Correlation between Anti-Corrosion Performance and Optical Reflectance of Nano Fluoride Film on Biodegradable Mg-Zn-Zr Alloy: a Non-Destructive Evaluation Approach

Da-Jun Lin¹, Fei-Yi Hung^{1,*}, Ming-Long Yeh², Hung-Pang Lee², Truan-Sheng Lui¹

¹ Department of Materials Science and Engineering, National Cheng Kung University, Tainan 701, TAIWAN.

² Department of Biomedical Engineering, National Cheng Kung University, Tainan 701, TAIWAN.

*E-mail: fyhung@mail.ncku.edu.tw

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Magnesium alloy is promising new biomaterial due to its satisfactory mechanical performance, biocompatibility and degradation of non-toxic substances. However, the dual problems of corrosion and hydrogen evolution require overcoming in order to reach a practical application level. For anti-corrosion modification, fluoride conversion treatment was chosen to provide varied MgF₂ coatings on the microstructure-modified Mg-Zn-Zr alloy. The aim of the present study was to investigate the influence of coating structures and their corresponding corrosion resistance. The fluoride coatings were constructed with nano-crystalline composites, which demonstrated that Mg-Zn precipitates participate in the coating-growth mechanism. In addition, the improved corrosion resistance was also systematically investigated. Compared with the pristine substrate, the F24h and F48h specimens significantly improved the anti-corrosion performance. Moreover, this report is the first report to propose a non-destructive evaluation method through simultaneous evaluation of the corrosion behavior and the establishment of a correspondence surface reflectance for fluoride conversion coatings on Mg-Zn-Zr alloy.

Keywords: Magnesium alloy, fluoride conversion coating, anti-corrosion, optical reflectance

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