

LAMPIRAN A



DATA-DATA

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Hasil Analisis Karbon Aktif dari Kayu Akasia

Tabel A.1 Hasil Analisis Karbon Aktif Dari Kayu Akasia

No	Parameter	SNI 06-3730-1995	Hasil Analisis (%)
1	Kadar air	Maks 15 (%)	0,25
2	Kadar abu	Maks 10 (%)	0,86
3	Kadar terbang	Maks 25 (%)	0,1

Hasil Analisis Unsur Karbon dari Kayu Akasia

Tabel A.2 Unsur Karbon dari Kayu Akasia Menurut Hasil Analisis EDS

No	Unsur	Persen berat (%)
1	Carbon	79,26
2	Oxygen	20,26
3	Calcium	0,25
4	Potassium	0,15
5	Iron	0,3
6	Magnesium	0,3
7	Sodium	0,3

Hasil Analisis AAS (*Atomic Absorption Spectrophotometry*)

Tabel A.3 Hasil Analisis AAS (*Atomic Absorption Spectrophotometry*)

No	Waktu impregnasi (jam)	Konsentrasi KOH (N)	Kandungan kalium (%)
1	18	1	55,88
2		2	69,72
3		3	79,78
4		4	83,55
5		5	82,15
6	21	1	57,28
7		2	70,13
8		3	74,39
9		4	83,16
10		5	85,63
11	24	1	56,35
12		2	73,07
13		3	76,90
14		4	81,52
15		5	84,85

Hasil Analisis Biodiesel

Tabel A.4 Hasil Analisis Biodiesel

No	Parameter dan Satuannya	SNI-04-7182-2006	Hasil Analisis
1	Titik nyala, °C	Min 100	170
2	Bilangan Asam, mg-KOH g	Maks 0,8	1,6833
3	Viskositas Kinematik Biodiesel Pada Suhu 40°C (ASTM D 445) (Cst)	2,3-6	4,6177
4	Massa Jenis (kg/m ³) Pada Suhu 40°C (ASTM D 1298)	850-890	857,4
5	Kadar air (%)	0,05	0,03

LAMPIRAN B



PERHITUNGAN

LAMPIRAN B

PERHITUNGAN

1. Persiapan Sebelum Impregnasi

1.1. Pembuatan Larutan KOH

$$N = \frac{\text{gram zat terlarut}}{BE} \times \frac{1000}{\text{ml larutan}}$$

$$\text{gram zat terlarut} = \frac{N \times BE \times \text{ml larutan}}{1000}$$

$$BE = \frac{Mr}{\text{Banyaknya atom H yang dilepas atau diterima}}$$

a. Larutan KOH pada Konsentrasi 1 N

$$\text{gram zat terlarut} = \frac{N \times BE \times \text{ml larutan}}{1000}$$

$$= \frac{1 \text{ N} \times \frac{56,11 \text{ gr/ml}}{1} \times 750 \text{ ml}}{1000 \text{ ml}}$$

$$= 42,0825 \text{ gram}$$

b. Larutan KOH pada Konsentrasi 2 N

$$\text{gram zat terlarut} = \frac{N \times BE \times \text{ml larutan}}{1000}$$

$$= \frac{2 \text{ N} \times \frac{56,11 \text{ gr/ml}}{1} \times 750 \text{ ml}}{1000 \text{ ml}}$$

$$= 84,165 \text{ gram}$$

c. Larutan KOH pada Konsentrasi 3 N

$$\text{gram zat terlarut} = \frac{N \times BE \times \text{ml larutan}}{1000}$$

$$= \frac{3 \text{ N} \times \frac{56,11 \text{ gr/ml}}{1} \times 750 \text{ ml}}{1000 \text{ ml}}$$

$$= 126,2475 \text{ gram}$$

d. Larutan KOH pada Konsentrasi 4 N

$$\text{gram zat terlarut} = \frac{N \times BE \times \text{ml larutan}}{1000}$$

$$= \frac{4 \text{ N} \times \frac{56,11 \text{ gr/ml}}{1} \times 750 \text{ ml}}{1000 \text{ ml}}$$

$$= 168,33 \text{ gram}$$

e. Larutan KOH pada Konsentrasi 5 N

$$\text{gram zat terlarut} = \frac{\text{N} \times \text{BE} \times \text{ml larutan}}{1000}$$

$$= \frac{5 \text{ N} \times \frac{56,11 \text{ gr/ml}}{1} \times 750 \text{ ml}}{1000 \text{ ml}}$$

$$= 210,4125 \text{ gram}$$

1.2. Pembuatan Larutan HCl 0,1 M 1000 ml

$$M = \frac{1000 \times \rho \times \%}{\text{BM}} = \frac{1000 \times 1,18 \times 37\%}{37,5} = 11,64 \text{ M} = 12 \text{ M}$$

Rumus pengenceran :

$$M_1 \times V_1 = M_2 \times V_2$$

$$12 \text{ M} \times V_1 = 0,1 \text{ M} \times 1000 \text{ ml}$$

$$V_1 = 8,53 \text{ ml}$$

No	Parameter	SNI 06-3730-1995	Hasil Analisis (%)
1	Kadar air	Maks 15 (%)	0,25
2	Kadar abu	Maks 10 (%)	0,86
3	Kadar terbang	Maks 25 (%)	0,1

