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The effect of structured electrodes on heating and plasma uniformity in capacitive discharges JULIAN SCHULZE, NICO SCHMIDT, EDMUND SCHUENGEL, UWE CZARNETZKI, Ruhr-University Bochum — The effect of structured (non-planar) electrode topologies, e.g. rectangular, rounded, and triangular trenches, on the electron heating dynamics and ion density profile in capacitive radio frequency plasmas is investigated experimentally and by an analytical model. 2D Phase Resolved Optical Emission Spectroscopy is utilized to study the dynamics of energetic electrons inside and outside these structures. In the presence of structured electrodes non-planar RF sheaths form, that affect the electron heating dynamics. We observe a local increase of energetic electrons above the structures caused by a combination of cross-firing of electron beams generated by sheath expansion heating and a temporal confinement of energetic electrons between the sheaths within the structure. The confinement within the trench is limited to the phase of sheath expansion. Also the ionization and, as a consequence the plasma density, are modified by these effects. This is characterized by radially resolved Langmuir probe measurements and described by a diffusion model. The control of the radial plasma density profile is demonstrated. Via customized electrode topologies high plasma uniformity at specific pressures and heights above the electrode is achieved.

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