REMOVAL OF ARSENATE AND ARSENITE BY FULLERS EARTH

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ABSTRACT

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The feasibility of removing toxic arsenic compounds from polluted water such as untreated wastewater, sewage and sludges is becoming important and necessity. Its solubility in natural system is strongly influenced by adsorption/desorption process. Adsorption controls mobility and bioavailability of arsenic in the environment. The method of adsorption was used as it involves low cost, less environmental pollution and efficient in removing ions.

For adsorption, clay material used is Fullers earth. Fullers earth belongs to the montmorillonite smectite group of clay minerals, called natural Ca-montmorillonite (acid-activated). Chemical formula is $Ca_{1.01}(Al_{2.95}Fe^{3+}_{0.25}Fe^{2+}_{0.04}Mg_{0.076})(Al_{0.21}Si_{7.79})O_{20}(OH)_4$. Fullers earth has remarkable adsorption efficiency. Thus, it is capable of adsorbing ionized materials like potent toxic materials from water. The objective of this study is to explore the feasibility of using Fullers earth for the removal of arsenite and arsenate from water and compare the adsorption behavior of arsenite and arsenate on Fullers earth with regard to adsorption kinetics, adsorption isotherms and the influence of pH on adsorption (adsorption envelops).

An adsorption maximum of approximately 82% was achieved for arsenite where the solution ionic strength was adjusted with 0.01 M $NaNO_3$ and 70% of adsorbance was achieved for the arsenite where the ionic strength of the solution was not adjusted. The high arsenic retention (arsenate about 83% and arsenite 81.8%) indicates it is of surface adsorption phenomena. Results indicate that high percentage of arsenate is adsorbed initially from pH 4 – 7 and arsenite was adsorbed around pH 7 in all cases (in neutral medium). With the time percentage adsorbance was increased and stabilized around 60% of adsorbance after the time about 20 hrs. According to adsorption isotherm data as the initial arsenite concentration increases, the adsorption also gets increased. The graph is similar to the type of physical

adsorption in which we do not observe continuously unlimited adsorption, since the adsorption ultimately leads to a limit.

These findings suggest that the clay material "Fullers earth" can be used as an efficient adsorbent material to remove arsenic from water. The method can be carried out under normal conditions and the relative cost effectiveness is an advantage.