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REMOVAL OF COD AND BOD FROM WASTE WATER BY LOW COST ADSORBENTS

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Abstract: *Waste water has become a big problem particularly with improvement in living standard of people. For this, sufficient capacity is not available for handling this wastewater. Bulk of this waste water is either discharge in open channels or accumulates in low-lying areas are flows through natural open drains. Biochemical oxygen demand (BOD) and chemical oxygen demand (COD) are the most commonly used parameters for the characterisation of waste waters. The present study is focused on COD and BOD reduction in waste water using discarded material based adsorbents (mixed adsorbents carbon, MAC and commercial activated carbon, CAC) . Under optimum conditions, and maximum COD and BOD reduction achieved using MAC and CAC. And the adsorbents are prepared from the neem leaves and coconut coir results showed that MAC offered potential benefits for COD and BOD removal from wastewater.*

Keywords: *adsorbents; BOD; COD; decentralised sectors; wastewater treatment*

INTRODUCTION

Waste water has become a big problem particularly with improvement in living standard of people. For this, sufficient capacity is not available for handling this waste water. Bulk of this waste water is either discharged in open channels or accumulates in low-lying areas or flows through natural open drains. Some affluent people however use individual captive wastewater storage wells. To comply with the stringent regulations and to restore safe environment, it has become imperative to find less costly and easily adaptable treatment technologies. Adsorption –based innovative technology (Rani Devi) et al., 2002; Rani Devi and Dahiya, 2006 Developed with low-cost carbonaceous materials showed good potential, more so for COD removal from the domestic wastewater thus, the adsorption approach can offer a simple and economic solution to environmental challenges. This paper is focused on the evaluation of adsorption capacity of discarded material based mixed adsorbent carbon for removal of COD and BOD from waste water generated in decentralized sectors.

COD (Chemical oxygen Demand) is the amount of external oxygen required to oxidize all organic matter present sample water. It is the measure of quality of water and expressed in terms of mg of oxygen consumed per litre of sample water (mg/L). The COD analysis using potassium dichromate as oxidizer is one of the direct method for COD measurement of organic matter in water.

One of the parameters that indicate the oxygen demand is Biochemical oxygen demand, BOD; and defined as the amount of free oxygen required for the biological oxidation of the organic matter under the aerobic conditions. Oxidation ditch, aerated lagoons, activated sludge, trickling filters etc. are the biological methods adopted for the treatment of these dairy waste waters. These give no doubt the good results but, required high initial cost, more maintenance and especially high retention time, skilled personnel and special type of equipment. On the contrary, the low cost treatment methods can be employed with the simpler equipment and the less maintenance.

Raw materials and equipment

MaterialsRequired

Waste water collected from outlet of pulp industry.

Apparatus

COD Apparatus	BOD Apparatus
➢ Heater	➢ Conical flask
➢ Round bottom flask	➢ Burette
➢ Reflux condenser	➢ Stand
➢ Measuring cylinder	➢ Measuring cylinder
➢ clamp	➢ weighing balance
➢ Pipes	➢ Heater

CHEMICALS

For COD:-

Mercuric sulphate

Di-chromate solution

Sulphuric acid reagent

Ferroin indicator

For BOD:-

Manganese sulphate

Alkali-azid solution

Sodium Thiosulphate

Starch indicator

Calcium chloride

Ferric chloride

Methodology

Procedure For Preparation Of Adsorbents

1.Preparation of coconut coir adsorbents

Wet the coconut coir in distilled water. Soak the coconut coir in sunlight for 3 to 4 days. Grind the soaked coconut coir in grinder. Wash the coconut coir with distilled water till its colour gets vanished. Then sieve the powder of coconut coir and take. The sieve the powder as adsorbents.

2.Procedure for preparation of neem leaves adsorbents

The crispy neem leaves Then wash neem leaves with distilled water till its colour gets vanished. Again soak the Wash the neem leaves with water Soak it in to the sunlight for 3 to 4 days After soaking grind neem powder and it is ready to use as an adsorbents.

Procedure for COD:-

Ferroin Take a reflux flask and placed 0.4gm of mercuric sulphate. Add 20 ml of sample. Add 10ml of concentrated Di-chromate solution. Place some glass beads in flask. Add slowly 30ml of sulphuric acid with reagent and mix thoroughly. Place condenser on the reflux flask and place whole assembly on heater. Start heater and reflux for a minimum period of 2 hours. Add glass beads to avoid bumping of solution. Cool the contain and wash with distilled water. Dilute the sample to make up volume up to 150ml. Titrate excess Di-chromate with ferrous ammonium sulphate solution place in burette using indicator. Sharp colour change from blue green to wine red indicate end point. Note down burette reading. Repeat the above solution procedure using distilled water in place of sample.

Procedure for BOD:-

Prepare dilution water saturated with air as discussed. At 1ml each of phosphate buffer, magnesium sulphate and calcium chloride and ferric chloride solution for each litre of dilution water and mix it well. In case of waste which is not expected to have sufficient bacteria population adds seed.

