Proximate Analysis of Durian Bark Briquettes and Coconut Shells with Starch Adhesive Based on SNI 01-6235-2000

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Abstract

Briquettes are alternative fuels that resemble charcoal but are made or composed of non-wood materials. Alternative energy sources that can be used as a substitute for kerosene and firewood fuel are now quite expensive. Durian skin and coconut shells are inexhaustible waste, even a lot of them. For this reason, it is necessary to use this waste in order to reduce waste and have economic value. Based on this, it is necessary to conduct research on the use of durian skin and coconut shell as briquette material, which was previously carbonized and molded into briquettes with a composition of charcoal (durian skin: coconut shell) 65: 30, 60: 35, 55: 40, 50: 45, 45: 50 with 5% starch adhesive. Then a proximate analysis is carried out which includes water content, ash content, Volatile Matter, Fixed Carbon and calorific value as well as the length of burn time The results of the analysis are the moisture content is more than 8%, the ash content is more than 8%, Volatile Matter is less than 15%, Fixed Carbon is 64% - 74.9% and the calorific value is more than 5000 kcal / gr for the composition of 50: 45 and 45: 50, while the length of time of burning briquettes (28 - 53) minutes.

Keywords: *Alternative Energy, Briquette, Coconut Shell, Durian Skin*

1. Introduction

Briquettes are one of the products of utilizing biomass as an energy source. Briquettes are an alternative fuel that resembles charcoal, but is made or composed of non-woody materials [1],[2]. Briquettes can be used instead of kerosene fuel and firewood which are now quite expensive.

Durian bark can be used as an alternative energy in the form of briquettes which are usually coal-based [3]. Inside the durian skin are essential oils, flavonoids, lignin, cellulose, and flammable saponins. The advantage of using durian bark briquettes is that they do not produce harmful gases for the environment and health, such as CO2, CO, NOx, and SOx. Based on this, the fuel briquettes made from durian skin can be said to be environmentally friendly [4].

Coconut shells are usually used as a staple ingredient for making activated charcoal. This is because coconut shells are a material that can produce a calorific value of around 6500–7600 cal/g. In addition to having a fairly high calorific value, coconut shell is also quite good as an activated charcoal ingredient [5]. Coconut shells can be processed into charcoal which is the raw material for making charcoal briquettes by carbonization process [6]. Coconut shell charcoal is charcoal made by carbonizing the coconut shell.

2. Method

The stages of research are as follows: Research materials The durian bark used in this study was obtained from a fruit seller. Coconut shells are obtained from coconut shell waste at coconut

sellers in traditional markets. Sample Preparation The moisture content of the material to be used as charcoal is determined to be 10% both durian skin and coconut shell skin by drying. Carbonization Process The carbonization process [7] is carried out separately between durian bark and coconut shell shell. Durian is carried out the carbonization process at a low temperature and the time required is not long, which is 30 minutes at a temperature of 400oC. As for coconut shells, a carbonization process is carried out at a temperature of 450oC for 1 hour. Manufacture of adhesive materials Starch glue is made by mixing tapioca flour and water with a ratio of tapioca flour and water of 1:15. After that, the mixture is heated while constantly stirring until evenly distributed. raw materials and adhesives Raw materials and adhesive materials are mixed according to the weight of each composition of raw materials and adhesives Briquette printing After mixing, raw materials and adhesives are introduced into the mold. Carrying out pressing by hand with the help of a collider made of iron. After pressing, it is allowed to stand first for 3 minutes, then the product is removed from the mold. Drying briquettes Briquette testing includes: Water content, ash content, volatile content, carbon content, calor value, duration of combustion Data collection and grouping, created tables and graphs Analysis of research results with quality methods based on SNI 01-6235-2000 Conclusion

