Preparation and Properties of Ni-W-rGO Composite Coatings

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Graphene oxide (GO) was prepared by a modified Hummers method. Ni-W-rGO composite coatings were synthesized by pulsed electrodeposition on an N80 steel plate. The GO specimens were characterized by Raman spectroscopy, Fourier-transform infrared spectroscopy, and X-ray diffraction. Microstructures of the Ni-W-rGO composite coatings were characterized by scanning electron microscopy equipped with energy dispersion spectroscopy analysis. The microhardness of all coatings were evaluated with a microhardness tester. The corrosion behavior of the Ni-W-rGO composite coatings was investigated by potentiodynamic polarization and electrochemical impedance spectroscopy in 3.5 wt% NaCl solution. The results showed that GO had been reduced to rGO on the cathode, forming a composite coating with nickel and tungsten co-deposits on the N80 plate. The coating was denser due to improved surface morphology, and GO markedly improved its microhardness and corrosion resistance. The optimum GO concentration was 0.6 g/L.

Keywords: composite coating; corrosion resistance; graphene oxide; microhardness; reduced graphene oxide

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