Influence of Micro-arc Oxidation Coatings on Corrosion Performances of AZ80 cast alloy

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To enhance the corrosion performance of cast AZ80 alloy, micro-arc oxidation (MAO) coating was synthesized at various processing current densities in a basic silicate-fluoride solution. The microstructure, composition, corrosion performance and Mott-Schottky characteristics of MAO coatings at different processing current densities were investigated using various microscopic characterization and electrochemical methods. It was found that a thinner (5.04 μm) MAO coating produced at the low processing current density obtained a more uniform and smaller discharge pores morphology and higher fluoride content compared to the other coatings produced at higher current densities. The open-circuit potential, corrosion current density and polarization resistance values of this coating were -1.28 V vs. Ag/AgCl electrode, 0.00589 $\mu\text{A}/\text{cm}^2$ and $1.53 \times 10^6 \Omega \cdot \text{cm}^2$ in 3.5 wt.% NaCl, respectively. After the Mott-Schottky test, the analysis of the coating showed that the uncoated and MAO coated AZ80 alloy exhibited p-type semiconductor characteristics. For the MAO coated specimens, the coating synthesized at the lower applied current density showed lower acceptor concentration and highly negative flat band potential. These features are associated with the reduced reactivity and improved corrosion resistance of this new MAO coating.

Keywords: Micro-arc oxidation; electrochemical kinetic parameters; Semi-conducting property; AZ80 cast alloy

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