SIMULATION OF SURFACE COMBUSTION ON A FLAT POROUS MATRIX

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Abstract: The nature of the upper limit of surface combustion on a flat porous matrix was investigated with the use of numerical simulation. A one-dimensional stationary problem is solved with the use of the overall kinetic mechanism, which was previously tested at simulation of self-ignition and laminar flame propagation of paraffin hydrocarbons. It was established that the intensity of heat exchange between gas and solid matrix material greatly influences the position of the flame front relative to the working surface of the matrix. The dependence of combustion limits on the specific power has been revealed. It was shown that appearance of the upper limit of surface combustion on the flat porous matrix is connected with flame blow-off from the matrix surface, whereas the limiting value of specific firing rate of combustion increases with the preheating temperature of methane–air mixture. However, at high preheating in the intermediate range of specific firing rates, the region of unstable combustion arises. The temperature of the working surface of the matrix is determined as a function of the specific firing rate.

Keywords: porous matrix; radiation burner; combustion of methane; mathematical modeling; stability of combustion

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