

Corrosion and cytotoxicity properties of ultralight Mg-8Li-0.5Ca alloys produced by laser powder bed fusion

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Biodegradable magnesium (Mg) alloys are meant to support healing processes and to be a replacement of human tissue over a period of time after fulfilling their function in terms of mechanical stability in the infected bone. The effect of Mg ions on bone-forming cells and their effect on osteogenic ability is beneficial. Achievement of the desired mechanical properties of Mg alloys is possible, but their widespread application is limited by the high and unpredictable corrosion rate. For orthopaedic implants, a uniform degradation rate of <0.5 mm/year in simulated fluids at 37°C is considered to ensure proper support of the implant [1-2].

This study focuses on producing a Mg-based alloys using laser powder bed fusion (LPBF) to investigate how the manufacturing method influences corrosion performance comparing to their cast counterpart. The powders for LPBF were produced using induction ultrasonic atomisation. The corrosion properties of both cast and LPBF Mg-8Li-0.5Ca alloys were tested using electrochemical and immersion methods. The corrosion rate of the materials was also investigated using hydrogen evolution and ion-release measurements. The cytotoxicity of the materials under investigation was assessed using the L929 murine fibroblast cell line. The samples were incubated at 37 °C in a 5% CO₂ atmosphere for 1, 3, 5 and 7 days. To evaluate the effect of released corrosion products on cell viability, an MTS assay was performed. Cytotoxicity testing revealed that LPBF produced material exhibited better biocompatibility than its cast counterpart. The obtained results provide a first insight into the corrosion and cytotoxicity properties of Mg-based alloys with the selected alloying elements produced by LPBF.

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2. 2F. Xing, S. Li, D. Yin, J. Xie, P.M. Rommens, Z. Xiang, M. Liu, U. Ritz, Recent progress in Mg-based alloys as a novel bioabsorbable biomaterials for orthopedic applications, *J. Magnes. Alloy.* 10 (2022) 1428–1456.