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Lampiran 1. Preparasi Sampel

Tongkol Jagung

↓

- Dipotong
- Dicuci
- Dikeringkan dibawah sinar matahari

↓

Sampel tongkol jagung kering

Lampiran 2. Proses Karbonisasi

Sampel tongkol jagung kering

↓

- Dikarbonisasi pada suhu 500° C selama 2 jam
- Didinginkan
- Dihaluskan
- Diayak menggunakan ayakan 200 mesh

↓

Serbuk karbon 200 mesh

Lampiran 3. Sintesis GO

Serbuk Karbon 200 mesh

- Diambil sebanyak 5 g
- Dilarutkan kedalam 100 mL H_2SO_4 98%
- Diaduk selama 2 jam pada rentang suhu 0-20^o C
- Ditambahkan 15 g $KMnO_4$ sedikit demi sedikit pada kisaran suhu 5-10^o C
- Diaduk kembali selama 2 jam pada suhu 35^o C
- Ditambahkan 100 mL aquades, dan diaduk selama 1 jam
- Ditambahkan 60 mL H_2O_2 30%
- Disentrifugasi selama 20 menit
- Disaring dan dicuci dengan aquades sampai pH netral

Filtrat | Endapan

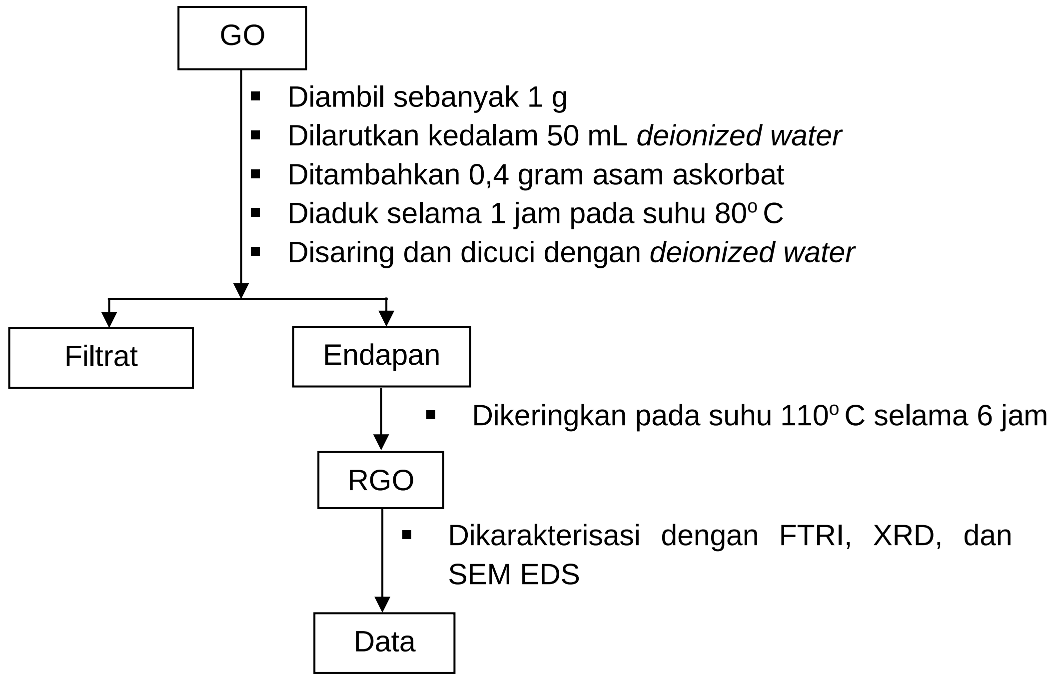
- Dikeringkan pada suhu 110^o C selama 6 jam
- Sampel dimasukan kedalam 100 mL aquades
- Disonikasi selama 2 jam.
- Disaring

Filtrat | Endapan

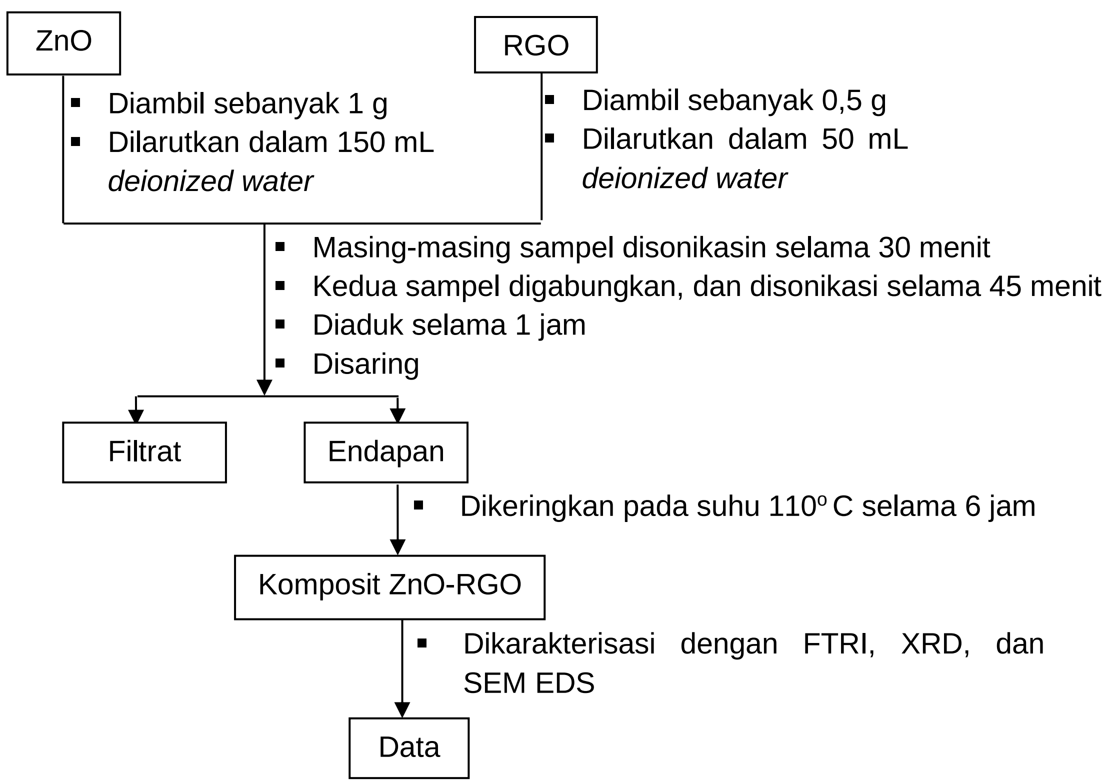
- Dikeringkan pada suhu 110^o C selama 6 jam

