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INFLUENCE OF PROCESS VARIABLES ON ADSORPTION OF CONGO RED ONTO MANGO LEAF CHAR USING FACTORIAL DESIGN ANALYSIS

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Abstract

Influence of process variables like pH, adsorbent dosage (D), initial dye concentration (C₀), particle size (S) and temperature (T) on adsorption of a direct dye on carbon derived from mango leaf were studied using a 25 factorial design. The main effects and interaction effects were determined using statistical methods. Maximum uptake obtained was 55.7 mg/g (pH = 2, T = 40 °C, D = 0.5 g/dm³, C₀ = 100 mg/dm³ and S = 53 μm). It was found that the effects of process variables namely pH, adsorbent dosage, initial dye concentration, particle size and temperature on dye uptake were statistically significant. In addition, 2-level, 3-level and 4-level interactions between the variables were also found to influence dye uptake significantly. The model explained 96.79% variation in the response leaving only 3.21% for residuals. Dye uptake capacity up to 55.7 mg/g could be obtained with the proposed carbonaceous adsorbent mango leaf char.

Key words: Congo red, direct dye, dye removal, factorial design, mango leaf char

Received: April, 2013; *Revised final:* March, 2014; *Accepted:* March, 2014

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