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STUDENT AWARD FINALIST: Oxygen Pathways in Streamer Discharge for Transient Plasma Ignition[1] S.J. PENDLETON, University of Southern California, S. BOWMAN, The Ohio State University, D. SINGLETON, University of Southern California, J. WATROUS, NumerEx LLC, C. CARTER, Air Force Research Laboratory, W. LEMPERT, The Ohio State University, M.A. GUNDERSEN, University of Southern California — The use of streamers for the ignition of fuels, also known as transient plasma ignition (TPI), has been shown in a variety of engines to improve combustion through decreased ignition delay, increased lean burn capability and increased energy release relative to conventional spark ignition. The mechanisms behind these improvements, however, remain poorly understood. Temperature measurements by optical emission spectroscopy demonstrate that ignition by TPI is a nonthermal process, and thus is almost entirely dependent on the production and presence of electron impact-created active species in the discharge afterglow. Of particular interest are active oxygen species due to their relatively long lifetimes at high pressures and the pivotal role they play in combustion reactions. In order to elucidate the oxygen pathways, here we report the investigation of the temporal evolution of the populations of atomic oxygen and ozone by use of two-photon absorption laser induced fluorescence (TALIF) and UV absorption, respectively. Experimental results are presented and compared to kinetic modeling of the streamers. Future experiments are proposed to better understand the physics behind TPI.

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