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Preparation and Corrosion Resistance of a Three-layer Composite Coatings on the Mg Alloy

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Abstract：

A composite three-layer coating was successfully manufactured on AZ91D Mg alloy surface, which was attributed to the protection of the Mg alloy. The three-layer(MSE)coatings were composed by micro-arc oxidation coating (MAO), self-assembled film (SAM), and electroless nickel coating (EN). The morphology and structure were characterized by SEM、EDS、XRD、AFM and XPS. The corrosion protection of each sample with composite coatings was tested by electrochemical techniques. The results show that the growth of nickel in the electroless plating process was in a preferred orientation along the Ni (111) direction, indicating that the nickel is amorphous. The MSE composite coatings own the best hydrophobicity and showed the smallest surface roughness. The corrosion current density of the MAO coating was declined by two orders of magnitude compared to that of the Mg alloy. The corrosion potential of the MSE composite coatings was shifted to -0.351 V. The MSE composite coatings own the biggest the AC impedance arc radius and smallest the corrosion current density, indicating that the MSE composite coatings provided the best corrosion resistance for Mg alloy.

Keywords: Mg alloy, micro-arc oxidation, self-assembly, electroless nickel plating,

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