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Production of Energetic Active-Oxygen Species at Atmospheric Pressure by Linear Microplasma Arrays[1] WILSON RAWLINS, KRISTIN GALBALLY-KINNEY, STEVEN DAVIS, Physical Sciences Inc., Andover MA, ALAN HOSKINSON, JEFFREY HOPWOOD, Electrical and Computer Engineering Department, Tufts University, Medford MA — Linear arrays of stripline resonators operated at microwave frequencies and low powers provide spatially and temporally continuous micro-discharges with high E/N at atmospheric pressure. When implemented in a discharge-flow reactor, these microplasmas excite metastable singlet molecular oxygen and dissociate oxygen molecules to produce atomic oxygen, with efficiencies comparable to conventional microwave resonant cavities at low pressures. At elevated pressure, production of atomic oxygen leads to prompt formation of ozone immediately downstream of the discharge exit. We have observed and quantified the production of $O_2(a\ ^1\Delta)$ metastables and O_3 in the effluent of linear microplasma arrays for O_2/He, O_2/Ar, O_2/N_2/He, and O_2/N_2/Ar mixtures as functions of pressure, gas flow rate, and species mixing ratio. We compare results for single-array microplasmas, where the discharge products are formed in a small volume and entrained into the bulk flow, and overlapping dual-array microplasmas which process larger gas flow volumes.

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