Plasma surface kinetic studies for high-aspect ratio contact hole etch profile simulation

천푸름, 이세아, 육영근, 최광성, 조덕균, 유동훈, 권득철[1],
임연호*, 장원석[1]
전북대학교; [1]국가핵융합연구소
(yeonhoim@jbnu.ac.kr*)

Recently, one of the critical issues in the etching processes of the nanoscale devices is to achieve ultra-high deep contact hole without anomalous behaviors such as sidewall bowing, and twisting profile. However, most of the process development still depends on the empirical routs due to the inherent complexities of plasma processes. As an effort to address this issue, we present a plasma-surface kinetic modeling based on the experimental plasma diagnostic data for silicon dioxide etching process under fluorocarbon plasmas. To capture the realistic surface reaction behavior, a polymer layer based surface kinetic studies are proposed as considering material balance of deposition and etching by using numerical methods of simultaneous ordinary differential equations about 70's surface reaction set. The surface kinetic studies of the fluorocarbon film region is considered by complex fluorocarbon balance for plasma etching conditions considering deposition, etching and polymer consumption. Finally, the surface kinetic studies results showed good agreements with experimental etch rates and could be coupled successfully for 3D etch profile simulations in high-aspect ratio contact hole plasma etching.