USE OF RADIOTRACER IN ADSORPTION STUDIES OF COPPER ON PEAT AND PHYTOREMOVAL OF ARSENIC FROM SOIL

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Use of radiotracer in adsorption studies of copper on peat .

Peat is a dark brown organic sediment widely studied as adsorbent of heavy metals and others hazardous pollutants from wastewaters. The great capacity of peat to adsorb metals in solution is due to its high humic content, where the uptake of metals in solution is mainly performed by functional groups of humic substances, such as carboxylic and phenolic groups of humic acids. Besides being a highly polar and porous material, some of peat's characteristics such as low cost and availability make it a good alternative for utilization in wastewater treatment. In attempt to develop systems for the removal of heavy metals in wastewater by the peat, sorption of metal ions in solution has been investigated by several researches with great advances related to the comprehension of thermodynamics and kinetics of the process. Sorption isotherms well correlated to Langmuir equation have been used to represent the chemical adsorption of metals on peat surface. With respect to the kinetics of the process, a pseudo-second order model has been successfully used to describe chemisorption of divalent metals on peat. The estimated total amount of peat in Brazil is about 1.6 billions m^3 distributed on two hundred peatlands toward the country. However, only a few studies have been published on the use of such material to reduce levels of hazardous substances from wastewaters.In this work copper adsorption by peat was studied using ^{64}Cu as tracer considering kinetics and thermodynamics aspects of the process (FIG.1). The study was carried out in agitated batch experiments with copper ions solutions at different initial concentrations at pH 4.5. Adsorption isotherm determined from equilibrium experiments was fitted to Langmuir's equation with a good correlation of the experimental data. Results obtained from kinetics experiments were fitted to a pseudo-second order model and also a good correlation of the data was obtained (FIG.2). Some parameters calculated from these studies, such as rate constant or peat capacity, can be used in the development of a treatment process based on peat adsorption in batch or in column. The use of radiotracer ^{64}Cu was presented as a simple, rapid and efficient technique to assess the copper adsorption by the peat. Scientific Cooperation Programs supporting by CNPq.

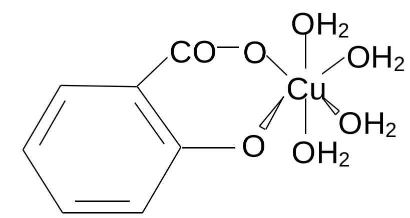

FIGURE 1 - Interaction between humic substance functional group and copper in solution.

Phytoremoval of arsenic from soil.

Arsenic is a semimetallic element and it also may be present as organometallic forms, such as methylarsinic acid and dimethylarsinic acid, which are active ingredients in many peticides.Arsenic is a toxic element that can be found in anthropogenic wastes and some geochemical environments. Arsenic can be added to soil through the use of synthetic fertilizers and pesticides. The continued application of these products can result in accumulation of toxic residues which, even in relatively low concentrations, could compromise or limit use of the water. The complexation of arsenic by dissolved organic matter in natural environments prevents sorption and co-precipitation with solid-phase organic and inorganic, thus increasing the mobility of arsenic in aquatic systems and um the soil. Arsenic is present in soil at levels ranging from 0.2 to 40 $\mu g\ g^{-1}$and urban air at levels around 0.02 $\mu g\ m^{-3}$, but for the general population the mains exposure to inorganic arsenic is through ingestion. Substantial evidence led the international Agency for Research on Cancer to conclude that ingestion of inorganic arsenic can cause skin cancer. Certain species of plants have found to accumulate very high concentrations of certain trace elements and these are referred to as “hyperaccumulator” species. *Peteris vittata* is extremely efficient in extracting arsenic from soil. This study investigates the concentrations of arsenic in brake fern, slows that the removal of arsenic in soil is this combination of the effects of *Peteris vittata* Linnaeus and arsenic solubility. The interaction of soil-plant system is fundamental for controlling the migration of arsenic to groundwater and its impact on drinking water. Total arsenic contents in soil and plant were determined by instrumental neutron activation analyses - INAA, Nuclear Reactor IEA-R1m. Arsenic adsorption maxima at pH 5.0 in kaolinite, adsorption of $H_2AsO_4^-$ declined steeply at pH 6,5 in all clays, however, these results explain observations of enhanced arsenic phytoavability. The *Pteris vittata* has a good adsorption capacity for arsenic soluble. The ability of brake fern to adsorb arsenic is directly related to its conductor tissue (vascular plant). CAPES; CNPq.

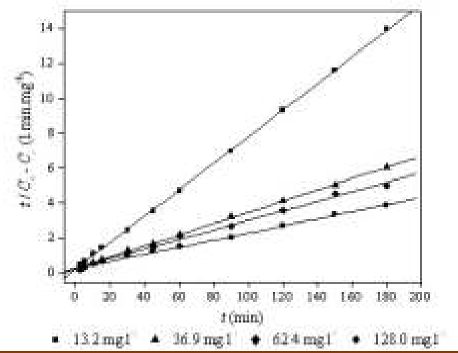

FIGURE 2 - Kinetics of copper removal in solution linearised according to the pseudo-second order rate equation.