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Particle-in-cell/Monte Carlo simulation of capacitively coupled chlorine plasmas KENJI MATSUOKA, YOSHINORI TAKAO, KOJI ERIGUCHI, KOUICHI ONO, Kyoto University — A better understanding of capacitively coupled plasmas (CCP) is still important, because of the development of dual-frequency CCP discharges, and also of the CCP mode that occurs in inductively coupled plasma discharges at low rf powers. This paper presents a two-dimensional particle-in-cell/Monte Carlo (PIC/MC) simulation of CCP chlorine discharges in an asymmetric parallel-plate rf plasma reactor. The model includes an external electrical circuit with a blocking capacitor and an rf power supply, which gives self-consistently the dc self-bias voltages on the powered electrode. Four charged species (e-, Cl_2+, Cl+, Cl-) are taken into account in uniformly distributed Cl_2 neutral backgrounds, together with electron-neutral elastic collision and ionization, dissociative attachment, positive ion-neutral elastic collision and charge transfer, and electron-ion and ion-ion recombination. The results indicated that the population of negative ions dominates that of electrons, which governs the plasma discharge and sheath dynamics, and thus the dynamics of incoming ion fluxes onto the powered electrode.

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