International Journal of Pure and Applied Mathematics
Volume 119 No. 14 2018, 827-830
ISSN: 1314-3395 (on-line version)
url: http://www.ijpam.eu
Special Issue

ijpam.eu

REMOVAL OF CHROMIUM FROM INDUSTRIAL WASTE WATER BY ADSORPTION USING COCONUTSHELL AND PALMSHELL

L.Soundari[1] , A.Agilan[2] , K.Rajarajan[3].
[1,2,3]Department Of Civil Engineering, IFET College Of Engineering and Technology, Tamil Nadu, India

Abstract

Nowadays, water quality has become the popular issue as best quality water is needed for their daily lives. There are many types of treatment to improve water quality and one of them is by using activated carbon. Prepared by using coconut shell and palm shell powdered as adsorbent. High amount of heavy metal ions like chromium (Cr) in the environment has been harmful for animal and human health. If we talk about tannery and chemical industries it is quite easily contain chromium in the waste water. So removal of chromium (Cr) from tannery wastes is important Here we used adsorption method for removal of chromium The concentration of Cr was determined by atomic absorption spectroscopy (AAS) through absorbance of the solution or sample. Removal of Cr was found to be dependent on pH and absorbance value Hence, in this study the efficiency of activated charcoal powder to removal Cr from chromium solution is investigated. The results of this study proved that activated charcoal powder can be used to remove chromium (Cr) from tannery effluent.

Keywords- Activated charcoal, adsorption, chromium removal.

1. Introduction

Industries like leather, textile etc. are having huge importance in the manufacturing of basic need. This is good but our prime concern is the waste water coming out of these tannery industries.

Waste water contain chromium and water contamination by chromium and its mixes are harmful, which are being blended with regular water from a mixed bag of modern effluents. It is toxic to the point that it prompts liver harm, pneumonic, Congestion, edema and reasons skin disturbance and results in ulcer arrangement. The Concentration of Cr in industrial wastewater was found in the range of 0.5 mg/L to 270000 mg/L. The tolerance limit for the discharge of Cr (VI) into inland surface water is 0.1mg/L and in potable water it is 0.05 mg/L . Chromium exists in the earth in two oxidation states i.e. Cr (VI) and Cr(III). Cr (III) is a supplement species utilized for control of Glucose and lipid digestion system in films, while Cr (VI) is profoundly cancer-causing and mutagenic because of its high oxidative character. So we can using activated carbon to removal of chromium by using coconut and palm shell powder.Chromium is a chemical element having atomic number 24. It is the first element in Group 6. The characteristics are gray in color, lustrous, hard and brittle metal which takes a highly shining, resists tarnishing, and has a high melting point.The activated charcoal as adsorbent to used in the chromium removal of the industrial waste water and it is highly to removing of heavy metals in the adsoption process than other charcoal.

1.1 Objective

The main objectives of this study are:

1. To produce activated carbon from coconut shell and palm shell.

2. To determine the effectiveness of activated carbon using coconut shell and palm shell.

3.To added in charcoal in waste water.

4.To choose the most suitable and effective characteristics of activated carbon from coconut shell and palm shell as wastewater pollutant removal.

1.2 Chromium

Chromium is a chemical element having atomic number 24. It is the first element in Group 6. The characteristics are gray in color, lustrous, hard and brittle metal which takes a highly shining, resists tarnishing, and has a high melting point. Chromium is an individual from the move metals, in gathering 6. Chromium (0) has an electronic design ,inferable from the lower vitality of the high turn setup. Chromium displays an extensive variety of conceivable oxidation states, where the +3 state is most steady vivaciously; the +3 and +6 states are most generally seen in chromium mixes, though the +1, +4 and +5 states are uncommon. Chromium (VI) mixes are intense oxidants at low or impartial pH. Hexavalent chromium is more dangerous.

1.3 Adsorption

Adsorption is a process that occurs when a gas or fluid solute gathers on the surface strong or a fluid (adsorbent), shaping an atomic or nuclear film (the adsorbate). It is unique in relation to assimilation, in which a substance diffuses into a fluid or strong to frame an answer. The term sorption includes both procedures, while desorption is the opposite procedure. Adsorption is agent in most common physical, organic, and synthetic frameworks, and is broadly utilized as a part of modern applications, for example, enacted charcoal, manufactured gums and water cleaning. Like surface pressure, adsorption is a result of surface vitality. In a mass material, all the holding necessities (ionic, covalent or metallic) of the constituent molecules of the material are filled. Anyway, molecules on the (clean) surface experience a bond lack, on the grounds that they are not entirely encompassed by different iotas.Therefore it is vigorously great for them to bond with whatever happens to be accessible. The careful way of the holding relies on upon the points of interest of the species included, yet the adsorbed material is for the most part delegated 10 showing physisorption or chemisorption process. Physisorption can also called physical adsorption is a kind of adsorption in which the adsorbate holds fast to the surface just through Van der Waals (frail intermolecular) collaborations, which are additionally in charge of the non-perfect conduct of genuine gasses. Chemisorption is a sort of adsorption whereby an atom sticks to a surface through the development of acompound bond, instead of the Van der Waals strengths which cause physisorption. Adsorption is normally depicted through isotherms, that is, capacities which unite the measure of adsorbate on the adsorbent, with its weight (if gas) or fixation (if fluid). One can discover in writing a few models portraying methodology of adsorption, to be specific, Langmuir, BET and Freundlich isotherm

