Lampiran 1 Perhitungan Data Hasil Penelitian

A. Randemen Karbon Tempurung Kelapa

1. Perhitungan massa 500 gram

Randemen % = $\frac{\text{massa akhir}}{\text{massa awal}}$ x 100 %

= $\frac{150}{500}$ x 100 %

= 30%

2. Perhitungan massa 1000 gram

Randemen % = $\frac{\text{massa akhir}}{\text{massa awal}}$ x 100 %

= $\frac{300}{1000}$ x 100 %

= 30%

3. Perhitungan massa 500 gram

Randemen % = $\frac{\text{massa akhir}}{\text{massa awal}}$ x 100 %

= $\frac{500}{1500}$ x 100 %

= 33%

B. Karbon Tempurung Kelapa

1. Perhitungan Kadar Air (dilakukan 2 kali/*duplo*)

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Keterangan:

W_1 = massa karbon yang hilang, gram

W_2 = massa karbon awal, gram

1.1 Pengujian Pertama

Massa cawan + sampel sebelum dioven = 40,0164 gram

Massa cawan + sampel setelah dioven = 40,9740 gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,0427 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,0427}{1}$ x 100 %

Kadar Air % = 4,2 %

1.2 Pengujian Kedua

Massa cawan + sampel sebelum dioven = 39,8313 gram

Massa cawan + sampel setelah dioven = 40,7926 gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,040 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,040}{1}$ x 100 %

Kadar Air % = 4 %

Rata-rata kadar air = $\frac{4,2+4}{2}$ = 4,1%

2. Perhitungan Kadar Abu (dilakukan 2 kali/*duplo*)

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Keterangan:

W_1 = massa karbon yang menjadi abu, gram

W_2 = massa karbon awal, gram

2.1 Kadar Abu

2.1.1 Pengujian Pertama

Massa cawan kosong = 39,8315 gram

Massa cawan + sampel setelah di *furnace* = 39,8629 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0314 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0314}{2}$ x 100 %

Kadar Abu % = 1,5 %

C. Karbon Aktif Tempurung Kelapa

- **Perhitungan Kadar Air (dilakukan 2 kali/*duplo*)**

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Keterangan:

W_1 = massa karbon yang hilang, gram

W_2 = massa karbon awal, gram

1. **Pengujian kadar air A1 (Konsentrasi $ZnCl_2$ 1M dengan suhu 400^0C)**

Pengujian Pertama

Massa cawan + sampel sebelum dioven = 40,0164 gram

Massa cawan + sampel setelah dioven = 40,9740 gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,0427 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,0427}{1}$ x 100 %

Kadar Air % = 4,2 %

Pengujian Kedua

Massa cawan + sampel sebelum dioven = 39,8432 gram

Massa cawan + sampel setelah dioven = 40,8875 gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,0423 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,0423}{1}$ x 100 %

Kadar Air % = 4,23 %

2. **Pengujian kadar air A2 (Konsentrasi $ZnCl_2$ 1M dengan suhu 500^0C)**

Pengujian Pertama

Massa cawan + sampel sebelum dioven = 44,6599 gram

Massa cawan + sampel setelah dioven = 45,7025 gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,0401 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,0393}{1}$ x 100 %

Kadar Air % = 4 %

Pengujian Kedua

Massa cawan + sampel sebelum dioven = 40,8432 gram

Massa cawan + sampel setelah dioven = 41,8875 gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,0406 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,0395}{1}$ x 100 %

Kadar Air % = 4,04 %

3. **Pengujian kadar air A3 (Konsentrasi $ZnCl_2$ 1M dengan suhu 600^0C)**

Pengujian Pertama

Massa cawan + sampel sebelum dioven = 40,0713 gram

Massa cawan + sampel setelah dioven = 41,5055 gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,03205 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,03205}{1}$ x 100 %

Kadar Air % = 3,2 %

Pengujian Kedua

Massa cawan + sampel sebelum dioven = 17,8702 gram

Massa cawan + sampel setelah dioven = 19,843gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,032 gram

W2 = 2 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,032}{1}$ x 100 %

Kadar Air % = 32 %

4. **Pengujian kadar air B1 (Konsentrasi $ZnCl_2$ 2M dengan suhu 400^0C)**

Pengujian Pertama

Massa cawan + sampel sebelum dioven = 44,6599 gram

Massa cawan + sampel setelah dioven = 45,7025gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,039 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,039}{1}$ x 100 %

Kadar Air % = 3,9 %

Pengujian Kedua

Massa cawan + sampel sebelum dioven = 17,8702 gram

Massa cawan + sampel setelah dioven = 19,823gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,0393 gram

W2 = 2 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,0393}{1}$ x 100 %

Kadar Air % = 3,93 %

5. Pengujian kadar air B2 (Konsentrasi $ZnCl_2$ 2M dengan suhu 500^0C)

Pengujian Pertama

Massa cawan + sampel sebelum dioven = 44,1071 gram

Massa cawan + sampel setelah dioven = 45,076 gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,0311 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,0311}{1}$ x 100 %

Kadar Air % = 3,11 %

Pengujian Kedua

Massa cawan + sampel sebelum dioven = 38,0291 gram

Massa cawan + sampel setelah dioven = 39,0632 gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,0314 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,0314}{1}$ x 100 %

