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Excitation of $O_2(^1\Delta)$ in Pulsed Radio Frequency Flowing Plasmas for Chemical Oxygen Iodine Lasers[1] NATALIA BABAEVA, Iowa State University, RAMESH ARAKONI, University of Illinois, MARK J. KUSHNER, Iowa State University — In chemical oxygen-iodine lasers (COIL), oscillation at 1.315 μm ($^2P_{1/2} \rightarrow {}^2P_{3/2}$) in atomic iodine is produced by collisional excitation transfer of $O_2(^1\Delta)$ to I_2 and I. Plasma production of $O_2(^1\Delta)$ [eCOIL] is interesting to eliminate liquid phase generators. For the flowing plasmas used for eCOILs (He/O_2, a few to 10s Torr) self sustaining electron temperatures are 2-3 eV whereas excitation of $O_2(^1\Delta)$ optimizes with T_e = 1-1.5 eV. Lowering T_e is of interest to increase system efficiency. One method is the spiker-sustainer (S-S). A high power pulse (spiker) is followed by a lower power quasi-dc period (sustainer). Excess ionization produced by the spiker enables the sustainer to operate with a lower T_e. Results from global kinetics modeling suggest that S-S can raise yields of $O_2(^1\Delta)$ to over 30%. In this paper, results from a computational investigation of radio frequency (13, 27, 56 MHz) excited flowing He/O_2 plasmas will be discussed with emphases on S-S techniques. The model is a 2-dimensional plasma hydrodynamics simulation encompassing a solution of Navier Stokes equations for neutral flow dynamics. The efficiency of S-S methods generally increase with increasing frequency by producing a higher electron density, lower T_e and, as a consequence, a more efficient production of $O_2(^1\Delta)$.

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