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# Treatment of Textile Waste Water using Activated Carbon Prepared from Pumpkin Peel

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## ABSTRACT

Now-a-days the pollution has been major challenging issues to the environmental engineers. Waste management and pollution control is a great environmental concern, hence research activity is needed to utilize the solid waste or convert it to a useful product. Utilization of AC to treat various pollutants present was undertaken. Process economy mainly depends on the selection of raw material and method of preparation of AC. To study the effects of activated carbon preparation variables, which were the activation temperature, activation time, chemical impregnation and particle size and the effect of various chemical activating agents on the porous characteristics of activated carbon.

**Keywords-** Pumpkin Activated Carbon, Pumpkin peel, Phosphoric Acid

## OBJECTIVE

- To prepare activated carbon from waste material such as Pumpkin peel & seed.
- Comparison of adsorption capacity from various activation method.
- To study the influence the factor such as pH, temperature, contact time, concentration of heavy metals, agitation speed.
- After the treatment the water can be used for irrigation and discharge into surface sources.

## I. INTRODUCTION

The Textile Wastewater has been a major challenge today due to the contaminants from natural and manmade origins that are hazardous to human health. Among various treatments used, activated carbon is a powerful adsorbent due to large surface area and pore volume that can be used for treatment process (Hassler, John -1974, Ramakrishna Gottipati, 2012). Commercial activated carbon is a preferred adsorbent for the removal of pollutants from the aqueous phase; however, its widespread use is restricted due to the

use of nonrenewable, high cost precursor material such as such as coal and high associated costs. To decrease treatment costs, attempts have been made to find inexpensive alternative activated carbon precursors, such as waste material (Dias, Manuel F. Almeida 2007).

## II. ACTIVATED CARBON

Activated carbon is a group of adsorbing substances, which having large internal pore structures. The term activated carbon is come from the word carbon" and active" which carbon meant a raw material undergoes a carbonization process while active mean a material in carbon condition undergoes an activation process to open a pore surface area as a maximum as can to increase adsorption rate of activated carbon (A.H.Mahvi, 2008).

Activated carbon have various uses such as activated is used to filter tobacco smoke, purification in clothing and textile, cosmetics and pharmaceutical industry, veterinary and medical such as detoxification. It is used in agriculture as a soil conditioner and controlling acidity and alkalinity of the soil and also, it is used as agent in gas masks, pollution control devices such as catalytic converter flue gas desulphurification (Matson, Hary 1971).

Adsorption on activated carbon is superior compared to other physical and chemical methods of treatments in terms of its capacity for efficiently removing a broad range of pollutants. The high adsorption capacities of activated carbons are related to the properties such as surface area, pore volume and pore size distribution.

## III. ADSORPTION STUDIES

Adsorption is a process in which special materials are used to remove substances from liquid phase. It occurs through surface attachment of substance present in the liquid on to solids. The special materials that are particle present in the liquid are attached are termed as adsorbent. The substances adsorbed are called adsorbate. Adsorption is a phenomenon that occurs at the surface and the molecules present in the liquid phase are taken up by the surface. It is different from absorption in which the molecules are taken up by the volume in absorption. Adsorption process is divided into two different groups depending on the type of the interaction between the adsorbed molecule and the adsorbate and are discussed.

## IV. ADSORPTION ISOTHERMS

Adsorption isotherms, also termed as equilibrium data, describes the information of the nature of solute-surface interaction, specific information about concentration of the adsorbate and the degree of the accumulation on to the surface of the adsorbent at specific temperature.

Isotherms are very helpful in designing adsorption system. The adsorption Isotherms are analyzed using the following models.

(i) Langmuir Model

$$q_e = \frac{q_{\max} C_e}{K_L + C_e}$$

(ii) Freundlich Models

$$q_e = K_F C_e^{\left(\frac{1}{n}\right)}$$

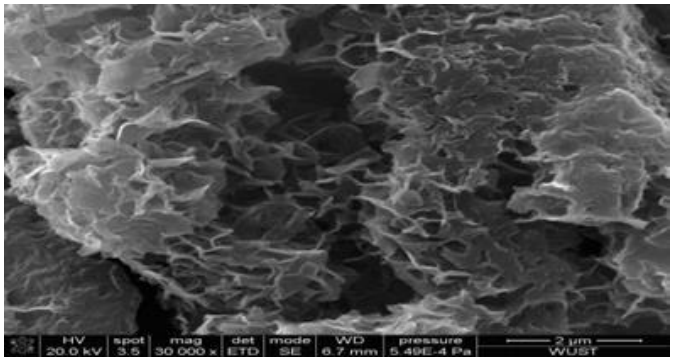
## V. POLLUTATIONS REMOVAL USING BATCH REACTOR

A batch reactor will be used to treat cadmium using GAC to find the various reactor systems for treating contaminants. In batch adsorption experiments, various dosage of activated carbon ranging from 0.1-1

g is added into 250 ml Erlenmeyer flasks, which contain working volume of 100 ml of solution. The experimental parameters are (i). Shaking 150rpm for 24 hrs, (ii) preset constant temperature. In this Study the effect of initial concentration, effect of temperature and the solution pH are studied. All the experiments are conducted in triplicate and the average values not exceeding more than 0.5% difference will be taken for calculation purpose.

