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Electrodeposition of iron powder particles of different characteristics

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Iron deposits obtained at high current densities and overpotentials are very important from a technological point of view. It has been stated that the open and porous structures of copper or iron deposits obtained at high current densities were ideally suited for use as electrodes in electrochemical devices such as fuel cells, batteries and chemical sensors, while the extremely high surface area is relevant for evaluating some electrochemical reactions. Mainly two types of electrolytes were investigated and these were based on sulfate and chloride electrolytes. With increasing duration of electrolysis, dendrites merge, which is unacceptable for the case of further application. These deposits must be grinded in order to obtain powders. However, in the range of lower acidity the deposits become powdery and, in some cases, may be spongy and sticky. Generally, up to now research indicates that electrodeposition of Fe powders have two steps, deposition of fragile film and grinding. It must be emphasized that we tried and succeeded to obtain Fe powders without grinding process. The aim of this work was to investigate electrodeposition processes of Fe powders from sulfate and chloride electrolytes and morphologies of powder as a function of type of electrolyte and current density.

Electrodeposition of Ni/SiC and Co/SiC composites in the presence of Cs⁺ ions

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Most of the papers on metal matrix composites were focused on nickel matrix materials, while studies on cobalt matrix composites are relatively limited. It is known that the amount of embedded phase in the composites depends on the metal-particle combination and is governed mainly by powder concentration in the plating bath, current density and agitation rate. However, enhanced incorporation of the particles can be achieved also by addition of some additives to the plating bath. The aim of this work was to find the importance of Cs⁺ ions as a potential promoter of SiC codeposition with nickel or cobalt. Composites were electrodeposited from Watt's-type baths with various concentrations of Cs⁺ ions. It was found that despite similarity of properties of both metals their behavior was different. SiC incorporation with cobalt was only little dependent on cesium concentration in the bath, while promoting effect of cesium (in some concentration range) was found during Ni/SiC codeposition. Particles suspended in the bath slightly affected the polarization curves during reduction of metallic ions, whereas cesium ions can inhibit the cathodic process. Linear sweep voltammetry showed better transport of nickel and cobalt ions to the cathode surface in the presence of SiC and Cs⁺. Some adsorption phenomena on SiC powder were also studied. The presence of Cs⁺ in the solution enhanced adsorption of ions on SiC, but higher values for Co²⁺ than Ni²⁺ ions were observed. Preferential cesium adsorption occurred simultaneously in both systems. The last phenomena lead to cesium incorporation into the composite coatings.