INFLUENCE OF RHODIUM ADDITIVE ON HYDROGEN ELECTROSORPTION IN PALLADIUM-RICH PD-RH ALLOYS

Urszula Koss, Mariusz Łukaszewski, Andrzej Czerwiński

University Of Warsaw, Faculty of Chemistry
Pasteura 1, 02-093 Warsaw, Poland, ukoss@chem.uw.edu.pl

Nowadays, when the supplies of natural resources are almost depleted, it seems necessary to search for new sources of energy. Thanks to its numerous advantages (such as high value of energy, availability, non-toxicity) hydrogen can be a widely used source of energy. However, due to the danger of explosion connected with hydrogen storage in gas or liquid phase, other forms of hydrogen storage are still investigated. Metal-hydrogen systems application seems to be one of the most promising solution. Pd and its alloys with noble metals are model systems widely studied to understand the process of hydrogen absorption in solid materials.

Hydrogen electrosorption into Pd-rich (> 80% at. Pd in bulk) Pd-Rh alloys has been studied in acidic solutions (0.5 M H_2SO_4) using cyclic voltammetry and chronoamperometry. The influence of temperature (in the range between 283 K and 328 K), electrode potential and alloy bulk composition on hydrogen electrosorption properties of Pd-Rh alloys is presented.

It was confirmed that the addition of small amounts of Rh (below 10% at.) to Pd-Rh alloys increases the maximum hydrogen solubility in the β phase region (maximum in Fig. 1).

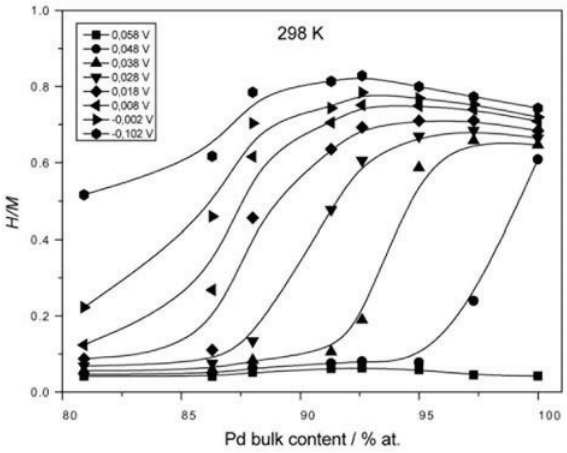

Fig. 1. The influence of alloy bulk composition on the amount of hydrogen electrosorbed at various potentials.

It has been found that the addition of Rh to Pd-Rh alloys decreases the potential of the oxidation peak of absorbed hydrogen and decreases the potential of the α→β phase transition. Increasing temperature decreases the potential of the oxidation peak of absorbed hydrogen, the maximum hydrogen solubility and the potential of the α→β phase transition. The two-phase region in the Pd-Rh-H system narrows with temperature increase and Pd content decrease.