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Optimal conditions for the deposition of novel anticorrosive coatings by RF magnetron sputtering for aluminum alloy AA6082 (Article)

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Abstract

Cerium and lanthanum coatings were deposited on glass, silicon (1 0 0), and aluminum alloy by RF magnetron sputtering in which several experimental conditions such as power, substrate temperature, and deposition time were varied, using pure CeO_2 and La_2O_3 targets. The effect of deposition parameters on the bonding structure, surface morphology and properties against corrosion of rare earth (RE) coatings formed on metallic substrate was reported. The microstructure and chemistry of the thin film were characterized by X-ray diffraction (XRD), Scanning Electron Microscopy (SEM), and X-ray photoelectron spectroscopy (XPS); whereas their use as corrosion resistant coatings was studied in aqueous NaCl solution (3.0 wt%) by using polarization curves. Variations in these properties were observed by increasing the substrate temperature which modifies the crystallinity of the rare earth coatings. XRD and XPS findings indicate that the cerium coatings are composed by CeO_2 and a significant quantity of Ce_2O_3 due to oxygen deficiency in the sputtering chamber, whereas La_2O_3/$La(OH)_3$ and some La intermetallic compounds are detected in the lanthanum films. Variations in the E_{corr} and I_{corr} were found as a function of the thickness, texture, and morphology of the as-prepared coatings.

Author keywords

AA6082 aluminum alloy; Coatings; Corrosion resistance; Rare earths; RF magnetron sputtering