

Biosorption of Metal Ions from Sarcheshmeh Acid Mine Drainage by Immobilized *Bacillus thuringiensis* in a Fixed-Bed Column

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Abstract : Heavy metals have a damaging impact for the environment, animals and humans due to their extreme toxicity and removing them from wastewaters is a very important and interesting task in the field of water pollution control. Biosorption is a relatively new method for treatment of wastewaters and recovery of heavy metals. In this study, a continuous fixed bed study was carried out by using *Bacillus thuringiensis* as a biosorbent for the removal of Cu and Mn ions from Sarcheshmeh Acid Mine Drainage (AMD). The effect of operating parameters such as flow rate and bed height on the sorption characteristics of *B. thuringiensis* was investigated at pH 6.0 for each metal ion. The experimental results showed that the breakthrough time decreased with increasing flow rate and decreasing bed height. The data also indicated that the equilibrium uptake of both metals increased with decreasing flow rate and increasing bed height. BDST, Thomas, and Yoon-Nelson models were applied to experimental data to predict the breakthrough curves. All models were found suitable for describing the whole dynamic behavior of the column with respect to flow rate and bed height. In order to regenerate the adsorbent, an elution step was carried out with 1 M HCl and five adsorption-desorption cycles were carried out in continuous manner.

Keywords : acid mine drainage, *Bacillus thuringiensis*, biosorption, Cu and Mn ions, fixed bed

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