DEFORMATION-HEAT EXPLOSION IN REACTIVE MEDIUM

A. V. Dubovik[1] and A. A. Matveev[2]

[1]N. N. Semenov Institute of Chemical Physics, Russian Academy of Sciences, 4 Kosygin Str., Moscow 119991, Russian Federation
[2]D. Mendeleev University of Chemical Technology of Russia, 9 Miusskaya Sq., Moscow 125047, Russian Federation

Abstract: The solution of a nonstationary problem on thermal ignition of chemically reacting substance with the account of dissipative heat generation owing to its deformation heating is presented. Critical conditions of ignition and the induction periods for adiabatic explosion in limiting cases of large and small deformation of the substance are determined.

Keywords: deformation; dissipation; heat explosion

Acknowledgments

The work was financially supported by the Russian Foundation for Basic Research (Project No. 14-03-00333a).

References

1. Frank-Kamenetskiy, D. A. 2967. *Diffuziya i teploperedacha v khimicheskoy kinetike* [Diffusion and heat transfer in chemical kinetics]. Moscow: Nauka. 492 p.
2. Zel'dovich, Ya. B., G. I. Barenblatt, V. B. Librovich, and G. M. Makhviladze. 1980. *Matematicheskaya teoriya goreniya i vzryva* [Mathematical theory of combustion and explosion]. Moscow: Nauka. 480 p.
3. Kachanov, L. M. 1969. *Osnovy teorii plastichnosti* [Fundamentals of plasticity theory]. Moscow: Nauka. 420 p.
4. Dubovik, A. V., and A. A. Matveev. 2014. Impact-induced explosion-like reactions in vinil halide polymers. *Rus. J. Phys. Chem. B* 33(4):33–37.
5. Yaroslavskiy, M. A. 1982. *Reologicheskiy vzryv* [Rheological explosion]. Moscow: Nauka. 193 p.
6. Dubovik, A. V. 2011. *Chuvstvitel'nost' tverdykh vzryvchatykh sistem k udaru* [Sensitivity of solid explosives to impact]. Moscow: Izd-vo RKhTU im. D. I. Mendeleeva. 276 p.
7. Schumacher, J. C. *Perchlorates*. New York, NY: Reinhold Publ. Corp. 270 p.
8. Manelis, G. B., G. M. Nazin, Yu. I. Rubtsov, and V. A. Strunin. 1996. *Termicheskoe razlozhenie i gorenie vzryvchatykh veshchestv i porokhov* [Thermal decomposition and combustion of explosives and solid propellants]. Moscow: Nauka. 223 p.

Received November 1, 2014

Contributors

Dubovik Alexander V. (b. 1938) — Doctor of Science in physics and mathematics, leading research scientist, N. N. Semenov Chemical Physics Institute RAS, Moscow, Russian Federation; a-dubovik@mail.ru

Matveev Alexey A. (b. 1989) — Ph.D. student, D. Mendeleev University of Chemical Technology of Russia, 9 Miusskaya Sq., Moscow 125047, Russian Federation; alexeymatveyev@mail.ru