

The presentation was at the annual meeting of the American Association of Aerosol Research held in Tacoma Washington, October 11-15, 1999. There was a book of abstracts but no official proceedings.

CALIBRATION PARTICLES RELEVANT TO THE MEASUREMENT OF NANOSIZE PARTICLES, George W. Mulholland*, National Institute of Standards and Technology, 100 Bureau Drive STOP 8653, Gaithersburg, Maryland 20899-8653. The development of technologies associated with nanometer size particles, such as automated wafer inspection systems, requires several monosize calibration particles with diameters in the range from 1 nm to 100 nm. The one relevant calibration standard from NIST is the 100 nm Standard Reference Material 1963. The characteristics of these particles will be described along with the methodology for characterizing the sizing uncertainty, which is based on ISO's "Guide to the Expression of Uncertainty." The issues of discrepancies among various accepted standards will be discussed along with the need for traceability to an accurate reference standard.

A summary of other sources of nanometer size calibration particles will be given along with information on nominal size, width of size distribution, and traceability. One limitation of existing polystyrene calibration particles is that the width of the size distribution increases dramatically with decreasing particle size. For example, the coefficient of variation for 100 nm spheres is about 0.02, while the value for 30 nm spheres it is about 0.2.

Another challenge for particle sizes less than 100 nm is the generation of an aerosol with the same characteristics as the particles in suspension. Typically the aerosol is formed by pneumatically atomizing a suspension of the monosize spheres. The contaminant in the water leaves a residue on the dried spheres. The thickness of this layer relative to the particle diameter increases as the particle size decreases. Also, for particles with diameters less than about 50 nm, the formation of multiplet particle can become an issue. The potential effectiveness of electrospray systems to reduce these effects will be discussed.

For very small particle sizes there are exciting new calibration possibilities based on "molecular" particles. These include dendrimers and macromolecules. The results of sizing studies carried out at NIST on dendrimers ranging in size from 2 nm to 15 nm will be presented.