

Modification of hexanitrohexaazaisowurtzitane crystals by the method of hydromechanical rolling

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Keywords: hexanitrohexaazaisowurtzitane, hydromechanical rolling, modification, spheroidization.

Abstract

Hexanitrohexaazaisowurtzitane (CL-20) is a modern high-energy oxidizer with high density, enthalpy of formation and optimal oxygen balance. Practical experience shows that the classical crystals of the product obtained as a result of mass crystallization are not homogeneous and also have the form of a rhombic bipyramid with sharp edges and a defective surface. While the use of spherical or oval oxidizer crystals with a smooth surface provides better packaging in the formulations and a denser filling of the compositions, as well as the safety of products based on it. A feasibility study of a method of hydromechanical rolling to improve quality of CL-20 crystals is given in the paper.

Based on the analysis of literature data, the optimal design of a marumerizer and a stirring device used for processing octogene (HMX) crystals was chosen. Under the study the optimal composition of a processing medium and CL-20 concentration in suspension was found, the best time and temperature regimes of the process were established.

As a result, some samples of CL-20 crystals with improved shape and crystal surface were obtained. The performed study has shown that the shape of the improved rolled crystals depends on the appearance of the original crystals. In addition, the large-crystalline product shows better results in the hydro-mechanical rolling than the fine-crystalline one.

The behavior of various polymorphic modifications of hexanitrohexaazaisowurtzitane in the hydromechanical rolling was studied. It was found that γ - ε -polymorphic crystals can be improved by the method of hydromechanical rolling, in contrast to α -modification, which under the processing conditions is re-modified into ε -polymorph.

The results obtained are confirmed by microscopic and spectroscopic studies, as well as gravimetric sieve analysis.

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