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산화막 화학적 기계적 연마에 영향을 미치는 실리콘 웨이퍼 나노토포그래피의 스펙트럼 분석
(Spectral analyses of the impact of nanotopography of silicon wafers on oxide CMP)

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Recently, the height change of silicon wafer surfaces nanotopography[1,2] has been an important issue because it seriously affects post CMP uniformity of dielectric films. The purpose of this study is to investigate quantitatively how the nanotopography impacts on oxide CMP. We proposed a formula for the spectral analyses comparisons between nanotopography and the film thickness variation after CMP [3,4].

We used two kinds of single-side-polished wafers with different characters in nanotopography (Wafer-A and B). Nanotopography of wafers were measured by ADE Nanomapper. Oxide films on the wafers were grown by means of PETEOS method. Polishing of oxide films was done on a Strasbaugh 6EC. Rodel IC1000/Suba IV pad and Cabot SS25 slurry were used. Oxide thickness of wafers before and after CMP were measured with Therma-Wave Opti-probe 2600DUV.

We propose a transfer function[5] as the ratio of Power Spectral Density(PSD) for the oxide film thickness variation to that for nanotopography based on the concept of the planarization length of CMP [6]. The result was examined with the transfer function. Though Wafer-A and Wafer-B have quite different characteristics of nanotopography to each other, the transfer functions of the wafers were calculated to be similar and this result supports the contention that our formulation is reasonable. This transfer function describes the character of the CMP process condition. (e.g. pad hardness, removal depth) The formula we proposed is useful for estimating the quantitative impact of the various kinds of nanotopography on film thickness variation after CMP.

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