Full Paper _____ *Thematic Section:* Research into New Technologies.
Reference Object Identifier – ROI: jbc-02/17-50-4-90 *Subsection:* Inorganic Chemistry.
Publication is available for discussion in the framework of the on-line Internet conference "*Butlerov readings*".
http://butlerov.com/readings/
Submitted on April 10, 2017.

Preparation of pure highly dispersed SiO_2 from a silica residue

© **Alfred N. Gabdullin**,[1]*+ **Evgenia A. Nikonenko**,[1] **Vyacheslav F. Markov**,[2]
Timofey M. Klyuev,[3] and **Valeria E. Tkacheva**[4]
[1] *Department of General Chemistry;* [2] *Department Physical and Colloidal Chemistry;* [3] *Department of Metallurgy of Heavy Non-Ferrous Metals. Ural Federal University of a Name of the First President of Russia B.N. Yeltsin. Mira St., 19. Ekaterinburg, 620002. Sverdlovsk Region. Russia.*
Phone: [1)] *(343) 375-45-68;* [2)] *(343) 375-93-18;* [3)] *(343) 375-93-18.*
E-mail: [1)] *gan1105@mail.ru ,* [2)] *mln@ural.ru ,* [3)] *t.m.kluev@urfu.ru*
[4] *Department of Electrochemical Production Technology. Kazan National Research Technological University. K. Marx St., 67. Kazan, 420015. Republic of Tatarstan. Russia.*
Phone: +7 (843) 231-41-20. E-mail: tka-valeriya@mail.ru.

*Supervising author; +Corresponding author

Keywords: highly disperse silica gel, magnesium silicate, liquid glass, leaching.

Abstract

At the present, a huge amount of technogenic silicon-containing waste has accumulated at the Ural. Therefore, a necessity has been arisen for their complex processing with the extract of all valuable inorganic components. In particular, due to the continuous increasing in demand for various modifications of highly disperse silica (aerosil, white carbon, silica gel) with a developed specific surface area (up to 300 m^2/g and higher), it has become necessary to develop a method for obtaining it. The starting material was the waste of the asbestos-enrichment industry – the serpentinite from the Bazhenovskoye deposit (Asbest city), containing approximately 40% of silicon dioxide in the form of silicates (lizardite, nimit, talc, etc.). After the nitric acid expositing of the crushed raw material, the silica is formed, contaminated with oxides of iron(III), chromium(III), manganese(II), magnesium, etc. The magnetic fraction, consisting of iron-chromate manganese spinels, was separated by wet magnetic separation. Purified, thus, silica was treated with a solution of sodium hydroxide. For precipitating the magnesium silicate, a magnesium nitrate solution was added to the resulting solution of sodium silicate. The precipitate from the solution containing sodium nitrate was separated by vacuum filtration. The nitric acid with pH < 1 was added to the precipitate that had been repulped in water. The resulting silicic acid was washed with distilled water until a negative reaction to the nitrate ion was observed. The precipitate was dried until a constant weight at 150 °C. To determine the chemical and phase composition, the following modern methods of analysis were used: optical spectral, X-ray phase, Raman spectroscopy and electron microscopy. The specific surface area determination of the obtained product was carried out by the BET method. The composition of the main substance there was 98.9% and the specific surface area was 436-730 m^2/g. According to the microimages analysis, the smallest particles of silicon dioxide has globule's form with a size of 70-120 nm. This product can find wide application in cosmetology, pharmacology, as a catalyst carrier, production of heat-resistant paint and varnish products, etc.

References

[1] *Patent of the Russian Federation* 2292300. IPC C 01 F 5/02. Method for processing serpentinite. I.I. Kalinichenko, A.N. Gabdullin; I.I. Kalinichenko is applicant and patent owner. №2005122242/15; declared 13.07.2005; published 27.01.**2007**. Bulletin №3. 10p.
[2] A.N. Gabdullin. Development of a method for the nitric acid processing of serpentinite Bazhenovskoye field. *Thesis of Cand. Tech. Sci. Kazan.* **2015**. 135p.
[3] A.S. Molodykh, V.V. Vaitner, E.A. Nikonenko, A.N. Gabdullin, and S.F. Katyshev. A method of producing nickel concentrate from Serov's nickel ore deposit. *Butlerov Communications*. **2016**. Vol.47. No.9. P.67-72. ROI: jbc-02/16-47-9-67
[4] *Patent of the Russian Federation* 2532871. IPC C22B 23/00. Method of processing oxidized nickel ores. I.I. Kalinichenko, V.V. Vaitner, A.S. Molodykh, V.N. Shubin; I.I. Kalinichenko is applicant and patent owner. № 2013118820/02; declared 23.04.2013; published 10.11.**2014**. Bulletin №31. 10p.
[5] V.N. Gaprindachvilli, L.K. Gogichadze. Nitric acid processing of Georgian serpentinites. *Community of the Georgian of Sciences of the Soviet Socialist Rebublics*. **1965**. №2. P.295-300.

[6] L.N. Hajarova. Hydrochloric acid processing of serpentinite. The thesis abstract of Cand. Tech. Sci. Kazan. **1999**. 16p.
[7] V.I. Korneev, V.V. Danilov. Soluble and liquid glass. St. Petersburg*: Stroyizdat, St. Petersburg*. **1996**. 216p.
[8] V.N. Gaprindachvilli, L.M. Ahvlediani. Production of liquid glass from waste acid processing of local serpentinites. *Community of the Georgian of Sciences of the Soviet Socialist Rebublics*. **1965**. E.40. №3. P.645-650.
[9] GOST 18307-78. Soot white. Technical conditions. *Moscow.* **1998**. 18p.
[10] GOST 14922-77. Aerosil. Technical conditions. *Moscow.* **1997**. 35p.