Kadar Air % = 3,14 %

6. **Pengujian kadar air B3 (Konsentrasi $ZnCl_2$ 2M dengan suhu 600^0C)**

Pengujian Pertama

Massa cawan + sampel sebelum dioven = 40,4303 gram

Massa cawan + sampel setelah dioven = 41,4499 gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,0279 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,0279}{1}$ x 100 %

Kadar Air % = 2,79 %

Pengujian Kedua

Massa cawan + sampel sebelum dioven = 40, 4679 gram

Massa cawan + sampel setelah dioven = 39,2521 gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,0280 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,0280}{1}$ x 100 %

Kadar Air % = 2,80%

7. **Pengujian kadar air C1 (Konsentrasi $ZnCl_2$ 3M dengan suhu 400^0C)**

Pengujian Pertama

Massa cawan + sampel sebelum dioven = 39,9264 gram

Massa cawan + sampel setelah dioven = 40,9532 gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,026 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,026}{1}$ x 100 %

Kadar Air % = 2,6 %

Pengujian Kedua

Massa cawan + sampel sebelum dioven = 40, 5439 gram

Massa cawan + sampel setelah dioven = 39,310 gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,0259 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,0259}{1}$ x 100 %

Kadar Air % = 2,6%

8. Pengujian kadar air C2 (Konsentrasi $ZnCl_2$ 3M dengan suhu 500^0C)

Pengujian Pertama

Massa cawan + sampel sebelum dioven = 39,8840 gram

Massa cawan + sampel setelah dioven = 40,9075 gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,0206 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,0206}{1}$ x 100 %

Kadar Air % = 2,06 %

Pengujian Kedua

Massa cawan + sampel sebelum dioven = 39,569 gram

Massa cawan + sampel setelah dioven = 38,366 gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,0203 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,0203}{1}$ x 100 %

Kadar Air % = 2,0%

9. Pengujian kadar air C3 (Konsentrasi $ZnCl_2$ 3M dengan suhu 600^0C)

Pengujian Pertama

Massa cawan + sampel sebelum dioven = 42,3387gram

Massa cawan + sampel setelah dioven = 43,3518 gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,0177 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,0177}{1}$ x 100 %

Kadar Air % = 1,77 %

Pengujian Kedua

Massa cawan + sampel sebelum dioven = 41,638 gram

Massa cawan + sampel setelah dioven = 40,461gram

W1 = (Massa cawan + sampel sebelum dioven) – (Massa cawan + sampel setelah dioven) = 0,0177 gram

W2 = 1 gram

Kadar Air % = $\frac{W1}{W2}$ x 100 %

Kadar Air % = $\frac{0,0177}{1}$ x 100 %

Kadar Air % = 1,77%

- **Perhitungan Kadar Abu (dilakukan 2 kali/*duplo*)**

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Keterangan :

W_1 = massa karbon yang menjadi abu, gram

W_2 = massa karbon awal, gram

1. Pengujian kadar abu A1 (Konsentrasi $ZnCl_2$ 1M dengan suhu 400^0C)

Pengujian Pertama

Massa cawan kosong = 40,0628 gram

Massa cawan + sampel setelah di *furnace* = 40,1156 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0528 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0528}{2}$ x 100 %

Kadar Abu % = 2,64 %

Pengujian Kedua

Massa cawan kosong = 41,643 gram

Massa cawan + sampel setelah di *furnace* = 41,120 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0523 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0523}{2}$ x 100 %

Kadar Abu % = 2,6 %

2. Pengujian kadar abu A2 (Konsentrasi $ZnCl_2$ 1M dengan suhu 400^0C)

Pengujian Pertama

Massa cawan kosong = 40,0446 gram

Massa cawan + sampel setelah di *furnace* = 40,0938 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0492 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0528}{2}$ x 100 %

Kadar Abu % = 2,49 %

Pengujian Kedua

Massa cawan kosong = 39,041 gram

Massa cawan + sampel setelah di *furnace* = 39,0938 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0528 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0528}{2}$ x 100 %

Kadar Abu % = 2,61 %

3. Pengujian kadar abu A3 (Konsentrasi $ZnCl_2$ 1M dengan suhu 400^0C)

Pengujian Pertama

Massa cawan kosong = 41,2741 gram

Massa cawan + sampel setelah di *furnace* = 41,3187 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0446 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0446}{2}$ x 100 %

Kadar Abu % = 2,22 %

Pengujian Kedua

Massa cawan kosong = 40,5001 gram

Massa cawan + sampel setelah di *furnace* = 40,5431 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0441 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0441}{2}$ x 100 %

Kadar Abu % = 2,2 %

4. Pengujian kadar abu B1 (Konsentrasi $ZnCl_2$ 3M dengan suhu 500^0C)

Pengujian Pertama

Massa cawan kosong = 40,0446 gram

Massa cawan + sampel setelah di *furnace* = 40,0939 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0493 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0493}{2}$ x 100 %

Kadar Abu % = 2,46 %

Pengujian Kedua

Massa cawan kosong = 41,11 gram

Massa cawan + sampel setelah di *furnace* = 41,1549 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0449 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0449}{2}$ x 100 %

Kadar Abu % = 2,45 %

5. Pengujian kadar abu B2 (Konsentrasi $ZnCl_2$ 2M dengan suhu 500^0C)

Pengujian Pertama

Massa cawan kosong = 37,9912 gram

Massa cawan + sampel setelah di *furnace* = 38,0313 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0401 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0401}{2}$ x 100 %

