

## Development of an rapid method for nitrocellulose mass plasticity determining

© Dilyara R. Sirazieva,<sup>+</sup> Tatiana A. Eneykina,<sup>\*</sup> Anatoly P. Pavlov, Evgenia S. Abramovskaya, Rosa F. Gatina, and Yuri M. Mihaylov

Federal Government Enterprise «State Science-Research Institut of Chemical Products».

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

Phone: +7 (843) 560-20-12, +7 (843) 564-52-45. E-mail: ibneeva-dilara88@mail.ru

\*Supervising author, <sup>+</sup>Corresponding author

**Keywords:** plasticity, nitrocellulose mass, bipolymer NC-PVN powder mass, limit shear stress, Vasiliev's standardized cone, hardware-graphics method.

### Abstract

Method of determining the concentrate nitrocellulose mass plasticity was developed according to the limit shear stress index which defined by the laboratory penetration method on the Vasiliev's standardized cone. Comparative data of limit shear stresses which obtained on the Vasiliev's standardized zone based on the experimental data of penetration depth and hardware-graphics method of flow curves which obtained by the capillary viscometry method are presented. For the first time the experimental method established Vasiliev's standardized cone constant equal 0.53 for a given type of masses, which is allows to determine the limit shear stress. Several advantages for new limit shear stress measurement method are revealed in comparing with known hardware-graphics method. Practicability of rapid method application for concentrate mass plasticity by the limit shear stress index is shown. A new method of nitrocellulose masses plasticity determining using limit shear stress value provides measurement results obtaining with relative error that doesn't exceed  $\pm 6\%$  for the confidence probability of 0.95. Moreover, limit shear stress values can be also used for the comparative quality evaluation of the solvents thermodynamic compatibility instead of known methods.

### References

- [1] V.I. Gindich. Pyroxiline Powder Technology. Edited by Korsakov A.G. *Kazan, Tatar Newspaper and Magazine Publ.* **1995**. 391p. (russian)
- [2] Spherical powders. Edited by Mihailov Yu.M. *Chernogolovka, Institute of Problems of Chemical Physics of the Russian Academy of Sciences Publ.* **2003**. 204p. (russian)
- [3] K.H. Nikoshina, E.F. Korobkova, N.M. Lyapin. Research of structure formation process in the pyroxiline powders polymer matrix using water-insoluble pore-former. *Vestnik KTU.* **2011**. Vol.14. No.17. P.80-83. (russian)
- [4] G.I. Yusupova, D.I. Gafarova. Formation of porous cellulose nitrate powders on a slow evaporating removable solvent – diacetone alcohol. *Butlerov Communications.* **2015**. Vol.43. No.9s. P.9-10. DOI: 10.37952/ROI-jbc-01/15-43-9s-9
- [5] V.E. Gul', V.N. Kuleznev. Structure and mechanical properties of polymers. *Moscow, Higher School Publ.* **1972**. 320p. (russian)
- [6] L.I. Selivanova, T.A. Eneykina, N.S. Gainutdinova, A.P. Pavlov, D.R. Ibneeva, R.F. Gatina, Yu.M. Mikhalov. Analysis of predicting possibility of rheological characteristics of filled lacquer compositions based on cellulose nitrate. *Butlerov Communications.* **2013**. Vol.34. No.5. P.34-40. ROI: jbc-02/13-34-5-34
- [7] N.S. Gainutdinova, T.A. Eneykina, S.V. Soldatov, A.P. Pavlov, R.F. Gatina, Yu.M. Mikhalov. Rheological feature filled cellulose nitrate lacquer compositions. *Butlerov Communications.* **2015**. Vol.43. No.8. P.134-139. DOI: 10.37952/ROI-jbc-01/15-43-8-134
- [8] D.R. Ibneeva, T.A. Eneykina, E.S. Abramovskaya, A.P. Pavlov, R.F. Gatina, Yu.M. Mikhalov. The properties of nitrocellulose lacquers as object of technological reprocessing. *Butlerov Communications.* **2015**. Vol.44. No.12. P.182-190. DOI: 10.37952/ROI-jbc-01/15-44-12-182
- [9] V.D. Kosoi. Engineering rheology in sausage production. *Moscow, Kolos Publ.* **2005**. 262p. (russian)
- [10] O.N. Savinok, V.D. Kosoi, V.G. Garbuz. The choice of rational parameters for rheological characteristics measuring of beef whole-muscle tissue by the penetration method. *Naukovi praci publ.* **2014**. Vol.1. No.46. P.160-163.

- [11] V.V. Denisenko, P.A. Lyashenko. Analysis of methods for the limit soil plasticity determining. *Nauchnye trudy KubGTU*. **2015**. No.10. P.1-17. (russian)
- [12] P.O. Boichenko. Determination of plasticity and consistency limits of clay soils using cone method. *Leningrad, Leningrad State University Publ.* **1964**. 10p. (russian)
- [13] P.O. Boichenko. To the problem of limit soil plasticity determining using the cone method. *Uchyonye zapiski LGU №209, seriya geol. nauk*. **1956**. No.7. P.40-48. (russian)
- [14] A.N. Pirogov, D.V. Donya. Engineering Rheology. *Kemerovo, Kemerovo Institute of Food Science and Technology Publ.* **2004**. 110p. (russian)
- [15] A.N. Abramov. Development of technical devices and express-method for forcemeat and sausage products quality determining according to the structural and mechanical characteristics: Extended abstract of PhD in technical sciences degree. *Moscow*. **1997**. 19p. (russian)
- [16] Site of students of chemists. [Chemical Portal]. ChemPort.ru. 2002-2013. Available at: <http://students.chemport.ru/materials/deviations.htm> (accesed 26 March 2017).
- [17] D.R. Sirazieva, T.A. Eneykina, B.F. Nurgaliev. Evaluation of solvents efficiency at the polyvinyl nitrate conversion. *Butlerov Communications*. **2016**. Vol.47. No.9s. P.21-22. DOI: 10.37952/ROI-jbc-01/16-47-9s-21
- [18] B.P. Shtarkman. Plastification of polyvinyl chloride. *Moscow, Himiya Publ.* **1975**. 248p. (russian)