ENVIRONMENTAL TECHNOLOGY, 2015
http://dx.doi.org/10.1080/09593330.2015.1075598

Synthesis of cryptocrystalline magnesite/bentonite clay composite and its application for removal of phosphate from municipal wastewaters

V. Masindi, W. M. Gitari and K. G. Pindihama

ABSTRACT
In the present study, nanocomposite of cryptocrystalline magnesite-bentonite clay was used as a novel technology for removal of phosphates from municipal effluents. Vibratory ball miller was used for fabrication of the composite. Removal of phosphate from an aqueous solution was achieved using batch experimental procedures. The parameters optimized include time, dosage, concentration and pH. An optimization experiment revealed that 30 mins of shaking time, 1 g of composite, 100 mg L^{-1} of phosphate, 1: 100 S/L ratios, 250 rpm, pH 10 and room temperature are the optimum conditions for removal of phosphate. Adsorption data fitted well to the Langmuir adsorption isotherm than Freundlich adsorption isotherms, thus confirming monolayer adsorption. Adsorption kinetics data fitted well to pseudo second-order kinetics than first-order kinetics, thus suggesting chemisorption. This comparative study showed better adsorption of the composite as compared to conventional methods of phosphate removal. The results suggest that the fabricated composite has the potential for remediation of phosphate-contaminated waters.

KEYWORDS
Cryptocrystalline magnesite; bentonite clay; composite; phosphate; adsorption; kinetics; isotherms