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Model calculations of O2(1D) production in microcathode sustained discharges in argon/oxygen mixtures E. MUNOZ-SERRANO, G. HAGELAAR, J.P. BOEUF, L.C. PITCHFORD, CPAT, Toulouse, France — It is now well established that non-thermal, high-pressure plasmas can be initiated and sustained between a microhollow cathode discharge (MHCD) acting as a plasma cathode and a third electrode placed some distance away. To investigate the properties of the plasma created in such a microcathode sustaind (MCS) discharge configuration, we have developed a 2D quasi-neutral model of a radially expanding "positive-column" in which the current crossing the exit plane of the MHCD is input as a boundary condition. We are particularly interested in determining operating conditions leading to high yields of singlet delta (metastable) oxygen molecules O2(1D), and thus the model includes a kinetic scheme to describe the plasma chemistry in pure O2 and in Ar/O2 mixtures. For 10% O2 in a 50 torr Ar/O2 mixture, a discharge current of 1 mA, a 200 micron MHCD hole diameter and 0.6 cm gap spacing, we find that the reduced electric field, E/N, on-axis at the mid-plane is about 15 Td. The calculated O2(1D) yield on-axis near the exit of the MHCD is 10%. For higher O2 partial pressures, quenching of O2(1D) in 3-body collisions with O2 and O atoms leads to a decrease in the predicted yield, but the optimum pressure depends on the assumed values for the 3-body quenching rates. Details of the model and results of species density profiles for a range of conditions will be presented.

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