Corrosion Degradation of AXJ530 Magnesium Alloy in Simulated Physiological Fluid and Its Mitigation by Fluoride and Chitosan Coatings for Osteosynthetic Applications

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The *in vitro* corrosion behavior of a new Ca-containing Mg alloy (AXJ530) was investigated in phosphate buffer saline (PBS) solution of pH 7.4 at 37 °C for potential biodegradable implant applications. Chemical methods as well as electrochemical open circuit potential, EIS and potentiodynamic polarization techniques were used to assess its vulnerability in PBS with time lapse over 96 h. The results showed that the corrosion rate is always faster for the alloy than for pure Mg at any immersion time > 3 h, mainly due to the micro-galvanic coupling effect. An important factor for Mg alloy application as biodegradable implant is the enhancement of its corrosion resistance and biocompatibility. To achieve this goal, the effect of hydrofluoric acid treatment on the corrosion performance of the alloy was examined by steeping the sample first in sodium hydroxide then in 40 wt.% HF solutions for 24 h at room temperature. Also, coated samples with chitosan (CS) natural polymer were performed using spin coating technique to improve the durability of the alloy. The electrochemical tests revealed that two-layer CS coating can effectively reduce the alloy deterioration in PBS and hence increases its biocompatibility compared to the HF-treated or the untreated bare alloy samples. Additionally, the sample surface of the alloy compared to that for Mg, before and after 96 h immersion in PBS were also examined by using SEM and EDX analyses to support the above obtained experimental results.

Keywords: Magnesium alloy; Biomaterials; Corrosion; Coatings; Fluoride; Chitosan; EIS.

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