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## Thermochemical approach to corrosion of *Ni-P* alloys in aqueous solutions

Hirnyj S. I., Ph.D., Scientist

Karpenko Physical-Mechanical Institute  
(5 Naukova Street, Lviv, 79060, Ukraine)

An increasing application of *Ni-P* alloys, known for their glass-forming abilities and good mechanical properties including wear resistance, is bringing the issue of corrosion resistance of these materials in different environments. Chemical reactivity of the alloy is driven by its thermodynamic stability in a particular corrosive media under possible influence of galvanic or microgalvanic elements. This is why electrolytic corrosion studies should cover both chemical and electrochemical interactions in broad ranges of *pH*, surface electrochemical potentials and activities of species. In such multi-parametric problem, thermodynamic analysis could be very beneficial in disclosing the possible corrosion paths. This work is concerned with chemical reactivity of *Ni-P* alloys in aqueous electrolytes using a thermochemical approach.

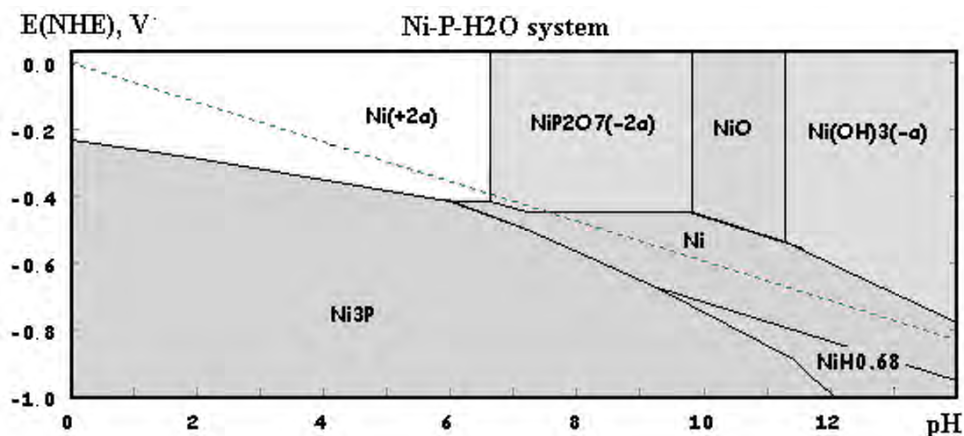


Fig. 1 A fragment of calculated potential-*pH* diagram for the system *Ni-P-H<sub>2</sub>O* at 298 K

Potential-*pH* diagrams have been calculated and analyzed for the *Ni-P-H<sub>2</sub>O* system (a fragment is presented at Fig. 1) according to the procedure established by Pourbaix [1]. The basic hydrolysis and redox equilibria have been analyzed regarding electro- and electroless (autocatalytic) deposition of *Ni-P* alloys and their corrosion behavior. The formation of *Ni<sub>3</sub>P* is well established in the broad range of *pH* (except for the strong caustic solutions) and cathodic potentials. The passivity of *Ni-P* alloys in acidified media is not reflected by the Pourbaix diagrams. Only in alkaline solutions the passivity of these alloys within the domain of water stability is granted by nickel (II) oxide, according to the calculations, though at lower potentials in the vicinity of the HER equilibrium, *NiO* is reduced to metallic *Ni*, which turns into  $\beta$ -*NiH<sub>x</sub>* at higher *pH* values (practically greater than *pH*10), with further shift to more cathodic potentials. No *P*-containing species suppose to take part in passivation of *Ni-P* alloys, according to the Pourbaix diagrams.

1. M. Pourbaix. Atlas of electrochemical equilibria in aqueous solutions. Oxford University Press, 1966. – 644 p.