

Fixed bed column study of Manganese removal from aqueous solution using windy Sand in sistan plain

Abstract

Heavy metals due to their non biodegradability properties and can accumulate in living tissues, thus becoming concentrated throughout the food chain and can be readily absorbed into the human body. Among them Manganese was examined in this study as a pollutant. The aim of this study is the manganese removal from aqueous solution using a windy Sand fixed bed column of Sistan plain. Flow rate, initial concentrations of manganese and bed height variables effects on the Breakthrough curves were examined. For describing and predicting the function of adsorbent columns in laboratory scale and expanding the results to real columns and a full-scale design, the BDST model was used. Windy sand was collected from Sistan plain and the particle size range 125-150 microns was selected. Manganese Titrisol was used for preparing stock solution (manufactured by Merk, Germany). manganese removal in a continuous condition, a column of glass with a height of 50 cm and 3 cm in diameter as a Gravity-flow reactor and fixed bed was used. The column was packed with layers of glass wool to prevent the floating of adsorbent out from the column and installed outlet faucet at the end of column that use for sampling. In order to manganese ion transmission from inlet to column were used from plastic tube. Results showed that the maximum absorption of manganese by sand at pH 4 is equal to 71.5%. Both Freundlich and Langmuir model well described the results. The Freundlich model has had correlation coefficient equal to 0.9862, shows a better description the data. Also, results showed that the manganese in the fixed bed adsorption using sand were dependent strongly to flow, initial concentration and bed height. Test results showed that Breakthrough time decreases with flow and concentration addition. The absorption capacity of the column increases with height. Evaluation of column bed parameters of the model BDST showed good correspondence with experimental data.

Keywords: Manganese adsorption; Fixed-bed column; Windy Sand; Adsorption isotherm; BDST model



University of Zabol
Graduate school
Faculty of Agriculture
Department of Water Engineering

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Supervisors:
Dr. Sh. Shamohamadi

Advisors:
Dr. J. Soltani
M. Hadi

By:
H. Kiyani

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