MATHEMATICAL MODELING OF CELLULAR DETONATION WAVE SUPPRESSION BY SYSTEM OF INERT POROUS BODIES*

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Abstract: Numerical simulation of the interaction of cellular detonation in a hydrogen–air mixture with a system of porous filters located at the walls of the channel was carried out. The main regimes and critical conditions for the attenuation and suppression of detonation in the filter system were obtained. In the first realized regime, at the volume fraction of filter particles less than critical, a detonation wave (DW) decelerates to a velocity less than the Chapman–Jouguet velocity and propagates in a stationary mode; a detonation cell size increases. In the second realized regime, at the volume fraction of filter particles equal or greater than critical, a DW splits into the shock wave (SW) and the lagging combustion front with the destruction of cellular structure. A map of detonation regimes was constructed. It follows from this map that with an increase in the volume fraction of particles in the filters, the gap between the filters can also be increased to successfully suppress the detonation.

Keywords: physical and mathematical modeling; homogeneous detonation; inert porous filter; detonation failure

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