

## Removal of highly toxic Cd(II) metal ions from aqueous medium using magnetic nanocomposite: adsorption kinetics, isotherm and thermodynamics

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### ABSTRACT

In this research, trisodium citrate (TSC) based magnetite ( $\text{Fe}_3\text{O}_4$ ) nanocomposite was developed ( $\text{Fe}_3\text{O}_4@\text{TSC}$ ) and applied as an efficient adsorbent for removal of Cd(II) from aqueous medium. The influence of experimental factors such as pH of the solution, amount of  $\text{Fe}_3\text{O}_4@\text{TSC}$ , temperature, contact time and initial Cd(II) concentration were studied. The results exhibited that the optimum pH value, equilibrium time and temperature were 7.6, 60 min and 298 K, respectively. The adsorption isotherm and kinetics were followed to the Langmuir isotherm and pseudo-second-order model, respectively. The maximum monolayer adsorption capacity was 312.5 mg/g at 298 K. The adsorption of Cd(II) on  $\text{Fe}_3\text{O}_4@\text{TSC}$  was exothermic in nature and spontaneous process based on negative values of  $\Delta H^\circ$  and  $\Delta G^\circ$ . The type of interactions between electropositive Cd(II) and the carboxylic group was electrostatic interactions.

*Keywords:* Magnetic; Nanocomposite; Isotherm; Kinetics; Toxic Cd(II)

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