LAMPIRAN

A. PERHITUNGAN

1. Perhitungan Jumlah Metanol

Contoh perhitungan jumlah metanol yang digunakan dalam setiap tahap dihitung sebagai berikut:

Perbandingan molar minyak jelantah dengan metanol = 1:6

Volume minyak jelantah = 100 mL

Densitas metanol (ρ metanol) = 0,788 g/mL

Densitas minyak jelantah (ρ minyak jelantah) = 0,9102 g/mL

Berat molekul minyak jelantah (BM minyak jelantah) = 850,32 g/mol

Berat molekul metanol (BM metanol) = 32 g/mol

1 Trigliserida + 3 Metanol → 3 Metil Ester + 1 Gliserol

- Menentukan mol minyak jelantah

Massa minyak = $V \times \rho$ minyak jelantah

Massa minyak = 100 mL × 0,9102 g/mL

Massa minyak = 91,02 gram

Mol minyak = (massa minyak)/(Berat Molekul minyak)

Mol minyak = (91,02 g)/(850,32 g/mol)

Mol minyak = 0,107 mol

- Menentukan mol metanol

Mol metanol = (koef metanol)/(koef minyak) × $mol\ minyak$

Mol metanol = 3/1 × 0,107 mol

Mol metanol = 0,3211 mol

Perbandingan 6:1 = 0,3211 mol × 6 = 1,9266 mol

- Menentukan volume metanol

Massa metanol = mol metanol × BM metanol

Massa metanol = 1,9266 mol × 32 g/mol

Massa metanol = 61,6512 gram

Volume metanol = (massa metanol)/(ρ metanol)

Volume metanol = (61,6512 gram)/(0,788 g/mL)

Volume metanol = 78,2376 mL = 78 mL

2. Perhitungan Jumlah Katalis

Katalis abu kulit pisang kepok matang yang digunakan dalam reaksi transesterifikasi sebanyak 1% berat minyak. Contoh perhitungan kebutuhan katalis adalah sebagai berikut:

% katalis = 1% berat minyak jelantah

$\rho\ minyak\ jelantah$ = 0,9102 g/mL

Massa katalis = $\rho minyak\ jelantah \times Vminyak\ yang\ digunakan$ × % katalis (b/b)

Massa katalis = 0,9102 gr/mL × 100 mL × 1%

Massa katalis = 0,9102 gram (untuk 1% berat minyak)

Massa katalis = 0,9102 gram (berat katalis untuk 1 variasi)

Total untuk 27 variasi = 27 × 0,9102 gram = 24,575 gram

3. Perhitungan Bilangan Asam Lemak Bebas (FFA)

Perhitungan asam lemak bebas minyak jelantah adalah sebagai berikut:

- ✓ Minyak Jelantah sebelum *Pretreatment*

$\%FFA$ = ($N_{NaOH} \times V_{NaOH} \times BM_{asam\ lemak}$)/(massa sampel × 1000) × 100%

$\%FFA$ = (0,25 N × 1,8 ml × 282 g/mol)/(7,05 gram × 1000) × 100%

$\%FFA$ = 1,8 %

- ✓ Minyak Jelantah setelah *Pretreatment*

$\%FFA$ = ($N_{NaOH} \times V_{NaOH} \times BM_{asam\ lemak}$)/(massa sampel × 1000) × 100%

$\%FFA$ = (0,25 N × 1,25 ml × 282 g/mol)/(7,05 gram × 1000) × 100%

$\%FFA$ = 1,25 %

- ✓ Penurunan Presentase ALB (*Asam Lemak Bebas*)

% Penurunan ALB (*Asam Lemak Bebas*) = ($\%FFA_{sebelum\ pretreatment}$ - $\%FFA_{setelah\ pretreatment}$) / $\%FFA_{sebelum\ pretreatment}$ × 100

= ((1,8-1,25)%/1,8%) × 100

= 30,56 %

4. Perhitungan Densitas

Contoh perhitungan densitas minyak jelantah dan biodiesel sebagai berikut:

Berat Piknometer kosong ($m_{piknokosong}$)= 26,7 gram

Volume piknometer ($V_{piknometer}$) = 50 ml

- ✓ Densitas Minyak Jelantah sebelum *Pretreatment*

  Pada kondisi suhu ruang (26 ℃)

Berat piknometer kosong + minyak jelantah = 73,12 gram

Berat Minyak = $Berat_{piknometer\ kosong + minyak\ jelantah} - Berat_{piknometer\ kosong}$

= 46,42 gram

Densitas minyak jelantah = (massa minyak jelantah)/(Volume piknometer)

Densitas minyak jelantah = (46,42 gram)/50 ml

Densitas minyak jelantah (26 ℃) = 0,9284 gr/ml = 928,4 kg/m^3

Pada kondisi direndam air (40 ℃)

Berat piknometer kosong + minyak jelantah = 68,42 gram

Berat Minyak = $Berat_{\text{piknometer kosong + minyak jelantah}} - Berat_{\text{piknometer kosong}}$

= 41,72 gram

Densitas minyak jelantah = (massa minyak jelantah)/(Volume piknometer)

Densitas minyak jelantah = (41,72 gram)/50 ml

Densitas minyak jelantah (40 ℃) = 0,8344 gr/ml = 834,4 kg/m^3

- ✓ Densitas Minyak Jelantah setelah *Pretreatment*

Pada kondisi suhu ruang (26 ℃)

Berat piknometer kosong + minyak jelantah = 72,21 gram

Berat Minyak = $Berat_{\text{piknometer kosong + minyak jelantah}} - Berat_{\text{piknometer kosong}}$

= 45,51 gram

Densitas minyak jelantah = (massa minyak jelantah)/(Volume piknometer)

Densitas minyak jelantah = (45,51 gram)/50 ml

Densitas minyak jelantah (26 ℃) = 0,9102 gr/ml = 910,2 kg/m^3

Pada kondisi suhu ruang (40 ℃)

Berat piknometer kosong + minyak jelantah = 65,98 gram

Berat Minyak = $Berat_{\text{piknometer kosong + minyak jelantah}} - Berat_{\text{piknometer kosong}}$

= 39,28 gram

Densitas minyak jelantah = (massa minyak jelantah)/(Volume piknometer)

Densitas minyak jelantah = (39,28 gram)/50 ml

Densitas minyak jelantah (40 ℃) = 0,7856 gr/ml = 785,6 kg/m^3

- ✓ Densitas Biodiesel

Berat piknometer kosong + biodiesel = 69,7 gram

Berat Minyak = $Berat_{\text{piknometer kosong + minyak jelantah}} - Berat_{\text{piknometer kosong}}$

= 43 gram

Densitas biodiesel = (massa biodiesel)/(Volume piknometer)

Densitas biodiesel = (43 gram)/ 50 ml

Densitas biodiesel = 0,86 gr/ml = 860 kg/m^3

6. Perhitungan Viskositas Kinematik

Menggunakan *viscometer otswaldz*

Contoh perhitungan viskositas minyak jelantah dan biodiesel sebagai berikut:

Viskositas sampel = k x sg x t

Keterangan : k = konstanta viskosimeter (kg/m.s2)

t = waktu alir (s)

Sg = (densitas sampel)/(densitas air)

Suhu °C	Rapat massa ρ (kg/m^3)	Viskositas Dinamik μ (Nd/m^2)
0,0	999,9	$1,792\times10^{-3}$
5,0	1000	1,519
10,0	999,7	1,308
20,0	998,2	1,005
30,0	995,7	0,801
40,0	992,2	0,656
50,0	988,1	0,549
60,0	983,2	0,469
70,0	977,8	0,406
80,0	971,8	0,357
90,0	965,3	0,317
100,0	958,4	$0,284\times10^{-3}$

- Kalibrasi Air :

ρ_{air} (40 ℃) = 992,2 kg/m^3

Viskositas air (40 ℃) = 0,656 x 10^{-3} kg/m.s

Sg_{air} = (densitas air 40 ℃)/(densitas air 4 ℃)

= 1 gr/ml / 1 g/cm^3

Sg_{air} = 1

t_{air} = 180 sekon

Viskositas air = k x sg x t_{air}

0,656 x 10^{-3} kg/m.s = k x 1 x 180 sekon

k = 0,656 x 10^{-3} kg/m.s / 180 s

k = 3,64 x 10^{-6} kg/m.s^2

- Viskositas Minyak Jelantah

✓ sebelum *Pretreatment*

$t_{\text{minyak jelantah}}$ = 12010 sekon

$\rho_{\text{minyak jelantah}}$ (40 ℃) = 834,4 kg/m^3

$Sg_{\text{minyak jelantah}}$ = (densitas sampel 40 ℃)/(densitas air 40 ℃)

= (834,4 kg/m^3)/(992,2 kg/m^3)

= 0,84

Viskositas dinamik = k x sg x $t_{\text{biodiesel}}$

Minyak Jelantah = 3,64 x 10^{-6} kg/m.s^2 x 0,84 x 12010 s

sebelum *Pretreatment* = 0,0368 kg/m.s

Viskositas kinematik minyak jelantah = 0,0368 kg/m.s / 834,4 kg/m^3

(40 ℃) = 39,65 x 10^{-6} m^2/s = 39,65 mm^2/s (cSt)

✓ setelah *Pretreatment*

$t_{\text{minyak jelantah}}$ = 12000 sekon

$\rho_{\text{minyak jelantah}}$ (40 ℃) = 785,6 kg/m^3

$Sg_{\text{minyak jelantah}}$ = (densitas sampel 40 ℃)/(densitas air 40 ℃)

= (785,6 kg/m^3)/(992,2 kg/m^3)

= 0,79

Viskositas dinamik = k x sg x $t_{\text{biodiesel}}$

Minyak Jelantah = 3,64 x 10^{-6} kg/m.s^2 x 0,79 x 12000 s

setelah *Pretreatment* = 0,0346 kg/m.s

Viskositas kinematik minyak jelantah = 0,0346 kg/m.s / 785,6 kg/m^3

(40 ℃) = 38,04 x 10^{-6} m^2/s = 38,04 mm^2/s (cSt)

- Viskositas Biodiesel

$t_{biodiesel}$ = 700 sekon

$\rho_{biodiesel}$ (40 ℃) = 860 kg/m^3

$Sg_{biodiesel}$ = (densitas sampel 40 ℃)/(densitas air 40 ℃)

= (860 kg/m^3)/(992,2 kg/m^3)

= 0,87

Viskositas dinamik biodiesel = k x sg x $t_{biodiesel}$

= 3,64 x 10^{-6} kg/m.s^2 x 0,87 x 700 s

= 0,0022 kg/m.s

Viskositas kinematik biodiesel = 0,0022 kg/m.s / 860 kg/m^3

(40 ℃) = 2,57 x 10^{-6} m^2/s = 2,57 mm^2/s (cSt)

6. Perhitungan Yield Biodiesel

Contoh perhitungan yield biodiesel sebagai berikut:

