



DETECTING OVERSIZED PARTICLES BY LIGHT SCATTERING METHODS

Many applications for particle size measurement include the need to look for over-size contaminants or agglomerates in the sample. Light scattering measurements can be sensitive to a very small amount of larger particles.

Background

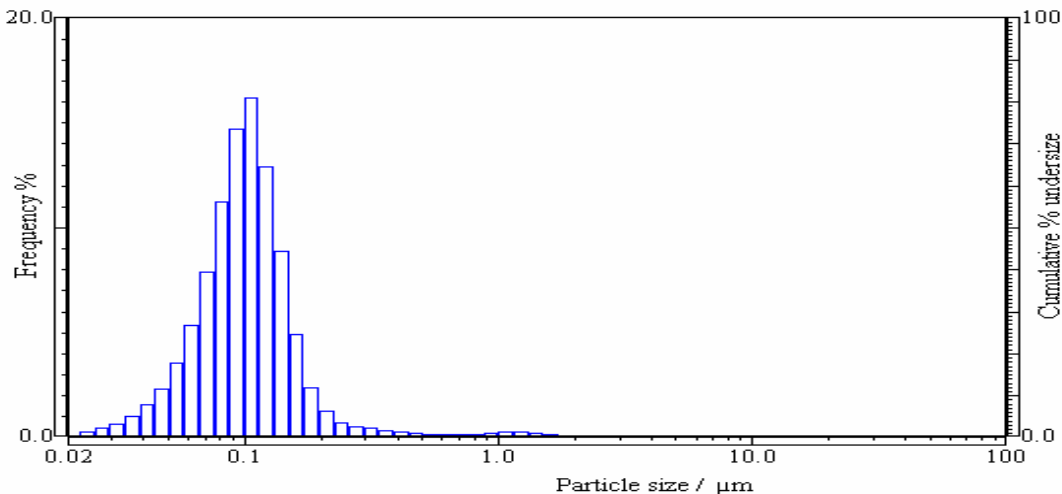
The ability to detect a very small proportion of larger sized particles in a sample is the prime objective in some applications such as coatings and abrasives. Oversized particles in coatings show up as blemishes in finishes. Oversized particles in abrasives used to polish surfaces can instead scratch the surface.

An application particularly sensitive to this is abrasive slurries used for the chemical mechanical polishing (CMP) of semiconductor wafer surfaces. These slurries can contain oversized particles, either as received from the supplier or in the form of aggregates of particles that form over time and during use. Scratching of a batch of wafers can cause a materials loss in the hundreds of thousands of dollars, which makes size monitoring for oversized particles extremely important to wafer manufacturers.

Silica Experiment

To quantify the sensitivity of the Horiba LA-910 particle size analyzer for detecting agglomerates in CMP slurry, an experiment was performed using a known fumed silica sample and adding small amounts of the BCR66 crushed quartz standard. The fumed silica had a measured median size of 0.099 μm and the BCR66 had a measured median size of 1.113 μm .

A series of different proportions was prepared and analyzed. The smallest amount of "contaminant" that was measured in this experiment was 0.26% by weight of BCR66 in the fumed silica sample. The sample added to the instrument was composed of 24.46mg of silica and 0.064mg of BCR66. The data below shows that the small mode around one micron (representing BCR66) is easily identified on the graph of the distribution.





Horiba LA-930 Particle Size Analyzer

Methods to Improve Sensitivity

If the goal of a measurement is to be sensitive to large size agglomerates, it is important to perform some experiments to verify the best combination of settings and conditions. In most cases, it is preferable to run the sample at a higher concentration so that there is more of the large material (on an absolute scale) in the system. This aids in getting the signal on the detector over the threshold. Increasing the analysis time may also help, particularly if the large-size signal is not completely stable.

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