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NUMERICAL SIMULATION OF A DETONATION ENGINE

Abstract

Detonation waves are supersonic pressure driven combustion waves, across which thermodynamic parameters change significantly. The sharp overpressures behind the detonation wave make this process attractive for the development of thermally efficient propulsion systems, such as pulsed detonation engines. There are two main types of detonation engines: pulse detonation engine and continuous detonation wave engine. In this paper, a three-dimensional numerical simulation of a continuous detonation wave engine is carried out. The mathematical model is based on the multicomponent gas dynamics considering chemical transformations and turbulent transport. The diameter of the chamber is 10 cm, the length is 10 cm and the main width of the channel is 0.5 cm. Oxygen is considered as an oxidizer, hydrogen or acetylene as fuels. The obtained results are compared with experimental data. This work was supported by the subsidy given to the Federal Science Center Scientific Research Institute for System Analysis of the Russian Academy of Sciences to implement the state assignment on the topic No. 1021061509701-5-1.2.1 “Development of algorithms and codes for multiscale processes and combustion simulations” (FNEF-2022-0021).