Development of low-cost titanium-based metal oxides and their applications

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Abstract The blockage of seawater pipelines caused by the attachment of marine organisms seriously affects the safety and life of service equipment. Chlorine production by electrolysis of seawater has attracted extensive attention as a simple and efficient method to prevent biofouling. Polymetallic oxide electrode (DSA) is a commonly used chlorine anode, which is generally coated on the surface of a titanium substrate, and the main component is an oxide formed by ruthenium (Ru), iridium (Ir), titanium (Ti) and other metals. At present, the high cost, Ru degradation, coating peeling, substrate passivation and other problems of DSA electrode have seriously affected its wide application in the field of anti-biofouling, among which coating peeling is the key to affecting the life of the electrode. In order to explore the effect of the surface structure of the titanium substrate on the adhesion between the coating and the substrate, the effect of the surface structure of the titanium substrate on the solid solution adhesion of Ru Ir Co Ni was investigated by hydrochloric acid etching. In this study, hydrochloric acid with different mass fractions (5%, 10%, 15%, 20%, 25%) was used to etch Ti matrix at room temperature and pressure. The electric double-layer capacitance of the titanium sheet with hydrochloric acid etching with 20% mass fraction was the largest, and the charge transfer resistance Rct was the smallest, which was 0.2165Ω • cm2, which meant that the titanium substrate treated under these conditions had the least influence on the chlorine evolution reaction.

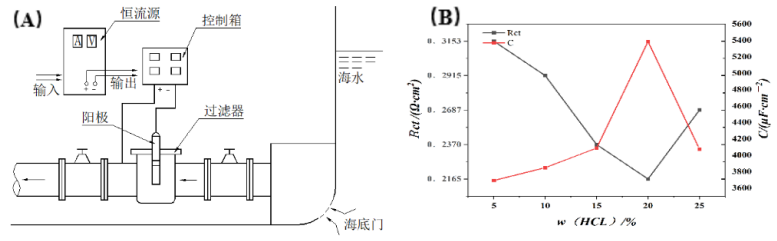

Fig. 1(A) Schematic diagram of the application of electrolytic seawater antifouling technology in seawater pipelines; (B) Relationship between Rct and C with HCL concentration;

Keywords DSA； chlorine separation electrode; biofouling; hydrochloric acid etching; electric double-layer capacitors; Charge transfer resistance