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REALIZATION OF CONTINIOUSLY ROTATING DETONATION FOR SYNGAS–AIR MIXTURES*

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Abstract: Numerical simulation of continuously rotating detonations (CRD) of stoichiometric two-fuel mixture with air has been carried out for the cylindrical annular detonation chamber (DC) of the rocket-type engine. The syngas $(1-\alpha)\mathrm{CO}+\alpha\mathrm{H_2}$, a binary mixture of hydrogen $\mathrm{H_2}$ and carbon monoxide CO, is taken as a fuel. The global flow structure in the DC and the detailed structure of the transverse detonation wave (TDW) front in the continuously rotating regime have been studied. Integral characteristics of the detonation process — the distribution of average values of static and total pressure along the length of the DC — and the value of specific impulse on the DC exit have been obtained. The regions of existence of stable CRD regime in coordinates "stagnation pressure p_m – stagnation temperature T_m" in the injection manifold (receiver) have been determined. The minimal values of the DC length and radius for CRD for some regions at the p_m–T_m plane have been found.

Keywords: two-fuel mixture; synthesis gas; detonation kinetics; continuous detonation; cell

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