Characterization Active Carbon and Clum Shell In Reducing pH, Color, COD, Fe and Organic Matter On Peat Water

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ABSTRACT-- Peat water can not be used as a source of communities water supply because the quality is still low, this study aims to determine the characterization of activated carbon and shells as well as their ability to improve water quality turf either singly or compilation. material characterization using XRD and SEM-EDS. Analysis of water parameters peat with a spectrophotometer. The results showed that the activated carbon made from palm shell and coconut shell has a good specification with indicators of yield, moisture content, iodine number and methylene blue. Results of X-Ray Diffraction showed that the shells are burned at high temperatures (> 800oC) to produce compounds arogenit, lime, calcite and porlandit. These compounds have a strong role in lowering the acidity of the peat water. SEM-EDS analysis results showed that clam shell powder containing elements C, O, Ca and CaO compounds. From the study it can be concluded singly and powder activated carbon shells has the ability to lower the water parameters of peat awater

Keywords: Activated carbon, shells, peat water

INTRODUCTION

The demand for clean water in the world continues to increase along with the increase of the world population [9] . The population of Indonesia in 2015 predicted by the Central Statistics Agency jumped to 247.5 million, and in need of clean water as much as 9391 billion m3, up 47 percent from 2000 [25]. and the greater part of the countries of the world water crisis, including some areas in our country.

Water shortages experienced by people in the province of Jambi, especially people who live in the area Lowlands. People living in this area are generally clean water with rainwater harvesting (rain-fed water). According [20] the quality and availability in the lowlands are influenced by topography and rainfall. One of the materials that can be used for water treatment activated carbon and peat is calcite. Activated carbon can be made from palm shell and coconut shell. Cangkag oil is one of the solid waste from palm oil mills which have not been utilized properly [18], Solid waste can be made into activated carbon [10]. And Activated carbon is very much needed both for industries and factories as well as for health and clean water. To meet the needs of our country is still a lot of carbon import from other countries are like Japan (Kyodo brands), USA (brand Calcon USA) and Canada (brand Jacobi).

Jambi province also has a sea area covering 9.259 km2 with a coastline of 411.75 km and water depths of 10-20 m in the territory of the District of Tanjung Jabung West and the District of Tanjung Jabung East. This area is the area that generates a lot of Blood cockle (*Anadara granosa*). These animals are highly favored by the people known as the dean Sea Food contains a lot of protein. Blood cockle is one of the soft animals (*molluscs*) bivalves class. Skin Shellfish (*Clum Shell*) compounds containing $CaCO_3$ and the potential for increasing the degree of acidity of the peat water The purpose of this study was to obtain data on the characteristics of activated carbon and coconut shell cakang oil and compile them, and then test the adsorption capacity and the decrease of pH, color, Fe, COD contained in the peat wate

RESEARCH METHODOLOGY

This study is an experimental research in the laboratory, the samples obtained from palm shells palm oil mills, palm tempuung samples obtained from merchants market Jambi coconut shells while the sample came from the East coast of Jambi

1. Tools and Materials Research

The instrument used in this study are: visible spectrophotometry (UVvis), Atomic Absorption Spektrometry, SEM, EDS, pH meters, X-Raya Difraction (XRD), furness, turdimetri, TDS and analytical balance, Tool glassware; micro pipette, beaker, erlenmeyer glass, funnel, flask, test tubes, and equipment oven, furnace, stirrers, cup and sieve poselin 2000 and 250 mess

The materials required include: bentonite, coal, coconut shells, and shells, peat water. Chemicals concentrated HCl, H_2SO_4, pH 4 Buffer reagent and pH 9, distilled water, HNO_3, H_2O_2, H_3PO_4, peat water, palm shells, K_2PtCl_6, HClcons. $CoCl_2.6H_2O$, HNO_3cons,, $CaCO_3$, $FeCl_3.6H_2O$, H_2SO_4, KSCN, 42 Whatman filter paper, Pb $(NO3)_2$, $Hg(NO_3)$ 2.H2O, $3CdSO_4.8H_2O$, HNO_3pkt, HClpkt, $SnCl_2$, sodium borohydride and distilled water

2. Preparation and characterization of activated carbon and Leather Shells

The process of manufacture of activated carbon consists of pyrolysis feedstock, followed by activation using phosphate acid activator. Pyrolysis was carried out at 600-700^{o}C.

