

February 19-20, 2018
Paris, France

B C Ladeira, J Org Inorg Chem 2018, Volume: 4
DOI: 10.21767/2472-1123-C1-002

EVALUATION OF THE ADSORPTION EFFICIENCY OF MODIFIED CLINOPTILOLITE ZEOLITE IN THE EXTRACTION OF HEXAVALENT CHROMIUM IONS

**B C Ladeira, J Vassoler, L M D Santana Rocha, T F Bottan
and M S R Gomes**

Faculdades Integradas de Aracruz, Brazil

The inappropriate disposal of wastewater with hexavalent chromium ions has been causing risks to human health, the environment and industries. The present study aims to minimize the concentration of dichromate ions in contaminated effluents using the adsorption technique to remove ions. Adsorption tests in batch were performed using natural clinoptilolite zeolite in its activated and functionalized form, where it was possible to evaluate the efficiency through the removal of contaminating material. The zeolite modification in order to improve substantially its activity and selectivity was made through the activation with NaCl and the functionalization with BaCl₂. The modified zeolite was added in a kitassato with a dichromate solution and stirred with the aid of a magnetic stirrer. The analysis of the ions adsorption efficiency was determined with statistical support of the center composite rotational design (CCRD), where the best conditions for three factors was tested. The adsorption efficiency factors and levels studied was the adsorbent particle size (ranging from 0.128 mm to 2.03 mm), the adsorbent material mass (ranging from 1 g to 5 g) and the contact time between zeolite and the solution (ranging from 0.5 h to 2 h). For the chromium ions adsorption, the best condition found was using particles with of 0.128 mm, zeolite mass in 3 g and contact time in 1.25 h at room temperature. The initial chromium concentration of 25 ppm was based on actual values of wastewater effluents in which the zeolite would be used after an initial effluent treatment by precipitation. The application of this adsorbent under the studied conditions for the removal of hexavalent chromium is sufficient to meet the resolution of the National Council for the Environment, CONAMA n° 430, which the valid limit for hexavalent chromium is 0.1 ppm. The chromium sample analysed, reached a 99.6% removal as result, it was possible to reach a final concentration of 0.089 ppm, which is in accord with the limit established by the Brazilian legislation. The concentration of hexavalent chromium ions present in the sample was determined by the 3500-Cr (Colorimetric) analysis method of the Standard Methods for the Examination of Water and Wastewater (1992). The adsorption isotherm which best represented a hexavalent chromium adsorption, under the used conditions, was Langmuir, where in concentrations between 10 and 500 ppm, resulted in R² of 0.96 and Q_{max} of 13.64 mg/g which is close to Q_{exp} of 12.65 mg/g, indicating that the hexavalent chromium adsorption on the solid is a propitious physical process.

Biography

B C Ladeira has recently completed his graduation in Chemical Engineering from Faculdades Integradas de Aracruz – FAACZ and currently pursuing his Postgraduation in Production Engineering at Universidade Cândido Mendes – UCAM. He has worked as a Research Assistant in the development laboratories of Fibria Celulose SA in Brazil, working with cellulose pulping and bleaching, physical paper assays and nanocellulose pilot plant. Currently, he is a trainee in the field of drug product development at Hovione FarmaCiência SA in Portugal..

brunocapiche@hotmail.com