

National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan



Reference Material Certificate

NMIJ CRM 5010-a

No. +++



Poly(ethylene glycol) Nonylphenyl Ether

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 the calibration of instruments, the validation of measurements, and the evaluation of analytical performance used to determine the average molecular mass and molecular mass distribution of polymers.

Certified Values

The certified values for the mass and number fractions with degree of polymerization from 1 to 29 are given in the table below. The mass and number fractions were calculated from the compositions of degrees of polymerization from 1 to 29 as the mathematical summation equals to 1, and other compositions are not certified as zero contents. The uncertainty of each 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		Poly(ethylene glycol) Nonylphenyl Ether			
CAS No.		9016-45-9			
Degree of Polymerization	Relative Molecular Mass	Certified Value Mass Fraction (kg/kg)	Expanded Uncertainty Mass Fraction (kg/kg)	Certified Value Number Fraction	Expanded Uncertainty Number Fraction
1	264	0.0002	0.0003	0.0006	0.0008
2	309	0.002	0.004	0.004	0.008
3	353	0.007	0.003	0.013	0.006
4	397	0.021	0.005	0.035	0.008
5	441	0.034	0.014	0.050	0.020
6	485	0.048	0.008	0.065	0.011
7	529	0.070	0.019	0.087	0.023
8	573	0.091	0.018	0.105	0.020
9	617	0.107	0.015	0.114	0.016
10	661	0.115	0.022	0.114	0.021
11	705	0.112	0.031	0.104	0.027
12	749	0.101	0.037	0.088	0.030
13	793	0.085	0.031	0.070	0.024
14	837	0.067	0.020	0.053	0.015
15	881	0.049	0.019	0.037	0.014

16	925	0.033	0.023	0.024	0.016
17	969	0.021	0.013	0.0140	0.0085
18	1013	0.0118	0.0088	0.0077	0.0057
19	1057	0.0064	0.0033	0.0040	0.0020
20	1101	0.0034	0.0071	0.0020	0.0042
21	1146	0.0022	0.0034	0.0013	0.0019
22	1190	0.0018	0.0028	0.0010	0.0016
23	1234	0.0018	0.0023	0.0009	0.0012
24	1278	0.0015	0.0016	0.0007	0.0008
25	1322	0.0012	0.0023	0.0006	0.0011
26	1366	0.0015	0.0017	0.0007	0.0008
27	1410	0.0015	0.0020	0.0007	0.0009
28	1454	0.0015	0.0019	0.0007	0.0009
29	1498	0.0015	0.0026	0.0006	0.0011

(2) The certified values for the mass-average molecular mass and the number-average molecular mass are given in the following table, which were calculated from the values of the mass and number fractions with degrees of polymerization from 1 to 29. 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 %.

Average Molecular Mass	Certified Value	Expanded Uncertainties
Mass-average Molecular Mass	695	61
Number-average Molecular Mass	657	51

Analysis

The mass and number fractions, and the mass-average and number-average molecular masses were measured by supercritical fluid chromatography with an evaporative light scattering detector (SFC-ELSD) calibrated by using uniform poly(ethylene glycol) nonylphenyl ether oligomers.

Metrological Traceability

The sensitivities of the SFC-ELSD were calibrated by using uniform poly(ethylene glycol) nonylphenyl ether oligomers. The concentrations of uniform poly(ethylene glycol) nonylphenyl ether oligomers for the calibration of the SFC-ELSD were determined by total organic carbon (TOC) measurement. The TOC measurement instrument was calibrated by NMIJ CRM 3001-a (Potassium Hydrogen Phthalate). Weighting were carried out by a JCSS-calibrated balance. The molecular mass of each component was calculated using "ATOMIC WEIGHT OF THE ELEMENTS 2007" published by IUPAC.

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 colorless liquid at room temperature. A unit of the CRM consists of approximately 1 g in the bottle made by polypropylene kept in an environment of dry argon.

Homogeneity

The homogeneity of this CRM was tested by SFC-ELSD analysis for 10 bottles picked up from 300 bottles. Analysis of

Date of Shipment: Xxxxx xx, 20xx

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variance applied to the SFC chromatograms proved the homogeneity of this CRM.

Instructions for Storage

The CRM should be stored under 5 °C in the original bottle tightly closed and shielded from light.

Instructions for Use

This CRM is for laboratory use only. After opening the bottle, it is desirable to use up as immediately as possible. Considering the homogeneity, a minimum sample size(mass) of 10 mg should be used to ensure valid results.

Precautions for Handling

Keep away from fire, heat and sparks. Use under open air. Wear suitable protective clothing and gloves. Avoid any pollution. This CRM is the first relevel compound in the law of Pollutant Release and Transfer Register (PRTR). Obey the law about storage and waste when the CRM is stored and disposed. Refer to the safety data sheet (SDS) on this CRM before use.

Preparation

This poly(ethylene glycol) nonylphenyl ether was prepared by Wako Pure Chemical Industries, Ltd., Osaka, Japan.

Technical Information

The CRM is the same chemical substance called by the common name of "Nonylphenol Ethoxylate."

NMIJ Analysts

The technical manager is KINUGASA Shinichi, the production manager is TAKAHASHI Kayori, and the analyst is TAKAHASHI Kayori.

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."

April 1, 2021: The expanded uncertainties and the displayed number of digits in molecular mass were changed. The description in "Expiration of Certification" was changed to "one year from the date of shipment."

Sample