

National Institute of Advanced Industrial Science and Technology

National Metrology Institute of Japan



Reference Material Certificate

NMIJ CRM 5722-a

No. +++



Polystyrene Latex Particles (300 nm, Monodisperse)

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 and control of the precision of the particle size and mass measuring instruments including a differential mobility analyzer (DMA) and an aerosol mass analyzer (APM), and validation of particle size and mass measurement methods.

Certified Values

The certified values of this CRM are given in the table below. The particle size and mass are defined as the number-weighted average of volume equivalent diameter and mass distributions, respectively, of polystyrene latex (PSL) particles. The uncertainties of the certified values are the expanded uncertainty obtained by multiplying the combined standard uncertainty 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 %.

	Certified value	Expanded uncertainty
Particle size	307.9 nm	3.3 nm
Particle mass	16.10 fg	0.51 fg

Analysis

The certified values of this CRM were determined by the electro-gravitational aerosol balance (EAB) method.¹⁻³⁾ The particle density used in the conversion from particle mass to particle size was determined by the method described in JIS Z 8901⁴⁾.

- 1) K. Ehara, K. Takahata and M. Koike, *Aerosol Sci. Technol.*, 40, 514-520, 2006.
- 2) K. Ehara, K. Takahata and M. Koike, *Aerosol Sci. Technol.*, 40, 521-535, 2006.
- 3) K. Takahata, H. Sakurai and K. Ehara, *Aerosol Sci. Technol.*, 54, 1386-1398, 2020.
- 4) JIS Z 8901:2006 Test powders and test particles

Metrological Traceability

A voltmeter, gauge blocks and a hydrometer used in the determination of the certified values by the EAB method were calibrated traceably to the System of Units (SI). The certified values, therefore, are traceable to the SI.

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 in the form of a 10 mg/mL water suspension of PSL particles, including 0.5 mg/mL of sodium azide as a preservative. A unit of the CRM consists of 10 mL in a polypropylene bottle.

Homogeneity

The homogeneity of this CRM was evaluated by the analysis of variance of particle size and mass measured by the electrical

mobility analysis⁵⁾ for 5 bottles randomly selected from among 50 bottles. The homogeneity between the bottles is not significant and is reflected in the uncertainty of the certified values.

5) K. Takahata and H. Sakurai, Earozoru Kenkyu, 36, 123-128, 2021 (in Japanese).

Instructions for Storage

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

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 suspension, the cap of the bottle should be tightly closed after use. Be aware of potential aggregation of particles when diluting this CRM with water or salt solutions. The CRM should be gently inverted several times before use.

Precautions for Handling

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

Preparation

The PSL particle suspensions of this CRM were prepared by Polysphere Co., Ltd.

Technical Information

At the time of certification, the particle density of this CRM determined by the method in JIS Z 8901 was $1.0541 \text{ g/cm}^3 \pm 0.0035 \text{ g/cm}^3$. The particle size distribution width, which is the standard deviation of the number-weighted particle size distribution, of this CRM determined by the electrical mobility analysis⁵⁾ was $2.3 \text{ nm} \pm 1.1 \text{ nm}$. The numbers following the symbol \pm indicate the expanded uncertainty obtained by multiplying the combined standard uncertainty by a coverage factor (k) of 2 and are the half-width of an interval estimated to have a level of confidence of approximately 95 %. Because the particle size distribution is narrow, assuming a normal number-weighted particle size distribution with the above particle size distribution width, the number average diameter (certified particle size) matches with the volume equivalent diameter of particles that have the number average mass (certified particle mass), and the number average mass (certified particle mass) matches with the mass of particles that have the number average diameter (certified particle size), to the last digit of the certified values.

NMIJ Analysts

The technical manager for this CRM is SAKURAI H., the production manager and the analyst are TAKAHATA K.

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.

Date of Shipment: Xxxxx xx, 20xx

5722a00-230224-230224

February 24, 2023

ISHIMURA Kazuhiko
President

National Institute of Advanced Industrial Science and Technology

If you have any questions about this CRM, please contact:
National Institute of Advanced Industrial Science and Technology,
National Metrology Institute of Japan,
Center for Quality Management of Metrology, Reference Materials Office,
1-1-1 Umezono, Tsukuba, Ibaraki 305-8563, Japan
Phone: +81-29-861-4059; Fax: +81-29-861-4009, <https://unit.aist.go.jp/nmij/english/refmate/>

Sample