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PRODUCTION OF ACTIVATED CARBON FROM COCONUT SHELL

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Abstract: Carbon or carbon coal of biomass or cellulose containing material can be made, such as the coconut cover using a thermal process. One of the thermal processes is pyrolysis, which in this process, the material becomes carbon. The result of pyrolysis is in the form of three types of products, namely, solids (carbon), gas (fuel gas) and liquid (bio-oil). Other products are gases such as carbon dioxide (CO2), methane (CH_4) and some gases that have small content. In general, the pyrolysis process takes place at a temperature greater than 300°C in 4-7 hours. Carbonized carbon or pyrolysis does not have a large adsorption capacity because the dose of pore structure is not developed, so an activation process is necessary. There is a need to know the best material to activate carbon through the chemical process. This article intent to debate the advantages and disadvantages of some description of chemical activation and determine the promising chemical for activation. Since several methods of chemical activation, the activator that promises to perform activated carbon is calcium chloride (CaCl2) because it can produce activated carbon having a maximum microscope to the operation of less than 450°C with a percentage ratio between the activator and It shows it around 29 -52 percent.

Key Words : Coconut Shell, $CaCl_2$ solution, Activated Carbon

1. INTRODUCTION

ACTIVATED CARBON IS A NON-GRAPHITE CARBON FORM THAT COULD OCCUR FROM CARBONACEOUS MATERIAL, SUCH AS COCONUT HOUSING, COAL, LIGNITE, WOODEN RICE HUSK, COIR CORD, ETC., ACTIVATED COAL IS A UNIQUE AND EFFECTIVE AGENT FOR DISTILLATION AND ISOLATION AND HEALING OF TRACE MATERIAL. ACTIVATED COAL IS USED IN METHANE AND STORAGE OF HYDROGEN, AIR PURIFICATION, SOLVENT RECOVERY, GOLD PURIFICATION, MEDICINE, WASTEWATER TREATMENT, AIR FILTERS, DENTAL WHITENING, PHARMACEUTICAL PRODUCTS, SUGARS, CHEMICALS AND OTHER PROCESSING INDUSTRIES. THE ACTIVATED CARBON CAN BE PREPARED FROM A WIDE VARIETY OF RAW MATERIALS WITH HIGH CARBON CONTENT AND LAW LEVELS OF INORGANIC COMPOUNDS.

Activated carbon has an impressive pore structure that makes it a very high surface area to capture and maintain materials, and can be produced from several organic carbon-rich materials, which include:

- coconut shells
- wood
- coal
- peat
- And more...

Fig.1.1: ACTIVATED CARBON

The coconut shell activated charcoal within the water purifier is formed of top quality coconut shell as staple by series production process. the looks is black and granulates with developed voidage. Fine adsorption performance high power, easy renewal, economic dependable and other advantages. Coconut shell activated charcoal is especially used for purification, decolorization, and declorination of beverage, purified water, beverage and industrial swage. It's also utilized in oil oil industry.

Fig.1.2: COCONUT SHELL

Granulated activated carbon has an almost big particle size consider to powder activated carbon and, has a smaller plane. The diffusion of the adsorbent is, therefore, an important factor. Therefore, these carbons are preferred by all the adsorption of gases and vapors, since its diffusion rate is faster. Granulated carbons are used for the healing of water, palliate and split of components of the flow system. GAC can be in the granular or extruded. Granulate coals are used for water treatment.

Fig.1.3: GRANULAR ACTIVATED CARBON

Powder activated carbons usually fall into the particle size range from 5 to 150 Å, with some available peripheral sizes. PACs are normally used in liquid phase adsorption applications and offer reduced processing costs and flexibility in the operation.

