National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan

Reference Material Certificate

NMIJ CRM 5701-b
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 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 %.

	Certified value (nm)	Expanded uncertainty (nm)
Light-scattering-intensity-averaged diameter	117.8	5.1

Analysis

The light scattering intensity averaged diameter was calculated from the diffusion coefficient of the polystyrene 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 $\lambda = 632.9908 \times 10^{-9}$ m was used as the wavelength of a He-Ne laser[1)] and $k_B = 1.380649 \times 10^{-23}$ m^2 kg s^{-2} K^{-1} was used as the value of the Boltzmann constant[2)] . The literature values $n = 1.3323$ [3)] and $\eta = 0.8902$ g m^{-1} s^{-1} [4)] were used for the refractive index n and viscosity η of water at 25 ºC, respectively. Temperature was determined by precise thermometer that was traceable to the Japan Calibration Service System. Detector angles were corrected by rotary encoder that was traceable to the Japan Calibration Service System Certified value is traceable to the International System of Units (SI).

1)https://www.bipm.org/documents/20126/41549578/M-e-P_unstab-HeNe_633.pdf/dcc689ee-8424-4cc8-ec76-1d33d187269b 2) The International System of Units (SI), 9th edition, 2019, 3) M. B. Huglin, S. J. O'Donohue, and M. A. Radwan, Eur. Polym. J. 1989, 25, 543, 4) JIS Z 8803:2011 “Methods for viscosity measurement of liquid”.

Indicative Value

The indicative value of the weight averaged diameter of this CRM is given in the table below. The uncertainty of the indicative 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 %.

	Indicative value (nm)	Expanded uncertainty (nm)
Weight-averaged diameter	114.1	6.8

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.

Description of the material

This CRM is aqueous particle dispersion of approximately 10 mg mL^{-1} particle concentration including 0.5 mg mL^{-1} sodium azide as preservative. A unit of the CRM consists of approximately 10 mL in the bottle made by polypropylene.

Homogeneity

The homogeneity of this CRM was determined by DLS analysis for 10 bottles taken from a total of 200 bottles. Analysis of variance applied to the calculated size proved the homogeneity of this CRM.

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 it 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 Fujikura Kasei Co., Saitama, Japan.

Technical Information

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 11.3 nm ± 1.0 nm and 12.5 nm ± 1.2 nm. The zeta potential of the CRM is –56.5 mV ± 7.2 mV at 25 °C and pH 6.7 by electrophoretic mobility measurements. The numbers after the ± symbols indicate the expanded uncertainties represented by a coverage factor (k) of 2, and they are the half-width of an interval estimated to have a level of confidence of approximately 95 %.

NMIJ Analysts

The technical manager for this CRM is SAKURAI H. The production manager is KATO H. and the analyst are NAKAMURA A.

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.

March 24, 2022

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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