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Adsorptive Removal of Copper in Aqueous Solutions using *Pandanus kaida* Leaf Powder

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Abstract

The study focused on investigating the feasibility and potential of *Pandanus kaida* (watekeiya) as a novel adsorbent for the removal of Cu (II) from aqueous solutions through evaluation of adsorbent characterization, batch adsorption, kinetic, adsorption isotherm, and regeneration studies. The initial and residual metal concentration in the solution was quantitatively analyzed using Flame Atomic Absorption Spectroscopy (FAAS). The optimum conditions for the maximum removal of Cu (II) by the adsorbent were found to be: 0.300 g in 100 mL of the adsorbate solution at pH 6 for 120 minutes contact time at a temperature of 60 ℃ and with a particle size of 250 μm. The adsorption isothermal studies conducted at 30℃, employing the use of Langmuir, Freundlich and D-R isotherm models revealed the Langmuir model as the best-fitted model with a correlation coefficient of 0.96 suggesting the occurrence of monolayer adsorption for the removal of Cu (II) by watekeiya leaf powder. The maximum monolayer adsorption capacity obtained from the Langmuir isotherm model was 15.45 mg g^{-1} at 30 ℃. The adsorption kinetics revealed that among pseudo-second-order, pseudo-first order, intraparticle diffusion and liquid film diffusion models, experimental data fitted the pseudo-second-order kinetics model the best with a correlation coefficient of 0.98 indicating that the rate-determining step of the adsorption proceeded via chemisorption. The regeneration studies carried out for two consecutive cycles confirmed the reusability of the absorbent. The characterization of the adsorbent done using FTIR revealed the presence of hydroxyl, amide, ether and carbonyl. The SEM analysis done on the adsorbent showed an irregular surface structure with pores which can aid in adsorption.

Keywords: *Heavy metals, Batch adsorption, Kinetic model, Isotherms, Water pollution*