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Generation of Energetic Species by RF Microplasma Arrays[1] W.T. RAWLINS, S. LEE, D.B. FENNER, S.J. DAVIS, Physical Sciences Inc., Andover MA, A.R. HOSKINSON, J. HOPWOOD, Electrical and Computer Engineering, Tufts University, Medford MA — We present preliminary results from the first implementation of a prototype single-board RF micro-discharge, linear array device in a discharge-flow reactor for quantitative determinations of ozone and singlet-oxygen production from microplasmas in O_2 and air at 1 atm. The ultimate objective is to develop compact, portable low-power micro-discharge based systems to generate energetic species for atmospheric-pressure applications including decontamination and disinfection. The technology uses application of low DC voltages and low applied powers (∼25 W) at ∼1 GHz frequencies, across small gaps in arrays of resonators to ignite and sustain highly energetic microplasmas at elevated pressures. A set of 15-resonator micro-discharge assemblies was designed, fabricated, and tested in static and flowing environments for O_2, air, and Ar flows at pressures of 20 Torr to 1 atm. O_3 production was measured by UV absorption spectrometry, and $O_2(a^1\text{delta-}_g)$ ("singlet-oxygen") concentrations were determined by absolute near-infrared emission spectroscopy. Near-infrared emission spectra from an argon plasma were also recorded, and showed extensive excitation of the Ar(I) $3p^5 4p - 3p^5 4s$ emission system near 12 eV.

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