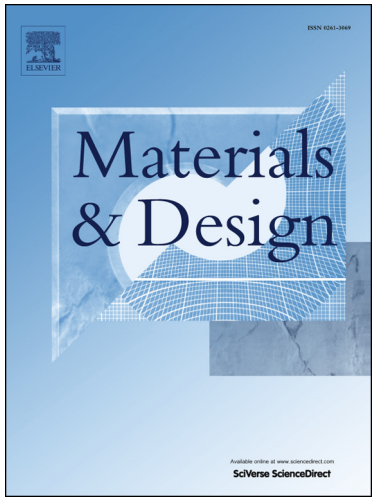

Biodegradable Mg-Zn-Ca-Sr bulk metallic glasses with enhanced corrosion performance for biomedical applications

Haifei Li, Shujie Pang, Ying Liu, Lulu Sun, Peter K. Liaw, Tao Zhang

PII: S0261-3069(14)00873-5
DOI: http://dx.doi.org/10.1016/j.matdes.2014.10.085
Reference: JMAD 6944

To appear in: *Materials and Design*

Received Date: 26 July 2014
Accepted Date: 29 October 2014

Please cite this article as: Li, H., Pang, S., Liu, Y., Sun, L., Liaw, P.K., Zhang, T., Biodegradable Mg-Zn-Ca-Sr bulk metallic glasses with enhanced corrosion performance for biomedical applications, *Materials and Design* (2014), doi: http://dx.doi.org/10.1016/j.matdes.2014.10.085

Biodegradable Mg-Zn-Ca-Sr bulk metallic glasses with enhanced corrosion performance for biomedical applications

Haifei Li [a, b], Shujie Pang [a, *], Ying Liu [a], Lulu Sun [a], Peter K. Liaw [b], Tao Zhang [a, *]

[a] Key Laboratory of Aerospace Materials and Performance (Ministry of Education), School of Materials Science and Engineering, Beihang University, Beijing 100191, China

[b] Department of Materials Science and Engineering, The University of Tennessee, Knoxville, TN 37996-2100, USA

Abstract:

Magnesium alloys with the integration of suitable corrosion behavior and good mechanical properties are desired for biodegradable materials. In this paper, novel biodegradable Mg-based bulk metallic glasses (BMGs) were synthesized in the Mg-Zn-Ca-Sr alloy system. Compared with the Mg-Zn-Ca BMG, the Mg-Zn-Ca-Sr BMGs with minor Sr incorporation possess improved glass-forming ability, better mechanical properties, enhanced and adjustable corrosion performance, reduced hydrogen evolution, and comparable cytocompatibility, indicating their promising potential to serve as biodegradable materials. The enhanced corrosion resistance of the Sr-incorporated BMGs is ascribed to the higher amount of the zinc hydroxide/oxide in the alloy surface, and a schematic model is proposed to illustrate the corrosion mechanisms of the Mg-Zn-Ca-Sr BMGs.

Keywords: Magnesium alloy; Biodegradable material; Bulk metallic glass; Mechanical property; Corrosion behavior

* Corresponding authors. Address: School of Materials Science and Engineering, Beihang University, Beijing 100191, China. Tel./fax: +86 10 82339705.

E-mail addresses: pangshujie@buaa.edu.cn (S.J. Pang), zhangtao@buaa.edu.cn (T. Zhang).