



The removal of methyl orange by nanohydroxyapatite from aqueous solution: isotherm, kinetics and thermodynamics studies

M. Lakrat^a, K. Azzaoui^{a,*}, S. Jodeh^{b,*}, N. Akartasse^a, E. Mejdoubi^a, A. Lamhamdi^{a,c},
M. Berrabah^a, O. Hamed^b, B. Razzouki^d, M. Algarra^e

^aLaboratory LMSAC, Faculty of Sciences, Mohamed 1st University, P.O. Box 717, Oujda 60000, Morocco, Tel. +212677042082; emails: k.azzaoui@yahoo.com (K. Azzaoui), meddlakrati@gmail.com (M. Lakrat), nakkartasee@yahoo.fr (N. Akartasse), ee.mejdoubi@gmail.com (E. Mejdoubi), abdellatiflamhamdi@hotmail.com (L. Lamhamdi), berrabah.mohamed@laposter.net (M. Berrabah)

^bDepartment of Chemistry, An-Najah National University, P.O. Box 7, Nablus, Palestinian Authority, Tel. +970599590498; emails: sjodeh@hotmail.com (S. Jodeh), ohamed@najah.edu (O. Hamed)

^cNational School of Applied Sciences Al Hoceima, Mohamed 1st University, P.O. Box 717, Oujda 60000, Morocco

^dDepartment of Chemistry, LS3ME, Faculty of Sciences, University Mohammed V, Rabat, Morocco, email: brazzouki@yahoo.fr

^eDepartment of Inorganic Chemistry, Faculty of Science, University of Malaga, Spain, email: malgarra67@gmail.com

Received 24 January 2017; Accepted 27 July 2017

ABSTRACT

Hydroxyapatite (HAp) is a biomaterial with a large number of useful applications. In this work, a method for the preparation of HAp at nanoscale was developed (nano-HAp). The prepared nano-HAp was used in the extraction of methyl orange (MO) from water. The special chemical composition, the crystal structure of HAp and molecular structure of MO made extraction occurs at a good efficiency. Structure of the prepared HAp was confirmed by powder X-ray diffraction, Fourier transform infrared spectroscopy and scanning electron microscope. Batch experiments were used to evaluate the tendency of the prepared nano-HAp for extracting the MO from water. The effect of temperature, time, pH and the amount of adsorbent on the rate of adsorption were evaluated and found to have a noticeable effect on the adsorption efficiency. The optimum conditions for extraction of MO by nano-HAp were determined. In all runs, in the first 5–15 min of contact time at room temperature the nano-HAp showed the highest rate of adsorption. Then, the rate leveled off after about 20 min. The temperature showed almost directly proportional with the rate of adsorption. The thermodynamic studies revealed a spontaneous nature of adsorption at different temperature.

Keywords: Wastewater; Hydroxyapatite; Methyl orange; Adsorption; Environment

* Corresponding author.