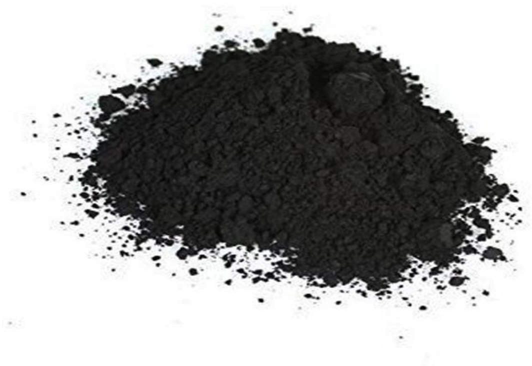

Fig.1.4: POWDERED ACTIVATED CARBON

Extruded activated carbons are a ovate pellet product vary in size from 1 mm to 5 mm. Typically utilized in gas phase reactions, EACs are a heavy-duty activated charcoal as a results of the extrusion process.

Fig.1.5: EXTRUDED ACTIVATED CARBON

2. LITERATURE REVIEW

E.Saputro et al. The process of Activated Carbon from Coconut Shells Through Chemical Activation, Carbon or charcoal can be made from biomass or cellulose contain materials such as coconut shells etc. using a thermal process. One of the thermal processes is pyrolysis. The material is converted into carbon. Mainly three types of product solid (charcoal), liquid (bio oil), gas (fuel). Other products are gases like carbon dioxide. The advantages and disadvantages of various class of chemical activation.

L.Zhang et al. Preparation of activated carbon from coconut shell chars in pilot-scale microwave heating equipment at 60kw, Experiments to prepare activated carbon by microwave heating indicated that microwave energy can decrease reaction temperature, rescue the energy and shorten clarifying time extraordinary compared to conventional heating, unpaid to its internal and volumetric heating backwash. Iodine numbers of the activated carbons all break the state standard of China. Pore structure of the test acquired which contain BET surface area, and pore size distributions of micro pores and total pores, was tested by nitrogen adsorption.

W.Shabuddin et al. Comparison on pore development of activated carbon produced from palm shell and coconut shell, A serious of experiments were conduct to compare the pore development in palm-shell and coconut-shell-based activated carbons produced under identical experimental condition. Carbonization and activation processes were carried out at 850 degree centigrade using a fluidized bed reactor. Within the range of burn off studies, at any burn off, the microprobe and mesopore volumes created in palm shell based activated carbon.

T. pannanyathanmaportt et al. Activated Coal Production of Coconut Shell: Optimization Using the methodology of the response surface, the activated carbon production of the coconut peel treated with phosphoric acid (H_3PO_4) was optimized using the methodology of the response surface (RSM). Fifteen combinations of the three variables to know; impregnation ratio (1, 1.5 and 2); Activation time (10, 20 and 30min); and the activation temperature (400, 450 and, 500 degrees Celsius) were optimized according to the evaluated responses (performance, bulk density, average pore diameter, small pore diameter and number of pores in a units area). The pore diameters were measured directly from scanning electron microscope images (SEM).

3. EXPERIMENTAL SECTION

3.1 Materials used

- Coconut shell
- Oven
- Plastic pail
- Mortar and pestle
- Distilled water
- Sieve
- CaCl2

3.2 Procedure

Coconut shell was collected from different places and was clean from other material such as coconut fiber and soil. After cleaning coconut shell was kept under the sunlight for several hours to remove moisture.

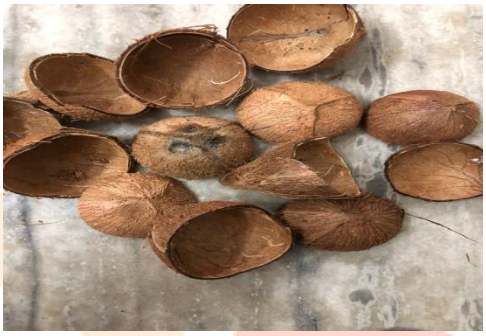

fig.3.1: Coconut shell

fig.3.2: coconut shell under sunlight

Next day, Coconut shell was burn inside a furnace at 300-500 degree centigrade (2-3 hours) which form charcoal from coconut shell.

