Ni-P TiO₂ Nanoparticle Composite Formed by Chemical Plating: Deposition Rate and Corrosion Resistance

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We studied the parameters influencing the chemical plating deposition rate of Ni-P TiO₂ nanoparticle composite layers and the corrosion resistance of the resulting layers. The amount of TiO₂ added, plating time, temperature and pH values were factors in a four-factor three-level orthogonal test; the parameters influencing the deposition rate of the Ni-P TiO₂ nanoparticle composite plating layer were optimized. A specimen featuring the composite plating layer was prepared under the optimized conditions and its corrosion resistance was compared with those of a Ni-P plating layer and a carbon steel matrix. Our results indicated that the corrosion resistance of the Ni-P TiO₂ nanoparticle composite plating layer was better than that of the Ni-P plating layer in the 3.5% NaCl solution, and the corrosion resistance of the Ni-P plating layer was slightly higher than that of the Ni-P TiO₂ nanoparticle composite plating layer which immersed in the 10% H₂SO₄ and 15% HCl solution. Furthermore, both these layers showed better corrosion resistances than that of the carbon steel matrix. The corrosion resistance mechanism of the nanometer composite plating layer was discussed.

Keywords: chemical plating, composite nanomaterial, deposition rate, corrosion resistance

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