INVESTIGATION OF THE PHOTOCATALYTIC PROPERTIES OF COBALT-DOPED TITANIUM OXIDE OBTAINED BY ANODIZING

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This paper presents a study Co-doped nanotubular titanium oxide (Co-NTO) obtained by anodizing at 30 V with various anodizing time. Cobalt doping of NTO was carried out by adding in electrolyte solution of various concentration cobalt nitrate, followed by annealing in air

Technological progress has always led to an increase in the consumption of common fuel sources at that time, which leads to a gradual decrease in the latter. Due to the reduction of their reserves and the future growth in demand, the need for the creation and use of renewable fuel sources is increasing. Since the middle of the twentieth century, hydrogen production has been a very energy-intensive technology with traditional electrolysis of water, therefore, technology for its production using renewable resources is being developed. The process of photocatalytic splitting of water has become increasingly popular over the years, since it uses water and solar energy. Due to the many factors affecting the process [1], the search for new materials is an urgent task. Most researchers choose titanium oxide as the starting material for further modification due to its characteristics: non-toxicity, resistance to photodegradation, small band gap, sufficient photoconversion and photocatalytic efficiency. To improve these characteristics, researchers widely use cationic and anionic doping. Thus, according to the review papers, cationic doping leads to an increase in the efficiency of photoconversion during photocatalytic splitting of water and a decrease in the band gap [2,3]. The presented works also present prospects for the use of titanium dioxide, as well as the ability of the material to work in the visible spectrum and increase the efficiency of the photocatalytic process.

At the moment, it is believed that the efficiency of photoconversion can be significantly increased by doping with cobalt, and the peak of conversion from ultraviolet to the visible part of the spectrum also shifts [4]. TiO_2 doping can be carried out by various methods: hydrothermal, decoration and immersion.

The production of nanotube coatings from titanium oxide (NTO) in an organic electrolyte with fluorinated ions was considered in [5]. The doped coatings were grown according to the previously mentioned method, at a voltage of 30 V and a different anodizing time from 40 to 120 minutes, as well as with the addition of different concentrations of $Co(NO_3)_2$ to the electrolyte. Then they were treated at a temperature of 400 °C for 1 hour with a heating-cooling rate of 1 °C/min in an air atmosphere.

The obtained samples were examined using a scanning electron microscope (SEM), X-ray spectrometry and incident photon-to-electron (IPCE) spectrometry. Figure 1 shows the IPCE results of the obtained Co-NTO.

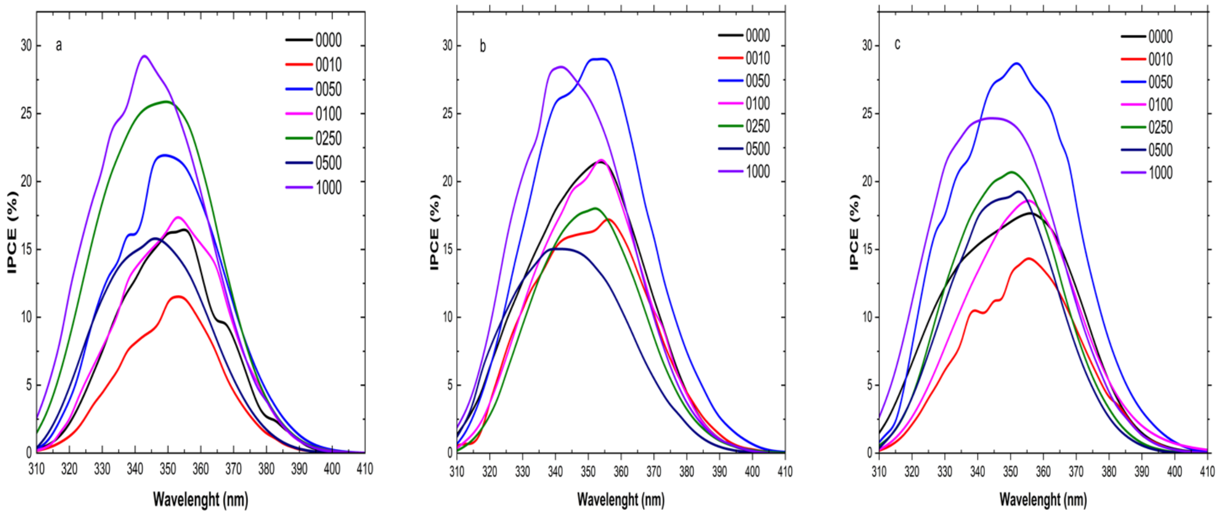

Рис. 1. Results of IPCE Co-doped TiO[под]2 obtained by anodizing in organic electrolyte 30V a) 40 b)60 c)120 min with concentration of Co(NO[под]3)[под]2 (0-1000mM)

The study of the effectiveness of IPCE samples depending on the dopant concentration shows that the samples 40:1000; 60:0050, 1000; 120: 0050, 1000 they have the best efficiency.

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