GO

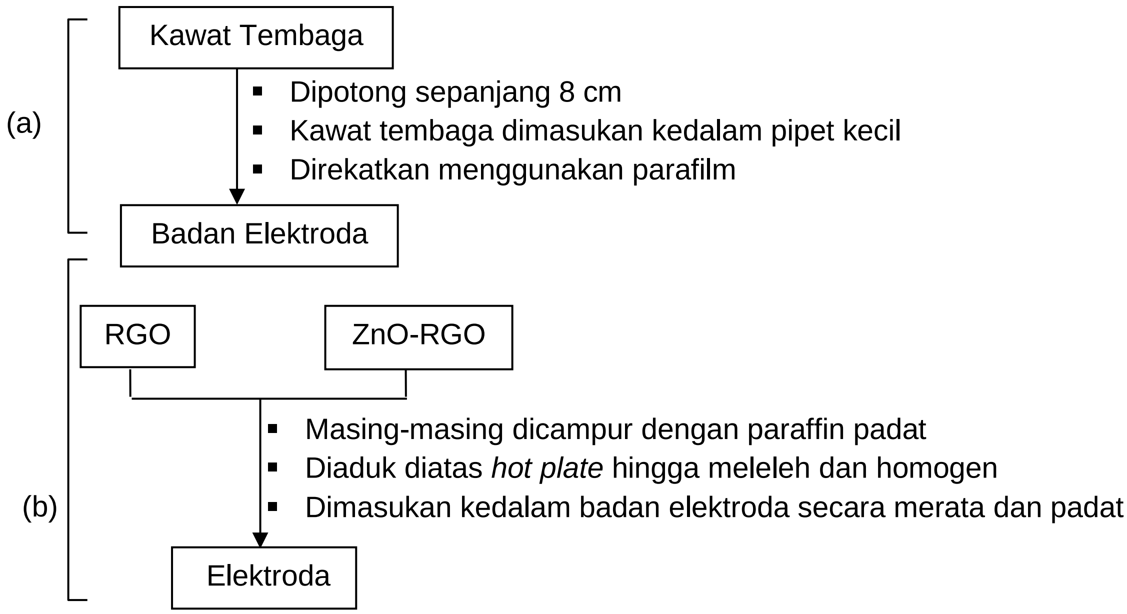
Lampiran 4. Sintesis RGO



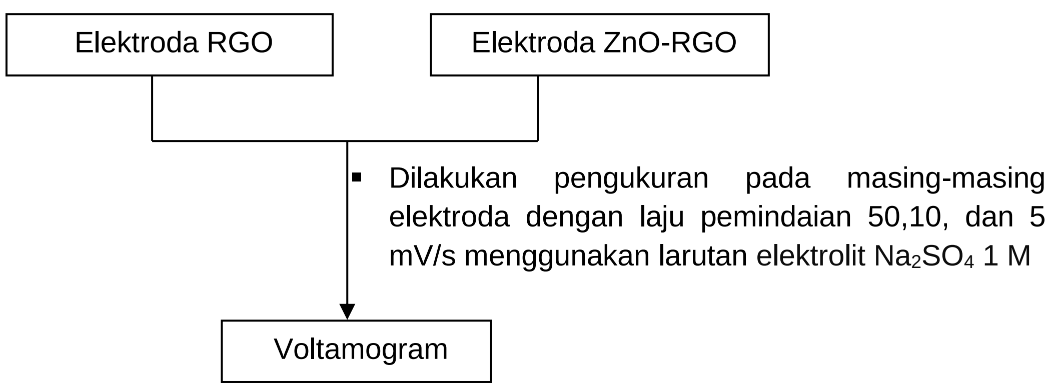
Lampiran 5. Komposit ZnO-RGO



Lampiran 6. Pembuatan Elektroda: (a) Badan Elektroda, dan (b) Pasta Elektroda



Lampiran 7. Pengukuran Elektrokimia



Lampiran 8. Dokumentasi Penelitian

1. Preparasi Sampel

Limbah Tongkol jagung

Proses Pengeringan Sampel

2. Proses Karbonisasi

Karbonisasi

Serbuk Karbon 200 mesh

3. Proses Sintesis RGO

Proses oksida menggunakan H_2SO_4 + $KMnO_4$

Pengadukan pada suhu 35 °C setelah penambahan $KMnO_4$

Penambahan H_2O_2 30%


Setelah disentrifugasi pada 10.000 rpm selama 20 menit


Proses Pencucian dan Penyaringan


Setelah dikeringkan dalam oven


Proses Sonikasi selama 2 jam


Penyaringan


Setelah dikeringkan dalam oven


Proses reduksi menggunakan asam askorbat


Proses Pencucian dan Penyaringan


Setelah dikeringkan dalam oven

4. Komposit ZnO-RGO

Proses Sonikasi
RGO dan ZnO

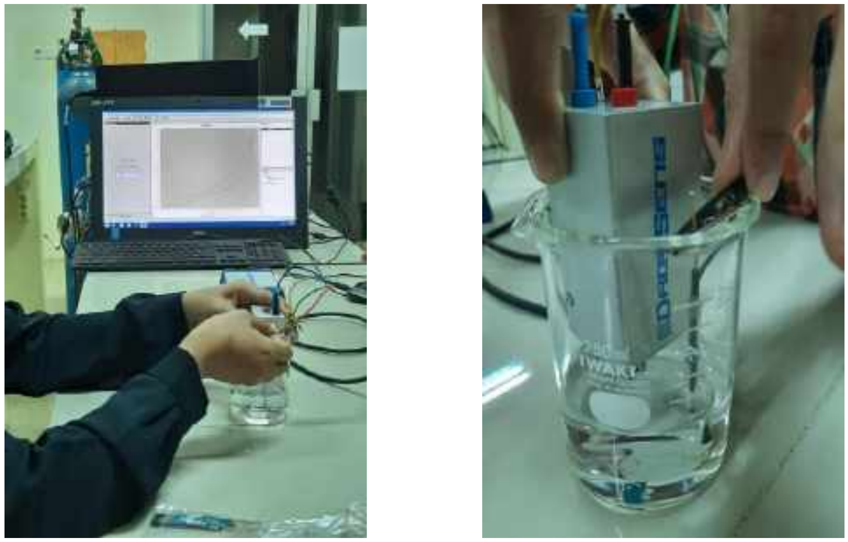
Proses Sonikasi larutan
komposit ZnO-RGO

Pengadukan selama 1 jam

Setelah dikeringkan
dalam oven

5. Elektroda RGO dan Elektroda Komposit

6. Pengukuran Elektrokimia



Pengukuran kapasitansi spesifik dengan metode siklik voltametri menggunakan Potentiostat.

Lampiran 9. Perhitungan Jarak Lapisan RGO

Jarak antar lembaran RGO dapat dihitung dengan persamaan Bragg:

$$\lambda = 2d \sin(\theta)$$

dimana λ adalah panjang gelombang, dimana d adalah jarak antar lapisan, θ adalah setengah dari sudut difraksi.

Diketahui:

λ = 0.154 nm

θ = 23,30°/2

= 11,65°

Ditanya:

Jarak antar lapisan (d)?

Sehingga:

$$d = \frac{\lambda}{2 \sin \theta}$$

$$= \frac{0,154}{2 \sin(11,65°)}$$

$$= \frac{0.154}{2 \times 0,202}$$

d = 0,381 nm

Lampiran 10. Penentuan Kapasitansi Spesifik

$$C_{sp} = \frac{A}{m \times k \times (\Delta V)}$$

Keterangan:

C_{sp} = Kapasitansi Spesifik (F/g)

A = Luas area kurva (Ampere.Volt)

m = Massa material (g)

k = Scan rate (V/s)

ΔV = (V_2-V_1), Tegangan (V)

Sampel GO:

1. Scan rate 50 mV/s

$$C_{sp} = \frac{0{,}00310 \text{ Ampere.Volt}}{0{,}1162 \text{ g} \times 0{,}05 \frac{\text{V}}{\text{s}} \times \left((1)-(-0{,}1)\right) \text{ Volt}}$$

$$= \frac{0{,}00310}{0{,}1162 \times 0{,}05 \times 1{,}1}$$

C_{sp} = 0,4851 F/g

2. Scan rate 10 mV/s

$$C_{sp} = \frac{0{,}00269 \text{ Ampere.Volt}}{0{,}1162 \text{ g} \times 0{,}01 \frac{\text{V}}{\text{s}} \times \left((1)-(-0{,}1)\right) \text{ Volt}}$$

$$= \frac{0{,}00296}{0{,}1162 \times 0{,}01 \times 1{,}1}$$

C_{sp} = 2,1045 F/g

3. Scan rate 5 mV/s

$$C_{sp} = \frac{0{,}00242 \text{ Ampere.Volt}}{0{,}1162 \text{ g} \times 0{,}005 \frac{\text{V}}{\text{s}} \times \left((1)-(-0{,}1)\right) \text{ Volt}}$$

$$= \frac{0{,}00242}{0{,}1162 \times 0{,}005 \times 1{,}1}$$

C_{sp} = 3,7866 F/g

Sampel RGO

1. Scan rate 50 mV/s

$$C_{sp} = \frac{0{,}03997 \text{ Ampere.Volt}}{0{,}1164 \text{ g} \times 0{,}05 \frac{\text{V}}{\text{s}} \times \big((1)-(-0{,}1)\big) \text{ Volt}}$$

$$= \frac{0{,}03997}{0{,}1164 \times 0{,}05 \times 1{,}1}$$

C_{sp} = 6,2433 F/g

2. Scan rate 10 mV/s

$$C_{sp} = \frac{0{,}03367 \text{ Ampere.Volt}}{0{,}1164 \text{ g} \times 0{,}01 \frac{\text{V}}{\text{s}} \times \big((1)-(-0{,}1)\big) \text{ Volt}}$$

$$= \frac{0{,}03367}{0{,}1164 \times 0{,}01 \times 1{,}1}$$

C_{sp} = 26,2964 F/g

3. Scan rate 5 mV/s

$$C_{sp} = \frac{0{,}01834 \text{ Ampere.Volt}}{0{,}1164 \text{ g} \times 0{,}005 \frac{\text{V}}{\text{s}} \times \big((1)-(-0{,}1)\big)\text{Volt}}$$

$$= \frac{0{,}01834}{0{,}1164 \times 0{,}005 \times 1{,}1}$$

C_{sp} = 28,4672 F/g

Sampel komposit ZnO-RGO

1. Scan rate 50 mV/s

$$C_{sp} = \frac{0{,}27595 \text{ Ampere.Volt}}{0{,}1168 \text{ g} \times 0{,}05 \frac{\text{V}}{\text{s}} \times \big((1)-(-0{,}1)\big) \text{ Volt}}$$

$$= \frac{0{,}27595}{0{,}1168 \times 0{,}05 \times 1{,}1}$$

C_{sp} = 42,9561 F/g

2. Scan rate 10 mV/s

$$C_{sp} = \frac{0{,}13817 \text{ Ampere.Volt}}{0{,}1168 \text{ g} \times 0{,}01 \frac{\text{V}}{\text{s}} \times \left((1) - (-0{,}1)\right) \text{Volt}}$$

$$= \frac{0{,}13817}{0{,}1168 \times 0{,}01 \times 1{,}1}$$

C_{sp} = 107,5420 F/g

3. Scan rate 5 mV/s

$$C_{sp} = \frac{0{,}13755 \text{ Ampere.Volt}}{0{,}1168 \times 0{,}005 \times ((1) - (-0{,}1))}$$

$$= \frac{0{,}13755}{0{,}1168 \times 0{,}005 \times 1{,}1}$$

C_{sp} = 214,1189 F/g

Lampiran 11. Penentuan Energi Spesifik

$$E_{sp} = \frac{1}{2} \times Csp \times (\Delta V)^2$$

Keterangan:

E_{sp} = Energi spesifik (Wh/kg)

C_{sp} = Kapasitansi spesifik (F/g)

ΔV = Tegangan (volt)

Sampel GO

1. Scan rate 50 mV/s

$$E_{sp} = \frac{1}{2} \times 0{,}4851 \text{ F/g} \times ((1) - (-0{,}1))^2 \text{ Volt}$$

$$= \frac{1}{2} \times 0{,}4851 \times (1{,}1)^2$$

$$= \frac{1}{2} \times 0{,}586971$$

E_{sp} = 0,2934 Wh/kg

2. Scan rate 10 mV/s

$$E_{sp} = \frac{1}{2} \times 2{,}1045 \text{ F/g} \times ((1) - (-0{,}1))^2 \text{ Volt}$$

$$= \frac{1}{2} \times 2{,}1045 \times (1{,}1)^2$$

$= \frac{1}{2} \times 2{,}546445$

$E_{sp} =$ 1,2732 Wh/kg

3. Scan rate 5 mV/s

$E_{sp} = \frac{1}{2} \times 3{,}7866 \text{ F/g} \times ((1) - (-0{,}1))^2$ Volt

$= \frac{1}{2} \times 3{,}7866 \times (1{,}1)^2$

$= \frac{1}{2} \times 4{,}581786$

$E_{sp} =$ 2,2908 Wh/kg

Sampel RGO

1. Scan rate 50 mV/s

$E_{sp} = \frac{1}{2} \times 6{,}2433 \text{ F/g} \times ((1) - (-0{,}1))^2$ Volt

$= \frac{1}{2} \times 6{,}2433 \times (1{,}1)^2$

$= \frac{1}{2} \times 7{,}554393$

$E_{sp} =$ 3,7771 Wh/kg

2. Scan rate 10 mV/s

$E_{sp} = \frac{1}{2} \times 26{,}2964 \text{ F/g} \times ((1) - (-0{,}1))^2$ Volt

$= \frac{1}{2} \times 26{,}2964 \times (1{,}1)^2$

$= \frac{1}{2} \times 31{,}818644$

$E_{sp} =$ 15,9093 Wh/kg

3. Scan rate 5 mV/s

$E_{sp} = \frac{1}{2} \times 28{,}6472 \text{ F/g} \times ((1) - (-0{,}1))^2$ Volt

$= \frac{1}{2} \times 28{,}6472 \times (1{,}1)^2$

$= \frac{1}{2} \times 34{,}663112$

$E_{sp} =$ 17,3315 Wh/kg

Sampel komposit ZnO-RGO

1. Scan rate 50 mV/s

$E_{sp} = \frac{1}{2} \times 42{,}9561\ \mathrm{F/g} \times ((1) - (-0{,}1))^2$ Volt

