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$O_2(^1\Delta)$ Production and Oxygen-Iodine Kinetics in Flowing Afterglows for Electrically Excited Chemical-Oxygen-Iodine Lasers[1] RAMESH ARAKONI, University of Illinois, NATALIE Y. BABAEVA, MARK J. KUSHNER, Iowa State University — Chemical oxygen-iodine lasers (COILs) achieve oscillation on the $^2P_{1/2} \rightarrow {}^2P_{3/2}$ transition of atomic iodine at 1.315 μm by a series of excitation transfers from $O_2(^1\Delta)$. In electrically excited COILs, (eCOILs) the $O_2(^1\Delta)$ is produced in a flowing plasma, typically He/O_2, at a few to tens of Torr. eCOILs additionally differ from conventional systems in the large amount of O atoms produced due to electron impact dissociation. O atoms are advantageous in that they react with and dissociate I_2, but O atoms also quench $I(^2P_{1/2})$. To some degree, the O atom density in the afterglow can be controlled by injecting NO or NO_2 which consumes O atoms. This also impacts O_3 production, particularly at higher pressures where quenching of $O_2(^1\Delta)$ by O_3 is problematic. In this paper, results from computational investigations using plug-flow and 2-dimensional plasma hydrodynamics models will be discussed for scaling laws in eCOIL systems for $O_2(^1\Delta)$ production. We will discuss O-atom management with NO/NO_2 additives and $I(^2P_{1/2})$ production with I_2 injection. Scaling to higher pressures will be discussed where gas heating and O_3 quenching of $O_2(^1\Delta)$ become important.

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Mark J. Kushner
Iowa State University

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