NOVATEUR PUBLICATIONS
INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING RESEARCH AND TECHNOLOGY
[IJIERT] ISSN: 2394-3696 Website: ijiert.org
VOLUME 8, ISSUE 6, June. -2021

THE PERFORMANCE OF GREEN MATERIAL IN WATER FILTRATION TOWARD THE POWER OF HYDROGEN (PH) AND TOTAL DISSOLVED SOLIDS (TDS)

Sirun
Madrasah Tsanawiyah Negeri 5 Rokan Hulu-Indonesia

Syafril Syafar
[2]Sekolah Tinggi Teknologi Pekanbaru

Lukman Hakim Nasution
SMK Negeri 1 Rambah, Rokan Hulu, Riau-Indonesia
Correspondent Email Auhtor :lukman.82@yahoo.com

Jeni Lukita Juana Prawita
Madrasah Tsanawiyah Negeri 5 Rokan Hulu-Indonesia

Galen Aquitha Surya de Gathy
Madrasah Tsanawiyah Negeri 5 Rokan Hulu-Indonesia

ABSTRACT
The level of water's power of Hydrogen (pH) and Total Dissolve Solid (TDS) do not meet the standard which is dangerous for human consumption. The result of well water measurements at MTs Negeri 5 Rokan Hulu shows that the pH and TDS levels of water are 5.5 mg/l, and 3.2 mg/l. While the natural material such as coconut shells, bagasse is quite abundant and can be used for the water filtration process. However, in order to find out its capabilities, experimental research was carried out by first making a water filtration device from Poly Vinyl Chloride pipe of 4inch in diameter, 100cm long, 1inch inlet and outlet. The oxidation process was not perfect, the material was pounded using a mortar, washed with clean water, and left to dry in the sun, then it was sieved with a mesh of 5 sieves for Coconut Shell Charcoal (CSC), and a mesh 20 sieves for Bagasse Charcoal (BC). The results of the analysis show that filtration using CSC increased the levels of pH is $4.55^{(+)}$ mg/l reduced the TDS by $1.42^{(-)}$ mg/l, and the highest decrease in TDS was $1.63^{(-)}$ mg/l. Whereas using BC increased the pH level by $1.88^{(+)}$ mg/l, decreased TDS by $1.74^{(-)}$ mg/l, and the highest decrease in TDS was $2.30^{(-)}$ mg/l. But for increasing the pH water level it is best to use the CSC of 5 mesh. On the other hand, for decreasing the TDS of water, it is best to use BC of a mesh 20. It can be concluded that the water filtration process of natural green method is worth to be developed because its pH standard and TDS is within the permissible limits of World Health Organization standards and is very environmentally friendly.

Keywords: power of Hydrogen, Total Dissolve Solid, water filtration, CSC, BC.

INTRODUCTION
Coconut shell is the best biomass for producing high quality carbon, because it has a unique cellular structure [1]. The thickness of the coconut shell ranges from 2 to 8mm, with a density value of 1.60 g/cm^3 [2]. If it is made in the form of particles the size of gravel or powder, the surface shape is rough, uneven, and irregular [3], and has a complex structure [4]. While the formation of coconut shell charcoal due to the incomplete oxidation process causes carbon molecules to breaks down and becomes charcoal [5]. Experimental on the process of removing water contaminated with chlorpyrifos as waste water with bagasse can reach 89%, this happens because of its morphological and physiochemical characteristics. The process of chlorpyrifos absorption to increase the power of Hydrogen water depends on the length of contact time, the initial chlorpyrifos concentration, and the adsorbent concentration were used [6].
Bagasse charcoal can remove the color of a liquid [7]; can also be used as an adsorbent for ferrihydrite,

where the adsorption capacity is very high and stable. Bagasse charcoal also has good separation speed, and is recyclable. So it is very well used for wastewater remediation [8]. So it is very well used for wastewater remediation [8]. However, the surface characteristics of the filtration material used affect the water contaminant separation process [9]. This is due to the contact of the water interface to the filtration material, which affects the results of the filtration process [10].

