

Traceability and Standards Applied to Microtrac Instruments

General concept on the use of standard materials

General use standards for various measuring devices provide the user with information as to how well their measuring device is performing when measuring a property having a known chemical or physical value. The standard, whether developed in-house or by an outside organization such as BCR (European), NIST, ISO, etc. demands that great care be taken in statistically assuring that the values can be supported scientifically for a particular scientific measuring device such as in calorimetry, chemical quantitative analysis, pH measurements and particle size measurements. The materials are specially formulated with specific applications and instruments in mind.

Various organizations often provide these materials in an amount such that the material is used completely, i.e., the entire contents of a container are used for a test. This assures that the material is being used in the correct amount for the device being tested. It also assures that the user does not impart any characteristics to the test material that could affect the present test or future tests should the material be collectible and reusable.

The standard materials contain directions for their use for a specific device or instrument. These should be followed in accordance with general use of the standard since measurement conditions, subsampling errors, operator technique and other influences can affect the outcome of the test. Varying the procedure can cause a fully functional instrument to provide aberrant data and concern on the part of the user. Using non-standard materials on instrumentation or under conditions that are not included in basic concept of their design may lead to misinterpretation of the performance of an instrument or measuring device. Thus, the materials should be applied according to their design criteria to test the features of interest.

Some organizations have been formed to provide these materials as described above. Commercial enterprises have undertaken the marketing and selling of materials to supplement those that are available from standards organizations such as NIST and BCR. These can be used as standards but represent secondary standards that are traceable to an organization such as NIST. This is done by a calibration using data, materials, or instruments identical in measuring capability to the standards organization. The materials are then prepared and measured using the on-site equipment, not those belonging to NIST.

This approach has been accepted in developing particle size standards used in microscopy, sieving, particle counting, and surface area measurements. At present, International Standards Organization (ISO) committees on particle size measurements are attempting to produce materials to evaluate the performance of dynamic and static (diffraction) light scattering that are not affected by sample preparation and sub-sampling. These will represent secondary standards since their measurements are based on another measuring principle such as microscopy or sieving. However, they may represent the best light scattering standard materials since: (1) considerable "round-robin" testing will be conducted after an extremely in-depth analysis of the particle size distribution, and (2) the material will have characteristics specifically designed for light scattering rather than adapting a present standard which is actually intended for another use.

One such approach to preparing secondary standards has been outlined by Duke Scientific in a publication titled "Improved array method for size calibration on monodisperse spherical particles by optical microscopy." Stanley D. Duke and Ellen B. Layendecker, Particulate Science and Technology 7:209-216, 1989. Hemisphere Publishing Company. The paper describes the method of using a NIST calibrated stage micrometer to measure polystyrene diameters. The polystyrenes after such a measurement can then be used as standards "linked" or "traceable" to NIST. Thus, an instrument operator can use those materials that might fit a particular size range of interest that NIST does not have in stock.