



Comparative study on the adsorption of malathion pesticide by different adsorbents from aqueous solution

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ABSTRACT

A study on the adsorption behavior and removal of an organophosphorous pesticide, malathion, from aqueous solution was carried out using batch method. The activated charcoal and bentonite clay were selected as commonly used adsorbents to be compared to a less commonly used kaolinite clay. Two thermally treated kaolinite samples were prepared at different temperatures. The samples were investigated by means of X-ray powder diffraction and thermogravimetric analysis. In aqueous medium, the thermally treated clay samples displayed higher adsorption capacities ($q_e = 356.06$ and $362.37 \mu\text{mol g}^{-1}$, for kaolinite, and $282.32 \mu\text{mol g}^{-1}$, for bentonite) relative to that of the untreated one ($q_e = 311.87 \mu\text{mol g}^{-1}$, for kaolinite, and $188.13 \mu\text{mol g}^{-1}$, for bentonite). In addition, the thermally treated kaolinite samples exhibited faster adsorption rates ($k_1 = 3.03 \times 10^{-3}$ and $2.77 \times 10^{-3} \text{ min}^{-1}$) compared with that of the untreated one ($k_1 = 1.84 \times 10^{-3} \text{ min}^{-1}$). Desorption of malathion from the loaded samples was also carried out for regeneration purposes. The adsorption/desorption cycle of malathion on the kaolinite samples was repeated several times and the removal efficiency of the regenerated kaolinite sample was noticed to decrease after the 3rd cycle.

Keywords: Malathion; Adsorption; Kaolinite; Bentonite; Insecticides; Isotherms

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