Massa Minyak Jelantah = 91,02 gram

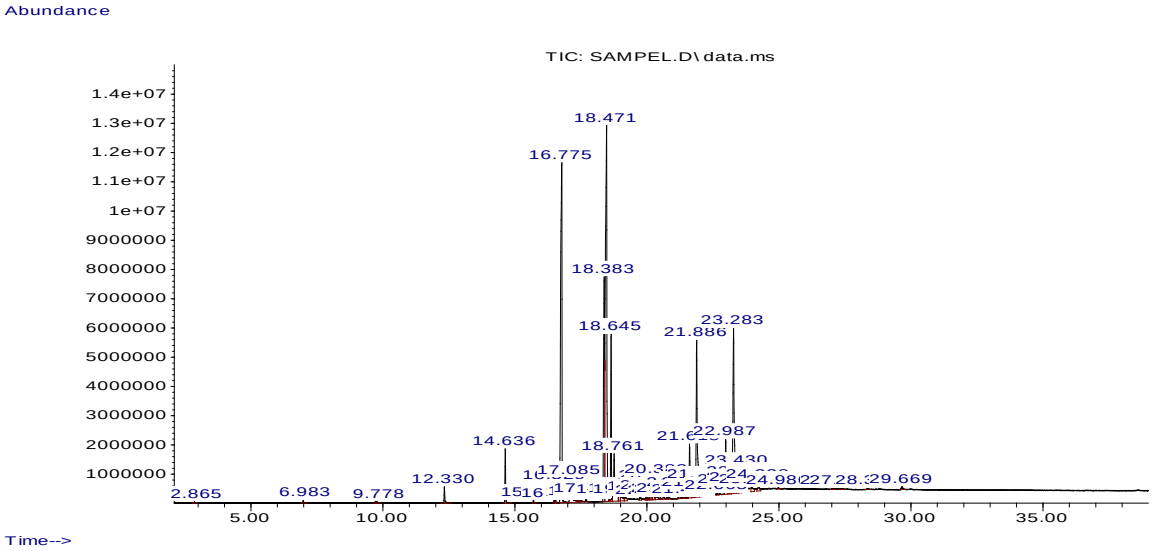
Yield Biodiesel = (massa biodiesel)/(massa minyak) x 100 %

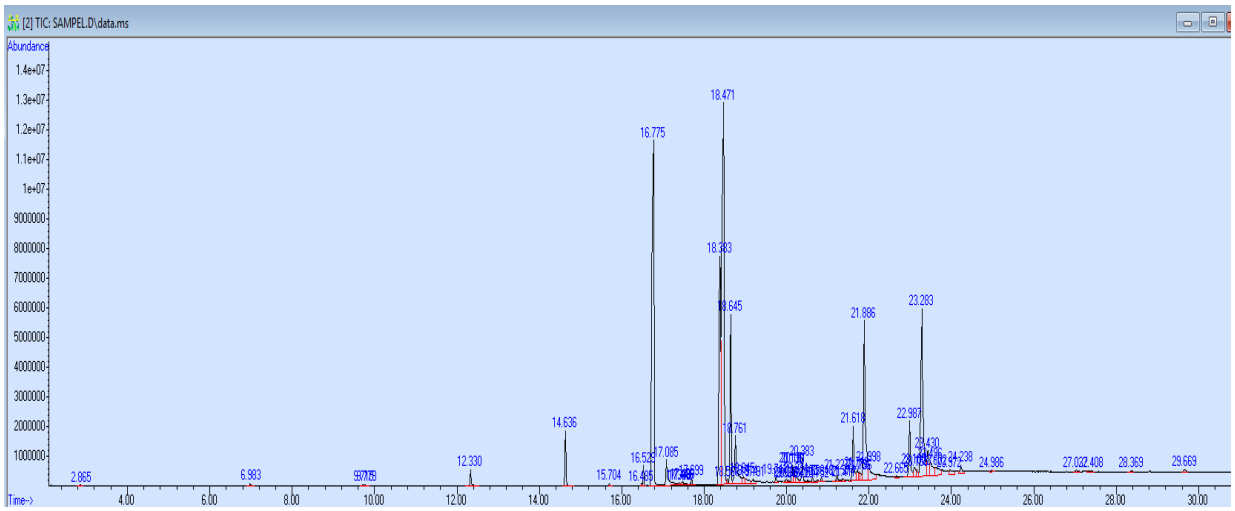
Yield Biodiesel = 82,77 gram/ 91,02 gram x 100 %

Yield Biodiesel = 90,93 %

B. HASIL ANALISA

- **GC-MS**





Library Search Report

Data Path : D:\MAHASISWA\UMI HANIFAH UNTIRTA\
Data File : SAMPEL.D
Acq On : 01 Nov 2022 15:06
Operator : UMI HANIFAH
Sample : SAMPEL BIODIESEL
Misc : S1 UNIV SULTAN AGENG TIRTAYASA
ALS Vial : 2 Sample Multiplier: 1

Search Libraries: D:\MassHunter\...ry\WILLEY09TH.L Minimum Quality: 0
Unknown Spectrum: Apex
Integration Events: ChemStation Integrator - events.e

Pk#	RT	Area%	Library/ID	Ref#	CAS#	Qual
1	2.865	0.03	D:\MassHunter\Library\WILLEY09TH.L Hexanal (CAS) $$ n-Hexanal $$ Hexa	10655	000066-25-1	64

```
    ldehyde $$ Caproaldehyde $$ Capron
    aldehyde
    Hexanal (CAS) $$ n-Hexanal $$ Hexa 10650 000066-25-1 64
    ldehyde $$ Caproaldehyde $$ Capron
    aldehyde
    Hexanal $$ n-Caproaldehyde $$ n-He 10658 000066-25-1 59
    xanal $$ Caproaldehyde $$ Caproic
    aldehyde

2  6.983 0.07 D:\MassHunter\Library\WILLEY09TH.L
    Octanoic acid, methyl ester $$ Cap 82929 000111-11-5 96
    rylic acid methyl ester $$ Methyl
    caprylate
    Octanoic acid, methyl ester (CAS)  82931 000111-11-5 95
    $$ Methyl octanoate $$ Methyl capr
    ylate
    Octanoic acid, methyl ester (CAS)  82927 000111-11-5 95
    $$ Methyl octanoate $$ Methyl capr
    ylate

3  9.715 0.04 D:\MassHunter\Library\WILLEY09TH.L
    2,4-Decadienal, (E,E)- $$ (E,E)-2, 70574 025152-84-5 97
    4-Decadienal $$ trans-2, trans-4-D
    ecadienal
    2,4-Decadienal, (E,E)- (CAS) $$ tr 70578 025152-84-5 95
    ans,trans-2,4-Decadienal $$ 2,4-De
    cadien-1-al
    2,4-Decadienal, (E,E)- (CAS) $$ tr 70575 025152-84-5 94
    ans,trans-2,4-Decadienal $$ 2,4-De
    cadien-1-al

4  9.778 0.15 D:\MassHunter\Library\WILLEY09TH.L
    Decanoic acid, methyl ester $$ Cap 145188 000110-42-9 98
    ric acid methyl ester $$ Metholene
    2095
    Decanoic acid, methyl ester $$ Cap 145189 000110-42-9 95
    ric acid methyl ester $$ Metholene
    2095
    Decanoic acid, methyl ester (CAS) 145196 000110-42-9 94
    $$ Methyl caprate $$ Methyl decano
    ate

5 12.330 0.96 D:\MassHunter\Library\WILLEY09TH.L
    Dodecanoic acid, methyl ester (CAS 218656 000111-82-0 98
    ) $$ Methyl laurate $$ Methyl dode
    canoate
    Dodecanoic acid, methyl ester (CAS 218640 000111-82-0 97
    ) $$ Methyl laurate $$ Methyl dode
    canoate
    Dodecanoic acid, methyl ester (CAS 218636 000111-82-0 96
    ) $$ Methyl laurate $$ Methyl dode
    canoate

6 14.636 2.51 D:\MassHunter\Library\WILLEY09TH.L
    Tetradecanoic acid, methyl ester ( 298327 000124-10-7 98
    CAS) $$ Methyl myristate $$ Unipha
    t A50
    Tetradecanoic acid, methyl ester ( 298306 000124-10-7 97
```

```
    CAS) $$ Methyl myristate $$ Unipha
    t A50
    Tetradecanoic acid, methyl ester ( 298318 000124-10-7 97
    CAS) $$ Methyl myristate $$ Unipha
    t A50

7 15.704 0.67 D:\MassHunter\Library\WILLEY09TH.L
    Methyl 13-methyltetradecanoate   337844 999337-84-4 99
    Pentadecanoic acid, methyl ester $ 337746 007132-64-1 99
    $ Methyl n-pentadecanoate
    Pentadecanoic acid, methyl ester ( 337751 007132-64-1 98
    CAS) $$ Methyl pentadecanoate

8 16.485 1.15 D:\MassHunter\Library\WILLEY09TH.L
    9-Hexadecenoic acid, methyl ester, 371355 001120-25-8 99
    (Z)- (CAS) $$ Methyl palmitoleate
    9-Hexadecenoic acid, methyl ester, 371346 001120-25-8 99
    (Z)- $$ Methyl palmitoleate
    9-Hexadecenoic acid, methyl ester, 371351 001120-25-8 99
    (Z)- (CAS) $$ Methyl palmitoleate

9 16.529 1.49 D:\MassHunter\Library\WILLEY09TH.L
    Methyl hexadec-9-enoate     371471 010030-74-7 99
    9-Hexadecenoic acid, methyl ester, 371342 001120-25-8 99
    (Z)- (CAS) $$ Methyl palmitoleate
    9-Hexadecenoic acid, methyl ester, 371351 001120-25-8 99
    (Z)- (CAS) $$ Methyl palmitoleate

10 16.775 26.24 D:\MassHunter\Library\WILLEY09TH.L
    Hexadecanoic acid, methyl ester (C 377200 000112-39-0 99
    AS) $$ Methyl palmitate $$ Uniphat
    A60
    Hexadecanoic acid, methyl ester (C 377194 000112-39-0 99
    AS) $$ Methyl palmitate $$ Uniphat
    A60
    Hexadecanoic acid, methyl ester $$ 377170 000112-39-0 99
    Palmitic acid, methyl ester $$ Un
    iphat A60

11 17.085 1.13 D:\MassHunter\Library\WILLEY09TH.L
    n-Hexadecanoic acid $$ Hexadecanoi 337724 000057-10-3 99
    c acid $$ n-Hexadecoic acid $$ Pal
    mitic acid
    Hexadecanoic acid (CAS) $$ Palmiti 337729 000057-10-3 99
    c acid $$ Palmitinic acid $$ Prifr
    ac 2960
    Hexadecanoic acid (CAS) $$ Palmiti 337728 000057-10-3 99
    c acid $$ Palmitinic acid $$ Prifr
    ac 2960

12 17.389 0.08 D:\MassHunter\Library\WILLEY09TH.L
    Hexadecanoic acid (CAS) $$ Palmiti 337720 000057-10-3 89
    c acid $$ Palmitinic acid $$ Prifr
    ac 2960
    Octadecanoic acid (CAS) $$ Stearic 415832 000057-11-4 86
    acid $$ n-Octadecanoic acid $$ Va
    nicol
    Octadecanoic acid (CAS) $$ Stearic 415828 000057-11-4 60
```

acid $$ n-Octadecanoic acid $$ Va
nicol

13 17.445 0.08 D:\MassHunter\Library\WILLEY09TH.L
Hexadecanoic acid (CAS) $$ Palmiti 337720 000057-10-3 89
c acid $$ Palmitinic acid $$ Prifr
ac 2960
Hexadecanoic acid (CAS) $$ Palmiti 337729 000057-10-3 83
c acid $$ Palmitinic acid $$ Prifr
ac 2960
cis-Vaccenic acid 410259 000506-17-2 50

14 17.488 0.17 D:\MassHunter\Library\WILLEY09TH.L
cis-10-Heptadecenoic acid, methyl 410261 999410-26-1 99
ester
CIS-10-HEPTADECENOIC ACID ME 410223 999410-22-3 91
9-Octadecenoic acid (Z)-, methyl e 447935 000112-62-9 90
ster (CAS) $$ Methyl oleate

