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INVESTIGATION OF A CELLULAR DETONATION STRUCTURE IN A GAS MIXTURE

Abstract

The process of detonation is not desirable in the case of accidents, but it can be useful if we talk about its application to a new generation of engines using detonation combustion mode. Detonation is a complex phenomenon due to a three-dimensional wave structure with an inhomogeneous dynamical wave front. If we consider the movement of a triple point through a detonation tube covered with soot, the shear forces from these triple points mark out a pattern like a fishnet at the inner walls. This structure is known as a detonation cell. As the leading shock, front spreads downstream, the triple points alternate. At the same time, the transverse wave oscillates perpendicular to the direction of propagation. It was found that these detonation cells are one of the most important parameters in the research and experiments of detonation processes. When considering the phenomenon of detonation using numerical modeling, it is often necessary to take into account the cellular structure, namely, the ability to resolve these structures. The study of the limits of the cell's existence is one of the ways to determine the possibility of controlling the detonation process. The paper considers the production of a cellular structure in hydrogen-air and acetylene-air mixtures, with different parameters, using the author's software package. This work was supported by the subsidy given to the Federal State Institution "Scientific Research Institute for System Analysis of the Russian Academy of Sciences" to implement the state assignment on the topic No. 0580-2021-0021 "Development of algorithms and codes for multiscale processes and combustion simulations".