"TREATMENT OF LEACHATE BY USING COIR (COCONUT FIBER) AS ACTIVATED CARBON"

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ABSTRACT: Activated carbon is useful in drinking water treatment because it acts as an adsorbent, and effectively remove particles and organics from water. In physico-chemical treatment, the separation of suspended particles from the liquid phase is usually carried out by the processes like coagulation, flocculation and sedimentation. These organics are of great concern in water treatment because they react with many disinfectants, especially chlorine, and cause the formation of disinfection-by-products. The increasing pH suggest that the filter media is a good for pH regulation as it increase the pH constantly closer to neutral from acidic range. The C.O.D. removal percentage was found to be 76.96%. Hence, the filter media was good for removal of C.O.D. The dissolved oxygen content of leachate at initial stage is found to be 5.8 ppm and after passing the leachate through filter media the dissolved oxygen content is increased and it comes out to be 7.2 ppm. These reading was taken in an alternate days, it was observed that if the leachate is passed through filter media the D.O. content in the leachate is increased.

Key Words: Adsorption, Chemical oxygen demand, Dissolved Oxygen.

1. INTRODUCTION

Efficient wastewater treatment is critical for the world. There is unprecedented environmental pressure being exerted on the environment by the rapidly expanding population. This growing population requires adequate clean groundwater to drink. (4) The environment demands relatively unpolluted surface water in streams and lakes to maintain the flora and fauna that humans have come to rely upon for food and recreation. Moeller estimates that 80% of the total disease burden in developing countries comes from waterborne illness. .Diarrhea still claims an estimated 2,000,000 children a year. (2), China reports that 300,000,000 of its citizens lack safe drinking water (3). In the USA, 95% of the population in rural areas receives its. Drinking water from groundwater-recharged wells (US Environmental Protection Agency, 1998). Water purification is the ultimate technique to ensure safe drinking water.

Activated carbon is useful in drinking water treatment because it acts as an adsorbent, and effectively remove particles and organics from water. These organics are of great concern in water treatment because they react with many disinfectants, especially chlorine, and cause the formation of disinfection-by-products. (1) Activated carbon is one of the best tools which can be used to reduce risks to human health and provide an aesthetically pleasing product at reasonable cost. The reason that activated carbon is such an effective adsorbent material is due to its large number of cavernous pores.

2. METHODOLOGY

Activated Carbon

Activated carbon is used to purify liquids and gases in a variety of applications, including municipal drinking water, food and beverage processing, odor removal, industrial pollution control, and point-of-use filters in the home. Public awareness and the concern about safe drinking water have driven consumers to install point-of-use carbon systems in their homes, further purifying the water that they drink.

Granular activated carbon (GAC) in combination with biological pretreatment is the leading technology for the treatment of landfill leachate for the removal of COD, absorbable organic halogens (AOX) and other toxic substances. (1) Adsorption is the process by which molecules with particular characteristics of size and polarity are attracted and held to the adsorbing surface. (9) However, activated carbon proves disadvantageous for large quantities without sustainable high COD removal efficiencies. Further, the effectiveness of carbon adsorption on the removal efficiency of COD in young leachate containing

high volatile fatty acid content is dependent on the magnitude and proportion of the high and low molecular weight free volatile acid fractions in the leachate. (6)

3. EXPERIMENTAL WORK

Preparation of activated Carbon:

The 50 ml concentrated Sulphuric acid was taken in a beaker and 500 ml of distilled water was added in it. Coconut husk was added in the above said solution and kept undisturbed for 24 hours. Then it was removed from the solution and kept in Oven for drying for about 24 hours. After 24 hours, it was removed from oven and kept open for cooling. Then it kept in Maffle Furnace in a crucible dish at 750 degree centigrade temperature for 2 hours. After 2 hours, the coconut husk in crucible became Activated Carbon, it was removed out with the help of tong. (4) It was kept open and allowed to cool. Then the burnt filaments of coconut husk (activated carbon) was crushed manually.

Leachate Preparation:

Initially the decomposable waste vegetables are taken in a beaker. Then the little quantity of water added over the waste vegetable and cover the beaker. The beaker is kept air tight. Sprinkle the water twice a day and make the beaker air tight again. After 72 hours open the beaker and collect the waste generated in a collecting jar. Allow the waste water generated to pass through the sieve and collect the prepared leachate in a beaker.

Construction of model:

The saline bottle was hung on stand, and a pipe connected with regulator was attached to saline bottle. A 2 litre bottle was cut from bottom. It was kept inverted fixed between bricks with the mouth of bottle closed with a cotton cloth. The bottle was filled with a layer of coarse aggregate, after that a layer of fine aggregate passing through IS sieve 4.75mm and retained on IS sieve of 2.36mm was placed on it. Two layers of activated carbon of 3cm each was placed on fine aggregates, and a filter paper was inserted between the two. A beaker was placed below the mouth of bottle for collecting the affluently (Fig.1).

