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Electrodeposited SnO₂/graphene composite as highly effective and stable anticorrosion coating for aluminum alloys in acidic environments

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Using cyclic voltammetry, a SnO₂/graphene (SnO₂/G) composite coating was electrodeposited on an aluminum alloy in this study. The morphology and composition of this coating were analyzed by scanning electron microscopy (SEM), X-ray diffraction (XRD) and X-ray photoelectron spectroscopy (XPS). Electrochemical impedance spectroscopy (EIS) measurements were performed to evaluate the stability and corrosion resistance of the coating. Moreover, the deposit formation mechanism and anticorrosion mechanism of the composite coating were investigated. The results showed that for electrodeposition conditions with a GO concentration of 0.06 mg/ml and a potential range of $0.6 \sim -1.1$ V (vs. SCE) at a scanning rate of 25 mV/s, the composite coating showed good stability in a strong mixed acid solution (0.5 M H₂SO₄ + 2 ppm HF). The protection efficiency of the deposited coating, which was immersed in an acidic solution for more than 70 h on an aluminum alloy substrate, remained greater than 99.33%, indicating good long-term stability of the composite coating.

Keywords: SnO₂/graphene, electrodeposition, aluminum alloy, corrosion

FULL TEXT

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