Preparation and Properties of an Electroless Triple-Layered Ni-P Based-TiO₂/ZrO₂ Composite Coating

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We first reported here a new triple-layered Ni-P based-TiO₂/ZrO₂ (NTZ) composite coating prepared by electroless plating on a substrate of Q235 carbon steel. The microstructure, mechanical and anticorrosion properties of the achieved coating were investigated. Meanwhile, a pure Ni-P coating, a double-layered Ni-P based-TiO₂ coating (NT) and a Ni-P based-ZrO₂ coating (NZ) were prepared as comparisons. The results indicated that TiO₂ and ZrO₂ particles were found on the surface of NT and NZ. Both types of the particles were detected on the cross-section of NTZ. In addition, NTZ not only showed a higher tribology property than other coatings but also a similar hardness with NZ. Furthermore, the highest corrosion resistance of NTZ among all coatings was determined by the lowest corrosion current density of 3.80×10^{-7} A/cm². Ni-P/TiO₂ layer under Ni-P/ZrO₂ layer in NTZ caused a higher corrosion resistance than NZ by increasing the corrosion path of harmful ions to substrate. The above research revealed that NTZ owned a potential application in the fields requiring both high mechanical and anticorrosion properties.

Keywords: Ni-P based-TiO₂/ZrO₂ composite coating; Electroless plating; Hardness; Tribology property; Corrosion resistance

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