Total Dissolved Solid is one of the major contaminants in water that can affect the original properties of water [11]. Total Dissolved Solid is also an important indicator that determines the quality of ground water [12]. Dissolved Solid in groundwater, as the main determinant of the taste of the water itself which can be measured by Total Dissolved Solid meter, which is a measuring instrument for determining dissolved minerals in water. The content of Dissolved Solid is greatly influenced by the mineral content of the water source, but it can be removed by a filtration process using dissolved or other materials. The effect of changes in the value of Total Dissolved Solid that occurs can affect the acceptability of water for consumption [13]. Overall the quality of Total Dissolved Solid from ground water is very important, especially in determining the suitability of the water whether it is suitable for consumption, and used in daily household needs [14]. To determine the quality of groundwater that is fit for consumption, such as groundwater from wells, is with physical parameters such as Total Dissolved Solid, and chemical parameters such as the power of Hydrogen. Levels of this parameter must be within the permissible limits of World Health Organization standards, namely power of Hydrogen 6.5 to 8.5 mg/l, and Total Dissolved Solid <100 and >500 mg/l [15].

Measurement of the power of Hydrogen levels in water through a filtration process needs to be done to determine the suitability of water quality whether it is suitable for human consumption or not [16]. The water filtration system aims to obtain water suitable for consumption, such as filtration using a two-layer membrane that can remove bacteria, purify, and increase the power of Hydrogen from surface water with a power of Hydrogen <6 mg/l [18]. This water filtration system can also be performed on rainwater by using the main ingredients of bentonite and corn cobs [19].

Green materials are a solution of an action to reduce waste and environmental pollution. Numerous studies have shown that green materials have achieved in every aspect from product design, product life cycle, and conceptual design to disposal. This minimizes harm to the environment by optimizing the use of natural resources. Green material-based products are targets in minimizing the influence of human action on ecosystems and the environment. The future prospects of green materials are sustainable production and recycling, to save the environment, reduce product costs, and are environmentally friendly materials related to current global problems [20]. The future prospect of green materials is sustainable production and recycling, to save the environment, reduce product costs, and are environmentally friendly materials related to today's global problems [20]. The increase in green materials for environmental applications continues to increase through advances in nanotechnology in certain fields, such as the process of remediation of wastewater treatment by utilizing the adsorption method. Green materials also play an important role in many potential areas, such as wastewater remediation for sustainable ecosystems [21]. Simple techniques of green material containing a high percentage, such as the application of wastewater treatment processes, are an effective response to the current needs of the earth, and as an effort to combat the effects of climate change which continues to increase dramatically [22].

MATERIAL AND METHODOLOGY

This study is a filtration process experiment to increase the power level power of Hydrogen and decrease the Total Dissolved Solid from well water samples, by using greener material that is charcoal from coconut shell and bagasse. This greener material is fed into a filtration device with a variety of sizes and thicknesses, where its performance will be measured by changes in the levels of power of Hydrogen and Total Dissolved Solid water before and after the filtration process.

2.1 Treated Water

Based on observations, the quality of well water has iron content; this is known from sediments, yellowish stains on the walls of the water reservoir, and yellowish stains on white clothes after washing. Furthermore, measurements were made using the power of Hydrogen and Total Dissolved Solid meter, and showed the

levels of power of Hydrogen and Total Dissolved Solid of 5.50 mg/l and 3.20 mg/l.

2.2 Green Material Treatment

Material treatment and water filtration of greener material is the process of conditioning the material with no use of chemical additives or elements. Greener materials used for the filtration process of processed water are coconut shells and bagasse obtained from the environment around the residents. The process of obtaining charcoal from coconut shells and sugarcane residue is done through natural combustion. This process uses a combustion furnace then the coconut shell charcoal and bagasse from the burning are pounded using a mortar. Coconut shell charcoal and bagasse that has been shaped grains are further sifted. Sifting using a 5 mesh sieve for Coconut Shell Charcoal (CSC), and 20 mesh for Bagasse Charcoal (BC), as shown by Figures 1 and 2.

