عنوان مقاله:

Numerical Investigation n of the Thermal Performance of a Porous Burner

محل انتشار:

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خلاصه مقاله:

Flames stabilized within porous media differ from conventional flames primarily due to the heat recirculation through the solid matrix. In this work, laminar flame propagation of methane in a porous medium is numerically investigated. For this purpose, an unsteady one-dimensional physical model of a porous burner using a single-step combustion mechanism is considered. In the present study, the flame location is not predetermined, and the computational domain is extended beyond either side of the porous medium to accurately model reactions close to the edges of the solid region. Thermal performance of the burner is studied by varying relevant parameters within a practical range. The predicted gas temperature profile near the reaction zone is much broader than that in an adiabatic premixed flame. The effect of volumetric heat transfer coefficient, Hv, on the temperature profile is investigated. The local gas temperature decreases in the reaction zone and the solid temperature increases in the preheat zone with an increase in Hv. Also, the corresponding local convective heat transfer rates for different values of Hv are calculated and compared. Simulation results also indicate that increasing the effective thermal conductivity of the solid, Ks, will decrease the solid phase temperature downstream of the flame location. Due to high temperature gradients in the solid matrix, its effective thermal conductivity has a significant impact on the conductive heat transfer rates.

کلمات کلیدی:

Porous Burner, Numerical Simulation, Effective Thermal Conductivity, Volumetric Heat Transfer Coefficient