The activation process by soaking in a solution of acid (H_3PO_4) for 6 hours [23], and then dried in an oven at 170^{o}C suhuh [8], [12]. Cooled after cooler in miling into powder. Characterization of activated carbon using X-Ray Diffraction instrument, SEM-EDS. Test adsorption capacity on pH, color, Fe, COD and Organic Matter on peat water, work procedures refer to the Indonesian National Standard [2], [1], [27], [11]

Samples shells cleaned of dirt. A total of 5 kg of shells are heated at temperatures> 600oC, then ground to fine powder form. Compilation made dengana by mixing activated carbon powder and shells in some comparisons. Activated carbon, powder shells and the compilation characterized by XRD da SEM-EDS, and ditetukan ability absorbance of each of the parameters pH, color, Fe, COD and organic substances contained in the peat water.

RESULTS AND DISCUSSION

Activated carbon daricangkang palm and coconut shell, which in activation of acid phosphate [5]. [17] has good specs. The results of the characterization of the yield, grade, water, ash content, iodine number of activated carbon produced as listed in Table 1

Table 1. Specification of Activated Carbon Coconut Shell Oil and its shell

No	Rendemen	Palp shell	Coconut shell	Average	Standard ASTM
1	Rendemen %	34,5	26,7	30,6	30
2	Water konten %	11,8	6,2	9,0	15
3	Ash conent %	4,4	5,8	5,1	Max 10
4	Iodine number mg g^{-1}	969,82	1012,92	991,37	Min 750
5	Methylen blue mg g^{-1}	303,31	288,84	296,07	Min 120
6	Partikcle size	150	150	150	Min 90
7	Volatil compundi %	89,61	96,71	93,16	Min 85

Table 1 shows that the activated carbon produced from palm shell and coconut shell, the quality is quite good, all the parameters of the specifications are in accordance with established standards [2]. where the average water content of 9.0%, ash content of 5.1%, 93.16% volatile compounds, methylene blue 296.07 mg g-1, while the absorption of iodine on average 991.37 mg g-1. From the results of this study can be confirmed that all of the resulting activated carbon, active carbon with good raw materials from palm shell and coconut shell used has a good potential for a decrease in peat water parameters.

Chromatogram analysis results using X-ray Diffraction of coconut shell activated carbon that has not been activated and can be activated is shown in Figure 1.

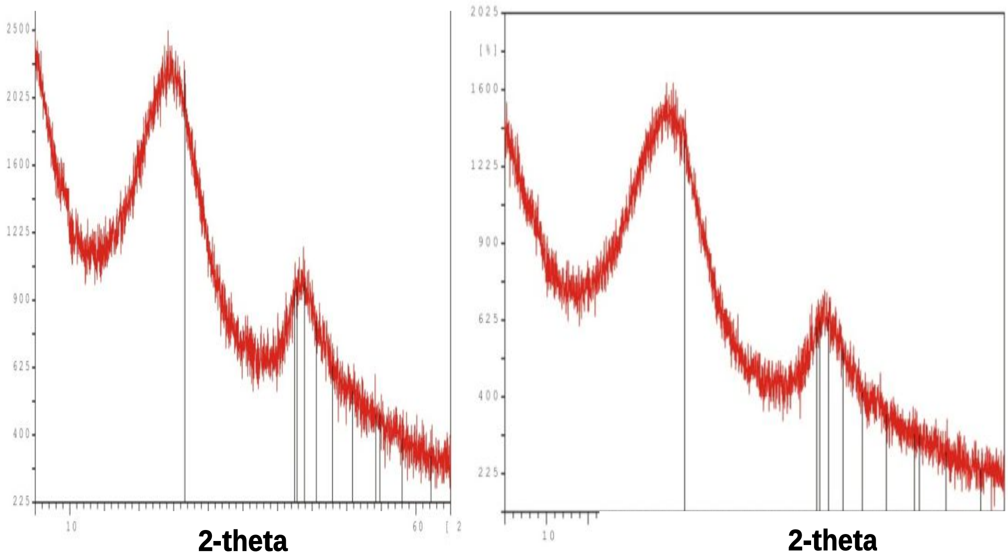


Figure 2. X-Ray Diffraction Spectrum Active Carbon Coconut shell (a) Prior to activating and (b) Once activated

