Effect of heat treatment on the corrosion and mechanical properties of Nickel Tungsten alloy electrodeposits

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Binary Ni-W coatings display good mechanical, tribological and anti-corrosion properties, but are not able to reach the hard chromium coatings performances. Heat treatment processes were performed and evaluated in order to improve the Ni-W properties.

Ni-W alloy coatings were produced with different compositions and microstructures depending on the composition of the plating bath and the deposition parameters. After the electrodeposition, samples followed four different annealing heat treatment cycles.

The microstructure of the deposits was studied using X-Ray Diffraction (XRD) and Scanning Electron Microscopy (SEM), while composition analysis of the coatings was performed by Energy-dispersive X-ray spectroscopy (EDS). The corrosion protection efficiency was evaluated by electrochemical characterisation and ageing tests. Sliding and Knoop hardness tests were performed to determinethe fritcion coefficient and the hardness and to analyse the wear behavior t of the coatings.

The results showed that heat treatment induced microstructural evolution and that the heat treated NiW coating at 500°C exhibited improved corrosion resistance compared to NiW as deposited with mechanical properties very similar to hard chromium coating.