Poster

Synthesis and modification of zeolite A from rice husk for use in water treatment

Molina Negrillo, Eduardo(1); Muñoz-Arias, Marcos(2); Prieto-Laria, Paula(1,3); Dominguez-Santos, Enrique(3); Farias, Tania(4); Ruiz-Salvador, Rabdel(3,5); Ballesteros Martín, Menta(1,3)

(1)Departamento de Biología Molecular e Ingeniería Bioquímica. Universidad Pablo de Olavide, Carretera de Utrera km. 1, Sevilla, España

(2)Facultad de Química. Universidad de la Habana, Habana, 10400, Cuba

(3)Centro de Nanociencia y Tecnologías Sostenibles (CNATS). Universidad Pablo de Olavide, Carretera de Utrera km. 1, Sevilla, España

(4)Instituto de Ciencia y Tecnología de Materiales. Universidad de la Habana, Habana, 10400, Cuba

(5)Departamento de Sistemas Físicos, Químicos y Naturales. Universidad Pablo de Olavide, Carretera de Utrera km. 1, Sevilla, España

Tutor académico: Menta Ballesteros Martín

Keywords: synthesis; extraction; zeolite A

ABSTRACT

Zeolites are microporous crystalline aluminosilicates that have unique properties for adsorption and ion exchange, making them useful in various applications related to water treatment. For certain applications, zeolites can be synthesized or modified (Mintova et al., 2016) in order to improve their eficiency, resistance or reuse capacity among other properties. Likewise, the synthesis of zeolites can be carried out from agroindustrial wastes in a circular economy scheme with the valorization of these byproducts (Yoldi et al., 2019). In this work, zeolite A was synthesized from rice husk ash obtained from the rice industry, due to its high silicon content (~90%) (Tran-Nguyen et al., 2021) and, after modifying its chemical composition through an ion exchange, its efficiency as a photocatalyst for water treatment was evaluated.

First, silicon is extracted from ashes with the use of a NaOH solution to obtain a soluble silicate and the concentration of extracted silicon is determined by means of a colorimetric analysis. Zeolite A is synthesized by a hydrothermal method by adding a solution of sodium aluminate to the previous silicon extract, in the proportion of Si/Al = 1. Finally, the zeolite is subjected to an ion exchange with a solution of 0,1M FeSO4 so that it incorporates iron as a compensation cation for the loads in its structure.

Finally, its efficiency as a photocatalyst in the degradation of imidacloprid in water is evalated, studying the effect of the concentration of said contaminant, as well as the concentrations of H2O2 and zeolite, under UV and visible light in the heterogeneous photo-Fenton type reaction.

REFERENCES

Mintova, S., Barrier, N., Robson, H., & Lillerud, K. P. (2016). Verified syntheses of zeolitic materials. Synthesis Commission of the International Zeolite Association.

Tran-Nguyen, P. L., Ly, K. P., Thanh, L. H. V., Angkawijaya, A. E., Santoso, S. P., Tran, N. P. D., Tsai, M. L., & Ju, Y. H. (2021). Facile synthesis of zeolite NaX using rice husk ash without pretreatment. Journal of the Taiwan Institute of Chemical Engineers, 123, 338–345. https://doi.org/10.1016/j.jtice.2021.05.009

Yoldi, M., Fuentes-Ordoñez, E. G., Korili, S. A., & Gil, A. (2019). Zeolite synthesis from industrial wastes. In Microporous and Mesoporous Materials (Vol. 287, pp. 183–191). Elsevier B.V. https://doi.org/10.1016/j.micromeso.2019.06.009