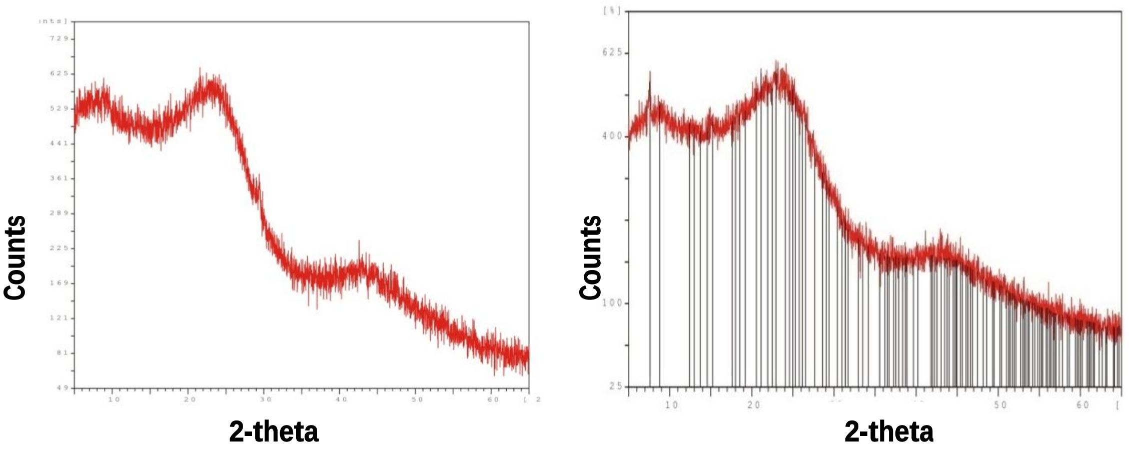
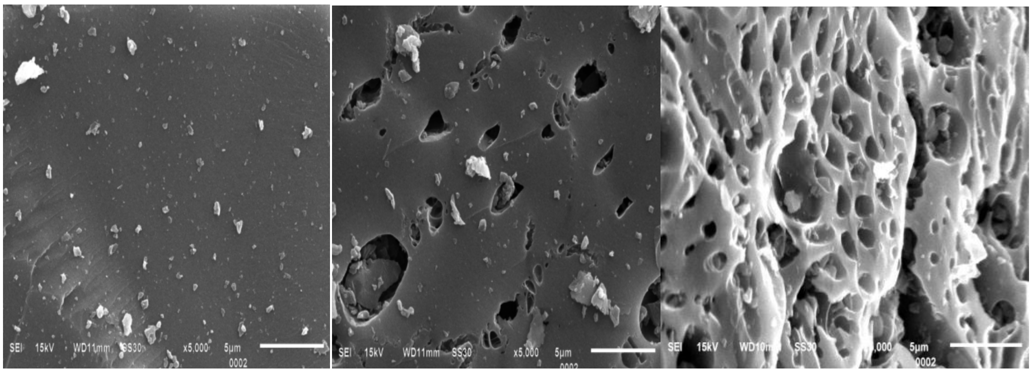


Fig (a X-Ray Diffraction Spectrum Active Carbon Sh (b) Palm (a) Prior to activating and (b) Once activated

The spectra in Figures 1 and 2 show that the activated carbon from coconut shell and palm shell amorphous (amorphous), of the results of X ray diffraction analysis showed that the dominant coconut shell activated carbon compounds composed of carbon (C) which appear on 9.575o peaknya, 28 , 0. Results of X-Ray Diffraction characterization is supported by the SEM-EDS analysis of data showing that the composition of coconut shell activated carbon is 98.03%. The activation process can affect the structure and composition of activated carbon, activated carbon activated with HCl and H_3PO_4 showed differences in surface shape, and structure of the pores, as shown in Figure 3.



(a) (b) (c)

Figure 3. SEM photos of activated carbon before activation (a), after activation of coconut shell (b), palm shells (C)

Figure 3 shows that the activated carbon coconut shell and palm shell that has been activated pores and open lot. Many pores were formed and the amount of pores in activated carbon affects the ability of the active carbon for adsorspi clicking substances present in water peat

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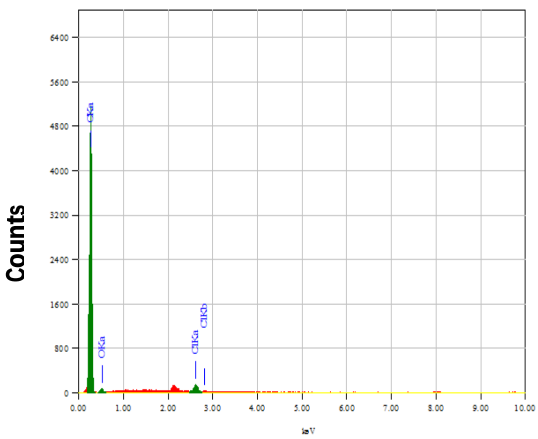
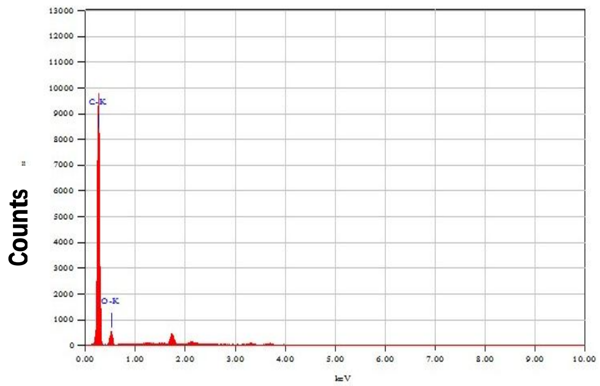




