



“Gheorghe Asachi” Technical University of Iasi, Romania



PERFORMANCE OF MODIFIED BENTONITES FOR ADSORPTION OF PHENOL: MECHANISMS, KINETICS AND ISOTHERMS

Xiping Luo, Xixi Chen, Li Liu*, Yanlong Feng, Bing Li, Jianzhong Guo*

Zhejiang Provincial Key Laboratory of Chemical Utilization of Forestry Biomass, Zhejiang A & F University, Lin'an, Zhejiang Province, 311300, China

Abstract

Three modified bentonites, hydroxy-aluminum pillared bentonite (Al(OH)-Bent), cetyl trimethylammonium bromide modified bentonite (CTAB-Bent), and both cetyl trimethylammonium bromide and hydroxy-aluminum modified bentonite (Al(OH)-CTAB-Bent) were prepared and characterized by Fourier transform infrared spectroscopy (FTIR) analysis. Batch experiments were conducted on the adsorption of phenol at different temperatures, pH and initial concentration. The results indicated that adsorption capacity on Al(OH)-CTAB-Bent for phenol adsorption in the aqueous solution reaches $85.0 \text{ mg} \cdot \text{g}^{-1}$, which suggests that Al(OH)-CTAB-Bent is an excellent adsorbent for phenol removal. The pseudo-second-order kinetic model can appropriately describe the kinetic data for the adsorption of phenol onto Al(OH)-CTAB-Bent. Equilibrium data are analyzed by the Langmuir, Freundlich and adsorption isotherm models. The adsorption equilibrium data could be very well fitted to the Langmuir and Temkin models ($R^2 > 0.99$). The results of adsorption thermodynamics indicate that adsorption of phenol onto modified bentonites are spontaneous and endothermic.

Keywords: adsorption, cetyl trimethylammonium bromide, modified bentonite, phenol, thermodynamics

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* Author to whom all correspondence should be addressed: e-mail: gjianzhong123@163.com; liuli582003@126.com