

Plackett-Burman design and response surface methodological approach to optimize basic dyes removal using sugarcane bagasse

Abstract:

Plackett-Burman design was applied to identify the most significant factors in the removal of Basic Blue 3 (BB3), Methylene Blue (MB) and Basic Yellow 11 (BY11) by natural sugarcane bagasse. The effect of operating parameters on dye uptake was studied in a batch system and a mathematical model showing the influence of each variable was obtained. The interaction between the factors and their optimum levels for maximum percentage uptake of BB3 and MB were determined using Response Surface Methodology (RSM). Both models were highly significant with correlation coefficients (R^2) of 0.9932 and 0.9944 for BB3 and MB, respectively in binary dye solution. For BB3, the optimum adsorption conditions were determined as initial pH 6.00, contact time 122.50 min, initial dye concentration 50 mg/L and sorbent dosage 0.09 g. Whereas for MB, the model predicted that an uptake greater than 90% could be obtained when the initial dye concentration, contact time and sorbent dosage were set at 80.40 mg/L, 192.37 min and 0.17 g, respectively. The percentage uptake predicted by the model was in good agreement with the experimental values.