

National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan



Reference Material Certificate

NMIJ CRM 5701-a
No. +++

Polystyrene Latex Nanoparticle, 120 nm

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 controlling the precision of analysis and validating analytical methods and instruments for the determination of light scattering intensity averaged diameter of nanoparticles in liquid phase using dynamic light scattering (DLS).

Certified Value

The certified value of the light-scattering-averaged diameter for 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 %.

	Certified value (nm)	Expanded uncertainty (nm)
Light-scattering-intensity-averaged diameter	118.5	1.8

Analysis

The light scattering intensity averaged diameter was calculated from the diffusion coefficient of the polystyrene (PS) latex nanoparticle measured by DLS using the Stokes-Einstein equation. The diameter was determined as a limiting value by extrapolating apparent diameters at different scattering angles and concentrations to both zero scattering angle and zero concentration.

Metrological Traceability

In the determination of the certified value of this CRM, the value $\lambda = 632.991 \times 10^{-9}$ m was used as the wave length of a He-Ne laser and $k_B = 1.3806488 \times 10^{-23}$ m² kg s⁻²K⁻¹ was used as the value of the Boltzmann constant. ¹⁾ The literature values $n = 1.3323$ ²⁾ and $\eta = 0.8902$ g m s⁻¹ ³⁾ were used for the refractive index n and viscosity η of water at 25 °C, respectively. Temperature was determined by precise thermometer that is traceable to the Japan Calibration Service System. Certified value is traceable to the International System of Units (SI).

1) CODATA, recommended values of the fundamental physical constants: 2010, 2) M. B. Huglin, S. J. O'Donohue, and M. A. Radwan, Eur. Polym. J. 1989, 25, 543, 3) JIS Z-8803:2011.

Indicative Values

The indicative values of the weight averaged diameter, the standard deviation of the distribution for the light scattering intensity diameter, and the standard deviation of the weight averaged diameter of this CRM are given in the table below. The uncertainties of indicative values are the half-width of the expanded uncertainty intervals calculated using a coverage factor (k) of 2, which gives a level of confidence of approximately 95 %.

	Indicative value (nm)	Expanded uncertainty (nm)
Weight-averaged diameter	114.4	6.1
Standard deviation of the light-scattering-intensity-averaged diameter distribution	11.9	0.9
Standard deviation of the weight-averaged-diameter distribution	13.2	0.6

Expiration of Certification

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

Sample Form

This CRM is in the form of aqueous particle dispersion of approximately 10 mg mL⁻¹ particle concentration. This CRM of ca. 10 mL in net volume is kept in a polypropylene bottle.

Homogeneity

The homogeneity of this CRM was determined by DLS and Flow Field Flow Fractionation (FFFF) analysis for 5 bottles taken from a total of 150 bottles. Analysis of variance applied to the DLS data and traces of FFFF-UV proved the homogeneity of this CRM. The homogeneity is reflected in the uncertainty of the certified value.

Instructions for Storage

This CRM should be stored at a temperature between 4 °C and 30 °C without allowing it frozen in the original bottle, tightly closed and shielded from light.

Instructions for Use

This CRM is for laboratory use only under clean conditions and at a temperature between 4 °C and 30 °C. In order to prevent drying the sample solution, the cap of the bottle should be tightly closed. Take care to prevent aggregation of particles when dissolving this CRM by aqueous media. The CRM should be gently inverted several times before use.

Precautions for Handling

If the CRM comes into contact with the eyes, flush with a large amount of running water. If the CRM comes into contact with skin, flush with running water. If the CRM leaks, clean using paper or cloth if necessary. Dispose of the CRM according to the relevant laws. Refer to the safety data sheet (SDS) on this CRM before use.

Preparation

This PS-latex nanoparticle suspension was purchased from JSR Corp., Japan.

Technical Information

The zeta potential of the CRM is -53.8 mV at 25 °C and pH 6.7 by electrophoretic mobility measurements.

NMIJ Analysts

The technical manager for this CRM is KINUGASA S. The production manager and the analyst are KATO H.

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

December 20, 2012: The expiration date of this certificate was changed from “March 31, 2014” to “March 31, 2017.”

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

February 10, 2016: The description in “Expiration of Certification” was changed to “one year after the date of shipment.”