DECELERATION CURVE OF HMX-BASED EXPLOSION COMPOSITION PRODUCTS UNDER NORMAL AND OVERDRIVEN DETONATION

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The current work presents the results of investigation into high-dense HMX-based explosive composition (HMX-based HE). The studied samples were 1.89 g/cm^3 in density. Fast processes were recorded by laser interferometry.

During the first experimental series, an explosive lens was used to initiate the detonation wave in the studied sample. Detonation profile at the HMX-based HE/LiF window interface and scattering velocity profile for metal foils of various thicknesses were recorded. The method described in [1] was used to reconstruct the chemical peak deceleration curve. The recorded detonation profiles did not show any classical sharp chemical peak. Using thin foil barriers, a classical deceleration curve of the explosive products (EP) of the above HE passing through the known Jouget point was obtained instead of the expected chemical peak deceleration curve in the HMX-based HE.

During the second experimental series, the detonation wave was initiated in the studied sample by aluminum plate impact at a velocity of 3.95 km/s. The EP deceleration curve in these experiments was obtained using not the foils but thicker copper, aluminum, or magnesium alloys barriers instead.

During the third experimental series, the overdriven detonation mode (P/P_J = 1.3) was implemented in the studied HMX-based HE sample initiated by aluminum plate impact at a velocity of 5.0 km/s. We recorded the detonation profile at the HMX-based HE/LiF window interface as well as the barrier scattering velocity profile for the barriers made of aluminum alloy, titanium, stainless steel, and tantalum. The deceleration curve of the initially overdriven explosive products was reconstructed.

Thus, for the studied HMX-based HE we determined detonation profiles under normal and overdriven by 1.3 times detonations; isoentropic curve of EP expansion (lower fragment of the EP deceleration curve) at normal detonation using foils; and EP Hugoniots (upper fragment of the EP deceleration curve) at normal and overdriven by 1.3 times detonations using barriers.

References

1. **Tarzhanov, V. I.** Chemical peak deceleration curve is the new feature of detonating explosives [Text] // Fizika Goreniya i Vzryva [Combustion, Explosion, and Shock Waves]. – 2020. – Vol. 56, No. 6. – P. 133–134 (in Russian).