URN etd-0407109-183713-1056
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Statistics This thesis had been viewed 36 times. Download 62 times.
Department
Year 2003
Semester 1
Degree Master
Type of Document Master's Thesis
Language zh-TW.Big5 Chinese
Title Particle growth and modification of nano-grade colloidal silica and its application
Date of Defense 0000-00-00
Page Count 85
Keyword
colloidal silica
glass water
partical growth

Abstract
The colloidal silica was formed through the process of ion-exchange and then controlling homogenous nucleation and surface growth. Two experimental methods had been done, one was constant volume process and another was constant concentration process. The effects of the formation procedure, seed concentration, and the amount of additive to the surface growth had been studied in this article. During the surface growing, the cerium ion was added with active silica acid for further modifing the surface of colloidal silica. The polishing performance of modified colloidal silica and had been tested by coating SiO2 film on the 2 cm x 2 cm silicon wafer.

According to the experimental results, we found that the method of constant volume process leads to the particle growth more significantly. The concentration of seed seems affect the mechanism of particle formation. The homogenous nucleation dominates the particle formation as the seed concentration is below 0.5 wt %. The homogenous nucleation and surface growth occur simultaneously as the seed concentration is in the range 0.5 wt% ~1.3 wt%. As the seed concentration is higher than 1.3 wt%, the surface growth would dominate the mechanism of particle formation. As the seed concentration is higher than 2.5 wt%, the particle in solution is gelled. The addition of KOH during particle formation is helpful to the surface growth of particle.

The polishing rate of cerium modified colloidal silica is higher than that of un-modification colloidal silica. The removal rates of SiO2 are affected by the polishing parameters such as down force and carrier speed. The results of polishing data agree with the Preston Equation.
Advisory Committee - advisor

Files etd-0407109-183713-1056-001.pdf

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Date of Submission 2004-08-11