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Enhanced ozone production in a pulsed dielectric barrier discharge plasma jet with addition of argon to a He-O\textsubscript{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\textsubscript{2} coflow. The overvoltage discharge can be sustained with up to a 5\% O\textsubscript{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\textsubscript{2} concentration, total gas flow rate, and applied voltage. For example, peak ozone densities >10\textsuperscript{16} cm\textsuperscript{-3} were measured with 3\% O\textsubscript{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(\textsuperscript{5}P) emission, but decreased ozone production and is followed by a transition to a filamentary discharge mode. The addition of argon at concentrations \geq5\% 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(1\textsuperscript{s}\textsubscript{5}) and He(2\textsuperscript{3}S\textsubscript{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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