MODELING OF SOLID-FUELLED RAMJET ENGINE WITH FLAME HOLDER

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Abstract: Stabilization of promoted combustion in a solid-fuelled ramjet engine equipped with a profiled channel part serving as a flame holder due to generation of a recirculation zone is considered. A mathematical model for coupled heat and mass transfer and combustion processes in the gas and solid phases is presented. The model is implemented in axisymmetric geometry by a high-order numerical scheme possessing low dissipation at arbitrary Mach numbers. The results of numerical simulations at two inlet velocities and two inlet pressures are presented. The structure of the flow, including diffusion combustion in the mixing layer, and recirculation zone in the flame holder are revealed. The time histories of the maximum temperature and total combustion power are presented. The model will further be applied to studies of combustion stability in solid-fuelled ramjets.

Keywords: solid-fuelled ramjet; gasification; turbulent combustion; combustor; numerical modeling

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