Effect of Electrochemical Bath Composition on the Preparation of Ni-W-Fe-P Amorphous Alloy

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The effect of nickel sulfate and sodium tungstate concentrations in an electrolytic bath on the process of obtaining the Ni-W-Fe-P alloy in the presence of a complexing agent and at high pH is investigated in the present work. The full 2² factorial planning points plus two central points are used for the development of the work. For this study, within the range of the proposed variables, the optimum concentrations found were 0.02 M nickel sulfate and 0.09 M sodium tungstate, achieving a 497 HV microhardness. The alloys obtained showed nodules and microcracks on their surfaces. It was observed that an increase in the sodium tungstate concentration in the bath favored the increase in the tungsten content, and this had a direct influence on the microhardness and corrosion resistance behavior. The best results were obtained with a tungsten content of approximately 18 at%. Values of tungsten above 22 at% in the film favored the increase in internal tension, thus promoting a greater number of microcracks, and these caused a reduction in the microhardness and corrosion resistance. All the coatings were amorphous.

Keywords: Electrodeposition, tungsten alloys, experimental planning, optimization.

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