

Improvement of corrosion resistance of rare earth element (REE)-based anodic oxidation coating on AZ91D magnesium alloy

Abstract

Anodization is a useful technique for forming protective films on magnesium alloys and improves its corrosion resistance. Based on the rare earth metal (REE) salt solution, the optimum parameter was selected by comparing the anti-corrosion property of anodic film. The structure, component and surface morphology of anodic film and cross-section were analyzed using X-ray diffraction (XRD) and scanning electron microscopy (SEM) coupled with Energy Dispersive Spectroscopy (EDS). The corrosion behavior was evaluated by immersion test. In this paper, a dense anodic film approximately 20 μm thick was prepared on a AZ91D magnesium alloy through anodic oxidation coating. The results show that the anodic films were mainly composed of $\text{Mg}_{17}\text{Al}_{12}$, $\text{Mg}_{17}\text{La}_2$, MgO and amorphous compounds. The best corrosion resistance was obtained with specimen anodized in solution containing both lanthanum nitrate and magnesium, whose corrosion resistance is approximately 3 times higher than that of as-received AZ91D magnesium alloy.

Keywords

Anodization; Corrosion resistance; Corrosion resistance keywords: Magnesium alloy; Rare earths element