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Removal of copper through adsorption by magnesium hydroxide nanorod

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ABSTRACT

In this study, the magnesium hydroxide nanorod (MHN) was successfully prepared by precipitation–recrystallization method, which was chartered with X-ray diffraction, transmission electron microscope and scanning electron microscope. In view of superiority, MHN was used as adsorbent to adsorb copper ions from wastewater. A range of tests in regard to the effect of initial Cu^{2+} ion concentration, initial solution pH value, contact time and MHN dosage on adsorption of Cu^{2+} ion from wastewater were investigated. The results revealed the investigated factors which can have a profound effect on adsorption of Cu^{2+} ion. The adsorption capacity reached about 250 mg/g within 50 min, showing that MHN had rapid adsorption effect to Cu^{2+} ion. By fitting three kinetic equations, the pseudo-second-order kinetic equation was found to fit the best adsorption behavior. The analysis of equilibrium isotherm proved that the adsorption behavior was in accordance with the Langmuir equation, and MHN had favorable adsorption capacity to copper ion (324 mg/g and 318 K). The obtained thermodynamic data exhibited that the adsorption behavior was viable, initiative and endothermic, and the degree of disorder was increasing. The testing on MHN regeneration was evaluated by desorbing the MHN copper-adsorbed in 0.1 M NaCl solution or 0.1 M sodium ethylenediaminetetraacetic acid (EDTA) solution. The removal efficiency after eight cycles still reached to 75% for regeneration with EDTA treatment. In conclusion, the presented results demonstrated the potential use of MHN in adsorbing copper ion from wastewater because of its speediness, high adsorption capacity and recyclability.

Keywords: Copper; Magnesium hydroxide; Nanorod; Adsorption; Kinetics; Thermodynamics

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