keV

Element	(keV)	Mass%	Error%	Mol%	Compound	Mass%	Cation	K
C K	0.277	97.64	0.22	[illegible]	[illegible]	97.64	0.00	96.5243
O		0.00						
Cl K	2.621	2.36	0.94	[illegible]	[illegible]	2.36	0.00	3.4757
Total		100.00		100.00		100.00	0.00	

keV

Element	(keV)	Mass%	Error%	Mol%	Compound	Mass%	Cation	K
C K	0.277	100.00	0.22	100.00	C	100.00	0.00	100.0000
O		0.00						
Total		100.00		100.00		100.00	0.00	

Figure 4. SEM-EDS spectra Activated Carbon Before activated

Figure 4 shows that the main components of coconut shell activated carbon constituent is the element Carbon (98.03%) and oxygen (0.33%), meaning that the carbonization process has been well done. After activation, the changes in the composition of the constituent, as shown by the EDS spectra. In the case of carbonization process water evaporation and decomposition of the components contained in the shell, namely cellulose, hemicellulose and lignin. Hemicellulose decomposition process takes place at a temperature of 200^{0}C to 250^{0}C marked with thin white smoke when burning. Cellulose decomposition process starts at a temperature of 280^{0}C and ends at a temperature between 3000C to 3500C, this stage is marked with out the smoke thicker and darker, brownish black. While lignin decomposition begins at temperatures between 300^{0}C to 350^{0}C and ends at a temperature between 400^{0}C to 450^{0}C in the process of smoke produced back color white and thin and gradually disappear [11], [12]. In the stage of carbonization, the raw material is heated without air and the addition of chemicals. The aim is to eliminate the carbonization of volatile matter and other gases present in coal [3].

At the time of immersion activator solution will be adsorbed by the charcoal, which then dissolves zaat-impurities that cover the pores of the charcoal. The loss of these substances on the surface of activated charcoal will cause the larger pores of activated carbon [7], [5], [13]. The bigger pores of activated charcoal resulted in the surface area of active surface so it will increase the adsorption capacity of the activated charcoal.

Utilization of activated carbon in the production of clean water filtration process based on the ability of activated carbon to absorb organic substances contained in the water like peat humic acid and fulvic acid [13]. The same study of activated carbon has also been developed by [17], [7], [4].

Effect of Activated Carbon Addition To The Water Parameters Peat

The results showed that the addition of activated carbon can affect the parameters relative to the peat water the better, but for the acidity of the peat water turns adding activated carbon can not fix the peat water pH, even reverse a decline in peat water pH value, meaning that it can increase the acidity of the peat water should rise up close to neutral pH in accordance with the standards of clean water, pH 6.5 to 8.5. Standard of health Indonesia , activated carbon containing fine particles when added to water and peat, then serve targeted particles dispersed in water soluble and which resulted in the value of TDS to rise. the effect of the addition of palm shell activated carbon and coconut shell to change the parameters of pH, TDS, color, iron and organic matter in the peat water can be seen in Figure 5.

