Study on a ZnAlMgNi plating

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Abstract: Zinc-aluminum-magnesium coatings possess excellent corrosion resistance, and electroplated zinc-nickel coatings are also a type of high-corrosion-resistant coating. However, there has been no research on the corrosion behavior after nickel electroplating on the surface of zinc-aluminum-magnesium coatings. Nickel was electroplated onto a zinc-aluminum-magnesium coating using electroplating technology to obtain a ZnAlMgNi plating. Scanning electron microscopy was used to analyze the surface microstructure of the samples, glow discharge optical spectroscopy was used to analyze the thickness of the nickel coating, X-ray photoelectron spectroscopy was used to analyze the composition of compounds on the sample surface, and polarization curve and AC impedance spectroscopy techniques were used to evaluate the effect of the nickel coating on the corrosion resistance of the zinc-aluminum-magnesium coating. The analysis results show that under different electroplating process conditions, the thickness of the nickel layer on the surface of the zinc-aluminum-magnesium coating is 100-600 nm. Polarization curve analysis shows that when the nickel coating is 100 nm thick, the corrosion potential of the sample increases from -1.016 V vs Ag/AgCl to -1.005 V vs Ag/AgCl, the corrosion current density increases from 14 mA/cm² to 17 mA/cm², and the polarization resistance decreases from 886 Ω·cm² to 693 Ω·cm². When the thickness of the nickel coating is 600 nm, the corrosion potential of the sample further increases to close to -1 V vs Ag/AgCl, the corrosion current density increases to 57 mA/cm², and the polarization resistance decreases to 289 Ω·cm². Compared to the zinc-aluminum-magnesium coating, the corrosion resistance of this ZnAlMgNi plating shows a significant decline.