Synthesis and properties of nanostructured titanium minerals

A. PONARYADOV

Institute of Geology Of Komi SC UB RAS, Russia, Syktyvkar, Pervomaiskaya st., 54 (alex401@rambler.ru)

The effective processing of mineral raw materials is the basic aim of geotechnologies. This could be achieved by fundamental understanding of physical and chemical properties of minerals as well as the possibilities of purposeful modification of these properties including nanosize modification. Thus, new technologies of effective mineral engineering, which include nanosize mineral substances, could be designed.

Nanosize technology applies the method of selective particle extraction or the method of particle generation. The surface reactions on nanostructured materials are in the focus of mineral engineering, because these reactions can be used to create nanodevices.

The synthesis method was essentially the one, described by Kasuga [1].

Samples were characterized by XRD (Philips PW1800) and TEM (Morgagni 268D). The IR spectra were obtained using Nicolet Impact 400. The specific surface area of the samples was calculated from low-temperature (–195°C) isotherm of N_2 adsorption, using the BET method. Before N_2 adsorption measurement all samples were pre-treated in O_2 flow at 350°C for 12 hours and then evacuated for 1 hour.

CO conversion on nano-TiO_2 was studied by IR spectroscopy using type Nicolet Impact 400 spectrometer. Self-supporting wafers of the samples were heated up to 400°C *in situ* in an IR cell for 1 hour at He, cooled to room temperature and diffusion reflectance spectra of the wafer were determined in the presence of 1.8%O_2/3.29%CO/He flow. Spectra were recorded at temperature region 50–400°C with a 50°C step.

Tubular form nanostructured titanium dioxide was prepared using soft chemical treatment with average specific surface area about 210 m^2/g. Acidic treatment does not influence neither on shape nor on chemical properties of nanotubes.

Reaction of CO oxidation on active surface sites was studied. We got more than 60 % CO conversion instead of 11 % on regular form titanium dioxide.

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Stages of the Mesozoic ore formation in the East Asia

V.A. PONOMARCHUK[1], A.A. SOROKIN[2], A.V.TRAVIN[1] AND A.P.SOROKIN[2]

[1]Institute of Geology and Mineralogy, Novosibirsk, Russia Koptuga st., 3(*correspondence: ponomar@uiggm.nsc.ru)
[2]Institute of Geology and Nature Management, Blagoveshchensk, Russia

A complex long history of formation of the East Asia was accompanied by the development of magmatic belts and ore deposits of different ages. In the recent years the authors obtained $^{40}Ar/^{39}Ar$ datings for the most important ore sites located in the territories of Mongolia, East Transbaikalia and Amur Region [1-4]. These data allow to compare geochronological boundaries of the ore formation and magmatism.

Deposit, age	Age of host rocks
Shakhtama, 159.5±1.5 Ma, 157±4 Ma	168-166 Ma
Zhireken, 163±1 Ma, 162±1 Ma	
Bugdaya, 156.9±2 Ma, 154.5±3 Ma	185±1.7, 178±1.8 Ma
Kharitonovskoye, 176.6±0.7 Ma	
Vykhodnoye124.1±1.9Ma, 122.6±1.9 Ma	127±0.8 Ma
Chubachi 122.6±1.9 Ma	138±4.8 Ma
Borgulikan, 122.6±1.9 Ma	125-127 Ma
Berezitovoye, 131.3 $\pm$ 2.3 Ma, 132.4 $\pm$ 2.2 Ma	132-128 Ma

The age of the above deposits varies in the range from 176 to 122 Ma. Moreover, the values of age ranging from 176 to 154 Ma and from 132 to 122 Ma are observed more frequently. The same ranges are typical for the manifestation of magmatism and ore formation in the eastern part of the Central Asian fold belt. Judging by the paleotectonic reconstructions these events occurred in the time of the formation of the Mongol-Okhotsk orogenic belt and marked the stages of tectonic plates' interaction at the Pacific Ocean-continent boundary

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[3] Sotnikov *et al.* (2007) *Doclady Earth Sci.* **417**, 1169-1172.
[4] Sotnikov *et al.* (2007) *Rus. Geol .and Geoph.* **48**, 177-184.