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Preparation and Corrosion Resistance of γ-aminopropyltriethoxysilane-TiO_2-GO/Waterborne Polyurethane Coating

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In this paper, γ-aminopropyltriethoxysilane-TiO_2-GO (KTG) composite particles were prepared using γ-aminopropyltriethoxysilane (KH550) by depositing nano-TiO_2 on graphene oxide (GO) substrate. The KTG/waterborne polyurethane (WPU) composite coating was prepared by blending KTG with WPU. Fourier transform infrared spectroscopy (FTIR), x-ray diffraction (XRD), and scanning electron microscope (SEM) were employed to characterize the composition and structure of the GO before and after the modification, while the water resistance, thermal stability and corrosion resistance of the composite coating were examined via water absorption test, contact angle test, thermogravimetric analysis (TGA), and electrochemical impedance spectroscopy (EIS). The results showed that nano-TiO_2 was successfully deposited on the GO surface. The incorporation of KTG composite particles reasonably improved the water resistance, thermal stability and corrosion resistance of the WPU coating. Optimum water resistance of the composite coating with 0.9% KTG incorporation, 1.3% water absorption rate reduction relative to the pure WPU coating, and 283 to 300°C increment in thermal decomposition temperature were achieved. Moreover, the corrosion resistance of the composite coating was significantly improved. Furthermore, a value of 7.89×10^{6} $\Omega\cdot cm^{2}$ coating resistance of the composite coating, 2.56×10^{-9} $A\cdot cm^{-2}$ corrosion current density, and 99.81% corrosion inhibition efficiency can attained.

Keywords: graphene oxide; nano-TiO_2; waterborne polyurethane; corrosion resistance

FULL TEXT