

Evaluation of kaolin clay and palm oil boiler fly ash as an adsorbent for removing methylene blue dye in wastewater

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Color removal in wastewater using adsorbents prepared from waste materials is a major treatment option. In this study, we attempted to develop adsorbents for color removal using residues from the palm oil industry. The objectives of this study were to prepare adsorbents using Kaolin clay (KC) with palm oil boiler fly ash (POBA), evaluate them for adsorption using methylene blue (MB), and modeling for dye removal. Four different adsorbents were prepared by mixing two types of Kaolin clay (KC₁ and KC₂) in two different ratios with POBA (1:1 and 1:2). After mixing, they were heated up 1200 °C for 1 h in a muffle furnace. Batch adsorption studies were conducted using four dye concentrations (15, 30, 50, and 100 ppm) with adsorbents (5 g of each) at room temperature. Adsorption studies under different pH (4, 7, and 10) were also conducted. The results showed that dye adsorption increases with increasing initial dye concentration, contact time, and initial pH. The equilibrium data were best fitted to the Langmuir isotherm model showing the monolayer coverage of MB onto the prepared adsorbents. Maximum adsorption capacity of KC₂: POBA (1:1), KC₂: POBA (1:2), KC₁: POBA (1:1) and KC₁: POBA (1:2) were found 0.51 mg/g, 0.33 mg/g, 0.47 mg/g, and 0.28 mg/g, respectively and they were significantly different (Probability =0.0001). Maximum color removal was observed in adsorbents prepared using KC₂ with POBA (1:1). However, further adsorption studies are suggested to evaluate the adsorbents using real dyeing wastewater before the large scale applications.

Key words: *Adsorption, isotherms, kaolin clay, methylene blue*

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