Comparison of inhibition properties of CeO_2 and La_2O_3 thin films synthesized by r.f. magnetron sputtering on different aluminium alloys

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Aluminum and its alloys are widely used in engineering applications because of their low density, favorable mechanical properties, good surface finish and relatively good corrosion resistance. Research efforts in the aeronautical industry have focused on the study of Al–Cu and Al–Zn alloys like the AA7075, AA5083, AA6061, AA8090. The electrochemical behavior of Al and its alloys have attracted the attention of many researchers; due to the natural oxide film on aluminum does not offer sufficient protection against aggressive anions. In this context, inhibitors are used to improve protective features of the surface. The development of new environmentally friendly and protective coatings to enhance the anticorrosive properties of these materials is of great research interest. As far as we know, sputtered La_2O_3 and Ce_2O_3 coatings to enhance the properties against corrosion of aluminum alloys have not been reported yet. Specifically, the work presented here is focused on the corrosion behavior of sputtered CeO_2 and La_2O_3 thin films deposited on AA6061, AA7075 and AA6082 aluminum alloys substrates in chloride media, using Tafel, electrochemical spectroscopy impedance and surface analyses. The films were deposited simultaneously onto Si(100), metallic and glass substrates, in order to determinate properly the structure, topography, morphology, chemical composition and its effect on the electrochemical properties. The electrochemical behavior of the films was related to the RE ion concentration as well as intermetallic compounds contained in each aluminum alloy. The EIS and Tafel studies showed that there was a significant increase in the resistance to corrosion after depositing La_2O_3 films on aluminum alloy substrates in comparison with the performance displayed by sputtered Ce_2O_3.