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Time dependence analysis of the 3D profile charging during SiO_2 etching in Ar^+/CF_4 plasma BRANISLAV RADJENOVIC, Vinca Institute of Nuclear Science, MARIJA RADMILOVIC-RADJENOVIC, ZORAN PETROVIC, Institute of Physics — Damage to integrated circuits (ICs) during manufacturing as a result of charging of the dielectrics during finalization of interconnects is both reducing the profitability and reducing the ability to reach large sizes of microchips and make complex system integration on a single chip. The ability to simulate feature charging was added to the 3D level set profile evolution simulator. The ion and electron fluxes were computed along the feature using a Monte Carlo method. The surface potential profiles and electric field for the entire feature were generated by solving Laplace equation using finite elements method. Calculations were performed in the case of simplified model of Ar^+/CF_4 non-equilibrium plasma etching of SiO_2. The time necessary for the electric field in the feature to reach its steady-state value is potentially very important for the orderliness of the whole simulation cycle. Since the calculations show that this time is about several milliseconds, which is very short comparing to the etching time step (during which we assume that the etching rate is constant), it is reasonable to calculate steady-state values of the electric field in the beginning of every Monte-Carlo step and use this field subsequently, instead of devising a complex and computationally costly scheme for the recalculation of the field during particle fluxes calculations.

Branislav Radjenovic
Vinca Institute of Nuclear Science

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