

산화막 CMP에서 세리아 입자의 패드 표면누적과 재료제거 관계

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Correlation between Ceria abrasive accumulation on pad surface and Material Removal in Oxide CMP

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Abstract : The oxide CMP has been applied to interlayer dielectric(ILD) and shallow trench isolation (STI) in chip fabrication. Recently the slurry used in oxide CMP being changed from silica slurry to ceria (cerium dioxide) slurry particularly in STI CMP, because the material selectivity of ceria slurry is better than material selectivity of silica slurry. Moreover, the ceria slurry has good a planarization efficiency, compared with silica slurry. However ceria abrasives make a material removal rate too high at the region of wafer center. Then we focuses on why profile of material removal rate is convex. The material removal rate sharply increased to 3216 Å/min by 4th run without conditioning. After 4th run, material removal rate converged. Furthermore, profile became more convex during 12 run. And average material removal rate decreased when conditioning process is added to end of CMP process. This is due to polishing mechanism of ceria. Then the ceria abrasive remains at the pad, in particular remains more at wafer center contacted region of pad. The field emission scanning electron microscopy (FE-SEM) images showed that the pad sample in the wafer center region has a more ceria abrasive than in wafer outer region. The energy dispersive X-ray spectrometer (EDX) verified the result that ceria abrasive is deposited and more at the region of wafer center. Therefore, this result may be expected as ceria abrasives on pad surface causing the convex profile of material removal rate.