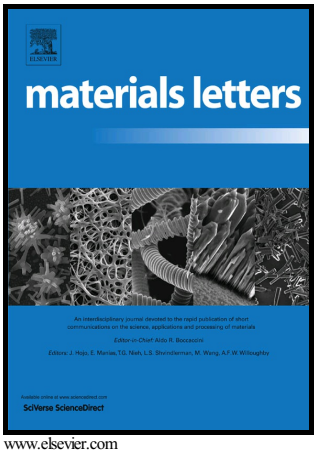

The effect of magnesium alloy wires and tricalcium phosphate particles on apatite mineralization on polylactide-based composites

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Abstract

Biodegradable magnesium alloy wires and tricalcium phosphate nanoparticles were used as a modifying phase of novel polylactide based composite system. The aim of this study was to determine the effect of those two components on apatite mineralization and thus potential bioactivity of the composite material. Studied samples were incubated in Simulated Body Fluid and Phosphate Buffer Saline to simulate biological environment. It was revealed that coexisting modification of polymer matrix with Mg and TCP resulted in formation of apatites with magnesium substitutions that have superior biological properties. Results of the study confirmed that chemical composition of the incubation medium affects composition of the precipitates. Designed multiphase composite can be potentially used for bioactive bone implants.

Keywords

Biomaterials, Composite materials, Magnesium alloy, Tricalcium phosphate, Polylactide, Apatite

1. Introduction

Biodegradable polymer based composites combined with different calcium phosphates (CaPs) are well-known for their suitability as bone engineering scaffolds, mainly due to the hydroxyapatite and other calcium phosphates chemical and crystal resemblance to the natural bone tissue [1–3]. However, when it comes to load bearing bone applications with desired biodegradability, this polymer-ceramic combination is not enough. Fortunately, biodegradable magnesium offers wide range of possibilities in the area [4,5]. Magnesium and its alloys are biocompatible and have favourable mechanical properties including Young's modulus much