Kadar Abu % = 2,005 %

Pengujian Kedua

Massa cawan kosong = 39,091 gram

Massa cawan + sampel setelah di *furnace* = 39,1210 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0403 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0403}{2}$ x 100 %

Kadar Abu % = 2,01 %

6. Pengujian kadar abu B3 (Konsentrasi $ZnCl_2$ 3M dengan suhu 500^0C)

Pengujian Pertama

Massa cawan kosong = 45,8366 gram

Massa cawan + sampel setelah di *furnace* = 45,8766 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0399 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0399}{2}$ x 100 %

Kadar Abu % = 1,99 %

Pengujian Kedua

Massa cawan kosong = 40,192 gram

Massa cawan + sampel setelah di *furnace* = 40,2316 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0396 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0396}{2}$ x 100 %

Kadar Abu % = 1,99 %

7. Pengujian kadar abu C1 (Konsentrasi $ZnCl_2$ 1M dengan suhu 400^0C)

Pengujian Pertama

Massa cawan kosong = 39,9039 gram

Massa cawan + sampel setelah di *furnace* = 39,950 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0461 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0461}{2}$ x 100 %

Kadar Abu % = 2,29 %

Pengujian Kedua

Massa cawan kosong = 39,7039 gram

Massa cawan + sampel setelah di *furnace* = 39,750 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0461 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0461}{2}$ x 100 %

Kadar Abu % = 2,3 %

8. Pengujian kadar abu C1 (Konsentrasi $ZnCl_2$ 1M dengan suhu 500^0C)

Pengujian Pertama

Massa cawan kosong = 41,6121 gram

Massa cawan + sampel setelah di *furnace* = 41,6502 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0381 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0381}{2}$ x 100 %

Kadar Abu % = 1,89 %

Pengujian Kedua

Massa cawan kosong = 40,5311 gram

Massa cawan + sampel setelah di *furnace* = 40,5697 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0386 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0386}{2}$ x 100 %

Kadar Abu % = 1,99 %

9. Pengujian kadar abu C1 (Konsentrasi $ZnCl_2$ 1M dengan suhu 600^0C)

Pengujian Pertama

Massa cawan kosong = 44,2636 gram

Massa cawan + sampel setelah di *furnace* = 44,2992 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0356 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0356}{2}$ x 100 %

Kadar Abu % = 1,77 %

Pengujian Kedua

Massa cawan kosong = 40,3385 gram

Massa cawan + sampel setelah di *furnace* = 40,3742 gram

W1 = (Massa cawan + sampel setelah di *furnace*) – massa cawan kosong = 0,0357 gram

W2 = 2 gram

Kadar Abu % = $\frac{W1}{W2}$ x 100 %

Kadar Abu % = $\frac{0,0386}{2}$ x 100 %

Kadar Abu % = 1,77 %

3. Perhitungan Daya Serap Iodin (dilakukan 2 kali/*duplo*)

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

Keterangan :