3. Result and Discussion

Making briquettes from coconut shell charcoal with durian bark charcoal that has been compressed with variations in the composition of raw materials, starting from 65:30, 60:35,55:40,50:45,45:50. Briquette production is carried out using a furnace at a temperature of 400oC. The resulting charcoal is mixed with different mass ratios and starch adhesive is added as much as 5% by weight of the overall raw material. Then testing is carried out, proximate analysis and the length of burn time

Table 1. Test Result Data

No.	Durian Skin and Coconut Shell Composition (%)	Adhesive	Adhesive Results of Proximate Analysis of Briquettes					Burning Duration (minutes)
			Water content (%)	Ash Content (%)	*Volatile Matter* (%)	Fixed Carbon (%)	Calorific Value (cal/gr)	
1.	SNI briquettes	-	≤ 8	≤ 8	≤ 15		≥ 5000	
2.	65 : 30	Kanji	23,85	8,11	13,8	64,3	4144,25	28
3.	60 : 35		18,91	8,29	8,68	64,7	4761,45	46
4.	55 : 40		11,99	8,28	7,68	70,2	4896,78	51
5.	50 : 45		11,16	8,64	6,93	74,3	5069,02	52
6.	45 : 50		9,15	8,74	5,87	74,9	5103,87	53

3.1. Water Content

Water content is one of the parameters that greatly affects the quality of the briquettes made because the higher the moisture content contained in a briquette, the calorific value and burn time value will be lower and vice versa.

Based on Figure 1, it can be seen that the greater the percentage of durian skin charcoal, the water content is getting bigger and smaller in the ratio of 45 durian skin charcoal 50 coconut shell charcoal, which is 9.15%. All briquettes with starch adhesive produced are not in accordance with SNI 01-6235-2000, so it is necessary to continue research by reducing the percentage of durian skin charcoal. Based on observations during the study, the passage of time is twitched with the glue adhesive of starch growing mold, which indicates the briquettes are in valley conditions.

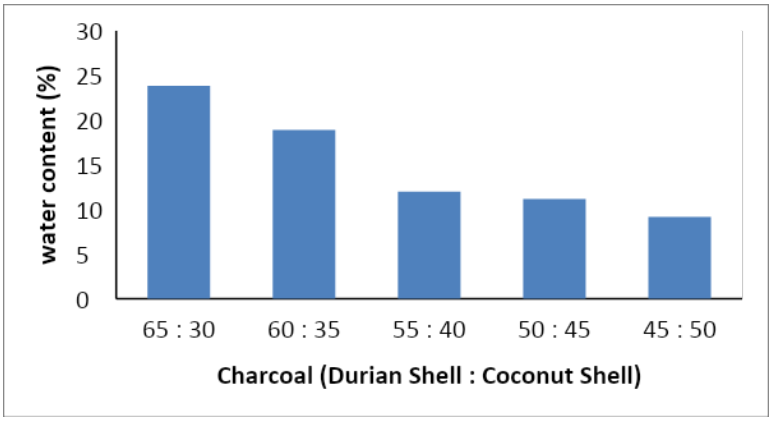


Figure 1. Relationship between Charcoal (Durian Shell: Coconut Shell) and moisture content

3.2. Ash content

Ash Content is also one of the important parameters as a determinant of whether or not the quality of a briquette is good [8], because the higher the ash content contained in a briquette can cause scale and can reduce the quality of briquettes because the calorific value and the length of time of combustion will decrease.

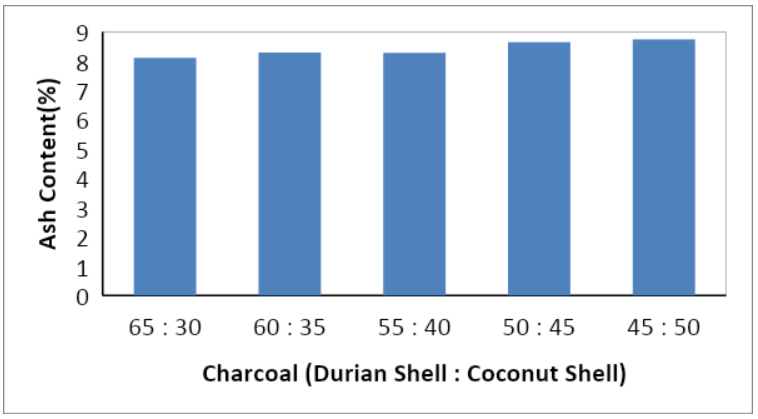


Figure 2. Relationship between Charcoal (Durian Shell: Coconut Shell) and ash content

