

Short Communication

Preparation and Phosphating of Yttrium-Based Chemical Conversion Coatings on AZ91D Magnesium Alloy for Corrosion Protection

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The yttrium-based chemical conversion coatings were prepared on AZ91D magnesium alloy by immersing in yttrium nitrate solution firstly, and then in ammonium dihydrogen phosphate ($\text{NH}_4\text{H}_2\text{PO}_4$) solution. The micro-morphology and the composition of the coating were investigated using scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), X-ray diffraction (XRD) and X-ray photoelectron spectroscopy (XPS), respectively. The results show that the number and size of the cracks in the coating were obviously reduced after phosphating, and the compactness of the yttrium conversion coatings were increased. The phosphated coating was mainly composed of Y_2O_3 , $\text{YO}_{x/y}$, $\text{Mg}_3(\text{PO}_4)_2$, AlPO_4 and YPO_4 . Furthermore, the corrosion resistance of the coating was measured by means of potentiodynamic polarization curves and electrochemical impedance spectroscopy (EIS). Following phosphating, the corrosion potential of the coating was shifted positively about 180mV compared to the uncoated one, and the corrosion current density decreased about one order of magnitude.

Keywords: AZ91D magnesium alloy; yttrium-based conversion coating; phosphating; corrosion resistance

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