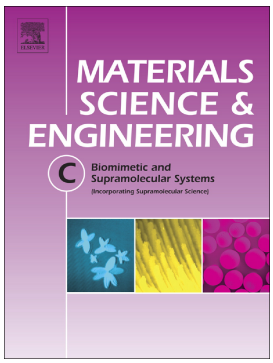

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Corrosion and Biological Performance of Biodegradable Magnesium Alloys Mediated by Low Copper Addition and Processing

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Abstract

Mg-Cu alloys were designed by introducing the well-known antibacterial property of copper into magnesium alloy to solve the infection problem especially under the neutralised environment *in vitro*. In this paper, the Mg-Cu alloys with further processing by solution and extrusion were studied to optimise the corrosion-related performance for their future application. It was shown that the differences in the property profile of Mg-Cu alloys are dependent on different compositions as well as on different microstructures that are obtained by the different processing routes. Galvanic corrosion can be significantly relieved by solution treatment and extrusion due to decrease and well distribution of cathodic Mg_2Cu phases. Negligible cytotoxicity were observed with rBMSCs incubation. Antibacterial assays proved that the alloys reduced the viability of Staphylococcus aureus by high alkalinity and copper ions releasing, especially in comparison with pure magnesium. Finally, the as-solutionized Mg-0.1Cu alloy showed the optimal corrosion properties and promising antibacterial activity, which warranted its potentials as antibacterial biodegradable implant materials.

Keywords: Magnesium alloy; Copper; Corrosion; Processing; Antibacterial

1. Introduction

Magnesium and its alloys have been intensively investigated as promising implant materials with merits of excellent biocompatibility and degradable characteristic to avoid the second surgery. Compared with permanent metallic fixation materials such as stainless steel and titanium alloys, the mechanical property of magnesium is in close proximity to the natural bone. Magnisum ion