$= \frac{1}{2} \times 42{,}9561 \times (1{,}1)^2$

$= \frac{1}{2} \times 51{,}976881$

E_{sp} = 25,9884 Wh/kg

2. Scan rate 10 mV/s

$E_{sp} = \frac{1}{2} \times 107{,}5420\ \mathrm{F/g} \times ((1) - (-0{,}1))^2$ Volt

$= \frac{1}{2} \times 107{,}5420 \times (1{,}1)^2$

$= \frac{1}{2} \times 130{,}12582$

E_{sp} = 65,0629 Wh/kg

3. Scan rate 5 mV/s

$E_{sp} = \frac{1}{2} \times 214{,}1189\ \mathrm{F/g} \times ((1) - (-0{,}1))^2$ Volt

$= \frac{1}{2} \times 214{,}1189 \times (1{,}1)^2$

$= \frac{1}{2} \times 259{,}083869$

E_{sp} = 129,5419 Wh/kg

Lampiran 12. Penentuan Daya Spesifik

$$P_{sp} = \frac{\mathrm{A}}{\mathrm{m}}$$

Keterangan:

P_{sp} = Daya spesifik (kW/kg)
A = Luas area kurva (Ampere.Volt)
M = Massa material (g)

Sampel GO

1. Scan rate 50 mV/s

$$P_{sp} = \frac{0{,}0031\ \mathrm{Ampere.Volt}}{0{,}1162\ \mathrm{g}}$$

= 0,0266 kW/kg

2. Scan rate 10 mV/s

$$P_{sp} = \frac{0{,}00269 \text{ Ampere.Volt}}{0{,}1162 \text{ g}}$$

= 0,0231 kW/kg

3. Scan rate 5 mV/s

$$P_{sp} = \frac{0{,}00242 \text{ Ampere.Volt}}{0{,}1162 \text{ g}}$$

= 0,0208 kW/kg

Sampel RGO

1. Scan rate 50 mV/s

$$P_{sp} = \frac{0{,}03997 \text{ Ampere.Volt}}{0{,}1164 \text{ g}}$$

= 0,3433 kW/kg

2. Scan rate 10 mV/s

$$P_{sp} = \frac{0{,}03367 \text{ Ampere.Volt}}{0{,}1164 \text{ g}}$$

= 0,2892 kW/kg

3. Scan rate 5 mV/s

$$P_{sp} = \frac{0{,}01834 \text{ Ampere.Volt}}{0{,}1162 \text{ g}}$$

= 0,1575 kW/kg

Sampel ZnO-RGO

1. Scan rate 50 mV/s

$$P_{sp} = \frac{0{,}27595 \text{ Ampere.Volt}}{0{,}1168 \text{ g}}$$

= 2,3625 kW/kg

2. Scan rate 10 mV/s

$$P_{sp} = \frac{0{,}13817 \text{ Ampere.Volt}}{0{,}1164 \text{ g}}$$

= 1,1829 kW/kg

3. Scan rate 5 mV/s

$$P_{sp} = \frac{0{,}13755 \text{ Ampere.Volt}}{0{,}1164 \text{ g}}$$

= 1,1776 kW/kg

Lampiran 13. Hasil Analisis FTIR

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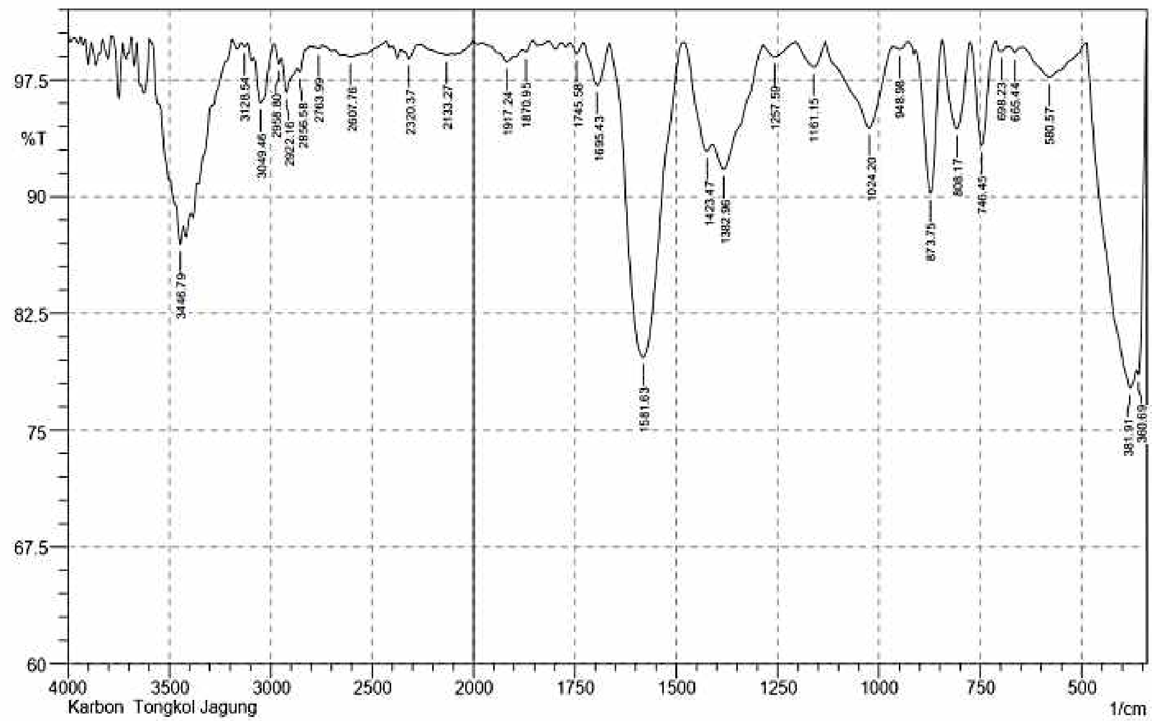

No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	360.69	78.57	3.876	364.55	343.33	1.483	0.425
2	381.91	77.705	3.786	487.99	366.48	8.681	2.266
3	580.57	97.674	2.04	648.08	489.92	0.957	0.774
4	665.44	99.236	0.402	680.87	648.08	0.073	0.021
5	698.23	99.33	0.514	711.73	680.87	0.064	0.041
6	746.45	93.293	6.651	775.38	711.73	0.875	0.86
7	808.17	94.362	5.586	842.89	777.31	1.026	1.012
8	873.75	90.225	9.518	908.47	844.82	1.443	1.366
9	948.98	99.465	0.307	966.34	927.76	0.062	0.026
10	1024.2	94.417	5.322	1132.21	968.27	2.16	2.008
11	1161.15	98.322	1.614	1203.58	1132.21	0.313	0.293
12	1257.59	98.987	0.806	1286.52	1203.58	0.215	0.151
13	1382.96	91.761	2.969	1409.96	1286.52	2.831	0.934
14	1423.47	92.93	1.529	1479.4	1411.89	1.372	0.323
15	1581.63	79.694	20.175	1664.57	1481.33	8.771	8.669
16	1695.43	97.145	2.726	1730.15	1664.57	0.454	0.418
17	1745.58	99.201	0.693	1762.94	1730.15	0.064	0.049
18	1870.95	99.302	0.314	1878.67	1853.59	0.045	0.016
19	1917.24	98.659	0.654	1938.46	1878.67	0.258	0.086
20	2133.27	99.102	0.187	2260.57	2106.27	0.444	0.095
21	2320.37	98.876	0.551	2339.65	2260.57	0.225	0.068
22	2607.76	98.981	0.129	2638.62	2574.97	0.267	0.02
23	2763.99	99.517	0.118	2775.57	2744.71	0.055	0.009
24	2856.58	98.014	0.6	2870.08	2827.64	0.261	0.046
25	2922.16	96.711	1.964	2947.23	2870.08	0.794	0.306
26	2958.8	98.524	0.658	2983.88	2947.23	0.15	0.045
27	3049.46	96.035	3.195	3084.18	2985.81	1.027	0.755
28	3128.54	99.641	0.22	3142.04	3115.04	0.031	0.014
29	3446.79	86.946	1.785	3496.94	3433.29	3.262	0.208

Comment;

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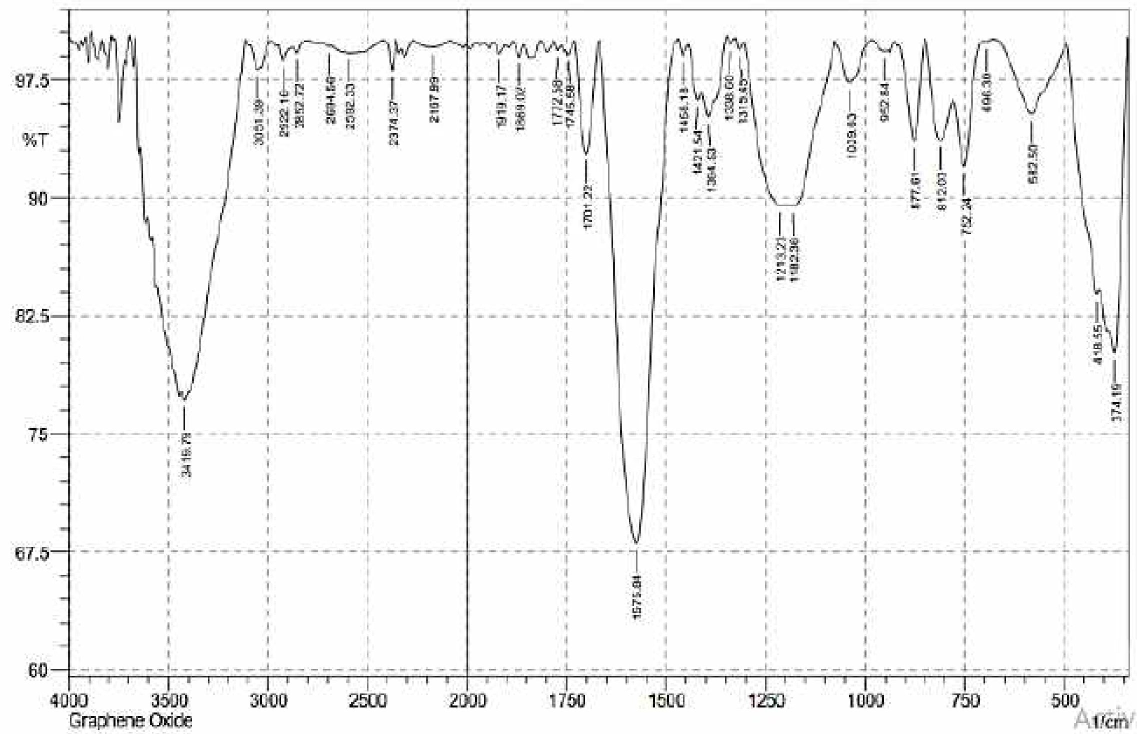


