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The effect of including fast neutrals and energy-dependent γ-coefficients in PIC simulations of capacitive RF plasmas JULIAN SCHULZE, Department of Physics, West Virginia University, ARANKA DERZSI, IHOR KOROLOV, ZOLTAN DONKO, Hungarian Academy of Sciences, EDMUND SCHUENGEL, Department of Physics, West Virginia University — In most PIC simulations of capacitive RF plasmas operated in noble gases only electrons and ions are traced and a constant ion induced secondary electron emission coefficient of $\gamma_{\text{ion}} \approx 0.1$ is used. Here, we demonstrate that tracing fast neutrals that originate from elastic ion-atom collisions in the sheaths, including ionization as well as secondary electron emission induced by these particles, and implementing realistic energy dependent γ-coefficients are essential for obtaining realistic results from such simulations. We find that the ionization caused by fast neutrals strongly enhances the plasma density in simulations of argon discharges driven at 13.56 MHz. This leads to smaller sheaths and limits the maximum driving voltage amplitudes, at which the simulation converges. Both effects are in agreement with experimental findings. Including realistic γ-coefficients also affects the plasma density and other process relevant parameters such as the ion energy and flux at the electrodes. The correct implementation of the energy dependence of secondary electron emission is found to have a drastic effect, if global control parameters used to change the ion bombardment energy in applications are tuned.

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