Using ToF-SIMS and EIS to Evaluate Green Pretreatment Reagent: Corrosion Protection of Aluminum Alloy by Silica/Zirconium/Cerium Hybrid Coating

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摘要

Abstract

Increasing environmental concern has led to the restrictive use of chromate conversion coatings to protect Al-alloys from corrosion. Our research is under way to find environmentally compliant substitute coating such as Si/Zr/Ce hybrid coating. The corrosion protection effect of green pretreatment reagent consisted of Si-containing base solution, Ce- and Zr-containing sealing solutions on the corrosion protection of Al-alloys was studied with a 3.5% NaCl aqueous testing solution. The correlation between the corrosion resistance measured by electrochemical impedance spectroscopy (EIS) and surface chemical composition of the hybrid coating measured by time-of-flight secondary ion mass spectroscopy (ToF-SIMS) was studied. The proposed green pretreatment reagent was found improve the corrosion protection of Al-alloys, presumably due to the formation of protective oxide film acting as an oxygen barrier.