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Local Corrosion Behavior and Model of Micro-arc Oxidation HA Coating on AZ31 Magnesium Alloy

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Abstract: In order to investigate the effect of the defects on the corrosion behavior of micro-arc oxidation (MAO) HA coating on magnesium alloy, scanning electrochemical microscopy (SECM) and local electrochemical impedance spectroscopy (LEIS) were applied for determining local corrosion mechanism. Scanning electron microscope (SEM) and X-ray diffraction (XRD) were applied to observe the microstructure and the composition of the samples before and after corrosion. XRD shows that $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ (HA) was detected in the MAO HA coating. Adhesion strength test shows the critical load of the MAO HA coating was about 4.08N. It can be found that from the SECM and the LEIS measurement, with the increase of immersion time, the corrosion of the MAO HA coating with artificial scratch is accelerated initially and gradually expanded from the scratch to the coating, and then the corrosion products prevent the scratch from further destroying. A physical model for the local corrosion due to defects (artificial scratches) of MAO coated AZ31Mg alloy was proposed.

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