SYNTHESIS OF NANOSTRUCTURED MATERIALS BASED ON TITANIUM DIOXIDE FOR PHOTODEGRADATION OF WATER

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To obtain porous TiO2 films, the «doctor-blading» method was used. In the production of films, titanium dioxide nanoparticles Degussa P25 (Sigma Aldrich) were used. Samples with the same thickness of a porous semiconductor film were obtained using a polymer film with a known thickness (25 μm) of the Meltonix brand (Solaronix, Switzerland). To prevent cracking of the resulting films, polyethylene glycol-sebacate was added to the main paste formulation. The polymer was added to the paste together with ethylene glycol in an amount of 25% by weight with respect to TiO2.

Nanotubes of titanium dioxide were obtained by electrochemical anodizing of titanium foil VT1-0, 99.7% (Russia). The thickness of the foil was 60 μm. Before anodizing, the titanium foil was chemically polished for 10 minutes. The base of the electrolyte was C2H6O2, with the content of NH4F and H2O. The anodic oxidation of titanium was carried out in an electrochemical cell in a potentiostatic regime at a temperature of 5-7 °C.

Nanostructures of titanium dioxide were obtained by hydrothermal synthesis. To this end, a solution containing 15 ml of deionized water (H2O), 15 ml of hydrochloric acid (HCl) (36.5-38.0%, Sigma-Aldrich) and 0.25 ml of titanium butoxide titanium butoxide (titanium butoxide) was poured into a stainless steel fluoroplastic-coated container, 97%, Sigma-Aldrich). The TiO2 nanostructures were synthesized on substrates with a conducting FTO layer (TEC-8, 8 Ω/m2). The FTO glass was purified by sonication in a mixture of deionized water, acetone and 2-propanol (1: 1: 1 volume ratio) for 30 minutes. The FTO-prepared substrates were then placed in the same vessel with a conductive side down. The stainless steel vessel is closed and placed in a convection oven. The samples were then calcined at a temperature of 500 °C for 2 hours. The values of specific surfaces of TiO2 nanostructures were measured by the BET method and amounted to 85 m2/g for a porous TiO2 film, 62 m2/g for TiO2 nanotubes and 29 m^2/g for TiO_2 nanorods.