REMOVAL OF HEAVY METALS USING MAGNIFERA INDICA FROM DYEING EFFLUENT

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ABSTRACT: Colour is the main attraction of any fabric. Manufacture and use of synthetic dyes from fabric dyeing as therefore become a massive industry today. Use of synthetic dyes has an adverse effect on all forms of life. Presence of sulphur naphthol, vat dyes, nitrates, acetic acids, soaps, enzymes, chromium compounds and heavy metals like copper, arsenic, lead, cadmium, mercury, nickel, and cobalt and certain auxiliary chemicals all collectively make the textile effluent highly toxic. It is important to remove these pollutants from the waste water before their final disposal. The study was performed to investigate the concentration of toxic heavy metals like cadmium (Cd) and Zinc (Zn). It was observed that the concentration of cadmium were much higher than the maximum permissible limits. Process parameters which include adsorbent dosages, PH and contact time of solution were varied in order to evaluate their influence on the adsorption process. The optimum contact time, dosage and PH for carbon with I.R-0.75 was 90 mins, 200mg and 7.00 with removal efficiency of 99.69%, 98.55% and 93.71% respectively. Hence easy and effective techniques are required for fine tuning of waste water treatment.

***keywords*: heavy metals , adsorption , chemical activation**

1.INTRODUCTION

One of the most important problems in designing and maintaining the industry from avoiding from generation of waste water that creates enormous problem to environment and public health . The industrial effluent consist of many different organic matters , heavy metals, chlorinated organic and inorganic salts.The characteristics of industrial effluent depends up on various factors including composition of raw materials in industry

and the type of industry. The composition and concentration of contaminants are influenced by the type of deposited wastes, the quality of waste water, hydrogeological factors and mainly by the type of heavy metal from the industry. Regardless of the nature of the compounds, they constitute a potential pollution problem for local ground and surface waters.

Many technologies have been applied to remove the pollution of waste water. Most of the treatment processes for wastewater treatment could be adapted for industrial waste water treatment. The potential methods are biological (aerobic, anaerobic) and physico-chemical (precipitation, oxidation, adsorption, stripping, reverse osmosis). The waste water quality plays a key role in choosing the method and level of treatment . physico-chemical treatment is appropriate to treat industrial waste water since this waste is derived from complex biodegradation organics and simple dissolved organics.

2.COLLECTION OF SAMPLES

The samples were collected from Mathi chemicals & dyeing units, Silankadu near Palipalayam at Erode, Namakkal District.

3. MATERIALS

Magnifera indica- the "common mango" or "Indian mango"- is the only mango tree commonly cultivated in many tropical and subtropical regions. It has been an important herb in the Ayurvedic and indigenous medical systems for over 4000years.Over 400 varieties of mangoes are known, many of which is ripen in summer. The mango fruit is obtained between April to May in Tamil Nadu. The fruit takes three to six months to ripen.

4.METHODS

4.1.PREPARATION OF ACTIVATED CARBON

The removal of colour from waste water, adsorption technique was employed using activated carbon prepared from leaves, barks, fruit and shell of available Magnifera indica (Mango) tree. There are two methods to prepare activated carbon, namely

