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BEHAVIOR OF PREMIXED STRETCHED FLAMES IN PLANAR CHANNEL*

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Experimental studies of low stretched flames require the microgravity conditions due to the significant effect of natural convection on the flame. This restriction forces the use of expensive experimental facilities. In recent studies [1, 2], an experimental setup allowing to reduce the natural convection effect on flame was proposed and it makes possible study low stretched flames under normal gravity conditions. The countercurrent flames in these papers were stabilized inside a flat microchannel. In present study, we proposed an experimental setup to study a low stretched flame stabilized near heated wall. The aim of the work was to establish the effect of a heated wall on the normal speed and flame extinction limit.

A lean (ϕ=0.6 and ϕ=0.7) methane-air stretched flames were investigated in experiment. The stretch rate was determined as the ratio of fresh mixture velocity at the burner outlet to the distance from the edge of the burner and heated wall. The average temperature along the heated wall was 1000±20 K and 1200±25 K, respectively. Location of the flame front was determined by averaging of blue signal peaks along the flame front line at a distance of ±1 cm from the burner's symmetry axis. For each experimental point, five images were taken, the data from which were averaged and the corresponding errors were determined.

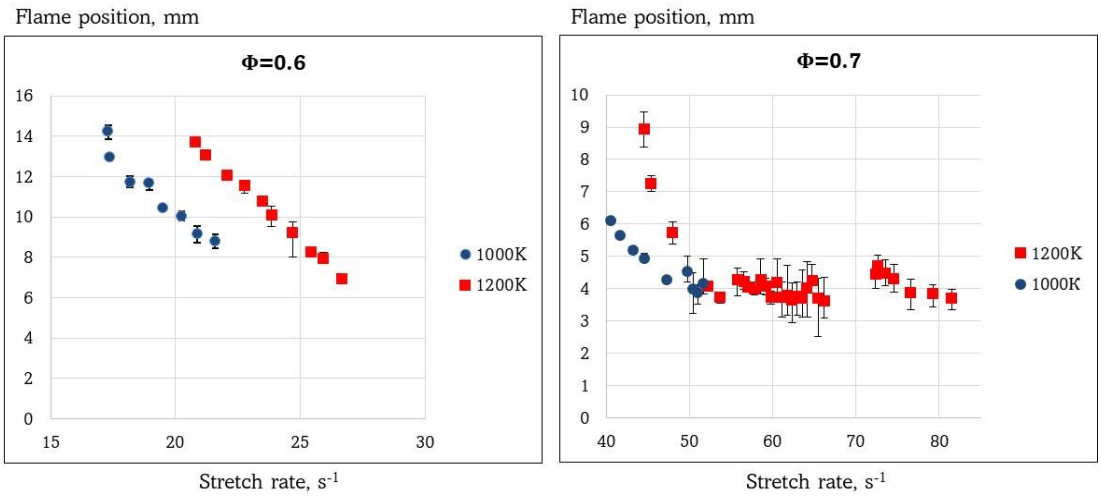

Fig.1. Dependency of flame location on stretch rate for different equivalence ratios and wall temperatures

Fig. 1 shows the dependences of flame front location on stretch rate obtained from the experiment. The experimental data clearly shows that a decreasing the wall temperature leads to a narrowing of the flame extinction limit. In addition, the experiment shows a significant difference from works [3, 4], in which the distance between the flames tended to zero and there was a critical value of stretch rate at which the flames collapsed. One of the explanations of this phenomena may be the fact that the selected wall temperatures were “relatively” low, and thus an additional heat loss from the reaction zone appeared in the system, which led to early quenching.

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