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Electron heating dynamics in magnetically-enhanced Capacitively Coupled Plasmas[1] BIRK BERGER, MORITZ OBERBERG, DENNIS ENGEL, CHRISTIAN WOELFEL, DENIS EREMIN, JAN LUNZE, RALF PETER BRINKMANN, PETER AWAKOWICZ, JULIAN SCHULZE, Ruhr Univ Bochum
— Capacitively coupled radio-frequency plasmas are frequently used in the industry to facilitate the processing of surfaces by e.g. etching and/or deposition. Adding a magnetron-like magnetic field configuration to the powered electrode is a well-established method in order to increase the heavy particle flux to the target. However, the understanding of fundamental physical processes in these discharges is still an open question in the plasma community. In order to overcome this drawback, the presented work investigates the electron power absorption dynamics of RF magnetron plasmas by phase resolved optical emission spectroscopy. Varying the neutral gas pressure, the magnetic flux density, as well as the applied voltage shows a significant impact on the excitation dynamics of energetic electrons. For low magnetic flux densities and a low neutral gas pressure, a beam-like behavior of the electrons can be observed, while stronger magnetic fields lead to the confinement of the electrons close the target. Under certain conditions an electric field reversal close to the powered electrode can be observed due to the required compensation of the mean ion flux to the electrode by the electron flux over one RF period.

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