V = Larutan natrium tiosulfat yang diperlukan, mL

N = Normalitas larutan natrium tiosulfat

12,69 = Jumlah iod sesuai dengan 1 mL larutan natrium tiosulfat 0,1 N

W = Contoh, g

3.1 Daya Serap Iod A1

3.1.1 Pengujian Pertama

V = 0,8 mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

= $\frac{10-\frac{0,8\ mL\ x\ 0,1\ N}{0,1}}{0,5\ gram}$ x 12,69 x 5

= 1167,48 mg/g

3.1.2 Pengujian Kedua

V = 0,8 mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

= $\frac{10-\frac{0,8mL\ x\ 0,1\ N}{0,1}}{0,5\ gram}$ x 12,69 x 5

= 1167,48 mg/g

3.2 Daya Serap Iod B1

3.2.1 Pengujian Pertama

V = 0,7 mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

= $\frac{10-\frac{0,7\ mL\ x\ 0,1\ N}{0,1}}{0,5\ gram}$ x 12,69 x 5

= 1180,17 mg/g

3.2.2 Pengujian Kedua

V = 0,8 mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

= $\frac{10-\frac{0,8\ mL\ x\ 0,1\ N}{0,1}}{0,5\ gram}$ x 12,69 x 5

= 1167,48 mg/g

Rata-rata kadar iodin B1 = $\frac{1180,17+1167,48}{2}$ = 1173,82 mg/g

3.3 Daya Serap Iod C1

3.3.1 Pengujian Pertama

V = 0,6mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

= $\frac{10-\frac{0,6\ mL\ x\ 0,1\ N}{0,1}}{0,5\ gram}$ x 12,69 x 5

= 1192,86 mg/g

3.3.2 Pengujian Kedua

V = 0,6 mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

= $\frac{10-\frac{0,6\ mL\ x\ 0,1\ N}{0,1}}{0,5\ gram}$ x 12,69 x 5

= 1192,86 mg/g

3.4 Daya Serap Iod A2

3.4.1 Pengujian Pertama

V = 0,5 mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

= $\frac{10-\frac{0,5\ mL\ x\ 0,1\ N}{0,1}}{0,5\ \text{gram}}$ x 12,69 x 5

= 1205,55 mg/g

3.4.2 Pengujian Kedua

V = 0,6 mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

= $\frac{10-\frac{0,6\ mL\ x\ 0,1\ N}{0,1}}{0,5\ \text{gram}}$ x 12,69 x 5

= 1192,86 mg/g

Rata-rata daya serap iodin = $\frac{1192,86+1205,55}{2}$ = 1199,20 mg/g

3.5 Daya Serap Iod B2

3.5.1 Pengujian Pertama

V = 0,4 mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

= $\frac{10-\frac{0,4\ mL\ x\ 0,1\ N}{0,1}}{0,5\ \text{gram}}$ x 12,69 x 5

= 1218,24 mg/g

3.5.2 Pengujian Kedua

V = 0,4 mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

= $\frac{10-\frac{0,4\ mL\ x\ 0,1\ N}{0,1}}{0,5\ \text{gram}}$ x 12,69 x 5

= 1218,24 mg/g

3.6 Daya Serap Iod C2

3.6.1 Pengujian Pertama

V = 0,3 mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

= $\frac{10-\frac{0,3\ mL\ x\ 0,1\ N}{0,1}}{0,5\ gram}$ x 12,69 x 5

= 1230,93 mg/g

3.6.2 Pengujian Kedua

V = 0,4 mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

= $\frac{10-\frac{4mL\ x\ 0,1\ N}{0,1}}{0,5\ gram}$ x 12,69 x 5

= 1218,24 mg/g

Rata-rata daya serap iodin C2 = $\frac{1230,93+1218,14}{2}$ = 1224,58 mg/g

3.7 Daya Serap Iod A3

3.7.1 Pengujian Pertama

V = 0,4 mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

= $\frac{10-\frac{0,5\ mL\ x\ 0,1\ N}{0,1}}{0,5\ gram}$ x 12,69 x 5

= 1205,55 mg/g

3.7.2 Pengujian Kedua

V = 0,6 mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

= $\frac{10-\frac{0,6\ mL\ x\ 0,1\ N}{0,1}}{0,5\ gram}$ x 12,69 x 5

= 1199,20 mg/g

Rata-rata daya serap iodin A3 = $\frac{1205,55+1192,86}{2}$ = 1199,20 mg/g

3.8 Daya Serap Iod B3

3.8.1 Pengujian Pertama

V = 0,6 mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

= $\frac{10-\frac{0,6\ mL\ x\ 0,1\ N}{0,1}}{0,5\ gram}$ x 12,69 x 5

= 1192,86 mg/g

3.8.2 Pengujian Kedua

V = 0,4 mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

= $\frac{10-\frac{0,4\ mL\ x\ 0,1\ N}{0,1}}{0,5\ gram}$ x 12,69 x 5

= 1218,24 mg/g

Rata-rata daya serap iod = $\frac{1192,86+1218,24}{2}$ = 1205,55 mg/g

3.9 Daya Serap Iod C3

3.9.1 Pengujian Pertama

V = 0,5 mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10-\frac{V\ x\ N}{0,1}}{W}$ x 12,69 x 5

$$= \frac{10 - \frac{0{,}5\ mL\ x\ 0{,}1\ N}{0{,}1}}{0{,}5\ \text{gram}} \text{ x } 12{,}69 \text{ x } 5$$

$$= 1205{,}55 \text{ mg/g}$$

3.9.2 Pengujian Kedua

V = 0,7 mL

N = 0,1 N

W = 0,5 gram

Iodin yang diadsorpsi, mg/g = $\frac{10 - \frac{V\ x\ N}{0{,}1}}{W}$ x 12,69 x 5

$$= \frac{10 - \frac{0{,}7\ mL\ x\ 0{,}1\ N}{0{,}1}}{0{,}5\ \text{gram}} \text{ x } 12{,}69 \text{ x } 5$$

$$= 1211{,}89 \text{ mg/g}$$

Rata-rata daya serap iod = $\frac{1205{,}55+11211{,}89}{2}$ = 1211,89 mg/g

4. Daya Serap Metilen Biru

Daya serap metilen biru, mg/g = $\frac{C1-C2}{1000}$ x V x $\frac{1}{B}$

Keterangan :

C1= Konsentrasi larutan metilen biru awal, ppm

C2 = Konsentrasi larutan metilen biru akhir, ppm

V = Volume larutan metilen biru yang digunakan

B = Berat sampel, gram

4.1 Daya Serap Metilen Biru A1

C1= 250 ppm

C2 = 1,901 ppm

V = 25 mL

B = 0,1 gram

Daya serap metilen biru, mg/g = $\frac{C1-C2}{1000}$ x V x $\frac{1}{B}$

$$= \frac{250 \text{ ppm} - 1{,}901 \text{ ppm}}{1000} \text{ x } 25 \text{ mL x } \frac{1}{0{,}1 \text{ gram}}$$

