

## Study of adsorption and desorption characteristics of Chromium in a fixed bed column using Rice Husk

### Abstract

One of the major environmental pollutants in industrial wastewater containing heavy metals. heavy Metals such as chromium Is in various industries such as plating industries, there is very toxic to humans and the environment. The purpose of this study is the hexavalent Chromium ( $\text{Cr}^{6+}$ ) removal from aqueous solution using a Rice Husk fixed bed column and the desorption function of this ion on the adsorbent. Rice Husk was collected and the particle size range 425-600 microns was selected. Salt of potassium dichromate was used for preparing stock solution (manufactured by Merk, Germany). A batch sorption study was carried out in order to obtain the optimal PH, equilibrium time and optimum isotherm and Kinetic model. The chromium sorption in the continuous flow mode using a glass column with a height of 50 cm and 3 cm in diameter were studied. Operation of adsorbent column were studied in flow rate of 5, 6.5 and 8 ml/min, chromium concentration of 6, 8 and 10 mg/lit and bed depth of 10, 12 and 14cm. Column behavior was investigated using Nonlinear and linear Thomas Model and model parameters were determined. Langmyr and Freundlich isotherm model, were used to study the adsorption equilibrium and Lagergren and Ho *et al* model for the study of adsorption kinetics. also desorption was performed to extract adsorbed chromium and adsorbent washing, by a solution of 0.5, 1 and 1.5 M of sodium hydroxide and nitric acid in the batch study and 1 M sodium hydroxide solution in the fixed bed column. Results showed that the maximum absorption of Chromium by Rice Husk at pH 1 is equal to 98.1% and Equilibrium time is 180 minutes. this study Showed that the Freundlich isotherm model with a correlation coefficient of 0.951 shows a better description of data. Also both Lagergren and model absorption processes are well described, but the Ho *et al* model with a correlation coefficient of 0.96 describes the data better. According to the results obtained, the Breakthrough time decreases with increasing of initial concentration and flowrate. Also The column absorption capacity increases with increasing bed height and decreasing inlet solution concentration increases, and decreases with increasing flow rate.. Evaluation of column bed parameters of the both form of Thomas model showed good correspondence with experimental data. Desorption of chromium by sodium hydroxide has better function than nitric acid, also The amount of chromium desorption about 75.6 % concentration of initial pollutant was obtained, indicating that the use of a molar solution of sodium hydroxide in the Chromium desorption has a good efficiency.

**Keywords:** Chromium adsorption, Fixed-bed column, Chromium desorption, Rice Husk, Thomas model.



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