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Fabrication of a versatile lignin-based nano-trap for heavy metal ion capture and bacterial inhibition

Duo Xiao, Wei Ding, Jiubing Zhang, Yuanyuan Ge*, Zijun Wu, Zhili Li*

School of Chemistry and Chemical Engineering, Guangxi University, 100 Daxuedong Road, Nanning, 530004, China.

Corresponding author: E-mail: geyy@gxu.edu.cn; lizhili@gxu.edu.cn. Tel/Fax: +86-771-3233718.

Abstract

Diverse functional nanomaterial with minimal environmental impact and reduced production cost is currently great needed because of the growing environmental awareness and shortage of petroleum resources. Herein we reported the creation of a lignin-based nano-trap (LBNT) through functionalizing one of the most abundant biomass on Earth, lignin, with both soft and borderline bases facilitating the coordination of different types of heavy metal ions. The resultant LBNT exhibited remarkable removal efficiencies of > 99 % toward both soft (Ag(I), Hg(II), Cd(II)) and borderline (Pb(II), Cu(II), Zn(II)) ions, of which the residual concentrations were diminished from 5 mg/L to 3~9 μg/L that were below the permission values of drinking water regulated by the World Health Organization (WHO). Moreover, the produced nanomaterial could be adopted to load metal ions in atomic-level dispersion for preparing advanced nanocomposite. This was evidenced by the high bactericide rate of the silver-loaded nanocomposite (Ag@LBNT) as an antimicrobial toward Escherichia coli (99.68%) and Staphylococcus aureus (99.76%). This work may pave a way for the

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