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Adsorption kinetics of sugarcane bagasse for selective removal of Cr (VI) and Cu (II) from aqueous solutions

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The Adsorption Kinetics for the simultaneous and selective removal of Cr(VI) and Cu(II) ions from aqueous mixture was investigated using sugarcane bagasse. Equal volumes of the laboratory prepared metal ion solutions of Cr(VI) and that of Cu(II), having the same initial concentration were mixed and used as test samples. Batch studies were performed at room temperature at three different initial concentrations of each metal ion to be present in the test sample: 10ppm, 30ppm and 50ppm. The available literature for the removal of each of these heavy metal ions when present individually in aqueous solutions was applied in these studies. Accordingly, water washed and sun dried sugarcane bagasse retained on 200 micron-mesh, was used for the study at a dosage of 0.4g/l of the test sample. No attempt was made to maintain a fixed pH as this involved addition of more chemicals adding to more contamination. Instead, the pH and remaining concentrations of the ions in the mixture after adsorption were monitored at various pre-set time intervals till equilibrium condition was attained. The pH of the test samples varied from 7.05 initial values to 8.09 at equilibrium, during all the batch studies. The study has revealed that the adsorbent had higher selectivity to Cu(II) ions in comparison to the Cr(VI) ions at the study conditions. The removal was faster and higher at low initial concentrations. The experimental results fit well with linearized Freundlich Adsorption Isotherm Model.

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Heavy metals in substrates of a freshwater wetland at Kelaniya

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Many natural wetlands function as successful remediation systems for the environmental impact due to industrial effluents and domestic effluents from urban and semi-urban areas. However, this protective function of natural wetlands often comes at the cost of substantial environmental degradation. Hence, wetland sediment analysis is essential in the assessment of the impact of industrial effluent discharge and in the determination processes of remediation of metals. The important fraction played by the sediments of wetlands is the regulation of nutrients (N, P, K) and other trace elements essential for plants as most bio-geo-chemical processes occur in the substrate of wetland to release nutrients and heavy metals.

Iriyawetiya wetland at Kelaniya is closer to the Kiribathgoda Township and it receives many effluents from urban runoff and industry. The urban runoff into wetland may include pollutants such as nutrients, toxic substances, poly-aromatic hydrocarbons, heavy metals, oils, pathogens and particles. A preliminary study showed that this wastewater carries appreciable amounts of toxic metals, especially heavy metals and their concentrations vary from place to place in the wetland. To determine the heavy metal concentrations in sediments of Iriyawetiya wetland, samples were collected from the inlets, outlets and the middle part of the wetland using a HDPE grab and metal concentrations in acid-digested samples were measured separately using an atomic absorption spectrophotometer.

Among the tested heavy metals Al, Fe, Cr, Zn, Cd, Mn and Ni (except Cu, Pb, Sn) were found in higher amounts in sediments at the inlet 01 area than the outlet area. Al, Cu, Sn, Cr, Zn, Cd, Pb, Mn and Ni in sediment of inlet 2 area were recorded comparatively lower values than the outlet area due to lesser loading of effluents in that area. The middle area of the wetland recorded higher amounts of all measured ten heavy metals than inlet 02. Al, Fe, Cu, Sn, Mn gave the highest values in the middle open areas of the wetland. This shows that pollutants in urban waste, when dispersed in to the aquatic environment, they accumulate primarily in water and sediments which accelerates the contamination of other water sources including groundwater and drinking water. Further it provides the mechanisms needed to be used for remediation methods of waste water using natural wetlands.