No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	374.19	80.155	6.808	387.69	343.33	2.874	0.932
2	418.55	83.873	0.974	493.78	414.7	3.522	0.436
3	582.5	95.326	4.58	677.01	495.71	1.644	1.774
4	696.3	99.908	0.054	702.09	677.01	0.002	0.002
5	752.24	92.001	5.504	779.24	704.02	1.379	0.757
6	812.03	93.669	4.25	848.68	781.17	1.365	0.776
7	877.61	93.602	6.347	916.19	850.61	0.937	0.913
8	952.84	99.308	0.197	983.7	943.19	0.077	0.021
9	1039.63	97.3	2.666	1076.28	983.7	0.548	0.539
10	1182.36	89.458	1.564	1199.72	1076.28	3.677	0.749
11	1213.23	89.509	1.217	1303.88	1201.65	3.498	0.965
12	1315.45	99.423	0.543	1327.03	1303.88	0.033	0.03
13	1338.6	99.747	0.396	1348.24	1330.88	0.004	0.016
14	1394.53	95.151	2.402	1409.96	1348.24	0.866	0.443
15	1421.54	96.206	1.472	1444.68	1409.96	0.393	0.116
16	1458.18	98.992	0.927	1469.76	1444.68	0.059	0.049
17	1575.84	68.078	31.935	1666.5	1469.76	16.158	16.174
18	1701.22	92.816	7.168	1730.15	1668.43	1.087	1.083
19	1745.58	99.105	0.49	1755.22	1730.15	0.061	0.025
20	1772.58	99.373	0.448	1782.23	1762.94	0.032	0.017
21	1869.02	98.963	0.853	1884.45	1857.45	0.064	0.044
22	1919.17	99.176	0.619	1932.67	1903.74	0.065	0.038
23	2187.99	99.56	0.451	2272.15	2085.05	0.227	0.234
24	2374.37	98.091	1.951	2420.66	2357.01	0.178	0.188
25	2592.33	99.194	0.042	2681.05	2584.61	0.273	0.035
26	2694.56	99.611	0.092	2719.63	2681.05	0.055	0.007
27	2852.72	99.212	0.462	2873.94	2806.43	0.106	0.035
28	2922.16	98.67	0.968	2949.16	2873.94	0.249	0.123
29	3051.39	98.165	1.614	3089.96	2983.88	0.472	0.387
30	3419.79	77.165	1.464	3433.29	3116.97	20.578	3.324

Comment;

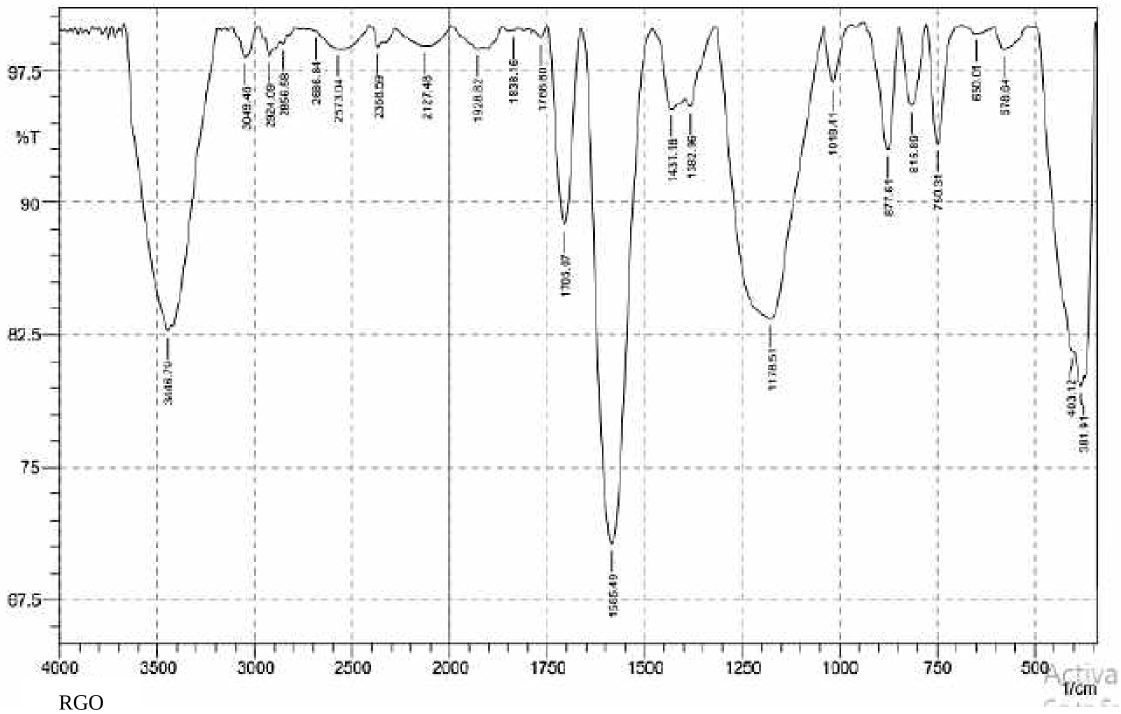
Graphene Oxide

Date/Time; 3/24/2023 9:58:39 AM

No. of Scans;

Resolution;

SHIMADZU



RGO

No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	381.91	79.59	1.429	505.35	376.12	7.133	1.013
2	403.12	81.615	0.341	505.35	401.19	4.666	0.067
3	578.64	98.653	1.306	605.65	516.92	0.306	0.297
4	650.01	99.559	0.005	651.94	636.51	0.029	0.001
5	750.31	93.315	6.739	777.31	688.59	0.992	1.01
6	815.89	95.506	4.47	846.75	777.31	0.779	0.775
7	877.61	92.965	6.843	925.83	848.68	1.247	1.175
8	1018.41	96.778	3.211	1041.56	972.12	0.441	0.444
9	1178.51	83.425	16.396	1315.45	1043.49	13.097	12.685
10	1382.96	95.441	1.132	1396.46	1317.38	0.807	0.072
11	1431.18	95.285	2.188	1479.4	1398.39	1.122	0.344
12	1585.49	70.69	28.144	1664.57	1481.33	12.611	12.478
13	1705.07	88.762	11.186	1749.44	1666.5	2.337	2.314
14	1766.8	99.327	0.558	1784.15	1749.44	0.06	0.043
15	1838.16	99.726	0.044	1842.02	1824.66	0.017	0.002
16	1928.82	98.711	0.268	1998.25	1917.24	0.273	0.067
17	2127.48	98.852	1.101	2279.86	1998.25	0.962	0.894
18	2368.59	98.81	0.561	2411.02	2349.3	0.166	0.047
19	2573.04	98.714	0.052	2681.05	2567.25	0.46	0.063
20	2686.84	99.685	0.026	2719.63	2681.05	0.043	0.004
21	2856.58	98.98	0.253	2870.08	2833.43	0.133	0.019
22	2924.09	98.306	0.921	2951.09	2870.08	0.439	0.152
23	3049.46	98.231	1.363	3088.03	2983.88	0.481	0.331
24	3446.79	82.724	1.447	3670.54	3431.36	12.243	2.603

Comment;

RGO

Date/Time; 4/17/2023 10:58:13 AM

No. of Scans;

Resolution;

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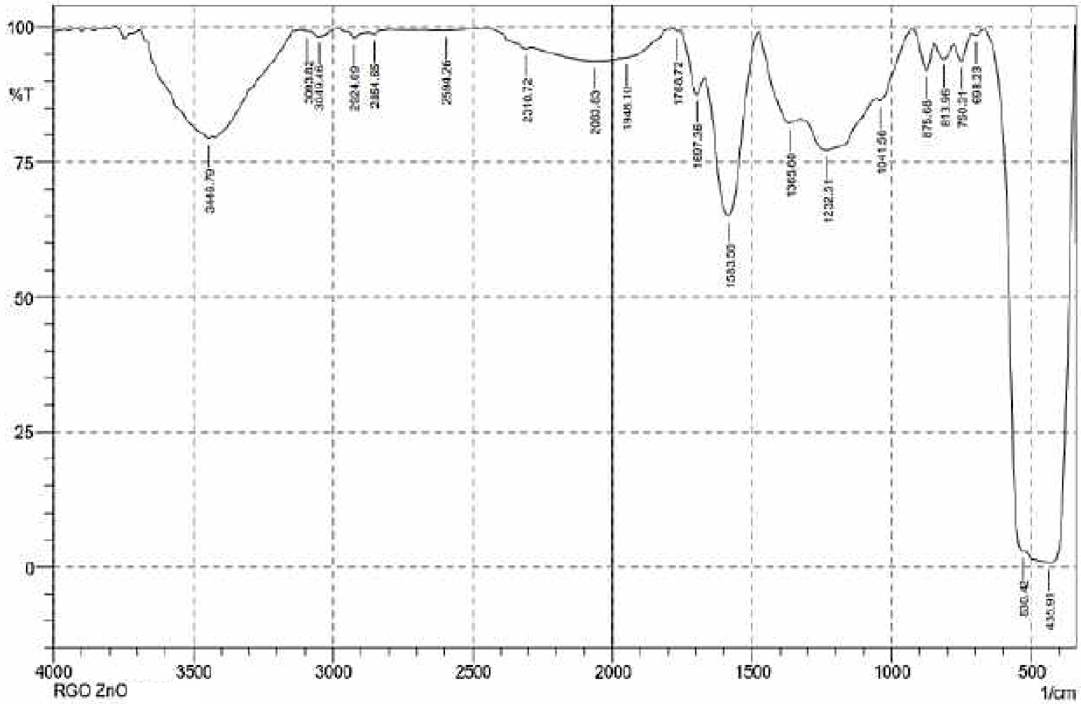
SHIMADZU