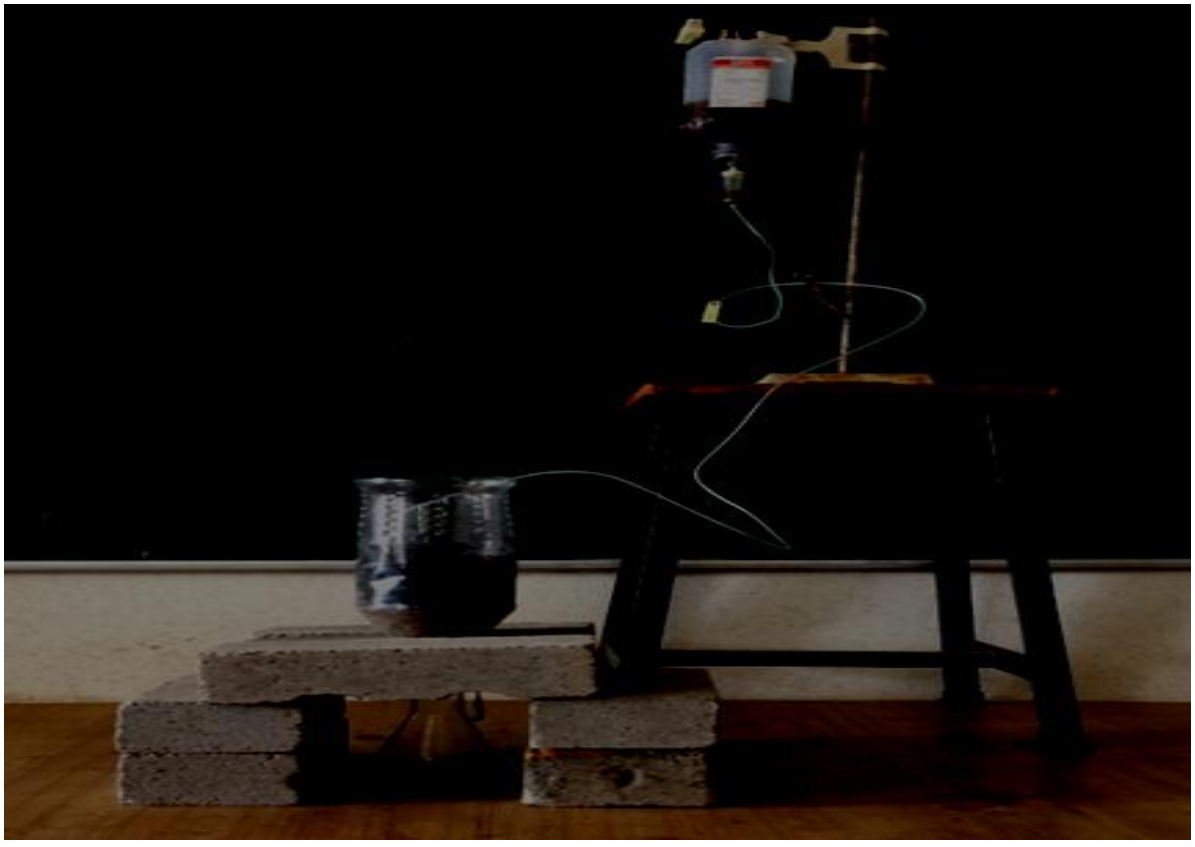

Fig.1 Experimental setup in the laboratory

4. RESULTS AND DISCUSSION

1. pH: Initial pH of untreated leachate was found to be 4.7 ppm, after treatment by the filter media pH was found to be 6.06 ppm .This procedure is followed at an interval of two days , after two days pH of untreated leachate was 5.746 and treated was 7.23 ppm. The increasing pH suggest that the filter media is a good for pH regulation as it increase the pH constantly closer to neutral from acidic range.

2. Chemical Oxygen Demand: The removal percentage was found to be 76.96%. Hence, the filter media was good for removal of C.O.D. but satisfactory result can be achieved if some necessary adjustment can be made. (9)

3. Dissolved Oxygen: The dissolved oxygen content of leachate at initial stage is found to be 5.8 ppm and after passing the leachate through filter media the dissolved oxygen content is increased and it comes out to be 7.2 ppm.

These reading was taken in an alternate days, it was observed that if the leachate is passed through filter media the D.O. content in the leachate is increased.

5. CONCLUSIONS

It has been found that the activated carbon prepared from coconut fiber is one of the efficient adsorbent, giving very good result in D.O., pH, C.O.D., etc. The result of the synthesis gives a hope to use the activated carbon prepared from coconut fiber as a adsorbent of good choice for improving D.O., pH and C.O.D in treated leachate, especially in the all-region of India where waste vegetables are decomposed, but in order to use it as adsorbent of choice for improvement in D.O., pH, C.O.D. etc. detailed investigations in the form of batch process (to optimizing the dose) and column process are necessary to check efficiency for complete study.

The COD reduction was observed upto 76.56%, which indicate that activated carbon can effectively reduce pollution in waste water, D.O. was not affected by some extent. The pH was increased by 8-10%. Considerable pollution of natural waters brings about a situation where meeting the growing requirements for drinking water and domestic water is not possible in many plants using traditional technological systems. It can be predicted that the river water quality will not remain same in the future. There will be increase in agricultural practices, industrial settlement and urbanization around the river which would ultimately lead to the contamination of water resources. In the present study it was observed that there is maximum reduction in chemical oxygen demand, biochemical oxygen demand and iron content of water by finer activated carbon Reduction in COD proves that the organic compounds can be efficiently removed by coconut shell activated carbon. Whereas in case of sand filters negligible reduction in iron and COD was observed. Turbidity reduction was almost same in both types of filtration materials. So, coconut shell activated carbon can be looked upon for future treatment of water in removing suspended solids, iron and total organic carbon instead of sand filtration in the treatment plants. This technique is highly advantageous, inexpensive and cost-effective and in turn there will be utilization of a waste which would be otherwise simply dumped. Various literature reviews also gave a remarkable evidence of removal of wide range of pesticides from coconut shell activated carbon. Thus, this improvisation can be rendered as a novel method for drinking water treatment taking environment into concern.

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