

Accepted Manuscript

Self-reinforcing injectable hydrogel with both high water content and mechanical strength for bone repair

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PII: S1385-8947(15)01684-8
DOI: <http://dx.doi.org/10.1016/j.cej.2015.12.021>
Reference: CEJ 14530

To appear in: *Chemical Engineering Journal*

Received Date: 9 September 2015
Revised Date: 30 November 2015
Accepted Date: 4 December 2015

Please cite this article as: X. Bai, S. Lü, Z. Cao, C. Gao, H. Duan, X. Xu, L. Sun, N. Gao, C. Feng, M. Liu, Self-reinforcing injectable hydrogel with both high water content and mechanical strength for bone repair, *Chemical Engineering Journal* (2015), doi: <http://dx.doi.org/10.1016/j.cej.2015.12.021>

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1 **Self-reinforcing injectable hydrogel with both high water content and mechanical strength**
2 **for bone repair**

3 Xiao Bai ^a, Shaoyu Lü ^{a,*}, Zhen Cao ^b, Chunmei Gao ^a, Haogang Duan ^a, Xiubin Xu ^a, Lu Sun ^a,
4 Nannan Gao ^a, Chen Feng ^a, Mingzhu Liu ^{a,*}

5 ^a *State Key Laboratory of Applied Organic Chemistry, Key Laboratory of Nonferrous Metal*
6 *Chemistry and Resources Utilization of Gansu Province and Department of Chemistry, Lanzhou*
7 *University, Lanzhou 730000, People's Republic of China*

8 ^b *School of stomatology, Lanzhou University, Lanzhou 730000, People's Republic of China*

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10 **ABSTRACT:** The main challenge for constructing hydrogels serving as a temporary skeleton to
11 support body load in bone tissue engineering is its poor mechanical strength. Covalent
12 crosslinking is generally introduced in hydrogel to enhance its mechanical strength. However,
13 this strategy always results in comitant reduction in the water content. In this study, a self-
14 reinforcing injectable hydrogel based on noncovalent and Diels-Alder (DA) chemical dual
15 crosslinking is developed to improve both its mechanical strength and water content. The
16 noncovalent crosslinking is designed through the supramolecular interaction of cyclodextrin and
17 adamantane, and the sol-gel transition of poly(*N*-isopropyl acrylamide) (PNIPAM), enabling
18 hydrogel formation in situ after injection. DA chemical crosslinking occurs via furfurylamine
19 grafted chondroitin sulfate (ChS-F) and maleimido-terminated poly(ethylene glycol) (PEG-
20 AMI), increasing the mechanical strength of hydrogel ($E \sim 25$ MPa). In vivo bone repair tests

* Corresponding author. Tel.: +86-931-8912387; fax: +86-931-8912582

E-mail address: lshy@lzu.edu.cn, mzliu@lzu.edu.cn

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