Abstract

Adsorption of basic violet 16 from aqueous solutions by Magnetic graphene oxide

Background and Objective: Dye wastewater from the textile manufacturing may show toxic or carcinogenic effects on organism when discharged into rivers and lakes changing their biological life. Therefore, in this study, the removal of basic violet 16 was investigated by a magnetite graphene oxide nanocomposites (Fe_3O_4@GO) optimizing by response surface methodology based on Box-Behnken method.

Methods: Fe_3O_4@GO nanocomposite was prepared by a facile in situ co-precipitation strategy, resulting in a suitable composite for the application of graphene oxide in wastewater treatment. The structure and morphology of the Fe_3O_4 @GO adsorbent were investigated using XRD, FT-IR, SEM, BET and VSM techniques.

Results: In the SEM images be observed that the Fe_3O_4 NPs are distributed between the GO sheets and empty spaces with large pores between GO sheets are visible, also the results of the FT-IR analysis showed that the largest group was carboxyl group. The various parameters in the process, such as pH, reaction time, adsorbent dose and initial concentration of dye, were evaluated. The proposed model (quadratic) with a high correlation coefficient (R^2 =0.98) and (R^2_{adj} =0.97) was approved. Favorable removal of dye (efficiency: 95.03%.) was obtained under following conditions: the dye concentration of 62.5 mg L^{-1}, the absorbance of 0.2 g L^{-1}, the reaction time of 60 minutes and solution pH of 7.5.

Conclusion: The results of the study of adsorption isotherms and kinetics showed that the adsorption process follows the Langmuir isotherm (R^2: 0.98) and the pseudo-second-order kinetic (R^2: 0.99) models. The present study showed that the Fe_3O_4 @GO adsorbent has high efficiency in removal of violet 16.

Keywords: Adsorption, violet 16, Graphene oxide, Magnetic nanopartic