Corrosion Protection of AZ31 magnesium alloy by PEO layers modified by zinc incorporation for Biomedical Applications

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Abstract

Researchers are investigating materials for bioresorbable implants to reduce the number of surgeries. Magnesium is a promising candidate due to its mechanical properties which are similar to those of human bone, but it corrodes rapidly and cannot maintain bone support over time. The goal is to extend the lifespan while promoting osseointegration and controlled implant dissolution. Both of these effects can be achieved through Plasma Electrolytic Oxidation (PEO).

This study focuses on the incorporation of various zinc compounds into the PEO bath to integrate zinc into the PEO layer for improving its antibacterial properties. Different salts and oxide, including $Zn_3(PO_4)_2$, $ZnSO_4$, $Zn(NO_3)_2$, and ZnO, are used. The corrosion properties of the samples are evaluated in body fluid (PBS) using Electrochemical Impedance Spectroscopy (EIS). Additionally, surfaces and cross-sections are analyzed using Scanning Electron Microscopy (SEM) to support the observed performance. DRX measurements are also carried out to understand the form in which zinc is included in the PEO coating.

Keywords: *Plasma electrolytic oxidation; biomedical applications; zinc; antibacterial; EIS; SEM.*