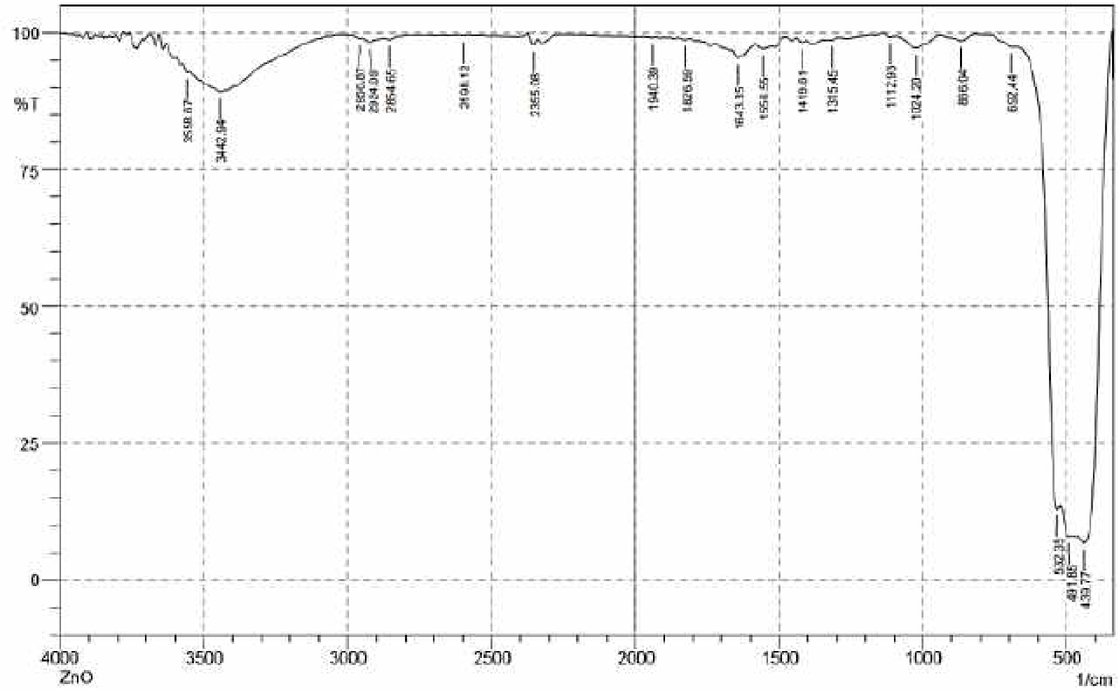


No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	435.91	0.811	48.92	524.64	345.26	260.971	125.081
2	530.42	2.98	2.715	665.44	526.57	61.344	1.258
3	698.23	98.383	0.6	711.73	667.37	0.217	0.053
4	750.31	93.719	3.819	777.31	711.73	1.197	0.546
5	813.96	94.06	2.748	846.75	779.24	1.442	0.489
6	875.68	91.963	5.871	925.83	848.68	1.565	0.959
7	1041.56	86.386	1.642	1055.06	927.76	4.411	0.515
8	1232.51	77.183	7.063	1327.03	1056.99	25.388	6.045
9	1365.6	82.181	4.778	1475.54	1328.95	8.849	2.504
10	1583.56	65.043	29.211	1668.43	1477.47	19.671	15.131
11	1697.36	87.537	5.619	1759.08	1670.35	3.111	1.026
12	1768.72	99.209	0.192	1780.3	1761.01	0.057	0.009
13	1948.1	94.323	0.137	1951.96	1805.37	2.359	0.374
14	2063.83	93.682	0.174	2287.58	2050.33	5.687	0.353
15	2310.72	96.002	0.735	2447.67	2289.5	1.578	0.245
16	2594.26	99.301	0.19	2634.76	2447.67	0.385	0.122
17	2854.65	98.603	0.493	2873.94	2794.85	0.299	0.036
18	2924.09	97.959	1.121	2949.16	2873.94	0.458	0.146
19	3049.46	98.261	1.113	3086.11	2983.88	0.515	0.266
20	3093.82	99.172	0.107	3115.04	3086.11	0.09	0.007
21	3446.79	79.344	1.351	3691.75	3433.29	16.032	2.823

Comment;
RGO ZnO

Date/Time; 12/4/2023 11:24:45 AM
No. of Scans;
Resolution;

SHIMADZU



No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	439.77	6.826	19.254	462.92	345.26	73.773	14.26
2	491.85	8.024	1.453	520.78	482.2	39.459	1.501
3	532.35	13.036	5.712	680.87	522.71	36.774	1.132
4	692.44	97.49	0.303	758.02	682.8	0.54	0.072
5	866.04	98.619	1.09	941.26	813.96	0.455	0.279
6	1024.2	97.235	2.241	1093.64	941.26	1.066	0.722
7	1112.93	99.339	0.316	1141.86	1093.64	0.096	0.035
8	1315.45	98.731	0.232	1327.03	1294.24	0.154	0.013
9	1419.61	98.241	0.551	1440.83	1406.11	0.223	0.048
10	1556.55	97.06	0.421	1585.49	1544.98	0.458	0.03
11	1643.35	95.443	1.683	1662.64	1587.42	1.19	0.32
12	1826.59	98.792	0.273	1853.59	1811.16	0.201	0.031
13	1940.39	99.19	0.115	1955.82	1928.82	0.067	0.005
14	2355.08	97.824	1.555	2374.37	2339.65	0.2	0.114
15	2598.12	99.535	0.005	2630.91	2586.54	0.089	0.001
16	2854.65	98.821	0.293	2872.01	2769.07	0.272	0.011
17	2924.09	98.261	0.751	2951.09	2872.01	0.439	0.097
18	2956.87	99	0.079	3014.74	2951.09	0.171	-0.01
19	3442.94	89.281	0.659	3550.95	3427.51	5.253	0.278
20	3558.67	92.778	0.454	3576.02	3552.88	0.679	0.017

Comment;

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Date/Time; 12/4/2023 11:14:22 AM

No. of Scans;

Resolution;

Apodization;

Activ
Go to

Lampiran 14. Hasil Analisis XRD

a. Karbon Tongkol Jagung

Peak List

No.	2theta [°]	d [Å]	I/I0 (peak height)	Counts (peak area)	FWHM	Matched
1	17.82	4.9734	186.68	508.59	5.2800	
2	20.62	4.3040	197.22	651.28	6.4000	
3	22.84	3.8904	201.68	878.31	8.4400	
4	25.68	3.4662	298.00	43.11	0.2400	
5	28.38	3.1423	195.11	56.38	0.5600	
6	33.28	2.6900	201.68	14.04	0.1350	
7	38.06	2.3624	252.04	36.41	0.2800	
8	40.56	2.2224	129.66	28.11	0.4202	
9	44.30	2.0431	1000.00	123.84	0.2400	A
10	50.28	1.8132	62.44	8.00	0.2481	
11	64.62	1.4412	393.25	40.58	0.2000	
12	77.68	1.2283	304.47	31.42	0.2000	

Integrated Profile Areas

Based on calculated profile

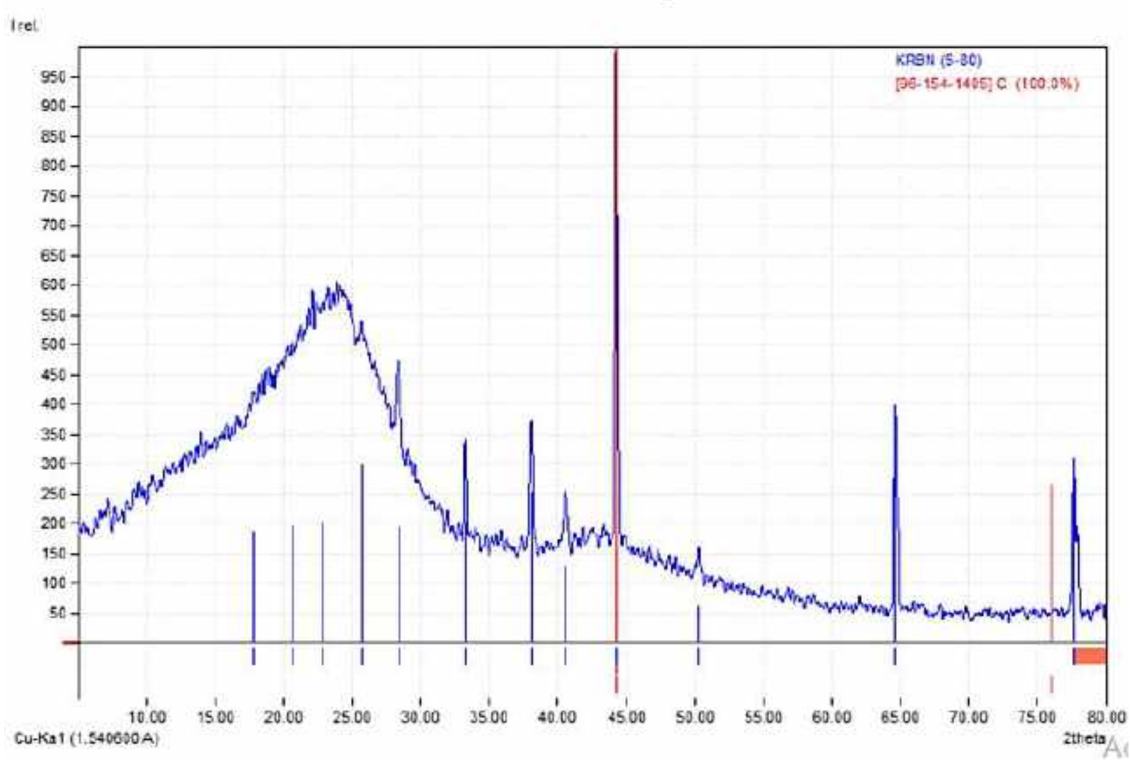
Profile area	*Counts*	*Amount*
Overall diffraction profile	350854	100.00%
Background radiation	245580	69.99%
Diffraction peaks	105274	30.01%
Peak area belonging to selected phases	7226	2.06%
Peak area of phase A (C)	*7226*	*2.06%*
Unidentified peak area	98049	27.95%

Peak Residuals

Peak data	*Counts*	*Amount*
Overall peak intensity	2420	100.00%
Peak intensity belonging to selected phases	124	5.12%
Unidentified peak intensity	2296	94.88%

Activate W

Diffraction Pattern Graphics



b. RGO

Match! Phase Analysis Report

Sample: RGO (5-70)

Sample Data	
File name	RGO.RAW
File path	C:/Users/TAMBANG/Documents/XRD KIMIA 120922/RGO
Data collected	Sep 16, 2022 17:21:55
Data range	5.000° - 80.000°
Original data range	5.000° - 80.000°
Number of points	3751
Step size	0.020
Rietveld refinement converged	No
Alpha2 subtracted	No
Background subtr.	No
Data smoothed	Yes
Radiation	X-rays
Wavelength	1.540600 Å

Peak List

No.	*2theta [°]*	*d [Å]*	*I/I0*	*FWHM*
1	23.30	3.8146	716.79	0.2400
2	27.78	3.2088	484.67	1.3256
3	38.02	2.3648	303.04	0.4122
4	44.24	2.0457	1000.00	0.2604
5	64.64	1.4408	835.07	0.3042
6	77.72	1.2277	798.69	0.4097

