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Atomic oxygen production scaling in a nanosecond-pulsed externally grounded dielectric barrier plasma jet BRIAN SANDS, UES, Inc. (AFRL), JACOB SCHMIDT, Spectral Energies, LLC. (AFRL), BISWA GANGULY, UES, Inc. (AFRL), JAMES SCOFIELD, Air Force Research Laboratory — Atomic oxygen production is studied in a capillary dielectric barrier plasma jet that is externally grounded and driven with a 20-ns risetime positive unipolar pulsed voltage at pulse repetition rates up to 25 kHz. The power coupled to the discharge can be easily increased by increasing the pulse repetition rate. At a critical turnover frequency, determined by the net energy density coupled to the discharge, the plasma chemistry abruptly changes. This is indicated by increased plasma conductance and a transition in reactive oxygen species production from an ozone-dominated production regime below the turnover frequency to atomic-oxygen-dominated production at higher pulse rates. Here, we characterize atomic oxygen production scaling using spatially- and temporally-resolved two-photon absorption laser-induced-fluorescence (TALIF). Quantitative results are obtained via calibration with xenon using a similar laser excitation and collection system. These results are compared with quantitative ozone and discharge power measurements using a helium gas flow with oxygen admixtures up to 3%.

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