Electroless nickel composite coatings containing solid lubricant MoS₂ particles

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Abstract

Nickel–Phosphorous–Molybdenum disulphide composite coatings were prepared using electroless nickel bath containing Molybdenum disulphide (MoS₂) particles. Plain Ni-P coatings were also prepared for comparison. Sodium Lauryl Sulphate (SLS) as a surfactant was used to disperse the second phase MoS₂ particles in the bath. Thickness of the composite coatings was around 30-40 μm with incorporated 1.5 wt. % MoS₂ particles. Field emission scanning electron microscopy (FESEM) studies showed that the surface morphology of the deposits was found to be rough compared to plain Ni-P deposits. Compositional analysis (EDAX) results showed that the plain Ni-P coating contains about 10 wt.% P. Incorporation of phosphorus content was not affected with the second phase MoS₂ particles inclusion. Differential Scanning Calorimetry (DSC) studies on the deposits showed a marginal increase in the crystallization temperature compared to plain Ni-P deposits indicating improved thermal stability. Composite coatings exhibited microhardness almost similar to plain Ni-P deposits both in as-deposited and heat treated (400°C for 1 hour) conditions. Structural studies carried out on these deposits indicated a single broad Ni (111) peak. In the case of composite coatings presence of additional peaks corresponding to MoS₂ (103) and (105) were observed. To evaluate the electrochemical behaviour of these coatings potentiodynamic polarization and electrochemical impedance measurements were carried out and results were discussed.

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