$$= 62{,}024 \text{ mg/g}$$

4.2 Daya Serap Metilen Biru A2

C1= 250 ppm

C2 = 1,534 ppm

V = 25 mL

B = 0,1 gram

Daya serap metilen biru, mg/g = $\frac{C1-C2}{1000}$ x V x $\frac{1}{B}$

= $\frac{250\ ppm - 1{,}534\ ppm}{1000}$ x 25 mL x $\frac{1}{0{,}1\ gram}$

= 62,116 mg/g

4.3 Daya Serap Metilen Biru A3

C1= 250 ppm

C2 = 1,468 ppm

V = 25 mL

B = 0,1 gram

Daya serap metilen biru, mg/g = $\frac{C1-C2}{1000}$ x V x $\frac{1}{B}$

= $\frac{500\ ppm - 1{,}468\ ppm}{1000}$ x 25 mL x $\frac{1}{0{,}1\ gram}$

= 62,133 mg/g

4.4 Daya Serap Metilen Biru B1

C1= 250 ppm

C2 = 1,8115 ppm

V = 25 mL

B = 0,1 gram

Daya serap metilen biru, mg/g = $\frac{C1-C2}{1000}$ x V x $\frac{1}{B}$

= $\frac{500\ ppm - 1{,}811\ ppm}{1000}$ x 25 mL x $\frac{1}{0{,}1\ gram}$

= 62,047 mg/g

4.5 Daya Serap Metilen Biru B2

C1= 250 ppm

C2 = 1,456 ppm

V = 25 mL

B = 0,1 gram

Daya serap metilen biru, mg/g = $\frac{C1-C2}{1000}$ x V x $\frac{1}{B}$

= $\frac{500\ ppm - 1{,}456\ ppm}{1000}$ x 25 mL x $\frac{1}{0{,}1\ gram}$

= 62,117 mg/g

4.6 Daya Serap Metilen Biru B3

C1= 250 ppm

C2 = 1,455 ppm

V = 25 mL

B = 0,1 gram

Daya serap metilen biru, mg/g = $\frac{C1-C2}{1000}$ x V x $\frac{1}{B}$

= $\frac{500\ ppm - 1{,}455\ ppm}{1000}$ x 25 mL x $\frac{1}{0{,}1\ gram}$

= 62,138 mg/g

4.7 Daya Serap Metilen Biru C1

C1= 250 ppm

C2 = 1,592 ppm

V = 25 mL

B = 0,1 gram

Daya serap metilen biru, mg/g = $\frac{C1-C2}{1000}$ x V x $\frac{1}{B}$

= $\frac{500\ ppm - 1{,}592\ ppm}{1000}$ x 25 mL x $\frac{1}{0{,}1\ gram}$

= 62,102 mg/g

4.8 Daya Serap Metilen Biru C2

C1= 250 ppm

C2 = 1,105 ppm

V = 25 mL

B = 0,1 gram

Daya serap metilen biru, mg/g = $\frac{C1-C2}{1000}$ x V x $\frac{1}{B}$

= $\frac{500\ ppm - 1{,}105\ ppm}{1000}$ x 25 mL x $\frac{1}{0{,}1\ gram}$

= 62,223 mg/g

4.9 Daya Serap Metilen Biru C3

C1= 250 ppm

C2 = 1,431 ppm

V = 25 mL

B = 0,1 gram

Daya serap metilen biru, mg/g = $\frac{C1-C2}{1000}$ x V x $\frac{1}{B}$

$$= \frac{500 \text{ ppm} - 1{,}431 \text{ ppm}}{1000} \text{ x } 25 \text{ mL x } \frac{1}{0{,}1 \text{ gram}}$$

