Abstract Submitted
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Spatially and Temporally Resolved Atomic Oxygen Measurements in Short Pulse Discharges by Two Photon Laser Induced Fluorescence[1] WALTER LEMPERT, MRUTHUNJAYA UDDI, EUGENE MINTUSOV, NAIBO JIANG, IGOR ADAMOVICH, Ohio State University — Two Photon Laser Induced Fluorescence (TALIF) is used to measure time-dependent absolute oxygen atom concentrations in O_2/He, O_2/N_2, and CH_4/air plasmas produced with a 20 nanosecond duration, 20 kV pulsed discharge at 10 Hz repetition rate. Xenon calibrated spectra show that a single discharge pulse creates initial oxygen dissociation fraction of $\sim$0.0005 for air like mixtures at 40-60 torr total pressure. Peak O atom concentration is a factor of approximately two lower in fuel lean (ϕ=0.5) methane/air mixtures. In helium buffer, the initially formed atomic oxygen decays monotonically, with decay time consistent with formation of ozone. In all nitrogen containing mixtures, atomic oxygen concentrations are found to initially increase, for time scales on the order of 10-100 microseconds, due presumably to additional O_2 dissociation caused by collisions with electronically excited nitrogen. Further evidence of the role of metastable N_2 is demonstrated from time-dependent N_2 2^{nd} Positive and NO Gamma band emission spectroscopy. Comparisons with modeling predictions show qualitative, but not quantitative, agreement with the experimental data.

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