Desalination and Water Treatment
www.deswater.com

doi: 10.1080/19443994.2014.941301

56 (2015) 684–694
October

Taylor & Francis
Taylor & Francis Group

Investigation of organic matter adsorption from TNT red water by modified bamboo charcoal

Dan Fu[a,b], Yihe Zhang[a,c,*], Xianghai Meng[a], Fengzhu Lv[a,*], Paul K. Chu[c], Kun Tong[a]

[a]*National Laboratory of Mineral Materials, School of Materials Sciences and Technology, China University of Geosciences (Beijing), Beijing 100083, China, Tel. +86 416 3212088; email: fudan20030333@126.com (D. Fu), Tel. +86 10 82323433; emails: zyh@cugb.edu.cn (Y. Zhang), mengxianghai_2006@163.com (X. Meng), lfz619@cugb.edu.cn (F. Lv), Tel. +86 13904279390; email: jiankang8848@sina.com (K. Tong)*

[b]*Department of Chemistry, Liao Ning Petrolchemical Vocational and Technology College, Liaoning 121001, China*

[c]*Department of Physics & Materials Science, City University of Hong Kong, Tat Chee Avenue, Kowloon, Hong Kong, China, Tel. +852 34427724; email: paul.chu@cityu.edu.hk (P.K. Chu)*

Received 14 November 2013; Accepted 26 June 2014

ABSTRACT

Bamboo charcoal impregnated with $ZnCl_2$ ($ZnCl_2$-BC) was used as an adsorbent to remove organic matters from TNT red water. The adsorption parameters, such as the adsorbent dosage, pH, contact time, dilution ratios of TNT red water, and temperature were studied. The equilibrium adsorption data were analyzed using Langmuir, Freundlich, and Temkin isotherms models. The Langmuir isotherm fitted the experimental results well. Kinetic analyses results showed that the adsorption kinetics was more accurately represented by the pseudo-second-order model. The studies of external diffusion and intraparticle diffusion models showed that external as well as intraparticle diffusions influenced on the actual adsorption process at different times and the removing velocity of organic matters from solution to the surface of adsorbent was very rapid. Thermodynamic studies showed that the adsorption of organic matters from TNT red water on $ZnCl_2$-BC was a spontaneous, endothermic, and random process at the solid/solution interface. The Dubinin–Radushkevich (D–R) models, thermodynamics, and the activation energy analysis indicated the adsorption was a physical mechanism. The adsorption was enforced by van der Waals force, hydrogen bonding formation electron, donor–acceptor interaction, and base and acid interaction based on HSAB theory.

Keywords: Adsorption; $ZnCl_2$-Bamboo Charcoal; Organic matter; TNT red water

*Corresponding authors.