

Accepted Manuscript

An insight into the effect of buffer layer on the electrochemical performance of MgF₂ coated magnesium alloy ZK60

Usman Riaz, Zia ur Rahman, Hassnain Asgar, Umair Shah, Ishraq Shabib, Waseem Haider



PII: S0257-8972(18)30332-3
DOI: doi:[10.1016/j.surfcoat.2018.03.081](https://doi.org/10.1016/j.surfcoat.2018.03.081)
Reference: SCT 23261

To appear in: *Surface & Coatings Technology*

Received date: 7 February 2018
Revised date: 23 March 2018
Accepted date: 26 March 2018

Please cite this article as: Usman Riaz, Zia ur Rahman, Hassnain Asgar, Umair Shah, Ishraq Shabib, Waseem Haider , An insight into the effect of buffer layer on the electrochemical performance of MgF₂ coated magnesium alloy ZK60. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Sct(2017), doi:[10.1016/j.surfcoat.2018.03.081](https://doi.org/10.1016/j.surfcoat.2018.03.081)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

An insight into the effect of buffer layer on the electrochemical performance of MgF₂ coated Magnesium alloy ZK60

Usman Riaz^a, Zia ur Rahman^b, Hassnain Asgar^a, Umair Shah^a, Ishraq Shabib^{a,b}, Waseem Haider^{a,b}

^a *School of Engineering and Technology, Central Michigan University, Mount Pleasant 48859, USA*

^b *Science of Advanced Materials, Central Michigan University, Mount Pleasant 48859, USA*

Corresponding Author: haide1w@cmich.edu

Abstract

Magnesium (Mg) has emerged as potential implant material owing to its property of biodegradation. The roadblock to the commercial use of Mg as implant material is its fast degradation in body fluids. The degradation of the Mg and its alloys can be retarded by surface coatings. In this work, the potential of MgF₂ coating on the surface of Mg alloy ZK60 (Mg-6.9Zn-0.8Zr) was evaluated for its corrosion properties. Two-step chemical conversion process was used to coat MgF₂ on the surface of ZK60 alloy. In the first step, a secondary layer of Mg(OH)₂ was introduced by boiling the samples in NaOH solution. In the second step, these samples were immersed in hydrofluoric acid to obtain MgF₂ coating. SEM, IR Spectroscopy, and XRD were employed to confirm the formation of Mg(OH)₂ and MgF₂. The wettability tests showed an increase in surface hydrophobicity as a result of conversion treatment. The potentiodynamic polarization tests exhibited an improvement in the corrosion potential from -1.52 V vs. SCE to -1.49 V vs. SCE after two-step conversion treatment. Moreover, coated sample witnessed a noticeable drop in hydrogen evolution compared to untreated ZK60. For a better insight, the results were compared to the MgF₂ coatings achieved on the surface of ZK60 without any buffer layer. The coating of MgF₂ with a buffer layer of Mg(OH)₂ on the surface of ZK60 exhibited a noble corrosion potential, controlled degradation, and nominal hydrogen evolution compared to the untreated ZK60.

Download English Version:

<https://daneshyari.com/en/article/8023835>

Download Persian Version:

<https://daneshyari.com/article/8023835>

[Daneshyari.com](https://daneshyari.com)