Study the Growth Mechanism and Corrosion Resistance of AZ91D Magnesium Aluminum Alloy Conversion Coatings

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ABSTRACT

In this conversion treatment study, AZ91D magnesium alloy is used as the experimental material. Meanwhile, both permanganate and vanadate conversion coatings solution are selected. SEM and EDS are used to observe the surface morphology of coatings, analyze the chemical composition and measure the realistic thickness of coatings. In the last, the corrosion resistance of conversion coatings is measured with polarization test.

From experimental results shows that, the growth mechanism of permanganate coatings on AZ91D magnesium alloy is the magnesium-aluminum composite oxide deposited on the surface of material matrix at the beginning to form the condensed lower bottom layer. With increasing the immersion time, the element of magnesium, aluminum, phosphorous, manganese and their oxide from conversion solution will continue deposit on the top of lower layer to form the loosen upper surface layer. In addition, the growth mechanism of vanadate coating is similar to the mechanism of permanganate coating. But the major elements of upper layer are vanadium, magnesium and aluminum which is from solution and dissolves from the base material, will co-deposit on the top of lower layer.

At the end, the corrosion resistance by polarization tests shown that both the permanganate and vanadate coatings have the smallest corrosion resistance values at 40°C and 1 minutes, because the coating cracks is more delicate. Therefore, the base material can be obtained better corrosive protection. If further increasing the conversion time, the width of the coating cracks will become wider, which will deteriorate to the corrosion resistance and also not good to the economic benefits.

Keywords : AZ91D Magnesium Alloy、Permanganate Conversion Treatment、Vanadate Conversion Treatment、Growth Mechanism、Polarization Tests

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