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The effect of pressure and driving frequency on electron heating in a capacitively coupled oxygen discharge JON TOMAS GUDMUNDSSON, University of Iceland, Reykjavik, Iceland and Department of Space and Plasma Physics, KTH–Royal Institute of Technology, Stockholm, Sweden, DAVID I. SNORRASON, HOLMFRIDUR HANNESDOTTIR, University of Iceland, Reykjavik, Iceland — We use the one-dimensional object-oriented particle-in-cell Monte Carlo collision code `oopd1` to study the evolution of the charged particle density profiles, electron heating mechanism, and the electron energy probability function (EEPF) in a capacitively coupled oxygen discharge with pressure and driving frequency. We find that at higher pressure (50–500 mTorr) the electron heating occurs mainly in the sheath region, and detachment by the metastable singlet molecules significant has a significant influence. At a low pressure (10 mTorr) and driving frequency of 13.56 MHz, Ohmic heating in the bulk plasma (the electronegative core) dominates. However, as the driving frequency is increased the electron heating transitions to occur mainly in the sheath region. Thus at low pressure and low driving frequency, the EEPF is convex and as the driving frequency is increased the number of low energy electrons increases and the number of higher energy electrons (>10 eV) decreases, and the EEPF develops a concave shape or becomes bi-Maxwellian. Furthermore, we find that adding detachment by the metastable states can significantly influence the peak of the ion energy distribution for O_2^+-ions bombarding the powered electrode, and hence the average ion energy and ion flux.

Jon Gudmundsson
University of Iceland

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