Poster

Fe_3O_4 nanoparticles-Loaded Cellulose Sponge: Novel system for the Arsenic removal from aqueous solution

D. Morillo, M. Avila, G. Perez M. Valiente
Grup de Tecniques de Separació, Universitat Autónoma de Barcelona, 08193 Bellaterra, Barcelona, Spain
Diego.Morillo@campus.uab.es

Magnetic properties provide certain nanoparticles, such as those of iron oxides, an interesting solution for separation purposes [1]. When a magnetic field is applied, the particles acquire a certain magnetization but, the long range order is lost when the field is removed. However, during magnetic separation particles interact with each other generating aggregates. To overcome this situation, we have developed the magnetite nanoparticles fixation on a sponge of cellulose which helps to decrease the aggregation state and increase the adsorption of pollutants from aqueous effluents. We have applied this system to the adsorption of arsenic, both arsenate and arsenite, from aqueous solutions.

Synthesis, characterization and application of magnetite nanoparticles to treat arsenic contaminated aqueous solution through a batch process were carried out. The experimental conditions effects over the arsenic adsorption capacity of magnetite nanoparticles are assessed. Magnetite nanoparticles have been synthesized by stocks solution of iron (III) and iron (II) in chloride media [2, 1]. Characterization was carried out by Transmission Electron Microscopy (TEM) determining particle size as shown in Fig.1a and X-Ray Diffraction (XRD) in order to certificate magnetite as the principal component of nanoparticles, Fig. 1b. Fixation of magnetite nanoparticles was performed over an Open-Celled Cellulose and Polyamide Sponge support (Forager Sponge, Dynaphore) using a spray of magnetite nanoparticles as present in Fig. 2a, 2b.

Observed adsorption capacity is higher for sponge systems than for magnetic nanoparticles, maintaining their overall nanoproperties and demonstrating that sponge system is a suitable solution for the aggregation problem on magnetic nanoparticles. A comparison with the adsorption of Arsenic by ferric ion loaded sponge [3] will be presented.

References:

[1] A. Uheida, G. Salazar-Alvarez, E. Björkman, Y. Zhang, M. Muhammed, J. Colloid Interface Sci., **298**, (2006) 501-507.
[2] A. Uheida, G. Salazar-Alvarez, E. Björkman, Y. Zhang, M. Muhammed, J. Colloid Interface Sci., **301** (2006) 402-408.
[3] J.A. Muñoz, A. Gonzalo, M. Valiente, Environ. Sci. Technol., **26,** (2002) 3405-3411.

Figures:

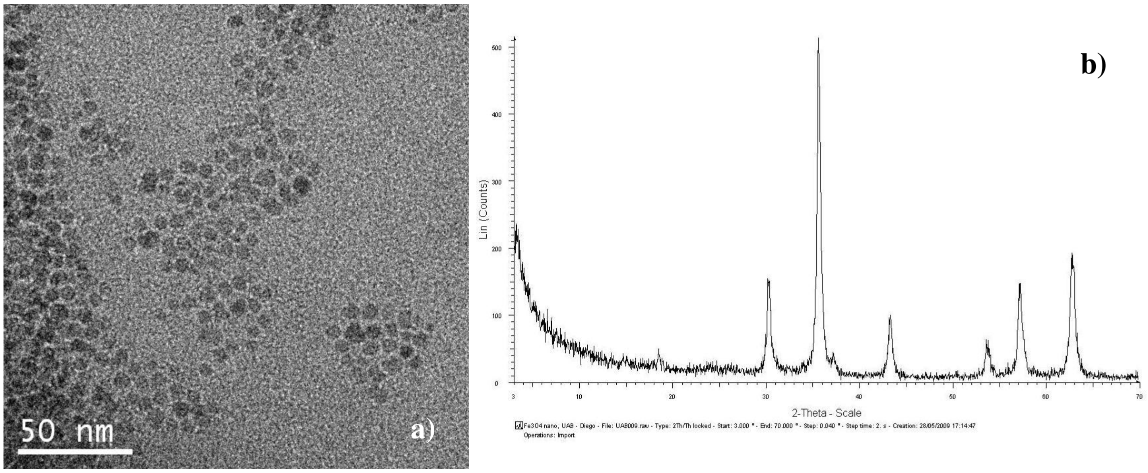

Fig 1. TEM images of Magnetite nanoparticles synthesized in this work and the distribution of size (a,), *X-ray diffractogram who shows the magnetite characteristics picks and its corresponding atomic planes* (b)

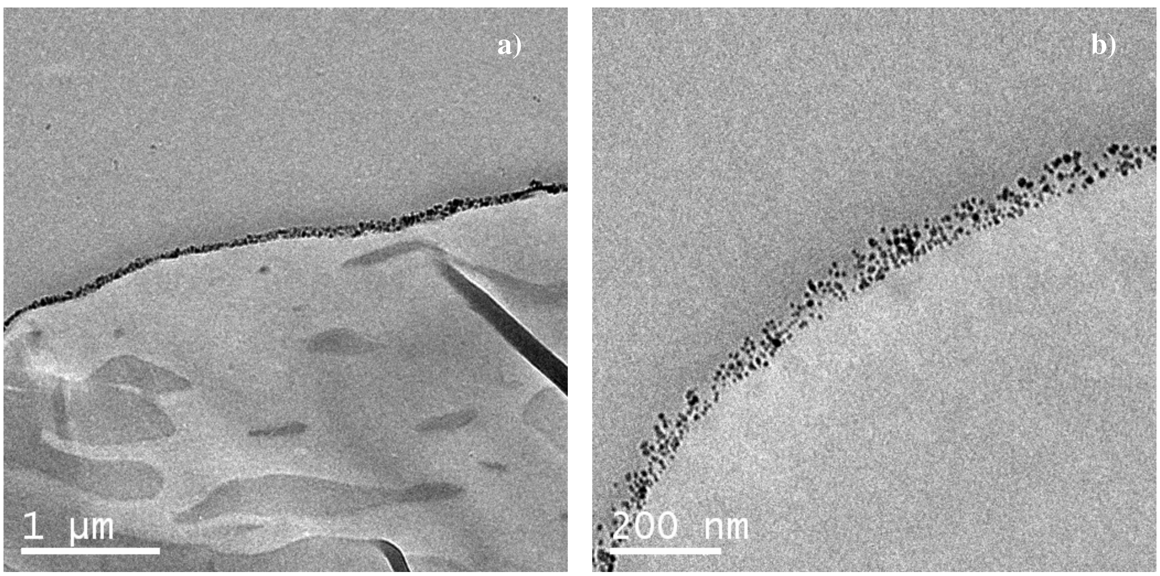

Fig. 2. TEM images of Magnetite nanoparticles loaded sponge (a, b).