Evaluating the optimum working parameters for the removal of methyl orange from aqueous solution based on a statistical design

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**ABSTRACT**

In this study, a $2^3$ full factorial design, rather than a conventional method, was used for determining the optimum working parameters and choosing the best adsorbent for removal of methyl orange (MO) from aqueous solution. Regenerated multiwall carbon nanotubes (reg-MWCNT), which had been used in previous studies, and granular-activated carbon (GAC) were selected as adsorbents for this application. The experimental design determined the effect of three factors (temperature, pH, and initial dye concentration) and the interactions between them. The extent of removal of MO by reg-MWCNT was higher than by GAC. All experimental factors were examined and their interactions were found to be significant for percentage removal of MO, with pH being the most significant. Using only eight experiments, the highest percentages of MO removal on reg-MWCNT and GAC were 98.51 and 84.66%, respectively, achieved when the pH of the dye solution was 2 at 25°C and with 20 mg/L initial dye concentration.

**Keywords:** Regenerated carbon nanotubes; Active carbon; Adsorption; Factorial design; Dye removal

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