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Peat Water Purification By Absorption With Baggase Charcoal

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Abstract

This research was aimed to use the bagasse Charcoal as an adsorbent to increase quality of peat water. Bagasse charcoal made by was carbonization at 300^{o}C for 2,5 hours and sieved 100 and 200 mesh. Absorption process was observed by contacting the bagasse charcoal with 100 ml of peat water for 30 minutes. The results of such intensity of color, turbidity and Fe metal content meets the standards PERMENKES RI "About The terms and Supervision QUALITY Water" no.416 / Menkes / PER / IX , respectively (1114 Pt-Co) (10.8 NTU), (0.148 mg / L), and (0128 mg / L) except pH.

Keywords: bagasse; carbonization; adsorption; peat water.

1. Introduction

Peat water is one of the many sources of water found in Riau because of the wide spread peat moss. Peat soil will produce peat water quality does not meet the physical requirements of the organoleptic quality of the water. Peat water has a brownish red color, high mineral salt and acidic pH in the range of 3-5. High color intensity on peat water caused by the presence of high dissolved organic matter, particularly in the form of humus acids and their derivatives[1].
Peat water has a character-specific, depending on the location, in terms of vegetation, soil types of the peat water is, the thickness of the peat, peat age, and the influence of weather[2].

If the peat water is used for prolonged consumption will have a negative impact on health. One effort that can be done to improve the water quality of the peat, which is the process of using charcoal adsorption bagasse as adsorbent. The ability of biomass bagasse adsorbent enhanced by activation of carbonization.

According to Husin [3], the chemical composition of bagasse consists of the presence of cellulose (37.65%), lignin (22.09%), pentosan (27.97%), SiO_2 (3.01%), ash (3.82 %), and the extract (1.81%). The content of cellulose and lignin, which has the potential to be converted into a carbon source that plays an important role in the adsorption process.

Bagasse as adsorbent has been used by researchers Ashabani [4] to reduce the iron content in well water. Bagasse was first activated with 0.1 M HCl adsorption efficiency reached 90.32%. Researchers Apriliani [5] have used the results of carbonization of bagasse charcoal as an adsorbent for heavy metals such as Pb, Cu, Cr, Cd with the highest adsorption efficiency respectively is 95.92%; 92.85%; 80.70%; and 58.98%. Power jerap bagasse charcoal has also been tested its effectiveness by Rinawanti [6] separately remediation magnesium, manganese, zinc, and nitrate in the leachate with efficiency, respectively for 86.50%; 80.67%; 73.86%; and 20.93%. Effectiveness based on the results of the analysis is higher than the use of bagasse fibers.

Based on previous studies, the use of bagasse charcoal to alter the characteristics of the peat water and improve water quality to be clean has never been reported. In this study, the adsorbent of bagasse charcoal was made on the condition of 300 ^{0}C temperature for 2.5 hours. The charcoal was then applied to the adsorption process of peat water..

This research studied the effect of variable adsorbent dose on the adsorption capacity of bagasse charcoal in improving peat water quality. Some water parameters analyzed, namely the intensity of color, pH, turbidity and Fe metal content.

2. Materials and methods

2.1. Chemicals

The materials used in this study were well dug peat water samples from the village of Long Rimbo, bagasse samples obtained from sugarcane juice seller in one area at the University of Riau, starch / starch, methylene blue (Merck), HNO_3 p (Merck), H_2SO_4 (Merck), HCl (Merck), KI (Merck), KIO_3 (Merck), I_2 powder (Merck), anhydrous $Na_2S_2O_3$ (Merck), Fe powder (Merck), akuabides.

2.2. Preparation Charcoal from Baggase

Samples of bagasse cleared from the husk, sugarcane dumped the rest of the existing water, washed thoroughly, drying in the sun ± 2-3 days. Further cut ± 1 cm and a blender to obtain a measure floured. The powder was sieved with a size of 100 <x <200 mesh. The powder is then heated in an oven at 105 ^{0}C until constant weight is obtained to remove the water content contained in the bagasse charcoal. The results of the sieve and then carbonized at 300 ^{0}C temperature conditions for 2.5 hours. Charcoal carbonization results are stored in a desiccator to maintain moisture.

