THE CONDITIONS AND PARAMETERS INFLUENCE ON THE DEPOSITION MECHANISM

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ABSTRACT: Development of science and technology led on design of new composites based on traditional materials, discovery of new materials for the matrix and reinforcement, form development and manner of distribution of reinforcement, their adaptation to technological requirements imposed on the material. Because of quality-price-performance ratio and outstanding qualities they possess, composites allow multifunctional pieces, shape simplification mechanisms and improve performance. Layers of composite materials made by deposits fall into the category of advanced materials. Metal matrix composites studied in this paper have the particularity that the matrix is a electrodeposited metal or alloy.

KEY WORDS: composites, metallic matrix, coatings.

1. INTRODUCTION

Electrolytic deposition is achieved by electrolysis of aqueous solutions of simple or complex salts containing metal ions to be deposited. Piece is coated cathode and anode current source can be an unassailable metal inert (insoluble anode in electrolysis) or metal coating, which dissolves as ions in solution (soluble anode in electrolysis), moving and discharged (submitted) at the cathode, forming protective metal layer. Electrolyte (electrolytic bath) includes: a metal compound which decomposes and is deposited in well-defined concentration, buffering agents to maintain constant acidity (pH) solution, inorganic substances to increase the electrical conductivity and special additives to improve porosity, adhesion, gloss coating or structure.

2. PHOSPHORUS CONCENTRATION EFFECT IN ELECTROLYTES

To achieve great quality electrolytic deposition is necessary that certain conditions. There are such parameters influencing the deposition such as phosphorus concentration, pH, current density, temperature.
Phosphorus is incorporated into the Ni-P layer depending on the concentration of phosphoric acid in the electrolytic solution, namely, the percentage of phosphorus in Ni-P alloy increases with increasing the amount of phosphor precursor in the electrolyte

(figure 1) and cathode efficiency decreases with increasing concentration of phosphoric acid. Percentage of incorporation of the particles is given by the particle volume fraction determined by chemical analysis [1]. Its value was obtained by dividing the total volume of particles with one particle volume and is well determined if the particles have a definite shape and size distribution and has a well-dispersed and within strict limits.

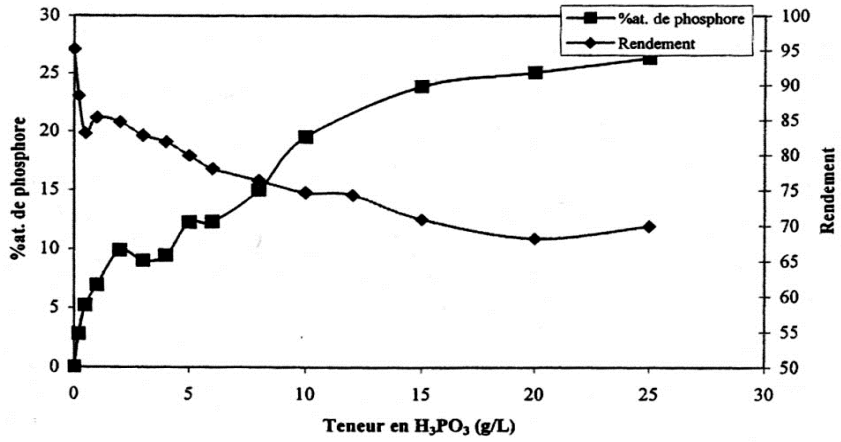

Figure 1. Influence of phosphorous acid in the electrolyte concentration on the phosphorus content in the layer and on the cathode performance [5]

3. EFFECT OF pH

This parameter has an important role in the deposition electrolyte. By its variation can increase the speed of the electrodeposition; has influence on the adhesion layer deposited on transition metals; influences the phosphorus content in Ni-P deposit. Other studies [2], [4] show a decrease in phosphorus content with increasing pH.

(Figure 4). The pH value can be between 0.5 and 2, but to obtain a higher layer properties optimal pH value should be 2 [4].

If the pH is too basic compared with the optimal value the deposit is blackish. This color corresponds to the formation of nickel hydroxide, $Ni(OH)_2$. If the pH is below optimum value the yield decreased.

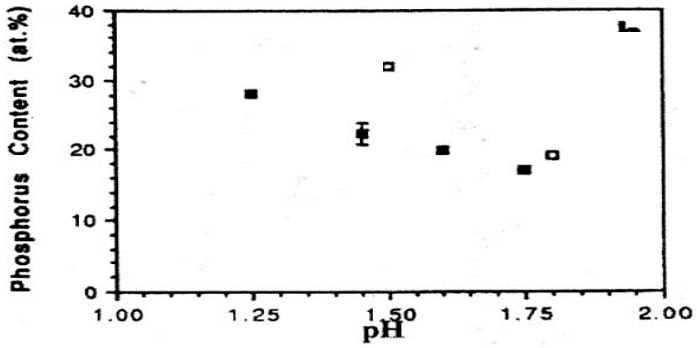

Figure 2. The influence of pH on the phosphorus content of the deposit by Harris [2]

4. THE CURRENT DENSITY AND TEMPERATURE EFFECT

Current density is an important parameter for the deposit composition and performance, this is why phosphorus reduction and efficiency increase with increasing current density [5] (figure 3).
Temperature is also a parameter that it plays an important role on the yield and phosphorus deposit in the layer, thus increasing the temperature causes a decrease in phosphorus incorporation in the layer [5].

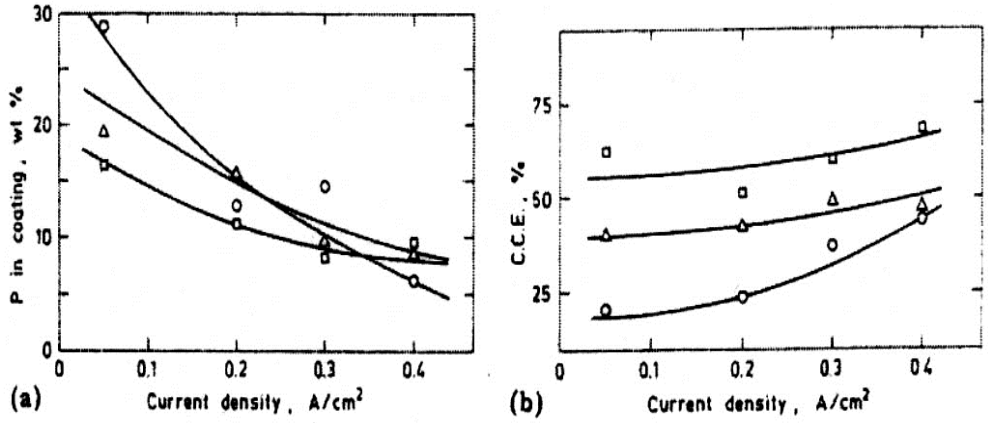

Figure 3. Influence of current density on the phosphorus content and cathodic efficiency [5]

5. CONCLUSIONS

Number of particles deposited per unit area depends on the content of phosphorous acid in the electrolyte and hence the phosphorus content in the layer [3]. Increased content of hard particles increases the amount of particles deposited per unit of surface layer and the amount of hard particles co-deposited is not constant throughout the composition. This phenomenon is particularly striking as the hard particles in the electrolyte concentration is higher. For deposits with high particle quantity surfasice hard saturation starts at lower content of phosphorous acid. For deposits with a lower concentration of hard particles particles that saturate the amount of particles per unit mass is lower, but still noticeable.

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