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Ignition in Ethanol-Containing Mixtures after Nanosecond Discharge ILYA KOSAREV, ALEKSANDR PAKHOMOV, SVETLANA KINDYSHEVA, NIKOLAY ALEKSANDROV, Moscow Institute of Physics and Technology, ANDREY STARIKOVSKIY, Princeton University, MIPT TEAM, PU TEAM — We study experimentally and numerically kinetics of ethanol ignition after a high-voltage nanosecond discharge. Active particles are produced in a high–voltage nanosecond discharge to favor the ignition of C_2H_5OH-containing mixtures at elevated gas temperatures. We consider stoichiometric ($\varphi = 1$) and lean ($\varphi = 0.5$) C_2H_5OH:O_2 mixtures (10%) diluted with Ar (90%). The gas temperature behind a reflected shock wave ranges from 1100 to 2000 K and the corresponding pressure ranges from 0.2 to 1 atm; these parameters are obtained from measured shock wave velocity. The ignition delay time is measured behind a reflected shock wave with and without the discharge using detection of CH radiation. Generation of the discharge plasma is shown to lead to an order of magnitude decrease in ignition delay time. It is shown that the observed effect of nonequilibrium discharge plasma on ethanol ignition is induced by chain reaction acceleration due to active species generation in the discharge rather than due to fast gas heating. The calculated ignition delay times are compared with the experimental data.

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