

The flow curves of nitrocellulose solutions on Hoppler viscosimeter

© Dilyara R. Sirazieva,⁺ Tatiana Alexandrovna Eneykina,*

Anatoly P. Pavlov, Rose F. Gatina, and Yury M. Mikhailov

“State research institute of chemical products” FSE. Svetlaya St., 1. Kazan, 420033.
Tatarstan Republic. Russia. Phone: +7 (843) 564-52-45. E-mail: gniihp@bancorp.ru

*Supervising author; ⁺Corresponding author

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Abstract

For the first time a possibility of an application of a Hoppler viscosimeter with the pressing ball for obtaining of the flow curves of 5-50% bipolymeric cellulose nitrates – polyvinyl nitrate (NC-PVN) solutions based on the measurements of the stationary velocity of a ball displacement along the wall of the cylindrical vessel has been checked experimentally. The relationships, rearranging the equations of the shear stress and rate by means of the correlation coefficients, underlie the method. The time of the ball immersion into the polymeric solution has been used as the main parameter, which is experimentally determined. The rheological flow law and the rheological parameters of reprocessing of 5-50% NC-PVN solutions in EA: a flow index, a consistency coefficient, have been established. It has been shown that 30-50% NC-PVN solutions in EA display properties of the non-Newtonian liquid to a greater degree and they are more structural ones in comparison with 5-20% NC-PVN solutions; the greater deviation of the flow index from 1 indicates on it. The values of the limit shear stresses that characterize the plastic (strength) properties of the polymeric compositions and allow to evaluate preliminary a possibility of a reprocessing of the nitrocellulose solutions, including the solutions, which are filled to the powders using the aqueous-dispersing, the lacquer-extrusion and the extrusion technologies, were found by the extrapolation of the rectilinear section of the flow curve to the axis of stresses. In the course of reprocessing of NC-PVN solutions in EA according to the aqueous-dispersing, the lacquer-extrusion and the extrusion technologies, the limits of a plasticity, corresponding to 90-1950 Pa, 1950-2750 Pa and 2750-5600 Pa, have been established. It has been shown, that the plasticity of NC-PVN die (50:50), filled with the octogen in the amount of 40 % by mass, increases ~1.7 times in comparison with the die, which is not filled, and it results in decreasing of a “brittleness” of the filled NC-lacquer.

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