Deposition Mechanism and Corrosion Resistance of Ni-Graphene Composite Coatings Prepared by Pulse Electrodeposition

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By adding graphene oxide (GO) to a Watt-type plating solution, a Ni-graphene (G) composite coating was prepared on a N80 steel substrate. Raman and FT-IR spectroscopy were performed to characterize the successful preparation and reduction of graphene oxide. The variation in the morphology of the composite coatings with changes in the average current density, rotation angle of cathode, and concentration of graphene oxide was examined using SEM and EDS analyses. An electrochemical corrosion test was used to study the effect of graphene oxide concentration on the corrosion resistance of composite coatings. A mechanism describing the action of the average current density and rotation angle of cathode during the codeposition process of Ni-G was proposed. It was found that the electrodeposition can be affected by the current density and rotation angle of cathode, confirming that the mechanism of Ni-G composite electrodeposition is controlled by both an electrochemical mechanism and a mechanical stirring mechanism. In addition, we proposed the mechanism of Ni-G composite electrodeposition.

Keywords: Ni-G composite coating; Pulse electrodeposition; Corrosion resistance; Deposition mechanism; Graphene oxide

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