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The role of electron-induced secondary electrons in low-pressure capacitively coupled oxygen plasmas[1] BENEDEK HORVATH, ARANKA DERZSI, ZOLTAN DONKO, JULIAN SCHULZE, Wigner Research Centre for Physics, West Virginia University, Ruhr-University Bochum, Dalian University of Technology — In this work, the role of the electron-surface processes in single-frequency (13.56 MHz) oxygen discharges is studied in the low-pressure regime (< 5 Pa). Two different models are used to describe the interaction of electrons with the electrodes: (i) a simple one assuming only elastic reflection of the electrons with a constant probability of 0.2 (model A) and (ii) a realistic one which takes elastic reflection, inelastic reflection and secondary electron emission into account as a function of the energy and angle of incidence of the electrons (model B). When the realistic model is used, a complex electron emission and ionization dynamics of ion-induced and electron-induced secondary electrons (γ- and δ-electrons, respectively) is found at low pressures, which is similar to the dynamics recently observed in argon under the same discharge conditions. However, in oxygen, electron-induced secondary electrons also have a remarkable effect on the electronegativity of the discharge: while electronegative discharges are obtained with model A, they are found to be electropositive with the realistic model under the same discharge conditions.

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