REMOVAL OF CADMIUM IONS FROM AQUEOUS MEDIUM USING BRICK PARTICLES

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The contamination of water by toxic heavy metals is becoming a serious environmental issue in the present day world. Cadmium, in particular, is a major water pollutant present in industrial effluents, and considered to be very harmful due to the highly toxic nature of this element and its tendency to accumulate in the tissues of living organisms.

The operation and maintenance costs of chemical-based treatment methods are very high and less environmentally-friendly. Therefore, low-cost, environmental-friendly treatment methods are very important for developing countries such as Sri Lanka. One such approach is to employ natural substances and industrial byproducts for waste water treatment.

The goal of this research was to study the removal of cadmium from aqueous medium by using brick particles. The studies were basically carried out to optimize the experimental parameters such as equilibration time, shaking time, particle size and to investigate the effect of adsorbate concentration, pH and ionic strength on the efficiency of cadmium removal by brick particles.

The percent removal initially increases rapidly with the increasing equilibration time reaching a plateau after an equilibration time of 3 hr where no significant effect on percent removal shown by the shaking time. As expected, the percent removal is largely affected by the size of brick particles due to the fact that increasing the effective surface area enhances the surface energy by increasing the number of adsorption sites. Experiments with change in solution pH suggest that intake of cadmium increase at highly basic conditions. On the other hand, cadmium shows low tendency to be adsorbed at high ionic strength environments. The adsorption of cadmium ions on brick follows both Langmuir (R^2 = 0.992) and Freundlich (R^2 = 0.983) adsorption isotherms suggesting an initial monolayer coverage of cadmium ions on brick particles, followed by multilayer coverage. Monolayer coverage of cadmium can easily be understood as the amount of cadmium removed increases linearly with increasing cadmium concentration reaching a plateau. The presence of sodium ions does not affect the removal of cadmium up to 300 ppm of sodium.

These results conclude that the method proposed introduces a low-cost and environmentally-friendly methodology for removal of cadmium ions from aqueous medium.