# Color Removal of Dye Wastewater Using the Bottom Coal Ash of Thermal Power Plant


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**ABSTRACT**

In the study, the thermal power plant waste material, bottom ash, was used as an adsorbent for the removal of Reactive Red 198 (R-R 198) and Reactive Black 5 ( R-Bk 5 ) from aqueous solution. Batch adsorption studies were conducted to explore the effect of pH, adsorbate concentration, sieve size, adsorbent dosage and temperature. Kinetic studies, thermodynamic studies and column operations were also carried out to study the effectiveness of dye removal. Greater dye-removal percentage was obtained with a decrease in the initial concentration of dyes and an increase in amount of adsorbent used. In addition, pseudo-first-order pseudo-second-order and Bangham ’ s models were used to describe the experimental dat. Kinetic studies showed that the adsorption process obeyed the pseudo-second-order kinetic model. Equilibrium isotherms were analysed by Freundlich, Dubnin-Radushkevich, Langmuir, Temkin and Redlich-Peterson isotherm equations using correlation coefficients and five different error functions. Langmuir equation is found to best represent the equilibrium data for R-R 198-bottom ash and R-Bk 5-bottom ash system. Thermodynamic studies showed that the adsorption was spontaneous and endothermic. Furthermore, adsorption column design was done to examine the effect of flow rate, adsorbate concentration and adsorbent dosage on color removal by scale-up and kinetic approach. The bottom ash without any pretreatment showed high surface area, pore volume and pore size, exhibiting it potential to be used as an adsorbent for the removal of R-R 198 and R-Bk 5.



Keywords : Adsorption ; Bottom ash ; Color removal ; Kinetics ; Column


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