

## Author's Accepted Manuscript

Effects of applied stress ratio on the fatigue behavior of additively manufactured porous biomaterials under compressive loading

Joep de Krijger, Calvin Rans, Brecht Van Hooreweder, Karel Lietaert, Behdad Pouran, Amir A Zadpoor



PII: S1751-6161(16)30413-1  
DOI: <http://dx.doi.org/10.1016/j.jmbbm.2016.11.022>  
Reference: JMBBM2143

To appear in: *Journal of the Mechanical Behavior of Biomedical Materials*

Received date: 4 April 2016  
Revised date: 12 October 2016  
Accepted date: 29 November 2016

Cite this article as: Joep de Krijger, Calvin Rans, Brecht Van Hooreweder, Karel Lietaert, Behdad Pouran and Amir A Zadpoor, Effects of applied stress ratio on the fatigue behavior of additively manufactured porous biomaterials under compressive loading, *Journal of the Mechanical Behavior of Biomedical Materials*, <http://dx.doi.org/10.1016/j.jmbbm.2016.11.022>

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

# Effects of applied stress ratio on the fatigue behavior of additively manufactured porous biomaterials under compressive loading

Joep de Krijger<sup>1</sup>, Calvin Rans<sup>2</sup>, Brecht Van Hooreweder<sup>3</sup>, Karel Lietaert<sup>4,5</sup>, Behdad Pouran<sup>6,7</sup>, Amir A Zadpoor<sup>6\*</sup>

<sup>1</sup>*Department of Materials Science and Engineering, Faculty of Mechanical, Maritime, and Materials Engineering, Mekelweg 2, Delft 2628CD, The Netherlands*

<sup>2</sup>*Faculty of Aerospace Engineering, Kluyverweg 1, Delft 2629HS, The Netherlands*

<sup>3</sup>*Department of Mechanical Engineering, KU Leuven, Leuven, Belgium*

<sup>4</sup>*3D Systems - LayerWise NV, Leuven, Belgium*

<sup>5</sup>*Department of Materials Engineering, KU Leuven, Leuven, Belgium*

<sup>6</sup>*Department of Biomechanical Engineering, Faculty of Mechanical, Maritime, and Materials Engineering, Mekelweg 2, Delft 2628CD, The Netherlands*

<sup>7</sup>*Department of Orthopedics, UMC Utrecht, Heidelberglaan100, 3584CX Utrecht, The Netherlands*

\*Corresponding author. Tel.: +31 15 2781021. a.a.zadpoor@tudelft.nl

## ABSTRACT

Additively manufactured (AM) porous metallic biomaterials are considered promising candidates for bone substitution. In particular, AM porous titanium can be designed to exhibit mechanical properties similar to bone. There is some experimental data available in the literature regarding the fatigue behavior of AM porous titanium, but the effect of stress ratio on the fatigue behavior of those materials has not been studied before. In this paper, we study the effect of applied stress ratio on the compression-compression fatigue behavior of selective laser melted porous titanium (Ti-6Al-4V) based on the diamond unit cell. The porous titanium biomaterial is treated as a meta-material in the context of this work, meaning that R-ratios are calculated based on the applied stresses acting on a homogenized volume. After morphological characterization using micro computed tomography and quasi-static

Download English Version:

<https://daneshyari.com/en/article/5020614>

Download Persian Version:

<https://daneshyari.com/article/5020614>

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