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Comparative Shock-Tube Study of Autoignition and Plasma-Assisted Ignition of C_2-Hydrocarbons ILYA KOSAREV, SVETLANA KINDYSHEVA, EUGENY PLASTININ, NIKOLAY ALEKSANDROV, Moscow Institute of Physics and Technology, ANDREY STARIKOVSKIY, Princeton University —

The dynamics of pulsed picosecond and nanosecond discharge development in liquid water, ethanol and hexane Using a shock tube with a discharge cell, ignition delay time was measured in a lean ($\varphi = 0.5$) C_2H_6:O_2:Ar mixture and in lean ($\varphi = 0.5$) and stoichiometric C_2H_4:O_2:Ar mixtures with a high-voltage nanosecond discharge and without it. The measured results were compared with the measurements made previously with the same setup for C_2H_6-, C_2H_5OH- and C_2H_2-containing mixtures. It was shown that the effect of plasma on ignition is almost the same for C_2H_6, C_2H_4 and C_2H_5OH. The reduction in time is smaller for C_2H_2, the fuel that is well ignited even without the discharge. Autoignition delay time was independent of the stoichiometric ratio for C_2H_6 and C_2H_4, whereas this time in stoichiometric C_2H_2- and C_2H_5OH-containing mixtures was noticeably shorter than that in the lean mixtures. Ignition after the discharge was not affected by a change in the stoichiometric ratio for C_2H_2 and C_2H_4, whereas the plasma-assisted ignition delay time for C_2H_6 and C_2H_5OH decreased as the equivalence ratio changed from 1 to 0.5. Ignition delay time was calculated in C_2-hydrocarbon-containing mixtures under study by simulating separately discharge and ignition processes. Good agreement was obtained between new measurements and calculated ignition delay times.

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