

PAPER BAG PACKED WITH ACTIVATED CARBON TO PURIFY DOMESTIC WATER

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Abstract

Water is a scarce precious source which is the basic requirement for existence of all living things. Local bodies/agencies setup water treatment plants to process raw water to convert them suitable for consumption. Due to the chemicals involved in the purification process. Responsibility of water utilize is not only limited to the production of safe drinking water. But also efficient and safe disposal of water treatment plant residues. In this project, we are going to analyze the usage of paper bags packed with activated carbon to purify domestic water.

The activated carbon used here is made from natural fibers like coconut shell. The preparation of activated carbon is more over meant with natural products like Camphor, lemon juice etc.

Initially, we are planned to analyze the parameters of three samples

- River water
- Ground water
- Stored tank water

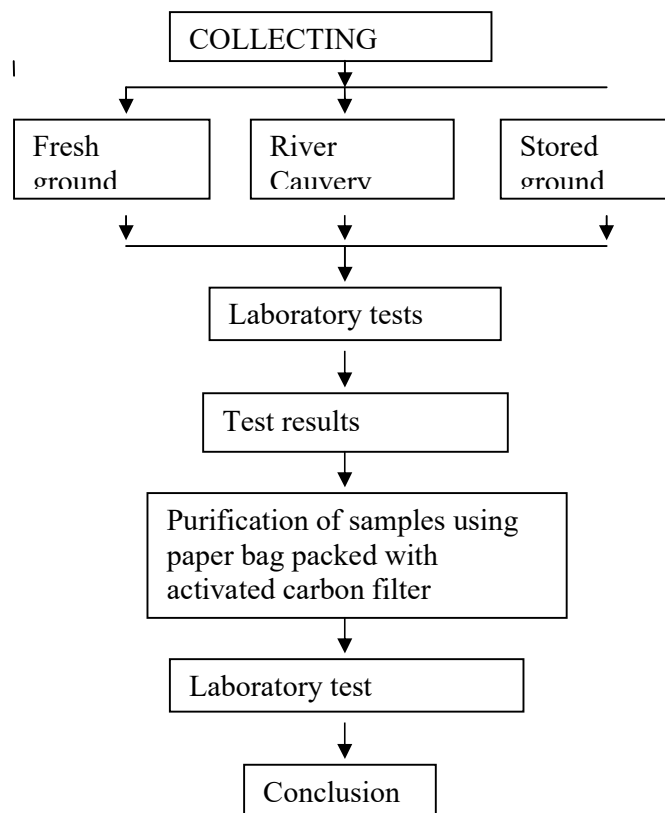
After the preparation of activated carbon the same three sets of samples are treated with that setup. Finally the test results before and after treatment will portray the conclusion.

Keywords—water, paper bag, activated carbon, laboratory tests

I. Introduction

Water is vital for all known forms of life. Water that is not fit for drinking but it is not harmful for other domestic needs. The aim of water treatment is to remove contaminants or reduce them to a concentration that means the water is safe to drink. Safe drinking water does not have to be sterile, and can contain organic and inorganic matter that the body can tolerate. Contaminants include sediments and pathogens (bacteria, viruses, protozoa, larger organisms (worms) or salts and toxins (fertilizers, heavy metals). Most commonly, water supplies are contaminated by human or animal excrement, or occasionally a dead animal carcass ends up in the water supply (e.g. cattle crossing a river). Contamination can also occur in the form of pollutants from human infrastructure such as mining or farming. Thus the limit of various components present in water defines its usage in various fields. In this project, we are going to find the results of using paper bags packed with activated carbon as a filter to purify domestic water.

II. METHODOLOGY



III. SELECTION OF MATERIALS

A. Materials used:

- Filter paper
- Activated carbon
- Lemon juice
- Calcium chloride
- Sample water

B. Filter paper

- Pour size : 11micron
- Thickness : 1.8mm
- Flow rate : 10.5s/100ml/sq. inch
- Material type : Cellulose
- Brand : Whatman

Filter paper is a semi-permeable paper barrier placed perpendicular to a liquid or air flow. It is used to separate fine substances from liquids or air. It is used in to remove solids from liquids.

IV. Activated carbon

Activated carbon is a porous substance derived from organic material (usually woody, fibrous stuff). The useful thing about activated carbon is that it can filter out contaminants from both water and air, which makes it an important substance in filtration system.