- Physical activation
- Chemical activation

The Mango leaves, barks, fruit and shell were cleaned, and broken into pieces, grinded to required sizes, then washed in distilled water for about 8 to 9 times. The powder is then oven dried at 100°C for 24 hours. The oven dried powder is filled in small container in three layers, by compacting each layer without any air space to avoid the loss in weight of the powder, otherwise it would result in burning of the material directly leaving behind only the ash. The small container is then placed into a big container, such that sand surrounded the small container completely, the lid of the big container was tightly fitted. Pin hole has been made on the lids of the containers for the escape of organic vapours . Then the setup is kept in Muffle furnace and heated at steady rate to attain the temperature of 800°C. Fifteen minutes after attaining the 800°C temperature the furnace was allowed to cool for about 10 hours and then the container is taken out. The activated carbon thus obtained is sieved to 150 Micron in size, then packed in polythene bags and kept in desiccators. In that mixture required quantity of distilled water was added and boiled on hot plate till most of the water evaporated and slurry like mixture was retained. After that the mixture was oven dried in a clean tray for 24 hours maintained at 105±5°C which helps in evaporation of moisture from the 47 mixture. Preheated carbonizing material was filled in the small container in three layers, by compacting each layer without any air space to avoid the loss in weight of the powder; otherwise it would result in burning of the material directly leaving behind only the ash. Then the setup is kept in Muffle furnace and heated at steady rate to attain the temperature of 800°C.Thirty minutes after attaining the 800°C temperature the furnace was allowed to cool for about 10 hours and then the container is taken out. Activated carbon thus prepared was washed with 0.1N HCl to remove the activating agent, followed by hot distilled water for about 8 times to remove the excess HCl present in the activated carbon. The activated carbon was dried at 105±5°C then packed in polythene bags and kept in desiccators.

Dried magnifera indica and activated maginefera indica

4.2.SELECTION OF OPTIMUM CONTACT TIME

The adsorption is strongly influenced by the contact time. To study the effect of contact time, 100mL of filtered wastewater(10% dilution) sample, was mixed with 1g of activated carbon, stirred at different contact times varying from (30mins, 90mins and 120mins). 1 mL of the sample was withdrawn by using a dropper and added in sampling tubes with scale that contained 9mL of deionised water for the purpose of dilution. After that, the batch shake flask experiments were performed using a gyratory shaker with 75 rpm. The samples were tested for their Cadmium and zinc ion concentration with the AAS.

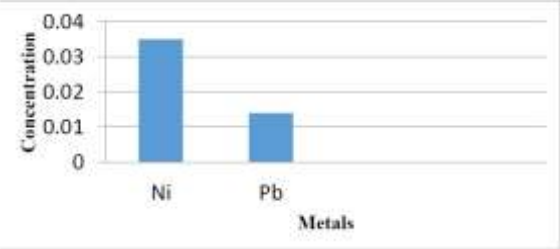
4.3.BIOSORPTION EXPERIMENTS

The biosorption of Cadmium, Zinc, Lead and Nickel from dyeing effluent was investigated in batch biosorption experiments. In batch sorption, a pre-determined powder of adsorbent is mixed with the sample, stirred for a given contact time and subsequently separated by filtration. Powder adsorbent is more suitable for the batch type contact process.

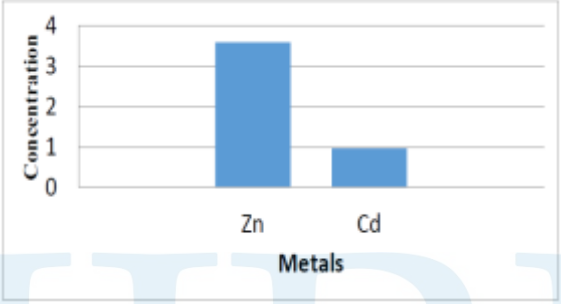
5.RESULTS AND DISCUSSION

The effect of contact time was studied at initial metal ion concentrations **Fig. 11** and **Fig. 12** shows the plot of adsorption efficiency against time for a fixed MLBFSP dosage of 1 g/L, and varied metal concentration. It can be clearly observed that the percentage of adsorption generally increased until time reached 90 minutes. After this time, there was a drop in the adsorption percentage. Thus, 90 minutes was chosen as the optimum time where the adsorption reached equilibrium.. While Most of the adsorption takes place in first 53 hour of contact and longer contact time has negligible effect on extraction of Cadmium and Zinc

