Environmental Engineering and Management Journal xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

"Gheorghe Asachi" Technical University of Iasi, Romania

PURE SODALITE SYNTHESIS, CHARACTERIZATION AND APPLICATION FOR HEAVY METAL IONS REMOVAL FROM AQUEOUS SOLUTIONS

Seyedeh Mahsa Kamyab[1], Soroush Modabberi[1*], Craig Denver Williams[2], Alireza Badiei[3]

[1]School of Geology, College of Science, University of Tehran, Tehran, Iran
[2]School of Applied Sciences, University of Wolverhampton, Wolverhampton, England
[3]School of Chemistry, College of Science, University of Tehran, Tehran, Iran

Abstract

Pure sodalites were successfully synthesized from kaolinite taking the advantages of alkaline fusion technique. The synthesized sodalites were then characterized via XRD, SEM/EDX, and FTIR methods. The efficiency of these sodalites for treatment of Cu^{2+}, Zn^{2+}, and Ni^{2+} ions in aqueous solutions was also scrutinized through batch adsorption experiments. Subsequently, the concentrations of Cu^{2+}, Zn^{2+}, and Ni^{2+} ions in final leachates were detected by ICP-OES analysis. Furthermore, the results proved that adsorption data fitted very well to Freundlich isotherm model assuming that the metal ions removal can be applied to multilayer adsorption. Moreover, the kinetics of the adsorption followed the pseudo-second-order model suggesting that the rate of adsorption process may be controlled by the chemical sorption. In brief, the synthesized sodalites excellent performance for heavy metal ions removal from aqueous solutions can shed light on their remarkable potential in purification applications. Additionally, considering high cost of the natural sodalite, synthesis of sodalites with homogeneous porous structure that can be used as great adsorbents would be profitable for environmental purposes.

Keywords: adsorption, heavy metal ion, pure zeolitic phase, sodalite, synthesis

Received: February, 2020; Revised final: July, 2020; Accepted: October, 2020

[*] Authors to whom all correspondence should be addressed: e-mail: modabberi@ut.ac.ir; Phone: +98-9122145463, Fax: +98-2166491623