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Renewable Energy From Rice Husk

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Abstract : The development of bioethanol gel with new types and characteristics is very important to continue to be developed because there are still a lot of fuel is not renewable and have environmental impacts. This study has the objective to study the optimization of bioethanol gel from rice husk biomass by adding various types of materials as an alternative thickening gel bioethanol process effective and environmentally friendly. This is because rice husk is one of the waste that can be used as an alternative energy with a fairly high cellulose content. In this study the variable changes that are used include the type of thickener and the weight ratio of thickener to the media while the fixed variable is rice husk. Stages of the research carried out is phase thickening process with various types of thickeners to produce bioethanol gel that is practical and environmentally friendly as well as the design of the equipment. Products analyzed calorific value and long burning and exhaust gas emissions. Interest in the future of this research is to produce bioethanol gel as renewable energy (renewable energy) that can be applied to society. From the results obtained, bioethanol gel resulting from the type of thickener Carbopol 940 has a high calorific value that is equal to 8522.52 kcal / kg, with the value of its CO emissions amounted to 0.009% of the volume of air in the open spaces, the flame obtained longest and blue with time 23 minutes 31 seconds.
Keywords : alternative fuels, cellulose, ethanol gel, rice husk.

1. Introduction

The increasing demand for energy and the increasing brushed gas and petroleum reserves, led to the exploration of alternative energy moves into high gear by all parties. Alternative energy is researched and developed is a renewable energy that has properties. One of the renewable energy that began many developed and used are bioethanol gel. The development of bioethanol gel with new types and characteristics is very important to continue to be developed because there are still a lot of fuel is not renewable and have environmental impacts To overcome these problems, researchers tried to explore biomass materials that can be processed into one of them is rice husk. Rice husk is one of the waste that can be utilized as an alternative fuel, in Malang still a lot of rice husks are not used among others in the area TunggulWulung Malang. , In general the results obtained husk milling process ranges from 20-30% of the weight of grain. So judging from the content that is high enough to result in environmental impacts besides the rice husk is still a fairly high cellulose content. So it makes researchers utilize the waste as raw material for renewable energy.

From research DewiKartikaRini, et.al, 2015rice husk composition analysis obtained are: 10:55% water content; 20:37 fiber%, ash: 13.36%; cellulose: 34.34% and lignin: 21:40. Visible composition contained cellulose is still quite large. So that it can be used as a raw material for the manufacture of bioethanol gel

The objective of this study was to determine the effect of thickening between Carboxl Methyl Cellulose - Na (CMC - Na) and Carbopol 940 on bioethanol gel products from rice husk biomass produced to obtain the optimum conditions in the manufacturing bioethanol gel.Extra Thickening or gelling agent is one of the factors that influence the nature and characteristics of the gel produced bioethanol

Based on research Merdjan, R.E and Matione. J in 2003, bioethanol gel is suitable for use when camping, cooking, and others due to the shape of the fuel gel easily in packaging and distribution as well as having excess does not produce smoke, not sooty and does not produce emissions dangerous compared to other alternative fuels.

While research AlmiraNugroho et al, 2016, about the making of ethanol gel using thickeners CMC obtained the best formulations according to the characteristics of viscosity, calorific value and combustion residues penambahankonsentrasi ethanol gel ethanol with 90% and the addition of 1.8 g CMC having a viscosity of 17 434 cP, combustion residues 29.44%, calorific value of 11.751 J / g, can burn for 11 minutes with no more than 10 grams and produces a blue flame colors.

Based on the research of Akhiroh Islam NurJanatul and SutjahjoDwiHeru, 2015, in a study about Ratio Catalyst Sodium Carboxymethylcellulose (Na CMC), Stearic Acid and Ethanol Against Characteristics of Making Bioethanol Solid from molasses obtained optimum results found in a sample of 100 ml of ethanol molasess levels 75%, CMC Na 20gr, 200gr of stearic acid with the characteristic that the calorific value of 6049.633 cal / g, the value of the ash content of 1.01%, the value of the flash point of 125^{o}C, the compressive strength of 0.5250 kg / cm2, the value a density of 0.9397 g / cm3, and produce a long flame for 3030 seconds.

