Applicability of Egyptian diatomite for uptake of heavy metals

Suzan S. Ibrahim\textsuperscript{a}, Hanan S. Ibrahim\textsuperscript{b,\ast}, Nabila S. Ammar\textsuperscript{b}, Hany H. Abdel Ghafar\textsuperscript{b}, Tarek S. Jamil\textsuperscript{b}, Mohsen Farahat\textsuperscript{a}

\textsuperscript{a}Metallurgical Central Research & Development Institute (CMRDI), P.O. Box 87, Helwan, Egypt
\textsuperscript{b}Water Pollution Research Department, National Research Center, Dokki, Egypt

Tel. +20 1008417630; Fax: +20 2 33370931; email: drhanan@yahoo.com

Received 15 February 2012; Accepted 5 August 2012

ABSTRACT

Three types of natural, classified, and refined diatomite were examined for their abilities to remove metal ions from aqueous solutions at different operating conditions including pH, contact time, amount of adsorbent, and metal concentrations. Batch adsorption experiments revealed that equilibrium was practically attained after 15 min for Cd and Zn, and after 30 min for Cu. On the other hand, Ni and Pb attained equilibrium after 60 min. The optimum dose for the removal of all understudied metals was recorded to be 9.0 g/L at an optimum pH of 4.7. According to the optimum condition study, refined (acid-washed) diatomite is the most efficient one with the selectivity sequence given as Pb\textsuperscript{2+} > Cd\textsuperscript{2+} > Zn\textsuperscript{2+} > Cu\textsuperscript{2+} > Ni\textsuperscript{2+} due to the correlation between the ionic radii of heavy metals with external and internal pore diameters of diatomite.

Keywords: Diatomite; Low-cost sorbent; Heavy metals; Optimum conditions

\ast Corresponding author.