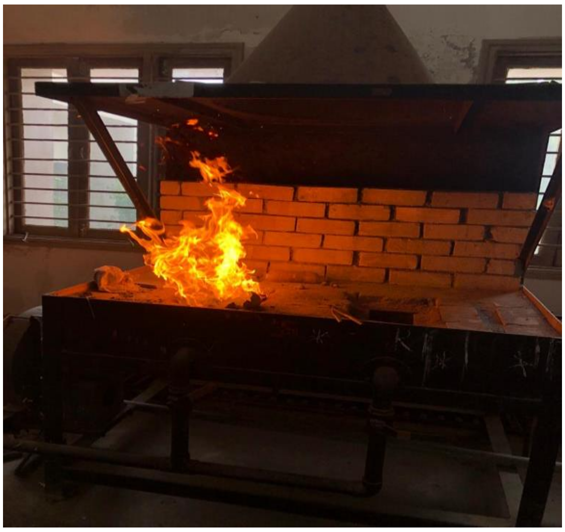

fig.3.3: furnace

After formation of charcoal from burned coconut shell, Charcoal was kept aside at room temperature for 1 hours.

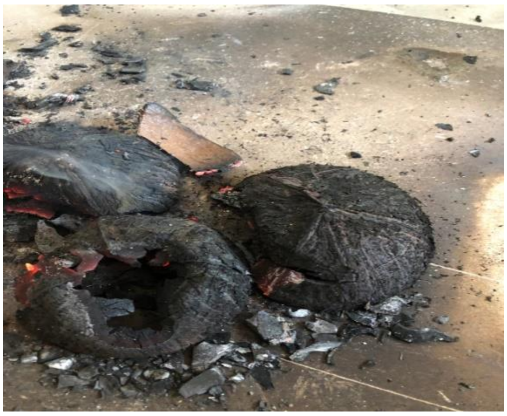

fig.3.4: after heating in furnace

Charcoal was crush with the help of Mortal and Pestle and after crushing, it was sieve to remove impurities present in it. And pure form of Charcoal was obtained.

fig.3.5: Pure form of charcoal

100gm of $CaCl_2$ was dissolved 300ml distilled water with a ratio of (1:3). Charcoal was injected in $CaCl_2$ solution and kept inside a dark room for 24 hours. To separate the carbon and impurities.

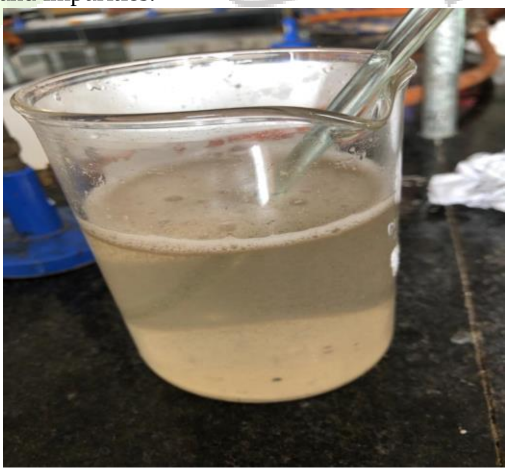

fig.3.6: $CaCl_2$ solution

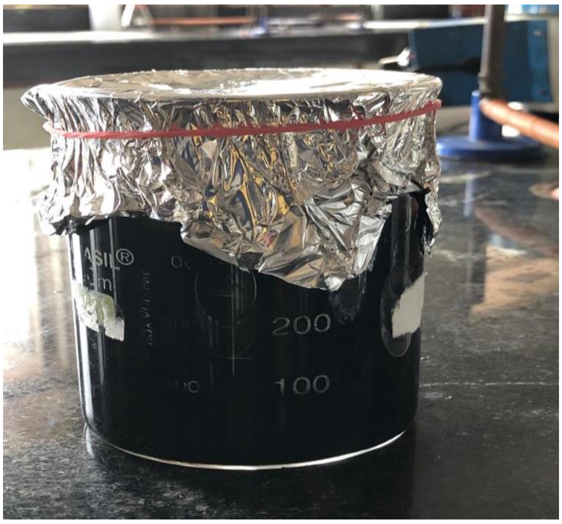

fig.3.7: Charcoal in CaCl2 solution

A separation layer of Carbon and impurities was obtained inside CaCl2 solution.

