



Adsorptive remediation of Cu(II) and Cd(II) contaminated water using manganese nodule leaching residue

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ABSTRACT

Investigations carried out for the application of manganese nodule leaching residue in the removal of Cu(II) and Cd(II) from aqueous solution by adsorption are described. Several parameters, namely pH of solution, time, initial concentration of adsorbate metal ion, residue dose, etc., have been varied to study the feasibility of using residue as potential adsorbent for remediation of Cu(II) and Cd(II) contaminated water. The adsorption kinetics followed pseudo-second-order equation and the rate of adsorption increased with solution temperature. The equilibrium data was best fitted into Langmuir adsorption isotherm and the maximum adsorption capacities of washed manganese nodule residue (*w*MNR) towards Cu(II) and Cd(II) were found to be 26.95 and 32.26 mg g⁻¹, at pH 5.5 and temperature 303 K, which improved to 40.32 and 38.17 mg g⁻¹, respectively, upon raising the solution temperature to 323 K. Negative values of ΔG° indicated that adsorption of Cu(II) and Cd(II) onto *w*MNR was spontaneous. The activation energy for Cu(II) and Cd(II) adsorption onto *w*MNR ranged between 40 and 65 kJ mol⁻¹. A mixed-type uptake mechanism involving chemical interaction and diffusion inside adsorbent particle is discussed. This study would be useful for future application of this material in the remediation of copper and cadmium contaminated wastewater.

Keywords: Adsorption; Manganese nodules; Manganese nodule leached residue; Heavy metals; Chemisorption

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