PO1051

Angular dependence of SiO2 etch rates during fluorocarbon plasma etching

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Fluorocarbon plasmas are widely used to etch SiO_2 contact holes in the fabrication of integrated circuits (IC). Because the minimum feature size of the device keeps shrinking, precise control over etch profiles is important during SiO_2 contact hole etching. Understanding the angular dependence of the SiO_2 etch rates is essential to predict and control the etch profile of SiO_2.
Also, it is important to understand the etch mechanism of SiO_2 in various fluorocarbon plasmas because etching characteristic can be affected by plasma chemistry. In this work, the angular dependence of SiO_2 etch rates was investigated in various fluorocarbon plasmas using a Faraday cage system.
The etching was carried out in an inductively coupled plasma system. The substrate was a SiO_2 film deposited on a p-type Si wafer. The discharge gases were C_4F_8, C_2F_6, CHF_3, and CF_4. The angular dependence of SiO_2 etch rates were analyzed in terms of normalized etch rates and normalized etch yields in each fluorocarbon plasma. It was shown that the degree of contribution to etching mechanism (either physical sputtering or chemical etching) was strongly dependent on etch chemistry during fluorocarbon plasma etching of SiO_2.

Keywords
fluorocarbon plasma
oxide etching
angular dependence
faraday cage