Removal of Heavy Metal Ions with Acid Activated Carbons Derived from Oil Palm and Coconut Shells

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Abstract

In this work, batch adsorption experiments were carried out to investigate the suitability of prepared acid activated carbons in removing heavy metal ions such as nickel(II), lead(II) and chromium(VI). Acid activated carbons were obtained from oil palm and coconut shells using phosphoric acid under similar activation process while the differences lie either in impregnation condition or in both pretreatment and impregnation conditions. Prepared activated carbons were modified by dispersing hydrated iron oxide. The adsorption equilibrium data for nickel(II) and lead(II) were obtained from adsorption by the prepared and commercial activated carbons. Langmuir and Freundlich models fit the data well. Prepared activated carbons showed higher adsorption capacity for nickel(II) and lead(II). The removal of chromium(VI) was studied by the prepared acid activated, modified and commercial activated carbons at different pH. The isotherms studies reveal that the prepared activated carbon performs better in low concentration region while the commercial ones in the high concentration region. Thus, a complete adsorption is expected in low concentration by the prepared activated carbon. The kinetics data for Ni(II), Pb(II) and Cr(VI) by the best selected activated carbon fitted very well to the pseudo-second-order kinetic model.

Keywords

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