Preparation and anti-corrosion Properties of SiO₂@MWCNTs@PFOTES Superhydrophobic Coatings on Magnesium Alloy

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Inspiration from nature provides the combination of micro-nano particles and low surface energy materials, a spraying method has been employed to prepare SiO₂@MWCNTs@PFOTES superhydrophobic coatings on magnesium alloy, which can enhance corrosion resistance and coating stability. The prepared coating is composed of silicon dioxide (SiO₂) particles obtained by hydrolysis and condensation reaction of ethyl orthosilicate (TEOS), and carboxylate modified carbon nanotubes (MWCNTs) as rough structure, and 1H, 1H, 2H, 2H-Perfluorooctyltriethoxysilane (PFOTES) as the fluorine silane coupling agent. The coating's composition is determined using field emission scanning electron microscopy (FESEM) and Fourier transform infrared (FTIR) spectroscopy. The polarization curve and electrochemical impedance spectroscopy (EIS) are used to investigate the corrosion resistance of the prepared superhydrophobic surface. Through the salt spray test, the salt resistance of the coating is further discussed. The corrosion current density after the coating is more than four orders of magnitude lower than that of bare magnesium alloy AZ31B, and the water contact angle increases from ~32° to more than 162°. The mechanical, chemical and environmental stability of the superhydrophobic coating has been proved through wear test, immersion test and salt spray test.

Keywords: Superhydrophobic coating; Mg alloy; Corrosion resistance; Salt spray

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