Desalination and Water Treatment
www.deswater.com

36 (2011) 141–151
December

1944-3994/1944-3986 © 2011 Desalination Publications. All rights reserved
doi: 10.5004/dwt.2011.2241

Utilization of agricultural waste chestnut shell for the removal of Reactive Brilliant Red K-2G from aqueous solution

Jing-Feng Gao*, Jin-Hui Wang, Quan Yuan, Chen Yang, Shu-Ying Wang, Yong-Zhen Peng

College of Environmental and Energy Engineering, Beijing University of Technology, 100 Pingleyuan, Chaoyang District, Beijing 100124, China.
Tel.: +861067391918; Fax: +861067392627; email: gao.jingfeng@bjut.edu.cn, gao158@gmail.com

Received 1 September 2010; accepted 11 May 2011

ABSTRACT

Chestnut shell, an agricultural residue, was used as a low-cost adsorbent to remove Reactive Brilliant Red K-2G (RBR) from aqueous solution. Batch adsorption experiments were conducted to study the effects of initial solution pH value, adsorbent dosage, initial dye concentration and temperature on the adsorption. It was proved that strong acidic condition was favorable for the adsorption process and the optimal pH value was 1.0. Freundlich isotherm was appropriate for describing the experimental data. The kinetics study revealed that the adsorption of RBR onto chestnut shell followed the pseudo-second order model well. The external mass transfer mainly governed the adsorption rate. Thermodynamic studies demonstrated the spontaneous and exothermic natures of the adsorption process. The FTIR analysis indicated that functional groups such as amine, hydroxyl and phenolic compounds on the chestnut shell may be the active binding sites for the adsorption of RBR.

Keywords: Adsorption; Reactive Brilliant Red K-2G; Chestnut shell; Isotherm; Kinetic

*Corresponding author