National Institute of Standards & Technology

Certificate

Standard Reference Material® 1692

Nominal 3 μm Diameter Polystyrene Spheres

(In Cooperation with ASTM)

This Standard Reference Material (SRM) is for use as a primary particle size reference standard for the calibration of particle size measuring instruments including flow-through counters and optical and electron microscopes. A unit of SRM 1692 is a suspension of polystyrene spheres in 5 ml of water at a weight concentration of about 0.25 % to which a dispersing agent and preservative were added by the manufacturer.

Certified Average Particle Diameter: 2.982 μm ± 0.016 μm

The average particle diameter (D) was measured by two techniques: Center Distance Finding (CDF), an optical technique related to array sizing, and Metrology Electron Microscopy (MEM), an electron microscope technique in which a focused electron beam is held stationary while the particles are scanned across by means of a moving stage, with interferometric readout position.

CDF provided D = 2.977 ± 0.011 μm based on 4600 spheres measured, and MEM provided D = 2.989 ± 0.009 μm based on 120 spheres. The certified value is taken as the average of both numbers.

The size distribution of the polystyrene spheres as determined by CDF, is Gaussian with a coefficient of variation of 0.7 % (excluding particles with diameters not on the main peak). The number of oversized outliers from the main peak is less than 0.5 %; the same is true for the undersized outliers. A sphere is defined as an outlier if its diameter is more than $4\sigma_D$ from the number average diameter of the vial. Care should be exercised to prevent contamination once the cap has been removed.

Expiration of Certification: The certification of **SRM 1692** is valid, within the measurement uncertainty specified, **for four years from the date of shipment from NIST**, provided the SRM is handled and stored in accordance with instructions given in this certificate (see "Instructions for Handling, Storage, and Use"). The certification is nullified if the SRM is damaged, contaminated or otherwise modified.

Maintenance of SRM Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet) will facilitate notification.

The particles used in this SRM were prepared, dispersed, and donated to NIST through ASTM Committee S21, by Duke Scientific Corporation of Palo Alto, CA.

The overall coordination of the measurements by the cooperating laboratories was performed under the direction of R.C. Obbink, ASTM-NIST Research Associate.

The technical direction and physical measurements leading to certification were provided by A.W Hartman, T. Doiron and J. Fu of the NIST Precision Engineering Division.

Michael T. Postek, Chief
Mechanical Metrology Division

Gaithersburg, MD 20899
Certificate Issue Date: 23 March 2011
Certificate Revision History on Last Page

Robert L. Watters, Jr. Chief
Measurement Services Division

Support aspects involved in the issuance of this SRM were coordinated through the NIST Measurement Services Division.

INSTRUCTIONS FOR HANDLING, STORAGE, AND USE

Care should be exercised once the cap has been removed to prevent contamination. The unit should be stored at room temperature and the vial should be properly capped.

Before sampling, manually shake and/or exposed the SRM vial to ultrasonics until the spheres are uniformly distributed, then take a sample by squeezing a drop from the vial. Use filtered (0.4 μm pore size filter) distilled water for dilution. When electrolytes are used for electrical sensing-zone measurements, first dilute the sample with water to prevent agglomeration.

Certificate Revision History: 23 March 2012 (Addition of expiration of certification; editorial changes); **20 May 1991** (Original certificate date).

Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730;e-mail srminfo@nist.gov; or via the Internet at http://www.nist.gov/srm.