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Plasma assisted ignition below self-ignition threshold in hydrogen, hydrogen-CO and hydrocarbon-air mixtures LIANG WU, JAMIE LANE, NICHOLAS CERNANSKY, DAVID MILLER, ALEXANDER FRIDMAN, ANDREY STARIKOVSKIY, DREXEL UNIVERSITY TEAM — The paper presents measurements of the time evolution of hydroxyl (OH) radicals in premixed hydrocarbon-air flows in the afterglow of a nanosecond-pulsed discharge at atmospheric pressure. The temperature ranged from 300 to 800 K (below the self-ignition point). The fuels were hydrogen, hydrogen-CO, methane, ethane, propane and butane at an equivalence ratio of 0.1 from 400 to 800 K. The plasma was generated by 20-kV pulses of 10 ns duration and a <1 ns rise time at a repetition rate of 10 Hz. Laser-induced fluorescence was used to measure the concentration of OH radicals after the discharge. The energy of the excitation laser was adjusted to ensure that the measurements were made under saturation conditions for all experiments. The time evolution of OH radicals was tracked by adjusting the delay time between the high-voltage pulse and the concentration measurement. The [OH] profiles show that after generation by the plasma the [OH] persists at significant level for a long time that lengthens with increasing temperature (starting at 500 K), which is not predicted in current kinetic models.

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