range is not found.

Incremental heat treatment and an IR-spectroscopic study of intermediate synthesis products allowed to make the conclusion that, at low temperatures the solvent is removed from the sample volume, as well as there is the decomposition of nitrates with oxygen and nitrogen dioxide evolution.

References

1. Mezencev K.V., Cherkasova T.G. // Pat. 2187081 Russian Federation: MPK51 7G01K 11/14; applicant and patentee Kuzbass State Technical University № 2001106739/28; appl. 11.03.2001; publ. 08.10.2002. Bull. № 22.– 3 p.
2. State Program of the Russian Federation "Development of the industry and increase its competitiveness in the period up to 2020" (Decree of the Russian Federation from 30.01.2013 N 91-p).
3. Bobrovnikova A.A., Cherkasova T.G., Shirokolobova A.G., Bolsunovskaya L.M. // Journal: Procedia Chemistry PII: S1876-6196(14)00135-1 DOI: 10.1016/j.proche. 2014.10.090. P.530–534.
4. Bobrovnikova A.A. Dissertation. … Cand. chem. sciences. Kemerovo: KemSU, 2013.– 120 p.
5. Bobrovnikova A.A., Isakova I.V., Tatarinova E.S. // Polzunovskiy Bulletin, 2011.– №4–1.– P.42–45.
6. Giniyatullina Y.R. Thermal study $[\{Cd(\varepsilon\text{-}C_6H_{11}NO)_5\}_2Cr(NCS)_6][Cd(\varepsilon\text{-}C_6H_{11}NO)_4Cr(NCS)_6]$ // Polzunovskiy Bulletin, 2011.– №4–1.– P.38–39.

The influence of a type of a metal component on glaze coloring

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Nanotechnology is one of the priority directions of the development of modern science. Annually revolutionary changes are occured in various areas of technologies: electronics, mechanics, medicine, chemistry using substances and materials, the dimensions of which do not exceed 100 nm. Notable examples of these materials are metals Cu, Fe and their oxides.

Use of nanoparticles of copper, most often caused by its antibacterial properties found broad application in surgery [1]. Devices for data recording of ultrahigh density are considered as interesting use of nanopowders of iron [2]. As components of ceramic paints these nanopowders still weren't tested though their properties- a big specific surface, chemical activity in certain temperature intervals, assume possibility of receiving unusual color effects. Therefore the purpose of this work is to study the influence of nanopowders of copper and iron on coloring of a glazed surface.

As samples for researches the nanopowders of copper and iron received by the EEP [3] method were taken/ In the presented micrographs, it is possible to notice big agglomeration of nanoparticles which sizes make of 50–80 nm.

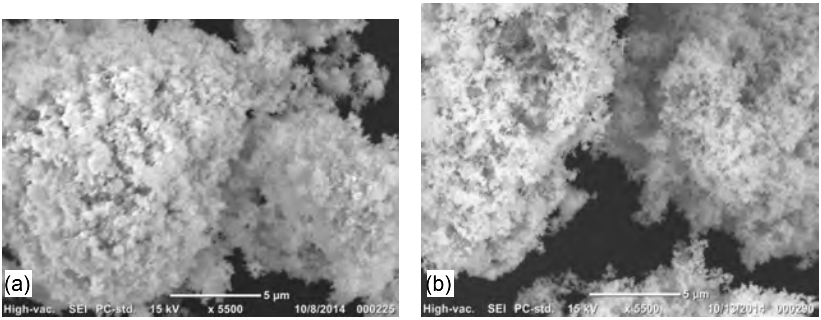

Fig. 1. *SEM-photos of nanodisperse powders a) iron; b) copper*

According to ZAF Method Standardless Quantitative Analysis an element ratio in nanopowder of iron was 98.16 % Fe and 1.84 % O; in copper nanopowders it was 91.45 % of Cu and 8.55 % of O.

