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Plasma surface kinetics studies of etch process in inductively coupled fluorocarbon and hydrogen-containing fluorocarbon plasmas WON-SEOK CHANG, Plasma Technology Research Center, National Fusion Research Institute, DONG-HUN YU, Kyung-Won Tech.Inc, DEOG-GYUN CHO, YEONG-GEUN YOOK, POO-REUM CHUN, SE-AH LEE, Chonbuk National University, DEUK-CHUL KWON, Plasma Technology Research Center, 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 (FC) plasmas have been used to obtain the ideal etch profiles. To achieve ultra-high deep contact hole, we present a plasma-surface kinetic studies based on the experimental plasma diagnostic data for silicon dioxide and nitride etch process under inductively coupled FC and HFC plasmas. For this work, the cut-off probe and QMS were used for measuring the electron densities and the ion and neutral radical species. Furthermore, the systematic surface analysis was performed to investigate the thickness and chemical bonding of polymer passivation layer during the etch process. The proposed semi-global surface kinetic model can consider deposition of polymer passivation layer and silicon oxide & nitride etching self-consistently. In this model, thickness of the passivated polymer layer on substrate is calculated from steady-state polymer consumption balance which is composed of sputtered consumption and polymer deposition during oxide etching. Finally, this work will provide better insights to understand basic phenomena of the plasma etching process, leading to the predictable and reliable 3D topography simulation (K-SPEED).

Won-Seok Chang
Plasma Technology Research Center, National Fusion Research Institute

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