PLASMADYNAMIC SYNTHESIS OF ULTRAFINE TITANIUM OXIDES

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Over the past decade, interest has increased in the creation of nanoscale materials due to their unique properties. One of such materials is titanium dioxide due to its characteristics, which is widely used in modern fields of science and technology, in particular, medicine, pigment production, microbiology, photocatalysis, etc. [1, 2]. Moreover, titanium dioxide is used in the coatings form serving to increase the mechanical strength, specific surface area and selectivity of catalysts obtained on their basis.

There are many different ways to produce nanosized titanium dioxide [3, 4], but they have several disadvantages: high cost of raw materials, multistage. This paper shows the synthesis of ultrafine titanium dioxide by the plasmodynamic method. The method allows to obtain material in a fraction of a second (10^{-3} sec.), is one-step and does not require any preliminary preparation, besides its implementation takes place in atmospheric conditions.

Plasmadynamic synthesis is realized in system, in which the main element is a pulsed high-current coaxial magnetoplasma accelerator (CMPA) of the erosion type with metal titanium electrodes. The power supply of the CMPA is provided from a partitioned capacitive energy storage with a capacity of up to C_{ch} = 28.8 mF and a charging voltage up to U_{ch} = 5 kV.

Figure 1 shows the SEM-image of the product obtained plasma-dynamic method. This study was conducted using a scanning electron microscope Hitachi TM-3000. The synthesized powder is sufficiently agglomerated, which is characteristic for electrophysical methods of dispersion [5]. Estimating the brightness and contrast of the image, we can conclude that the product consists of materials of similar density and is characterized by a fairly wide distribution in the range from 100 nm to 3 μm. There is the presence of single spherical objects with a size of 5 microns.

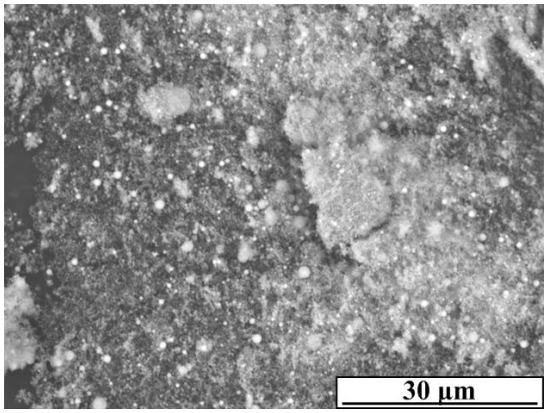

Fig. 1. The SEM-image of synthesize material

Powder of Ti-O phases were obtained by the synthesis in a supersonic plasma jet. The results of scanning electron microscopy have shown that the particles have a spherical form with their sizes varying from 100 nm to 5 microns.

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