= 62,114 mg/g

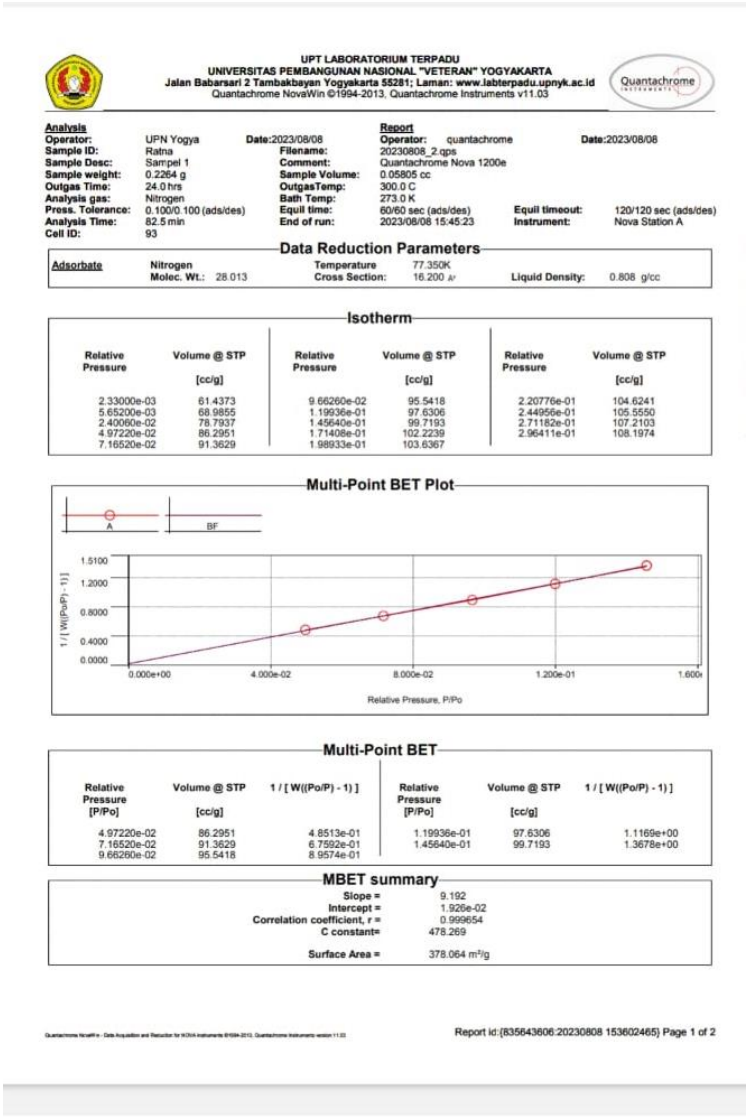
Lampiran 2 Dokumentasi Penelitian

Penjemuran batok kelapa	Pembersihan batok kelapa
	
Penjemuran batok kelapa	Pembersihan batok kelapa
	
Pengkarbonan (pirolisis) dengan suhu 300^0C selama 2 jam	Penyayakan menggunakan ayakan partikel 25 *mesh*
	
Penimbangan bahan kimia	Pembuatan larutan $ZnCl_2$ 1M, 2M dan 3M

	
Pencampuran Larutan kimia dan karbon sebesar 2 : 1	Proses Impregnasi menggunakan larutan $ZnCl_2$ 1M, 2M dan 3M
	
Perendaman selama 24 jam	Penetralan setelah dilakukan perendaman selama 24 jam
	
Memasukan karbon aktif yang telah netral kedalam *furnace* selama 2 jam dengan variasi suhu 400^0C, 500^0C dan 600^0C.	Hasil setelah *furnace*

	
Pengujian kadar air	Pengujian kadar abu
	
Pengujian iodin	Pengujian metilen biru
	
Pengaplikasian dalam penjerapan CO_2	Pengujian FTIR

Lampiran 3 Hasil Uji Luas Permukaan Karbon Aktif Terimpregnasi $ZnCl_2$ dan Suhu Impregnasi



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Quantachrome NovaWin ©1994-2013, Quantachrome Instruments v11.03

Analysis
Operator: UPN Yogya
Sample ID: Ratna
Sample Desc: Sampel 1
Sample weight: 0.2264 g
Outgas Time: 24.0 hrs
Analysis gas: Nitrogen
Press. Tolerance: 0.100/0.100 (ads/des)
Analysis Time: 82.5 min
Cell ID: 93
Date: 2023/08/08

Report
Operator: quantachrome
Filename: 20230808_2.qps
Comment: Quantachrome Nova 1200e
Sample Volume: 0.05805 cc
OutgasTemp: 300.0 C
Bath Temp: 273.0 K
Equil time: 60/60 sec (ads/des)
End of run: 2023/08/08 15:45:23
Equil timeout: 120/120 sec (ads/des)
Instrument: Nova Station A
Date: 2023/08/08

Data Reduction Parameters

Adsorbate: Nitrogen
Molec. Wt.: 28.013
Temperature: 77.350K
Cross Section: 16.200 A²
Liquid Density: 0.808 g/cc

Isotherm

Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]
2.33000e-03	61.4373	9.66260e-02	95.5418	2.20776e-01	104.6241
5.65200e-03	68.9855	1.19936e-01	97.6306	2.44956e-01	105.5550
2.40060e-02	78.7937	1.45640e-01	99.7193	2.71182e-01	107.2103
4.97220e-02	86.2951	1.71408e-01	102.2239	2.96411e-01	108.1974
7.16520e-02	91.3629	1.98933e-01	103.6367		

Multi-Point BET Plot

Multi-Point BET

Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((Po/P) - 1)]	Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((Po/P) - 1)]
4.97220e-02	86.2951	4.8513e-01	1.19936e-01	97.6306	1.1169e+00
7.16520e-02	91.3629	6.7592e-01	1.45640e-01	99.7193	1.3678e+00
9.66260e-02	95.5418	8.9574e-01			

MBET summary

Slope = 9.192
Intercept = 1.926e-02
Correlation coefficient, r = 0.999654
C constant= 478.269
Surface Area = 378.064 m²/g

