

## PREPARATION OF ACTIVATED CARBON FROM POLYSTYRENE

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**Abstract** - Activated carbon is commercially used for treating the waste water. The adsorption property of activated carbon widely used in the removal of color, odors and pathogenies from the waste water.

Activated carbon (AC) prepared by using the waste polystyrene which poses a various disposal polystyrene as its non- decomposable material. As a consequence, activated carbon made from polystyrene has a relative capacity to adsorption of ordinary elements specific capacitance when applied as a carbon which is connectively over able. This work offers a strategic destination for this environment unfriendly residue by converting from into useful way. The best activated carbon produced by adding (NOAH) & heated and very high temperature up to 600 °C.

**Key Words:** polystyrene, acetone acid, NAOH.

Moisture content, ash content

### 1. INTRODUCTION

Activated Carbons are the most powerful adsorbents known. It is basically a solid material consisting mainly of pure carbon. A characteristic feature is its porous structure and the resulting immense surface area which may be as large as 1500 m<sup>2</sup>/gm. Due to its exceptional adsorption qualities, activated carbon is widely used in process destined to purify, discolor, recuperate and remove odors at low cost and superior efficiency. Activated carbons work on the principle of adsorption. Adsorption is an interfacial process involving the collection of gaseous or solute components on the surface of adsorbent solids. This phenomenon is associated with physical attractive forces that bind gaseous and solute molecules commonly known as Van-der-Waals forces. Adsorption is thus a physical process, i.e. the substances adsorbed on the solid do not undergo any chemical reaction with the latter. The adsorbing solid is referred to as adsorbent and the substance to be adsorbed from the liquid or the gas phase as the solute.

The adsorption power and rate is determined by the kind of activated carbon, the particle size, the pore size and its distribution

### MATERIAL AND METHOD

Testing of specimen

Moisture test

Ash content test

Density test

Matter soluble in water

Matter soluble in acid

Iron content

### II. DETAILS EXPERIMENTAL

#### 2.1. Materials and Procedures

##### 1. 1. Materials

POLYSTYRENE HCL, SODIUM HYDROXID (NAOH)

1. The activated carbon used in this study was commercial product supplied by (E. Merck, Darmstadt), in grain and powder form of plant origin. Before its use the carbon was put in an oven at 120° C for 24 hours.

2. Polystyrene Matrix Polystyrene used was obtained by radical polymerization of styrene in the presence of the catalyst C14H6O4 at 60 °C

3. Preparation of the composite material (Polystyrene-activated carbon) A polystyrene-active carbon composite material was prepared by combining the properties of polystyrene with the large specific surface area of activated carbon: 2 g of polystyrene was dissolved in 50 ml of toluene with continuous stirring and 10 g of powder activated carbon were added to the polymer solution with stirring for 30 minutes. The mixture is spread at cartridge WPP105M surface for 48 hours to obtain a cartridge covered with composite material then placed inside the experimental device equipped with an inlet of the polluted solution and a decontaminated solution outlet after passing through the composite material of the cartridge.

### METHOD OF BATCH EXPERIMENTS

Batch experiments were conducted in polythene bottles of 300ml capacity proved with screw caps. The polythene bottles were washed well with chromic acid before and after use.

100ml of the solution containing 10mg/L of ions under investigation were taken in the bottle. After the addition of carbon, the bottles were equilibrated for specific periods of time in a rotary mechanical shaker. At the end of the equilibration period, the solutions were filtered; using G-

3 crucibles if necessary and the concentration of respective ions were established by spectrophotometer.



**POLYSTYRENE WAST MATERIAL**



**POLYSTYRENE CARBON**

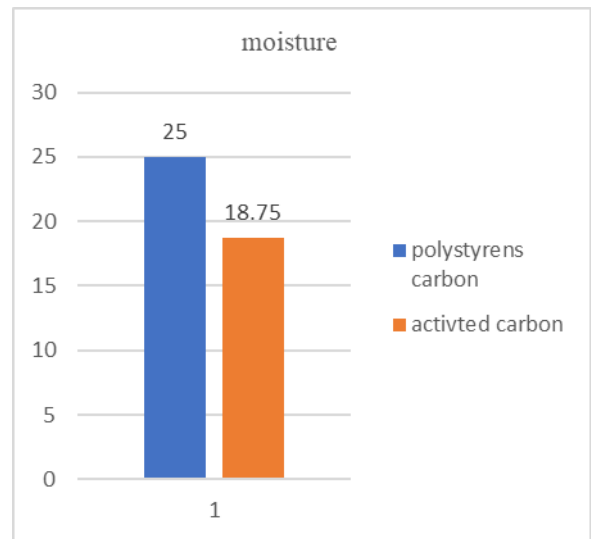


**ACTIVATED CARBON**

**METHODS FOR THE DETERMINATION OF CARON CHARACTERISTICS:**

**1. MOISTURE CONTENT**

Moisture content is an indicator of the amount of the water present in soil.



