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REVIEW ARTICLE

# Anticorrosion strategy for magnesium alloys through a superhydrophobic approach utilizing slippery liquid-infused porous surface coating

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**Abstract** Magnesium (Mg) and its alloys have a wide range of possible uses in various industries because of their lightweight properties. Nevertheless, the practical applications of Mg alloys are significantly limited due to their restricted corrosion resistance, despite their numerous desirable properties including low density, high specific strength, and excellent biocompatibility. Applying a protective coating to the surface can effectively inhibit corrosion. In order to create slippery liquid-infused porous surfaces (SLIPS), it is necessary to have suitable porous micro/nanostructures and infuse liquid lubricant using surface treatment. The coatings on Mg alloys must significantly enhance the properties such as hardness, adhesion, wear and scratch resistance, elastic modulus, tensile and fatigue strength, impact resistance, and friction coefficient, while providing superior corrosion resistance. This method has been shown to effectively resist corrosion in Mg alloys. This review article provides an overview of recent formulation of SLIPS to enhance the water-repellent properties of Mg alloys for corrosion prevention. The SLIPS technique on Mg alloys and its functional corrosion performance by biomimetic-based SLIPS, polymer-based, and layered double hydroxide (LDH) techniques breakthroughs are disclosed. SLIPS has the potential to expand the range of applications for Mg alloys, including self-cleaning, anti-icing, drag reduction, and anti-fouling capabilities.

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## Introduction

A substantial interest has been directed toward magnesium (Mg) alloys because of their favorable characteristics, particularly within industrial sectors such as manufacturing, marine applications, transportation, aerospace, electronics, and implant material. This heightened attention is attributed to their low densities, good vibration absorption, excellent thermal/electrical conductivity, impressive strength-to-weight ratios, and feasible castability.[1–5] However, despite their advantageous properties, Mg alloys are notably susceptible to corrosion, which significantly limits their potential applications.[6–11]

Corrosion of Mg, often triggered by environmental factors such as moisture, salt, and chemical exposure, causes damage on the structural integrity of materials, leading to safety risks and operational disruptions for industries worldwide.[6,12–16] Because the Mg component has a tendency to corrode differently when combined with different materials, galvanic corrosion must be taken into consideration. As a result, finding efficient and long-lasting anti-corrosion techniques have become crucial to the development of strong and durable material structures.

Over the years, the evolution of hydrophobic coatings has marked a significant approach in the field of surface engineering and corrosion prevention mainly focused on Mg alloys. The initial focus on conventional methods, such as anodizing and chemical inhibitors, provided the groundwork for the development of early hydrophobic coatings aimed at reducing the contact between water and various substrates.[13,16,17] These early hydrophobic coatings, typically based on fluori-

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