Self-sealing Microarc Oxidation Coating Mainly Containing ZrO₂ and Nano Mg₂Zr₅O₁₂ on AZ91D Mg Alloy

Mingqi Tang^{1,*}, Yufei Shao², Zaiqiang Feng¹, Wen Wang², Gang Li¹, Zhenwei Yan², and Ruizhu Zhang¹

¹ School of Materials Science and Engineering, North China University of Water Resources and Electric Power, Zhengzhou 450045, China

² School of Mechanical Engineering, North China University of Water Resources and Electric Power, Zhengzhou 450045, China

*E-mail: tangmq400@163.com

doi: 10.20964/2020.12.86

Received: 29 August 2020 / Accepted: 19 October 2020 / Published: 31 October 2020

ZrO₂-Mg₂ZrO₁₂-MgO composite oxide coating was obtained on AZ91D Mg alloy via MAO (microarc oxidation) technique in an alkaline phosphate solution with K₂ZrF₆ and ZrO₂ nanoparticles. The influence of K₂ZrF₆ and ZrO₂ nanoparticles on the thickness, microstructure, elemental composition, and anti-corrosion property of the MAO coatings were investigated. Added K₂ZrF₆ in the solution improved the forming efficiency of MAO coating. Due to the self-sealing effect of ZrO₂·nH₂O colloid particles produced by K₂ZrF₆ hydrolysis, the hole size and quantity in the MAO coating surface decreased. Moreover, K₂ZrF₆ induced nano-Mg₂ZrO₁₂ to appear in the MAO coating. On the contrary, the MAO coating prepared in the K₂ZrF₆ free solution composed mainly of MgO and non-crystal phosphate. The MAO coating had better compactness and anti-corrosion property which fabricated in the solution with 10 g/L K₂ZrF₆. The thickness, compactness, and anti-corrosion property of the MAO coating were further enhanced because of the addition of ZrO₂ nanoparticles in the solution containing 10 g/L K₂ZrF₆.

Keywords: Mg alloy; Microarc oxidation; Zirconia; Self-sealing; Anti-corrosion property

[FULL TEXT](#)

© 2020 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).