

ELECTROCHEMICAL PROPERTIES OF Ni-Pd ELECTROPLATINGS AT EVOLUTION OF HYDROGEN AND OXYGEN IN ACID AND ALKALINE ENVIRONMENTS**Drozdovich V. B., Kubrak P.B., Zharski I. M.***Belarusian State Technological University, Belarus, Minsk
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There are actually important based on the technical-economical analysis questions of creation of highly effective bipolar electrodes, electrode-diaphragm blocks with zero-gap for alkaline electrolyzes, and from there are questions of replacement of expensive oxygen Pt-Ir electrode and the cathode with the platinum electrocatalyst for membrane electrolyzes.

The work purpose was plating and investigation of electrocatalytical and hydrogen sorption properties of galvanic Ni-Pd coverings on various substrates. The Ni-Pd coverings were obtained from ammonium-chloride and ammonium-sulfuric-chloride electrolytes.

The charging curves were obtained for these coverings on various substrates. The initial section of charging curves corresponding to β -phase of palladium hydride was practically linear. The dim peak desorption of hydrogen was observed at potential to be more positive 0.2 V and the area of peak was much more for porous substrates than that area to be for smooth nickel. The smooth of peaks, most possibly, was caused by the alloy formation of nickel with palladium and the saturation of Ni-Pd covering by hydrogen together with possible formation of new phases. The horizontal platform of charging curves for the Ni-Pd covering on smooth and porous nickel was observed at range of potentials from 0.8 to 1.35 V as well as the platform for palladium electrodes that corresponded to so-called β - α transition, i.e. transformation of the rich hydrogen phase (β -phase) in phase impoverished by hydrogen (α -phase). However, the horizontal section in charging curve for the Ni-Pd alloy covering on smooth and porous nickel was displaced in the area of positive potentials on 0.7 V, and the horizontal section for this alloy on the porous titan was transposed more than on 1 V in comparison with the horizontal section in charging curve for palladium covering. Maximal limiting currents were reached at rate of potential to be more 0.05 V/s.

It was established, that the Ni-Pd coverings plated on porous titanic substrates and thermoprocessed in air at temperature 500 °C possessed raised electrocatalytical activity in evolution of hydrogen, oxygen, direct anode conversion of ethanol in alkaline media, corrosion resistance in nitrate, fluoride, chloride media at temperature 80 °C. Using the XRD method, scanning electronic microscopy with chemical energydisperse analysis, chemical etching it was established, that uniform volume distribution of Ni-Pd covering in porous structure of titanic substrate had been result of thermodiffusion processes.

The palladium and nickel has close electronic structure and the different sizes of atoms. Taking into account that energy of activation to increase at accretion of lattice sizes, it is possible to expect increase of exchange current with magnifying of the maintenance of nickel in alloy.

Thus, the analogy in behavior of adsorbed and dissolved in Ni-Pd covering hydrogen as well as the hydrogen in palladium coverings and the hydrogen adsorbed on platinum surface was observed that testified to similarity high electrocatalytical properties of these materials in evolution reaction of hydrogen.