

## Crystallization and co-crystallization of CL-20. Influence of some process conditions on product properties

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### Abstract

Crystallization of CL-20 (HNIW) with all the variety of methods faces a number of problems caused by heterogeneous nucleation, polymorphic transformations of the product in the process of crystallization, stability most polymorphic modifications of HNIW under normal conditions, difficulty reproducing granulometric composition and polymorphic purity of the product in laboratory, pilot and industrial facilities. Analysis of literary data shows that important but little researched factors that determine the properties of crystalline product obtained by different methods are: the properties of the crystallizer material; properties of solvents to process the surface of the devices after crystallization; properties of solvents and sediments used in HNIW crystallization. An important element is the analysis of the influence of the type of plasticizers of mixed energy materials (MEM) on the crystallization and co-crystallization processes of HNIW in MEM compositions. It is of some interest to obtain HNIW ultra-dispersing and nanoscale powders in the MEM plasticizer environment, if used as sediments in HNIW crystallization processes.

The article presents the results of experimental studies of influence: the type of material from which the crystallizer is made, the influences of the type of polar solvents used to wash the crystallizer before its subsequent use, influences of the type of MEM plasticizers, as sediments or environments for the creation of the emulsion of HNIW solution in emulsion and sedimentary methods, on crystallization (recrystallization) HNIW; polar polymer-type material for co-crystallization in the polar polymer/HNIW system in thin layers under normal conditions and at cryogenic temperature. The results of the research on the co-crystallization of octogen and HNIW in the environment of inert and nitroester plasticizers of MEM are also presented.

Glass, aluminum, stainless steel, porcelain and fluoroplast crystallizers were used to crystallize HNIW/acetone/*o*-xylol. Acetone, water, ethanol, *o*-xylol in different combinations or sequences were used to wash crystallizers or to process them further before crystallizing. MEM plasticizers were used as sediments instead of *o*-xylol: transformer oil, dioctyladipineate, propylene glycol, diethylene, triethylene glycol and nitroglycerin. Polar polymer/HNIW casseators used glass, aluminum, stainless steel, fluoroplast and polyethylene to co-crystallize in thin layers at room and cryogenic temperatures. Polyvinylacetate, acetyleulose, nitrocellulose were used as polar polymers. The co-crystallization of HNIW with the octogen was considered in model blends with the above MEM plasticizers.

Studies allow you to choose the conditions for the crystallization and co-crystallization of HNIW with the provision of reproducible characteristics of variability, polymorphic composition, including for the receipt of a high-dispersive product  $\epsilon$ -modifications.

The possibility of obtaining a high-dispersal product (crystalline HNIW and its co-crystallizates with MEM components) using SEM plasticizers as sediments or components of mixtures has been confirmed, which is a promising direction alternative technologies for making MEM based on high-dispersal fillers.

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