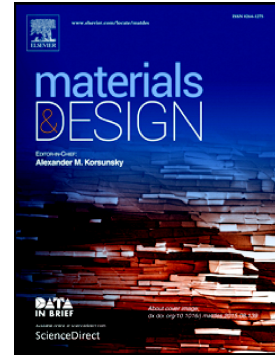


Accepted Manuscript

Morphological and mechanical characterization of topologically ordered open cell porous iron foam fabricated using 3D printing and pressureless microwave sintering

Pawan Sharma, Pulak M. Pandey



PII: S0264-1275(18)30723-8
DOI: doi:[10.1016/j.matdes.2018.09.029](https://doi.org/10.1016/j.matdes.2018.09.029)
Reference: JMADE 7390
To appear in: *Materials & Design*
Received date: 27 June 2018
Revised date: 5 September 2018
Accepted date: 13 September 2018

Please cite this article as: Pawan Sharma, Pulak M. Pandey , Morphological and mechanical characterization of topologically ordered open cell porous iron foam fabricated using 3D printing and pressureless microwave sintering. *Jmade* (2018), doi:[10.1016/j.matdes.2018.09.029](https://doi.org/10.1016/j.matdes.2018.09.029)

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 proof before it is published in its final 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.

Morphological and mechanical characterization of topologically ordered open cell porous iron foam fabricated using 3D printing and pressureless microwave sintering

Pawan Sharma, Pulak M. Pandey

Pawan Sharma¹, Pulak M. Pandey²

¹Research Scholar, Department of Mechanical Engineering, Indian Institute of Technology Delhi, New Delhi-110016, India

²Professor, Department of Mechanical Engineering, Indian Institute of Technology Delhi, New Delhi-110016, India

¹scholarpawansharma@gmail.com, ²pmpandey@mech.iitd.ac.in

Abstract

Topologically ordered porous structures (TOPS) have shown great potential in biomedical application. For biodegradable application, TOPS can prove to be advantageous especially for iron-based biodegradable materials. However, limited work has been reported which discusses the fabrication and characterization of iron-based TOPS. Hence, in the present work, topologically ordered open cell porous iron foam (TOPIF) was developed using a novel fabrication procedure consisting of 3D printing and pressureless microwave sintering. Different unit cell structures namely cubic, truncated octahedron and pyramid were used. Porosities in the range of 45.6-86.9 % and 5-22 % variation in dimensions were obtained. Compressive modulus of elasticity, plateau stress and ultimate compressive strength of TOPIF with 45.6-86.9 porosity were found in the range of 218.67-854.04 MPa, 4.24-21.60 MPa and 13.16-52.06 MPa respectively. Moreover, flexural modulus of elasticity and ultimate flexural strength in the range of 161-753 MPa and 9-38 MPa respectively were obtained. Analysis based on Gibson-Ashby model was performed and good agreement with experimental results was obtained. A comparative study showed that the fabricated TOPIF samples possessed ideal properties as required for an augmentation procedure of a human cancellous bone.

Keywords: Porous iron; 3D printing; microwave sintering; morphology; mechanical characterization.

Download English Version:

<https://daneshyari.com/en/article/11029834>

Download Persian Version:

<https://daneshyari.com/article/11029834>

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