

Bath conditions role in promoting corrosion protection on aluminum alloy using rare earth conversion coatings

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Abstract

Rare earth conversion films were obtained on the AA6061 aluminum alloy by the immersion method varying several experimental conditions such as rare earth (RE) concentration, bath temperature and immersion time. Formation dynamics of RE coatings and the effect of bath conditions on their structure, morphology, topography and corrosion resistance properties were investigated for the protection of this substrate immersed in an aqueous solution of NaCl. X-ray diffraction and scanning electron microscopy results revealed that the increment of the RE concentration caused some small cracks around the aluminum alloy intermetallic phase, whereas bath temperature and immersion time stimulated the conversion of the rare earths to more stable compounds, La_2O_3 and CeO_2 . During electrochemical evaluation, the CeCCs displayed a steady state potential at times longer than 250 min; as for LaCCs, longer time intervals were required to reach a stable potential. After covering with rare earth conversion films, the anticorrosive properties of the aluminum alloy were evidently improved. This enhancement is presumably due to the improved barrier properties of the anticorrosion product layer. Additional active corrosion protection was originated from the inhibiting action of the lanthanide ions trapped either as oxides or hydroxides in this surface layer. © 2011 The Electrochemical Society.

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