A New Method for the Rapid Identification of sub-20nm Particles in UPW.

by
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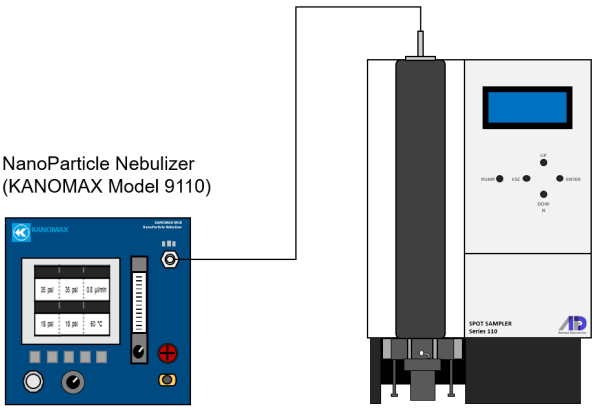
Abstract: The detection of particles in Ultrapure Water (UPW) is critical for successfully manufacturing semiconductors. As semiconductor line width continues to shrink, particle detection at less than 20 nanometers will become essential. Particle composition is also important, as it allows for the identification of particle source/s. Recent attempts at sub-50nm particle identification in UPW have been partially successful (Blackford 2009), however, this method required long sample periods and were material dependent.

Combining the NanoParticle Nebulizer developed by Kanomax FMT with the Spot Sampler aerosol particle collector developed by Aerosol Devices, provides a new method of collecting and identifying particles as small as 10nm within a 24-hour collection period. The NanoParticle Nebulizer produces droplets of UPW of very small size which rapidly dry to produce particles consisting of dissolved inorganic and high-molecular-weight organic material originally present in the UPW sample. The Spot Sampler uses a condensation particle growth technique that produces micrometer size water droplets seeded by discrete particles aerosolized by the NPN. An on-line drying process ensures dry particles are deposited on the collection substrate. The increase in particle size by condensational growth is necessary to exploit inertial separation to gently deposit the particles onto a substrate for SEM/EDX analysis. The substrate in the Spot Sampler is repositionable allowing for time resolved particle collection.

Calibration of the collection efficiency and system verification is accomplished by injecting colloid particles at a known number concentration into the UPW sample stream.

This paper describes the principals of operation for both the Spot Sampler and the NanoParticle Nebulizer and reports results of UPW particle identification using a Hitachi SU8200 Series FE-SEM combined with Oxford Instruments EDX analysis. The NanoParticle Nebulizer was also used to inject 10nm colloidal silica particles into UPW; the results for the successful collection of these particles by the Spot Sampler are described in this paper.



Reference:

Blackford, David, et al, NanoParticle Collection Device for Ultra-Pure Water, UPW Conference Portland OR, November 2009.