While based on research DewiKartikaRini, et al, 2015 about the study of the rotation speed and the concentration of acid stearic On Bioethanol Gel environmentally friendly, from this research, the best results of the highest calorific value, emission testing, and flame test were the 85% bioethanol variation with 4% of stearic acid with the speed of rotation at 670 rpm with a calorific value were 8392.10 kcal / kg and its CO emissions values were 0.009% by volume of open space. As for the flame test the best results were the 85% ethanol concentration with 5% weight of stearic acid with longest flame for 7 minutes / 5grams

Research purposes

The purpose of this research is :

1. Determine the influence of the type of thickener Carboxyl Methyl Cellulose - Na (CMC-Na) and Carbopol 940 on the gel bioethanol from rice husk
2. Provide alternative energy gel fuel is environmentally friendly.
3. Apply the gel bioethanol process technology into renewable energy that benefit society.

Benefits of research

This study provides a benefit that makes one solution to address the depletion of fuel that is renewable, and environmentally friendly and can be applied to the public.

2. Experimental

This research was conducted at the Microbiology Laboratory of Chemical and Environmental Engineering Laboratory Modeling TheInstituteof National Technology Malang, Indonesia.

Variables used in the study is:

The independent variablesis :Weight thickeners used: 3, 4, 5, 6 grams with the type of thickening agent Carbopol 940 and CMC-Na.

Variables control :

1. Bioethanol used are of the highest rice husks results at 11:02% is added to pure ethanol until the concentration is 90%
2. The stirring speed is 670 rpm

3. The temperature in the process of coagulation is room temperature
4. Massa bioethanol used is 75 grams

Work procedures :

a. He preparation phase thickeners weighing
Considering thickeners to be varied at 3, 4, 5 and 6 grams

b. Phase manufacture of bioethanol gel

- Incorporating thickeners which had been weighed into the beaker glass
- Adding bioethanol corresponding variable into the glass beaker containing thickeners
- Add distilled water as much as 10% of bioethanol
- Stirred by using the stirring speed of 670 rpm

As for the physical properties of bioethanol gel analysis as follows:

Calorific Value Analysis

- Incorporate bioethanol gel into the sample container bomb calorimeter
- Covering bomb calorimeter
- Pumping oxygen into bomb
- Fill tool calorimeter with cooling water up to the mark
- Incorporate into the tool bomb calorimeter and closing tool
- Run the tool bomb calorimeter
- Take note of the results of the analysis of the bomb calorimeter

Fire Test Analysis

- Considering the cup
- Fill the cup with bioethanol gel 5 grams
- Considering the contents of the cup + bioethanol gel
- Burning bioethanol gel
- Take note of the time of ignition and observe the color of the flame
- Considering the weight of the final residue

Emission Test Analysis

- Preparing the Gas Analyzer tool in the sewer gases of combustion of bioethanol gel
- Connect tool to a source of electric Gas Analyzer then wait up to ± 6 minutes for the heating process tool
- Once the indicator shows the writing instrument Gas Ready, exhaust Inserting the probe into the sewer gases of combustion
- Viewing readings of CO, HC, CO2 and O2 or other gases from the burning if there
- Print the measurement by pressing Print
- Stopping the measurement process by removing the exhaust probe of the drain and pressing the Esc key
- Pressing the Zero to dispose of used gas that enters in the tool
- Conduct testing in the same way with bioethanol gel result of the different variables

