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RSE-SEE

South-East Europe

Second Regional Symposium on Electrochemistry

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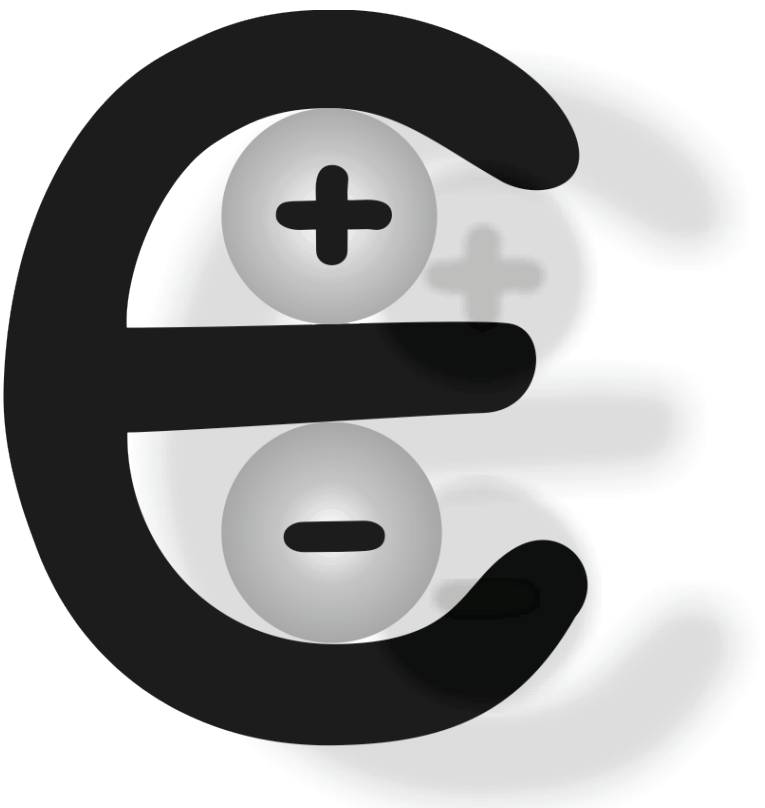

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SDE-P-19

Effect of parameters of pulsating current (PC) regimes on morphology of electrodeposited copper in hydrogen co-deposition range

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The most often employed electrolytes for the electrodeposition of copper are those based on aqueous solutions of sulfuric acid (H_2SO_4) and cupric sulfate ($CuSO_4$). There is an ionic equilibrium of a lot of species in the $CuSO_4$-H_2SO_4-H_2O system. Electrodeposition processes at high current densities and overpotentials are very suitable for experimental verification of this ionic equilibrium, because there is parallelism between copper electrodeposition and hydrogen evolution reaction at high current densities and overpotentials. In this study, it is shown that effects attained by the choice of appropriate parameters of square-waves pulsating current (PC) on morphology of electrodeposited copper were equivalent to those obtained by electrodepositions at the constant overpotential in the hydrogen co-deposition range from six solutions of different concentrations of $CuSO_4$ and H_2SO_4. In this way, it was clear that it is possible to simulate the ionic equilibrium of the species in the $CuSO_4$-H_2SO_4-H_2O system using the only one electroplating solution if the appropriate parameters of PC regimes are used.

SDE-P-20

Electrodeposition of nickel composite coatings with Al_2O_3 and TiO_2

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Composite coatings containing either alumina or titania particles in a nickel matrix were prepared by means of electrochemical deposition from nickel plating baths in which fine submicron size particles of γ-alumina (Buehler USA) or titania (Cinkarna Celje Slovenia) were kept suspended by mechanical stirring. Conventional nickel sulphate plating bath was used in all electroplating experiments. Coatings were prepared under constant stirring rate and temperature but at different current densities and different concentration of particles suspended in the bath. Deposition time was adjusted accordingly to the operating current to obtain an approximately constant coating thickness. Copper plates were used as a substrate for nickel composites coatings. Particles content in the composites was determined by dissolving of samples of coatings and analyzing the obtained solutions by AAS-ICP method. Optical and SEM microscopy were used in studying the surface morphology of coatings.
The structure and mechanical properties of the composites were investigated as a function of applied current density and particles content in the coatings. The surface morphology and microstructure was significantly altered due to the particles embedded in the coatings. Metallographic analysis has shown a uniform particles distribution across the coating. Particles content significantly affects the microhardness of composites as well as the wear resistance. Coatings prepared from a particles-free bath served for comparison with composite ones.