Abstract Submitted
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Student Award Finalist: Comparison of the effect of sawtooth-like voltage waveforms on discharge dynamics of Ar, H_2, and CF_4 plasmas
BASTIEN BRUNEAU, E. JOHNSON, LPICM-CNRS, Ecole Polytechnique, France, T. GANS, D. O'CONNELL, A. GREB, York Plasma Institute, Univ. of York, UK, I. KOROLOV, A. DERZSI, Z. DONKO, Wigner Research Centre for Physics, Budapest, Hungary, E. SCHUNGEL, S. BRANDT, J. SCHULZE, Dept of Physics, West Virginia Univ., USA, P. DIOMEDE, D.J. ECONOMOU, Plasma Processing Laboratory, Univ. of Houston, USA, S. LONGO, Dipartimento di Chimica dell' Universita' di Bari, Italy, T. LAFLEUR, J.-P. BOOTH, LPP-CNRS, Ecole Polytechnique, France — The use of Tailored Voltage Waveforms to excite a plasma has been previously shown to efficiently control the ion energy (through the Electrical Asymmetry Effect) by varying the "amplitude" asymmetry of the waveform. In this work, the effect of a "slope" asymmetry of the waveform is investigated by using sawtooth-like waveforms. When a discharge is excited with such a waveform, one sheath expands rapidly and contracts slowly, while the reverse occurs at the other sheath. While using such waveforms, different discharge gases are compared, namely Ar (as an electropositive gas), H2 (as a light gas), and CF4 (as an electronegative gas). For each gas, phase resolved optical emission spectroscopy measurements are compared with PIC simulations, showing excellent agreement. The dynamics of the excitation rates are very different for the different gases and are shown to be correlated with the dominant heating mechanisms. It is shown that the asymmetry obtained with sawtooth-like voltage waveforms can be very large, and can even be reversed, depending on the gas used.

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