Study on Flame Structure of Methane-Air Combustion with Hydrogen Peroxide Addition

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Abstract

The effects of hydrogen peroxide addition on the reaction pathway of premixed methane/air flames are investigated numerically using the PREMIX code with the GRI-Mech 3.0 chemical kinetic mechanisms and detailed transport properties. Hydrogen peroxide is used as the oxidizer substituent of air. Results show that the laminar burning velocity and adiabatic flame temperature of methane flame are significantly increased with H2O2 addition. The dominant reactions of intermediate species are also investigated. Hydrogen peroxide increases all the reaction rates of intermediate species and the concentrations of intermediate species are significantly enhanced. Therefore, the reaction pathway is changed that CH2O is primarily produced by the progressive reaction of CH3 to CH3O and then to CH2O. This change is primarily due to the substantial increase of HO2.

Keyword：Hydrogen peroxide, Laminar burning velocity, adiabatic flame temperature, Methane flame, Numerical simulation