Corrosion Behavior and Structure of Plasma Electrolytic Oxidation Coated Aluminum Alloy

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doi: 1020964/2017.07.70

Received: 18 March 2017 / Accepted: 11 May 2017 / Published: 12 June 2017

In this study, the plasma electrolytic oxidation (PEO) coatings were formed on aluminum alloy in a cheap and convenient electrolyte. The effect of different current densities, i.e., 5 A/dm², 10 A/dm², 15 A/dm² and 20 A/dm² on microstructure and corrosion behavior of coatings was comprehensively studied by scanning electron microscopy (SEM), stereoscopic microscopy, potentiodynamic polarization and electrochemical impedance spectroscopy (EIS) tests, respectively. It was found that the pore density decreased and the pore size increased with the increment of the applied current density. The X-ray diffraction (XRD) results showed that the coatings were only composed of α -Al₂O₃ and γ -Al₂O₃. Potentiodynamic polarization test proved that the coating formed under the current density of 10 A/dm² showed the best anti-corrosion property. The long time EIS test showed that the coating formed under the current density of 10 A/dm² was capable to protect the aluminum alloy substrate after long time of immersion in 0.59 M NaCl solution, which confirmed well with the salt solution immersion test results in 2 M NaCl solution.

Keywords: Aluminum alloy; Plasma electrolytic oxidation (PEO); Current density; Structure; Corrosion resistance

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