

THE INFLUENCE OF THE METHOD OF SUPPLYING FUEL COMPONENTS ON THE CHARACTERISTICS OF A DETONATION ROCKET ENGINE

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Abstract: Using the computational technology developed at the N. N. Semenov Federal Research Center of Chemical Physics of the Russian Academy of Sciences, the possibility of reducing the fuel supply pressure to a detonation rocket engine (DRE) with an annular combustion chamber (CC) was investigated by replacing its radial supply with its axial supply and, accordingly, replacing the axial supply of oxidant with its radial supply. It is shown that with fixed mass flow rates of fuel components (natural gas (NG) and oxygen) and, therefore, fixed overall equivalence ratio, such a replacement leads to restructuring of the DRE operation mode: the mode with three equidistant detonation waves (DWs) circulating over the fire plate of the DRE is replaced by the mode with a single DW. At the same time, the degree of incompleteness of fuel burnout significantly increases and the average pressure in the CC decreases. The obtained results mean that the DRE performance is largely determined by the organization of molecular and turbulent mixing of the fuel components in the zone of circulation of DWs. With the given mass flow rates of fuel component, the optimal conditions for their supply to the DRE, ensuring the greatest efficiency of the operation process should exist.

Keywords: detonation rocket engine; annular combustion chamber; natural gas; oxygen; supply pressure of fuel components; numerical simulation

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