Determine the DO for blank and simple on first day.

Take BOD bottle containing blank. Add 2ml of manganese sulphate solution by means of pipette, dipping the end of the pipette just below the surface of water in BOD bottle containing blank. Add 2ml of Azide alkali potassium iodide in a smaller manner. Insert the stopper with care to extrude bubble and mix by repeatedly inverting and shaking the bottle vigorously. Red precipitate will from if DO is present in water. Allow the precipitate to settle half way, and mix again. Again allow the precipitate to settle half way. Add 2ml of concentrated sulphuric acid in the same manner as done in step 2and 3 and insert the stopper and mix up thoroughly as before.

Table1: COD For Fresh effluent

Sr. No	Time duration	Sample details	Volume of sample	Initial burette reading	Final burette reading
1	Day 1	Blank	10	0	11
2	Day 2	Fresh effluent	10	0	0.4

Sample calculations

COD (FRESH EFFLUENT)=(A-B)* Normality of ferrous ammonium sulphate*8*1000/Volume of sample

=(11-04)*0.1*8*1000/10 = 848 mg/l

For COD after adding adsorbent

Table 2: COD After adding adsorbent

Sr. no	Time duration	Sample details	Volume of sample (ML)	Initial burette reading (ML)	Final burette reading
1	Day 1	Effluent	10	0	2.9
2	Day 2	Effluent	10	0	4.2

Sample calculation

COD =(A-B)*Normality of ferrous ammonium sulphate *8*1000/volume of sample

= (11-2.9)*0.1*8*1000/10

= 684 mg/l.

Sample calculation for BOD

Table3: For BOD fresh effluent

Sr. no	Time duration	Bottle sample (ml)	Burette reading (ml)		Dissolved oxygen in (mg/l)
1	Day 1	Fresh effluent	0	7	466.66
2	Day 2	Blank	0	6	406

Sample calculations For BOD (DO)

DO 1 = Volume of sodium thiosulphate consume in ml* normality*0.08*106

=7*0.025*0.08*1000/30

=466.66 mg/l

Do2 = volume of sodium thiosulphate consume in ml*normality*0.08*10^6

= 6.1*0.025*0.08*10^6/30

= 406 mg/l

BOD(mg/l) = D1-D2/P

= (466.66-406)/30/300

=6.74 (mg/l)

Sample Calculations

Table 4: For BOD After adding adsorbent

Sr. no.	Time Required	Bottle Sample	Burette Reading (ml)		Dissolved oxygen in (mg/l)
1	Day 1	After adsorbent	0	5.7	340
2	Day 2	After adsorbent	0	4.2	280

For (Do)

Do 1 = Volume of sodium thiosulphate consume in ml*normality*0.08*10^6

= 5.7*0.025*0.08*1000/30 =340 mg/l

Do 2 = Volume of sodium thiosulphate consume in ml*normality*0.08*10^6

= 4.2*0.025*0.08*10^6/30

= 280 mg/l

For BOD

BOD (mg/l) = D1-D2/P

= (340-280)/30/300

= 6.66 mg/

Applications

For COD

Chemical oxygen demand (COD) is an indicative measure of amount of oxygen that can be consumed by reaction in measured solution.
IT is commonly expressed in mass of oxygen consumed over volume of solution in SI unit is mg/l.
COD test can be used to easily quantify the amount of organic in water.
COD is useful in terms of water quality(e.g lake and rivers)
COD test is often use to monitor water treatment plant efficiency.

For BOD

BOD can be used as a gauge of effectiveness of waste of water treatment plants.
It is listed as conventional pollutants in the U.S clean water act.
BOD is similar in function to COD in that BOTH measure it provides an index to assess the effect

discharge waste water will have on the receiving environment.

BOD is used to evaluate the amount of biodegradable organic material present in effluent.

RESULT AND DISCUSSION

In the above experiment we had study about removal of COD (chemical oxygen demand) and BOD (bio chemical oxygen demand) from effluent sample collected from pulp industry outlet.

Following are the readings for COD and BOD

COD reading for fresh effluent=848 (mg/l)

COD for after adding adsorbents=684 (mg/l)

BOD reading for fresh effluent= 6.74 (mg/l)

BOD reading after adding adsorbents=6.66(mg/l)

From this experiment we found that the change in time the amount of COD and BOD is reduced by using low cost adsorbents.

CONCLUSION

From this study it is concluded that mixed adsorbents carbon shows a good potential for waste water treatment in the decentralized communities of the world in general, and developing countries in particular. Using this innovative technique, the COD and BOD can effectively be curtailed from the waste water. For building a standalone treatment unit in decentralized sectors, the parameters of optimum operating conditions are studied, can be used for maximum removal of COD and BOD from waste water. It is also interfered that the adsorbents may be incorporated in the conventional treatment along the aeration process it may be provide better treatment results with low energy consumption. Moreover, it might be a good practise for the decentralized communities where supply of energy is a problem and is a problem and not available in sufficient quantity.

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