

Accepted Manuscript

Development of a Novel Loading Device for Studying Magnesium Degradation under Compressive Load for Implant Applications

Qiaomu Tian, Jose Antonio Mendez, Laura Rivera-Castaneda, Omar Mahmood, Adam Showalter, Elizabeth Ang, Sarah Kazmi, Huinan Liu

PII: S0167-577X(17)31915-8
DOI: <https://doi.org/10.1016/j.matlet.2017.12.147>
Reference: MLBLUE 23645

To appear in: *Materials Letters*

Received Date: 28 August 2017
Revised Date: 11 December 2017
Accepted Date: 29 December 2017

Please cite this article as: Q. Tian, J. Antonio Mendez, L. Rivera-Castaneda, O. Mahmood, A. Showalter, E. Ang, S. Kazmi, H. Liu, Development of a Novel Loading Device for Studying Magnesium Degradation under Compressive Load for Implant Applications, *Materials Letters* (2017), doi: <https://doi.org/10.1016/j.matlet.2017.12.147>

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.



Development of a Novel Loading Device for Studying Magnesium Degradation under Compressive Load for Implant Applications

Qiaomu Tian¹, Jose Antonio Mendez^{1,2}, Laura Rivera-Castaneda¹, Omar Mahmood¹, Adam Showalter¹, Elizabeth Ang¹, Sarah Kazmi¹, Huinan Liu^{1,3,*}

¹Department of Bioengineering, University of California, Riverside. Riverside, CA, USA, 92521

²Department of Mechanical Engineering, University of California, Riverside. Riverside, CA, USA, 92521

³Materials Science and Engineering, University of California, Riverside. Riverside, CA, USA, 92521

*Corresponding Author:

Huinan Liu, Ph.D.

Associate Professor

Department of Bioengineering

Materials Science and Engineering Program

University of California at Riverside

900 University Avenue

Riverside, CA 92521

Office: MSE 227

Phone: 951 827 2944

Fax: 951 827 6416

Email: huinan.liu@ucr.edu

Abstract

Medical implants play a key role in treating bone fractures. Permanent implants are currently used for immobilization of fractures and bearing physiological loads during bone healing. After bone has healed, these implants, if not removed, often cause complications in the long run; and secondary surgeries for removing them pose additional discomfort and expenses for patients. Magnesium (Mg)-based bioresorbable implants, can potentially eliminate the need for additional surgeries by degrading safely over time in the human body. When studying the degradation behaviors of Mg-based implants *in vitro*, it is important to simulate physiological conditions *in vivo* closely, including loading. Considering that implants often carry physiological loads *in vivo* and mechanical stresses affect the degradation rate of Mg, a novel loading device was designed and manufactured for studying Mg degradation under load over a long period of time in a simulated body fluid *in vitro*. Degradation of Mg rods were investigated by immersing in a revised simulated body fluid (rSBF) for two weeks while a consistent compressive load was applied using the loading device. The results showed that the loading device provided a consistent load of 500 ± 45 N during the two weeks of immersion. Mg rods showed a significant

Download English Version:

<https://daneshyari.com/en/article/8014201>

Download Persian Version:

<https://daneshyari.com/article/8014201>

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