Next Generation Particle Detection in CMP Slurries

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Semiconductor fabrication continues to demand better slurry monitoring with each successive generation of technology. Advanced fabrication methods now require more than 30 individual CMP planarization steps in the most advanced flows, such as sub-10 nm microprocessors. The Mavlipa G3 provides the next generation capability for real-time monitoring of particle size distributions in CMP slurries at each of the key points along the path from slurry manufacturing to distribution system to point of use. Currently, there are no other metrology instruments capable of analyzing undiluted slurries for particle sizes ranging from below 800 nm to over 10 microns and concentrations from just a few per mL to over a billion particles per mL (9 orders of magnitude).

This presentation will start by describing the patented multi-sensor optical particle sizing (MSOPS) method which enables non-invasive, non-destructive PSD measurement across an extremely broad range of particle sizes and concentrations. This is a significant advancement compared to other commercially available systems which generally require slurry sampling and heavy dilution. In an R&D setting, the G3 can measure virtually any type of abrasive in a CMP slurry (as shown in Fig 1) and allows slurry formulation teams to quickly connect PSD details with CMP polishing performance.

For production CMP, real-time monitoring of the slurry can reduce the risk of scrap by enabling faster response to any unexpected PSD excursions. It can also provide the details needed to later connect process data with end-of-line yield and further refine process control strategies. Additional applications will be discussed as appropriate.

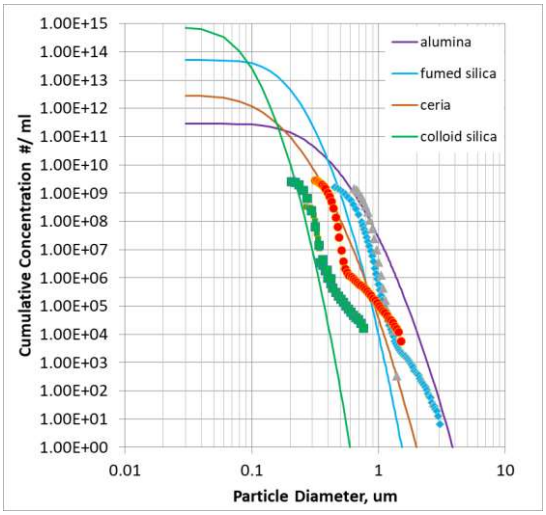

Fig.1 Slurry PSD data for 4 different particle types

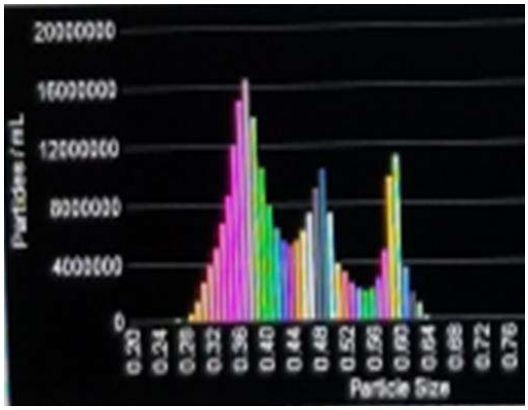

Fig.2 Histogram of mixture of PSL spheres (nominal sizes of 400, 500, & 600 microns)

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Preference: X Oral ☐ Poster

Topic Area: Consumables, Equipment & Metrology