Preparation and Corrosion Resistance of ZIF-8-(5, 6-dimethylbenzimidazole)/LDHs Composite Film on Magnesium Alloy

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The following study is conducted to improve the corrosion resistance of magnesium alloy. First, ZnAl layered double hydroxide (ZnAl LDH) film was prepared on AZ61 magnesium alloy by using hydrothermal method. Then, as-prepared ZnAl LDH was put into 2-methylimidazole (2-mIm) solution to synthesize ZIF-8 film (ZIF-8/LDH). Finally, ZIF-8/LDH film synthesized ZIF-8-DMBIM film (ZIF-8-DMBIM/LDHs) via a shell-ligand-exchange-reaction in the methanol solution containing 5, 6-dimethylbenzimidazole (DMBIM). The surface morphology, structure, and composition of the composite film were observed and determined by scanning electronic microscopy, X-ray diffraction, Fourier transform infrared spectroscopy, and energy-dispersive X-ray spectroscopy. The wettability of composite film was measured by using a water contact angle meter, and the corrosion resistance of the composite film was estimated by the polarization curve and electrochemical impedance spectroscopy techniques. Results show that the prepared ZIF-8-DMBIM/LDH composite film has a dense hexagonal plate morphology with a two-layer structure and a thickness of 3.5 μm . Compared with ZnAl LDH and ZIF-8/LDH films, ZIF-8-DMBIM/LDH composite film has a high contact angle (115.7°), low corrosion current density, and high corrosion potential and polarization resistance due to its near-smooth surface, dense two-layer structure, and hydrophobic characters.

Keywords: Magnesium alloy; Corrosion resistance; Composite film; Metal organic framework; Layered double hydroxide; Hydrophobicity

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