On the velocity of the stationary non-ideal detonation wave

R.E. Semenko (Sobolev Institute of Mathematics, Novosibirsk)

The problem is dedicated to the one-dimensional stationary detonation in the porous media. The process of detonation is modelled with the reactive Euler equations including the losses due to the interaction between the moving combustion products and the obstacles. It is well-known that the calcualtions of the solutions for self-sustined detonation problem is complicated by the fact the solution is suppose to have sonic locus which is the singular point of the Euler equations. The conditions that provide the smooth solution across this point are in fact the ones which determine the value of detonation speed as the eigenvalue of the boundary-value problem. While the case with no losses and one-stage exothermic reaction leads to the solution with sonic locus at infinity, the losses of momentum [1,2] and/or endothermic stages of the reaction [3] cause sonic locus to move inside the reaction zone to the finite distance from the shock front. That in turn create the problem of continuation of the solutions past the sonic locus. The results of the current research show the dependence of the detonation wave velocity on the amount of losses while taking into account the heat loss due to the exchange of the temperature between combustion products and obstacles or due to the endothermic reaction stage.

Thanks. This work is supported by the grant of the Mathematical center in Akademgorodok.

References

[1] I. Brailovsky, G. Sivashinsky, *Effects of momentum and heat losses on the multiplicity of detonation regimes*, Combustion and Flame, **128**:1 (2002), 191–196.

[2] R. Semenko, L.M. Faria, A.R. Kasimov, B.S. Ermolaev, *Set-valued solutions for non-ideal detonation*, Shock Waves, **26**:2 (2016), 141–160.

[3] D.I. Kabanov, A.R. Kasimov, *Linear stability analysis of detonations via numerical computation and dynamic mode decomposition*, Phys. Fluids, **30** (2018), 036103.