Application of raw, HCl- and H₂SO₄-activated bentonite as adsorbents for the removal of Zn²⁺ and Pb²⁺ from aqueous solution

Meghdad Rezapour¹,*, Hadi Abdollahi⁵, Hamid Khorrami⁴, Javad Taghavi Valmazuei⁴

¹Department of Mining and Metallurgical Engineering, Amirkabir University of Technology, Tehran 15875-4413, Iran, Tel. +98 93 60445312, Tel./Fax: +98 21 64542900; email: meghdad0111@yahoo.com (M. Rezapour), Tel. +98 93 53845200; email: h.khorrami@yahoo.com (H. Khorrami), Tel. +98 93 70715400; email: javad.taghavi.2008@gmail.com (J. Taghavi Valmazuei)

⁵School of Mining, College of Engineering, University of Tehran, Tehran 1439957131, Iran, Tel. +98 91 25032335; email: hadi_abdollahi2003@yahoo.com

Received 17 February 2014; Accepted 4 November 2014

ABSTRACT

Raw and activated clay minerals were used as adsorbents for adsorbing Pb and Zn ions from an aqueous solution. Bentonite was activated using sulfuric and hydrochloric acids and sodium chloride. Activated bentonite with sulfuric and hydrochloric acids provided maximum adsorption of Pb and Zn ions as 490 mg L⁻¹ (98%) and 275 mg L⁻¹ (55%), respectively. The initial concentration of ions in solution was 500 mg L⁻¹. Minimum values of standard deviation for Pb and Zn ions were 0.06 and 0.03, and the values of coefficient of determination (R²) for Pb and Zn ions were 0.996 and 0.998, respectively. Freundlich isotherm was preferred for describing the sorption of these metals. Furthermore, experimental results confirmed that the pseudo-first-order kinetic model was more suitable to interpret the mechanism of the sorption process.

Keywords: Raw; Activated bentonite; Na-bentonite; Adsorption; Aqueous solution

*Corresponding author.

1944-3994/1944-3986 © 2014 Balaban Desalination Publications. All rights reserved.