Abstract Submitted
for the GEC12 Meeting of
The American Physical Society

Feature Profile Simulations and Finite Penetration Depth PAUL MOROZ, DANIEL MOROZ, Tokyo Electron US Holdings — In plasma materials processing, energetic ions, neutrals and UV photons typically penetrate deep inside solid materials breaking atomic bonds and displacing atoms on their paths. These important phenomena are rarely taken into consideration in processing simulation software, primarily because the proper penetration depths and the corresponding energy depositions, breaking bonds, and atom displacements are difficult and computationally expensive to compute. The FPS-3D feature profile simulator [1-2] is doing that computationally efficiently by utilizing tabulated results obtained with other methods. We discuss, compare, and present results of such simulations made with different methods, one of which is the molecular dynamics analysis. In general, molecular dynamics could be used for simulating materials processing, etching and deposition, but it is extremely computationally expensive to be used for large groups of atoms. In practice, molecular dynamics methods are too slow to be used for feature profile simulations. However, they could help in defining proper chemical reactions and corresponding rates to be used in an advanced feature profile simulator such as FPS-3D. We present results of FPS-3D simulations for Si and SiO2 etching in Ar/Cl2 and Ar/C4F6/O2 plasmas.

[1] P. Moroz, "General Feature Profile Simulator FPS-3D," ECS Transactions, **35**, 25 (2011).
[2] P. Moroz, "Numerical Simulation of Feature Profile Evolution using FPS-3D," IEEE Transactions of Plasma Science, **39**, 2804 (2011).

Paul Moroz
Tokyo Electron US Holdings

Date submitted: 15 Jun 2012 Electronic form version 1.4