INFLUENCE OF THE COMPONENTS RATIO ON THE INITIATION OF DETONATION OF HEPTANE–AIR–OXYGEN MIXTURES IN A REACTIVE-TYPE PULSED COMBUSTOR

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Abstract: The study on the influence of the composition of heptane–air–oxygen mixture on detonation onset in a pulsed detonation combustor is presented. It turned out that the parameters of the detonation regime (wave velocity and run-up distance) depend substantially on the fuel-to-oxidant equivalence ratio and oxygen content in a mixture. On the whole, increase in the oxygen content in a mixture which is determined by oxygen-to-air ratio [O_2/air] does not only promote deflagration-to-detonation transition, but also reduces the run-up distance length where detonation wave is formed. Such regimes are observed at the values of ratio $[O_2/\text{air}] \geq 0.5$ where combustion wave attains the velocities exceeding 2000 m/s typical for overdriven detonation for a given mixture.

Keywords: wave velocity; deflagration-to-detonation transition; equivalence ratio; oxygen-to-air ratio

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