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Hydrodynamic modelling of ccrf discharge plasmas in oxygen[1]
MARKUS M. BECKER, IGOR SHEYKIN, DETLEF LOFFHAGEN, INP Greifswald, Felix-Hausdorff-Str. 2, 17489 Greifswald, Germany, CHRISTIAN KÜLLIG, KRISTIAN DITTMANN, JÜRGEN MEICHSNER, Institute of Physics, University of Greifswald, Felix-Hausdorff-Str. 6, 17489 Greifswald, Germany — Capacitively coupled radio frequency (ccrf) oxygen plasmas are widely used for surface treatment applications. In the present contribution hydrodynamic modelling has been performed for discharge plasmas in a reactor with plane parallel electrodes to analyze the impact of negative ions and metastable molecules. Assuming radial symmetry of the plasma a time-dependent, spatially one-dimensional model has been used. The coupled system of Poisson's equation, of balance equations for the densities of 17 heavy particle species and the electrons as well as of the electron energy density has been solved taking into account about 180 collision processes in the reaction kinetics. Main features of the model are given and results for discharges at pressures from 30 to 100 Pa, applied voltages between 0.2 and 1 kV at a frequency of 13.56 MHz are reported. In particular, the electronegativity characteristics and the influence of the secondary electron emission coefficient are discussed. The comparison of modelling results with experimental data of electronegativity and excitation rate of atomic oxygen shows fair agreement.

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