Figure 1 Coconut Shell Charcoal (CSC) passed 5 mesh

Figure 2 Bagasse Charcoal (BC) passed 20 mesh

The material is then inserted into a water filtration device made of 4inch diameter, 100cm long, with 1inch diameter water inlet and outlet Poly Vinyl Chloride pipe. Measurement of the power of hydrogen, and Total Dissolved Solids of 50 liters of treated water was carried out using a power of Hydrogen and Total Dissolved Solid meter.

2.3 Variation in Green Material Thickness

The thickness variations in green material thickness shown in Table 1 are for each material in the filtration tool. This is done as suitability for the measurement of the treated water filtration process. Apart from that, it is a measure of the performance ratio of the power of Hydrogen and Total Dissolved Solid water before and after the filtration process. For every thickness of the material in the filtration tool, 50 liters of treated water are given**.**

Table 1 Variation in Green Material Thickness

Greener Material	Thickness (Centimeter)	Code
Coconut Shell Charcoal (CSC)	5	A_1
	10	A_2
	20	A_3
	30	A_4
	40	A_5
	80	A_6
Bagasse Charcoal (BC)	5	B_1
	10	B_2
	20	B_3
	30	B_4
	40	B_5
	80	B_6

RESULTS AND DISSCUSION

The results of the power of hydrogen and total dissolve solid were measured in the green material water filtration process with various thicknesses of each material, as shown in Table 2.

Table 2 The Level of pH and TDS of green material filtrated water

Greener Material	Thickness (Centimeter)	Code	pH Initial Water (mg/l)	pH Final Water (mg/l)	TDS Initial Water (mg/l)	TDS Final Water (mg/l)
Coconut Shell Charcoal (CSC)	5	A_1	5.50	9.70	320	2.04
	10	A_2	5.50	9.90	3.20	1.90
	20	A_3	5.50	10.00	3.20	1.85
	30	A_4	5.50	10.10	3.20	1.75
	40	A_5	5.50	10.20	3.20	1.60
	80	A_6	5.50	10.40	3.20	1.57
Bagasse Charcoal (BC)	5	B_1	5.50	6.80	3.20	1.70
	10	B_2	5.50	7.20	3.20	1.65
	20	B_3	5.50	7.40	3.20	1.50
	30	B_4	5.50	7.50	3.20	1.48
	40	B_5	5.50	7.60	3.20	1.26
	80	B_6	5.50	7.80	3.20	1.15

Based on Table 2, the thickness of Coconut Shell Charcoal (CSC) and Bagasse Charcoal (BC) affects the levels of power of Hydrogen and Total Dissolved Solid in filtered water. The thicker the material filtrates the water, the greater the change in the rate of increase in power of Hydrogen and the decrease in Total Dissolved Solid. The rate of increase in power of Hydrogen water ranged from $1.30^{(+)}$ mg/l to $4.90^{(+)}$ mg/l, with a decrease in Total Dissolved Solid $1.16^{(-)}$ mg/l to $2.05^{(-)}$ mg/l.