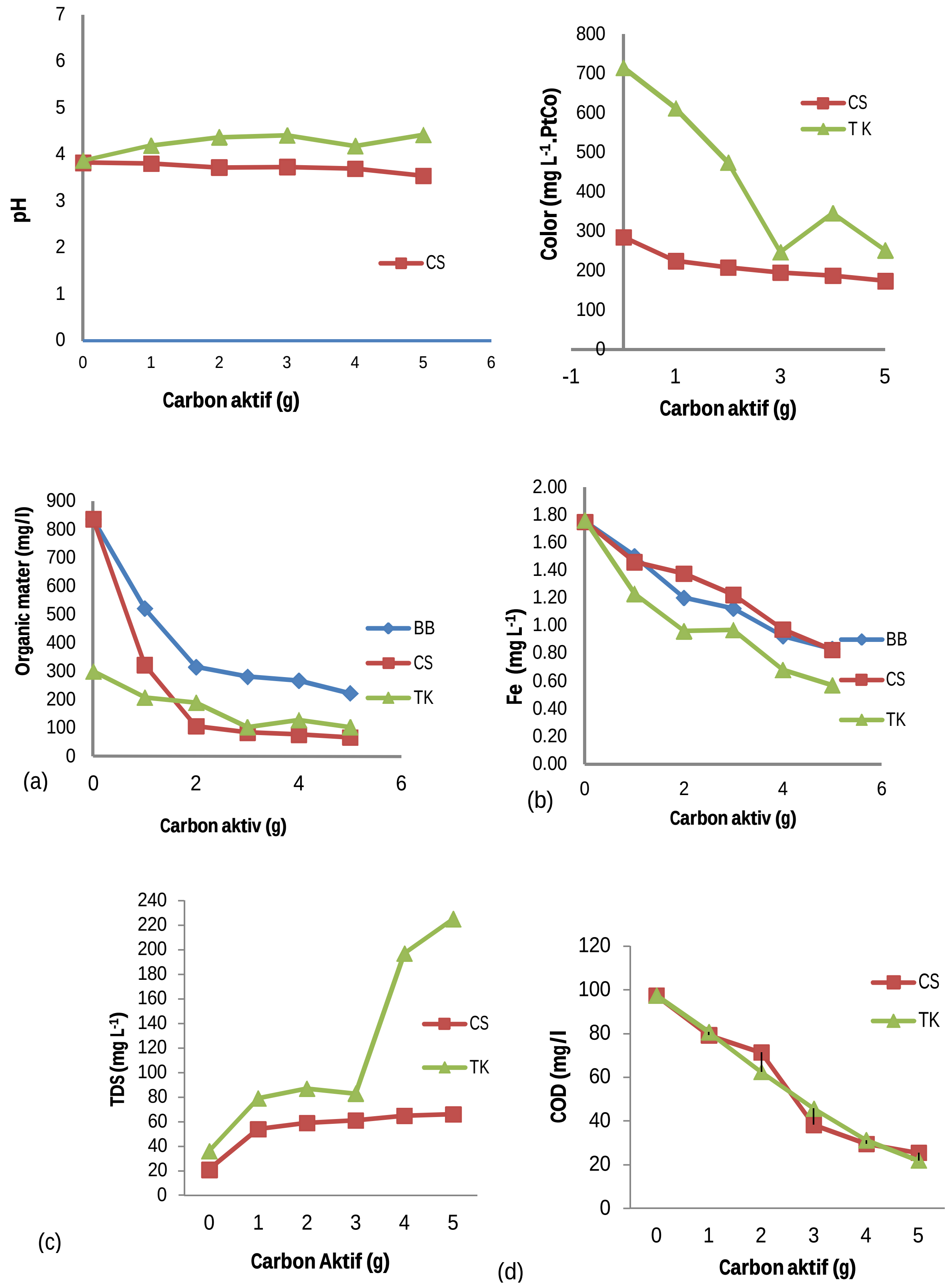


Figure 6. Changes in parameter a). Color, b). Organic substances, c). Iron (Fe), d). TDS, (e) pH and (f) COD , Peat Wate After addition of Activated Carbon

The increase in TDS in the water after the addition of activated carbon peat caused by activated carbon particles partially dissolve in water to form colloidal peat and not settle so that the solute in the peat water will rise. The acidity of the peat water increased after the addition of activated carbon, this is due to leaching rudimentary activated carbon, active carbon, which is activated by the addition of a strong acid HCl or H_3PO_4, causing activated carbon are acidic (pH> 5). When activated carbon is added to an acidic peat water (pH <4.0), then the peat water pH will be dropped,

The use of activated carbon pore can reproduce [24]. End of the pore structure and the addition of surface area depending on the raw materials used, and greatly affect the power adsopsi activated carbon. According to Vladimir [26], [24] that there is a relationship between the characteristics of activated carbon porosity with its ability to adsorb absorbent. If seen from the results of this study, the proposed theory is true according to the data obtained for example activated carbon activated with H_3PO_4 mempuyai pores are more open and have a great kemampauan degrade organic matter in the peat water up to 91.92%.

Activators are used berfungi dissolve impurities that cover the pores of activated carbon. The ability of the activator to enhance the activity of carbon is not the same one to another depending on the type and nature of aktivatornya and is also affected by the type of raw material used activated carbon.

2. Characterization of Skin Tests for parameter Shellfish and Water Peat

Shells that have been burned cooled and then pulverized into powder. The powder shells that produced a fine white powder as shown in Figure 7.

