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PRODUCTION, STRUCTURE AND PHOTOCATALYTIC PROPERTIES OF NANOTUBULAR TIO_2

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Abstract

Photocatalytic processes are among the most efficient treatment methods of waters polluted with recalcitrant organic substances. Nanotubular TiO_2 arrays with photocatalytic properties were obtained in the process of titanium anodic oxidation in the fluoride-containing electrolyte. Under the proposed conditions of electrolysis, a coherent system of tightly adjoining nanotubes was formed with the internal diameter of 60-80 nm and walls thickness up to 60-65 nm, the tubes height being dependent on process duration, reaching over 200 mkm. It was shown that it is the specifics of the formation, destruction and renewal of the barrier layer that determines the tubular structure of anodic titanium coatings formed. Various anodizing regimes were proposed to obtain the different TiO_2-containing structures – nanotubular and fine dispersed ones. Subsequent annealing of nanotubular titanium dioxide provokes the series of structural-phase transformations, modifying its photocatalytic properties. The nanotubular systems thus obtained were tested as photo-catalysts, both as compact coatings and as fine dispersed particles, in the especially developed integrated photoreactor. It was shown that using the proposed equipment and photocatalysts produced, the efficient photodestruction of the persistent organic pollutants such as benozhiazol (BT) can be reached due to the combination of chemical and physical effects.

Keywords: active radicals, nanotubes, photocatalytic process, titanium dioxide

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