Degradation of a High Build Epoxy Primer/Polyurethane Composite Coatings under Cyclic Wet–dry Conditions

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The degradation of a high build epoxy anti-corrosion primer and a grey polyurethane topcoat on carbon steel were investigated under cyclic wet–dry and 3.5% NaCl solution immersion conditions by electrochemical impedance spectroscopy (EIS), Fourier transform infrared spectroscopy (FTIR) and scanning electron microscopy (SEM). The process was compared with that of a composite coat comprising the high build epoxy primer and a polyurethane topcoat. The results show that, under wet–dry conditions, the water absorption was lower than that in the continuous immersion test, but with time, the wet–dry cycles promoted more micropores in the coatings, which accelerated the penetration of the corrosive electrolyte into the coating and thereby caused a barrier performance decrease in the later process. The effect of the cyclic wet–dry conditions on the composite coating was smaller than that on the single-layer coating. The protective properties of the composite coating mainly depended on the high build epoxy anti-corrosion primer.

Keywords: cyclic wet–dry; coating performance; EIS; epoxy primer; polyurethane topcoat

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