Integrated Profile Areas

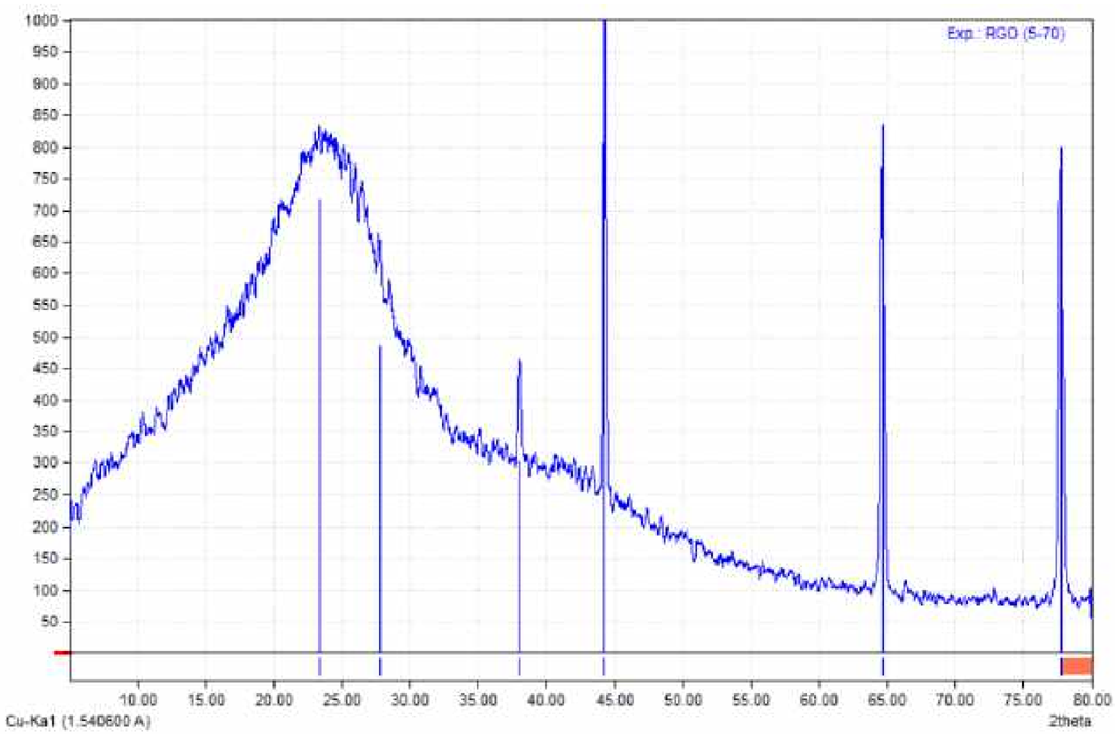
Based on calculated profile

Profile area	*Counts*	*Amount*
Overall diffraction profile	439492	100.00%
Background radiation	243864	55.49%
Diffraction peaks	195628	44.51%
Peak area belonging to selected phases	0	0.00%
Unidentified peak area	195628	44.51%

Peak Residuals

Peak data	*Counts*	*Amount*
Overall peak intensity	735	100.00%
Peak intensity belonging to selected phases	457	62.16%
Unidentified peak intensity	278	37.84%

Diffraction Pattern Graphics



c. ZnO-RGO

Peak List

No.	2theta [°]	d [Å]	I/I0	FWHM	Matched
1	31.77	2.8142	547.95	0.2422	A
2	34.46	2.6005	412.68	0.2309	A
3	36.28	2.4741	1000.00	0.2294	A
4	47.57	1.9099	230.48	0.2434	A
5	56.62	1.6242	341.04	0.2628	A
6	56.76	1.6206	187.10	0.9376	
7	62.86	1.4773	282.95	0.2651	A
8	63.10	1.4722	48.36	0.2400	
9	66.31	1.4084	33.73	0.4400	A
10	67.94	1.3785	235.14	0.2686	A
11	68.18	1.3743	52.01	0.2400	
12	69.05	1.3592	114.21	0.2574	A
13	69.34	1.3541	29.67	0.2400	

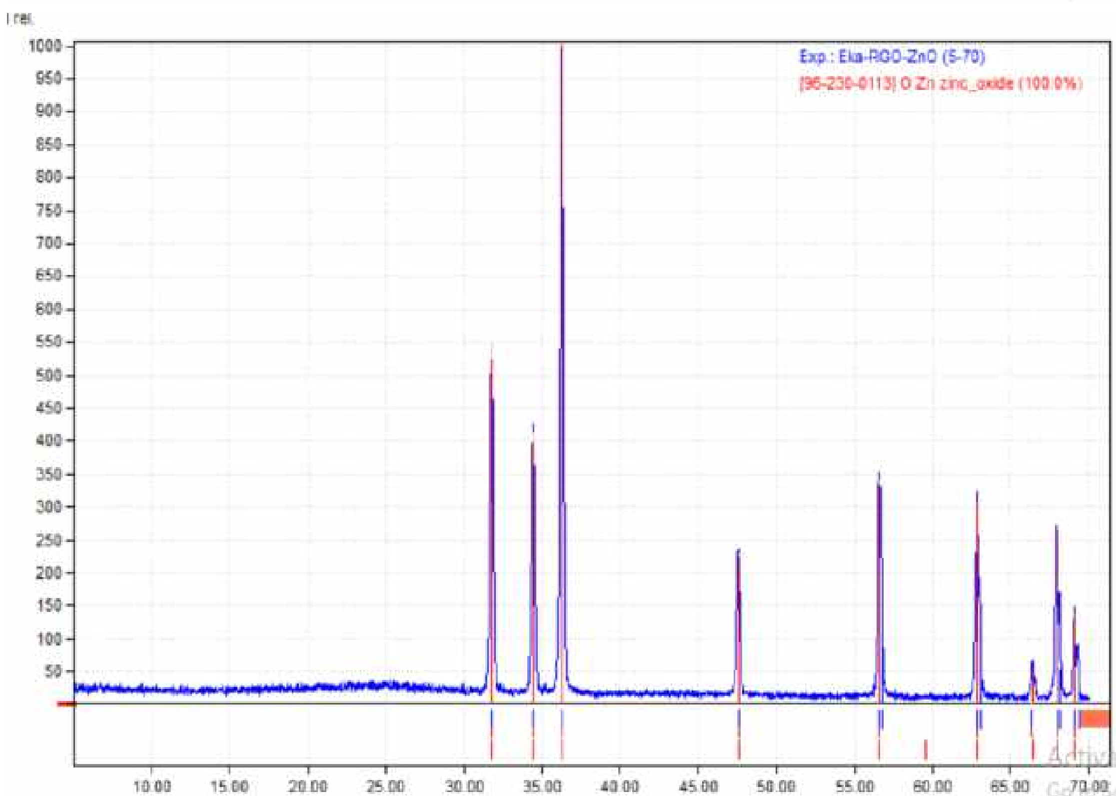
Integrated Profile Areas

Based on calculated profile

Profile area	*Counts*	*Amount*
Overall diffraction profile	274852	100.00%
Background radiation	119160	43.35%
Diffraction peaks	155692	56.65%
Peak area belonging to selected phases	113152	41.17%
Peak area of phase A (zinc_oxide)	*113152*	*41.17%*
Unidentified peak area	42540	15.48%

Peak Residuals

Peak data	*Counts*	*Amount*
Overall peak intensity	3348	100.00%
Peak intensity belonging to selected phases	3138	93.71%
Unidentified peak intensity	211	6.29%



d. ZnO

No.	2theta [°]	d [Å]	I/I0	FWHM	Matched
1	31.82	2.8100	565.30	0.2327	A
2	34.47	2.5997	390.91	0.2242	A
3	36.32	2.4715	1000.00	0.2235	A
4	47.62	1.9081	224.54	0.2323	A
5	56.67	1.6230	350.01	0.2505	A
6	62.93	1.4758	274.25	0.2656	A
7	63.14	1.4713	31.47	0.2400	
8	66.29	1.4088	22.27	0.9715	A
9	68.00	1.3776	254.74	0.2383	A
10	68.24	1.3733	53.87	0.2400	
11	69.10	1.3582	126.10	0.2258	A
12	69.38	1.3535	31.31	0.2400	

Integrated Profile Areas

Based on calculated profile

Profile area	*Counts*	*Amount*
Overall diffraction profile	235196	100.00%
Background radiation	42814	18.20%
Diffraction peaks	192382	81.80%
Peak area belonging to selected phases	147798	62.84%
Peak area of phase A (zinc_oxide)	*147798*	*62.84%*
Unidentified peak area	44584	18.96%

Peak Residuals

Peak data	*Counts*	*Amount*
Overall peak intensity	4133	100.00%
Peak intensity belonging to selected phases	4078	98.67%
Unidentified peak intensity	55	1.33%

