FOREIGN INVESTIGATIONS OF NEW HIGH-DENSITY REACTIVE MATERIALS FOR DIFFERENT ADVANCED MUNITIONS

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Abstract: The development of new high-density energetic materials (RM (Reactive Materials), HDRM (High-Density Reactive Materials), DIME (Dense Inert Metal Explosives), RMBX (Reactive Multiphase Blast Explosive), and RMS (Reactive Material Structures) is discussed. High-energy metal–fluoropolymer RM with moderate strength and density (2–3 g/cm^3) are implemented in missile warheads, armor-piercing incendiary bullets, and shaped charges. So-called HDRM became an independent branch of RM investigations. High density (7–8 g/cm^3) and strength (140–600 MPa) make them suitable for structural metal replacement and upgrade different munitions without changing the weight and size characteristics. It is possible to use HDRM for producing shell casings, warheads, and reactive fragments. Structural RM (or RMS) have similar properties, but their density and strength are provided by the metal frame. Tungsten wire reinforced composites achieved density and strength close to that of the structural steels. The experiments confirmed the possibility of RMS use in penetration bombs at impact velocities of 300–760 m/s. Explosive compositions with tungsten additives, DIME, increase the density of equipment and may be used to reduce side effects of precision weapons without damage efficiency reduction. In RMBX, tungsten is replaced by pyrophoric heavy metals (for example, Ta). The energy release of RMBX ($\sim$ 30 kJ/cm^3) provides the blast perfomance higher than the conventional thermobaric explosives.

Keywords: energetic materials; high density reactive materials; mechanochemical reactions; high velocity impact; lethality; metal-PTFE compositions; reactive material structures; dense inert metal explosive

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