15 17.699 0.49 D:\MassHunter\Library\WILLEY09TH.L
Heptadecanoic acid, methyl ester (415858 001731-92-6 98
CAS) $$ Methyl heptadecanoate
Heptadecanoic acid, methyl ester (415850 001731-92-6 97
CAS) $$ Methyl heptadecanoate
Hexadecanoic acid, 15-methyl-, met 415885 006929-04-0 97
hyl ester $$ Methyl isoheptadecano
ate

16 18.383 9.60 D:\MassHunter\Library\WILLEY09TH.L
9,12-Octadecadienoic acid (Z,Z)-, 442621 000112-63-0 99
methyl ester (CAS) $$ Methyl linol
eate
9,12-Octadecadienoic acid, methyl 442673 002462-85-3 99
ester
9,12-Octadecadienoic acid (Z,Z)-, 442618 000112-63-0 99
methyl ester (CAS) $$ Methyl linol
eate

17 18.471 33.33 D:\MassHunter\Library\WILLEY09TH.L
9-Octadecenoic acid, methyl ester, 447972 001937-62-8 99
(E)- $$ Elaidic acid, methyl este
9-Octadecenoic acid (Z)-, methyl e 447957 000112-62-9 99
ster (CAS) $$ Methyl oleate
9-Octadecenoic acid, methyl ester, 447978 001937-62-8 99
(E)- (CAS) $$ Methyl elaidate $$
FAME 18:1

18 18.561 0.38 D:\MassHunter\Library\WILLEY09TH.L
11-Octadecenoic acid, methyl ester 447993 052380-33-3 96
$$ Methyl 11-octadecenoate
10-Octadecenoic acid, methyl ester 447987 013481-95-3 95
(CAS) $$ METHYL OCTADEC-10-ENOATE
10-Octadecenoic acid, methyl ester 447985 013481-95-3 95
(CAS) $$ METHYL OCTADEC-10-ENOATE

19 18.645 6.88 D:\MassHunter\Library\WILLEY09TH.L
Octadecanoic acid, methyl ester $$ 453387 000112-61-8 99
Stearic acid, methyl ester $$ Kem

ester 9718
Octadecanoic acid, methyl ester (C 453396 000112-61-8 99
AS) $$ Methyl stearate $$ Kemester
9718
Octadecanoic acid, methyl ester (C 453374 000112-61-8 98
AS) $$ Methyl stearate $$ Kemester
9718

20 18.761 1.80 D:\MassHunter\Library\WILLEY09TH.L
9-OCTADECENOIC ACID $$ ELAIDINSAEU 410099 999410-09-9 99
RE
OCTADEC-9-ENOIC ACID $$ 9-OCTADECE 410104 999410-10-4 99
NOIC ACID
9-Octadecenoic acid, (E)- $$ trans 410193 000112-79-8 99
-.delta.(sup 9)-Octadecenoic acid

21 18.945 0.04 D:\MassHunter\Library\WILLEY09TH.L
Thiosulfuric acid (H2S2O3), S-(2-a 80762 002937-53-3 96
minoethyl) ester $$ Cysteamine, S-
sulfo-
9-Octadecenoic acid (Z)- (CAS) $$ 410112 000112-80-1 95
Oleic acid $$ Red oil $$ Oelsauere
OCTADEC-9-ENOIC ACID $$ 9-OCTADECE 410107 999410-10-7 95
NOIC ACID

22 19.014 0.56 D:\MassHunter\Library\WILLEY09TH.L
9-Octadecenoic acid (Z)- (CAS) $$ 410108 000112-80-1 99
Oleic acid $$ Red oil $$ Oelsauere
9-Octadecenoic acid (Z)- (CAS) $$ 410102 000112-80-1 99
Oleic acid $$ Red oil $$ Oelsauere
6-Octadecenoic acid 410222 999410-22-2 99

23 19.191 0.63 D:\MassHunter\Library\WILLEY09TH.L
Methyl 9-cis,11-trans-octadecadien 442583 999442-58-3 95
oate
9,17-Octadecadienal, (Z)- $$ (9Z)- 360379 056554-35-9 94
9,17-Octadecadienal #
9,12-Octadecadienoic acid (Z,Z)-, 442635 000112-63-0 93
methyl ester (CAS) $$ Methyl linol
eate

24 19.741 0.05 D:\MassHunter\Library\WILLEY09TH.L
2-(METHYL-D3)-CYCLONONANONE $$ Cyc 76587 032454-54-9 55
lononanone, 2-methyl-d3- (CAS)
1-Heptadecene (CAS) $$ Hexahydroap 287872 006765-39-5 43
lotaxene $$ 1 - heptadecene
cis-Vaccenic acid 410259 000506-17-2 41

25 19.963 0.17 D:\MassHunter\Library\WILLEY09TH.L
10,13-Octadecadienoic acid, methyl 442595 056554-62-2 90
ester (CAS)
Dibutylphosphoramidate 203924 999203-92-4 55
Cyclopropaneoctanal, 2-octyl- $$ 8 404888 056196-06-6 53
-(2-Octylcyclopropyl)octanal #

26 20.003 0.03 D:\MassHunter\Library\WILLEY09TH.L
Cyclopentadecanone, 2-hydroxy- $$ 292764 004727-18-8 89
2-Hydroxycyclopentadecanone #

9-Octadecenoic acid (Z)- (CAS) $$ 410112 000112-80-1 60
Oleic acid $$ Red oil $$ Oelsauere
cis-10-Heptadecenoic acid, methyl 410261 999410-26-1 59
ester

27 20.046 0.04 D:\MassHunter\Library\WILLEY09TH.L
Fumaric acid, tetradec-3-enyl unde 726090 999726-09-0 38
cyl ester
cis-11-Eicosenoic acid, methyl est 518835 999518-83-5 38
er
7-Isopropyl-4a-methyloctahydro-2(1 203116 054594-42-2 30
H)-naphthalenone #

28 20.136 0.05 D:\MassHunter\Library\WILLEY09TH.L
2-(METHYL-D3)-CYCLONONANONE $$ Cyc 76587 032454-54-9 38
lononanone, 2-methyl-d3- (CAS)
Palmitoyl chloride $$ Hexadecanoyl 387805 000112-67-4 38
-chloride- $$ Palmitic acid chlori
de
Palmitoyl chloride $$ Hexadecanoyl 387803 000112-67-4 38
-chloride- $$ Palmitic acid chlori
de

29 20.181 0.79 D:\MassHunter\Library\WILLEY09TH.L
cis-11-Eicosenoic acid, methyl est 518835 999518-83-5 99
er
methyl ester of cis-.DELTA.(11)-C(518838 003946-08-5 94
20:1) acid $$ CIS-11-EICOSENOIC AC
IDME
cis-13-Eicosenoic acid, methyl est 518901 999518-90-1 93
er

30 20.234 0.06 D:\MassHunter\Library\WILLEY09TH.L
4-(Trifluoromethyl)phenylacetonitr 142256 002338-75-2 35
ile $$ p-Trifluoromethylphenylacet
onitrile
Adipic acid, nonyl trans-2-methylc 609715 999609-71-5 27
yclohexyl ester
cis 2-methyl 1-phenyl 1-cyclopenta 143016 039522-58-2 27
necarbonitrile

31 20.383 1.86 D:\MassHunter\Library\WILLEY09TH.L
Eicosanoic acid, methyl ester (CAS 523614 001120-28-1 99
) $$ Arachidic acid methyl ester
Eicosanoic acid, methyl ester $$ M 523616 001120-28-1 99
ethyl arachisate $$ Methyl eicosan
oate
Eicosanoic acid, methyl ester (CAS 523618 001120-28-1 99
) $$ Arachidic acid methyl ester

32 20.511 0.01 D:\MassHunter\Library\WILLEY09TH.L
1H-Indole, 2-methyl-3-phenyl- (CAS 199687 004757-69-1 43
) $$ 3 PHENYL-2-METHYLINDOLE
2-Myristynoyl-glycinamide 403683 999403-68-3 27
1,1,1,3,5,5,5-Heptamethyltrisiloxa 238341 001873-88-7 25
ne $$ Bis(trimethylsiloxy)methylsi
lane

33 20.633 0.19 D:\MassHunter\Library\WILLEY09TH.L
Octadec-9-enoic acid 410106 999410-10-6 42
OCTADEC-9-ENOIC ACID $$ 9-OCTADECE 410107 999410-10-7 42
NOIC ACID
9-Methyl-Z-10-tetradecen-1-ol acet 371406 999371-40-6 38
ate

34 20.752 0.03 D:\MassHunter\Library\WILLEY09TH.L
Pyridine-3-carboxamide, oxime, N-(405484 288246-53-7 59
2-trifluoromethylphenyl)-
3-Quinolinecarboxylic acid, 6,7-di 327604 999327-60-4 55
fluoro-1,4-dihydro-4-oxo-, ethyles
ter
1,2-Benzisothiazol-3-amine tbdms 358158 999358-15-8 38

35 20.848 0.01 D:\MassHunter\Library\WILLEY09TH.L
1H-Indole, 2-methyl-3-phenyl- (CAS 199687 004757-69-1 49
) $$ 3 PHENYL-2-METHYLINDOLE
cis-11-Eicosenoic acid 484531 005561-99-9 47
1,2,5-Oxadiazol-3-amine, 4-(3-meth 198339 999198-33-9 30
oxyphenoxy)-

36 21.227 0.33 D:\MassHunter\Library\WILLEY09TH.L
Bicyclo[4.3.1]decan-10-one 71209 020440-21-5 83
Oleic acid, 3-hydroxypropyl ester 555014 000821-17-0 70
$$ 3-Hydroxypropyl (9E)-9-octadece
noate #
9-Octadecenoic acid (Z)-, 2-hydrox 587486 003443-84-3 70
y-1-(hydroxymethyl)ethyl ester $$
2-Monoolein

37 21.374 0.01 D:\MassHunter\Library\WILLEY09TH.L
Methyl 2-octylcyclopropene-1-octan 479341 003220-60-8 44
oate
Methyl 9,10-methylene-octadec-9-en 479340 999479-34-0 43
oate
Benzo[h]quinoline, 2,4-dimethyl- $ 199727 000605-67-4 38
$ 2,4-Dimethylbenzo[h]quinoline #

38 21.417 0.01 D:\MassHunter\Library\WILLEY09TH.L
2-Methyl-5H-dibenz[b,f]azepine 199741 999199-74-1 43
1,2-Bis(trimethylsilyl)benzene $$ 240171 017151-09-6 42
Trimethyl[2-(trimethylsilyl)phenyl
]silane #
1,1,1,3,5,5,5-Heptamethyltrisiloxa 238341 001873-88-7 38
ne $$ Bis(trimethylsiloxy)methylsi
lane

39 21.618 0.07 D:\MassHunter\Library\WILLEY09TH.L
Ether, isopropyl 2-benzyl-2-propen 154812 999154-81-2 47
yl
1-Naphthalenol, 1,2,3,4-tetrahydro 154279 021503-12-8 43
-, acetate $$ 1-Acetoxytetralin
4-Phosphorinanone, 1-methyl- (CAS) 36262 016327-48-3 38
$$ 1-Methyl-4-phosphorinanone

40 21.718 0.48 D:\MassHunter\Library\WILLEY09TH.L
2-Butoxy-4-methyl-[1,3,2]dioxabori 112059 003208-68-2 30

nane
Adipic acid, 2-ethylhexyl isobutyl 494032 999494-03-2 25
ester
2H-Azepine-2-thione, hexahydro- (C 35231 007203-96-5 25
AS) $$ Thiocaprolactam

