Date of Shipment: ***** xx, 2019 3402d03-190919-200401

National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan

Reference Material Certificate

NMIJ CRM 3402-d01

Sulfur 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 used for the sulfur dioxide determination.

Certified Value

The certified value of this CRM is 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 Substance Fraction (mol/mol)	Expanded Uncertainty, Substance Fraction (mol/mol)	Cylinder No.
Sulfur dioxide	7446-09-5	0.99997	0.00010	4MK-19333

Analysis

The amount-of-substance fraction of each impurity in this CRM was determined by the analytical instruments listed below. The certified value was determined by the subtraction method (ISO 6142-1:2015).

Impurities	Analytical Equipments
Carbon dioxide	Gas chromatograph with thermal conductivity detector
Nitrogen	Gas chromatograph with thermal conductivity detector
Oxygen + Argon	Gas chromatograph with thermal conductivity detector
Methane	Gas chromatograph with flame ionization detector
Propane	Gas chromatograph with flame ionization detector
Water	Fourier-transform infrared spectrometer
Carbonyl sulfide	Fourier-transform infrared spectrometer

Metrological Traceability

The gas chromatograph used for the certification was calibrated using primary reference gases prepared by the gravimetric method in NMIJ in accordance with ISO 6142-1:2015. The FT-IR was calibrated using primary reference gases analyzed by the dew-point hygrometer in NMIJ. The dew-point hygrometer is traceable to the primary standard at NMIJ. Small amount of calbonyl sulfide was determined by comparison FT-IR spectrum and simulation based on HITRAN database. The certified value is traceable to the International System of Units (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 https://kcdb.bipm.org/AppendixC/default.asp).

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.

Sample Form

This CRM is toxic gas, and it is supplied in a manganese steel cylinder with an inner volume of 10 L. Specification of the outlet of the cylinder is W22-14thread right male. The residual mass of the filled gas in this CRM is more than 5 kg. The residual mass can be estimated from the following procedure; (1) Take out a large cap for the attached valve and an outlet of valve. (2) Weigh the cylinder. (3) When the mass of cylinder is *a*, the mass of value is *b*, and, the mass of body of cylinder is *c*, the mass of gas in the cylinder equals to *a* minus (*b* + *c*).

Instructions for Storage

This CRM of toxic gas should be stored in compliance with regulations for high pressure gases. Pay attention to that this CRM is colorless and oderless toxic gas. Avoid direct sunlight, and keep temperature below 40 ºC at any time. Store the CRM at a place with good ventilation. Fasten the cylinder with chain to avoid it from falling down. Refer to the safety data sheet (SDS) on this CRM for storage.

Instructions for Use

We recommend sufficient substitution of residual gas in stainless regulators, valves, piping, measuring instruments, and so on with this CRM gas before use. To avoid contamination, we recommend check leakage from a joint of piping. Operation for purge should be repeated adequately. This CRM should be under the residual mass of filled gas more than 1 kg, because the amount of each impurity might depend on the residual mass. It is desirable that the CRM is used around room because the certified value is based on the analytical results in this temperature range. Use this sulfur dioxide under gas phase (not liquid phase), although the gas phase and the liquid phase coexists. If you use this sulfur dioxide gas as liquid, the certified value in this CRM will be not assured.

Precautions for Handling

Refer to the SDS on this CRM before use. This CRM should be returned to Center for Quality Management of Metrology of AIST after use or after the expiry date.

Preparation

This CRM was filled in a 10 liter manganese-steel high-pressure gas cylinder, by Sumitomo Seika Chemicals Co., LTD.

NMIJ Analysts

The technical manager for this CRM is SHIMOSAKA T. The production manager is MATSUMOTO N. The analysts are MATSUMOTO N. and SHIMOSAKA T.

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 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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