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PROCESSING METHODS FOR THE REMOVAL OF HEAVY METALS : A REVIEW

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ABSTRACT

Many methods have been used by researchers to obtain most optimal and cost effective methods to remove soluble solids from wastewater. Of these solids, metals have received a lot of attention due to their harmful and toxic effects when present in abundance. At least 15 metals are considered to be toxic and approximately half of these numbers are emitted in the environment in quantities that are hazardous to the environment in addition to the human health. This is considered to be the most dangerous metal due to its mutagenic and carcinogenic properties. Heavy metal dangerous to human health in high quantities.

Keywords: Heavy Metals, Adsorption and Physical methods.

I INTRODUCTION

Some of the methods employed to remove these metals include chemical precipitation, Distillation, filtration, Flocculation, Reverse Osmosis, magnetic fields, Sedimentation, flue gas purification, and adsorption **[1]**. These methods have their own advantages and disadvantages. Precipitation method cannot be used when concentrations of heavy metal ions present is low in large volumes of water. Flocculation needs to accompany precipitation, which usually results in large volumes of sediments containing heavy metal ions forming. Also, small concentrations of metals remain dissolved in water after separation, hence, resulting in as unsuitable method **[2]**. Other methods are either time consuming, expensive or cannot be applied on large volumes of waste water. Adsorption however is a cost effective, relatively quick method of removing heavy metals from polluted water despite of the concentration of metals or volume of water and where it is present. Different materials may be used as adsorbents to adsorb heavy metals from wastewater. Of those investigated in prior research include many other inorganic adsorbents such as silica, alumina, polymer, zeolites and activated carbon etc.**[3-4]** are since long used.

Waste products and other natural products are readily used as adsorbates, hence, allowing for a low-cost and feasible method for removing metals from wastewater **[5]**. The problem lies in obtaining the optimal adsorbent and corresponding conditions that effectively remove a large percentage of a known metal.

There are many methods available for elimination of metal ions from effluents. Treating waste water is a certainly an expensive endeavor. In short, the first priority is to reduce the amount of waste generated in chemical and other

industries. Again manufacturing processes can be modified for waste reduction. Entrained solids are removed by settling, filtration, or centrifugation. The treatment technologies have been categorized as physical, chemical, biological, thermal, or stabilization.

The major methods of industrial waste water treatment involves physical and chemical. These have their own advantages and disadvantages because of their expense and discard problems. A grouping of different processes is also often used to achieve the desired water quality in most inexpensive way **[6]**. Chemical methods involve electro flotation, electro kinetic coagulation, and conventional oxidation methods by oxidizing agents, irradiation and electro chemical processes. Although, these methods are efficient for treatment of water contaminated with heavy metal pollutants, but these are expensive and hence commercially unattractive. The high electrical energy requires and consumption of chemical reagents is also common problems.

Physical treatment processes include gravity separation, phase change systems, such as air and steam stripping of volatiles from liquid wastes, and various filtering operations. Chemical treatment transforms waste into less hazardous substances using pH neutralization, oxidation or reduction, and precipitation. Biological treatment uses microorganisms to degrade organic compounds in the waste stream.

Adsorption behaves differently when different materials are dissolved in water and hence, different data may be obtained for the same conditions with varying different parameters **[7]**. Adsorption experiments were carried out to determining the adsorption from metal ions solution. The effect of pH of initial solution, reaction temperature, Adsorbent dosage and metal ions concentration and stirring Speed are important parameters.

Batch tests were conducted extensively by previous researchers to test the efficiency of the adsorbent on the adsorbate, testing various experimental conditions. Batch tests are low-priced and easy way to determine if the material employed and conditions used are successful in producing significantly good results **[8]**.

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