DEVELOPMENT OF THE METHOD FOR EVALUATING THE ACCELERATION ABILITY OF HIGH EXPLOSIVES ON THE BASIS OF GURNEY MODEL

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Abstract: A semiempirical method for calculating the acceleration ability (AA) of individual explosives and aluminized compositions was developed using experimental data arrays. The method is based on the Gurney model and the assumption that the coefficient of transformation of chemical energy into the kinetic energy depends on the number of moles of gaseous explosion products (EP). In the case of individual high explosives (HEs), the calorimetric heat of explosion and the corresponding EP composition are used. The equations, derived for aluminized HE, permit calculating the velocities of copper cylinder at a degree of EP expansion 2 and 7 (method T-20) and the velocity of steel plate at a distance 40 mm (method M-40). In this case, the effective degree of Al oxidation, heat effect, and product composition are evaluated for the considered stages of expansion process. The equations take into account the dependence of AA on the oxygen content of base explosive, charge density, concentration, and particle size of ingredients. The AA evaluation was conducted for the aluminized model HMX-based mixtures containing a series of HEs with a positive oxygen balance.

Keywords: high explosive; acceleration ability; aluminum; heat of explosion; calculation

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Figure Captions

Figure 1 Convergence of calculated (W_c) and experimental (W_e) velocities of the shell (T-20) for individual explosives. Straight line — function $y = x$

Figure 2 Relative plate velocities (M-40) depending on the content of the explosive oxidizer in the mixture with HMX; solid lines — binary compositions; dashed lines — compositions with the addition of 12.5% Al; explosive oxidizer: *1* — BTNEN; *2* — HNF; *3* — ADN; and *4* — DNG

Table Captions

Table 1 Experimental (V_e) [19] and calculated (V_c) velocities of the plate (M-40) for explosives and Al-free compositions

Table 2 Experimental and calculated velocities of the shell (T-20) and plate (M-40) for compositions containing 15% Al

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