Short Communication

Corrosion Resistance of Nickel-Phosphorus/Nano-ZnO Composite Multilayer Coating Electrodeposited on Carbon Steel in Acidic Chloride Environments

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In this study, a multilayer nickel-phosphorus (Ni-P)/nano-ZnO composite multilayer coating electrodeposited on carbon steel (CS) substrate was investigated for higher corrosion resistance and surface hardness. Scanning electron microscopy, X-ray diffraction and energy-dispersive X-ray spectroscopy analysis were employed to consider the microstructure, surface morphology and composition of the samples. The polarization and electrochemical impedance spectroscopy (EIS) tests were used to measure the corrosion resistance of the Ni-P/n-ZnO composite multilayer coated CS and its heat treatment in acidic chloride environment. The results showed that the multilayer ZnO nanostructures and Ni-P coatings on CS substrates indicated an excellent corrosion protection behavior because of the ceramic protective barrier and higher hardness on the metal surface. The corrosion protection of heat-treated Ni-P/n-ZnO coated CS revealed a lower I_{corr} and higher E_{corr} than the other samples which can be related to the considerable enhancement of hardness in the Ni-P/n-ZnO composite multilayer coating by heat treatment.

Keywords: Electrodeposition; Multilayer coating; Carbon steel; Heat treatment; Corrosion behavior

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