Experimental study of coupled acoustic and electric discharge effect on methane–air flame

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The development of advanced power-generating plants based on high-speed combustion chambers requires the solution of a number of fundamental problems. In particular, the important task is the flammability limit expansion in the high-speed flows. As one of the cleanest fuels methane becomes more and more popular in new designed engines. A new method of coupled acoustic and electrical discharge treatment of premix combustion of methane–air mixture was studied. Experimental data of blow-off limits of a laminar and turbulent flame under the wide flow-rate range are presented. The effect of the acoustic waves and high-voltage electric discharge on blow-off limits, velocity fluctuations and flame characteristics is shown. Under the experiments exciting acoustic frequency was varied in the range 10–1000 Hz with amplitudes up to 140 dB. It is shown that acoustic and electrical discharge treatment can provide changes in stabilization conditions and intensification of laminar and turbulent combustion under the wide ranges of mixture equivalence ratio and flow Reynolds number.

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