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Insights into Plasma Etch Profile Evolution with 3D Profile Simulation SARAVANAPRIYAN SRIRAMAN, ALEX PATERSON, Lam Research, YITING ZHANG, MARK KUSHNER, University of Michigan — Plasma etching is critical for pattern transfer in microelectronics fabrication. For planar devices, efforts in 2D etch profile simulations were sufficient to understand critical etch process mechanisms. In contrast, to understand the complex mechanisms in etching 3D structures of current technology nodes such as FinFETs, 2D profile simulators are inadequate. In this paper, we report on development of a 3D profile simulation platform, the Monte Carlo Feature Profile Model (MCFPM-3D). The MCFPM-3D builds upon the 2D MCFPM platform that includes aspects such as mixing, implantation, and photon assisted processes and addresses reaction mechanisms in surface etching, sputtering, and deposition to predict profile evolution. Model inputs include fluxes of species from plasma derived from the Hybrid Plasma Equipment Model (HPEM). Test cases of Si/SiO_2 etching in Ar/Cl_2 and $Ar/CF_4/O_2$ plasmas for representative 2D/3D feature topographies are considered and phenomena such as selectivity and aspect ratio dependent etching will be discussed.

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