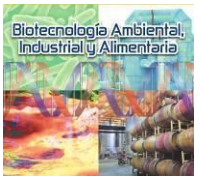
Poster

Modified natural zeolites for water disinfection using heterogeneous photo-Fenton at near neutral pH



Salameh Borrero, Carlos[1, 2], Farías, Tania[2], Ramirez Surey[3], Canosa,Ines[1], Flores, Amando[1] Ruiz-Salvador, A. Rabdel[4] y Ballesteros, Menta[1]

(1) Departamento de Biología Molecular e Ingeniería Bioquímica, Carretera de Utrera, km.1,41013 - Sevilla (España)

(2) Instituto de Ciencia y Tecnología de Materiales (IMRE), Universidad de la Habana, Zapata y G s/n, Habana 10600, Cuba

(3) Centro de Quimica Ambiental, Fac. de Química y Farmacia, Univ. Central de las Villas (UCLV), Santa Clara, Cuba

(4) Departamento de Sistemas Físicos, Químicos y Naturales, Carretera de Utrera, km.1,41013 - Sevilla (España)

Emial: mmbalmar@upo.es (M.B.)

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ABSTRACT

According to the World Health Organisation (WHO) [1], microbiologically contaminated water for for human consumption can transmit diarrheal diseases or acute respiratory infections, among others, causing 485,000 deaths from diarrhea each year. Therefore, water contaminated with pathogenic organisms (bacteria resistant to antibiotics, viruses, etc.) must be adequately treated for its safe use.

Currently there are several types of treatments for water disinfection, and in recent years the interest of the scientific community in Advanced Oxidation Processes (POAs) has increased significantly [2]. Among all types of POAs, the heterogeneous photo-Fenton process has been used for the degradation of a large number of contaminants in water. Likewise, there are studies that demonstrate its efficacy for the inactivation of pathogens. Its effectiveness lies in the generation of hydroxyl radicals through the oxidation-reduction reactions that occur on the surface of a photocatalyst due to the action of UV-Vis light and the presence of an oxidising agent (hydrogen peroxide) capable of producing profound changes in the chemical structure of contaminants and irreversible damage to microorganisms.

In this work, modified natural zeolites (NZ) were used as an efficient photocatalytic and low-cost support [3] for the inactivation of a model microorganism (*E. coli*). To do this, first, natural zeolite clinoptilolite from the Tasajeras site (Villa Clara) was was subjected to ion exchange with Fe^{2+}, following an usual procedure [4]. Once the material was obtained, it was characterised by DRX, SEM and IR, to ensure that the synthesis had been carried out properly. Next, its efficiency was evaluated in an 850 mL jacketed glass reactor with constant agitation and illuminated with UV or visible light at a constant temperature of 25ºC and initial pH of 6.5. The tests were performed with an initial concentration of *E. coli* of 10^6 CFU/mL and adding H_2O_2 (10 mM) and modified zeolite

(0.85 gr) at the beginning. The reduction of bacterial concentration was then evaluated every 30 minutes through serial dilutions. Likewise, in addition to the photo-Fenton process, to understand the isolated effect of the different parameters of the process, radiation disinfection; radiation - H_2O_2; H_2O_2; modified zeolite; modified radiation-zeolite; H_2O_2 - modified zeolite (Fenton) and the viability of the cells and their recreation were evaluated. Finally, the ability of the used catalyst to be recovered and cyclically reused without losing its photocatalytic activity was evaluated.

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