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Secondary electron effect on sustaining capacitively coupled discharges: A hybrid modeling investigation of the ionization rate[1] YING-YING WEN, YU-RU ZHANG, YUAN-HONG SONG, YOU-NIAN WANG, Dalian University of Technology — A one-dimensional fluid/Monte Carlo hybrid model was used to quantitatively study the secondary electron (SE) effect on sustaining the discharge by examining the ionization induced by bulk electrons (BEs) and SEs under different external discharge parameters. In single frequency discharges, the results indicate that as the voltage increases, SEs gain more energy from the stronger electric field. Therefore, the ionization region induced by SEs expands and the ionization rate becomes comparable to and even exceeds that of BEs. As the pressure increases, the ionization of SEs increases, and SEs gradually dominate the discharge. Besides, the profile of the SE ionization rate varies from flat to saddle-shape, due to the energy loss at the discharge center at higher pressures. When the discharge gap expands, the electron density in the case without SEs increases linearly, whereas the value first increases and then decreases in the model with SEs taken into account. In direct current (DC)/RF sources, the ionization induced by SEs first increases gently and then decreases with increasing DC voltage. Finally, the effect of SE in a pulsed discharges is studied.

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