Effects of Rare Earth Metal Oxide Doping on Micromorphology and Corrosion Behavior of Hydroxyapatite-Graphene Oxide Composite Coating Fabricated on AZ91 magnesium alloy

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Hydroxyapatite (HA)-graphene oxide (GO) composite coatings reinforced with various rare earth (RE) metal oxide (La_2O_3 and Y_2O_3) of composite coatings are electrophoretic deposited on AZ91 magnesium alloy substrate. The effects of RE metal oxide on the composition, surface morphology and corrosion behavior of HA-GO composite coatings in the solution of 0.9 wt. % have been systemically investigated. According to the experimental results, HA-GO- Y_2O_3 composite coating had displayed superior performance of corrosion prevention in 0.9 wt. % NaCl solution. Considering the results of EIS, microstructures, the surface porosity and the RE metal oxide in the HA-GO composite coatings. Taking the roles of the formation of HA-GO-RE complexes in pores/cracks of HA-GO composite coatings at the composite coatings/ the Mg (OH)₂ film interface in the corrosion mediums into account, the precipitation of precipitated HA-GO-RE protective film is a reasonable explanation for the corrosion resistance of AZ91 Mg alloy. The experimental results manifested that the effects of the microstructures and porosity, the formation of HA-GO-RE complexes in pores/cracks and Cl^- concentration in NaCl solutions on improving corrosion resistance of AZ91 Mg alloy exhibited obviously synergistic effects.

Keywords: Magnesium alloy; HA-GO; Rare earth (RE) metal oxide; Corrosion resistance

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