2. Analisa Karbon Aktif

2.1. Uji Kadar Abu

$$\text{Kadar Abu} = \frac{m_3 - m_1}{m_2 - m_1} \times 100 \%$$

$$\text{Massa cawan (} m_1 \text{)} = 43,5133 \text{ gram}$$

$$\text{Massa cawan + sampel awal (} m_2 \text{)} = 44,5133 \text{ gram}$$

$$\text{Massa cawan + abu (} m_3 \text{)} = 43,5219 \text{ gram}$$

$$\text{Kadar Abu} = \frac{m_3 - m_1}{m_2 - m_1} \times 100 \%$$

$$= \frac{43,5219 - 43,5133}{44,5133 - 43,5133} \times 100\%$$

$$= 0,0086 \times 100\%$$

$$= 0,86 \%$$

2.2. Uji Kadar Air

$$\text{Kadar Air} = \frac{b - c}{b} \times 100\%$$

Massa cawan + sampel sebelum di oven (b) = 47,7631 gram

Massa cawan + sampel sesudah di oven (c) = 47,640 gram

$$\begin{aligned}\text{Kadar Air} &= \frac{b - c}{c} \times 100\% \\ &= \frac{47,7631 - 47,640}{47,7631} \times 100\% \\ &= 0,25\%\end{aligned}$$

2.3. Uji Kadar Zat Terbang

$$\text{Kadar Zat Terbang} = \frac{m_2 - m_3}{m_2 - m_1} \times 100\% - M_{ad}$$

Massa cawan (m_1) = 42,2253

Massa cawan + sampel sebelum pemanasan (m_2) = 43,2273

Massa cawan + sampel sesudah pemanasan (m_3) = 43,2238 gram

Kadar air % (M_{ad}) = 0,25

$$\begin{aligned}\text{Kadar Zat Terbang} &= \frac{m_2 - m_3}{m_2 - m_1} \times 100\% - M_{ad} \\ &= \frac{43,2273 - 43,2238}{43,2253 - 42,2253} \times 100\% - 0,25 \\ &= 0,35 - 0,25 \\ &= 0,1\%\end{aligned}$$

3. Konversi AAS

Keterangan	Konsentrasi ($\mu\text{g/ml}$)	Kalium yang Terserap (%)
1 N 18 Jam	8,252	55,88
2 N 18 Jam	11,327	69,72
3 N 18 Jam	11,343	79,79
4 N 18 Jam	12,307	83,55
5 N 18 Jam	16,693	82,15
1 N 21 Jam	7,989	57,29
2 N 21 Jam	19,776	47,13
3 N 21 Jam	14,370	74,39
4 N 21 Jam	12,594	83,17
5 N 21 Jam	13,433	85,64

Keterangan	Konsentrasi ($\mu\text{g/ml}$)	Kalium yang Terserap (%)
1 N 24 Jam	8,164	56,35
2 N 24 Jam	10,072	73,07
3 N 24 Jam	12,961	76,90
4 N 24 Jam	13,819	81,53
5 N 24 Jam	14,165	84,85

Konversi ppm ($\mu\text{g/ml}$) ke persentase kalium yang terserap (%) :

Larutan 1 N 18 Jam :

- $$\text{ppm} = \frac{\text{gram zat terlarut} \times 1000 \text{ ml}}{0,75 \text{ L}}$$

$$= \frac{42,0825 \text{ gram} \times 1000 \text{ ml}}{0,75 \text{ L}}$$

$$= 56.110 \text{ ppm}$$
- $$\begin{aligned} \text{Konsentrasi per 15 gram} &= \text{Konsentrasi larutan} \times 100 \text{ ml} \times 2 \times 15 \text{ gr} \\ &= 8,252 \times 100 \text{ ml} \times 2 \times 15 \text{ gr} \\ &= 24755,91 \end{aligned}$$
- $$\begin{aligned} \text{Kalium yang Terserap (\%)} &= \frac{\text{ppm-konsentrasi per 15 gram}}{\text{ppm}} \times 100\% \\ &= \frac{56110-24755,91}{56110} \times 100\% \\ &= 55,88 \text{ \%} \end{aligned}$$

4. Biodiesel

a. Perbandingan Rasio Molar

Diketahui :

- Bahan Baku Minyak Jelantah = 100 gram
- BM Minyak Jelantah (Trigliserida) = 851, 9923 gr/mol
- BM Asam Lemak = 271,3168 gr/mol
- BM Metanol = 32,04 gr/mol
- ρ Metanol = 0,792 gr/cm³

Rasio Molar Minyak : Metanol = 1 : 6

- Mol Minyak Jelantah 100 gram

$$n = \frac{\text{gr}}{\text{BM}} = \frac{200 \text{ gram}}{271,3168 \text{ gr/mol}} = 0,7371 \text{ mol}$$

- Mol Metanol

$$\begin{aligned} n &= \text{Mol} \times \text{Minyak Jelantah} \\ &= 6 \times 0,7371 \text{ mol} \\ &= 4,4229 \text{ mol} \end{aligned}$$

