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Time resolved PLIF and CRD diagnostics of OH radicals in the afterglow of plasma discharge in hydrocarbon mixtures LIANG WU, JAMIE LANE, NICHOLAS CERNANSKY, DAVID MILLER, ALEXANDER FRIDMAN, ANDREY STARIKOVSKIY, DREXEL TEAM — Two types of diagnostic techniques have been used to investigate the OH radical dynamics in the afterglow of a pulsed nanosecond discharge. The time resolved Planar Laser Induced Fluorescence (PLIF) imaging and Cavity Ring-Down (CRD) techniques provide the information of spatial distribution and absolute concentration of OH, respectively. Experiments were carried out using a lean methane/air mixture (ϕ=0.1) at atmospheric pressure for temperatures of 300 K and 500 K. The nanosecond pulsed discharge was formed in a pin to pin electrode system. PLIF imaging indicated uniform OH radical dynamics along the discharge channel, and CRD spectroscopy showed a long life time (>200 μs) for [OH] at 500 K. This life time is not predicted by any existing kinetic models. The absolute [OH] from CRD was consistent with our previous [OH] measurements using Laser Induced Fluorescence (LIF). Comparison of OH radical emission dynamics with discharge emission dynamics from excited nitrogen revealed a close similarity in spatial distribution and allowed clarification of the mechanisms of atomic oxygen formation.

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