Secondary electrons in dual-frequency capacitive radio frequency discharges\textsuperscript{1} JULIAN SCHULZE, EDMUND SCHUENGEL, UWE CZARNET-ZKI, Ruhr-University Bochum, ZOLTAN DONKO, Hungarian Academy of Sciences — Two fundamentally different types of dual-frequency capacitive RF discharges can be used to realize separate control of the ion mean energy, $<E_i>$, and the ion flux, $\Gamma_i$, at the electrodes: (i) Classical discharges operated at substantially different frequencies, where the low and high frequency voltage amplitudes, $\phi_{lf}$ and $\phi_{hf}$, are used to control $<E_i>$ and $\Gamma_i$, respectively. (ii) Electrically asymmetric (EA) discharges operated at a fundamental frequency and its second harmonic with adjustable phase shift, $\theta$, between the driving frequencies, which is used to control $<E_i>$. We study the effect of secondary electrons on the quality of this separate control in both discharge types in argon at different gas pressures by PIC/MCC simulations with focus on the effect of the control parameter for $<E_i>$ on $\Gamma_i$ for different secondary yields, $\gamma$. A dramatic effect of tuning $\phi_{lf}$ in classical discharges and a significantly less pronounced effect of tuning $\theta$ in EA discharges is observed. This is caused by a transition from $\alpha$- to $\gamma$-mode induced by changing $\phi_{lf}$ and not induced by changing $\theta$.

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