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Silicon oxide surface reaction modeling coupled with global bulk plasma model in inductive coupled fluorocarbon plasmas SE-AH LEE, POO-REUM CHUN, YEONG-GEUN YOOK, KWANG-SUNG CHOI, DEOG-GYUN CHO, Chonbuk National University, DONG-HUN YU, Kyung Won Tech.Inc, WON-SEOK CHANG, DEUK-CHUL KWON, National Fusion Research Institute, YEON-HO IM, Chonbuk National University — Ultra-high deep contact-hole etching is one of the critical issues in fabrication processes of the nanoscale devices. The fluorocarbon plasmas have been used to obtain the ideal etch profiles. As an effort to address this issue, we developed a predictable global plasma model that is coupled strongly with surface reaction and bulk plasma chemistry under fluorocarbon plasmas. For this work, bulk plasma diagnostics in inductively coupled fluorocarbon plasma was performed by quadruple mass spectrometry, Langmuir probe, and cut-off probe. Based on bulk plasma diagnostic data and SiO_2 etch rates, key information such as rate coefficient and reaction paths for realistic bulk plasma and surface chemistry could be obtained in this work. Furthermore, global plasma model was strongly coupled with surface reaction model to capture the realistic plasma phenomena. Finally, the predicted modeling results of etch rate as functions of plasma conditions showed good agreement with experimental data of SiO_2 etching. We believe that this model approach can provide useful and effective route to predict the complex plasma phenomena for oxide etching process in fluorocarbon plasma.

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