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Abstract: The effects of nanosecond discharge on ignition characteristics of a stoichiometric methane-air mixture without inert diluent gas were studied by numerical simulation at 1atm and initial temperature of 1300K. A modified non-equilibrium plasma kinetic model was developed to simulate the temporal evolution of particles produced during nanosecond discharge and its afterglow. As important roles in ignition, path fluxes of O and H radicals were analyzed in detail. Different strength of *E/N* and different discharge duration were applied to the discharge process in this study. And the results presented that a deposited energy of 1-30mJ/cm^3 could dramatically reduce the ignition delay time. Furthermore, temperature and radicals analysis was conducted to investigate the effect of non-equilibrium plasma on production of intermediate radicals. Finally, sensitivity analysis was employed to have further understanding on ignition chemistries of the mixture under nanosecond discharge.

Keywords: nanosecond discharge; ignition delay time; methane; kinetic modeling; numerical simulation;

1 Introduction

In recent years, non-equilibrium plasma assisted combustion has provided new opportunities

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