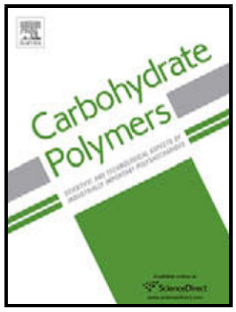

Title: Synthesis of Cellulose-Based Double-Network Hydrogels Demonstrating High Strength, Self-Healing, and Antibacterial Properties

Authors: Yixi Wang, Zhicun Wang, Keliang Wu, Jianning Wu, Guihua Meng, Zhiyong Liu, Xuhong Guo

PII: S0144-8617(17)30334-X
DOI: http://dx.doi.org/doi:10.1016/j.carbpol.2017.03.070
Reference: CARP 12159

To appear in:

Received date: 10-12-2016
Revised date: 21-3-2017
Accepted date: 21-3-2017

Please cite this article as: Wang, Yixi., Wang, Zhicun., Wu, Keliang., Wu, Jianning., Meng, Guihua., Liu, Zhiyong., & Guo, Xuhong., Synthesis of Cellulose-Based Double-Network Hydrogels Demonstrating High Strength, Self-Healing, and Antibacterial Properties.*Carbohydrate Polymers* http://dx.doi.org/10.1016/j.carbpol.2017.03.070

Synthesis of Cellulose-Based Double-Network Hydrogels Demonstrating High Strength, Self-Healing, and Antibacterial Properties

Yixi Wang[a,b], Zhicun Wang[a,b], Keliang Wu[a,b], Jianning Wu[a,b], Guihua Meng[a,b],Zhiyong Liu[a,b,*], Xuhong Guo[a,b,c]

[a] School of Chemistry and Chemical Engineering, Shihezi University, Shihezi, Xinjiang 832003, PR China. E-mail: lzyongclin@sina.com.

[b] Key Laboratory for Green Processing of Chemical Engineering of Xinjiang Bingtuan/Key Laboratory of Materials-Oriented Chemical Engineering of Xinjiang Uygur Autonomous Region/Engineering Research Center of Materials-Oriented Chemical Engineering of Xinjiang Bingtuan, Shihezi, Xinjiang 832003, PR China.

[c] State Key Laboratory of Chemical Engineering, East China University of Science and Technology, Shanghai 200237, P. R. China.

Highlights

- A novel double network hydrogel with superior mechanical property was prepared.
- The prepared hydrogel maintained good self-healing properties.
- The hydrogel possessed an excellent antibacterial property (antibacterial rate>93%), which could protect itself from microbial attack.

ABSTRACT: Novel antibacterial double-network (DN) hydrogels with superior mechanical and self-healing properties are developed via the UV-initiated copolymerization of polyacrylic acid (PAA)-grafted quaternized cellulose (QCE) and polyvinyl alcohol (PVA). The QCE functioned as an antibacterial agent, resulting in excellent antibacterial capability (antibacterial rate>93%). The hydrogels are thus protected from microbial attack in natural environments, prolonging their lifetime. The PVA functioned as a physical cross-linker, resulting in superior mechanical properties. At PVA and QCE contents of 8% and 1.5%, respectively, the strain and stress at break of hydrogel were 465.37% and 1.13 MPa, respectively. The hydrogel maintained good self-healing properties owing to ionic bonding between the ferric ions and carboxylic groups, and hydrogen bonding between the PVA molecules. The hydrogel was responsive to pH; its water-holding ability could be controlled