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## **An applicability of the penetration method for optimization of a granulated product yield in an aqueous-dispersing manufacturational method**

**Tatiana A. Eneykina,\* Nikita Yu. Ivanov,+ Dilyara R. Sirazieva,+  
Anatoly P. Pavlov, Dmitry S. Sedachev, and Rose F. Gatina**

*“State Research Institute of Chemical Products” Federal State Enterprise.*

*Svetlaya St., 1. Kazan, 420033. Tatarstan Republic. Russia.*

*Phone: +7 (843) 564-52-45. E-mail: [gniihp@bancorp.ru](mailto:gniihp@bancorp.ru)*

\*Supervising author; +Corresponding author

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### **Abstract**

The course of the plasticization process of cellulose nitrates (NC) was studied according to an immersion value of a measuring system of a tripod penetrometer, which makes it possible to establish time modes for obtaining a polymeric (powder) lacquer during the formation of a product with a granule size of 0.4-0.8 mm based on an aqueous-dispersing technology. It was found that with a single introduction of ethyl acetate (EC) a value of the immersion depth reaches ~43.5-44.0 mm in approximately 40-50 minutes, the rheological curve is a sinusoidal kinetic dependence with a single plateau. This range of the immersion depth can be roughly recommended for evaluation of a readiness of NC-NG (nitroglycerin) lacquer (87:13) irrespective of the properties of the initial raw material under the production conditions of the formation of the granulated product, which is confirmed by the identical yields of the target fraction of product with the granule size of 0.4-0.8 mm in laboratory and production conditions. It is shown that along with the characteristics of the gunpowder lacquer it is important to observe certain hydrodynamic mixing conditions in the reactor to control the required granule size. The parameters of the Reynolds criterion are calculated for laboratory and industrial type apparatuses with a paddle stirrer speed of 400 min<sup>-1</sup> and 140-150 min<sup>-1</sup> respectively. The distribution curves of the fractional composition of granular products of the 0.4-0.8 mm fraction obtained under production conditions are given. With a higher mixing intensity, the fractional composition shifts towards the formation of smaller granules, remaining in the same fraction range. It has been showed that the yield of the target product fraction, irrespective of a frequency of EC introduction, is ~65-71% when the K-2 measuring system is immersed into the powder lacquer to the depth of

44.0-51.5 mm. The obtained results confirm the applicability of the penetration method for assess the completion of the process of formation of homogeneous lacquers under conditions of time constraints and variable properties of the feedstock, as well as to optimize the yield of the target product fraction.

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