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3D feature profile simulation based on realistic surface kinetic studies of silicon dioxide etch process in fluorocarbon plasmas WON-SEOK CHANG, National Fusion Research Institute, DONG-HUN YU, Kyung Won Tech.Inc, DEOG-GYUN CHO, YEONG-GEUN YOOK, POO-REUM CHUN, SE-A LEE, Chonbuk National University, DEUK-CHUL KWON, MI-YOUNG SONG, JUNG-SIK YOON, National Fusion Research Institute, YEON-HO IM, Chonbuk National University — Low pressure fluorocarbon plasmas are commonly used in microelectronics fabrication of plasma etching of dielectric materials. Recently, one of the critical issues in the etching processes of the nanoscale devices is to achieve ultrahigh deep contact hole without anomalous behaviors such as sidewall bowing and twisting profile. To achieve this goal, the fluorocarbon gases have been used to optimize the reactant fluxes and obtain the ideal etch profile. However, the semiconductor industries still suffer from the absence of the robust and predictable modeling tools due to the inherent complex plasma chemistry. As an effort to address this issue, we have developed a 3D topography simulator using the level set algorithm based on new memory saving technique, which is suitable in the contact hole etching. For this feature profile simulation, we performed a fluorocarbon plasma-surface kinetic modeling based on our experimental data, a polymer layer based this model was proposed as considering material balance of deposition and etching through steady-state FC layer. Finally, the modeling results showed good agreements with experimental data and could be used successfully for 3D etch profile simulations with consideration of polymer layer.

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