ELECTROCATALYTIC PROPERTIES OF THIN NI-ZN ALLOY

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ABSTRACT

Preparation of Ni-Zn alloys by electrodeposition and their electrochemical properties is described in this contribution. Zn component was extracted from the layers by HCl solutions for their activation. Electrocatalytic properties of the layers were estimated by the current – voltage curves in KOH solution. The best layer was selected on these bases.

1. INTRODUCTION

This work was created for better understanding to galvanic deposition of metals and electro catalytic properties of these depositions. This knowledge will by used to design best electrodes for electrolytic cell for hydrogen production.

2. EXPERIMENTAL

Ni-Zn alloys were electrodeposited, onto brass electrodes and nickel electrodes, using a commercial alkaline electrolyte (SLOTOLOY ZN 80 - produced by Dr.-Ing. Max Schlötter GmbH & Co.KG, SRN) of composition strictly identical to the industrial electrolyte, at 32 °C temperature. The chemical composition of the electrolyte was given in Table 1.

Compound	Concentration
NaOH	120 g l^{-1}
SLOTOLOY ZN 80	115 ml l^{-1}
Zinc	8 g l^{-1}

Table 1: Composition of alkaline plating bath

The working electrode area varied with the method of surface characterization. The plating cell was provided with an air bubbling. Parameters of galvanic deposition are given in table 2. The samples were after deposition immersed in hydrochloric acid (5% HCl, for 30s) for their activation consisting in dissolution of zinc from them.

Surface material	Time [min]	T [°C]	I [A/dm^2]
Brass	9	32	2,5
Brass	6	32	4
Nickel	9	32	2,5
Nickel	6	32	4

Table 2: Parameters of galvanic deposition

Then samples were tested with program GPES on device AUTOLAB (Eco Chemie). The supporting electrolyte was 1M KOH in distilled water. Measuring apparatus has three compartements for reference, counter and work electrodes. The samples were connected as work electrode, Saturated Calomel Electrode was connected as reference electrode and platinum electrode was connected as counter electrode. The device is shown in Fig. 1. Samples were tested in described way by means of cyclic voltammetry.

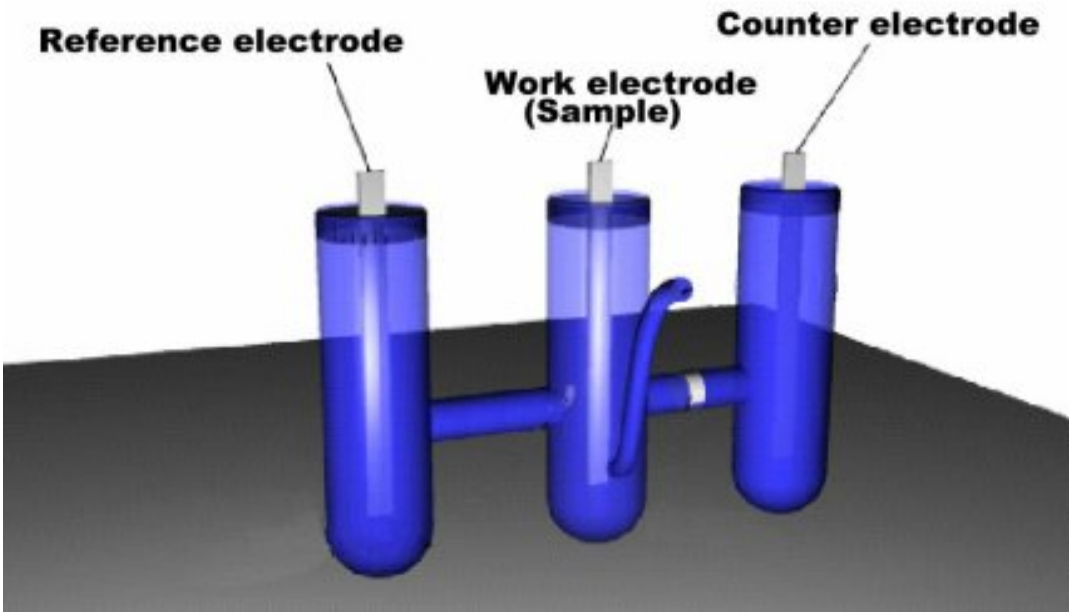

Fig. 1: Connection diagram

3. RESULTS AND DISCUSSION

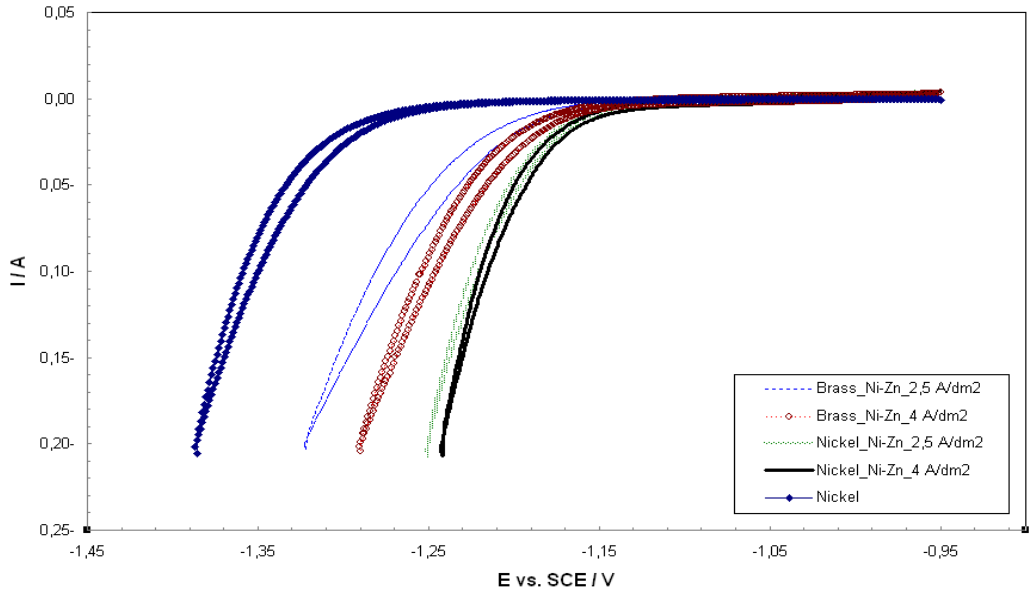

Fig. 2: Voltage-current curves

How we can see in graph of all samples, the sample Nickel-ZnNi_4 is the most acceptable because the voltage of hydrogen evolution is the highest of them and the energy loss in the electrolytic cell would be lowest. The samples Nickel-Ni-Zn_2,5 and Nickel-Ni-Zn_4 have very similar curves and difference potential is about 0,01V. It is because of nickel surface. The samples with brass surface were bad. Difference potential between Nickel surface a Nickel_Ni-Zn_4 is about 0,14V.

4. CONCLUSION

Purpose of this work was to create galvanic deposits of metals with electro catalytic properties. This galvanic deposition will be used to create the best electrodes for electrolysis cell for hydrogen production. It is clear, that we can create suitable surface for electrodes. Hence, the reduction of energy requirement by their use is possible. Further, the starting preposition of activation by addition of zinc was proved successfully.

ACKNOWLEDGEMENTS

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