Acti
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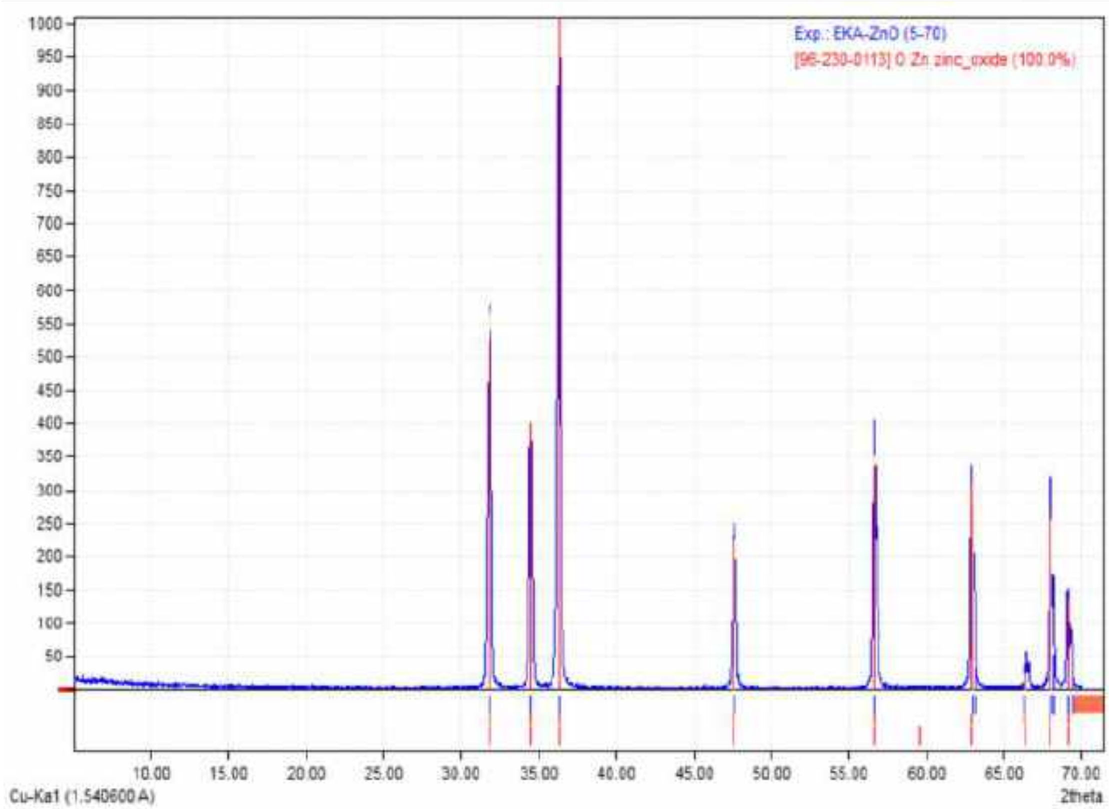
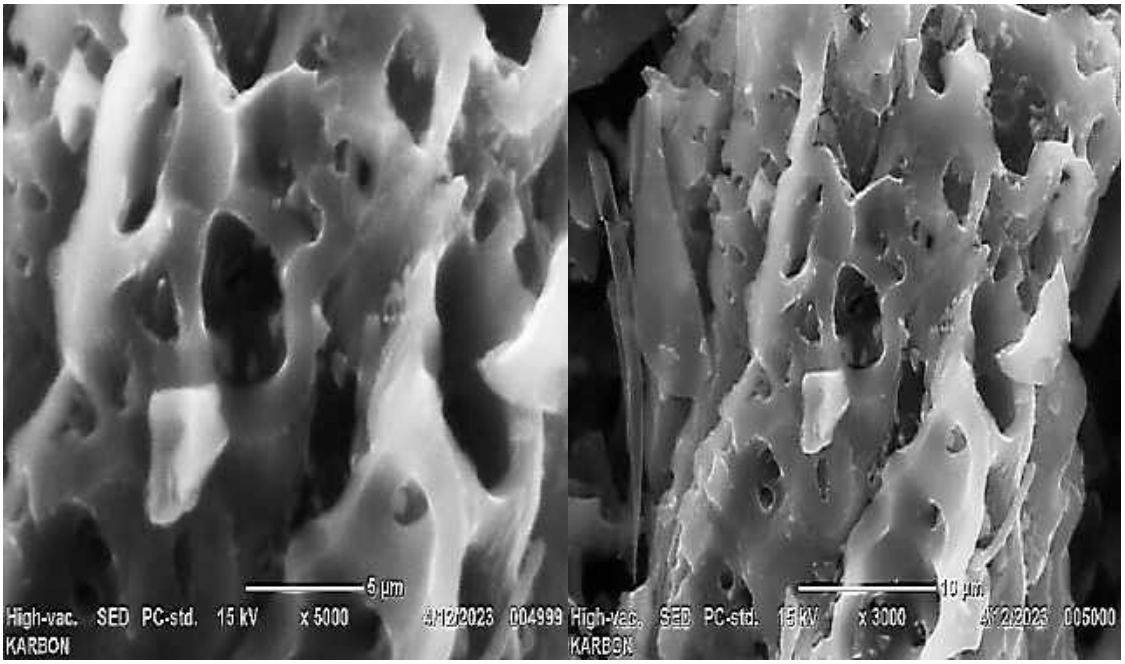
Diffraction Pattern Graphics

