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NUMERICAL SIMULATION OF POROUS BURNERS AND HOLE PLATE SURFACE BURNERS

ABSTRACT

In comparison to the free flame burners the porous medium burners, especially those with flame stabilization within the porous material, are characterized by a reduction of the combustion zone temperatures and high combustion efficiency, so that emissions of pollutants are minimized. In the paper the finite-volume numerical tool for calculations of the non-isothermal laminar steady-state flow, with chemical reactions in laminar gas flow as well as within porous media is presented. For the porous regions the momentum and energy equations have appropriate corrections. In the momentum equations for the porous region an additional pressure drop has to be considered, which depends on the properties of the porous medium. For the heat transfer within the porous matrix description a heterogeneous model is considered. It treats the solid and gas phase separately, but the phases are coupled via a convective heat exchange term. For the modeling of the reaction of the methane laminar combustion the chemical reaction scheme with 164 reactions and 20 chemical species was used. The proposed numerical tool is applied for the analyses of the combustion and heat transfer processes which take place in porous and surface burners. The numerical experiments are accomplished for different powers of the porous and surface burners, as well as for different heat conductivity characteristics of the porous regions.

KEYWORDS

gas combustion, numerical simulation, porous medium burners

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