



Equilibrium and kinetic studies on adsorption of Pb(II) by activated palm kernel husk carbon

Zheng-ji Yi^{a,b}, Jun Yao^{a,*}, Hui-lun Chen^a, Fei Wang^a, Xing Liu^b, Jin-sheng Xu^{b,*}

^a*School of Civil & Environmental Engineering, and National 'International Cooperation Base on Environment and Energy', University of Science and Technology Beijing, Beijing 100083, China, Tel./Fax +86 10 62333305; emails: yizhengji2004@126.com (Z.-j. Yi), yaojun@ustb.edu.cn (J. Yao), chenhuilun@gmail.com (H.-l. Chen), wangfei6699@gmail.com (F. Wang)*

^b*Key Laboratory of Functional Organometallic Materials of College of Hunan Province, Department of Chemistry and Material Science, Hengyang Normal University, Hengyang 421008, China, Tel. +86 734 8484932; emails: liuxing1127@sina.com (X. Liu), jsh_xu@126.com (J.-s. Xu)*

Received 23 April 2014; Accepted 30 January 2015

ABSTRACT

Batch experiments were conducted to study the ability of activated palm kernel husk carbon (APKHC) to adsorb Pb(II) ions from aqueous solutions. The effects of various operational parameters, such as temperature (25–55°C), pH (1.0–5.0), contact time (0–120 min), and adsorbent dose (0.5–3.5 g/L) were examined. The results suggested that the adsorption of Pb(II) is exothermic and strongly dependent on pH. The optimum pH for Pb(II) removal is 5.0. The Pb(II) uptake by APKHC was fast and reached an equilibrium in 80 min. The Pb(II) removal efficiency increased with increasing APKHC dosage up to 2.0 g/L, and then reached a plateau with approximately 97% of Pb(II) removed. Experimental data were fitted using Langmuir and Freundlich isotherms. The Pb(II) adsorption can be described well by the Langmuir model with a maximum monolayer uptake capacity of 98.04 mg/g. Kinetic study results suggested that the adsorption process proceeded according to the pseudo-second-order kinetic model. In short, APKHC can be used as an effective economical adsorbent for Pb(II) removal.

Keywords: Pb(II); Adsorption; Activated palm kernel husk carbon (APKHC); Isotherm; Kinetics

*Corresponding authors.