

National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan



Reference Material Certificate

NMIJ CRM 7906-a

No. +++



Polychlorinated Biphenyl Mixture in Nonane

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 calibrating instruments, and validating analytical methods and instruments during analysis of polychlorinated biphenyls (PCBs) in mineral oil samples and similar materials.

Certified Values

The certified values of this CRM, expressed as mass fractions of 10 kinds of PCB congeners, are 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 Mass fraction (mg/kg)	Expanded uncertainty Mass fraction (mg/kg)
CB8 (2,4'-dichlorobiphenyl)	34883-43-7	2.32	0.15
CB28 (2,4,4'-trichlorobiphenyl)	7012-37-5	6.16	0.28
CB52 (2,2',5,5'-tetrachlorobiphenyl)	35693-99-3	7.5	0.4
CB101 (2,2',4,5,5'-pentachlorobiphenyl)	37680-73-2	6.61	0.32
CB118 (2,3',4,4',5'-pentachlorobiphenyl)	31508-00-6	5.10	0.23
CB138 (2,2',3,4,4',5'-hexachlorobiphenyl)	35065-28-2	5.31	0.23
CB153 (2,2',4,4',5,5'-hexachlorobiphenyl)	35065-27-1	6.99	0.32
CB180 (2,2',3,4,4',5,5'-heptachlorobiphenyl)	35065-29-3	6.2	0.5
CB194 (2,2',3,3',4,4',5,5'-octachlorobiphenyl)	35694-08-7	1.52	0.08
CB206 (2,2',3,3',4,4',5,5',6-nonachlorobiphenyl)	40186-72-9	0.361	0.026

*Notation for PCB congeners is based on the IUPAC number.

Analysis

The certified values of this CRM were based on the analytical results of PCBs in gravimetrically diluted samples by isotope dilution mass spectrometry (IDMS). The measurements were performed with a gas chromatograph/high resolution mass spectrometer equipped with HT8-PCB or DB-XLB column. The mass resolution was 10000 in electron impact ionization and selected ion monitoring mode. Certified values were weighted means of the results obtained by the two methods.

Metrological Traceability

The certified values of this CRM were determined by IDMS as a primary method of measurement. Because the calibration solution for the measurements was prepared from NMIJ standard solutions of CB28 (CRM 4206-a), CB153 (CRM 4207-a) and CB194 (CRM 4209-a); and high purity other PCB congeners of which purities were evaluated in NMIJ, and the sample and calibration solutions were prepared gravimetrically using JCSS-calibrated balances, the certified values are traceable to the

Date of Shipment: Xxxxx xx, 20xx

7906a00-120331-220127

International System of Units (SI).

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 the certificate.

Description of the material

This CRM is a nonane solution. It is in the form of a clear liquid, and it of ca. 1 g in net volume is kept in an amber ampoule (2 mL-volume) with argon gas.

Instructions for Storage

This CRM should be stored at a temperature between 15 °C and 30 °C in a clean atmosphere and shielded from light.

Instructions for Use

This CRM is for laboratory use only. This CRM should be used promptly once after the ampoule is opened.

Precautions for Handling

Wear a protective mask, gloves, and other protective equipment when handling this CRM. It should be handled, stored, and disposed of in accordance with the prevailing laws. Refer to the safety data sheet (SDS) on this CRM before use.

Preparation

Technical PCB mixtures obtained from GL Sciences Inc. were added gravimetrically to reagent grade nonane (KC300, 49.64 mg/kg; KC400, 49.45 mg/kg; KC500, 49.55 mg/kg; and KC600, 49.52 mg/kg). The PCB spiked solution was homogenized by mechanical mixing and approximately 1 g of the mixture was sealed in an amber ampoule with argon gas.

Technical Information

Mass fractions of PCB homologues were the results obtained by a Japanese official method for the determination of PCBs in waste (Notification No. 192 of the Ministry of Welfare (1992)). To estimate mass fractions of homologues, the GC/MS response factors of PCB isomers having same number of chlorine atoms (chlorine number: 1 to 9) are assumed to be the same. The pretreatment of the sample specified in the above official method was omitted, and the arithmetic means of the quantitative results (average value of $n = 5$, respectively) at the time of the certification obtained by applying the above two methods were calculated as technical information.

Because the mass fractions of CB209 (decachlorobiphenyl) and CB3 (4-chlorobiphenyl) were low, the CRM was not diluted for the IDMS measurement (column: HT8-PCB) for the determination of these congeners. The uncertainty of the technical information is the expanded uncertainty obtained by multiplying the combined standard uncertainty by a coverage factor, and it is the half-width of an interval estimated to have a level of confidence of approximately 95 %.

Date of Shipment: Xxxxx xx, 20xx

7906a00-120331-220127

Mass fractions of PCB homologues/congeners in CRM 7906-a based on the Japanese official method for the determination of PCBs in waste

PCB	Technical information	Expanded uncertainty
	Mass fraction (mg/kg)	Mass fraction (mg/kg)
(Mono)Chlorobiphenyls	0.016	0.005*
Dichlorobiphenyls	4.33	0.08*
Trichlorobiphenyls	32.1	1.0*
Tetrachlorobiphenyls	58.4	2.9*
Pentachlorobiphenyls	40.2	1.5*
Hexachlorobiphenyls	35.4	2.4*
Heptachlorobiphenyls	23.7	0.4*
Octachlorobiphenyls	7.14	0.27*
Nonachlorobiphenyls	0.56	0.03*
CB209 (Decachlorobiphenyl)	0.00512	0.00018**
CB3 (4-chlorobiphenyl)	0.00352	0.00012**

* $k=2$, ** $k=2.78$

The densities of this CRM measured with an oscillation-type density meter at room temperature at the time of the certification are 0.7179 g/cm³ at 20 °C and 0.7140 g/cm³ at 25 °C.

NMIJ Analysts

The technical manager for this CRM is NUMATA M., the production manager is NUMATA M., and the analysts are ISHIKAWA K., INAGAKI S. and MATSUO M.

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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Revision history

April 1, 2015: "Metrology Management Center" was renamed to "Center for Quality Management of Metrology."

November 12, 2015: The uncertainties of some certified values were reassigned.

The description in "Expiration of Certificate" was changed to "one year from the date of shipment."

January 27, 2022: The uncertainties of some certified values were reassigned.

"Indicative Values" was changed to "Technical Information."

Sample