3. Results and Discussion

Caloric Analysis

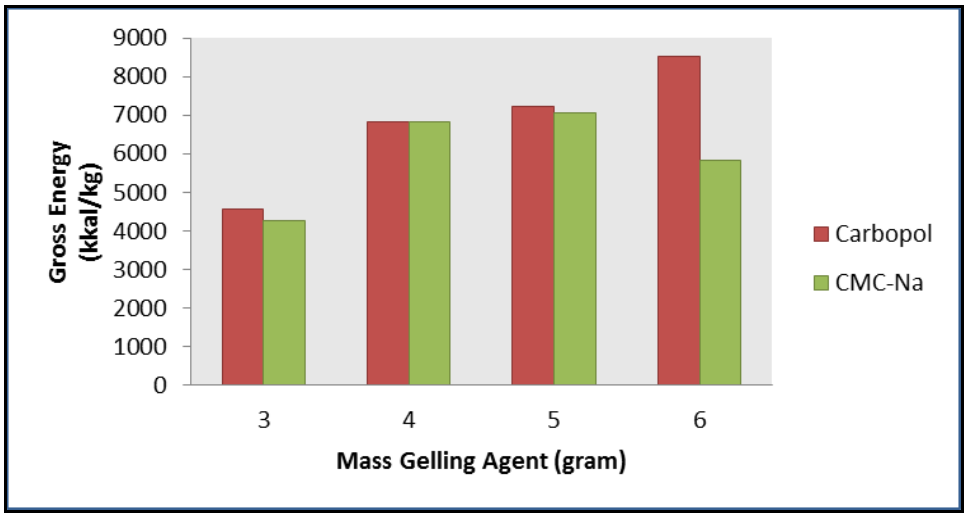

Figure 1. Effect Against thickener Material Type Calorific Value

The heating value is influenced by the mass of the thickening agent but it is also influenced by the composition of carbon bound to a fuel. The higher the carbon bound owned by a fuel, then the value kalornya also higher. This is due to the burning of carbon needed to react with oxygen to produce heat. From the research that has been done the best results is to use Carbopol 940 with a value of 8522.52 kcal / kg.

According to the study Robinson (2006), the calorific value of ethanol gel commercial in South Africa is 16.4 MJ / kg (3919.70 kcal / kg). while the calorific value of ethanol gel on research Lloyd and Visagie (2007) is 16.1 MJ / kg (3847.99 kcal / kg) containing a concentration of 70% ethanol.

Gas Emission Analysis

Exhaust emissions are the rest of the combustion engine either vehicle wheeler vehicles, boats / ships and aircraft that uses fuel. Usually this happens exhaust emissions due to incomplete combustion of the exhaust system and combustion engines as well as the escape of particles due to lack of insufficient oxygen in the combustion process. Emissions are one cause of the greenhouse effect and global warming is happening lately

Several factors affect the exhaust emissions, among others :

a. Carbon monoxide (CO) is a gas that is odorless, tasteless and colorless. Therefore the environment has been polluted by gas CO can not be seen by the eye.
b. Hydrocarbons (HC) is an air pollutant gaseous, liquid or solid. Most hydrocarbons derived from the combustion of gaseous methane. In a large enough amount of hydrocarbon gas can trigger the formation of harmful substances such as ketones and aldehydes.
c. CO_2 gas (carbon dioxide) is the result of the process of combustion of gasoline or HC (compound hydrate) with O_2 (oxygen). CO_2 concentration the higher the better, this shows the direct status RUAG fuel combustion process in the engine. CO_2 source only from the combustion chamber in the engine and CC. But at a certain condition this high CO_2 concentrations are inversely related to the climate out there. Because CO_2 is the largest source of emissions of greenhouse gases.
d. NOx (oxides of nitrogen compound) is a chemical bond between the nitrogen and oxygen. NOx compounds are produced due to the high concentration of oxygen and the temperature in the combustion chamber. Under normal conditions the atmosphere, nitrogen is an inert gas that is very stable which will not bind to other elements. But in conditions of high temperature and high pressure in the combustion chamber, the nitrogen will break the bond that binds with oxygen. Emissions of NOx compound is very unstable and when terlepaske free air, would bind with oxygen and form NO_2. This compound was very dangerous because of the toxic and in contact with the water to form nitrate compounds

e. H_2O is the result of complete combustion of the fuel (hydrocarbons) which reacts with oxygen. Have you ever heard the term "flood the engine in a motor vehicle?" The machine was flooding because of their H_2O which are waste products of combustion are not wasted resulting machine was not lit and due to the many H_2O were not wasted in the engine combustion process will be hampered and can produce emisi- other gas emissions.

