



Adsorption Potentials of Fadama Clays towards Heavy Metals (Zinc and Cobalt)

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Abstract

This study investigated the potentials of Fadama Clays (Wetland soil) in the adsorption of heavy metals such zinc and cobalt ions. Fadama Clays collected from three different locations in Delta State were analyzed for Physico-chemical parameters. The effect of pH, contact time and adsorbent dosage were evaluated. The adsorption behavior was characterized using adsorption isotherms, adsorption kinetics (pseudo second order rate equation), diffusion-chemisorptions kinetics and adsorption edge experiments. Application of Langmuir isotherm and adsorption kinetics showed that Fadama soils adsorbed the metal ions at lower pH values of 1 to 4. Adsorption kinetics (pseudo second order rate equation) showed that FAP (Patani Fadama clays) had the highest equilibrium rate constant K (0.277mg/l/mins and 0.147mg/l/mins) for Zn and Co respectively and next is FAU (Uwhurun Fadama clays) (0.214mg/l/mins and 0.000mg/l/mins). FAK (Kokori Fadama clays) has the lowest equilibrium rate constant (K) (0.079mg/l/mins and 0.100 mg/l/mins). Application of Diffusion-chemisorptions kinetics indicated FAK yielded maximum adsorption capacities for the two metal ions with K_{DC} (Zn:0.89mg/g/l Co:0.24mg/g/l) followed by FAP with K_{DC} (Zn: 0.32mg/g/l Co:0.22mg/g/l) and FAU the least with K_{DC} (Zn:0.15 mg/g/l Co:0.23 mg/g/l) at lower pH values of 1 to 4. This was as a result of available surface area and reduced distance for the sorbate to travel to reach an active sorption site.

Keywords: Fadama, Adsorption Isotherm, Adsorbent, Diffusion-chemisorptions (K_{DC}).

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