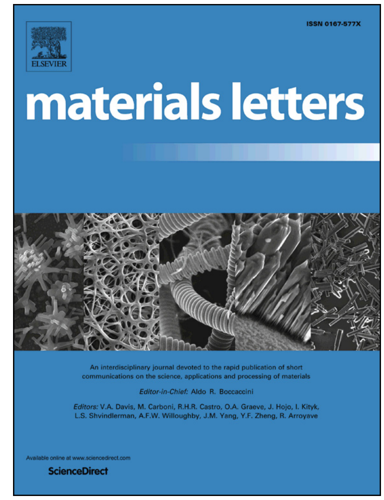
Accepted Manuscript



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PII: S0167-577X(17)31525-2
DOI: https://doi.org/10.1016/j.matlet.2017.10.065
Reference: MLBLUE 23300

To appear in: *Materials Letters*

Received Date: 15 July 2017
Revised Date: 20 September 2017
Accepted Date: 15 October 2017

Please cite this article as: T. Bian, K. Zhao, Q. Meng, H. Jiao, Y. Tang, J. Luo, Preparation and Properties of Calcium Phosphate Cement/Small Intestinal Submucosa Composite Scaffold Mimicking Bone Components and Haversian Microstructure, *Materials Letters* (2017), doi: https://doi.org/10.1016/j.matlet.2017.10.065

Preparation and Properties of Calcium Phosphate Cement/Small Intestinal Submucosa Composite Scaffold Mimicking Bone Components and Haversian Microstructure

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Abstract: Calcium phosphate cement (CPC)/small intestinal submucosa (SIS) composite scaffold was prepared in this work by subtly stacking bio-inspired Haversian motifs (lamellar cylindrical motifs), which can form a structure similar to the Haversian microstructure in natural bones. SIS is rich in collagen and CPC can be easily transformed to hydroxyapatite into body fluids, making the components of the scaffold similar to natural bones. Porosity and specific surface area of the scaffold were 32±0.58%, and 26.749±2.691 m^2/m^3 respectively. Pore size mainly ranges from 100 μm to 400 μm. The large specific surface area and the pore size are not only beneficial to cells attachment, growth, migration and revascularization, but also to the scaffold mineralization. After soaking for 6 h at 10× simulated body fluids, the compressive strength of the scaffold was about 27 MPa, 3 times more than that of the original scaffold. Thanks to the increasing compressive strength with holding the soaking time, the scaffold should be suitable for in vivo implanting and bone remodeling.

Key words: Bio-inspired; Haversian microstructure; Specific surface area; Pore size; CPC/SIS scaffold

1. Introduction

An ideal bone scaffold should be made of biomaterials imitating the structure and properties of bone extracellular matrix. While unique mechanical properties of bone tissue rely on its hierarchical structure and composition. Reznikov et al. [1, 2] divided the hierarchical structure of bones into 6 levels: Level 1: the major components collagen and bone mineral hydroxyapatite (HAp); Level 2: the mineralized collagen fibril building block; Level 3: fibril arrays; Level 4: arrays of parallel fibrils; Level 5: cylindrical motifs - osteons; Level 6: Bone- subtly assembled osteons. At present, the artificial nano-fiber bone scaffold structures are mainly constructed by stacking or rolling ordered fibrous membranes [3-5], which can improve mechanical properties or

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