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Relative Sputtering Rates of Oxides and Fluorides of Aluminum and Yttrium

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In order to understand the erosion behavior of oxide ceramics during their exposure to fluorocarbon plasma, the thin films of AlF_3, YF_3, Al_2O_3, Y_2O_3 and SiO_2 were deposited on silicon and then their surfaces were irradiated with Ar ions of different kinetic energy. When we measured the relative sputtering rates, fluoride was sputtered faster than oxide with strong dependency on its chemistry, while the sputtering rates of oxides were nearly identical. The fact that AlF_3 was sputtered a few times faster than YF_3 is consistent with previously observed faster etch rate in Al_2O_3 than in Y_2O_3 under fluorocarbon plasma. These results support that erosion of ceramics under fluorocarbon plasma occurs by a physical removal process of fluorinated surfaces which were simultaneously induced by their interaction with the fluorocarbon plasma. Based on these results, implications for plasma resistance of oxide ceramics and production of contamination particles in the silicon wafer processing chamber under

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