Biodegradable Polylactic acid and Polylactic acid/Hydroxyapatite Coated Iron Foams for Bone Replacement Materials

Monika Hrubovčáková*, Miriam Kupková, Miroslav Džupon, Mária Giretová, Ľubomír Medvecký, Róbert Džunda

Institute of Materials Research, Slovak Academy of Science, Watsonova 47, SK-04001 Košice, Slovak republic

*E-mail: mhrubovcakova@saske.sk

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Biodegradable iron open cell foams fabricated via replica method have been studied as a potential material for bone scaffold. In order to improve their degradable behaviour and biocompatibility, the polylactic acid and polylactic acid/hydroxyapatite coatings were applied on foams. Microstructure of uncoated and coated iron foams was investigated using scanning electron microscopy. In vitro degradability of the manufactured foams was tested using electrochemical and static immersion tests in a simulated body fluid - Hank's solution. Mechanical properties and biocompatibility were studied by compression test and cytotoxicity test. The manufactured cellular foams have exhibited a highly porous 3D structure with open interconnected macropores similar to that of a cancellous bone. The presence of coatings on the foams' struts improved their mechanical properties and accelerated their biodegradability as compared to uncoated ones. Cytotoxicity test revealed that the presence of polylactic acid and polylactic acid/hydroxyapatite coating increased the cell viability.

Keywords: biodegradable metals, bone scaffolds, iron foams, biodegradation, mechanical properties

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