity test and stability test. Purity in the mass fraction was converted from the purity in the amount-of-substance fraction by using the molecular weight of 1,4-dioxane and concentrations of impurities. Combined standard uncertainty of the purity in the mass fraction was estimated by combination of standard uncertainties due to the molecular weight of 1,4-dioxane, average molecular weight of impurities and the purity in the amount-of-substance fraction.

Metrological Traceability

The purity in the amount-of-substance fraction was determined by the freezing point depression method with adiabatic calorimeters. Temperature (platinum resistance thermometer), voltage (digital multi-meter), resistance (standard resistor) and heating duration (universal counter) of the adiabatic calorimeters were calibrated and they were traceable to the International System of Units (SI). The purity in the mass fraction was converted from the purity in the amount-of-substance fraction based on the results of an impurity analysis with a gas chromatograph with the flame ionization detector calibrated with standard solutions prepared by NMIJ and a validated Karl-Fischer titrimeter. Therefore, the certified values are traceable to the 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

<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 200 subdivided ampoules with almost same intervals in order of subdivision for homogeneity tests by gas chromatography and Karl-Fischer titrimetry. Area percentages of 1,4-dioxane by gas chromatography and water content by Karl-Fischer titrimetry were measured and evaluated as homogeneity tests. The evaluated variation of purity between the ampoules due to inhomogeneity was taken into account for the uncertainty of the certified values. Thus, this CRM is homogeneous within the range of the uncertainty of the certified values.

Instructions for Storage

This CRM should be stored at a temperature between 2 °C and 8 °C and shielded from lights.

Instructions for Use

This CRM is for laboratory use only. The ampoules of this CRM should be allowed to warm to room temperature and then shaken well before opening. This CRM is hygroscopic and should be used promptly once the ampoule 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 when handling. Refer to the safety data sheet (SDS) on this CRM before use.

Preparation

This CRM was subdivided by KANTO CHEMICAL CO., INC. Fifteen milliliters each of 1,4-dioxane was filled into an amber glass ampoule in an argon atmosphere.

Technical Information

This CRM contains dibutylhydroxytoluene (BHT) as a stabilizer.

NMIJ Analysts

The technical manager for this CRM is NUMATA M. The production manager is SHIMIZU Y. and the analysts are SHIMIZU Y., KITAMAKI Y. and YOSHIMURA E.

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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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 12, 2015: The description in "Expiration of Certification" was changed to "one year from the date of shipment."
November 16, 2018: The description on Mutual Recognition Arrangement under Metre Convention was added.