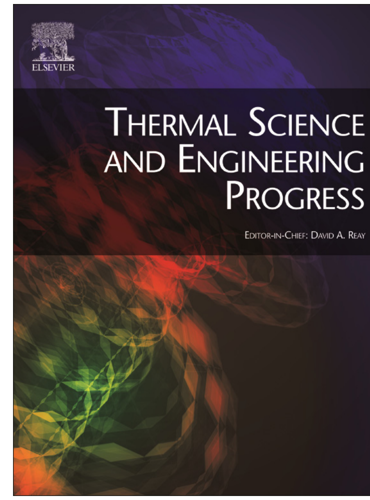

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Investigation of NOx in piloted stabilized methane-air diffusion flames using Finite-rate and Infinitely-fast chemistry based combustion models

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ABSTRACT

The present work reports on the numerical investigation of NOx in three turbulent piloted diffusion flames of different levels of extinction. The study involves two-dimensional axisymmetric modeling of combustion in these flames with fairly detailed chemistry, i.e. GRI 3.0 mechanism. The main focus of the study is to analyze the effects of the two different combustion model approaches, such as infinitely fast chemistry based unsteady flamelet and finite rate chemistry based EDC, in predicting the NOx formation in three piloted methane jet flames (Sandia D, E, and F). The EDC approach is able to predict the passive scalar quantities but shows over-prediction in the reactive scalar quantities and NO prediction, while the unsteady flamelet modeling is found to be essential in predicting the accurate formation of slow kinetic species like NOx. The inability of flamelet and EDC approach in capturing localized flame extinction is observed, which lead to an over-prediction of NOx at larger downstream locations. Further, the dominance of NOx formation pathways is investigated in all three flames.