Abstract Submitted
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The role of the singlet metastables in capacitively coupled oxygen discharges JON TOMAS GUDMUNDSSON, University of Iceland, MICHAEL A. LIEBERMAN, University of California at Berkeley — The roles of the singlet metastable molecules $O_2(a^1\Delta_g)$ and $O_2(b^1\Sigma_g)$ in a capacitively coupled rf driven oxygen discharge at 50 mTorr are explored using the one-dimensional object-oriented PIC/MCC code oopd1. Earlier we have demonstrated that the metastable molecule $O_2(a^1\Delta_g)$ has a significant influence on the discharge properties such as the electronegativity, the effective electron temperature and the electron heating processes [1]. A recent global model study indicates that the density of $O_2(b^1\Sigma_g)$ state can be higher than the density of the $O_2(a^1\Delta_g)$ state [2]. Thus the oxygen discharge model now includes the $O_2(b^1\Sigma_g)$ molecule and related reactions. The singlet metastable states of the oxygen molecule have significant influence on the discharge properties. Electron heating is only observed in the sheath region and the electron energy probability function becomes even more concave or bi-Maxwellian when the $O_2(b^1\Sigma_g)$ state is included in the simulation. The center electronegativity is in the range of 0.67 - 1.9.

[1] J T Gudmundsson and M A Lieberman, Plasma Sources Sci. Technol. 24 (2015) 035016
[2] D A Toneli et al., J. Phys. D. accepted 2015

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