

CONCEPTION OF MINICHANNEL AS THE SOURCE OF SELF-IGNITION AT HIGH SUPERSONIC SPEED

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Presence of «the thermal generator» at the high supersonic speeds of a flow in the channel becomes obligatory. The original scheme of ignition and flame stabilization at fuel parallel injection is suggested.

Developed «the thermal generator» is carried out as slotted channel (mini-channel) which is the part of the main channel of the combustor model. It was supposed that high static parameters of the flow in the mini-channel should promote self-ignition of the fuel-air mixture. Simultaneously, the exhaust of mini-channel into recirculation zone should lead to ignition of fuel-air mixture in the main channel. Tests have been performed in hot shot wind tunnel of IT-302M ITAM SB RAS in a mode of the attached pipe under following conditions on the entrance of the main channel: $M = 4-6$, $P_0 = 90-270$ bar and $T_0 = 1900-2900$ K. Equivalence ratio (hydrogen) changed from 0.6 to 1.1 in the main channel and from 0.03 to 0.11 in the mini-channel. Experiments were performed both at fuel injection into the main channel and the mini-channel simultaneously, and separately in each of channels. The mini-channel has been tested with or without geometrical critical cross-section at the exit.

As a result of the performed researches it has been obtained that in all range of the flow parameters change at the entrance of the model channel, the self-ignition of air-hydrogen mixture was occurring. Combustion is realized even at the absence of fuel injection in the mini-channel because the part of fuel from the main channel gets to the mini-channel. The mini-channel with geometrical critical section was choked up. Nevertheless, the outflow of hot combustion products from the inlet led to hydrogen ignition in the flow core with the subsequent stabilization in recirculation zone at the mini-channel exit.

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