Based on Figure 2, from the results of the study all compositions with starch adhesive that have been made do not meet the SNI 01-6235-2000 standard exceeding 8%, but not significant. The more durian skin charcoal and the less coconut shell charcoal, the less ash content, which means that more ash is produced.

3.3. Fixed carbon

The value of the carbon fixer is the fixed carbon content of the briquettes. A low fixed carbon content will have a low calorific value and vice versa a high fixed carbon content will have a high calorific value as well.

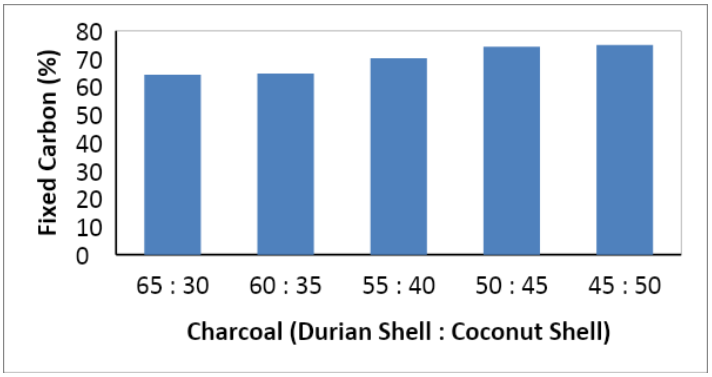


Figure 3. Relationship between Charcoal (Durian Shell: Coconut Shell) and fixed carbon

3.4. Calor Value

Calor value or commonly also called heat value is one of the parameters that is very important in determining the quality of good briquettes because it is related to their use [9]. To find out the value of the heat of combustion in briquettes, it is necessary to know in advance the value of the heat.

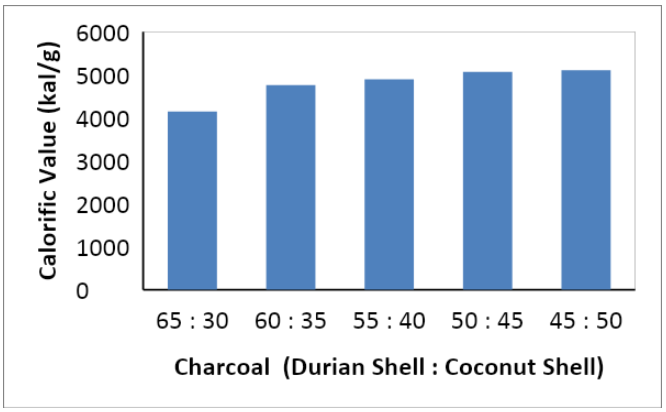


Figure 4. Relationship between Charcoal (Durian Shell: Coconut Shell) and Calorific Value

According to the SNI standard 01-6235-2000 the calorific value of briquettes is a minimum of 5000 cal/g, but in this study there is one briquette that meets, namely in a mixture ratio of 50:45 and 45:50 the resulting calorific value of 5069.02 cal/g and 5103.87 cal/g, this is because durian skin has a smaller calorific value compared to coconut shells. The calorific value is not too high because the water content is quite high above 8% or does not meet the requirements, due to starch adhesive that causes moist briquettes.

