DECONTAMINATION OF CADMIUM CONTAINING AQUEOUS SOLUTIONS USING FELDSPAR

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Contamination of water by toxic heavy metal is becoming a serious environmental issue in the present day world. Cadmium, in particular, is a major water pollutant in industrial effluent, and considered to be very harmful due to the highly toxic nature and its tendency to accumulate in the tissues of living organisms. Feldspar, among many natural substances such as saw-dust, kaolinite, marine macro algas, grape stalk and chitin, can be utilize to remove cadmium from effluent waters.

The studies were basically carried out to characterize feldspar, to optimize the experimental parameters such as equilibrium time, shaking time particle size, pH, absobate concentration and temperature, and to evaluate the isotherms, kinetics and isosteric heat of adsorption.

Characterization of feldspar revealed that majority of feldspar used in this study is consisted of orthoclase. The surface charge of feldspar was determined by potentiometric methods and the point of zero charge of the feldspar is in between pH 6.0 - 6.5. Surface specific area was determined by methylene blue adsorption method and specific surface area is 14.68 m^2 g^{-1}. Prior to determine the surface area of feldspar, surface areas of standard samples of gibbste and kaolinite were determined to calibrate the system. According to the isosteric heat of adsorption, feldspar surface is homogeneous under physicochemical conditions applied in this study.

The percent removal cadmium initially increases rapidly with the increasing equilibration time reaching a plateau after of 3 hours where no significant effect on shaking time is observed. As expected, the percent removal is largely affected by the dimeter of feldspar particles due to the fact that increasing the effective surface area enhances the surface energy by increasing the number of adsorption sites. Experiments done by changing solution pH suggest that cadmium removal increase at highly basic conditions. Presence of phosphate, sulphate and chloride reduce the removal efficiency of cadmium.

The adsorption of cadmium ions on feldspar follows both Langmuir (R^2 = 0.9859) and Freundlich (R^2 = 0.9926) adsorption isotherms suggesting an initial monolayer coverage of cadmium ions on feldspar particles, followed by multilayer coverage. Reaction rate studies indicate that the removal of cadmium by feldspar follows first order kinetics including initial fast adsorption and subsequent slower adsorption.

These results can be utilized to design an efficient, low cost and environmental friendly methodology for removal of cadmium from effluents.

Key words: Feldspar /Cadmium /adsorption /kinetics /surface charge /surface area /isosteric heat