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Mechanism of plasma-assisted ignition for H_2 and C1-C5 hydrocarbons ANDREY STARIKOVSKIY, Princeton University, NIKOLAY ALEKSANDROV, Moscow Institute of Physics and Technology — Nonequilibrium plasma demonstrates ability to control ultra-lean, ultra-fast, low-temperature flames and appears to be an extremely promising technology for a wide range of applications, including aviation GTEs, piston engines, ramjets, scramjets and detonation initiation for pulsed detonation engines. To use nonequilibrium plasma for ignition and combustion in real energetic systems, one must understand the mechanisms of plasma-assisted ignition and combustion and be able to numerically simulate the discharge and combustion processes under various conditions. A new, validated mechanism for high-temperature hydrocarbon plasma assisted combustion was built and allows to qualitatively describe plasma-assisted combustion close and above the self-ignition threshold. The principal mechanisms of plasma-assisted ignition and combustion have been established and validated for a wide range of plasma and gas parameters. These results provide a basis for improving various energy-conversion combustion systems, from automobile to aircraft engines, using nonequilibrium plasma methods.

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