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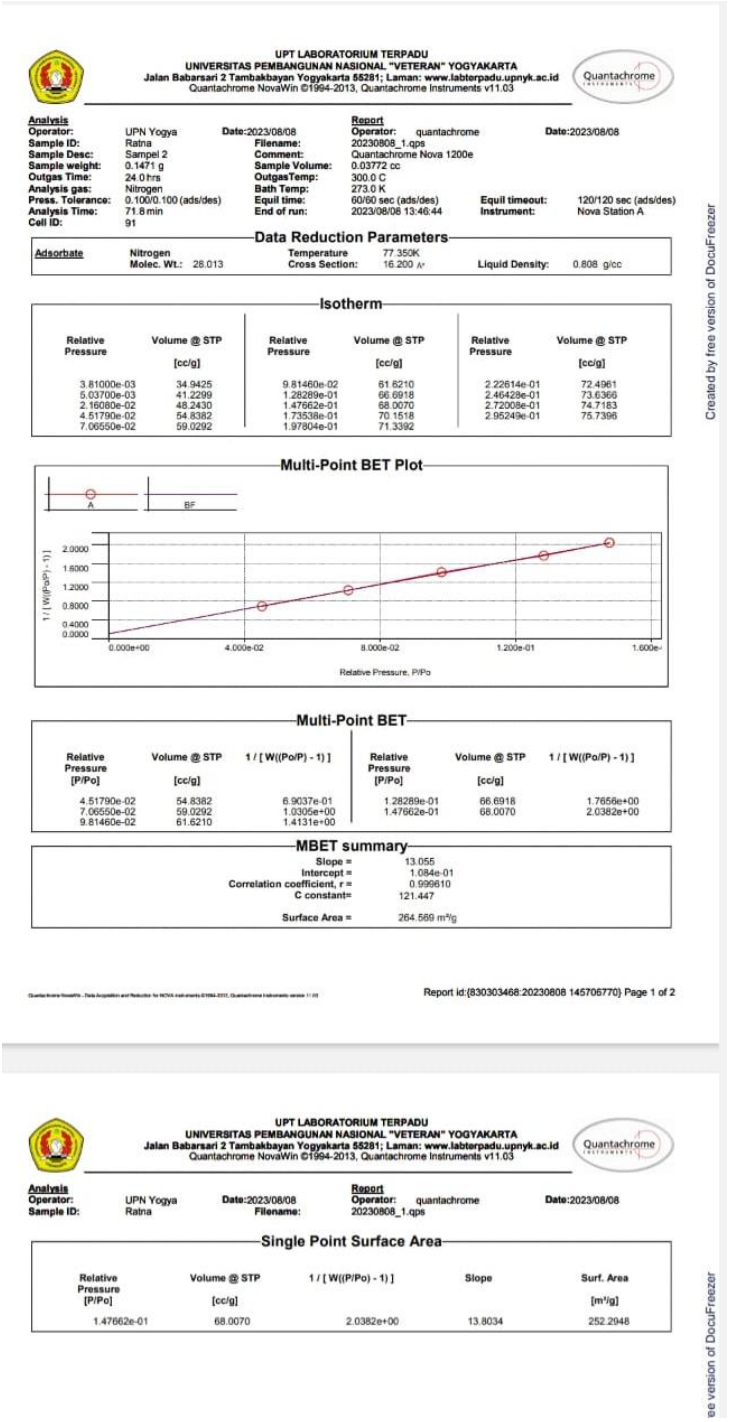
Analysis
Operator: UPN Yogya
Sample ID: Ratna
Date: 2023/08/08
Filename:

Report
Operator: quantachrome
20230808_2.qps
Date: 2023/08/08

Single Point Surface Area

Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((P/Po) - 1)]	Slope	Surf. Area [m²/g]
1.45640e-01	99.7193	1.3678e+00	9.3914	370.8199

Lampiran 4 Hasil Uji Luas Permukaan Karbon Aktif Komersial



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Analysis
Operator: UPN Yogya
Sample ID: Ratna
Sample Desc: Sampel 2
Sample weight: 0.1471 g
Outgas Time: 24.0 hrs
Analysis gas: Nitrogen
Press. Tolerance: 0.100/0.100 (ads/des)
Analysis Time: 71.8 min
Cell ID: 91
Date: 2023/08/08

Report
Operator: quantachrome
Filename: 20230808_1.qps
Comment: Quantachrome Nova 1200e
Sample Volume: 0.03772 cc
OutgasTemp: 300.0 C
Bath Temp: 273.0 K
Equil time: 60/60 sec (ads/des)
End of run: 2023/08/08 13:46:44
Date: 2023/08/08
Equil timeout: 120/120 sec (ads/des)
Instrument: Nova Station A

Data Reduction Parameters

Adsorbate: Nitrogen
Molec. Wt.: 28.013
Temperature: 77.350K
Cross Section: 16.200 A²
Liquid Density: 0.808 g/cc

Isotherm

Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]
3.81000e-03	34.9425	9.81460e-02	61.6210	2.22614e-01	72.4961
5.03700e-03	41.2299	1.28289e-01	66.6918	2.46428e-01	73.6366
2.16080e-02	48.2430	1.47662e-01	68.0070	2.72008e-01	74.7183
4.51790e-02	54.8382	1.73538e-01	70.1518	2.95249e-01	75.7396
7.06550e-02	59.0292	1.97804e-01	71.3392		

Multi-Point BET Plot

Multi-Point BET

Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((Po/P) - 1)]	Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((Po/P) - 1)]
4.51790e-02	54.8382	6.9037e-01	1.28289e-01	66.6918	1.7656e+00
7.06550e-02	59.0292	1.0305e+00	1.47662e-01	68.0070	2.0382e+00
9.81460e-02	61.6210	1.4131e+00			

MBET summary

Slope = 13.055
Intercept = 1.084e-01
Correlation coefficient, r = 0.999610
C constant= 121.447
Surface Area = 264.569 m²/g