3.5. Volatile Matter

Volatile matter levels are substances or compounds that evaporate due to the decomposition of several compounds that are still present in briquettes other than water, bound carbon and ash. Volatile substances are hydrocarbons, methane and CO elements. High levels of volatile matter can be affected by temperature and the duration of the carbonization process. High levels of evaporating substances are caused by imperfect carbonization processes. The greater the temperature and the length of carbonization time, the more evaporated substances are wasted so that when testing volatile matter levels are obtained low values.

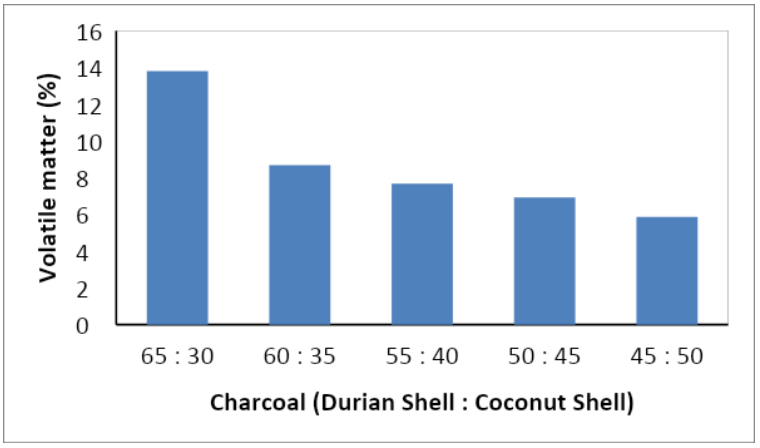


Figure 5. Relationship between Charcoal (Durian Shell: Coconut Shell) and volatile matter

Based on Figure 5, it can be concluded that the mixture of raw materials greatly affects the level of volatile matter produced and the content of volatile matter in durian skin is greater than that of coconut shell. The higher the composition of coconut shell charcoal, the smaller the volatile matter content, while the higher the composition of durian skin charcoal, the greater the level of volatile matter produced.

3.6. Burning Duration

The duration of combustion time on briquettes depends on the mass or weight of the briquettes, because the heavier it is, the longer the combustion time will be [10]

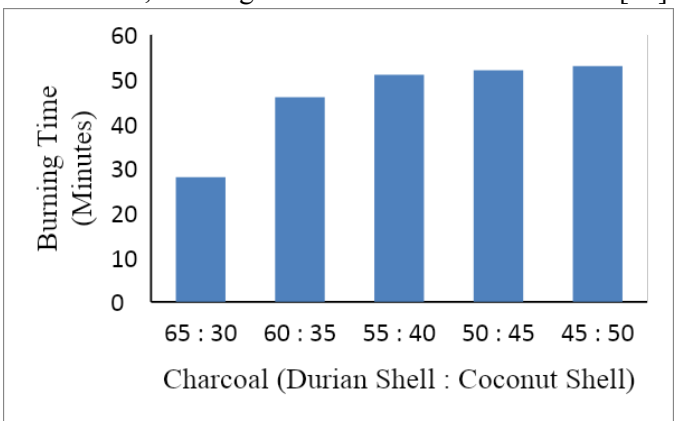


Figure 6. Relationship between Charcoal (Coconut Shell: Durian Skin) and length of burn time

Based on the chart 6 the length of burn time obtained is 28 – 53 minutes, not too long or from 1 hour. The length of burn time on briquettes affects the calorific value produced, the higher the calorific value produced, the longer the burning time needed [11], the higher the ash content of the briquettes, it can complicate the briquette combustion process because of the low volatile matter content.

4. Conclusions

Proximate analysis based on SNI 01-6235-2000 and test the length of time of burning briquettes mixed with durian skin charcoal and shell with starch adhesive can be concluded that the moisture content value is more than 8%, the ash content is less than 8%, volatile matter is less than 15%, fixed carbon (64.3 – 74.9)%, while the calorific value is more than 5000 cal/gr in a mixture of 50: 45 and 45: 50. Length of time burning briquettes (28 – 53) minutes, not too long or less than 1 hour

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