

Universal surface reaction model for fluorocarbon plasma processes for silicon, silicon oxide, and silicon nitride substrate

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Recently, high aspect-ratio contact hole etching(HARC) in semiconductor memory industries has been confronted by the most considerable difficulty due to the inherent complexities. To date, there have been no universal surface kinetic models for better understanding of this critical process for industrial applications. In general, the plasma multi-physicochemical surface reactions become more complicated with the variation of the target material. To address these issues in this work, we have developed a realistic and universal surface reaction model of the plasma etching process for various target materials. This model was considered with a self-consistent model, including detailed kinetic models of plasma deposition and etching under the presence of the passivation layer. Through verification of this model via comparisons with experimental data, we demonstrate that our surface reaction model can be useful to various industrial applications toward next-generation HARC technology.