

## Utilization of differently activated charcoal from coconut shells (*C. nucifera*) for textile dye adsorption

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Dye effluents released from numerous dye-utilizing industries are toxic and carcinogenic to both aquatic life and human beings. Before discharging, dye wastewater should be treated to minimize its harmful effects on the environment and other living beings. Numerous studies have demonstrated that the best alternative approach for dye adsorption is the utilization of activated charcoal. In this study, activated charcoal made from coconut shells in three different weight ratios of carbon to sodium hydroxide (NaOH) and three different pyrolysis temperatures were adopted for the adsorption process with four different industrial dyes taken from textile industries. FTIR spectroscopy was employed to identify the functional groups in the adsorbents. Further, the effects of contact time on dye adsorption were studied. The experimental result showed that the best adsorption capacity of activated carbon was AC-9 at a weight ratio of carbon to NaOH, 1:3, and a pyrolysis temperature of 800 °C, for dye adsorption. According to the results, higher pyrolysis temperatures and higher carbon: NaOH weight ratios have a direct impact on adsorption capacity development and changed the physical properties of activated carbon. The greater the quality of the activated carbon produced, the larger the surface area and pore diameter. When investigating the effect of contact time, initially increased rapidly and reached the maximum adsorption capacity after some time. After carrying out rigorous experiments, it was concluded that activated carbon prepared from coconut shells under high conditions can be effective for the removal of textile dye. This would have the potential to use in large-scale processes, due to their low cost, easy synthesis pathway, and ready availability.

**Keywords:** *Adsorbents, contact time, pyrolysis temperature, sodium hydroxide to carbon weight ratio*