



## Synthesis of copper oxide nanoparticle and photocatalytic dye degradation study using response surface methodology (RSM) and genetic algorithm (GA)

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### ABSTRACT

The aim of our research was to study the ability of CuO nanoparticle which was synthesized for photocatalytic dye degradation of Direct Red 31 (DR31), Reactive Red 194 (RR194) and Reactive Red 120 (RR120) and to apply response surface methodology (RSM) and genetic algorithm (GA) in the optimization of the process. The characteristics of the nanoparticle were investigated by XRD, SEM and FTIR. The experiments were analyzed using response surface methodology and genetic algorithm. A Historical Data Design was used to evaluate the effects and interactions of the four significant variables: catalyst dosage, dye concentration, reaction time and salt (inorganic anion) on the photocatalytic degradation of dyes as the process response. All the experimental data showed the good agreement with the predicted results according to RSM and GA optimizations. Under the optimized conditions (catalyst dosage, 0.005 g; dye concentration, 50 mg/L; reaction time, 180 min and inorganic anion, blank) the maximal decolorization efficiencies of 78.25% , 80.08% and 70.14% were achieved for DR31, RR194 and RR120 respectively.

*Keywords:* Synthesis; Copper oxide nanoparticle; Photocatalytic dye degradation; Response surface methodology; Genetic algorithm

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