Influence of boundary conditions on cellular detonation

Mikhalchenko E V[1,2,@] **and Nikitin V F**[1,2]

[1] Federal State Institution "Federal Scientific Center Research Scientific Institute for System Analysis of the Russian Academy of Sciences", Nakhimovsky Prospect 36K1, Moscow 117218, Russia
[2] Lomonosov Moscow State University, Leninskiye Gory 1, Moscow 119991, Russia

[@] mikhalchenkolena@yandex.ru

This study is devoted to the influence of boundary conditions on the ability to maintain a detonation structure and on the detonation cell size. The main combustive mixture under investigation is syngas–air; the content of syngas is [CO]:[H2]=1:1. The detonation is triggered by a strong detonation wave in a primary stoichiometric mixture: hydrogen with oxygen. Dependent on boundary conditions: partial outflow on walls, or closed walls, the imposed detonation in syngas-air mixture is either maintained in a cellular mode, or develops into a shock wave and retarding combustion. The mathematical model is based on multicomponent gas dynamics with chemical transformations of the components. It is obtained that periodic boundary condition on walls and closed boundary conditions bring to very similar solutions and stable cellular detonation in syngas with air. Fully open boundaries bring to quick degradation of detonation structure, partial opening brings to various cell sizes.
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