Preparation activated carbon from natural waste fibrous materials:

- a) Commercial carbon is made with hardwood or coconut husk.
- b) The first step is to heat the material to a stage where everything but the carbon burns off.
- c) The time it takes to fully char varies depending on the material and heat, but we have found that 4 hours tends to be a good consistent number.
- d) The material should be black and have the consistency of charcoal.
- e) Use your hand or a hammer to crush the carbon to a powder.
- f) The next step is to increase the preliminary pore size of the charcoal. This is where the acid/base/strong salt comes in. You're going to want to make a 25% solution of Calcium Chloride (50g) and Lemon juice (50ml)
- g) To remove the ash content within the carbon, you should first rinse out the carbon in the container. If you have time, let it fully dry.
- h) Add enough of the solution to the container to fully submerge the carbon. Cover, and let rest for 24 hours.
- i) Applying heat to the activated carbon after chemical exposure helps to fully refine the product and maintain its integrity.
- j) After the 24 hour waiting period, rinse out the solution and drain the carbon. You want to have wet carbon, but not saturated carbon. Place it back in the container.
- k) You now want to exposure the carbon to 225-250 degrees Fahrenheit for about 3 hours.
- l) The heat will dry the carbon and finish the product.

a. Lemon juice

Lemon juice is a kind of citric acid. This is great for making food quality activated carbon. This will also increase the preliminary pour size of charcoal. Also remove ash content in the charcoal.

b. Calcium chloride

Calcium chloride solutions are corrosive in microscopic level, increasing the surface area of the char by creating pores and thus increasing the filtration properties of the substances. This too performs same as that of lemon juice.

c. Sample water

We have chosen three water samples. First one is fresh ground water from the locality near No.1 tollgate, Second one is river Cauvery water from chathram and finally stored tank water from same locality as that of fresh ground water nearly stored for three or four days.

V. laboratory tests

Various water parameters test were conducted before and after purifying the sample water. The final results are tabulated below

a. pH value

As per IS 10500-2012 Indian standard Drinking water –specification, acceptable pH limit for drinking water is 6.5 to 8.5 no relaxation is agreeable in the absence of alternative source.

TABLE I. pH VALUE OF SAMPLES

Samples	pH VALUE	
	<i>Before test</i>	<i>After test</i>
Fresh ground water	7.90	7.53
Cauvery water	8.30	7.61
Stored ground water	8.22	7.57

b. Turbidity

As per IS 10500-2012 Indian standard Drinking water –specification, acceptable turbidity limit for drinking water is 1 and permissible limit in the absence of alternative source is 5.

TABLE II. TURBIDITY,NTU,MAX

Samples	Turbidity (NTU)	
	<i>Before test</i>	<i>After test</i>
Fresh ground water	2.3	1.8
Cauvery water	2.7	1.9
Stored ground water	9.6	1.5

c. Total Hardness

As per IS 10500-2012 Indian standard Drinking water –specification, acceptable limit for Total Hardness is 200 mg/l and permissible limit in the absence of alternative source is 600 mg/l. the total hardness measured here as CaCO₃.

TABLE III. TOTAL HARDNESS(AS CaCO₃)

Samples	Hardness(mg/l)	
	<i>Before test</i>	<i>After test</i>
Fresh ground water	189	168
Cauvery water	142	120
Stored ground water	196	175

d. Total Dissolved Solids(TDS)

As per IS 10500-2012 Indian standard Drinking water –specification, acceptable limit for Total Dissolved Solids is 500 mg/l and permissible limit in the absence of alternative source is 2000 mg/l.

TABLE IV. TOTAL DISSOLVED SOLIDS

Samples	TDS(mg/l)	
	<i>Before test</i>	<i>After test</i>
Fresh ground water	40	0
Cauvery water	150	0

Samples	TDS(mg/l)	
	<i>Before test</i>	<i>After test</i>
Stored ground water	200	0

Total Alkalinity

As per IS 10500-2012 Indian standard Drinking water –specification, acceptable limit for Total Alkalinity as calcium chloride is 200 mg/l and permissible limit in the absence of alternative source is 600 mg/l.

TABLE V. TOTAL ALKALINITY

Samples	Alkalinity(mg/l)	
	<i>Before test</i>	<i>After test</i>
Fresh ground water	106	62
Cauvery water	160	54
Stored ground water	60	34

CONCLUSION

From these analysis we have concluded that the self prepared activated carbon purify the water samples and also decreases various parameter. Thus this can be used for economical purification of water.

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