Table 1. Emissions Gas Analysis For the thickeners CMC-Na

No	Sample Code	Compositions			
		CO	CO_2	HC	O_2
		%vol	%vol	ppm vol	%vol
1	CMC – Na 3 gr	0.133	5.62	564	13.71
2	CMC – Na 4 gr	0.031	3.6	805	16.6
3	CMC – Na 5 gr	0.012	3.63	436	15.39
4	CMC – Na 6 gr	0.016	3.41	388	16.37

Table 2. Emissions Gas Analysis For the thickeners CMC-Na

No	Sample Code	Compositions			
		CO	CO_2	HC	O_2
		%vol	%vol	ppm vol	%vol
1	Carbopol 3 gr	0.009	2.33	557	16.61
2	Carbopol 4 gr	0.018	1.95	800	17.91
3	Carbopol 5 gr	0.012	3.68	438	14.64
4	Carbopol 6 gr	0.011	1.56	257	18.13

From research gained CO gas emissions from bioethanol gel smallest of the type of thickener is Carbopol 940 0.009% by volume. So it can be said that this gel bioethanol gas emissions standards under which the CO emission rate is smaller than the standard proposed by Indonesian National Standard (SNI).

As emissions produced by bioethanol gel is very good for the environment it can be seen the amount of CO very close to 0. Good Combustion can produce very little CO gas because CO gas formed by reaction between bioethanol imperfect with oxygen. The main bioethanol combustion reaction with oxygen is as follows:

$$C_2H_5OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O$$

Combustion of bioethanol gel good yield blue flame, which means perfect combustion occurs so that the amount of CO_2 produced more than its number CO.

Fire Test Analysis

Based research by Pujiastuti P. Et.al., 2013. Flash point is the lowest temperature at which the fuel vapor in the mixture with air will light when subjected to a flame test (test flame) on certain conditions. The occurrence of a stable flame can be indicated by the high blue flames can be produced by the fuel .

Reaction zone, is the area where all the chemical reactions and heat release occur. Reaction zone begins at the point where the stoichiometric reactions begin to occur until when the burning is complete. Diffusion flame area is divided into regions:

1. Luminous Region (yellow region)
2. Non-luminous region (blue zone)

Based Turns, 1996, Most of the reaction process occurs in the area in blue so as to have a relatively higher temperature, while the yellow areas indicate the percentage of the carbon particles.

Table 3. Results of analysis and long time flame burning

Type	Mass of Bioethanol (gram)	Burning Times	Flame
Carbopol 3 gr	75	17 minute 25 secon	blue
Carbopol 4 gr	75	11 minute 47 secon	blue
Carbopol 5 gr	75	18 minute 59 secon	blue
Carbopol 6 gr	75	23 minute1 secon	blue
CMC Na 3 gr	75	15 minute 45secon	Reddish blue
CMC Na 4 gr	75	18 minute 20 secon	reddish blue
CMC Na 5gr	75	18 minute 33 secon	reddish blue
CMC Na 6 gr	75	14 minute 32 secon	reddish blue

