Abstract Submitted
for the GEC13 Meeting of
The American Physical Society

Enhanced ozone production in a pulsed dielectric barrier discharge plasma jet with addition of argon to a He-O_2 flow gas BRIAN SANDS, UES, Inc., BISWA GANGULY, JAMES SCOFIELD, Air Force Research Laboratory — Ozone production in a plasma jet DBD driven with a 20-ns risetime unipolar pulsed voltage can be significantly enhanced using helium as the primary flow gas with an O_2 coflow. The overvolted discharge can be sustained with up to a 5% O_2 coflow at <20 kHz pulse repetition frequency at 13 kV applied voltage. Ozone production scales with the pulse repetition frequency up to a "turnover frequency" that depends on the O_2 concentration, total gas flow rate, and applied voltage. For example, peak ozone densities $>10^{16}$ cm^{-3} were measured with 3% O_2 admixture and <3 W input power at a 12 kHz turnover frequency. A further increase in the repetition frequency results in increased discharge current and 777 nm O(^5P) emission, but decreased ozone production and is followed by a transition to a filamentary discharge mode. The addition of argon at concentrations $\geq$5% reduces the channel conductivity and shifts the turnover frequency to higher frequencies. This results in increased ozone production for a given applied voltage and gas flow rate. Time-resolved Ar($1s_5$) and He(2^3S_1) metastable densities were acquired along with discharge current and ozone density measurements to gain insight into the mechanisms of optimum ozone production.

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Date submitted: 13 Jun 2013 Electronic form version 1.4