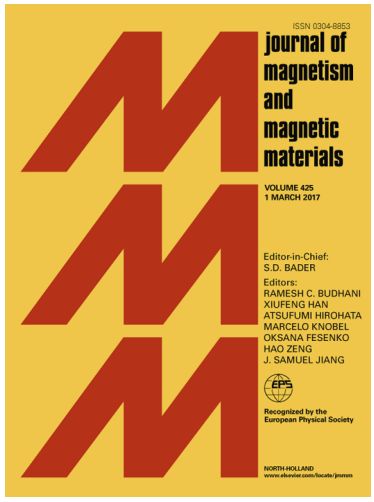

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Removal of copper and nickel from water using nanocomposite of magnetic hydroxyapatite nanorods

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Abstract

A nanocomposite of magnetic hydroxyapatite was synthesized and tested as an adsorbent for the removal of copper (Cu (II)) and nickel (Ni(II)) from aqueous solution. The adsorbent was investigated using Transmission Electron Microscopy (TEM), Scanning Electron Microscopy equipped with an Energy Dispersive Spectrometer (SEM/EDS), X-Ray powder diffraction (XRD) and the Brunauer–Elmet–Teller nitrogen adsorption technique (BET-N_2 adsorption). Batch experiments were carried out to determine and compare the adsorption parameters of Fe_3O_4 and its composite with hydroxyapatite. It was found that the adsorbent is nanostructured and has a specific surface area of 101.2 m^2g^{-1}. The Langmuir adsorption isotherm was found to be an appropriate model to describe the adsorption processes, showing the adsorption capacities of Cu(II) and Ni(II) of 48.78 mg g^{-1} and 29.07 mg g^{-1}, respectively. In addition to the high adsorption capacity, the fully-adsorbed material could be easily separated from aqueous media using an external magnetic field. These results suggested that the utilization of new hydroxyapatite - Fe_3O_4 nanocomposite for the removal of Cu(II) and Ni(II) is a promising method in water technology.

Keywords

Nanocomposite; Hydroxyapatite; Magnetite; Copper; Nickel; Adsorption mechanism

1. Introduction

Heavy metals are reported as the major pollutants in both the industrial wastewater and rainwater. They are non- biodegradable and accumulate in the environment, causing both short and long term harmful effects[1,2]. Copper and nickel are the most commonly used heavy metals in metal processing.