- Massa Metanol

$$\begin{aligned} m &= \text{mol metanol} \times \text{BM metanol} \\ &= 4,4229 \text{ mol} \times 32,04 \text{ gr/mol} \\ &= 141,709 \text{ gram} \end{aligned}$$

- Volume Metanol

$$v = \frac{m}{\rho \text{ metanol}} = \frac{141,709 \text{ gram}}{0,792 \text{ gr/cm}^3} = 178,9253 \text{ ml}$$

- b. Analisis Biodiesel (Katalis 3 %, T = 65°C dan t = 120 menit)

- a. Bilangan Asam

Diketahui :

- N KOH = 0,1 N
- BM KOH = 56,11 gr/mol
- Berat Sampel = 2 gram

$$\text{Bilangan Asam} = \frac{\text{ml titran KOH} \times \text{N KOH} \times \text{BM KOH}}{\text{gr sampel}}$$

$$\text{Bilangan Asam} = \frac{0,6 \text{ ml} \times 0,1 \text{ KOH} \times 56,11 \text{ KOH}}{2 \text{ gram}} = 0,16833$$

- b. Uji Kadar Air

$$\text{Kadar Air} = \frac{b - c}{b} \times 100\%$$

Massa cawan + sampel sebelum di oven (b) = 47,7 gram

Massa cawan + sampel sesudah di oven (c) = 49,682 gram

$$\begin{aligned} \text{Kadar Air} &= \frac{b - c}{c} \times 100 \% \\ &= \frac{5 - 4,97}{4,97} \times 100\% \\ &= 0,0362 \% \end{aligned}$$

c. Massa Jenis

massa = (gr biodiesel + piknometer) – gr pikometer kosong

$$m = 58,52 \text{ gram} - 37,2734 \text{ gram} = 21,2466 \text{ gram}$$

$$\rho \text{ biodiesel} = \frac{m}{v} = \frac{21,2466 \text{ gram}}{24,781 \text{ ml}} = 0,8574 \text{ gr/ml}$$

d. Viskositas

Diketahui

- $t \text{ bola jatuh} = 10 \text{ s} = 0,167 \text{ menit}$

- $\rho_2 (\rho \text{ biodiesel}) = 0,8531 \text{ gr/ml}$

$$\begin{aligned} \mu &= 3,3 \text{ mpa} \cdot \text{menit} \cdot \text{ml/gr} \cdot \text{s} \times (8,02 \text{ gr/m l} - 0,8531 \text{ gr/ml}) \times 0,167 \text{ menit} \\ &= 3,9394 \text{ cP} \end{aligned}$$

$$\mu = \frac{\mu}{\rho_{\text{biodiesel}}} = \frac{3,9496 \text{ cP}}{0,8531 \text{ gr/ml}} = 4,6177 \text{ cSt}$$

e. % Rendemen

Diketahui :

$$\text{Berat Produk} = 161,8 \text{ gram}$$

$$\begin{aligned} \% \text{Rendemen} &= \frac{161,8 \text{ gram}}{200 \text{ gram}} \times 100 \% \\ &= 88,35 \% \end{aligned}$$

LAMPIRAN C



DOKUMENTASI

LAMPIRAN C
DOKUMENTASI



Hasil Karbonisasi



Proses Screening



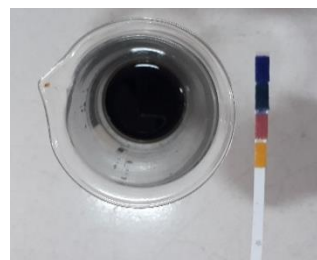
Hasil Screening



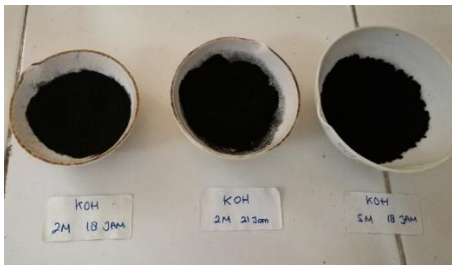
Aktivasi



Pencucian Dengan Aquades



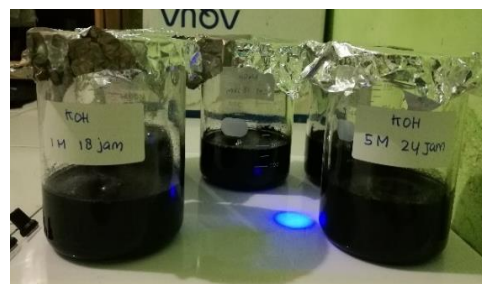
Tes pH



Hasil Oven



Proses Furnace



Proses Impregnasi



Hasil Furnace



Hasil Furnace



Proses Refluk



Proses Dekantasi



Penyaringan Katalis



Pencucian Biodiesel



Pemanasan Biodiesel



Biodiesel



Analisis Kadar Air



Analisis Viskositas



Analisis Titik Nyala



Analisis Densitas



Analisis Zat Terbang



Analisis Kadar Abu

