



Thematic section: Research into New Technologies.

Subsection: Polymer and Composite Technology.

Full Paper

The Reference Object Identifier – ROI-jbc-A/21-2-3-15

The Digital Object Identifier – DOI: 10.37952/ROI-jbc-A/21-2-3-15

Received 24 July 2021; Accepted 27 July 2021

Influence of domestic amorphous silicon dioxide on the properties of thermo aggressively resistant rubber

**Ivan S. Spiridoniv, Nikolay F. Ushmarin, Sergey I. Sandalov,
Evgeny N. Egorov, and Nikolay I. Kol'tsov*⁺**

*Department of Physical Chemistry and Macromolecular Compounds. Chuvash State
University of I.N. Ulyanov. Moscow Ave., 15. Cheboksary, 428015. Chuvash Republic.
Russia. Phone: +7 (8352) 45-24-68. E-mail: koltsovni@mail.ru*

*Supervising author; ⁺Corresponding author

Keywords: amorphous silicon dioxide, ZEOSIL 1165 MP, rubber mixture, vulcanizates, rheometric properties, physical-mechanical and performance indicators.

Abstract

The article investigates the effect of replacing imported silicic acid filler ZEOSIL 1165 MP (France) with domestic amorphous silicon dioxide produced by *Tulagiprokhim JSC* in a rubber mixture based on NBR-6280 hydrogenated nitrile butadiene caoutchouc. The study was carried out with the aim of developing rubber for sealing elements of packer-anchor equipment for the oil and gas industry, which withstand the effects of corrosive media at elevated temperatures. It was found that the introduction of amorphous silicon dioxide into the caoutchouc matrix does not lead to technological complications in the manufacture of the rubber mixture. Amorphous silicon dioxide was evenly rubbed into the rubber mixture and did not cause it to stick to the rolls or "furrow" on the rolls of the rolls. On the sections of the finished rubber mixture, no agglomerates of undispersed amorphous silicon dioxide were found. The viscosity values (maximum and minimum torques) of a rubber mixture containing amorphous silicon dioxide are slightly higher than for its version containing ZEOSIL 1165 MP. This indicates that version of rubber mixture with the amorphous silicon dioxide at a faster rate than the with ZEOSIL 1165 MP version. In terms of physical and mechanical properties, vulcanizates containing amorphous silicon dioxide are practically not inferior to those of vulcanizates containing ZEOSIL 1165 MP. Replacing ZEOSIL 1165 MP with amorphous silicon dioxide increases the rubber's resistance to aggressive media (air, standard SZhR-1 fluid). Thus, domestic amorphous silicon dioxide can be used instead of imported ZEOSIL 1165 MP in rubbers for the manufacture of thermo aggressively resistant sealing elements.

For citation: Ivan S. Spiridonov, Nikolay F. Ushmarin, Sergey I. Sandalov, Evgeny N. Egorov, Nikolay I. Kol'tsov. Influence of domestic amorphous silicon dioxide on the properties of thermo aggressively resistant rubber. *Butlerov Communications A*. **2021**. Vol.2. No.3. Id.15. DOI: 10.37952/ROI-jbc-A/21-2-3-15

References

- [1] G.A. Lysova. Hydrogenated nitrile butadiene rubbers. Properties. Recipe building. Application. Thematic overview. Ser. Production of rubber and asbestos products. *Moscow: TsNIITEneftkhim*. **1991**. Iss.6. 56p. (Russian)
- [2] Y.S. Kovshov, V.V. Moiseev, T.P. Zharkikh, I.P. Zornikov. Hydrogenated nitrile butadiene caoutchoucs (preparation, properties and application). *Kauchuk and Rubber*. **1990**. No.6. P.28-33. (Russian)
- [3] Yu.V. Korovina, U.I. Shcherbina, R.M. Dolinskaya, M.Ye. Leizeronok. Peroxide vulcanization of hydrogenated nitrile butadiene. *Kauchuk and Rubber*. **2007**. No.1. P.4-7. (Russian)
- [4] B.Yu. Anisimov, A.S. Dykman, N.S. Imyaninov, S.A. Polyakov. Hydrogenation of nitrile butadiene caoutchoucs. *Kauchuk and Rubber*. **2007**. No.2. P.32-38. (Russian)
- [5] I.S. Spiridonov, N.F. Ushmarin, S.I. Sandalov, and N.I. Koltsov. The effect of hydrogenated butadiene-nitrile caoutchoucs on the properties of rubber for sealing elements. *Butlerov Communications*. **2017**. Vol.50. No.4. P.45-49. DOI: 10.37952/ROI-jbc-01/17-50-4-45
- [6] Great reference book of the rubber worker. Ed. Reznichenko S.V., Morozova Yu.L. *Moscow: Limited liability company "Publishing Center" Techninform "MAI"*. **2012**. Vol.1. 744p. (Russian)
- [7] Ivan S. Spiridonov, Nikolay F. Ushmarin, Sergey I. Sandalov, Evgeny N. Egorov, Nikolay I. Kol'tsov. Influence of domestic amorphous silicon dioxide on the properties of thermo aggressively resistant rubber. *Butlerov Communications*. **2021**. Vol.67. No.8. P.38-41. DOI: 10.37952/ROI-jbc-01/21-67-8-38 (Russian)