41 21.756 0.06 D:\MassHunter\Library\WILLEY09TH.L
2-Naphthalene-sulfonic acid 200544 999200-54-4 53
2,4-DIPHENYL GLUTARONITRILE 309450 999309-45-0 27
1,3-Dihydrobenzo(c)thiophene-1-pen 330194 072938-79-5 27
tanol 2,2dioxide

42 21.796 0.01 D:\MassHunter\Library\WILLEY09TH.L
2-Methyl-5H-dibenz[b,f]azepine 199741 999199-74-1 53
1,3-Dihydrobenzo(c)thiophene-1-pen 330194 072938-79-5 22
tanol 2,2dioxide
2-isopropylthio-N-allylaniline $$ 199393 102968-92-3 22
N-Allyl-2-isopropylthioaniline

43 21.886 0.01 D:\MassHunter\Library\WILLEY09TH.L
2-Amino-3-(.alpha.-furyl)-1,4-naph 289084 999289-08-4 59
thoquinone
3-Pyridinemethanamine, N-[[4-(dime 289462 999289-46-2 38
thylamino)phenyl]methylidene]-
Palmitoyl chloride $$ Hexadecanoyl 387803 000112-67-4 35
-chloride- $$ Palmitic acid chlori
de

44 21.998 1.36 D:\MassHunter\Library\WILLEY09TH.L
Docosanoic acid, methyl ester (CAS 584204 000929-77-1 91
) $$ Methyl behenate $$ Methyl doc
osanoate
Docosanoic acid, methyl ester $$ B 584197 000929-77-1 78
ehenic acid, methyl ester $$ Methy
l behenate
Docosanoic acid, methyl ester (CAS 584202 000929-77-1 68
) $$ Methyl behenate $$ Methyl doc
osanoate

45 22.665 0.1 D:\MassHunter\Library\WILLEY09TH.L
2-Methyl-5H-dibenz[b,f]azepine 199741 999199-74-1 50
Cyclotrisiloxane, hexamethyl- $$ D 238255 000541-05-9 38
imethylsiloxane cyclic trimer
Cyclotrisiloxane, hexamethyl- (CAS 238257 000541-05-9 38
) $$ 1,1,3,3,5,5-HEXAMETHYL-CYCLOH
EXASILOXANE

46 22.987 0.03 D:\MassHunter\Library\WILLEY09TH.L
3-(2,2-dideuterobutyl)-thiophene-1 111634 999111-63-4 59
,1-dioxide
N-Methyl-2,5-dicyanopyrrole 37968 999037-96-8 53
Pyrano[2,3-b]indole, 2,3,4,4a,9,9a 151866 056298-84-1 47
-hexahydro-3-methyl- (CAS)

47 23.105 0.03 D:\MassHunter\Library\WILLEY09TH.L
Hexadecyl hexanoate 555284 999555-28-4 25
1,1,1,3,5,5,5-Heptamethyltrisiloxa 238341 001873-88-7 25
ne $$ Bis(trimethylsiloxy)methylsi

lane
1,2-Benzisothiazol-3-amine tbdms 358158 999358-15-8 25

48 23.155 0.01 D:\MassHunter\Library\WILLEY09TH.L
2-Methyl-5H-dibenz[b,f]azepine 199741 999199-74-1 50
2-Naphthalene-sulfonic acid 200544 999200-54-4 50
3,5-Dimethyl-2,6-bis(trimethylsilo 411321 999411-32-1 38
xy)pyridine

49 23.283 0.87 D:\MassHunter\Library\WILLEY09TH.L
Oleic acid, 3-hydroxypropyl ester 555014 000821-17-0 90
$$ 3-Hydroxypropyl (9E)-9-octadece
noate #
9-Octadecenoic acid (Z)-, 2-hydrox 523343 004500-01-0 89
yethyl ester $$ Cithrol A
9-Octadecenoic acid (Z)-, 2,3-dihy 587482 000111-03-5 87
droxypropyl ester $$ Olein, 1-mono

50 23.430 1.02 D:\MassHunter\Library\WILLEY09TH.L
Octadecanoic acid, 2-hydroxy-1-(hy 591363 000621-61-4 46
droxymethyl)ethyl ester $$ Stearin
, 2-mono-
6-Octadecenoic acid, (Z)- $$ (6Z)- 410221 000593-39-5 44
6-Octadecenoic acid #
Palmitoyl chloride $$ Hexadecanoyl 387804 000112-67-4 43
-chloride- $$ Palmitic acid chlori
de

51 23.496 1.16 D:\MassHunter\Library\WILLEY09TH.L
Tetracosanoic acid, methyl ester $ 633616 002442-49-1 91
$ Methyl lignocerate $$ Methyl tet
racosanoate
6-Octadecenoic acid, (Z)- $$ (6Z)- 410221 000593-39-5 55
6-Octadecenoic acid #
Tetracosanoic acid, methyl ester (633621 002442-49-1 53
CAS) $$ Methyl lignocerate $$ FAME
24:0

52 23.602 0.01 D:\MassHunter\Library\WILLEY09TH.L
2-Methyl-5H-dibenz[b,f]azepine 199741 999199-74-1 43
1,2-Benzisothiazol-3-amine tbdms 358158 999358-15-8 41
1,1,1,3,5,5,5-Heptamethyltrisiloxa 238341 001873-88-7 41
ne $$ Bis(trimethylsiloxy)methylsi
lane

53 23.972 0.02 D:\MassHunter\Library\WILLEY09TH.L
2-Methyl-5H-dibenz[b,f]azepine 199741 999199-74-1 47
2-Naphthalene-sulfonic acid 200544 999200-54-4 47
1-Naphthalene-sulfonic acid 200545 999200-54-5 47

54 24.238 0.06 D:\MassHunter\Library\WILLEY09TH.L
2-Naphthalene-sulfonic acid 200544 999200-54-4 47
2-Methyl-5H-dibenz[b,f]azepine 199741 999199-74-1 47
3,7,11-Trimethyldodeca-6(E),10-die 203515 076164-11-9 35
ne

55 24.986 0.08 D:\MassHunter\Library\WILLEY09TH.L
Tetrasiloxane, decamethyl- (CAS) $ 481761 000141-62-8 47

```
     $ Decamethyltetrasiloxane
     Cyclotrisiloxane, hexamethyl- (CAS 238254 000541-05-9 46
     ) $$ 1,1,3,3,5,5-HEXAMETHYL-CYCLOH
     EXASILOXANE
     Cyclotrisiloxane, hexamethyl- $$ D 238255 000541-05-9 46
     imethylsiloxane cyclic trimer

 56 27.032 0.05 D:\MassHunter\Library\WILLEY09TH.L
     Ethyl 5-formyl-3-(2-ethoxycarbonyl 405830 999405-83-0 59
     )ethyl-4-methyl-1H-pyrrole-2-carbo
     xylate
     2-P-NITROPHENYL-1,3,4-OXADIAZOL-5- 198194 041125-77-3 50
     ONE $$ 2-p-Nitrophenyl-oxadiazol-1
     ,3,4-one-5
     Cyclotrisiloxane, hexamethyl- (CAS 238258 000541-05-9 46
     ) $$ 1,1,3,3,5,5-HEXAMETHYL-CYCLOH
     EXASILOXANE

 57 27.408 0.02 D:\MassHunter\Library\WILLEY09TH.L
     2-P-NITROPHENYL-1,3,4-OXADIAZOL-5- 198194 041125-77-3 50
     ONE $$ 2-p-Nitrophenyl-oxadiazol-1
     ,3,4-one-5
     Cyclotrisiloxane, hexamethyl- (CAS 238259 000541-05-9 49
     ) $$ 1,1,3,3,5,5-HEXAMETHYL-CYCLOH
     EXASILOXANE
     Cyclotrisiloxane, hexamethyl- (CAS 238258 000541-05-9 46
     ) $$ 1,1,3,3,5,5-HEXAMETHYL-CYCLOH
     EXASILOXANE

 58 28.369 0.02 D:\MassHunter\Library\WILLEY09TH.L
     2-P-NITROPHENYL-1,3,4-OXADIAZOL-5- 198194 041125-77-3 86
     ONE $$ 2-p-Nitrophenyl-oxadiazol-1
     ,3,4-one-5
     Ethyl 5-formyl-3-(2-ethoxycarbonyl 405830 999405-83-0 59
     )ethyl-4-methyl-1H-pyrrole-2-carbo
     xylate
     Cyclotrisiloxane, hexamethyl- (CAS 238259 000541-05-9 49
     ) $$ 1,1,3,3,5,5-HEXAMETHYL-CYCLOH
     EXASILOXANE

 59 29.669 0.05 D:\MassHunter\Library\WILLEY09TH.L
     Ethyl 5-formyl-3-(2-ethoxycarbonyl 405830 999405-83-0 59
     )ethyl-4-methyl-1H-pyrrole-2-carbo
     xylate
     2-P-NITROPHENYL-1,3,4-OXADIAZOL-5- 198194 041125-77-3 50
     ONE $$ 2-p-Nitrophenyl-oxadiazol-1
     ,3,4-one-5
     Tetrasiloxane, decamethyl- (CAS) $ 481761 000141-62-8 47
     $ Decamethyltetrasiloxane


UMUM.M Tue Nov 01 15:53:21 2022
```

INSTRUMENT CONTROL PARAMETERS: GCMS

D:\MassHunter\GCMS\1\methods\UMUM.M
Tue Nov 01 15:45:43 2022

Control Information

Sample Inlet : GC
Injection Source : GC ALS
Injection Location: Front
Mass Spectrometer : Enabled

GC

GC Summary
Run Time 39 min
Post Run Time 0 min

OVEN

Temperature
Setpoint On
(Initial) 50 °C
Hold Time 0 min
Post Run 70 °C
Program
#1 Rate 10 °C/min
#1 Value 290 °C
#1 Hold Time 15 min

Equilibration Time 0.25 min
Max Temperature 325 °C
Maximum Temperature Override Disabled
Slow Fan Disabled

FRONT SS INLET HE

Mode Split
Heater On 290 °C
Pressure On 7.6522 psi
Total Flow On 104 mL/min
Septum Purge Flow On 3 mL/min
Gas Saver On 20 After 3 min mL/min
Split Ratio 100 :1
Split Flow 100 mL/min
Liner A Liner has not been selected.
Vol Injek 0,2 µL

THERMAL AUX 2 (MSD TRANSFER LINE)

Temperature
Setpoint On
(Initial) 290 °C

COLUMN

Column #1
Flow
Setpoint Off
(Initial) 1 mL/min
Post Run 0.57353 mL/min

Column Information Agilent 19091S-433UI
HP-5ms Ultra Inert
Temperature Range -60 °C—325 °C (350 °C)
Dimensions 30 m x 250 µm x 0.25 µm
Column lock Unlocked
In Front SS Inlet He

Out MSD
(Initial) 50 °C
Pressure 7.6522 psi
Flow 1 mL/min
Average Velocity 36.445 cm/sec
Holdup Time 1.3719 min
Control Mode Constant Flow

Column Outlet Pressure 0 psi

Valve 1
Name ?
Type Gas Sampling Valve
GSV Loop Volume 1 mL
Load Time 0.5 min
Inject Time 0.5 min

Signals
Signal #1: Test Plot
Description Test Plot
Save Off
Data Rate 50 Hz
Dual Injection Assignment Front Sample

Signal #2:
Description None

Signal #3:
Description None

Signal #4:
Description None

MS INFORMATION

General Information

Acquisition Mode : Scan
Solvent Delay (minutes) : 2
Tune file : D:\MassHunter\GCMS\1\5977\BBM etune.u
EM Setting mode Delta : 0.000000

Normal or Fast Scanning : Normal Scanning
Trace Ion Detection : Off
Run Time (if MS only) : 26.67 minutes

[Scan Parameters]
Start Time : 2
Low Mass : 35
High Mass : 650
Threshold : 150
A/D Samples: : 4

[MSZones]
MS Source : 230 C maximum 250 C
MS Quad : 150 C maximum 200 C

Timed Events

Number Events= 0

TUNE PARAMETERS for SN: US1904M017

Trace Ion Detection is OFF.

