Preparation and Corrosion Resistance of AKT-Waterborne Polyurethane Coating

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In this paper, an inorganic-organic composite modification of nano-TiO₂ has been carried out using aluminum sulfate octahydrate and γ -aminopropyltriethoxysilane (KH550) to obtain AKT with good dispersion performance. The AKT-WPU composite coating with different amounts of nano-TiO₂ added was prepared by blending AKT with waterborne polyurethane (WPU). The nano-TiO₂, before and after modification, was analyzed by Fourier transform infrared spectroscopy and indicates that alumina and KH550 can be successfully grafted onto the surface of nano-TiO₂. Our thermogravimetric analysis shows that the heat resistance of the AKT-WPU composite coating was improved. The corrosion resistance of the AKT-WPU composite coatings was investigated by electrochemical impedance spectroscopy and polarization curves. Our results show that the addition of AKT significantly improves the corrosion resistance of the composite coating. The resistive modulus of the composite coating with 0.7% AKT addition amounted to $5.05 \times 10^6 \Omega$. The corrosion current density is $5.21 \times 10^{-9} \text{ A}$, which is more than two orders of magnitude lower than that with the pure WPU coating. The corrosion inhibition efficiency can reach 99.54%. The coating was subjected to a long-term immersion test and observed by a scanning electron microscope. After immersion for 360 h, our results show that the coating still protected the stainless steel.

Keywords: nano-TiO₂; waterborne polyurethane; corrosion resistance

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