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Adsorption and desorption of cadmium on synthetic schwertmannite

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ABSTRACT

Cadmium is a toxic contaminant in environment, it is essential to remove Cd^{2+} from wastewater. This study has investigated the feasibility of using synthetic schwertmannite for Cd^{2+} removal from aqueous solution. Schwertmannite was synthesized by two methods, and characterized by XRD, SEM and FTIR. The slow synthetic schwertmannite was used for batch experiments, which were conducted under different Cd^{2+} concentrations, temperatures, pH and Cd^{2+} desorption ability at different pH was also investigated. Results showed that the Langmuir isotherm described the adsorption of Cd^{2+} well. Thermodynamic study manifested the absorption was spontaneous and endothermic. The synthetic schwertmannite had high adsorption capacity for Cd^{2+} removal of 110 mg/g with an adsorbent dosage of 1 g/L and an initial pH 8.0 at 25ºC. At pH > 6.0 cadmium adsorption was dramatically increased, nearly 100% cadmium was adsorbed at pH = 8.0. In natural pH range for schwertmannite, Cd^{2+} adsorbed in schwertmannite had a good regeneration ability, Cd^{2+} desorption proportion of total sorbed quantity was 50–80%, and the desorption rate increased with the decrease of pH. Therefore, Schwertmannite can be employed as an efficient adsorbent for the removal of cadmium from contaminated water.

Keywords: Cd^{2+}; Schwertmannite; Adsorption; Desorption

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