



Adsorption of sunset yellow by luffa sponge, modified luffa and activated carbon from luffa sponge

Fei Xu^{a,†}, Xiao-yu Qi^{b,†}, Qiang Kong^{a,*}, Li Shu^c, Ming-sheng Miao^d, Shiguo Xu^a, Yuan-da Du^a, Qian Wang^a, Qun Liu^d, Shuai-shuai Ma^d

^aCollege of Geography and Environment, Shandong Normal University, 88 Wenhua Donglu, Jinan 250014, Shandong, China, Tel. +86 531 86182550; Fax: +86 531 86180107; emails: kongqiang0531@hotmail.com (Q. Kong), xufeisdn@yahoo.com (F. Xu), mailxsg@126.com (S. Xu), 392331698@qq.com (Y. Du), qianwang86@sdu.edu.cn (Q. Wang)

^bNo. 4 Middle School of Ningyang County, 118 Xinggang Road, Tai'an 271400, Shandong, China, email: 1737197806@qq.com

^cSchool of Engineering, RMIT University, 402 Swanston Street, Melbourne, VIC 3000 Australia, email: li.shu846@gmail.com

^dCollege of Life Science, Shandong Normal University, 88 Wenhua Donglu, Jinan 250014, Shandong, China, emails: mingshengmiao@163.com (M. Miao), 373400619@qq.com (Q. Liu), 2410191093@qq.com (S. Ma)

Received 6 February 2017; Accepted 13 May 2017

ABSTRACT

We investigated the adsorption of sunset yellow (SY) in water by luffa sponge (LC)-based materials. Modified luffa sponge (MLC) and luffa sponge activated carbon (LAC) were prepared by chemical modification and H₃PO₄ activation, respectively, followed by charring. Dried LC adsorbs SY poorly through a physical adsorption process, with an equilibrium adsorption capacity of 14 mg/g at 298 K. MLC and LAC showed substantially improved adsorption of SY. The maximum equilibrium adsorption capacity of MLC for SY reached 137 mg/g – 9.78 times that of raw luffa – and this adsorbent had a maximum removal rate of 99.9%. The adsorption capacity of LAC for SY was even higher, with the maximum equilibrium adsorption rate reaching 476.19 mg/g and the maximum removal rate exceeding 99% at 298 K. The kinetics of adsorption fit the pseudo-second-order kinetic equations for the three adsorbing agents, which suggests that the main limiting factor for adsorption is the adsorption mechanism. The isotherm curves for the three adsorbents fit the Langmuir isotherm equation with correlation coefficients above 0.99, which indicates the adsorption is monolayer adsorption.

Keywords: Luffa sponge; Modification; Activated carbon; Sunset yellow; Adsorption

* Corresponding author.

†These authors contributed equally to this work.

Presented at the 9th International Conference on Challenges in Environmental Science & Engineering (CESE-2016), 6–10 November 2016, Kaohsiung, Taiwan.

1944-3994/1944-3986 © 2017 Desalination Publications. All rights reserved.