2.3. Analytical methods for Peat Water

Adsorption process Bagasse charcoal carbonization results (condition 300 ^{0}C, 2.5 hours) with mass variations (0.5; 1; 1.5; 2) g adsorbed in 100 mL of water samples of peat. The mixture was stirred with a magnetic stirrer at a speed of 150 rpm for 30 minutes. After stirring was completed, the mixture is allowed to stand and allowed to ± 1 week so it can be completely settled. The filtrate obtained was analyzed by mass variation parameters and the peat water compared with clean water standards for the determination of the optimum absorption conditions. Results were analyzed and compared with the provisions based PERMENKES 416 / Menkes / Per / IX / 1990.

3. Result and discussion

Samples were coded according to the reaction conditions the adsorption process (Table 1) to make it easier to analyze the results of observation.

Table 1. Code each sample

Adsorben dose (gr)	Contact of time (minutes)	Code
0,5	30	$A_{0,5\text{-}30}$
1,0	30	$A_{1,0\text{-}30}$
1,5	30	$A_{1,5\text{-}30}$
2,0	30	$A_{2,0\text{-}30}$

3.1. Peat water parameters before adsorption. Before treated, peat water parameters analysis namely odor, color intensity, pH, turbidity, Fe content. Analysis of the overall parameters of peat water before adsorption process is shown in **Table 2**

Table 2. The results of the analysis of parameters of peat water samples before adsorption

Parameter	Result
color (Pt-Co)	2028
turbidity (NTU)	39,7
pH	3,79
Fe content (mg/L)	1,192

3.2. Peat water parameter analysis after adsorption

3.2.1 Intensity of Colors. Initial color of peat water before adsorption showed a high intensity of 2028 Pt-Co. Organoleptic, 11 respondents stated that the peat water reddish brown. Humic acids contribute to give a brown color. The presence of iron ions causes the water to a reddish color. Figure 1 shows the intensity of colors in the peat water after adsorption.

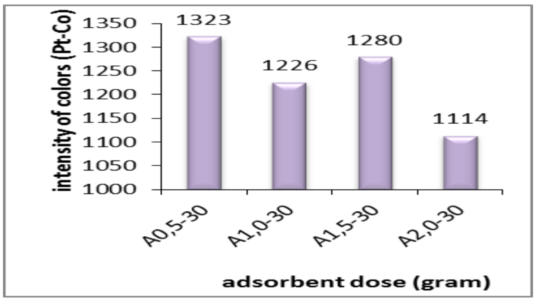

Figure 1. The intensity of the color of peat water after adsorption at each reaction condition (clean water standards: 50 Pt-Co).

Mass variations also affect the decrease in intensity of color. It can be seen that the removal efficiency of each parameter is obtained by using the highest mass of bagasse charcoal as much as 2.0 grams. The more doses of the adsorbent, the surface area will be increased so that the availability of active sites in the pores of the adsorbent more thus allowing an increase in absorption.

3.2.2. pH. The presence of organic acids were dispersed in peat of water , cause acidic pH tended . The results of the analysis of the peat water pH after adsorption can be seen in Figure 2.

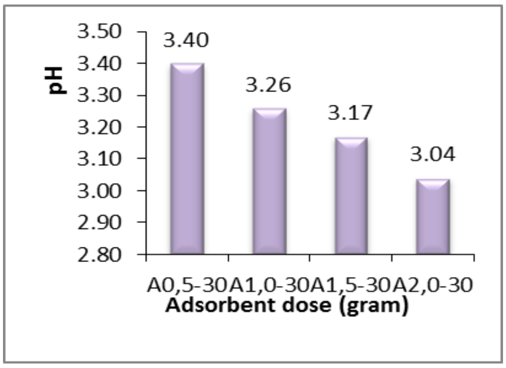

Figure 2. The pH value of peat water after adsorption (initial pH: 3.79; standard clean water from 6.5 to 9.0)

The overall pH of the peat water adsorption results do not meet clean water standards are set. The lower the pH value is affected by the acid sites on the surface of solids bagasse charcoal.

