Interaction of cathodically evolved hydrogen with electroless Ni-P electrode

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Transition metal phosphides have received considerable attention as electrocatalysts [1]. Among them, nickel phosphides have been widely explored for electrocatalytic HER [2,3]. The improved electrocatalytic properties of Ni–P alloy coatings are explained by the influence of different factors. One of them is the ability of amorphous Ni-P electrode to adsorb and absorb significant amounts of hydrogen, which changes the electron structure of the basic metal [4].

Our previous works are devoted on the electrocatalytic properties of electroless Ni-P coatings on a steel substrate in terms of hydrogen reaction in alkaline or acidic media in a wide range of phosphorus content of the coatings [5,6]. The present research is focused on evaluation of the interaction of cathodically released hydrogen with the electroless Ni-P alloy coating. It is well known that the phosphorus compounds play the role of promoters for the penetration of hydrogen during the cathodic polarization of steel, nickel, etc. [7]. The electroless deposition of Ni-P itself is accompanied by the evolution of hydrogen, part of which is incorporated into the coating. By electrochemical methods, Devanathan-Stachurski permeation cell, differential thermal analysis, X-ray diffraction and X-ray microanalysis, data are obtained on the process of interaction of hydrogen with Ni-P coating when used as an electrode for HER in alkaline or acidic media - diffusion of hydrogen in the alloy coating, phase transformation, composition and morphology of the alloy coating before and after electrochemical treatment.

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References
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