Report id:{830303468:20230808 145706770} Page 1 of 2

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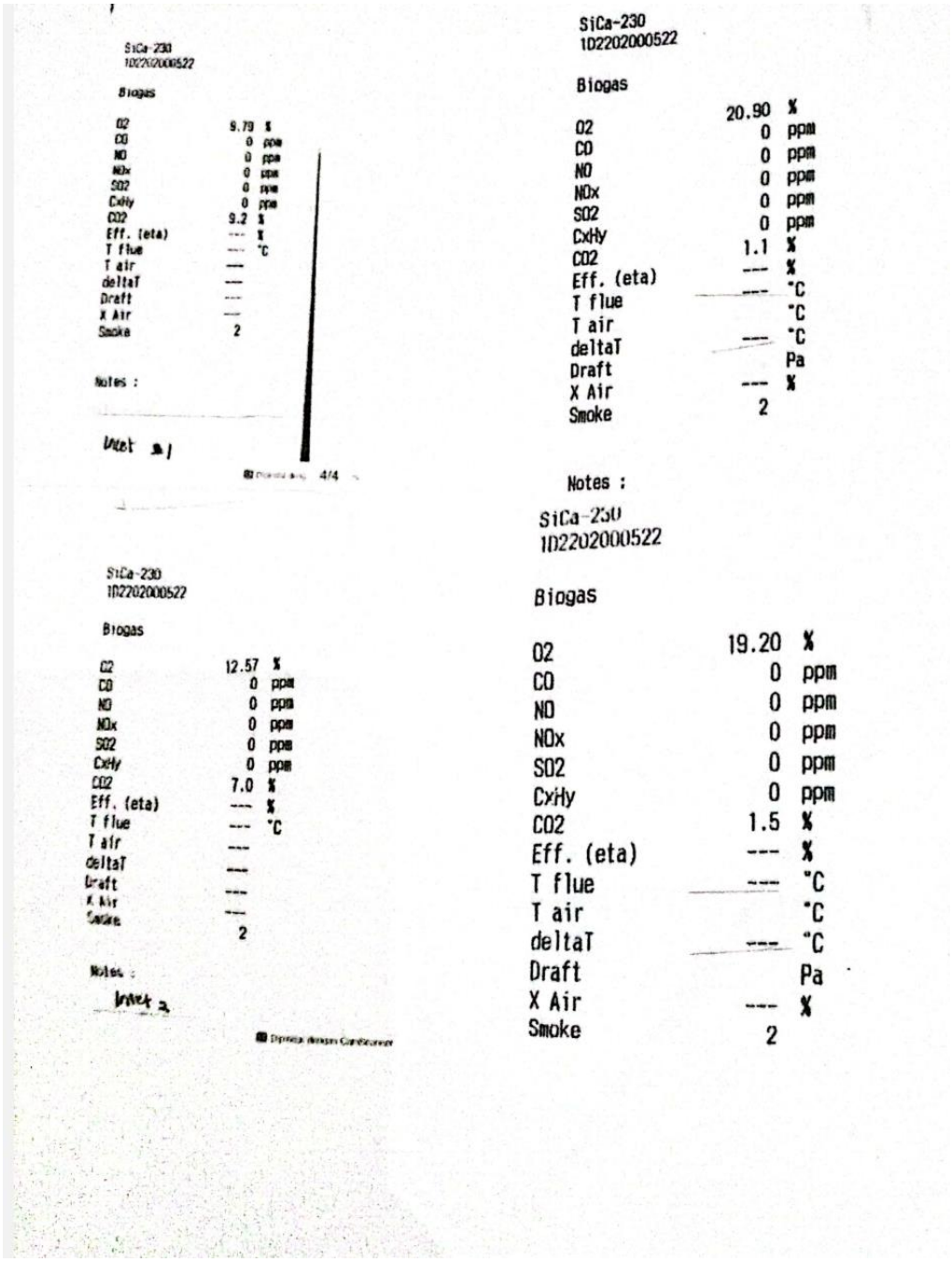
Analysis
Operator: UPN Yogya
Sample ID: Ratna
Date: 2023/08/08

Report
Operator: quantachrome
Filename: 20230808_1.qps
Date: 2023/08/08

Single Point Surface Area

Relative Pressure [P/Po]	Volume @ STP [cc/g]	1 / [W((P/Po) - 1)]	Slope	Surf. Area [m²/g]
1.47662e-01	68.0070	2.0382e+00	13.8034	252.2948

Lampiran 5 Penjerapan CO_2



SiCa-230
1D2202000522

Biogas

O2	9.79 %
CO	0 ppm
NO	0 ppm
NOx	0 ppm
SO2	0 ppm
CxHy	0 ppm
CO2	9.2 %
Eff. (eta)	--- %
T flue	--- °C
T air	---
deltaT	---
Draft	---
X Air	---
Smoke	2

Notes :

SiCa-230
1D2202000522

Biogas

O2	20.90 %
CO	0 ppm
NO	0 ppm
NOx	0 ppm
SO2	0 ppm
CxHy	1.1 %
CO2	--- %
Eff. (eta)	--- °C
T flue	°C
T air	--- °C
deltaT	Pa
Draft	--- %
X Air	2
Smoke	

Notes :

SiCa-230
1D2202000522

Biogas

O2	12.57 %
CO	0 ppm
NO	0 ppm
NOx	0 ppm
SO2	0 ppm
CxHy	0 ppm
CO2	7.0 %
Eff. (eta)	--- %
T flue	--- °C
T air	---
deltaT	---
Draft	---
X Air	---
Smoke	2

Notes :

SiCa-230
1D2202000522

Biogas

O2	19.20 %
CO	0 ppm
NO	0 ppm
NOx	0 ppm
SO2	0 ppm
CxHy	0 ppm
CO2	1.5 %
Eff. (eta)	--- %
T flue	--- °C
T air	°C
deltaT	--- °C
Draft	Pa
X Air	--- %
Smoke	2