

## Universal plasma etch reaction modeling for fluorocarbon plasma processes

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Recently, plasma etching technology is still regarded as one of the critical steps for the fabrication process of the sub-10 nm 3D device in spite of long developing history. Its inherent complexity of this technology results in the absence of a plausible surface reaction model so far. The development of the next generation technology toward sub 10nm node has depended on empirical knowledge of plasma process engineers. To address these issues, we proposed a realistic surface reaction model which can apply to most of the fluorocarbon plasma. This model is based on surface reactions of multi-layer (polymer, mixed layer and target layer). Our semi-analytical model can extract critical parameters such as the thickness of the polymer passivation layer, and transition energy for deposition and etching regime at the given plasma conditions. Finally, we demonstrate that our surface reaction model can be useful to industrial applications toward sub 10-nm node technology through the verification of this model via comparisons with experimental data.