

Removal of Malachite Green dye from aqueous solution using a new nanocomposite: Equilibrium, kinetic and thermodynamic studies

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In this study, trisodium citrate based magnetite nanocomposite (Fe_3O_4 -TSC) was used for the removal of malachite green (MG) dye from aqueous medium. The adsorption tests were performed at different parameters. The optimized pH and time were found to be 7 and 40 min, respectively. The equilibrium adsorption data were demonstrated using Langmuir and Freundlich isotherms and better agreement was attained with the Langmuir model. The maximum adsorption capacity was calculated 435 mg g^{-1} using Langmuir equation. The kinetic parameters displayed that MG adsorption onto Fe_3O_4 -TSC followed pseudo-second-order kinetic model. The thermodynamic parameters were evaluated and it was found that adsorption of MG onto Fe_3O_4 -TSC was spontaneous and exothermic. The desorption studies showed the best recovery of MG dye in 0.1 M HCl. Finally, it was found that Fe_3O_4 -TSC can be effortlessly separated from mixed solutions using external magnetic field.