34.593 : EMISSION
70.007 : ENERGY
0.503 : REPELLER
89.822 : IONFOCUS
17.627 : ENTRANCE_LENS
1408.533 : EMVOLTS
1408.5 : Actual EMV
0.33 : GAIN FACTOR
2171.000 : AMUGAIN
139.750 : AMUOFFSET
2.000 : FILAMENT
0.000 : DCPOLARITY
10.278 : ENTLENSOFFSET
8.002 : Ion_Body
-0.398 : EXTLENS
-5.000 : MASSGAIN
-23.000 : MASSOFFSET

END OF INSTRUMENT CONTROL PARAMETERS

- **XRD**

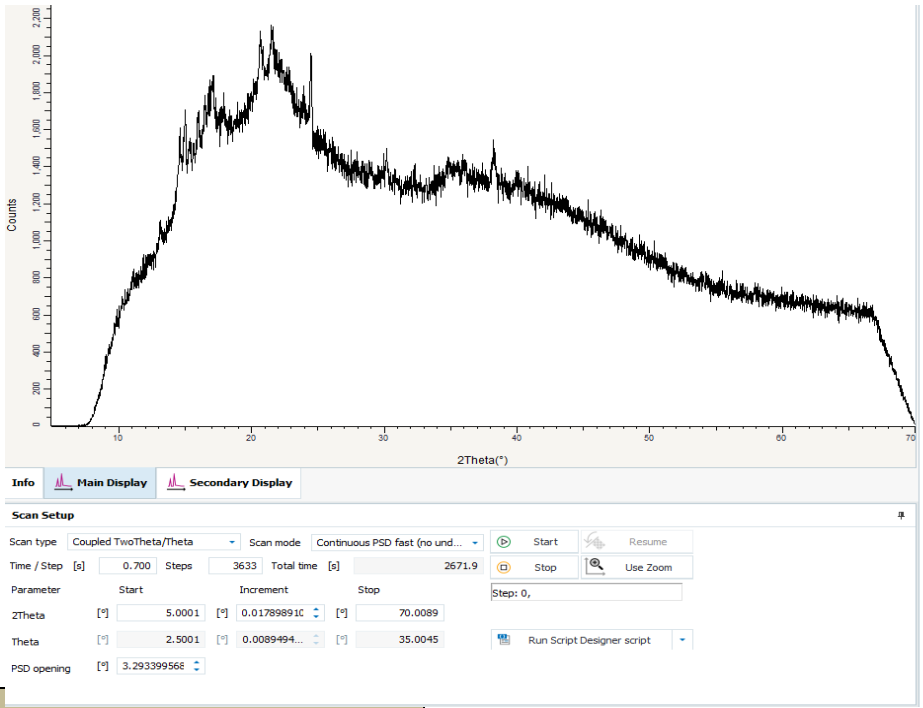
  - **Sebelum Kalsinasi**

Test Report

Name of Project	XRD 054 – Kulit Pisang Sebelum Reaksi/ Sebelum Kalsinasi
User Name	M. Alfian Pratama
Name of the Test	XRD
Test Date	31 Oktober 2022

Test Runs Chart

Test Runs Chart



Validation

Chair of Integrated Laboratory

Dr. Didied Haryono, ST., MT.

NIP. 196810062001121002

Head of Nanoparticles Laboratory

Dr. Lusiani Dewi Assaat, S.Pd., M.Si.

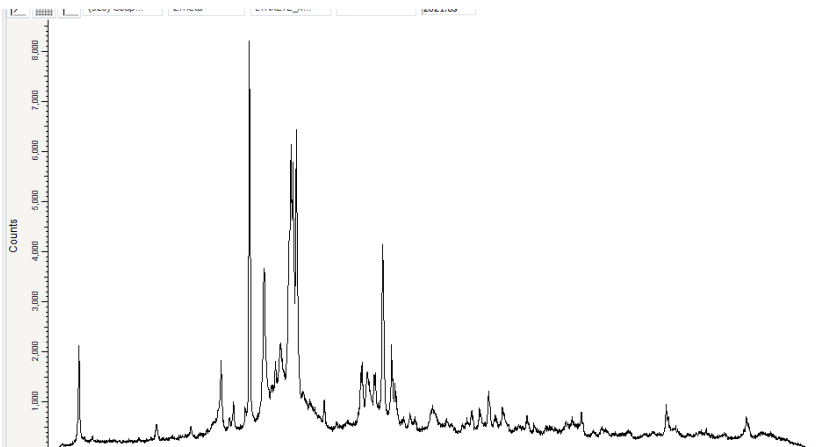
NIP. 198010102005012003

- **Setelah Kalsinasi**

Test Report

Name of Project	XRD 40 – 550 5 Jam
User Name	M. Alfian Pratama
Name of the Test	XRD
Test Date	12 Oktober 2022

Test Runs Chart



Validation

Chair of Integrated Laboratory

Dr. Didied Haryono, ST., MT.

NIP. 196810062001121002

Head of Nanoparticles Laboratory

Dr. Lusiani Dewi Assaat, S.Pd., M.Si.

NIP. 198010102005012003

• **S**

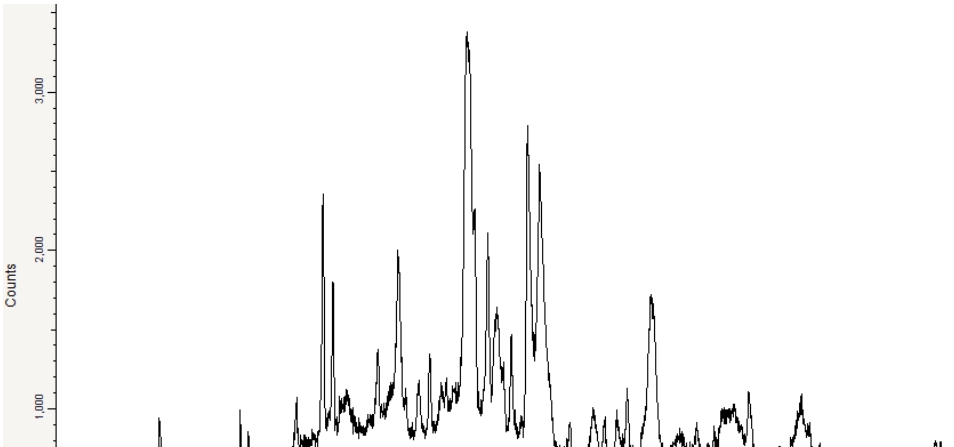
etelah Reaksi Transesterifikas

i

Test Report

Name of Project	XRD 055 – Kulit Pisang Sesudah Reaksi
User Name	M. Alfian Pratama
Name of the Test	XRD
Test Date	31 Oktober 2022

Test Runs Chart



Validation

Chair of Integrated Laboratory

Dr. Didied Haryono, ST., MT.

NIP. 196810062001121002

Head of Nanoparticles Laboratory

Dr. Lusiani Dewi Assaat, S.Pd., M.Si.

NIP. 198010102005012003

- **SEM**

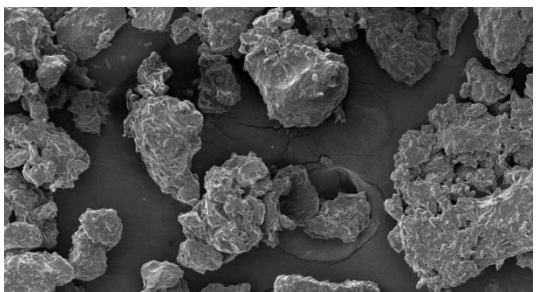
- **Seebelum Kalsinasi dan Setelah Kalsinasi**

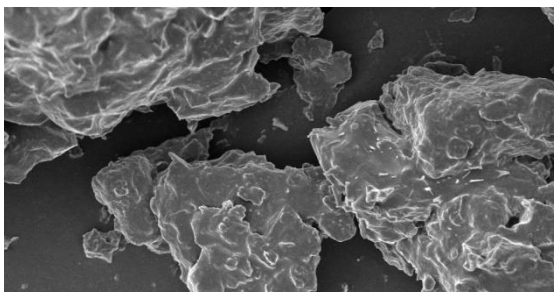
Test Report

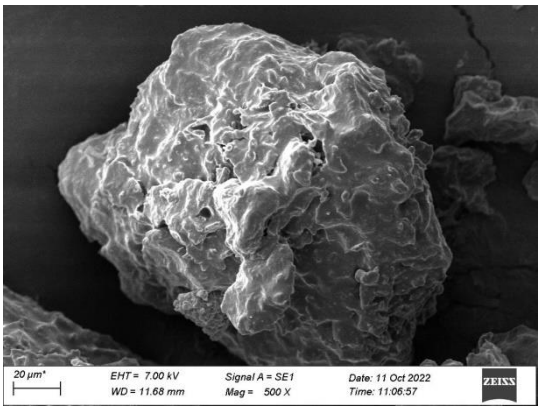
Name of Project	SEM (052 – 053) – Kitosan Kulit Pisang
User Name	Safitri Mukti Rahayu
Name of the Test	SEM
Test Date	11 Oktober 2022

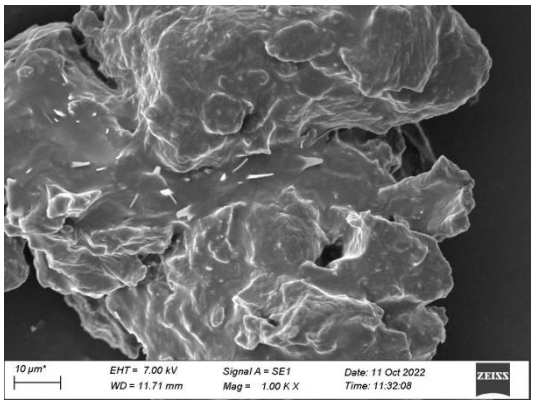
Test Runs Image

- **SEBELUM KALSINASI**

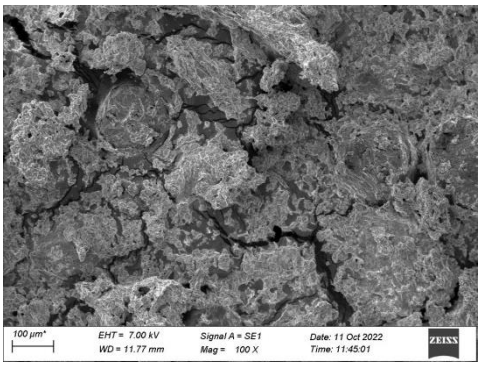


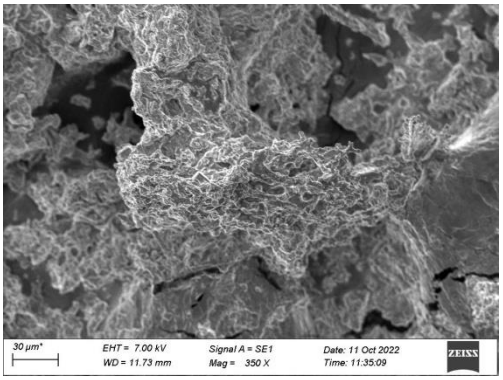


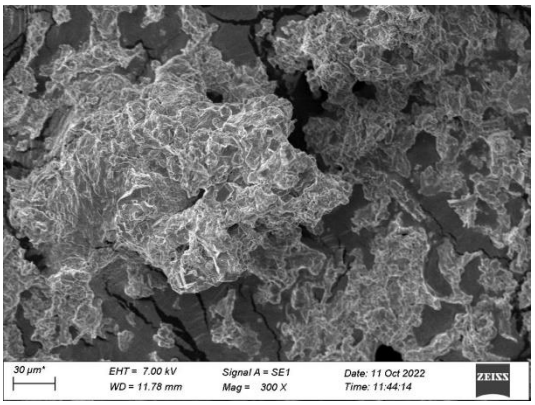

20 µm*
EHT = 7.00 kV
WD = 11.68 mm
Signal A = SE1
Mag = 500 X
Date: 11 Oct 2022
Time: 11:06:57
ZEISS


10 µm*
EHT = 7.00 kV
WD = 11.71 mm
Signal A = SE1
Mag = 1.00 K X
Date: 11 Oct 2022
Time: 11:32:08
ZEISS

- **SETELAH KALSINASI**







Validation

Chair of Integrated Laboratory

Dr. Didied Haryono, ST., MT.

