THE MODEL OF DETONATION RAMJET: FIRING TESTS IN A PULSED WIND TUNNEL WITH THE AIRFLOW OF MACH 5.7 AND STAGNATION TEMPERATURE 1500 K

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Abstract: The mode of continuous spinning detonation (CSD) of hydrogen in an annular combustor (AC) has been experimentally recorded for the first time in an axisymmetric model of a detonation ramjet with a diameter of 310 mm and a length of 1050 mm under airflow conditions with a Mach number of 5.7 and stagnation temperature of 1500 K in a pulsed wind tunnel AT-303 of ITAM SB RAS. The thrust and specific impulse of the ramjet model were 1550 N and 3300 s, respectively. In contrast to the conventional ramjet operating on fuel deflagration, the operation process in the detonation ramjet is distinguished by a very rapid turbulent and molecular mixing of fuel components and a very high burning rate (combustion in the self-ignition mode behind the propagating shock wave), as well as very low internal drag (absence of ledges, cavities, etc.). In view of the high thrust and weight performance, the detonation ramjet can be considered as an alternative to the conventional concepts of a ramjet with fuel deflagration.

Keywords: detonation ramjet; hydrogen; firing tests; pulsed wind tunnel; specific impulse; thrust

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