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Polymeric Microgels for Chemical Mechanical Planarization (CMP) Processing

Researchers at the University of South Florida have developed new abrasive particles to carry out Chemical Mechanical Planarization (CMP) at relatively low mechanical stress.

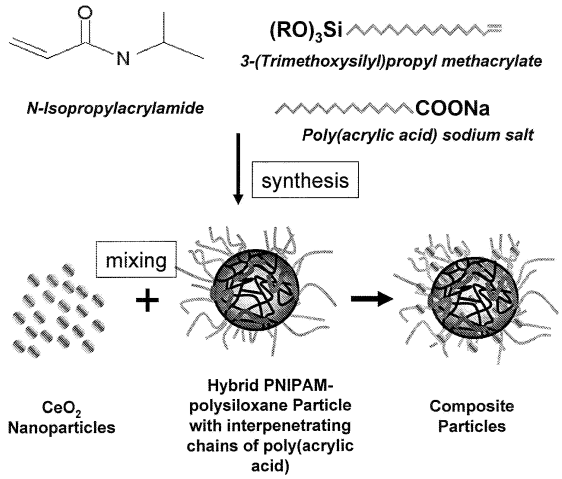
CMP is a combination of mechanical scraping and chemical treatment of the wafer's surface. The polishing process involves active abrasion of the wafer surfaces using particles present in the microgel and active mechanical component. Such an abrasion results in surface scratches on the wafer which leads to the formation of puddles in further layers causing an electrical short circuit. Defects during CMP may hamper the device yield. These defects result in nullifying the advantages of using CMP as a global planarization technique. Therefore, there is a need for a new type of a semiliquid mixture resulting in reduced scratches on the surface of the wafer during CMP process.

Researchers at USF have developed unique slurries using soft particles that do not cause aggressive scratching. The slurries are composed of organic-inorganic colloidal particles. Experimental results have indicated that the planarization of silicon oxide wafers using these mixtures exhibited lower topographical variations and surface roughness as compared to microgels consisting of only silica or ceria nanoparticles. This polymeric microgels when used during CMP process is useful in reducing the roughness of the surface during the fabrication of semi-conductor devices. Further, it has potential applications in the photolithography process.

ADVANTAGES:

- **Reduces surface roughness**
- **Achieves CMP with lower stress**
- **Lower defect rate**
- **Lower particle residue**
- **Composition of gel can be controlled**

Optimizes Both Removal Rates and Reduces Surface Scratches and Particle Residue at the Same Time



Schematic Diagram of the CMP Polishing Process

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