Initial Metal Concentration

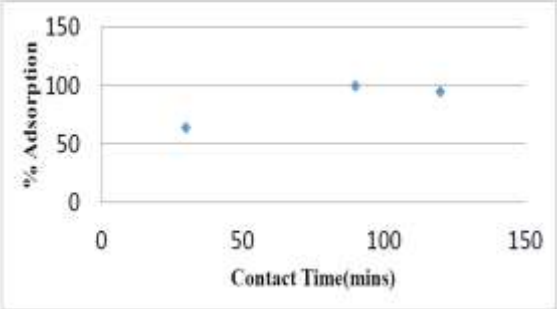


Initial Metal Concentration



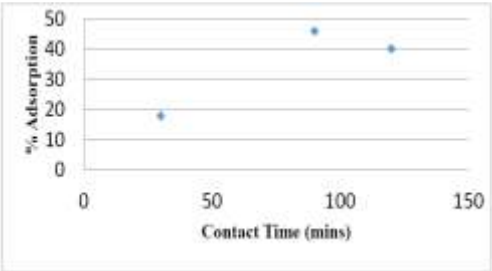
In the present study, Magnifera indica has been used for the removal of Cadmium (Cd) from dyeing effluent. Based on the above conditions the results obtained indicating the effect of various experimental conditions such as equilibrium time, pH, amount of adsorbent etc. has been studied.

Effects of removal of metal Cadmium



The highest percentage of adsorption of Cadmium was found to be 56.59 %, 86.59% and 98.55 % respectively

Effects of removal of metal Zinc



for the highest percentage of adsorption of zinc was found to be 19.40 %, 38.03% and 41.34% respectively.

6.CONCLUSION

Result revealed that the most of the parameters were within the permissible limit of PCB standard while cadmium is not within the permissible limits. Based on present study of adsorption by MLBFSP and experimental information derived from literature the following conclusions are made for cadmium removal –

The maximum adsorption capacity of Cadmium on MLBFSP was 119.8 mg/g. The optimum contact time for the maximum adsorption capacity of Cadmium(Cd) on MLBFSP was 90 minutes. The metal uptake of Cd on MLBFSP decreased with increasing MLBFSP dosage. The maximum adsorption of cadmium took place in the

pH range 7.0. The maximum adsorption takes place in 90 minutes and further increase in duration of contact time has negligible effect. The maximum adsorption capacity of Cadmium was obtained at 0.2 g/L MLBFSP dosage.

7. REFERENCES

1. Abdunnaser Mohamed Etorki, Mahmoud El-Rais, Mohamed Tahher Mahabbis, Nayef Mohamed Moussa, **"Removal of Some Heavy Metals from Wastewater by Using of Fava Beans"**, American Journal of Analytical Chemistry, 2014, 5, 225-234

2. IJu; Okoli , Ibe Ezuma **"Adsorption Studies of Heavy Metals by Low-Cost Adsorbents"**, J.Appl ,Sci. Environ. Manage. *September 2014* Vol. 18 (3) 443-448

3. Ghomri F., Lahsini A., Laajeb A., Addaou *A.* "**The Removal Of Heavy Metal Ions (Copper, Zinc, Nickel And Cobalt) By Natural Bentonite"**, Larhyss Journal, ISSN 1112-3680, n° 12, Janvier 2013, pp. 37-54

4. Ghanshyam Pandhare, Nikhilesh Trivedi, Nitin Kanse S.D.Dawande, **"Synthesis of Low Cost Adsorbent from Azadirachta Indica (Neem) Leaf Powder"**. Pandhare et al, International Journal of Advanced Engineering Research and Studies E-ISSN2249–8974

5. Neetu Sharma, D.P. Tiwari and S. K. Singh, **"Efficiency Of Chemically Treated Potato Peel And *Neem* Bark For Sorption of Direct Red-81 Dye From Aqueous Solution"**, ISSN Vol. 7 | No.4 |399-409 | October-December | 2014

6. Sachin M.Kanawade, R.W.Gaikwad & S.A.Misal, **"Low cost Sugarcane Bagasse Ash as an Adsorbent for Dye Removal from Dye Effluent"**