THE ELECTROCHEMICAL FORMATION OF SnO_2-Sb_xO_y COATINGS

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To increase the electrical conductivity of tin dioxide, which is the *n*-type semiconductor, the doping by antimony oxide is used. The SnO_2 - Sb_xO_y coating is used as a working coating of the sensors, electrodes in the batteries, fuel cells, supercapacitors, sun protecting films of high reflectance. In order to manufacture the unsoluble anodes, used in the electrochemical processes of organic substances oxidation, the doped tin dioxide coating is formed on the titanium substrate. Such coating has high overpotential of oxygen evolution. The active layer of doped tin dioxide is usually deposited on the titanium by pyrolysis process, sputtering, sol-gel method, chemical vaporization, "paint brush" or by thermal oxidation [1].

A better adhesion of the coating to the titanium substrate is achieved when the process of the electrode manufacturing includes the stage of the electrochemical deposition of the tin-antimony alloy layer as a thick working layer or the thin underlayer [2].

The final stage of nearly all known methods of forming tin dioxide coating is heat treatment. The result of the heat treatment is the formation of the titanium dioxide film on the surface of the titanium. During the operation of the electrode the electrical resistance increases and the service term in different environments is decreased.

In order to increase the service term of the electrode with the doped tin dioxide coating and for resource saving during the manufacturing of such electrode, the coating is formed in two stages. The first stage is the electrodeposition of the tin-antimony alloy on the cathode. The second stage is the electrochemical oxidation of the alloy on the anode. The adhesion of the oxide film to the titanium substrate is high due to significant cathodic polarization during alloy deposition. Oxidation of the obtained coatings is suggested to carry out in the electrolyte containing tin ions in different oxidation states.

It is shown that the highest catalytic activity in the test reaction of the phenol oxidation and higher resistance during the accelerated testing is observed for multylayer SnO_2 - Sb_xO_y coatings. These coatings were obtained by oxidation of the multilayer films consisting of the nanoscale layers of tin-antimony alloy of different composition.

Referanses:

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