Thematic Section: Physicochemical Research. **Full Paper**
Subsection: Polymer Chemistry. *Reference Object Identifier* – ROI: jbc-01/18-55-8-53
The Digital Object Identifier – DOI: 10.37952/ROI-jbc-01/18-55-8-53
Submitted on June 18, 2018.

The study of dielectric properties of one-component polyurethane modified esters of ortho-silicic acid in centimeter ultra-high frequencies

© **Vladimir Yu. Chukhlanov**,[1]*+ **Kirill V. Smirnov**,[2] and **Natalia V. Chukhlanova**[3]
[1] *Department of Chemical Technology;* [2] *Department of Biology and Ecology;*
[3] *Department of Biology and Ecology. Alexander Grigorievich and Nikolay Grigorievich Stoletovs State University of Vladimir. Gorkogo St., 87. Vladimir, 600000. Vladimir Region. Russia.*
Phone: [1)] *+7 (4922) 47-99-46;* [2)] *+7 (4922) 47-97-53;* [2)] *+7 (904)030-08-61.*
E-mail: [1)] *chukhlanov11@gmail.com;* [2)] *kirillv.smirnov@yandex.ru;* [3)] *natalyferre@yandex.ru*

*Supervising author; +Corresponding author

Keywords: polyurethane, modifier, tetraethoxysilane, tetrapropoxysilane, dielectric characteristics, super-high frequency.

Abstract

In the work presented here dielectric characteristics of a one-component polyurethanes modified esters of ortho-silicic acid including tetraethoxysilane and tetrapropoxysilane by way to improve dielectric characteristics in the centimeter super-high frequency radio. Research has shown that introduction tetraethoxysilane and tetrapropoxysilane in polyurethane oligomer lead to large rise of hydrophobic characters of developed composition. In the course of investigations made it clear that permittivity up to the hub to depend from nature of esters of ortho-silicic acid and also from it content in composition. Was determined the dependence of tangent of angle of dielectric loss on a frequency of 9/8 GHz from content of esters of ortho-silicic acid. It is found that dielectric loss far fewer in composition modified esters of ortho-silicic in comparison with unmodified monopartite polyurethanes. Maximum effect will be attained using os modifier is tetraethoxysilane by concentration from 3 to 5 percent. Apart from nature esters of ortho-silicic acid by concentration the last in composition from above 5% there is to growth of dielectric loss. In consequence of incurred researches it is found that moisture absorption of materials modified esters of ortho-silicic acid way below than unmodified materials. This lead to lowering of dielectric loss as a consequence to more high-pitched stability of electrical properties in process of exploitation of materials based on monopartite polyurethane.

References

[1] S.T. Peters. Handbook of Composites Hardcover. *Springer, 2nd edition.* **1997**. 1118p.
[2] S.N. Yakovlev. On some physical properties of structural polyurethanes. *Izvestia SPbSTI.* **2013**. No.20. P.78-80. (russian)
[3] V.Yu. Chuhlanov, O.G. Selivanov. Dielectric properties of a polymethylphenylsiloxane-modified epoxy-resin resin sealing composition in a centimeter microwave range. *Adhesives. Sealants. Technology.* **2015**. No.3. P.6-10. (russian)
[4] V.Yu. Chukhlanov, S.S. Kriushenko and N.V. Chukhlanova. Elastic Polyurethane Foams Modified by Tetraethoxysilane. *Theoretical Foundations of Chemical Engineering.* **2015**. Vol.49. No.4. P.518-522.
[5] A.Yu. Alentyev, M.Yu. Iablokova. The binder for composite polymer materials. *MSU publishing, RU.* **2010**. P.69.
[6] V.Y. Chukhlanov, O.G. Selivanov, N.V. Chukhlanova. A Sealing composition wich high dielectric characteristics and increased optical transparency on basis of epoxy diane resin modified wich phenyl ethoxysilane. *Polymer Science. Series D.* **2016**. Vol.9(3). P.281-285.
[7] M.A. Makarova, V.V. Tereshatov, V.N. Strelnikov. Segmented polyetherurethanes based on mixtures of oligoester diisocyanates and a mixed hardener. *Chemical technology.* **2011**. No.12(7). P.411-412. (russian)
[8] Electrical Properties of Polymers - by Tony Blythe and David Bloor. *Cambridge University Press.* 2 Edition (June 19, **2008**). 496p.
[9] S.J. Park, K.S. Cho and S.H. Kim. A study on dielectric characteristics of fluorinated polyimide thin film. *Journal of Colloid and Interface Science.* **2004**. Vol.272. P.384-390.