HYDROTHERMAL SYNTHESIS AND RESEARCH OF NANOPARTICLES CRYSTALLIZED IN THE SYSTEM NiO - SiO₂ - TiO₂ - H₂O

Gatina E.N., Maslennikova T.P., Ugolkov V.L., Pivovarova L.N.

Institute of Silicate Chemistry. I.V. Grebenshchikov Russian Academy of Sciences, 199034, St. Petersburg, Nab. Makarova, 2, e-mail: gatina.en@iscras.ru

Nanotubes of nickel hydrosilicate $Ni_3Si_2O_5(OH)_4$ are promising as components of functional and composite materials such as sorbents, electrode components of lithium ion batteries, fillers of non-porous pervaporation membranes, etc. [1, 2]. Due to its electrochemical properties, titanium oxide is used in solar cells, photocatalysts, "smart" materials, coatings, etc.

The purpose of this work is to synthesize under the hydrothermal conditions nanoparticles of the composition $(Ni,Ti)_3Si_2O_5(OH)_4$ of various morphology and sizes and to study their physicochemical properties.

The phase composition of the samples was determined using XRD, the shape and size of the nanoparticles were registered using high-resolution TEM, while the elemental composition of the samples was determined. The specific surface area of the samples (BET method), thermal stability (DSC/TG) were determined, the IR spectra of hydrosilicates, the effective diameter of the agglomerates and the ζ – potential of the synthesized particles (the DSB method) were obtained.

Under hydrothermal conditions, nanoparticles of Ti-containing nickel hydrosilicate were obtained. Depending on the synthesis conditions and the amount of titanium dioxide introduced into the hydrothermal solution, nanoparticles of various morphology (nanotubes and nanosheets) were obtained. The results of the analysis of EDX spectra of the samples confirmed the presence of titanium in the structure of hydrosilicate in the amount of 5-10 mol. %

All samples with water formed suspensions of microdisperse aggregates with a ζ -potential modulus less than or equal to 30 mV. Regardless of morphology, samples had high specific surface areas. Sorption and photocatalysis with respect to methylene blue was studied on nanoparticles.

References

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2. Yang Y., Liang Q., Li J., Zhuang Y., He Y., Bai B, Wang X. Nano Research, 2011, 4 (9), 882-890.