

## Structure, mechanical properties and electrochemical behavior of electrodeposited Ni–P alloys

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Nickel phosphorus (Ni–P) alloy thin films were prepared by electrodeposition on pre-cleaned copper substrates using a galvanostatic cathodic electrodeposition method from sulfate electrolyte baths at various phosphorous acid concentrations. X-ray diffraction studies reveal that with the increase in phosphorus content, the structure of the Ni–P electrodeposited coatings transformed from microcrystalline to a mixture of nanocrystalline and amorphous phases, then to amorphous phase. Scanning electron microscopic studies reveal spherical shaped grains at low phosphorus contents and modules of cauliflower type morphology at higher phosphorus concentrations. A systematic study on the relationships between the structure and wear resistance of nickel-phosphorus coatings with different phosphorus contents (i. e. 1.5–13.5 wt.% P) and under different thermal treatments has been performed. Electrochemical behavior of electrodeposited Ni–P alloys was investigated in chloride neutral solutions. Measurements were performed by potentiodynamic polarization method. The effects of phosphorus concentration on the crystal structure, morphology, hardness, wear resistance and electrochemical behavior of Ni–P coatings were studied and discussed.