

# Flame acceleration and deflagration-to-detonation transition in acetylene-based gaseous mixtures

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The paper is devoted to the joint experimental and numerical analysis of the non-stationary flame development in channels filled with diluted oxyacetylene mixtures. In particular, gas-dynamic mechanisms of the flame acceleration and peculiarities of various stages of the process observed experimentally [1] are interpreted with the help of detailed numerical analysis employing contemporary computational techniques and chemical kinetic schemes of acetylene oxidation. The criterial approach developed earlier by authors for estimation conditions required for a successful transition to detonation in hydrogen-based mixtures [2] is applied to examine the particular scenario and general possibility of DDT event in considered acetylene mixtures. The obtained results can be useful for the design of new propulsion devices and robust safety measures when using promising acetylene-based fuels.

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- [1] Krivosheyev P, Penyazkov O and Sakalou A 2020 *Combustion and Flame* **216** 146–160
- [2] Kiverin A D and Yakovenko I S 2018 *Mathematical Modelling of Natural Phenomena* **13** 54