

# Contents

<b>Chapter 1 Fundamentals of Gaseous Deflagrations and Detonations</b>	<b>1</b>
Features of autoignition of methane–hydrogen mixtures <i>A. V. Arutyunov, A. A. Belyaev, K. Ya. Troshin, A. V. Nikitin, and V. S. Arutyunov</i> .....	3
Pulsed combustion of fuel–air mixture in the cavity under the boat bottom: Simulation and outdoor tests <i>S. M. Frolov, S. V. Platonov, K. A. Avdeev, V. S. Aksenov, V. S. Ivanov, A. E. Zangiev, I. A. Sadykov, R. R. Tukhvatullina, F. S. Frolov, and I. O. Shamshin</i> .....	4
Mathematical modeling of supersonic mixing and combustion in near-wall region <i>R. S. Solomatin and I. V. Semenov</i> .....	7
Detonation initiation in combustible gas mixture upon interaction of a shock wave with an inert gas bubble <i>P. Yu. Georgievskiy, V. A. Levin, and O. G. Sutyryn</i> ....	9
Ranking of fuel–air mixtures in terms of their propensity to deflagration-to-detonation transition <i>S. M. Frolov, V. I. Zvegintsev, V. S. Aksenov, I. V. Bilera, M. V. Kazachenko, I. O. Shamshin, P. A. Gusev, and M. S. Belotserkovskaya</i> .....	11

Numerical simulation of detonation wave propagation in the nonuniform media in the shock-attached frame <i>Ya. E. Poroshyna, A. I. Lopato, and P. S. Utkin</i> .....	16
Detonation propagation in periodic nonuniform media: Resonance and mode locking phenomena <i>A. Kasimov and A. Goldin</i> .....	18
The effect of an initial sinusoidal density perturbation on the nonlinear dynamics of one-dimensional unsteady gaseous detonations <i>Mira Kim, Xiaocheng Mi, C. B. Kiyanda,                  Honghui Teng, and Hoi Dick Ng</i> .....	20
Propagation of gaseous detonations in planar curved rectangular channels <i>M. L. Fotia, J. Hoke, A. J. Olson,                  and S. A. Schumaker</i> .....	23
Modeling of initiation of gas detonation in a plane radial chamber <i>D. V. Voronin</i> .....	25
Experimental investigation of the unsteady wall heat flux generated by the propagation of a self-sustained detonation <i>H. Quintens, Q. Michalski, F. Viot, J. Sotton,                  and M. Bellenoue</i> .....	26
Numerical study of detonation propagation in viscous turbulent flow in a duct <i>V. A. Sabelnikov, V. V. Vlasenko, S. Bakhne,                  S. S. Molev, and A. I. Troshin</i> .....	28
Unconfined hydrogen detonations: Experiments, modeling, and scaling <i>M. Kuznetsov, A. Lelyakin, J. Xiao, and W. Breitung</i>	30
Detonation structures in a supersonic annular ramjet chamber <i>A. V. Trotsyuk</i> .....	33

**Chapter 2 Fundamentals of Heterogeneous Deflagrations and Detonations** 35

Features of p-type silicon combustion in the solid fuel pSi–NaClO<sub>4</sub> · H<sub>2</sub>O composites  
*V. N. Mironov, O. G. Penyazkov, P. N. Krivosheyev, Y. A. Baranyshyn, E. S. Golomako, and S. O. Shumlyayev*..... 37

Fast combustion modes of composites “mound of porous silicon fragments – sodium perchlorate monohydrate” in the atmosphere  
*V. N. Mironov, O. G. Penyazkov, E. S. Golomako, and S. O. Shumlyayev*..... 40

Numerical simulation of the compaction effect during shock wave – particle layer interaction  
*Ya. E. Poroshyna and P. S. Utkin* ..... 43

Two-dimensional numerical simulation of the shock wave – particle layer interaction using Cartesian grid method  
*D. A. Sidorenko and P. S. Utkin*..... 45

Explosion and detonation processes in chemically active bubbly systems  
*P. A. Fomin* ..... 47

High-response complex for analyzing droplets and vapors in aerosol clouds formed in the atmosphere due to liquid dispersion  
*A. V. Zagnit’ko, N. P. Zaretskiy, I. D. Matsukov, V. V. Pimenov, and S. E. Sal’nikov* ..... 50

**Chapter 3 Pulsed and Continuous Detonations** 53

Propagation of the burning wave in a pulsed detonation combustor operating on mixtures of heptane and Jet A-1 with air and oxygen at [O<sub>2</sub>/air] < 1  
*M. S. Assad, O. G. Penyazkov, I. I. Chernuho, and K. Alhussan* ..... 55

Two engineering solutions for pulsed detonation engine design <i>K. V. Migalin and K. A. Sidenko</i> .....	57
Multidimensional simulations and test fires of a hydrogen-fueled ramjet with an annular detonative combustor at approaching air flow of Mach 2 and 1.5 <i>V. S. Ivanov, V. S. Aksenov, S. M. Frolov, P. A. Gusev, I. O. Shamshin, and A. E. Zangiev</i> .....	59
Pulse-detonation steam superheater <i>S. M. Frolov, V. A. Smetanyuk, I. O. Shamshin, F. S. Frolov, and S. A. Nabatnikov</i> .....	62
Burning of a mixture of liquid kerosene and cold air in a detonation chamber 503 mm in diameter with chamber geometry variation <i>F. A. Bykovskii, S. A. Zhdan, and E. F. Vedernikov</i> ....	66
Research and development of detonation engine system for the sounding rocket flight experiment S-520-31 <i>Jiro Kasahara, Keisuke Goto, Ryuya Yokoo, Buyakofu Valentin, Akira Kawasaki, Ken Matsuoka, Koichi Matsuyama, Akiko Matsuo, Ikkoh Funaki, Daisuke Nakata, and Masaharu Uchiumi</i> .....	68
An oasis of pure aerothermal dilemmas: Integrating turbines with rotating detonation combustors <i>G. Paniagua, J. Braun, T. Meyer, V. Athmanathan, and S. Roy</i> .....	70
Pressure measurements in rotating detonation engines <i>V. S. Ivanov, S. S. Sergeev, S. M. Frolov, Yu. M. Mironov, A. E. Novikov, and I. I. Schulz</i> .....	73
The supersonic argon flow parameters in an arcjet thruster <i>V. I. Gorbunkov, V. V. Shalay, and N. V. Pustovoi</i> .....	76
<b>Chapter 4 High Explosives</b>	<b>79</b>
Detonation of a low-density emulsion explosive <i>S. A. Gorinov and I. Yu. Maslov</i> .....	81

Contribution of “oxidizer–fuel” reactions to detonation  
parameters and metal acceleration by explosion

*A. S. Smirnov, I. A. Kuznetsov, O. A. Ukhabin,*

*A. S. Orlov, A. B. Morozov, A. A. Merkin,*

*and V. G. Kozhevnikov ..... 83*

**Author Index** 84