

Study for corrosion behavior in vitro of in-cast Zn-1Mg and Zn-1Mg-1Ag (wt.%) under different simulated body fluid conditions and first insights of antibacterial activity

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Zinc (Zn) is a biodegradable metal with controlled degradation, unlike iron (Fe), which degrades slowly with long-term retention of its corrosion products, and unlike magnesium (Mg), which corrodes rapidly, producing harmful hydrogen gas. Zn is known as an essential nutrient for physiological functions in the human body, with intermediate potential vs SHE (-0.76 V) compared to Fe (-0.44 V) and Mg (-2.73 V). These factors make Zn a promising biocompatible material for biomedical applications that can extend to diverse domains such as in cardiovascular stents, orthopedic scaffolds, and wound closure devices¹⁻². Therefore, the main goal of this work was to analyze the corrosive behavior of cast Zn alloys: Zn-1Mg and Zn-1Mg-1Ag (wt. %) and describe the role of silver (Ag) addition on the degradation performance. To approach this, immersion tests were performed using various solutions simulating physiological conditions (HBSS+P/S, DMEM+P/S, and DMEM+FBS+P/S) during 7 days under cell culture conditions according to ASTM G1-03³. pH, osmolality, and corrosion rate were analyzed. Surface degradation was examined using scanning electron microscopy (SEM) and optical profilometry. For preliminary antibacterial activity observations, agar diffusion tests were conducted. As per the results of this work, both Zn-1Mg and Zn-1Mg-1Ag provided stable pH and osmolality values, and their corrosion rate and surface damage match the requirements of biomedical applications. As for the inhibition zone registered against *S. aureus*, the addition of Ag improved the antibacterial effect.

1. Mostaed E et al., *Act. Biomater.*, **2018**, Vol. 71, 1-23.

2. Rao J et al., *ACS Biomater. Sci. Eng.*, **2024**, Vol. 10, 5454-5473.

3. ASTM Special Technical Publication, **2017**, 1-9.

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