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A particle-in-cell/Monte Carlo simulation of a dual frequency capacitively coupled chlorine discharge SHUO HUANG, University of Michigan - Shanghai Jiao Tong University Joint Institute, Shanghai Jiao Tong University, JON TOMAS GUDMUNDSSON, Science Institute, University of Iceland — The effect of the control parameters of both the high and low frequency sources on a dual frequency capacitively coupled chlorine discharge is investigated using a hybrid approach consisting of a particle-in-cell/Monte Carlo simulation and a volume averaged global model. The dependence of the plasma parameters such as particle density, effective electron temperature, electron energy probability function and ion energy and angular distributions for both Cl^+ and Cl_2^+ ions, on the discharge pressure, driving frequency, driving current density and secondary electron emission, is systematically investigated. As the low-frequency current density is increased the flux of Cl_2^+ ions to the surface increases only slightly while the average energy of Cl_2^+ ions to the surface increases almost linearly with increasing low-frequency current, which shows possible independent control of the flux and energy of Cl_2^+ ions by varying the low-frequency current in a dual frequency capacitively coupled chlorine discharge. Besides, as the high frequency current increases, the electron heating is enhanced in the sheath region and diminished in the bulk region, showing a transition of the electron heating from the drift-ambipolar mode to the α mode.

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