NIP. 196810062001121002

Head of Nanomaterials Laboratory

Dr. Lusiani Dewi Assaat, S.Pd., M.Si.

NIP. 198010102005012003

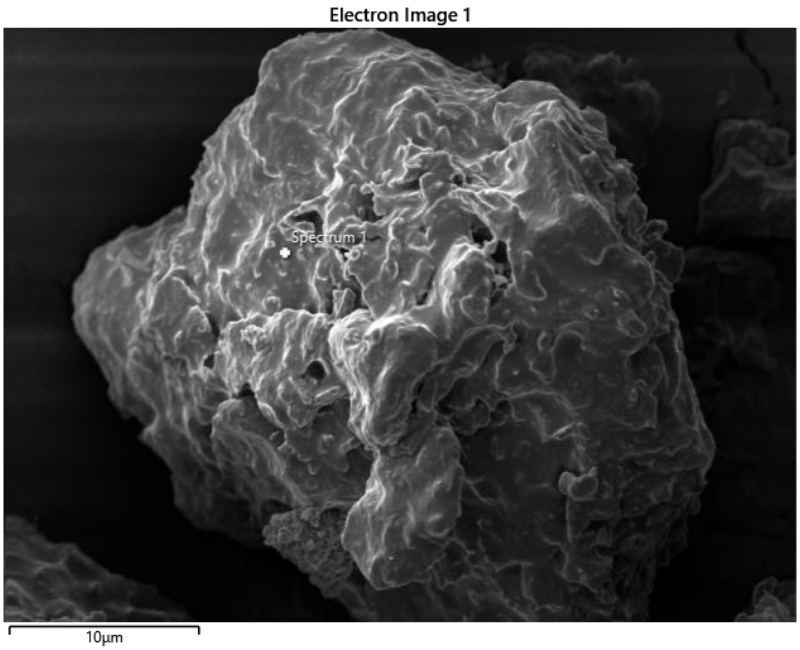
- **EDX**

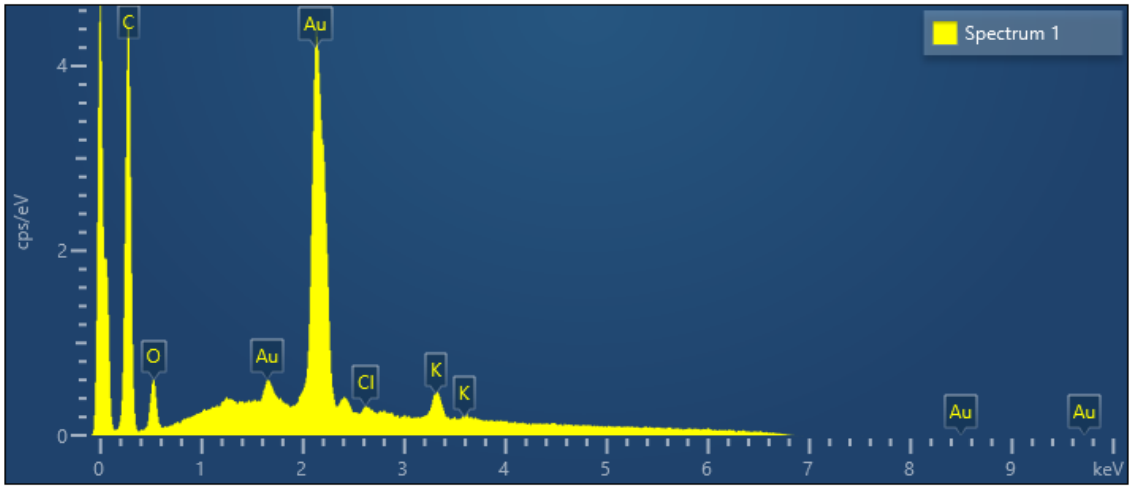
  - **Sebelum Kalsinasi**

Test Report

Name of Project	SEM 052 – Chi Sebelum Kalsinasi
User Name	Safitri Mukti Rahayu
Name of the Test	EDS
Test Date	11 Oktober 2022

Test Runs Image





Spectrum 1				

Element	Line Type	Weight %	Weight % Sigma	Atomic %
C	K series	77.76	0.51	87.84
O	K series	8.74	0.24	7.41
Cl	K series	1.85	0.25	0.71
K	K series	11.64	0.45	4.04
Total		100.00		100.00

Validation

Chair of Integrated Laboratory

Dr. Didied Haryono, ST., MT.

NIP. 196810062001121002

Head of Nanoparticles Laboratory

Dr. Lusiani Dewi Assaat, S.Pd., M.Si.

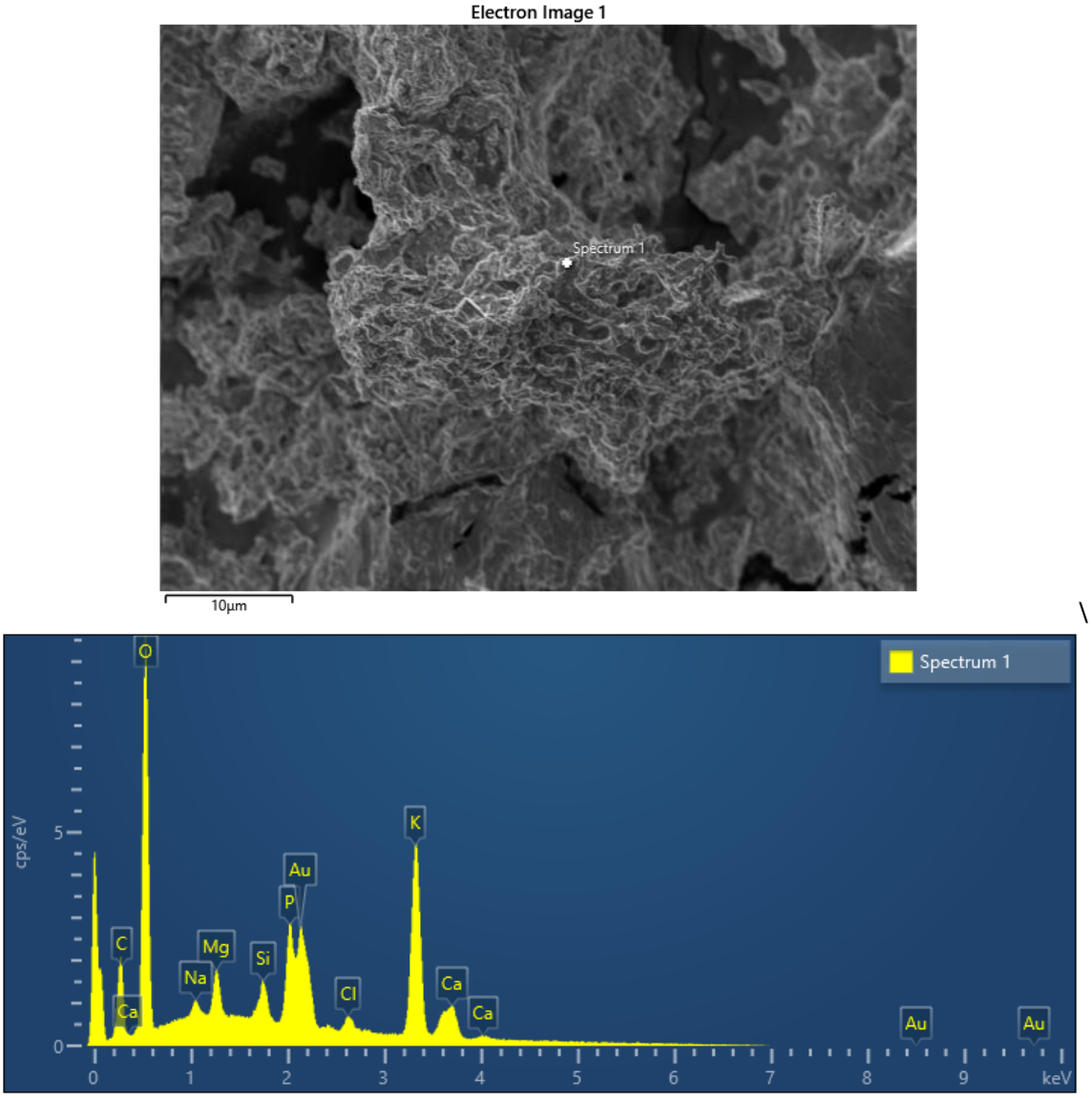
NIP. 198010102005012003

- **Setelah Kalsinasi**

Test Report

Name of Project	SEM 053 – Chi Setelah Kalsinasi
User Name	Safitri Mukti Rahayu
Name of the Test	EDS
Test Date	11 Oktober 2022

Test Runs Image



\

Spectrum 1				
Element	**Line Type**	**Weight %**	**Weight % Sigma**	**Atomic %**
C	K series	6.57	0.34	12.96

O	K series	32.22	0.26	47.74
Na	K series	0.53	0.06	0.55
Mg	K series	1.67	0.06	1.63
Si	K series	1.79	0.07	1.51
P	K series	6.09	0.13	4.66
Cl	K series	1.55	0.10	1.04
K	K series	40.09	0.31	24.30
Ca	K series	9.50	0.27	5.62
Total		100.00		100.00

Validation

Chair of Integrated Laboratory

Dr. Didied Haryono, ST., MT.

NIP. 196810062001121002

Head of Nanoparticles Laboratory

Dr. Lusiani Dewi Assaat, S.Pd., M.Si.