## VI. SCANNING ELECTRON MICROSCOPE (SEM) ANALYSIS

SEM micrographs of activated carbon particles showed cavities, pores and more rough surfaces on the carbon samples. Granular pores and cavities will increase the surface area of the adsorbent. SEM micrographs of the chemically activated carbon by tamarind seed (AC-1) were presented . In these, well-developed porous surface was observed at higher magnification.




Pumpkin peel (AC-1) under 30000X magnification

## VII. PRELIMINARY TEST

### PREPARATION OF ACTIVATED CARBON:

- The sample is heated by SUNLIGHT in 2 days.
- Then, the sample is placed on HOT AIR OVEN in 4 hour at 105 °C.
- Because the removal of moisture content in pumpkin peel.
- After 4 hour the sample is added with Phosphoric Acid(H3PO4) in 30 mins- 0.5ml per 1g.
- Then also added with citric acid in pumpkin peel for the purposes of given more strengthening.
- The sample Pumpkin peel& seed is fired in Muffle Furnace in 1 hour at 400 °C.

Pumpkin peel Hot Air Oven Phosphoric Acid

Muffle Furnace Activated Carbon

## VIII. DETERMINATION OF SOLIDS

A well mixed sample is filtered through a filter paper and the filter is evaporated to dryness in a weighted dish and dried to constant weigh at 105o
C. The increase of weigh represents the total dissolved solids

### PROCEDURE:

1. Dry the empty china dish and filter paper in an oven at 105 c, cool it in a dessicator.
2. Weigh empty china dish as (W1).
3. Filter 20ml of well mixed domestic waste water sample passing through the filter paper.
4. Take the filtrate and place it in a china dish. Evaporate it to complete dryness in a water bath.

5. Now day the china dish along with the filtrate ( solids ) in an oven at 105oC, cool it in dessicator.
6. Weigh the china dish along either the solids as ( W2 ).
7. Therefore totaldis solved solids = (W2 – W1 ) / ( volume of sample ) (mg/l)

## IX. METHODOLOGY

The preparation of activated carbon using pumpkin peel.The textile waste water is collected from Rajeswari textile industry at rasipuram. Find out the initial characteristics of textile waste water (pH, Colour, Solids, BOD, COD, Cadmium, Chromium). Pollutants removes from using for batch reactor to findout the chemical& physical parameters. Adsorption isotherms following for this methods are Freundlich, Langmuir isotherms. Final characteristic of waste water to find out the chemical& physical parameters. The following methods of processing we are followed from the filteration of textile waste water.

Processing

## X. RESULTS

We are collecting by final output sample of textile wasste water by using activation carbon prepared from pumkin peel. (i)Textile waste water, (ii)Terafil candle filter, (iii)Filtered water by using activation carbon

Final Outlet Sample

INITIAL CHARACTERISTICS OF TEXTILE WASTE WATER

| S.No | Test Parameters | Unit | Test Results |
|---|---|---|---|
| 1. | Colour | - | Red colour |
| 2. | pH Value at 25° C | - | 8.15 |
| 3. | Ammonia as N | mg/lit. | 55 |
| 4. | Potassium as K | mg/lit. | 40 |
| 5. | BOD 27C, 3Days | mg/lit. | 150 |
| 6. | COD | mg/lit. | 412 |

FINAL CHARACTERISTICS OF TEXTILE WASTE WATER

| S. No | Test Parameters | Unit | Test Result | Drinking Water Standard (IS 10500 -2012) | Irrigation Standard (IS 11624 – 1986) |
|---|---|---|---|---|---|
| 1. | Colour (Hazen Units) | - | Colourless | Colourless | Colourless |
| 2. | pH Value at | - | 7.85 | 6.5 - 8.5 | 4 – 8.6 |

| | | | | | |
|---|---|---|---|---|---|
| | 25° C | | | | |
| 3. | Ammonia as N | mg/ lit. | 45 | 0.5 | 75 |
| 4. | Potassium as K | mg/ lit. | 26 | 3.5 - 5 | 100 |
| 5. | BOD 27⁰C, 3Days | mg/ lit. | 30 | Absent | 30 |
| 6. | COD | mg/ lit. | 150 | Absent | 200 |

## XI. CONCLUSION

- Pumpkin peel shell was used as a raw material to prepare activated carbons by chemical activation method with H3PO4.
- BOD and COD removal efficiency of Terafil candle filter is 41% and 36%.
- BOD and COD removal efficiency of pumkin activated carbon is 80% and 63%.
- After the treatment the water can be used for irrigation purpose and discharge into inland surface water bodies.

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