Environmental Engineering and Management Journal

October 2017, Vol. 16, No. 10, 2255-2265
http://omicron.ch.tuiasi.ro/EEMJ/

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PERFORMANCE CHARACTERISTICS OF SYNTHETIC ZEOLITE F9 IN TREATING HIGH IRON AND MANGANESE ACID MINE DRAINAGE

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Abstract

The negative effects of acid mine drainage (AMD) on the natural and human environments are well understood in South Africa, yet a robust and economic AMD treatment technology has not been developed. The current study aimed at exploring the performance of synthetic zeolite F9 in AMD treatment with specific focus on iron and manganese removal. For this, batch adsorption mode was adopted for which the effects of adsorbent dosage, initial pH and temperature were investigated. As a result, it was found that adsorbent dosage, initial solution pH and temperature have some effect on the adsorbent performance. Zeolite raised the pH of AMD, which observation would minimize or eliminate the need for post-treatment pH adjustment. In attempt to determine the capacity and rate of metal removal, isotherm and kinetic data were modeled using appropriate equations. To this end, Langmuir isotherm was found to fit equilibrium data while kinetically the metal adsorption followed the Elovich kinetic mechanism. To understand the metal-adsorbent interaction mechanism, zeolite was characterized before and after adsorption in which it was found that metal adsorption was physical in nature. The results obtained thus far give indication that zeolite F9 is a potential media for AMD treatment.

Keywords: acid mine drainage, adsorption, iron, manganese, zeolite

Received: February, 2013; Revised final: February, 2014; Accepted: February, 2014

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