Abstract Submitted
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The effect of dust on the electron heating in capacitively coupled H_2/SiH_4 single- and dual-frequency discharges[1] EDMUND SCHÜNGEL, SEBASTIAN MOHR, SHINYA IWASHITA, JULIAN SCHULZE, UWE CZARNETZKI, Institute for Plasma and Atomic Physics, Ruhr-University Bochum — Hydrogen diluted silane discharges exhibit a high dust concentration under typical application conditions. Therefore, the role of dust in fundamental plasma processes needs to be understood. We study a capacitively coupled rf discharge in H_2/SiH_4 using Phase Resolved Emission Spectroscopy, two-dimensional laser light scattering on the dust particles as well as current and voltage measurements. The results show that the electron heating is strongly affected by the presence of dust particles. In particular, a mode transition occurs from the traditional α-mode to a bulk drift field mode (Ω-mode), if the amount of dust is increased. An analytical model of the electron dynamics in Ω-mode has been developed. An asymmetric dust particle density profile, e.g. due to a gas temperature gradient, induces an asymmetry in the electron heating and, thereby, in the ion density profile of a single frequency parallel plate discharge. In electrically asymmetric discharges, the discharge asymmetry can usually be controlled via the phase angle between the applied harmonics. It is found that the Electrical Asymmetry Effect works in discharges operated in both α- or Ω-mode, as the width of the control interval is almost independent of the dust distribution.

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