3D feature profile simulation for fluorocarbon plasma etching processes

육영근, 조덕균, 유동훈[1], 장원석[2], 권득철[2], 김진태, 윤정식[2], 임연호*
전북대학교; [1]경원테크; [2]국가핵융합연구소
(yeonhoim@jbnu.ac.kr*)

One of the critical issues in the etching processes of the nanosize devices is to achieve ultra-high deep contact hole without anomalous behaviors such as sidewall bowing and twisting profile. To achieve this goal, the fluorocarbon gases have been used with numerous additives (e.g., O2, CO, and Ar) to optimize the reactant fluxes and obtain the ideal etch profiles. We have developed 3D topography simulator using the multiple level set algorithm to adopt new memory saving technique. For the ballistic transport of neutral and ions inside the 3D feature profile, the parallelized numerical schemes based on multi-core processes were developed to avoid the time consuming computation. Furthermore, a fluorocarbon plasma-surface kinetic modeling was performed using the experimental plasma diagnostic data for silicon dioxide etching process under inductively coupled C4F6/O2/Ar plasmas. Then, the local etch rates were evaluated as functions of local neutral and ion fluxes and integrated with 3D feature profile simulator. Finally, we demonstrated various aspects of etch process such as sidewall bowing, etch stop and twisting from 3D feature profile simulator.