Chemical Modification of Particle Surfaces: Probing for Possible CMP Applications

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Abrasive particles for use in CMP slurries or incorporated in polishing pads have evolved from sizes larger than several microns to low nanometers, and compositions from natural minerals to synthetic. The trend has been to prepare particles that cause less scratching and dishing, have higher selectivity between chemical types of layers on a wafer, are easily removed after polishing, and still have fast removal rates. A high level of synergism exists between abrasive needs by the CMP community and colloid and particle expertise at Clarkson's Center for Advanced Materials Processing. For several years the speaker and his colleagues have carried out R&D in areas of particle synthesis and surface modification. The speaker has focused his attention on the latter, where the surface modifications have included coating or encapsulation of cores to alter hardness and density, as well as attachment of molecular functionalities capable of altering surface charge, metal ion binding, etc. Several deposition methods such as electrostatic charge, non-solvent addition and in situ synthesis are employed to create the new surface in controlled quantity, thickness and uniformity. In this talk some examples of alumina and silica coated with several polymers and some polishing data using them will be presented. Also, presented will be a chemists vision for how new chemistry might be applied for controlling the activity of BTA, and for using principles of polyelectrolyte association and interparticle adhesion to generate new abrasives for the CMP industry.