D-2-7 A systematic investigation of the factors affecting the anti-chlorine ion permeability property of waterborne acrylic glass flake anticorrosive coatings

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ABSTRACT

Reinforcement corrosion caused by chloride ion penetration diminishes the safety and durability of the marine concrete structure fearfully. Due to the shielding effect of glass flake, the glass flake anticorrosive coatings can greatly extent the time that chloride ion penetrating into reinforced concrete, and effectively improve the anti-penetration and anti-corrosion properties of reinforced concrete. Here we developed an environment friendly waterborne acrylic glass flake coatings using glass flake as the main anti-corrosion pigment for corrosion protection in marine environment. The effects of manufacturing processes and artificial accelerated weathering on the anti- chloride ion permeability of glass flake coatings were investigated. Several kinds of surface treatment reagents and different surface treatment process were used for glass flake. The effects of different surface treatment processes on properties of glass flake coatings were compared. It was found that mixing of titanate coupling agent NDZ-311 with glass flake through ultrasonic treatment in 30 min showed the best results. After ultrasonic treatment with titanate coupling agent, glass flake in the paint film were mostly arranged with the same orientation, and the SEM showed that treated glass flake combined closely to the resin matrixes. The effect of particle size of glass flake and the amount of glass flake in coatings on coatings properties were also investigated. The results showed that when the diameter of glass flake was 100 μm and the pigment volume content (PVC) was 21.2%, the coatings showed the best performance. The chloride ion anti-penetration of glass flake coatings was 1.0×10^{-5} mg/(cm^2.d), and the adhesion strength between coating and concrete was 2.5 MPa. Finally, we qualitatively analyzed the weather resistance of glass flake coatings according to ISO 11341-2004. It was shown that, after 1000 h of artificial accelerated weathering, the samples were free of blistering, peeling and cracking, and there was no chalking or color change/fade.

KEY-WORDS: Anticorrosive coating, marine environment reinforced concrete, glass flake, chlorine ion penetration.