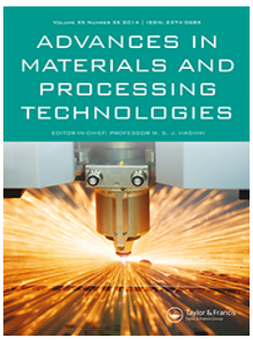

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RESEARCH ARTICLE

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Experimental studies and influence of process factor on zinc-nickel-based coating on mild steel

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ABSTRACT

Sulphate-rich electrolytic bath containing $ZnSO_4.7H_2O$ in NiP solution was used to develop coating with Ni-P-Zn matrix under optimised process parameter. The major considerations are to examine the factor variance and the effect of varying time parameter between 10, 15, 20 and 25 min on the developed coating. Wear loss evolution was examined using reciprocating sliding wear tester with a force of 10 N and 20 N. The microhardness behaviour was examined using durascan microhardness tester with diamond indenter. The change in the structural build-up and the corrosion performance trend was observed using a scanning electron microscope enhanced with energy dispersive spectroscopy and potentiodynamic polarisation route. From the result we observe that time-dependant factors impact maximally on the crystal growth which rightly influences the coating hardness performance. For wear performance, the counter with external forces couldn't penetrate wholly into the lattice of the developed coating due to the resilient formation of stable flakes. The microstructure formation shows stable dispersed crystal build-up and homogeneous growth. An excellent corrosion resistance characteristic was noticed with Ni-P-Zn-25 min matrix.

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KEYWORDS
Coating; time dependant; incorporation; microstructure; matrix

1. Introduction

The continuous demand for improved engineering material for an advance application is overwhelming due to need to reduce cost and essential failure of metal in service. Mild steel susceptibility often poses a concern due to its pitting rate, instability at high temperature and ease of structural deformation [1–4]. However, in special conditions and services, a structural application involving steel such as automobile, manufacturing plant, bridges, petrochemical highways, etc., are vulnerable with the challenges of hardness and corrosion deterioration [5].

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