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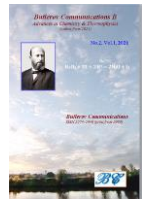

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Types of structures of hexogen- and aluminium-filled cellulose nitrate materials manufactured based on the aqueous-dispersing technology

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Abstract

There were calculated the parameters of the dispersed-filled structure of the hexogen- and aluminium-filled composites: a volume fraction of a filler, a matrix density, a free volume of the filler, an average statistically distance between filler particles, a free volume of a matrix The types of structures of the given hexogen- and aluminium-containing composites depending on a filler content and particle sizes were determined in accordance with the well-known classification of the filled systems. It was found that the highly filled compositions based on RDX with a particle diameter of ≈ 11 μm are produced with a filling rate of 26-35 % wt., and the aluminium based compositions with a particle diameter of ≈ 3.8 μm are produced with a filling rate from 18 to 25 % wt. These high melting fillers, acting as volumetric postactive burning inhibitors, allow to exclude the phlegmatization stage in the manufacture of the ball powder, ensuring a constancy of the ballistic characteristics while increasing the flight speed of 5,6 mm rifle cartridge bullet from 315 to 400 m/s in comparison with the standard deterred single-base powder. To obtain the filled granules of the composite with the optimum physico-chemical characteristics the hexogen-filled compositions are more preferable in comparison with the aluminium-filled materials due to a poor activity of a hexogen with respect to a polymeric matrix as well as due to a plasticization of ЛД-70 matrix, allowing not only to obtain the dense ball elements, but also to use the lower modulus according to ethylacetate. A more complete combustion of propelling charge with hexogen and a shot with a lower volume of a flame are the additional advantages of the hexogen-containing materials when using composites in the composition of

propelling charges for small arms systems in contrast to the aluminium-containing analogue.

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