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Evaluation of magnetic silica polyaniline graphene oxide composite for efficient removal of chlorinated phenol from aqueous solutions

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Wastewater treatment containing phenols and chlorinated phenols has attracted research efforts. Therefore, in the present study an attempt was made to remove 2,4-dichlorophenol from aqueous solution using an environment friendly adsorbent. Magnetic silica polyaniline graphene oxide composite (Fe_3O_4@SiO_2@PANI-GO) was synthesized and characterized by Scanning electron microscopy (SEM), Fourier transformed infrared spectroscopy (FTIR) and Energy Dispersive X-ray (EDX) techniques. The impact of various factors influencing the adsorption capacity of 2,4-dichlorophenol such as solution pH, temperature, concentration of 2,4-dichlorophenol, amount of adsorbent and contact time was studied in batch experiments. The adsorption data of 2,4-dichlorophenol was evaluated for kinetic models and adsorption isotherms. Among the kinetic models studied, pseudo second order model was the suitable to describe the adsorption kinetics and close agreement of theoretical qe value (121.95 mg/g) with experimental value (107.24 mg/g) was found. The adsorption isotherm indicated that the adsorption process best described by the Freundlich isotherm model. The monolayer adsorption capacity (Q°) was 625.0 mg/g. The negative value of ΔG° and positive values of ΔH° confirmed the spontaneous and endothermic adsorption process. Positive value of ΔS° exhibited that the adsorption was favorable and Fe_3O_4@SiO@PANI-GO showed affinity for 2,4-dichlorophenol. The reusability potential of the adsorbent was also studied.