Abstract Submitted
for the GEC15 Meeting of
The American Physical Society

Plasma Assisted Combustion Mechanism for Hydrogen and Small Hydrocarbons ANDREY STARIKOVSKIY, Princeton University, NIKOLAY ALEKSANDROV, Moscow Institute of Physics and Technology — The main mechanisms of nonequilibrium gas excitation and their influence on the ignition and combustion were briefly discussed. Rotational excitation, vibrational excitation, electronic excitation, dissociation by electron impact and ionization were all analyzed, as well as the ways in which the selectivity of the gas excitation in the discharge can be controlled. The model consists of two parts. The first part describes gas excitation by electron impact – rotational, vibrational and electronic states population by pulsed discharges. The second part considers energy relaxation in the plasma (formation of Maxwell-Boltzmann equilibrium across translational, vibrational and electronic degrees of freedom of molecules), quenching and decomposition of excited states, their reactions and recombination – with formation of thermally-equilibrium pool of radicals, which could be considered as initial conditions for any detailed combustion kinetic mechanism. The mechanism was verified against available kinetic data in a wide temperature range. Despite of some lack of knowledge of mechanism details, nonequilibrium plasma demonstrates great potential for controlling ultra-lean, ultra-fast, low-temperature flames and is an extremely promising technology for a very wide range of applications.

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Date submitted: 19 Jun 2015 Electronic form version 1.4