Figure 7. Skin Shells. (a). Dry (b). Once Burned

Characterization of shells can be performed using X ray Diffrakxion [14]. From X-ray diffraction spectra, it is known that the skin is the major constituent of raw shellfish arogenit mineral calcite at 93%, and after being burned can be transformed into a compound of calcite, lime and portlandit. Blood sea shells fired at a temperature of 560oC transformed into calcite to 99.7%, and the combustion furnace produces 8.6% and portlandit calcite (*limestone*) 91.4%, while the burnt shells of the lake with a furnace at temperatures> 800oC to form a compound 19.5% calcite, lime 23.08% and 57.5% portlandit.

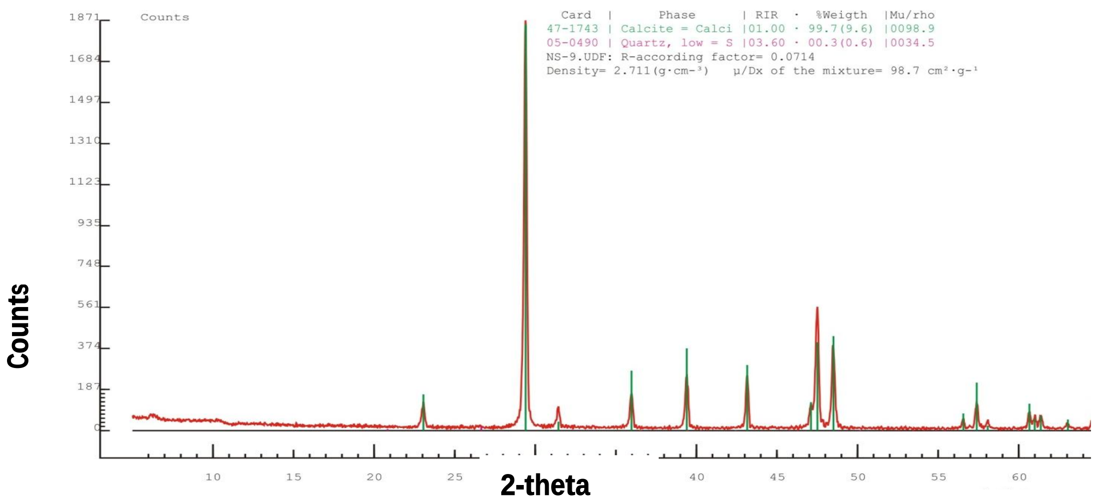
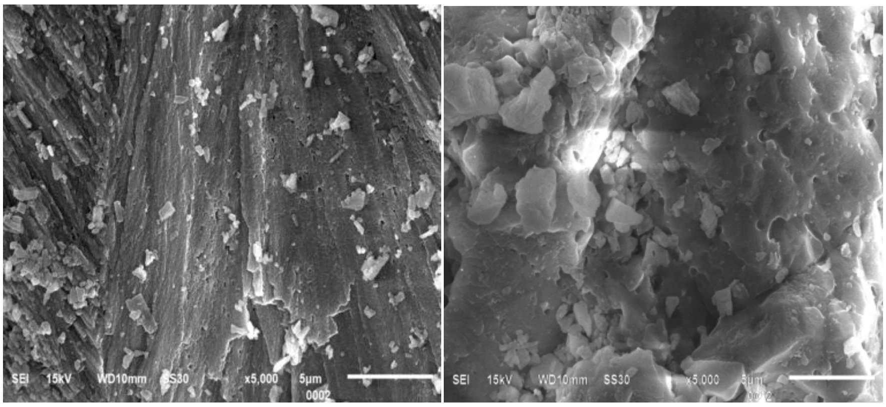


Figure 8. Powder XRD spectra Skin Shells Sea Shells on the temperature of 560oC Burned

