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Removal Of Toxic Metals From Electroplating Industrial Waste Water Using Groundnut Shell And Coconut Shell

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Abstract: Toxic heavy metal contamination of industrial wastewater is an important environmental problem. Many industries such as electroplating, pigments, metallurgical processes, and mining and leather industries release various concentrations of heavy metals. Metal ions such as cadmium, nickel, chromium, copper, lead, zinc, manganese and iron are commonly detected in both natural and industrial effluents. Heavy metal pollution has become one of the most serious environmental problems today. The collected steel effluents from Sastha electroplating industry located at Ambattur estate, Chennai. By using methods like chemical precipitation, chemical coagulation for removing metal ions from effluents. These processes may be effective or inexpensive, the heavy metal ions are present in high concentrations. Adsorption process is one of the efficient methods for the removal of heavy metals due to its simplicity, easiness in handling, availability of various adsorbents and more efficiently removes the heavy metals at lower concentration levels. This necessitates the use of groundnut shell for adsorption of heavy metals. At initial stage, both zinc and chrome water having high concentration of toxic metals after the treatments the concentration level is reduced and it is recharged into ground water.

Keywords: Industrial waste water, Toxic metals, Aluminium sulphate, Sodium hydroxide, Filters, Activated carbon

Introduction: The removal of toxic metals in industrial waste water. It is useful for ground water recharge and free from land and water pollution. An experimental work is carried out in an effective and inexpensive manner.

Literature Survey:

R Malik , D S Ramteke & S R Wate et al.,(2006)[3] explains about the activation of char with zinc chloride results in considerable modification of its textural and adsorption properties. The results indicate that Groundnut Shell base Powdered Activated Carbon (GSPAC) could be employed as low-cost alternative adsorbent to commercial activated carbon in the wastewater treatment for removal of acid dyes. They mainly explains about the activation of char with zinc chloride to test its adsorptive nature.

GunatilakeS.k et al.,(2015)[1] explained about the Physical and other common chemical methods produce toxic sludge which is unable to settle within industries. Although chemical cost is high chemical treatments is one of the most suitable treatments for toxic inorganic compounds produced from various industries which cannot removed from any biological and physical techniques. Physical separation techniques are primarily applicable to particulate forms of metals, discrete particles or metal bearing particles.

ACTIVATED CARBON (GROUNDNUT SHELL+COCONUTSHELL) :

Groundnut shell is washed thoroughly, dried, crushed, powdered and sieved to 2mm.Heat in electrical furnace at 400c for 30 minutes. The powder is impregnated by zinc chloride for 24 hoursat 100±5c and carbonized at 650°c for 15 minutes. Then it is treated with Hcl for removing of zinc chloride. The char is treated with hot distilled water for removing chloride and acidity. The characterisation of adsorbent properties are analysed. Recently, efforts have beenmade to use cheap and readily available agricultural wastes such as coconut shells, orange peel, rice husk peanut husk and saw dust as adsorbents to remove heavy metals from waste water. We use groundnut shell as the adsorbent.

The process of carbonization is to convert coconut shells to charcoal or char. The charring process is Pyrolysis, which is the chemical decomposition of the shell by heating in the absence of oxygen for hours. Thus the produced several Activated Carbon is used in thepurification of Liquids and Gases. Thus the produced Groundnut shell AC and Coconut shell is mixed in ratio of (50:50).

FIG.1 ACTIVATED CARBON POWDER(GROUNDNUT SHELL+COCONUT SHELL

The prepared activated carbon is mixed with the water from the flocculation process . Once the carbon is mixed with the solution the reaction starts between the activated carbon and the waste treated water. The activated carbon prepared from the groundnut shell is absorbed the heavy concentrated material such as zinc and the chromium from the industrial waste water. Only those with the heavy toxic metals are benefit by these activated carbon process and they are absorbed and the toxic concentration are reduced. Hence the ash that are mixed with thewater after the absorbed process the waterare in muddy state and the colour are changed due to the addition of the ash(activated carbon).In order to remove the water free from the ash particles we filter the water after the adsorption process. So the water are collected with the low toxic concentration.

Experimental methodology

The collected water is first undergone for the ph and the concentration test, after that the water sample is increased the ph range
9 by adding sodium hydroxide so the alkality of the water is increased . Then the flocs are formed in the surface of the water

i.e here the chemical precipitation process takes place.The metals with the heavy concentration are float in the form of flocsThe formed flocs are removed using the filters by keeping then four few hours. Then the water is taken and the prepared activated carbon is now added into it for the removal of the remaining heavy concentration of metals. In the process by adding the activated carbon the adsorption process is taken place . The activated carbon after mixing in water kept for 1day so that the adsorption takes place and the toxic metals are removed. Then the wateris now made reduced to reduce the alkality by adding Hydro Chloric Acid into it. Now the water is having the quality to recharge into the ground

TESTING AND RESULTS

pH test and the Concentration test

To find the power of hydrogen can be tested by using the ph meter and for the concentration test the Atomic Adsorption Equipment is used following are the apparatus and procedures of the test.

a. Water samples
b. Ph meter
c. Atomicadsorption
d. Beaker
e. Electrodes

Coagulants

pH test

SAMPLE	INITIAL pH VALUE	FINAL pH Value
Zinc Plated Water	6.63	6.8
Chrome Plated Water	5.82	6.1

Concentration test

PARAMETER mg/L	INITIAL VALUES		FINAL VALUES	
SAMPLE	**1**	**2**	**1**	**2**
Arsenic	0.01	0.01	0.01	0.01
Cadmium	0.017	0.01	0.08	0.01
Chromium	0.024	136	0.012	0.85
Lead	0.016	0.03	0.014	0.03
Zinc	230	37	0.75	1.2

1. Zinc Plated Water
2. Chrome Plated Water

RESULTS AND DISCUSSION

The toxic metals in the industrial waste water can be removed upto the minimum concentration range of pollution control board. pH and the concentration test have been done to analyse its normal limitation of CGWB. Here we collected steel effluents from Sastha electroplating industry located at Ambattur estate, Chennai.

Chemical precipitation and coagulants are the effective methods which does not cause any environmental problems. Finally the toxic metals have been completely adsorbed by the groundnut shell ash. The water quality ranges its normality on ph and concentration. The treated water should consists of toxic metals as per the pollution control board which should not exceeds that level. It should not cause any harmful effect towards the living organisms and does not affect the environmental system. The treated should be balanced in their pH and its concentration. Initially the pH range ofzinc plated water is 6.63 and after thetreatment process the range of pH is 6.8. For chrome plated water initially ph rangeis 5.82 and the final range is 6.1.The initial concentration range of zinc plated water is 230 (zinc) and after treatment process the concentration range is 0.75. For chrome plated water initial concentration is 136 (chromium) and final concentration range is 0.85.

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