


Abstract

Layered Double Hydroxide Coatings Loaded with Corrosion Inhibitors for Corrosion Protection of AZ31[†]

Borja Pillado^{1,*}, Marta Mohedano¹, Rubén del Olmo¹, Beatriz Mingo², Endzhe Matykina¹
and Raúl Arrabal¹

¹ Departamento de Ingeniería Química y de Materiales, Facultad de Ciencias Químicas, Universidad Complutense, 28040 Madrid, Spain; mmohedan@ucm.es (M.M.); rubandom@ucm.es (R.d.O.); e.matykina@quim.ucm.es (E.M.); rarrabal@ucm.es (R.A.)

² Department of Materials, University of Manchester, Oxford Road, Manchester M13 9PL, UK; beatriz.mingo@manchester.ac.uk

* Correspondence: bpilla01@ucm.es

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Abstract: Layered double hydroxide (LDHs) coatings were developed for the corrosion protection of AZ31 Mg alloy. AZ31 is widely used in the transport industry due to its low mass density and good mechanical properties. LDH coatings were fabricated under co-precipitation 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 inhibitor aqueous baths. Na₂WO₄·H₂O and LiNO₃ inorganic inhibitors were used, respectively, to produce inhibitor-loaded systems: 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). The surface was also evaluated via the determination of water drop contact angle and the performance of a paint adhesion test 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_{10mHz}~10² Ω cm²; LDH, Z_{10mHz}~10³⁻⁴ Ω cm²; LDH-inhibitor, Z_{10mHz}~10⁵ Ω cm²).

Keywords: corrosion; layered double hydroxides; magnesium alloys; corrosion inhibitors



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