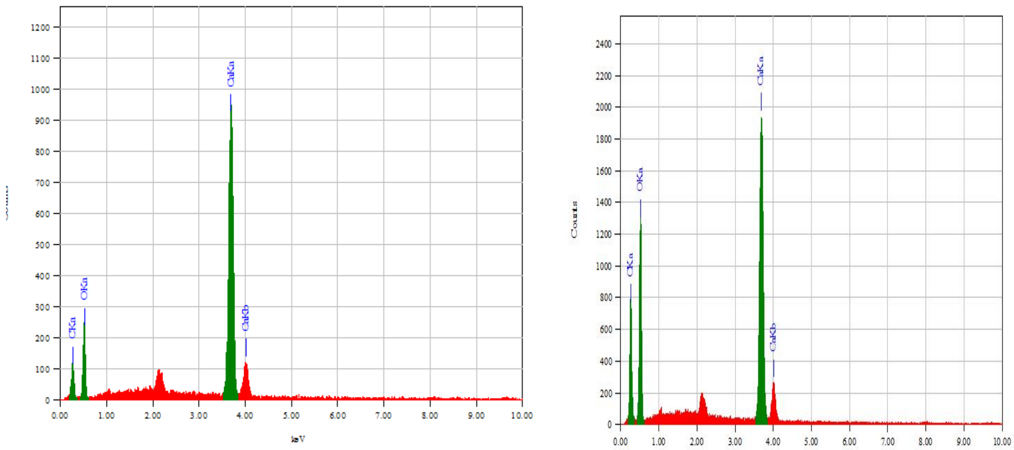
The results of characterization by X-Ray Diffraction showed that the shells are composed of minerals arogenit, calsit, lime and porlandite. Raw sea shell has arogenit mineral content ($CaCO_3$) 100% with orthorhombic crystal form. The results of this study together with research conducted by Wahyu and Hastuti (2010) is a mineral arogenit shells, which is mostly composed of the chemical compound calcium carbonate, the system is shaped orthorhombic crystals. SEM images of the powder shells showed that the surface topography powder shells differ between the solid form (arogenite) eperti shown in Figure 9



(a) (b)

Figure 9. SEM photos Powder Skin Shellfish (a) Raw Sea Shells (b) Sea Shells Skin After Burned

SEM images of the powder shells in Figure 9 shows that the surface and structure of sea shell (Anadara granosa) unbaked over rough and uneven (Figure 9a) compared to shells that have been burned (Figure 9b). The results of the analysis of the EDS spectra of the dust shells showed that the content of most of the powder composition of shells is the element carbon, calcium and oxygen. Peaks that appear on the skin powders taps EDS spectra can be seen in Figure 10 and 11.



Element	(keV)	Mass%	Error%	Mol%	Compound		Mass%	Cation	K
C K	0.277	6.36	0.06	24.06	C	6.36	0.00		4.3835
O		26.72							
Ca K	3.690	66.93	0.52	75.94	CaO	93.64	24.00		95.6165
Total		100.00		100.00		100.00	24.00		

Element	(keV)	Mass%	Error%	Mol%	Compound	Mass%	Cation	K
C K	0.277	18.78	0.06	51.92	C	18.78	0.00	14.1250
O		23.17						
Ca K	3.690	58.05	0.51	48.08	CaO	81.22	24.00	85.8750
Total		100.00		100.00		100.00	24.00	

Figure 10. SEM-EDS spectra Sea Shells Skin Before and after Burned

In Figure 10 it is known that the constituent elements of largest shell is carbon (C), oxygen and calcium (Ca), which form the compound CaO. The results of SEM-EDS analysis shows that the skin raw unbaked shells composed of atomic elements C 6.36%, O 26.72% and 66.93% Ca and 93.64% CaO to form compounds. Shells were burned by the furnace having the composition C 2.14%, O 27.02%, 69.94% Ca and CaO compound formed is 97.86%. The compound CaO is a chemical compound that, when dissolved in water to form a compound of calcium hydroxide (Ca (OH) 2). This chemical compound having two functional groups OH-so in aqueous solution is alkaline (pH> 7.0).

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The effect of addition of powder Shells Against Skin Parameters Peat water

Basically, the addition of shells in peat water aimed at neutralizing the water's pH acidic peat. The level of acidity (pH) of peat water area of Jambi on average ranged from 3.2 to 5.2. pH is in the range of this value indicates poor water quality peat and unfit for consumption as drinking water. In addition to raising the pH of the peat water, the addition of powder shells are also capable of lowering the water parameters such as peat, color, Fe and organic substances. The addition of calcite shells in peat water can raise the pH of the suspension and dissolved substances (TDS) and lower organic matter, color and iron. The relationship between the addition of powder shells with the changes peat water parameters as in Figure 12.

