Enhanced Corrosion Resistance of Anodic Films Containing Alumina Nanoparticles on as-rolled AZ31 alloy

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In this work, the samples of magnesium alloy AZ31 were anodized in two kinds of electrolytes, each with and without alumina nanoparticles. The structure, morphology and composition of four kinds of films were characterized using X-ray diffraction (XRD), scanning electron microscopy (SEM) and energy dispersal spectroscopy (EDS), respectively. The corrosion behaviors of films were studied using electrochemical impedance spectroscopy and potentiodynamic polarization curves. The wear behaviors were evaluated using a ball-on-disc rotating wear test. The results showed that the alumina nanoparticles tended to gather in cracks and pores leading to increased film density and lower corrosion rates. The wear rates of films were decreased by adding nanoparticles.

Keywords: composite anodic films, corrosion resistance, wear resistance, nanoparticles, magnesium alloy

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