



## Evaluation of performance of calcined bones as a new adsorbent for the removal of carbaryl pesticide from aqueous solutions

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Received 7 January 2017; Accepted 20 July 2017

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### ABSTRACT

In this work, the efficiency of animal bone meal (ABM) as a new low-cost adsorbent for removing a carbaryl pesticide from aqueous solutions has been investigated. Factors affecting the adsorption process: adsorbent amount, contact time, pesticide concentration, solution pH, particle size of adsorbent and temperature were studied by using the batch technique. The results showed that carbaryl adsorption equilibrium was rapidly attained after 50 min of contact time. The isotherms of adsorption data were analyzed by Langmuir and Freundlich adsorption isotherm models. The adsorption capacity,  $Q_m$ , obtained from the Langmuir isotherm plots were 24.94, 24.75, 24.63 and 24.27 mg·g<sup>-1</sup>, respectively, at 303, 313, 323 and 333 K. The rates of adsorption were found to confirm to the pseudo-second-order kinetics with good correlations ( $R^2 > 0.99$ ). The characteristic results namely dimensionless separation factor  $R_L$ , the adsorption intensity  $n$  and a comparison of maximum adsorption capacity (24.94 mg·g<sup>-1</sup>) observed in this study with other adsorption capacities as reported in the literature showed that ABM can be employed as a promising alternative to commercial adsorbents in the removal of carbaryl pesticide from aqueous solution.

*Keywords:* Animal bone meal; Adsorption isotherms; Carbaryl; Removal; Water treatment; Kinetics

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