Modification of electrodeposited cobalt alloys for hydrogen evolution by superimposed external magnetic field

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The electrocatalytic activity towards the hydrogen evolution reaction is most likely related to the active surface area of the coatings (accounting for the porosity of the coatings and the presence of some nodules at the coatings surface). It is known that magnetic field (B) influence the electrodeposition process of metals. The different magnetic force generates an additional convection, which can affect the morphology of the deposit.

The magnetic forces generated by the passage of the current and the superimposed magnetic field create additional convection which affect the morphology of the deposits. Thus, by using a magnetic field may result in obtaining alloys having better catalytic properties for hydrogen evolution (fuel cell) or new materials with the physical properties allowing to use them for new applications. In theory, the size of grain of the deposits is a function of speeds of nucleation and growth of the nucleus; the more numerous nucleuses are, the lower size of grain is. A magnetic field applied parallel to the surface of the electrode generates a convection (magnetohydrodynamic effect MHD) of the electrolyte; it results in a laminar flow on the surface of the electrode which reduces the diffusion layer and increases the concentrations gradients. This results in change of the size of the grains and thus can also influence the texture and formation of various phases of the deposits. These various effects can be caused at the same time by the above mentioned convection but also by the magnetic properties, when the field is superimposed the growth in the direction of easier magnetization appears.

The present work aims to obtain Co alloys by electrodeposition having high cathodic activity for hydrogen evolution in 8 M NaOH at 90°C. External magnetic field generated by permanent magnet was used in order to modify composition and morphology of alloy. The changes in morphology and composition of alloys was searched in order to determine influence of magnetic field on alloys` electrodeposition.