



Design of experiments for Malachite Green dye removal from wastewater using thermolysis – coagulation–flocculation

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Received 29 June 2011; Accepted 8 November 2011

ABSTRACT

Thermolysis – coagulation–flocculation was used for reduction of colour and chemical oxygen demand (COD) of aqueous basic dye Malachite Green. Statistical design of experiment was used for thermolysis experiments which resulted of 69.57% and 70.59% maximum reduction of COD and color, respectively at the optimum conditions of 95 min treatment time, 82°C treatment temperature, and pH 11.02. MgCl₂ was used as coagulant for coagulation–flocculation. About 98% of color and 90% of COD were reduced at a final pH of 10.89 and a coagulant dose of 3 g MgCl₂ l⁻¹ of dye solution. The optimum conditions for coagulation–flocculation process were determined by varying a single factor while keeping other factors fixed at a specific set of conditions. Coagulation–flocculation after thermolysis at the optimal operating conditions resulted in a reduction of 91.26% COD and 98.78% color at final pH 10.89 but at a much lesser coagulant dosage of 500 mg l⁻¹. Compared to only coagulation–flocculation, combined process of thermolysis followed by coagulation–flocculation produced relatively less floc, since lesser amount of coagulant was required to remove higher color and COD.

Keywords: Design of experiments; Malachite Green; COD; Color; Thermolysis; Coagulation–flocculation

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