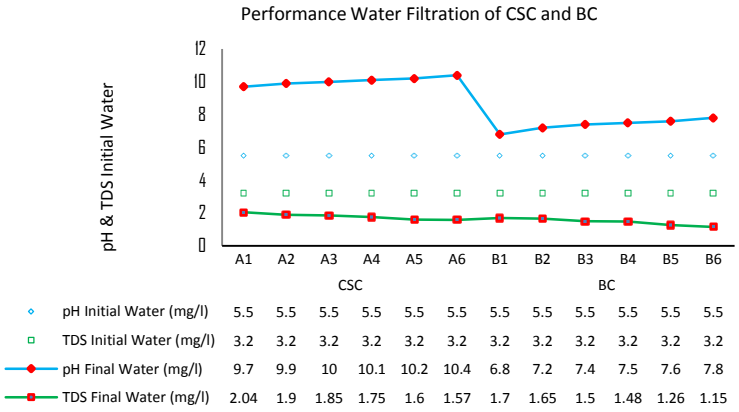

Figure 3 Performance green materials in water filtration

Based on Figure 3, that water filtration using Coconut Shell Charcoal (CSC) has an average increase of power of Hydrogen of $4.55^{(+)}$ mg/l, decrease of Total Dissolved Solid of $1.42^{(-)}$ mg/l, and the highest decrease of Total Dissolved Solid was produced is $1.63^{(-)}$ mg/l. Meanwhile, by using Bagasse Charcoal (BC), the average power level of Hydrogen increased by $1.88^{(+)}$ mg/l, the Total Dissolved Solid level decreased by $1.74^{(-)}$ mg/l and the highest Total Dissolved Solid level produced was $2.1^{(-)}$ mg/l.

The level of power of Hydrogen water as a result of filtration using Coconut Shell Charcoal (CSC) is 9.70 mg/l to 10.40 mg/l, indicating that the water is alkaline, even though the Total Dissolved Solid level is between 2.04 mg/l to 1.57 mg/l. Meanwhile, the power of hydrogen content of filtered water using Coconut Shell Charcoal (CSC) is between 7.20 mg/l to 7.80 mg/l, with Total Dissolved Solid 1.70 mg/l to 1.15 mg/l. However, for the achievement of the best increase in the power rate of Hydrogen and the decrease in Total Dissolved Solid water, it is possible only by using Bagasse Charcoal (BC). Achievement levels of power of Hydrogen produced are between 7.20 mg/l to 7.80 mg/l, Total Dissolved Solid 1.65 mg/l to 1.15 mg/l, with a size of 20 mesh, a thickness of 5cm to 80cm on a 4inch diameter filtration media.

CONCLUSION

Water filtration performance of greener material by using CSC and SDC affects the level power of Hydrogen and Total Dissolved Solid of filtered water. The level of increase in the power of Hydrogen water is $1.30^{(+)}$ mg/l to $4.90^{(+)}$ mg/l, with a decrease in Total Dissolved Solid by $1.16^{(-)}$ to $2.05^{(-)}$ mg/l. The level of increase of power of Hydrogen and decrease of the maximum Total Dissolved Solid by CSC is $10.40^{(+)}$ mg/l and $1.57^{(+)}$ mg/l, SDC is $7.80^{(+)}$ mg/l and $1.15^{(+)}$ mg/l. The water filtration process with CSC passed mesh 5, and SDC passed mesh 20 with a thickness of 5cm to 80cm is eligible to be developed because the power content of Hydrogen and Total Dissolved Solid is within the permissible limits of the World Health Organization standard, 6.5 to 8.5 mg/l, <100 and >500 mg/l, and is very environmentally friendly.

ACKNOWLEDGMENT

The author would like to express thanks to the Religion Ministry of Republic Indonesia and Rokan Hulu State Government for facilitating the author during conducting research. Also, many thanks go to the author's supervisor and Indofiller Research Consultant for their advice and technical support.

