

Composition and morphology of Fe-Co-Mo electrolytic alloys

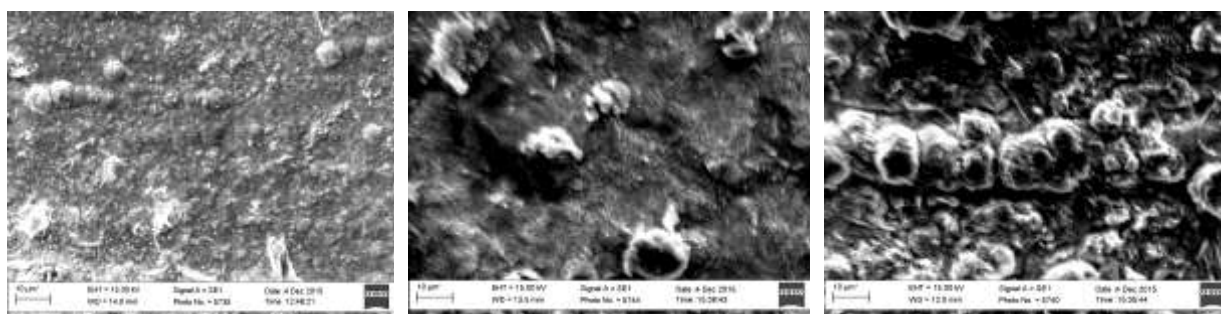
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Thin layers Fe-Co-Mo are promising high magnetic and catalytic properties. Paper deals with the influence of electrolysis parameters on the composition and morphology of above systems.

The coatings Fe-Co-Mo were deposited in direct current (dc) mode on the substrate made of copper from the citrate bath at a concentration ratio of electrolyte components (Fe^{3+}): (Co^{2+}):(MoO_4^{2-}) as 2: 2: 1 containing 0.08–0.09 mol/dm³ MoO_4^{2-} . The surface treatment includes polishing, degreasing, etching and thoroughly rinsing. Electrolysis was carried out at a temperature 20–25°C.

It was obtained uniform matt coating with iron content 53 at. %, cobalt 32 at.% and molybdenum 15 at.% at cathodic current density i_c 2–3 A/dm². Molybdenum content in the alloy is increased up to 25 at.% with a simultaneous decrease of Fe to 47 at.% with an unchanged cobalt content at the level of 30–32 at.% at higher current densities up to 5–6 A/dm². This demonstrates the competitive reduction of the iron and molybdenum in cathodic process. Such a change in the quantitative composition of the coatings is reflected in the surface morphology which varies from a crystal (Fig. *a*) to fine-globular (Fig. *c*). At the same time, one can see decreasing current efficiency from 70 to 60% with the rise of current density associated with an increase in the hydrogen evolution reaction contribution in the total cathodic process.



The coatings composition, at%:

Fe – 53; Co – 32; Mo – 15
a

Fe – 48; Co – 30; Mo – 22
b

Fe – 47; Co – 28; Mo – 25
c

Fig. The morphology of the coating alloy Fe-Co-Mo at a cathodic current density i_c , A/dm²: 3 (*a*), 4 (*b*), 5 (*c*). Magnification $\times 1000$

It was shown that the variation of electrolysis parameters allows obtaining coatings with an extended range of content alloying components, which allows controlling the composition and properties of the coatings.