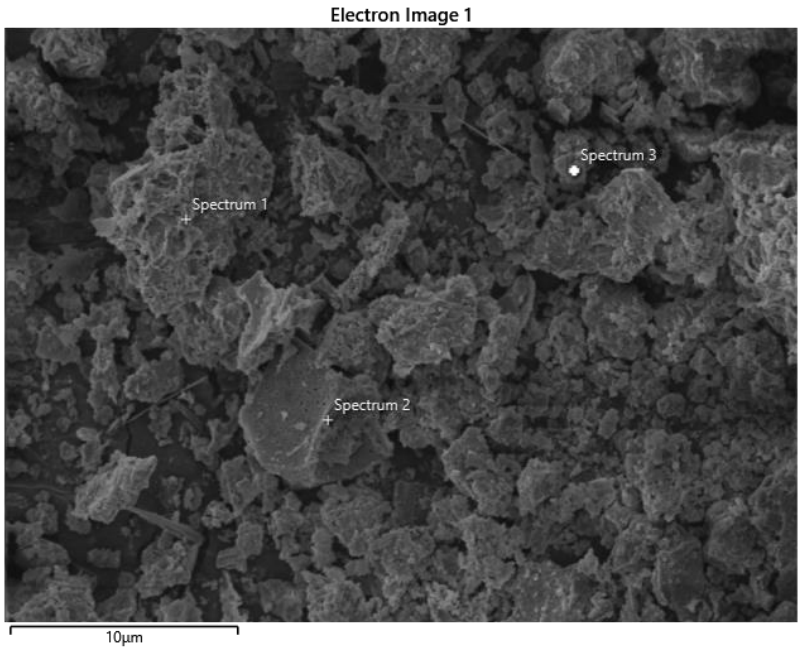
NIP. 198010102005012003

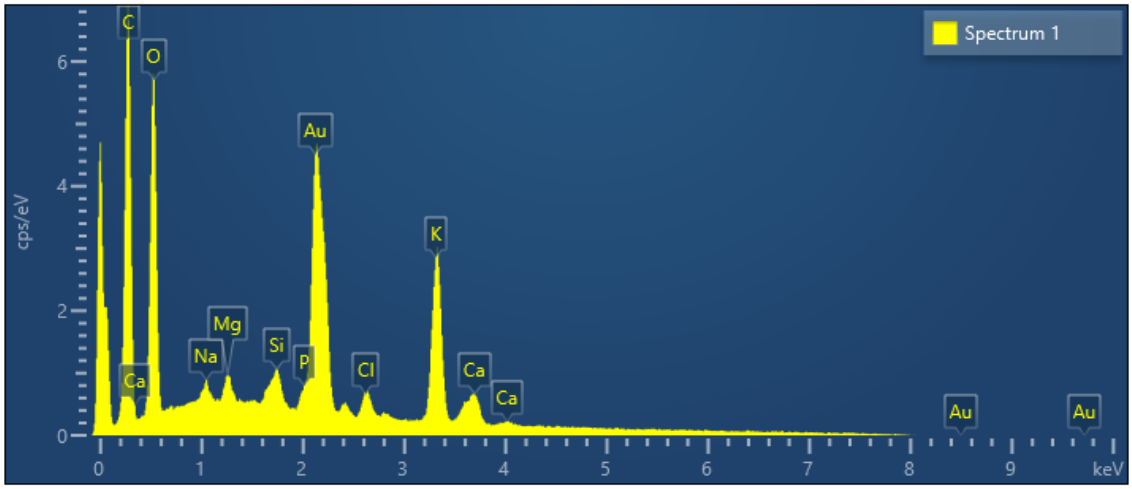
- **Setelah Reaksi Transesterifikasi**

Test Report

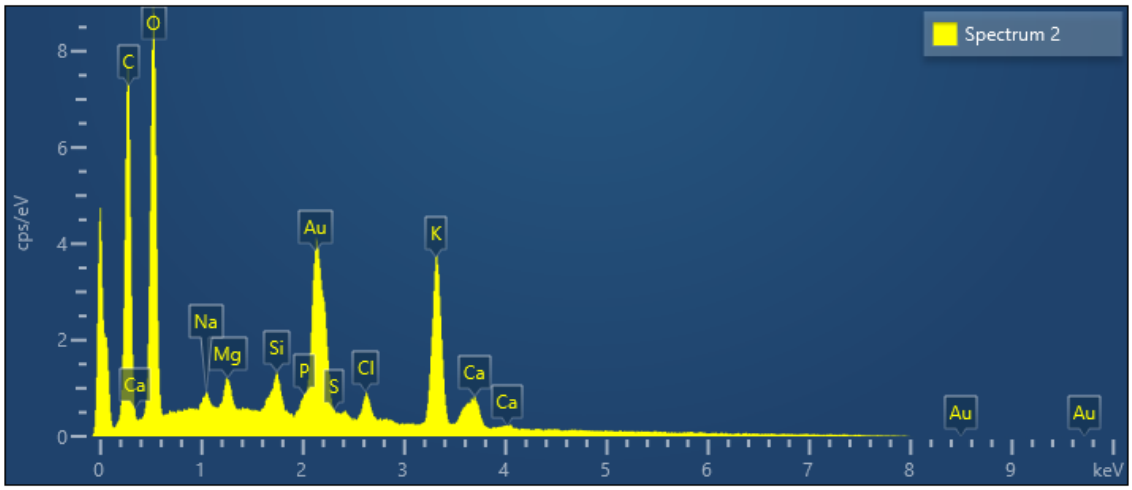
Name of Project	SEM 058 – Kitosan Kulit Pisang Setelah Transesterifikasi
User Name	Safitri Mukti Rahayu
Name of the Test	EDS
Test Date	25 Oktober 2022

Test Runs Image



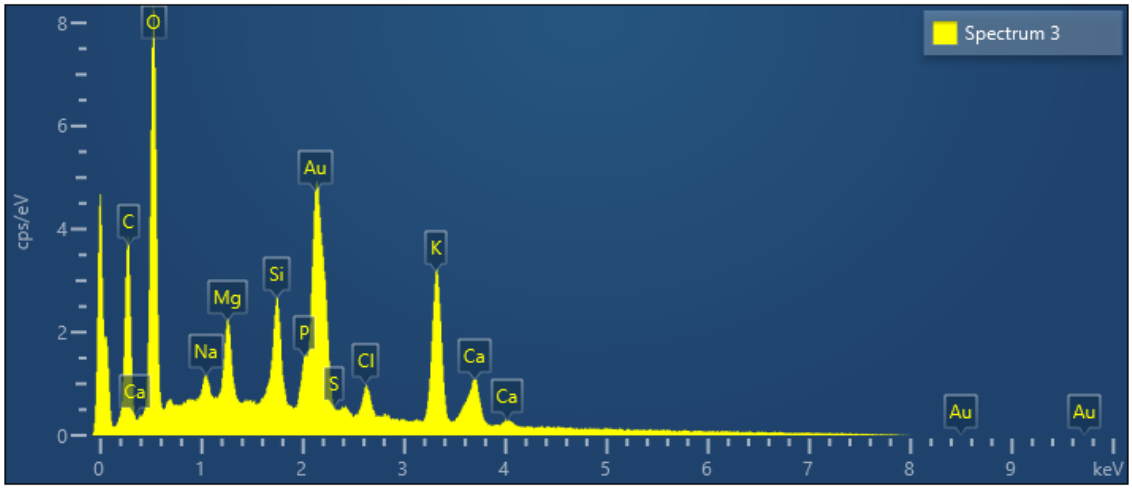


Spectrum 1				
Element	**Line Type**	**Weight %**	**Weight % Sigma**	**Atomic %**
C	K series	40.36	0.43	56.90
O	K series	26.49	0.28	28.03
Na	K series	0.54	0.06	0.40
Mg	K series	0.75	0.05	0.52
Si	K series	1.25	0.07	0.75
P	K series	0.92	0.11	0.51
Cl	K series	1.97	0.10	0.94
K	K series	22.36	0.26	9.68
Ca	K series	5.36	0.20	2.26
Total		100.00		100.00



Spectrum 2				
Element	**Line Type**	**Weight %**	**Weight % Sigma**	**Atomic %**
C	K series	35.18	0.43	50.67
O	K series	31.05	0.29	33.57
Na	K series	0.50	0.05	0.38
Mg	K series	0.92	0.05	0.66
Si	K series	1.35	0.06	0.83
P	K series	0.86	0.10	0.48
S	K series	0.37	0.11	0.20
Cl	K series	2.03	0.09	0.99
K	K series	22.46	0.24	9.94

Ca	K series	5.27	0.18	2.28
Total		100.00		100.00



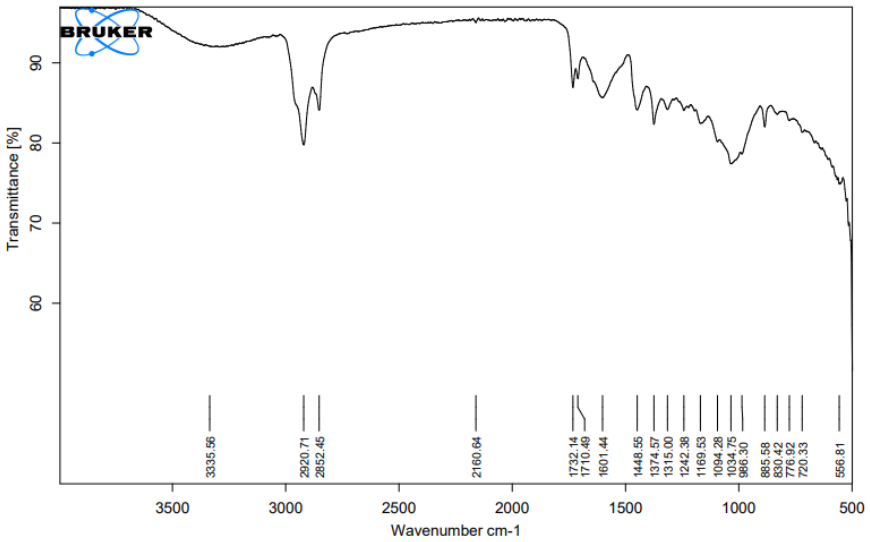
Spectrum 3				
Element	**Line Type**	**Weight %**	**Weight % Sigma**	**Atomic %**
C	K series	23.46	0.54	37.29
O	K series	32.77	0.34	39.11
Na	K series	0.84	0.07	0.70
Mg	K series	2.53	0.07	1.98
Si	K series	4.18	0.09	2.84
P	K series	2.54	0.14	1.56
S	K series	0.44	0.14	0.26
Cl	K series	2.59	0.11	1.39
K	K series	21.85	0.27	10.67
Ca	K series	8.79	0.23	4.19
Total		100.00		100.00

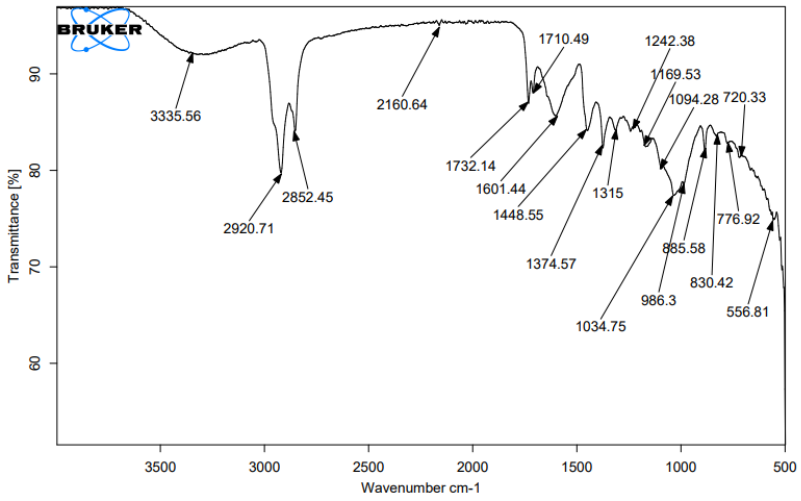
Validation

Chair of Integrated Laboratory	Head of Nanoparticles Laboratory
	
Dr. Didied Haryono, ST., MT.	Dr. Lusiani Dewi Assaat, S.Pd., M.Si.
NIP. 196810062001121002	NIP. 198010102005012003

