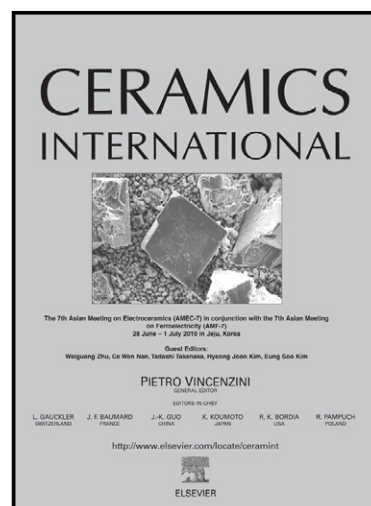


Effect of layer printing delay on mechanical properties and dimensional accuracy of 3D printed porous prototypes in bone tissue engineering

Arghavan Farzadi, Vicknes Waran, Mehran Solati-Hashjin, Zainal Ariff Abdul Rahman, Mitra Asadi, Noor Azuan Abu Osman



www.elsevier.com/locate/ceramint

PII: S0272-8842(15)00401-0
DOI: <http://dx.doi.org/10.1016/j.ceramint.2015.03.004>
Reference: CERI10082

To appear in: *Ceramics International*

Received date: 15 November 2014

Revised date: 13 February 2015

Accepted date: 2 March 2015

Cite this article as: Arghavan Farzadi, Vicknes Waran, Mehran Solati-Hashjin, Zainal Ariff Abdul Rahman, Mitra Asadi, Noor Azuan Abu Osman, Effect of layer printing delay on mechanical properties and dimensional accuracy of 3D printed porous prototypes in bone tissue engineering, *Ceramics International*, <http://dx.doi.org/10.1016/j.ceramint.2015.03.004>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Effect of layer printing delay on mechanical properties and dimensional accuracy of 3D printed porous prototypes in bone tissue engineering

Arghavan Farzadi^{a,*}, Vicknes Waran^b, Mehran Solati-Hashjin^a, Zainal Ariff Abdul Rahman^c, Mitra Asadi^a, Noor Azuan Abu Osman^a

^a Department of Biomedical Engineering, Faculty of Engineering, University of Malaya, 50603 Kuala Lumpur, Malaysia

^b Division of Neurosurgery, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia

^c Oral Cancer Research Team; Cancer Research Initiatives Foundation (CARIF) ; Subang Jaya , Selangor , Malaysia.

**Corresponding author: arghavan@um.edu.my
Tel.: +601123288082*

Abstract

Recent advancements in computational design and additive manufacturing have enabled the fabrication of 3D prototypes with controlled architecture resembling the natural bone. Powder-based three-dimensional printing (3DP) is a versatile method for production of synthetic scaffolds using sequential layering process. The quality of 3D printed products by this method is controlled by the optimal build parameters. In this study, Calcium Sulphate based powders were used for porous scaffolds fabrication. The X- direction printed scaffolds with a pore size of 0.8 mm and a layer thickness of 0.1125 mm were subjected to the depowdering step. The effects of four layer printing delays of 50, 100, 300 and 500 ms on the physical and mechanical properties of printed scaffolds were investigated. The compressive strength, toughness and tangent modulus of samples printed with a delay of 300 ms were observed to be higher than other samples. Furthermore, the results of SEM and μ CT analyses showed that samples printed with a delay of 300 ms have higher dimensional accuracy and are significantly closer to CAD software based designs with predefined 0.8 mm macro pore and 0.6 mm strut size.

Keywords

Additive Manufacturing, 3D printing, Dimensional accuracy, Compressive strength, Delay in Printing.

Download English Version:

<https://daneshyari.com/en/article/10624533>

Download Persian Version:

<https://daneshyari.com/article/10624533>

[Daneshyari.com](https://daneshyari.com)