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Flame Dynamics in Small Scale Channels

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Abstract : Flame dynamics in heated quartz glass channels of various aspect ratios (2,5,10,15) were experimentally investigated. A premixed Propane-air mixture was used for the reported experiments. Regarding micro-combustion, flame quenching is considered to be the most crucial problem to overcome first. Experiments were carried out on four channels with different aspect ratios. The results show that at a very low equivalence ratio ϕ=0.4, there is no flame inside the channels. The FREI condition (Flame with repetitive extinction and ignition) was overcome by increasing velocity and by making the channels more in contact with the external heater. The flame tested inside the channels at different locations for V=0.3 m/s or higher below V=0.65 m/s. The effects of equivalence ratio and flow velocity on the characteristics of combustion in the channels were examined. Different ways of flame propagation were observed in the current investigations based on how they appear as planar, concave and convex flames.

Keywords : flame stabilization, combustion, flame dynamics, small-scale channels, external heater
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