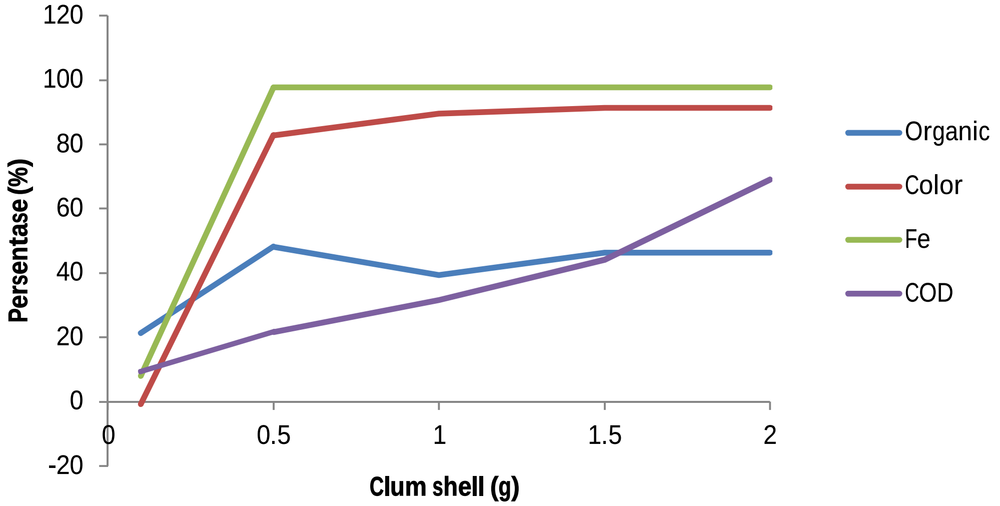

Figure 12. Percentage Change Water Parameters Peat Powder Skin After addition of Shellfish

The results of the study in Figure 13 shows that with the use of powder shells at a dose of 0.5 g 500 mL-1 gave the best results in the increase in pH, a decrease in water color and organic matter of peat

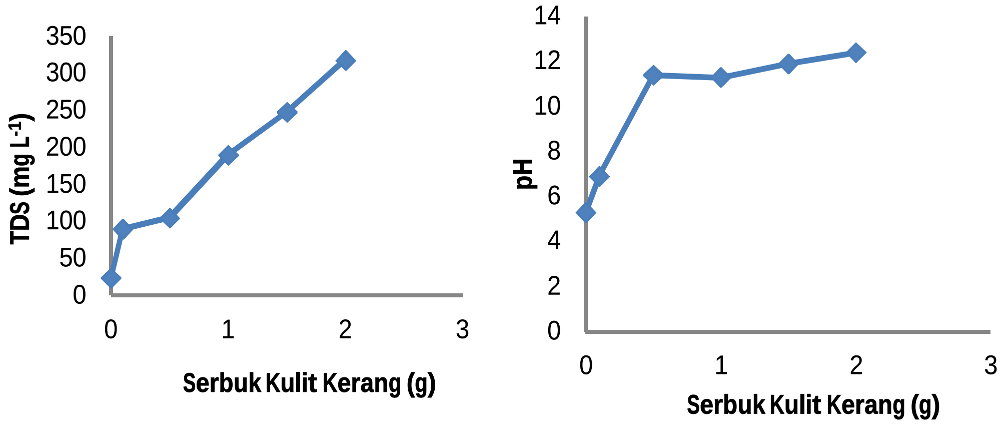

Figure 13. Changes in TDS and pH After Addition of Powdered Water Peat Skin Shells

Figure 13 shows that the addition of powder shells may increase TDS peat water, the more powder shells are added the rising value of TDS, it is due to the addition of powdered shells cause many solutes derived propagators shells. The acidity of peat water can be improved by the addition of alkaline compounds. The curve in Figure 13b shows that the addition of powder shells can raise the pH of the peat water, the more the addition of powdered shells then the pH of the peat water rises. The increase of the peat water pH after the addition of powdered shells, caused by dust shells containing chemical elements that can form compounds of Ca $(OH)_2$. These compounds in water can be decomposed into OH- ions (alkaline) and will react with H + ions (acidic) and form a water molecule is neutral (pH 7).

CONCLUSIONS AND RECOMMENDATIONS

From the research it can be concluded that the activated carbon made from batbara, cngkang palm and coconut shell have good specifications in accordance with the standards indicators of yield, moisture content, angk iodine and methylene blue. Results of X-Ray Diffraction showed that activated carbon produced contains high carbon Unur, and diukung with SEM EDS showed that activated carbon has a pore that much.

Results of X-Ray Diffraction showed that the shells are burned at high temperatures (> 800oC) to produce compounds arogenit, lime, and porlandit calsit. Compounds of this compound has a strong role in lowering the acidity of the peat water. Results of X-Ray Diffraction supported by SEM-EDS showed that the powder shells containing elements C, O, Ca and CaO compounds. Activated carbon and powder shells already has the ability to lower the peat water parameters, and the ability to be better if it is done compiling.

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