1.4 Charcoal

Charcoal is a light black residue consists of carbon and any remaining ash obtained by removing water and other volatile constituent from animals and vegetation substances. It is normally created by warming of wood or other substance without oxygen. It is normally a sullied type of carbon. Initiated carbon can be delivered from distinctive crude carbon assets like lignite, peat, coal, and biomass assets, for example, wood, sawdust, bagasse, and coconut shells. Enacted carbon, additionally called initiated charcoal, actuated coal, or an "air conditioner channel", is a manifestation of carbon prepared to have low volume pores that build the surface territory accessible for adsorption or substance responses. Enacted is in some cases substituted with dynamic. Because of its high level of micro porosity, only one gram of enacted carbon has a surface zone in overabundance of 500 m2, as dictated by gas adsorption. An actuation level adequate for helpful application may be accomplished singularly from high surface zone; be that as it may, further concoction treatment regularly upgrades adsorption properties. Enacted carbon is typically gotten from charcoal and, progressively, high-porosity bio char. Enacted carbon is created in most created in large rage. It is one of the strongest adsorbents known and has surface territories that can achieve 1500 m2/g. The exceptionally permeable carbon is created financially in the created world through a conventional steam initiation process. Unfortunately, such a fantastic enacted carbon obliges pyrolysis temperatures of more or less 800 to 1000°C. This temperature reach is infeasible utilizing the innovations promptly accessible as a part of the creating scene on a little scale. On the other hand, enacted carbon can be created through synthetic enactment of charcoal. The source and nature of the carbon may assume a part in the quality and consistency of initiated carbon created, yet to lessen biological effect, nearby farming waste repercussions can be utilized as a substitution as a part of the actuated carbon creation process.

2. Methodalogy

1) Collection of material like coconut shell and palm shell.
2) Powdered preparation of coconut and palm shell.
3) Activated carbon preparation using coconut and palm shell powder.
4) Preparation of standard chromium solution.
5) Testing of chromium using activated carbon in atomic absorption spectroscopy.
6) Result and discussion.

3. Experimental Work

1) Collection of materials like coconut shell and palm shell washed with water.
2) Dried it under sun for one day and then burnt it at 650 degree centigrade for 2 hours. It got completely carbonized by using muffle furnace.
3) Then crushed the sample which brought it down into small particles and separated into different mesh size, basically we wanted very fine particle.
4) The crushed particles are sieve by 4.75 mm.

3.1 Activated Carbon Preparation

1) Calcium chloride of 25 gram is mixed with distilled water for 70ml for preparing the solution

2) After the calcium chloride solution mixed with 80 gram of activated carbon.
3) To prepare on paste.
4) After the paste is covered and rested on 24 hours.
5) The paste is filtered by using clean cloth .
6) Small amount of moisture content present on the sample.
7) The filtered particles are taken on crucible now kept it in the furnace at 700 degree centigrade a very high temperature to increase the porosity of activated carbon.
8) After taking out from the furnace we again washed it with distilled water and dried in the furnace at 110 degree centigrade for 2 hours.
9) Activated charcoal is now ready to use.

3.2 Removal Of Chromium

1) Taking of 2.82 gram of potassium dichromate in 500ML of water mixed on it.
2) For making 1000 ppm of chromium for using activated carbon chromium should be removed on it.

4. Result

Now we went for atomic absorption spectroscopy (AAS). We got the absorbance of each sample which has mentioned latter on in the table. Now we added 1 gram activated charcoal to each sample and left for 2 hours. Adsorption of chromium had taken place and again we had gone for AAS to get absorbance.

References

[1] Aggarwal, D., Goyal, M., Basal, R.C., 1999. Adsorption ofchromium by activated carbon from aqueous solution. Carbon 37, 1989–1997.

[2] Alaerts, G.J., Jitjaturunt, V., Kelderman, P., 1989. Use ofcoconut shell-based activated carbon for chromium(VI)removal. Water Sci. Technol. 21, 1701–1704.

[3] Arulanantham, A., Balasubramanian, N., Ramakrishna, T.V.1989. Coconut shell carbon for treatment of cadmium andlead containing wastewater. Metal Finishing 87, 51–55.

[4] Benito, Y., Ruiz, M.L., 2002. Reverse osmosis applied to metalfinishing wastewater. Desalination 142, 229–234.Chakravarty, S., Dureja, V., Bhattacharyya, G., Maity, S.,

[5] Bhattacharjee, S., 2002. Removal of arsenic from groundwater using low cost ferruginous manganese ore. Water Res. 36, 625–632.

[6] Charerntanyarak, L., 1999. Heavy metals removal by chemical coagulation and precipitation. Water Sci. Technol. 39, 135–138.Clesceri, L.S., Greenberg, A.E., Eaton, A.D., 1998

[7] Standard methods for the Examination of Water and Wastewater20th. American Public Health Association, Washington (pp.3-65–3-68).Dantas, T.N.D., Neto, A.A.D., Moura, M.C.P., 2001.

[8] Emsley J (2001) Chromium- Nature's Building Blocks: An A-Z Guide tothe Elements. Oxford, England, UK: Oxford University press, pp: 495-498.

[9] Katz SA, Salem H (1992) The toxicology of chromium with respect to its chemical speciation – A review. Journal of Applied Toxicology 13: 217-224.

[10] Barakat MA (2010) New trends in removing heavy metals from industrial wastewater. Arabian Journal of Chemistry 4: 361-377.

[11] Fu F, Qi W (2011) Removal of heavy metal ions from wastewaters – A review. Journal of Environmental Management 92: 407-418.

[12] http://vlab.amrita.edu/?sub=2&brch=190&sim=606&cnt=1

[13] El Shafey EI (2007) Sorption of Cd (II) and Se (IV) from aqueous solution using modified rice husk. Journal of Hazardous Materials 147: 546-555.

[14] Dhanakumar S, Solairaj G, Mohanraj R, Pattabhi S (2007) Removal of chromium (VI) from aqueous solution by adsorption using cooked tea dust. Indian Journal of Science and Technology : 1-6.