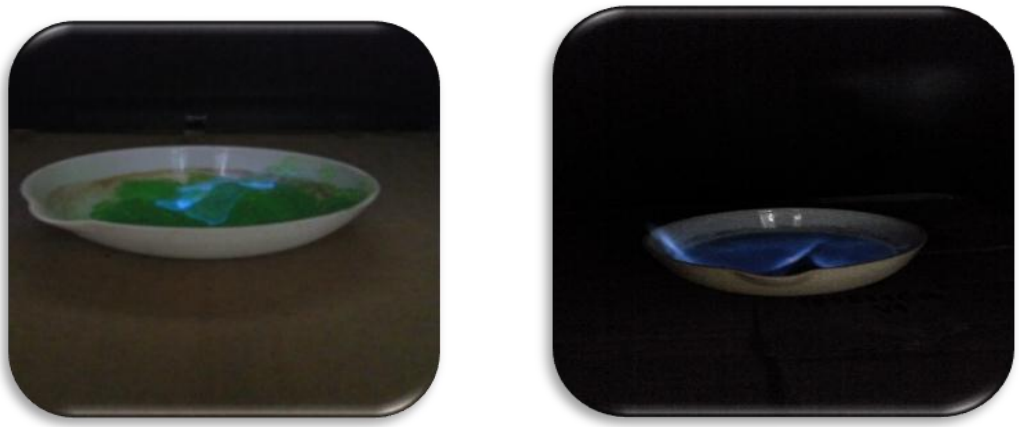

Figure 2. Flame Burning with Carbopol 940

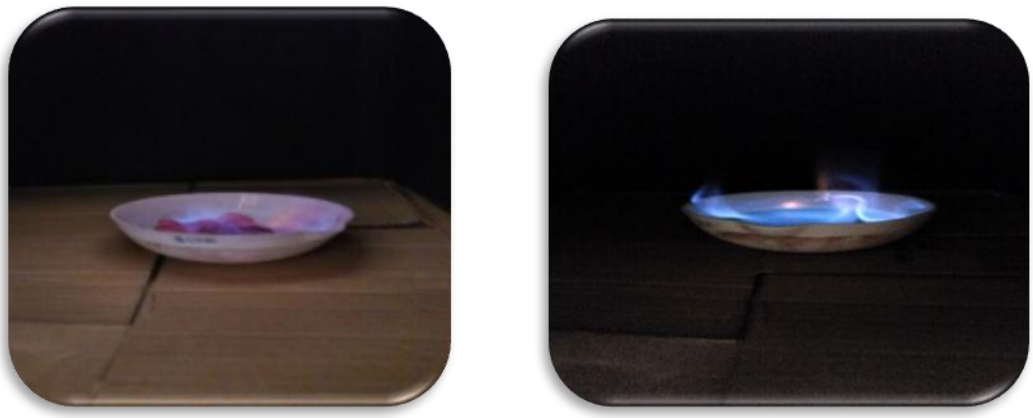

Figure 3. Flame Burning with CMC - Na

From the research it turns out the mass and type of thickening affect the flame at the time of the firing, looks more and more mass thickener so long burning time is also longer, it is because the bond between the thickeners and water content in bioethanol more perfect that the combustion process the amount of bioethanol that burn more completely, leaving a mixture of water and soot thickening that if in space will form a layer like a candle that is easily cleaned. But for CMC - Na decreased slightly due to the CMC-Na 6 g are dense clumps resulting in incomplete combustion and provide effect on a long burning.

4. Conclusions

From the results of this study concluded that:

1. The type of thickener greatly affects the physical properties of the resulting gel bioetnaol and the best results using this type of thickener Carbopol 940.
2. Based on testing performed calorific value, bio-ethanol gel resulting from the type of thickener Carbopol 940 has a high calorific value that is equal to 8522.52 kcal / kg
3. From the emission test results obtained emission values for all types of thickeners are very small and the smallest is of the type of thickener Carbopol 940 with its CO gas emission values of 0.009% the volume of air in the open spaces.
4. Based on the test flame using bio-ethanol fuel gel obtained flame longest and blue is the type of thickener Carbopol 940 with a time of 23 minutes 31 seconds

5. Acknowledgment

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