

5G11: MECHANISM OF PLASMA ASSISTED OXIDATION AND IGNITION OF ETHYLENE-AIR FLOWS BY A REPETITIVELY PULSED NANOSECOND DISCHARGE.

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Comment by Godfrey Mungal.

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How do your results compare with Kim et al. [1] which discussed an initial low temperature oxidation (cool flame), decay of radicals and the eventual formation of H₂ and CO which enhance flame behavior?

Reference:

[1] W. Kim, M.G. Mungal, M.A. Cappelli, *Appl. Phys. Letters* 92, 051503 (2008) 3.

Reply by Igor Adamovich

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Our results are qualitatively consistent with kinetic modeling calculations for methane-air by Kim et al. (2008). According to our kinetic model prediction, ethylene ignition is indeed preceded by a region of low-temperature plasma chemical fuel oxidation, with CO, H₂O, and CH₂O being the dominant species (Fig. 25 in the paper). Instead of removing these species from the simulation, we have tried to remove the primary radicals generated by the plasma (O, H, and C₂H₃), which resulted in a considerable increase of ignition delay time [1]. We have some reservations using the term "cool flame" for this region since it is not self-sustained but this is a semantics issue. Basically, we are in agreement with Prof. Mungal and his co-workers and we thank him for drawing our attention to their work.

Reference:

[1] Mintusov et al., AIAA, paper #2008-3899, 2008.