REFERENCES

1) Satpal Singh Sekhon (2021). From Coconut Shell Biomass To Oxygen Reduction Reaction Catalyst: Tuning Porosity And Nitrogen Doping. Renewable and Sustainable Energy Reviews Volume 147, 111173.
2) Tomas U. Ganiron Jr (2013). Sustainable Management of Waste Coconut Shells as Aggregates in Concrete Mixture. Journal of Engineering Science and Technology Review Volume 5, 48-55.
3) A.S. Leman (2017). Durability of coconut shell powder (CSP) concrete. Materials Science and Engineering Volume 271, 012007.
4) Kumar S (2013). Comparative Study on Coconut Shell Aggregate with Conventional Concrete. International Journal Engineering Innovation Volume 2, 67-70.
5) K.D.M.S.P.K.Kumarasinghe (2019). Activated Coconut Shell Charcoal Based Counter Electrode For Dye-Sensitized Solar Cells. Organic Electronics Volume 71, 93-97.
6) Meenu Mariam Jacob (2020). Bagasse Based Biochar for the Adsorptive Removal of Chlorpyrifos from Contaminated Water. Journal of Environmental Chemical Engineering Volume 8, 103904.
7) Zhao, J (2011). Effect of Activated Charcoal Treatment of Alkaline Hydrolysates from Sugarcane Bagasse on Purification of P-Coumaric Acid. Chemical Engineering Research and Design Volume 89, 2176-2181.
8) Yu Xin (2021). Fabrication of Ferrihydrite-Loaded Magnetic Sugar Cane Bagasse Charcoal Adsorbent for the Adsorptive Removal of Selenite from Aqueous Solution. Colloids and Surfaces A: Physicochemical and Engineering Aspects Volume 614, 126131.
9) Chih-HsienLin (2021). Influence of Water, H_2O_2, H_2SO_4, and NaOH Filtration on the Surface Characteristics of a Graphene Oxide-Iron (GO-Fe) Membrane. Separation and Purification Technology. Volume 262, -118317.
10) Xiaolei Zhang (2021). Interfacial Characteristics in Membrane Filtration for Oil-In-Water Treatment Processes. Journal of Membrane Science. Volume 623, 119092.
11) Mohammed Hamdan Aldayel Aldossary (2020). Effect of Total Dissolved Solids-Contaminated Water on The Properties of Concrete. Journal of Building Engineering. Volume 32, 101496.
12) Mehdi Jamei (2020). Prediction of Surface Water Total Dissolved Solids Using Hybridized Wavelet-Multigene Genetic Programming: New Approach. Journal of Hydrology. Volume 589, 125335.
13) R.Devesa (2018). Guidance for Optimizing Drinking Water Taste By Adjusting Mineralization As Measured By Total Dissolved Solids (TDS). Desalination. Volume 439, 147-154.
14) Fatemeh Barzegari Banadkooki (2020). Estimation of total dissolved solids (TDS) using new hybrid machine learning models. Journal of Hydrology. Volume 587, 124989.
15) M. Antilin Princela (2021). Regional assessment of groundwater quality for drinking purpose. Journal Materialstoday: Proceedings. Volume 45, 2916-2920.
16) WisamThamer Al-Mayah (2021). Chemical and Microbial Health Risk Assessment of Drinking Water Treatment Plants in Kut City, Iraq. Journal Materialstoday: Proceedings. Volume 42, 3062-3067.

17) Nitin Kothari (2021). Design And Implementation of Iot Sensor Based Drinking Water Quality Measurement System. Journal Materialstoday: Proceedings. Volume 15, 2214-7853.
18) Tasuma Suzuki (2020). Removal of Standard Plate Count Bacteria from Surface Water With Low Turbidity Via Integrated M. Oleifera Seed Coagulation Pretreatment And Two-Layer Cloth Filtration Process. Journal of Water Process Engineering. Volume 38, 101648].
19) Mengyue Wang (2021). Enhanced Removal of Heavy Metals and Phosphate in Storm water Filtration Systems Amended With Drinking Water Treatment Residual-Based Granules. Journal of Environmental Management. Volume 280, 111645.
20) Paul Thomas (2021). 29-Future Prospective of Advanced Green Materials. Applications of Advanced Green Materials. Woodhead Publishing in Materials, 733-749.
21) Sayfa Bano (2021). 19-Advanced Application of Green Materials in Environmental Remediation. Applications of Advanced Green Materials. Woodhead Publishing in Materials, 481-502.
22) Gassan Hodaifa (2021). Chapter 10-Green Techniques for Wastewaters. Interface Science and Technology. Volume 30, 217-240.