Degradation behavior of coatings formed by the plasma electrolytic oxidation technique on az61 magnesium alloys containing 0, 1 and 2 wt% ca

Anawati, author

Abstrak

The characteristics of coatings formed by Plasma Electrolytic Oxidation (PEO) are affected by the composition of metal substrates. In this work, the effect of alloying element Ca (0, 1 and 2 wt%) on the degradation behavior and apatite-forming ability of PEO coated AZ61 magnesium alloys was clarified by means of polarization measurements in 0.9% NaCl solution and an in-vitro test in Simulated Body Fluid (SBF), respectively. The AZ61 alloys were subjected to plasma electrolytic oxidation at a constant current of 200 A/m2 at 25°C for 8 min in 0.5 M Na3PO4 solution. The surface investigation suggested no significant effect of Ca content on the morphology of the PEO coating formed on the AZ61 specimens. The coatings exhibited an eruption-like structure decorated with micropores and microcracks. Their average thicknesses were 13.2, 17.4 and 14.3 μm for AZ61, AZ61-1Ca and AZ61-2Ca, respectively. The polarization measurements showed no significant difference in the corrosion potentials (-1.60 VAg/AgCl) and corrosion current densities (1.61×10-5 A cm-2) of all the coated specimens. Similarly, there was no significant effect of Ca on the apatite-forming ability in SBF, as indicated by the lack of apatite deposition on all the coated specimens after 14 days of immersion. Further sealing of the PEO coatings by chemical treatment in NaOH solution is suggested to enhance the corrosion resistance.