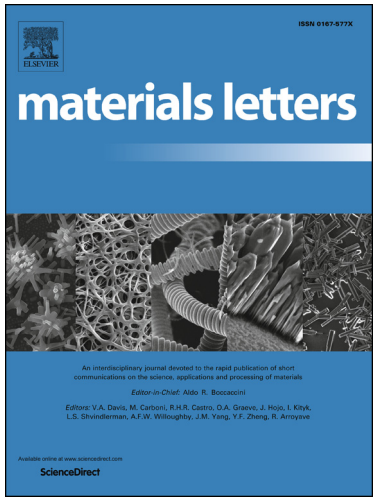

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Quantitative analysis of the role of nanohydroxyapatite (nHA) on 3D-printed PCL/nHA composite scaffolds

Myoung Hwan Kim[1], Chulhee Yun[3,4], Elna Paul Chalisserry[3,4], Yong Wook Lee[2,3,4], Hyun Wook Kang[1,3,4], Sang-Hyug Park[1,3,4], Won-Kyo Jung[1,3,4], Junghwan Oh[1,3,4], Seung Yun Nam[1,3,4*]

[1] Department of Biomedical Engineering, Pukyong National University, Busan, Korea

[2] School of Electrical Engineering, Pukyong National University, Busan, Korea

[3] Interdisciplinary Program of Marine-Bio, Electrical & Mechanical Engineering, Pukyong National University, Busan, Korea

[4] Center for Marine-Integrated Biomedical Technology (BK21 Plus), Pukyong National University, Busan, Korea

E-mail: synam@pknu.ac.kr

Corresponding address: 45, Yongso-ro, Nam-gu, Busan, Korea 48513

Abstract. Nanohydroxyapatite (nHA) is a widely accepted bone substitute material due to its biocompatibility and intrinsic osteoconductive properties. For various tissue-engineered applications including 3D-printing fabrication of bone substitutes, composite scaffolds combining calcium phosphate such as nHA with synthetic polymer such as polycaprolactone (PCL) have been extensively explored to enhance the mechanical and physiochemical properties. In this study, 3D-printed PCL/nHA scaffolds were developed using mechanical extrusion-based 3D bioprinter. Scaffold morphology, chemical composition, mechanical strength, cell proliferation, and mineralization were quantitatively analyzed at various concentrations of nHA (0, 10, 20 and 30 wt%). The experimental results suggest essential data to optimize mechanical properties, printability, cellular interactions, and osteoconductivity of 3D-printed PCL/nHA composite scaffolds.

Keywords

Biomaterials, Bioceramics, Composite materials, Microstructure

1. Introduction

Recently, 3D printing has been extensively used to fabricate complex tissue substitutes composed of various materials [1]. In orthopedic and dental applications, polycaprolactone (PCL) is one of the most widely used