

Article

Corrosion of AZ31 with LDH conversion coatings loaded with inorganic inhibitors.

Borja Pillado ^{1,*}, Marta Mohedano ¹, Rubén del Olmo ¹, Beatriz Mingo ², Endzhe Matykina ¹ and Raúl Arrabal ¹

¹ Departamento de Ingeniería Química y de Materiales, Facultad de Ciencias Químicas, Universidad Complutense, 28040, Madrid, Spain

² Department of Materials, University of Manchester, Oxford Road, Manchester, M13 9PL, UK

* Correspondence: bpilla01@ucm.es

Abstract: Layered Double Hydroxides (LDHs) coatings were developed for corrosion protection of AZ31 Mg alloy. LDH coatings were fabricated under coprecipitation conditions and applied under hydrothermal conditions. Two different systems Zn-Al LDH and Li-Al LDH were studied. Specimens were post-treated via immersion for 2 h at 45 °C in Na₂WO₄·H₂O or LiNO₃ baths respectively, to produce Zn-Al LDH(W) and Li-Al LDH(Li). The characterization of the coatings was carried out by field-emission scanning electron microscope (FESEM), X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR). The corrosion process was studied by electrochemical impedance spectroscopy (EIS) and scanning vibrating electrode technique (SVET). Surface was also evaluated by water drop contact angle and paint adhesion test by using an epoxy primer. The characterization of the coating revealed two-layered coatings with a denser inner layer and a flaky outer layer. Both coatings improved the corrosion resistance of the AZ31 alloy. Loading with inhibitor further increased the corrosion resistance by one order of magnitude (Bare substrate, $Z_{10\text{mHz}} \sim 10^2 \Omega \text{ cm}^2$; LDH, $Z_{10\text{mHz}} \sim 10^{3-4} \Omega \text{ cm}^2$; LDH-inhibitor, $Z_{10\text{mHz}} \sim 10^5 \Omega \text{ cm}^2$).

Keywords: Corrosion; Layered Double Hydroxides; Magnesium alloys; Corrosion inhibitors