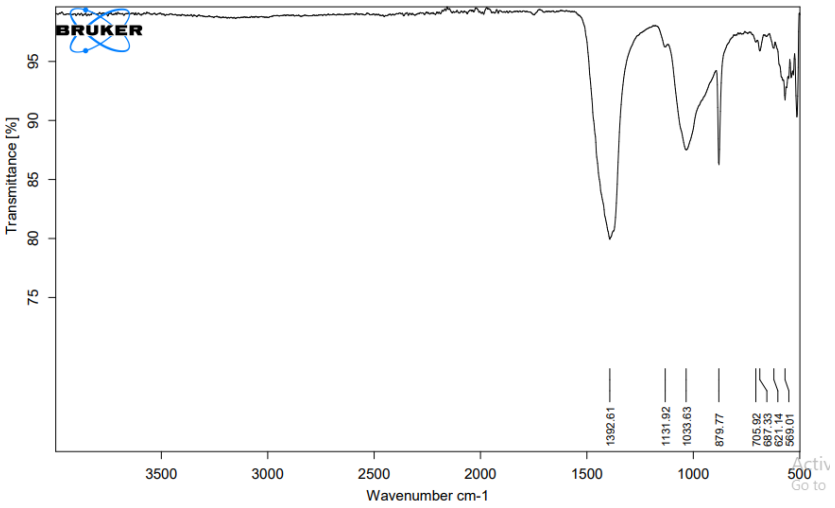
- **FTIR**

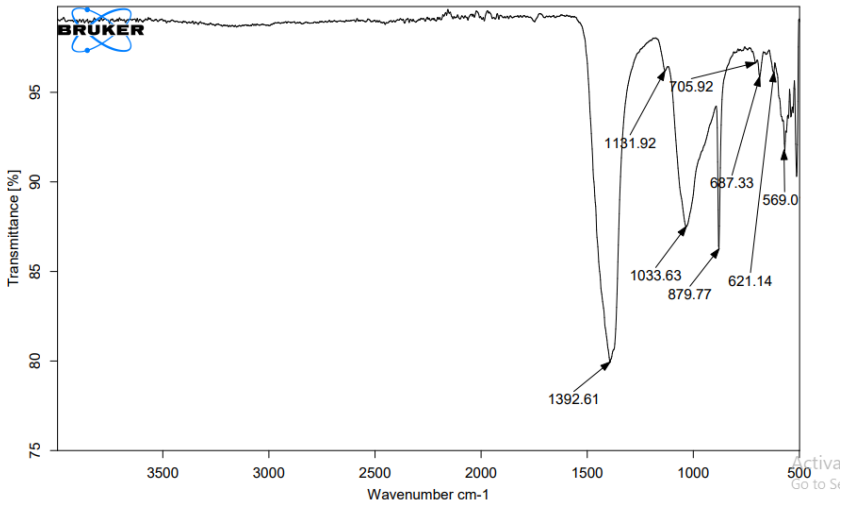
  - **Sebelum Kalsinasi**



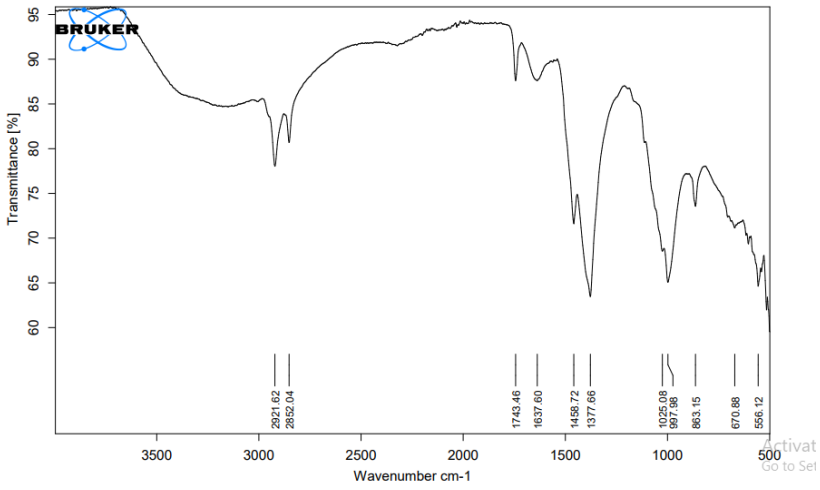


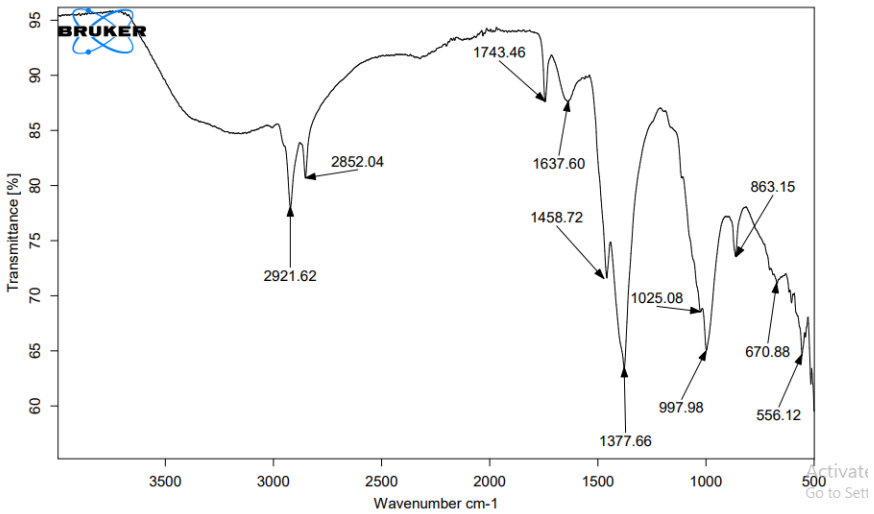
- **Setelah Kalsinasi**





- **Setelah Reaksi Transesterifikasi**





C. DOKUMENTASI

❖ Proses Pembuatan Katalis

(a)

(b)

(c)

(d)

Gambar 1. Preparasi Katalis Kulit Pisang Kepok Matang (a) Menimbang kulit pisang yang dibutuhkan (b) Pencucian (c) Pemotongan (d) Pengeringan dengan oven

(a)

(b)

(c)

(d)

(e)

(f)

Gambar 2. Preparasi Kalsinasi Kulit Pisang Kepok Matang (a) Penimbangan hasil oven (b) Pengayakan (c) Pembagian pada cawan porselen (d) Katalis 450^{o}C (e) Katalis 550^{o}C (f) Katalis 650^{o}C

❖ **Proses Transesterifikasi**

(a)

(b)

(c)

(d)

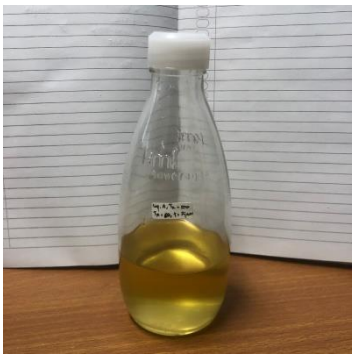
(e)

(f)

(g)

(h)

(i)

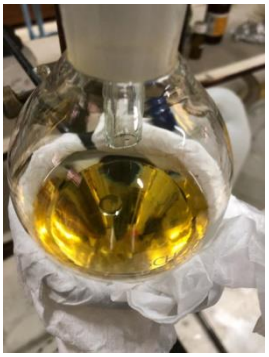


(j)

Gambar 3. Proses Transesterifikasi (a) Pengukuran minyak dan methanol (b) Es batu (c) Rangkaian alat (d) Methanol dan katalis di panaskan (e) Minyak dimasukan (f) Rangkaian sempurna (g,h,i) Penyaringan Minyak (j) Hasil biodiesel

(a)

(b)



(c)

Gambar 4. Reusability Katalis (a) Katalis sehabis pemakaian (b) Proses pemanasan (c) Penyaringan

❖ **Analisa Kimia & Fisik**

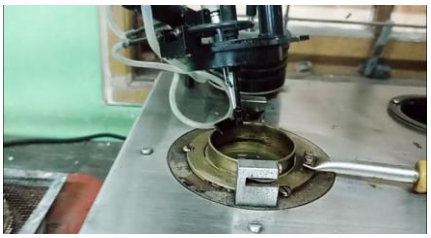
(a)

(b)

Gambar 5. Uji FFA (a) Sebelum titrasi (b) Setelah titrasi

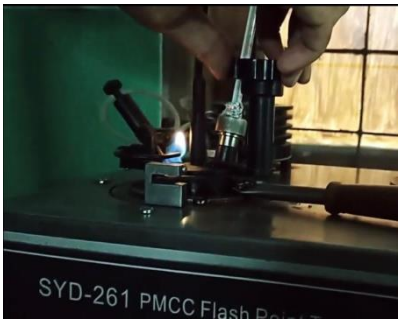
(a)

(b)



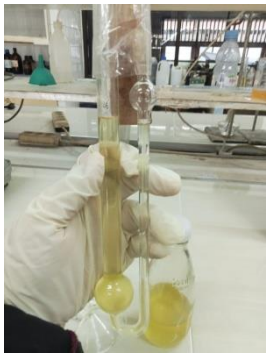
(c)

(d)



(e)

Gambar 6. Analisa Flash Point (a) ON alat (b) Pemasangan gas (c) Pemasukan sampel (d) Menyalakan pemantik (e) Keluar titik nyala



(a)

(b)

Gambar 7. Analisa (a) Viskositas (b) Densitas

KEMENTERIAN PENDIDIKAN DAN KEBUDAYAAN
JURUSAN TEKNIK KIMIA- FAKULTAS TEKNIK UNIVERSITAS SULTAN AGENG TIRTAYASA

BORANG REVISI LAPORAN PENELITIAN

Judul Penelitian : Potensi Kulit Pisang Kepok Matang Sebagai Katalis Heterogen Penghasil Biodiesel dengan Bahan Baku Minyak Jelantah

Nama Mahasiswa : 1. Nisrina Nada Salma 3335180038

2. Umi Hanifah 3335180028

REVISI
1. Peraturan tentang biodiesel seperti sudah ada yang baru, mohon direvisi yang peraturan ESDM No 12 tahun 2015. 2. Penelitian tentang kuliah pisang kepok hasilnya belum disampaikan pada halaman 2 di bagian latar belakang. Ini bisa ditambahan bagian dari state of the art dari penelitian ini termasuk beberapa penelitian pengambilan kalium dari bahan yang lain dan bagaimana hasil kualitas biodiesel yang dihasilkan 3. Karakteristik dari kalium untuk berbagai variasi sebaiknya dilengkapi pada bagian awal sehingga nanti terpilih yang terbaik 4. Analisa pengaruh dari beberapa parameter perlu diperkuat sehingga terlihat mana faktor yang paling dominan berpengaruh terhadap yield

Cilegon, 4 Januari 2023

Dosen Penguji 1,

Dr. Ing-Anton Irawan, ST., MT
NIP.197510012008011007

KEMENTERIAN PENDIDIKAN DAN KEBUDAYAAN
JURUSAN TEKNIK KIMIA- FAKULTAS TEKNIK
UNIVERSITAS SULTAN AGENG TIRTAYASA

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Judul Penelitian : Potensi Kulit Pisang Kepok Matang Sebagai Katalis Heterogen Penghasil Biodiesel dengan Bahan Baku Minyak Jelantah

Nama Mahasiswa :
1. Nisrina Nada Salma 3335180038
2. Umi Hanifah 3335180028

REVISI

Cilegon, 10 Januari 2022
Dosen Penguji 2,

Wardalia, ST., MT
NIP.198406202008122002