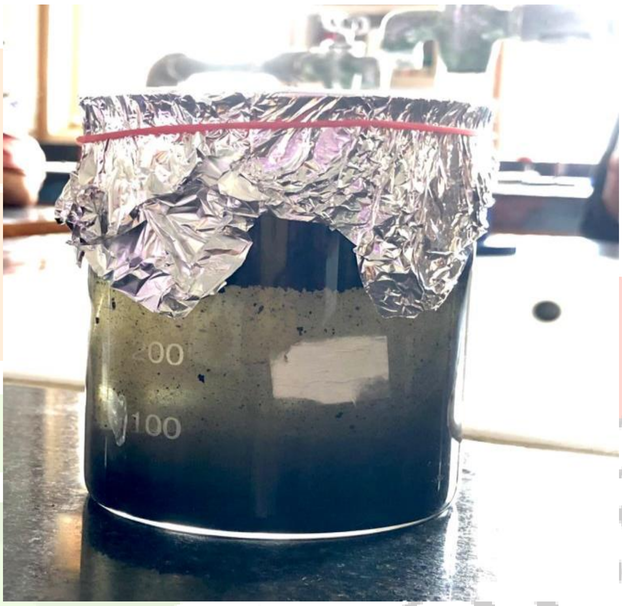

fig.3.8: Impurities and charcoal separation

Impurities were removed, and carbon settle was separate, then carbon was kept inside an oven in Petri dish. For 7-8 hours for drying, after drying it was again crush, which results into Crystalline form Activated Carbon.

fig.3.9: Crystalline form of Activated carbon

4. Result and Discussion

Sr. No	Test	Result
1.	Description	Black odorless powder
2.	Water content	19.47%
3.	Water Soluble content	21.67%
4.	Acid soluble content	24.06%
5.	Sulphated ash	23.68%
6.	Adsorptive Power	Not Less Than 7.5 ml of 0.01% w/v Methylene blue is decolorizes per g.
7.	pH of 5% w/v Aqueous Extract	7.26
8.	Uncarbonized constituents	The filtrate having slightly yellowish tint

Lab India Automatic titrator

A titrator consists basically of an electric burette, a sensor whose signal is amplified with a preamp and a microcomputer, the titrator measures the signal of the sensor and uses this information to control the addition of the titrator with the electric burette. Once a final point is making, the microcomputer calculates the volume of TITRANT added and changes this value into a result conforming to the formulas. The necessary formulas for this calculation you can program and depend on the type of analysis. Water content, Water Soluble content and Acid soluble content have been analyzed under Automatic titrator

Muffle Furnace

Muffle furnace refers to a kind of jacketed enclosure that's wont to heat a cloth to significantly high temperatures while keeping it contained and fully isolated from external contaminates, chemicals or substances. Muffle furnace are usually lined with stainless steel, making them mostly decomposition resistance. Sulphated ash have been analyzes under Muffle furnace.

Wet Chemical Analysis

The wet chemical analysis apply the procedure to decay a sample with a reagent like acids to dissolve in a solvent and quantifies the targeted elements using many methods. Dissolution and insulation of the sample is discharged if necessary. Adsorptive Power, pH of Aqueous Extract, Uncarbonized constituents have been analyze under Wet Chemical Analysis.

5. CONCLUSION

The Present Study was to prepare Activated Carbon from waste Coconut Shell. $CaCl_2$ solution was prepared in which charcoal was immersed inside it to get carbon. Water soluble acid, acid soluble, water content were carried out by Titrator. And test was carried out by Wet Analysis and Muffle furnace. From, the above study we can conclude that waste coconut shell would give pure form of carbon with cheaper coast and ease of comfort for manufacturing it at Lab scale.

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