Nanopowders of metals were mixed with lead-free frit in various rations and formed samples of a cylindrical form. It should be noted that, when mixing with oxidic powder metal agglomerates were easily collapsed. Firing was carried out in vacuum at 920 °C (speed of increase in temperature was of 60 °C / min, endurance 120 sec).

The received samples have various shades: emerald (copper) and claret (iron) with wavelengths from 494 to 591 nm. With increase of nanopowders concentration the intensity of the coloring increases.

References

1. Alekseeva T.P. Ranozazhivlyaushie preparaty na osnove nanostructurnuh materialov organocheskoi I neorganicheskoi prirody // Alekseeva T.P., Bogoslovskaya O.A., Rahmetova A.A. [i dr.] // Mater. IV Mezhdunar. nauch. konfer. “Phiziko-himicheskie osnovi formirovaniya I modifikacii micro- I nanostructure” PHMNN2010.– Har’kov, 2010.– P.270–273.
2. Qina D.H., Zhangc H.L., Xua C.L., et al. Magnetic domain structure in small diameter magnetic nanowire arrays // Applied Surface Science, 2005.– Vol.239.– P.279–284.

Table 1. Results of firing samples in vacuum

Cipher	The composition of the glaze	Character color	Firing temperature	λ, nm	A sample of the painted surface
C1	Fe + 1 % lead free. frit	Fuzzy (watercolor) turquoise-pink color, RGB 31.7-32.7-35.6	920	590	
C2	Fe + 2 % lead free. frit	Dark claret with blurred gray-green fields RGB-33.3-33.3-33.4	920	591	
C3	Fe + 5 % lead free. frit	Maroon with light turquoise well-rounded fragments RGB - 31.9-34.4-33.7	920	572	
C4	Cu + 1 % lead free. frit	Light turquoise with blurred dark fields RGB - 29.6-33.3-37.1	920	502	
C5	Cu + 2 % lead free. frit	Turquoise and green-black areas RGB - 28.6-33.1-38.7	920	494	
C6	Cu + 5 % lead free. frit	Emerald with dark areas (malachite) RGB-26.6-39.1-34.3	920	511	

3. Il'in A.P. Razvitie electrovzryvnoi tehnologii polucheniya nanoporoshkov v NII vysokih napryazhenii pri Tomskom politehnicheskom universitete. Izvestiya Tomskogo politehnicheskogo universiteta, 2003.– Vol.306.– №1.– P.133–139.

The modified electrode for the determination of cholesterol

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Cholesterol plays vital role in human's body; it is involved in the synthesis of vitamin D, various steroid hormones. It plays an important role in the nervous and immune systems, besides cholesterol involved in lipid metabolism. It is well-known fact that high concentrations of cholesterol in the blood can lead to cardiovascular diseases. According to statistics from the World Health Organization, 17.5 million people died from cardiovascular diseases in 2012, representing 31% of all global deaths [1]. Therefore, control of cholesterol blood levels and cholesterol food levels is of great importance.

There are several methods of cholesterol determination. The most attractive for this purpose looks electrochemistry, due to its simplicity, rapidness and low costs. Sensors give an opportunity of size minimization and real-time analysis.

Earlier was developed enzymatic sensor [2]. Usage of enzyme helped to improve the selectivity of sensor. Enzymatic sensor was based on hydrogen peroxide detection, which was generated by cholesterol oxidation on Cholesterol Oxidase. This type of determination has disadvantages, such as inaccuracy due to its indirect nature, enzymatic sensitivity to storage conditions.

Voltammetric determination depends on the nature of electrode material, and also depends on the potential at which the electrochemical reaction of analyte takes place. Cholesterol itself doesn't give a selective electrochemical response.

In the present work the working electrode surface was modified with 2,6-diacetyl-2,4,6,8-tetraazabicyclo[3.3.0.]octane-3,7-dione-diphosphonic acid, which was synthesized at Jacobs University Bremen (Bremen, Germany). On the working electrode modifier inflicted electrochemically. Application of the modifier helped to get a response from cholesterol. Cholesterol