3.2.3.Turbidity The intensity of the initial turbidity of 39.7 NTU peat water. Turbidity is caused due to the presence of suspended particulates in the water in the form of organic matter decomposed peat [7]. The results of the turbidity parameter analysis of water samples of peat after the adsorption process can be seen in Figure 3.

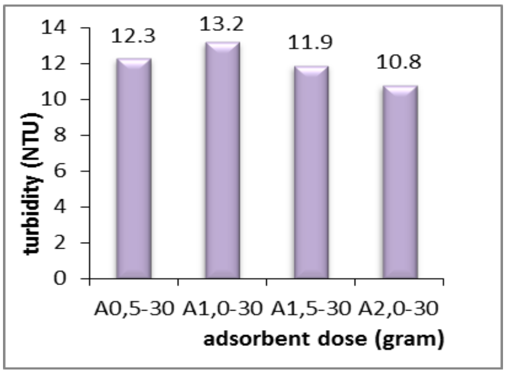

Figure 3. The value of peat after adsorption of water turbidity (25 NTU standard clean water)

Decrease in turbidity caused by peat adsorbed contaminants in water due to the pull of bagasse charcoal surface is stronger than the strong power hold in solution. The compounds are easily adsorbed usually has a smaller solubility values of adsorbent [8]. If the amount of particulates in the peat water decreases, the scattered light will be less, so that the turbidity decreased and the water will look clear as more and more light is transmitted

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3.2.4 Fe metal content. The presence of iron ions give the water a reddish color in the peat. The iron content before adsorption of 1.192 mg / L. The results of the analysis of the iron content in the peat water after adsorption can be seen in Figure 4. In Figure 4, adsorption at the contact time of 30 minutes at a dose of 2 grams (A2,0-30) with residual Fe content in the sample is 0.148 mg / L. The longer the contact time, the more opportunity for bagasse charcoal particles in contact with ferrous metals that are bound in the pores of the charcoal. Long contact time between the adsorbate with the adsorbent allows more bonds are formed between the particles of charcoal with iron metal. Selection of contact time and dosage of the best views of the effectiveness of bagasse charcoal in reducing the iron content in water samples of peat [4].

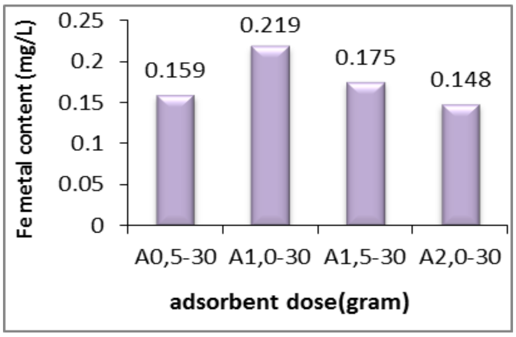

Figure 4. Analysis of iron in water samples of peat (initial iron content; 1.192 mg / L); water standard of 1.0 mg / L

The results of the analysis indicate the color of each sample not meet clean water requirements, just decrease the color intensity of each sample. Charcoal is considered able to reduce the intensity of the color of the water early 2028 Pt-Co. is A2,0-30 (Pt-Co 1114). In the analysis of parameters of turbidity, and the metal content of Fe, indicating overall bagasse charcoal adsorbent dose variation (A0,5-30; A1,0-30; A1,5-30; A2,0-30) qualified water below the threshold which have been set while the pH of the sample as a whole there is no eligible. Increasingly low pH value is influenced by the pH of acidic peat water, but it is affected by the acid sites on the solid surface of bagasse charcoal

4. Conclusion

Charcoal bagasse has been created through the process of carbonization. After the adsorption process, the variation of the dose at 30 minutes contact time were affecting each parameter were observed. Overall results of the analysis of turbidity and iron content of peat water after adsorption meet the standards prescribed by PERMENKES 416 / Menkes / Per / IX / 1990. For color intensity and pH parameters not meet the standards.

Acknowledgment

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