

Removal of Cu(II) and Pb(II) from wastewater using biochar-clay nanocomposite

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ABSTRACT

The new nanocomposite material has been synthesized from inexpensive and abundantly available materials. Bentonite and water hyacinth were used as the precursors for the preparation of bentonite – biochar nanocomposite. The nanocomposite was produced at 400°C under a combination of nitrogen and carbon dioxide environment. The adsorption capability of the nanocomposite was tested for the removal of Cu(II) and Pb(II) from aqueous solution. Temperature dependent forms of Langmuir and Freundlich equations were employed to correlate the experimental data. Based on the physical meaning assessment of the parameters, the Langmuir equation with its temperature dependent form can correlate the experimental data better than Freundlich. The maximum adsorption capacity for nanocomposite toward Cu(II) and Pb(II) are 78.1 mg/g and 44.7 mg/g, respectively. The adsorption kinetic data of Cu(II) and Pb(II) onto bentonite and nanocomposite follow pseudo-first-order equation, with k_1 strongly dependent on temperature. The thermodynamic study reveals that the adsorption Cu(II) and Pb(II) was controlled by physical adsorption and spontaneous.

Keywords: Nanocomposite; Biochar; Bentonite; Adsorption isotherm; Adsorption kinetic

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