

National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan



Reference Material Certificate

NMIJ CRM 3407-c01



Carbon Dioxide

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 intended for use in the calibration of instruments for carbon dioxide determination.

Certified Value

The certified value of this CRM is amount-of-substance fraction of carbon dioxide in gas phase inside this cylinder, which is given in the table below. The uncertainty of the certified value is the expanded uncertainty obtained by multiplying the combined standard uncertainty by a coverage factor (k) of 2, and it is 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)	Cylinder Number
Carbon Dioxide	124-38-9	0.999995	0.000006	3BIS-8781

Analysis

The amount-of-substance fraction of each impurity in gas taken out by opening the valve of gas cylinder placed vertically was determined by the analytical equipment listed below. The certified value was determined by the subtraction method. The subtraction method was described in the ISO 6142-1:2015 "Gas analysis--Preparation of calibration gas mixtures--Gravimetric method".

Impurity	Analytical equipment
Nitrogen	Gas chromatograph with thermal conductivity detector
Oxygen	Gas chromatograph with thermal conductivity detector
Hydrogen	Gas chromatograph with thermal conductivity detector
Methane	Gas chromatograph with flame-ionization detector
Carbon Monoxide	Gas chromatograph with flame-ionization detector
Water	Capacitive hygrometer

Metrological Traceability

The gas chromatographs used for the certification were calibrated using NMIJ's primary reference gases prepared by the gravimetric method (ISO 6142-1:2015). The capacitive hygrometer was calibrated using a hygrometer which was traceable to the International System of Units (SI). Therefore, the certified value is traceable to the SI.

Mutual Recognition Arrangement under Metre Convention

The certified value 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

Date of Shipment: Xxxxx xx, 20xx

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and Measures (BIPM).

Expiration of Certification

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

Description of the Material

This CRM is in the form of colorless and odorless gas supplied to users in the 10-liter manganese steel high-pressure gas cylinder with W22-14 threads right (male) outlet. The residual mass of the CRM in the cylinder is 4.5 kg or more at the time of the shipment. The residual mass is estimated from the following procedure; (1) Weigh the cylinder with the cylinder cap and the cap of outlet of valve taken off. (2) When the cylinder mass is a , the valve mass is b , and the mass of the cylinder body is c , the mass of the CRM in the cylinder equals $(a - (b + c))$. The mass of the cylinder body and the valve are marked on each surface.

Instructions for Storage

This CRM should be stored in compliance with regulations of high-pressure gas and so on. The cylinder of this CRM should be stored away from direct sunlight and fire at a temperature of 40 °C or less in a well-ventilated place.

Instructions for Use

It is desirable that this CRM is used at room temperature from 20 °C to 26 °C. The gas must be taken out by opening the valve of gas cylinder placed vertically. Carbon dioxide in liquid phase inside the cylinder must not be withdrawn. Once carbon dioxide in liquid phase inside the cylinder is withdrawn, the certified value of this CRM is invalid. This CRM should be used with a residual mass of at least approximately 1 kg. A high-pressure regulator made of stainless steel and stainless steel tubes should be used. Operation for purge should be repeated adequately, in order to prevent the contamination of the gas.

Precautions for Handling

This CRM is liquefied high-pressure gas. Refer to the safety data sheet (SDS) on this CRM before use.

Preparation

High-purity carbon dioxide gas was filled in the 10-liter manganese steel cylinder by SHOWA DENKO GAS PRODUCTS CO., LTD.

NMIJ Analysts

The technical manager for this CRM is SHIMOSAKA T. The production manager is MATSUMOTO N. Analysts for production are MATSUMOTO N. and TAKADA K.

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.

April 17, 2023

ISHIMURA Kazuhiko
President

National Institute of Advanced Industrial Science and Technology

Date of Shipment: Xxxxx xx, 20xx

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If you have any questions about this CRM, please contact:
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