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SYNTHESIS AND PHOTOCATALYTIC ACTIVITY OF COATINGS TI/TINOM·ZrO_2 FOR PURIFICATION OF INDUSTRIAL WASTE WATER FROM ORGANIC AROMATIC CONTAMINANTS

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It is shown that photocatalytic processes on semiconductor materials are promising for use in technologies for purifying industrial waste water and air from toxic organic impurities for solving important environmental problems.

Studies on the formation of coatings with titanium(IV) oxide supplemented with zirconium(IV) oxide have been carried out. The Ti/TiO_2 coverings were formed by anodic oxidation of technical alloys of VT1-0 grade titanium and E-125 zirconium from aqueous electrolyte solutions based on 0.5 M sulfuric acid and 1 M potassium pyrophosphate. To obtain mixed oxide coatings of the Ti/Ti_nO_m·ZrO_2 composition, zirconium(IV) oxide of a given concentration was additionally introduced into the electrolyte solutions. The photocatalytic activity of the obtained systems was assessed by the phenol oxidation reaction.

It is shown that, as a result of anodic oxidation of the VT1-0 alloy in sulfuric and pyrophosphate electrolytes, it is possible to obtain mixed oxide systems of the Ti/Ti_nO_m·ZrO_2 composition with a porous and microcrystalline surface structure and a zirconium content of up to 2 % by weight. It was found that an increase in the pH of the electrolyte leads to a significant decrease in the content of zirconium in the coatings. It is shown that the contact masses Ti/TiO_2, Zr/ZrO_2, Ti/Ti_nO_m·ZrO_2 are photocatalytically active in the oxidation of phenol under the action of UV radiation, and the mixed Ti/Ti_nO_m·ZrO_2 coatings formed from a sulfuric acid electrolyte exhibit a higher catalytic activity with respect to compared with both individual oxides and Ti/Ti_nO_m·ZrO_2 deposited from pyrophosphate electrolytes. The results obtained indicate the possibility of creating photocatalytic converters using mixed oxide systems formed on metal supports for purifying wastewater from organic aromatic compounds.

Keywords: coatings, titanium(IV) oxide, electrochemical anodizing, photocatalytic activity, zirconium(IV) oxide, organic aromatic pollutants, phenol, waste water, purification.

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