Graph (a)

**2. ASH CONTENT**

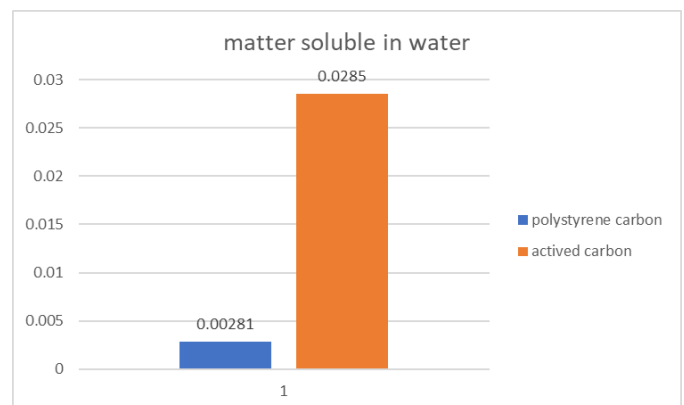
The ash content is measure of the total amount of minerals present with in a food, where as the mineral content is a measure of the amount of specific inorganic components.

**3. APPARENT DENSITY TEST**

The ratio between the apparent value of dry specimen mass of the soil sample. The value is limited by external specimen forces which include voids.

**4. MATTER SOLUBLE IN WATER**

The are soluble they usually dissolve faster and better in warm or hot water. Papper and sand are insoluble, they will not dissolve even in hot water.



Graph (b)

**5. MATTER SOLUBLE IN ACID.**

The solubility of sample oxides and sulfides, both strong bases, often depend on ph. Oxides or hydroxides

**6. P<sup>H</sup>**

The ph value is a number from 1 to 14, with 7 as the middle point. Values below 7 indicate acidity which increases as the number decrease, 1 being the most acidic.

**7. DECOLOURISING POWER**

The carbon is expressed in term of milligrams of methylene blue adsorbed by 1g of activated carbon.

**8. PHENOL NUMBER**

Phenol number or the phenol value of any carbon is defined as the amount of carbon in milligrams per litre required to decrease 100µg of phenol by 90%.

**9. IRON CONTENT**

The iron content of the carbon was determined by 1-10 phenanthroline method. The ash obtained under ash content was transferred to a 150ml conical flask and 50ml of dilute hydrochloric acid was added and heated to boiling.

**10. ION EXCHANGE CAPACITY**

The slurry was carefully transferred to the burette. The column was never allowed to drain completely and the level of the liquid was maintained at about 1cm above the carbon bed.

**TEST RESULT**

TABLE.NO.1

S.N	METHODS	ACTIVATED CARON RESULTS	POLYSTYRENE CARBON RESULTS
1.	MOISTURE	18.75g	25g
2.	ASH CONTENT	7.56g	0.00263g
3.	APPARENT DENSITY TEST	7g	7g
4.	MATTER SOLUBLE IN WATER	0.00285g	0.0281g
5.	MATTER SOLUBLE IN ACID	942.40g	833.35g
6.	P <sup>H</sup>	7.32g	7.12g
7.	DECOLOURISING POWER	2.51g	2.25g
8.	PHENOL NUMBER	15.66g	20g
9.	IRON CONTENT	2g	2g
10.	ION EXCHANG CAPACITY	18.66g	20g

DIFFERENT BETWEEN ACTIVATED CARBON AND POLYSTYRENE CARBON

**CONCLUSIONS**

In the present project study, a waste organic source material such as polystyrene was used and subjected to carbon preparation. By doing pyrolysis follow by thermal activation, a carbon derivative was prepared. This carbon derivative (PTPC) was used to examine the removal of HCL (II) from distilled water and wastewater. The following conclusions are states as follows:

- 1) The yield of the carbon was found to be 63%. This when 100g of palm tree powder was used, the resulting weight of the carbon was found to be 63g.
- 2) The PTPC carbon has a good bulk density and sufficient surface area.
- 3) The carbon was able to remove HCL (II) by adsorption mechanism.
- 4) Preliminary studies indicated that the PTPC carbon required about 5 hour's equilibration time to achieve about 80% to 85% removal of acetone acid(II).
- 5) The optimum P<sup>H</sup> for the removal was found to be over the range 4.0 – 8.0.
- 6) The optimum carbon dosage was found to be 200mg/100ml of solutions under optimum p<sup>H</sup> condition for acetone acid removal.
- 7) The Optimum Carbon dosage was found to be 500mg/100ml for an initial concentration of 20mg/l
- 8) Experiments were conducted to know the potential of this PTPC using synthetically prepared electroplating wastewater in which the concentration of was kept around 20mg/l. Proportionate quantities of carbon were added using isotherm studies (4 g/l) to the wastewater. After adjusting the p<sup>H</sup> of this water over the range 4.5 – 5.5, the adsorption studies indicated a removal of 96 – 97%.
- 9) Experiments with synthetic wastewater indicate that 6.7g/L of PTPC required to remove about 85% of over a period of 5 – 6 hours. The remaining liquid requires final polishing stage of filtration through sand filters to achieve about 94% removal.
- 10) The follows freundlich adsorption isotherm. The removal of in distilled water was found to be greater than tap water. The lower adsorption capacity in tap water may be due to competition of common cations available in tap water.

Thus it can be concluded that PTPC can effectively be used for the removal of HCL(II) & AC (II) from aqueous system.

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