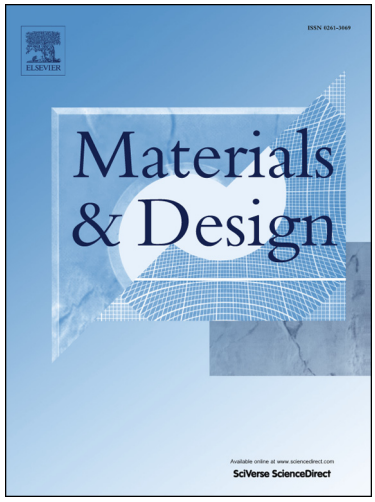

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Fabrication of graded porous titanium–magnesium composite for load-bearing biomedical applications

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Abstract

A kind of graded porous titanium–magnesium (Ti-Mg) composite, i.e., about 1-1.5 mm thick porous Ti layer is wrapped over the internal dense Ti-Mg composite, has been successfully fabricated by infiltration casting and acid etching. The outer porous Ti layer maintains its initial entangled structure, which can be easily adjusted to the ideal porosity and the porous structure. The thickness of the porous layer can be controlled by etching time. When the outer porous layer accounted for 41.6-42.4% of the total volume of the cylindrical sample, the compressive strength and the Young's modulus of the as-prepared graded porous composite are 110 MPa and 5 GPa, respectively, being comparable to that of natural bone. The outer porous layer provides good osteoconduction ability, and the internal dense Ti-Mg composite contributes to the monolithic strength and stiffness. Such biomechanical properties suggest its potentials for load-bearing bio-applications.

Keywords: graded porous titanium; graded porous composite; infiltration casting; acid etching; implant

1. Introduction

Titanium (Ti) and its alloys served as biomaterials exhibited good corrosion resistance, outstanding mechanical properties and excellent biocompatibility [1,2]. For different applications in the orthopedics, Ti and Ti-based alloy biomaterials could be made into specific

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