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Finite Penetration Depth Model for 2D and 3D Simulation of Etching, Deposition, and Implantation PAUL MOROZ, Tokyo Electron US Holdings, Inc. — Chemical and physical processes of plasma-solid interactions in materials processing are very diverse and complex. Final results often involve a few competing mechanisms such, for example, as etching and deposition, which go on simultaneously. The general feature profile simulator, FPS-3D [1], was developed with the goal of simulating process results for different conditions, chemistry, and materials. While low-energy species interact only with the surface mono-layer of solid materials, ions or fast neutrals could penetrate deeply inside materials. In a case of polymer deposition layers, energetic species might go through them and lead to etching of main materials. To take those effects into account, FPS-3D computes penetration depth of any energetic particle. Of course, calculating penetration depth is a complex and time consuming task by itself, especially for chemically complex targets. We are using the Range code results for that, and FPS-3D quickly computes penetration depth by spline interpolation of Range data. To demonstrate how etching, deposition, and implantation are treated by FPS-3D, we consider the case of SiO2 etching in fluorocarbon-argon-oxygen plasma in a capacitive-type plasma system.

[1] P. Moroz, APS-DPP, NP8, Atlanta, GA, 2009.

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