COBALT-VANADIUM COATING CORROSION BEHAVIOR IN AN ALKALINE ENVIRONMENT

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Electrode materials for the electrochemical production of hydrogen must correspond a number of properties such as catalytic activity, corrosion resistance, sufficient hardness, have a long service life, which can reduce the cost of produced hydrogen. Co-V alloys have unique properties, such as high mechanical strength, thermal stability and the ability to form passive oxide films that effectively protect the material base from corrosion.

Co-V alloy coatings on steel samples from citrate electrolyte were deposited by galvanostatic mode. Corrosion studies were carried out in solution 2M NaOH, which is used for the industrial electrochemical production of hydrogen. The obtained coatings corrosion resistance was evaluated by the polarization dependence analysis, which includes the cathodic and anodic voltammograms recording in the corrosion potential zone. Corrosion current density (j_{cor}) was determined by the extrapolation of partial anodic and cathodic dependencies linear sections in Tafel coordinates lg$j$-ΔE.

The results of the Co-V alloys corrosion-electrochemical behavior studies demonstrate that vanadium content increase leads to better coating corrosion resistance compared to pure cobalt material (Fig. 1). Increase of vanadium content in the alloy shifts corrosion potential to the negative side, decreases the corrosion current which leads to a decrease in the corrosion rate.

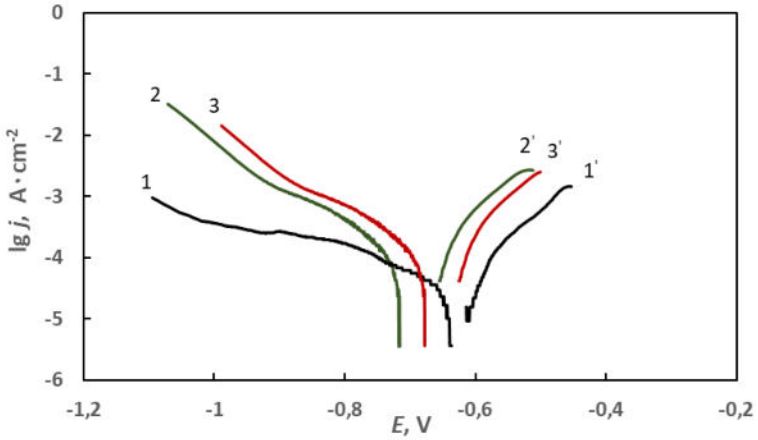

Fig. 1. Cathodic (1, 2, 3) and anodic (1', 2', 3') polarization dependences for steel electrodes with coating :1, 1' – Co; 2, 2' – Co-$V_{1.5}$; 3, 3' – Co-$V_{0,7}$ in an alkaline environment.

The corrosion potential shifts to the negative side due to the cathodic reaction inhibition in an alkaline environment as a consequence of the alloys surface passivation by low-soluble cobalt hydroxides limiting the depolarizer's access to the electrode surface.

Albeit vanadium is a relatively expensive element, its addition in small quantities provides a significant improvement of the alloy protective properties.