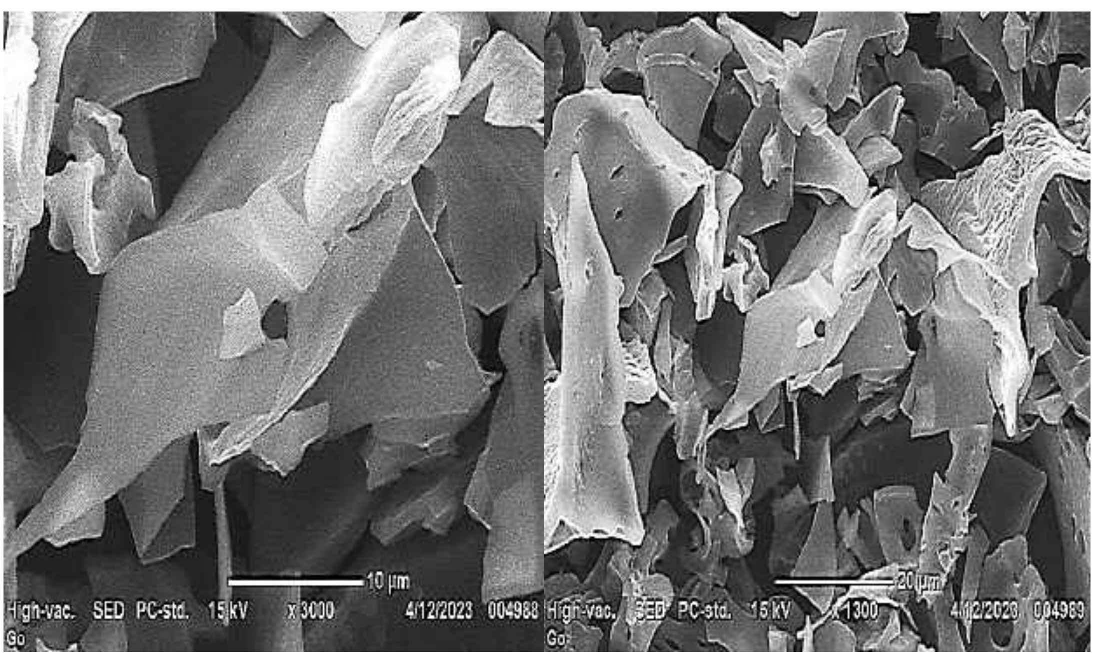


Lampiran 15. Hasil Analisis SEM

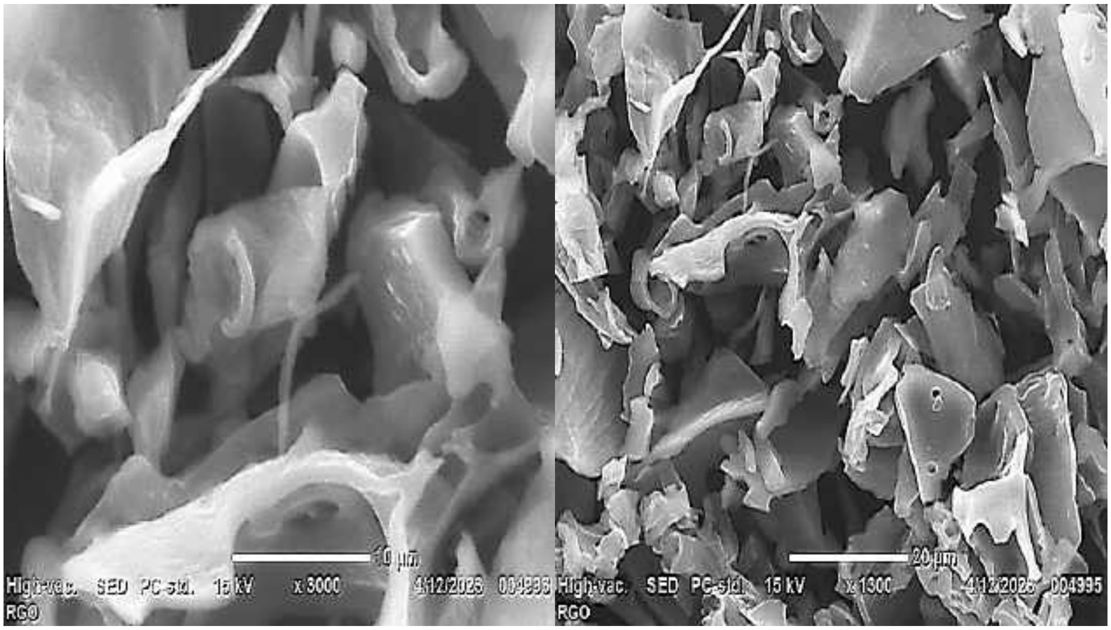
a) Karbon tongkol jagung



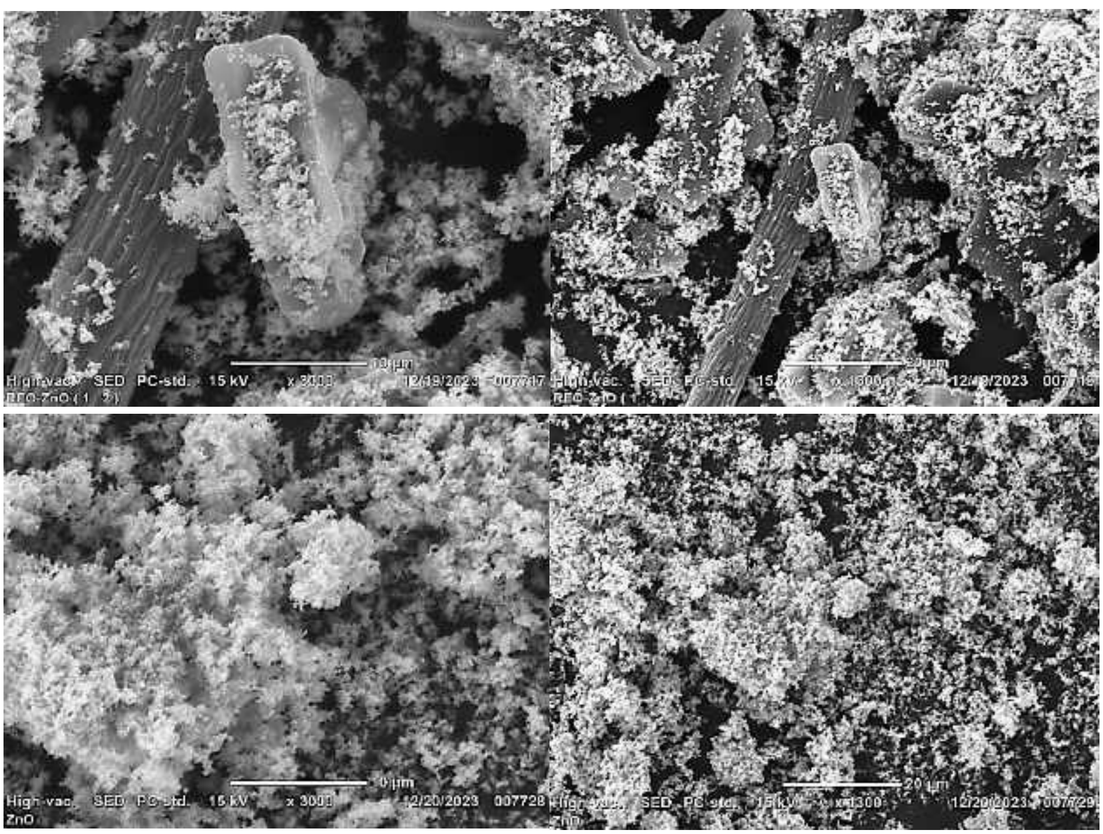
b) GO



c) RGO



d) ZnO-RGO dan ZnO



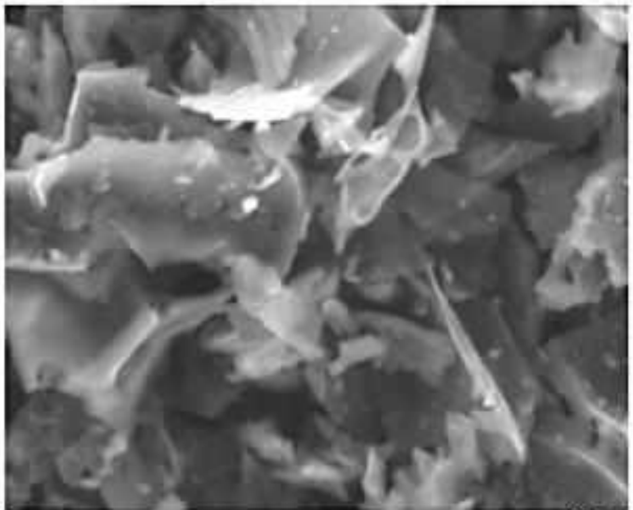
Lampiran 16. Hasil analisis EDS

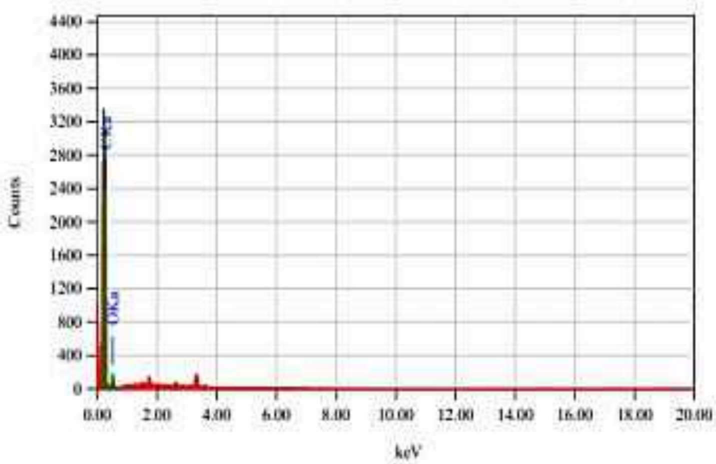
a) Karbon tongkol jagung

View002

JEOL 1/1

Title	: IMG1
Instrument	: JCM-6000PLUS
Volt	: 15.00 kV
Mag.	: x 1,500
Date	: 2023/04/12
Pixel	: 512 x 384





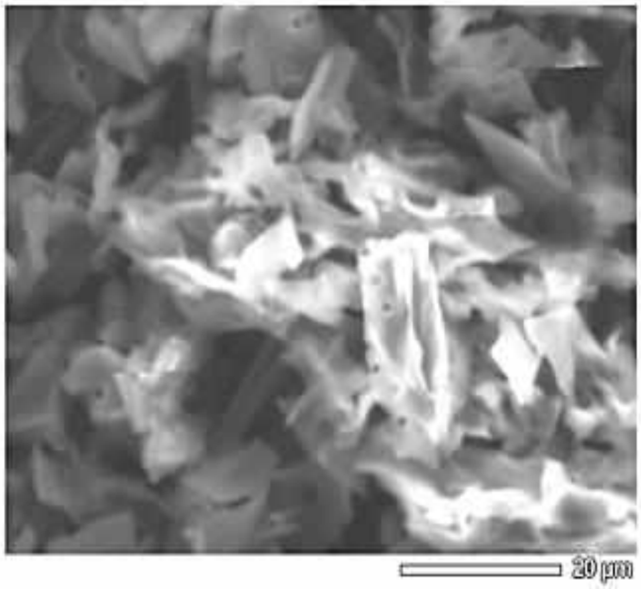
Acquisition Parameter

Instrument	: JCM-6000PLUS
Acc. Voltage	: 15.0 kV
Probe Current	: 1.00000 nA
PHA mode	: T3
Real Time	: 50.71 sec
Live Time	: 50.00 sec
Dead Time	: 1 %
Counting Rate	: 1489 cps
Energy Range	: 0 - 20 keV

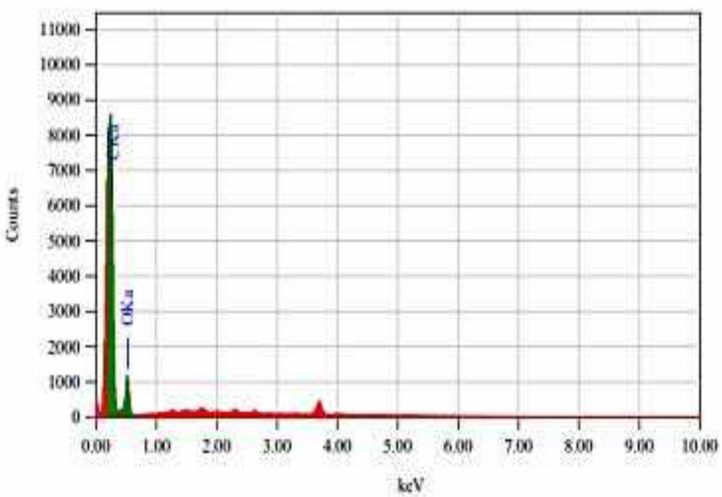
Thin Film Standardless Standardless Quantitative Analysis
Fitting Coefficient : 0.8612

Element	(keV)	Mass%	Counts	Sigma	Atom%	Compound	Mass%	Cation	K
C K (Ref.)	0.277	94.59	5166.07	0.82	95.88				1.0000
O K	0.525	5.41	763.60	0.22	4.12				0.3869
Total		100.00			100.00				

b) GO



Title	: IMG1
Instrument	: JCM-6000PLUS
Volt	: 15.00 kV
Mag.	: x 1,500
Date	: 2023/04/12
Pixel	: 512 x 384



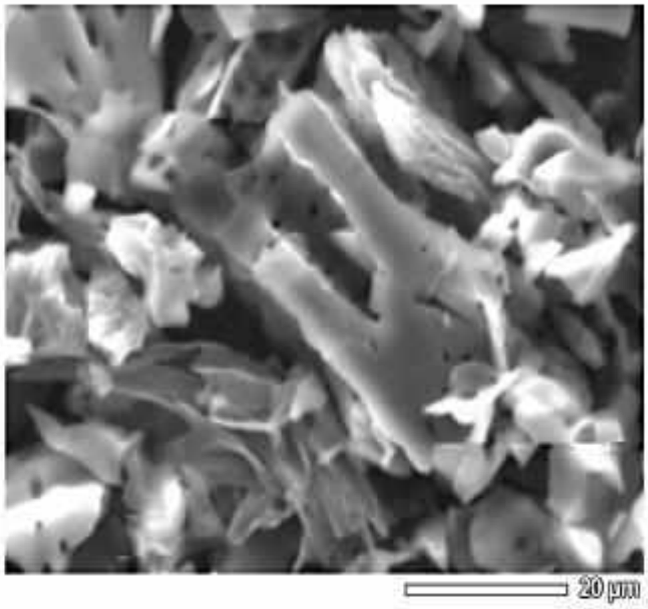
Acquisition Parameter

Instrument	: JCM-6000PLUS
Acc. Voltage	: 15.0 kV
Probe Current	: 1.00000 nA
PHA mode	: T3
Real Time	: 51.00 sec
Live Time	: 50.00 sec
Dead Time	: 1 %
Counting Rate	: 3957 cps
Energy Range	: 0 - 20 keV

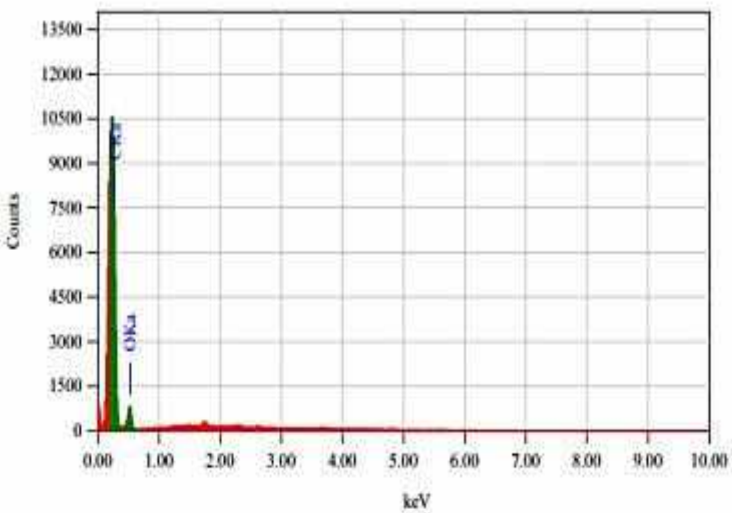
Thin Film Standardless Standardless Quantitative Analysis
Fitting Coefficient : 0.7893

Element	(keV)	Mass%	Counts	Sigma	Atom%	Compound	Mass%	Cation	K
C K (Ref.)	0.277	84.48	11998.24	0.48	87.88				1.0000
O K*	0.525	15.52	5697.30	0.23	12.12				0.3869
Total		100.00			100.00				

c) RGO



Title	: IMG1
Instrument	: JCM-6000PLUS
Volt	: 15.00 kV
Mag.	: x 1,500
Date	: 2023/04/12
Pixel	: 512 x 384



Acquisition Parameter

Instrument	: JCM-6000PLUS
Acc. Voltage	: 15.0 kV
Probe Current	: 1.00000 nA
PHA mode	: T3
Real Time	: 51.13 sec
Live Time	: 50.00 sec
Dead Time	: 2 %
Counting Rate	: 4421 cps
Energy Range	: 0 - 20 keV

Thin Film Standardless Standardless Quantitative Analysis

Fitting Coefficient : 0.8144

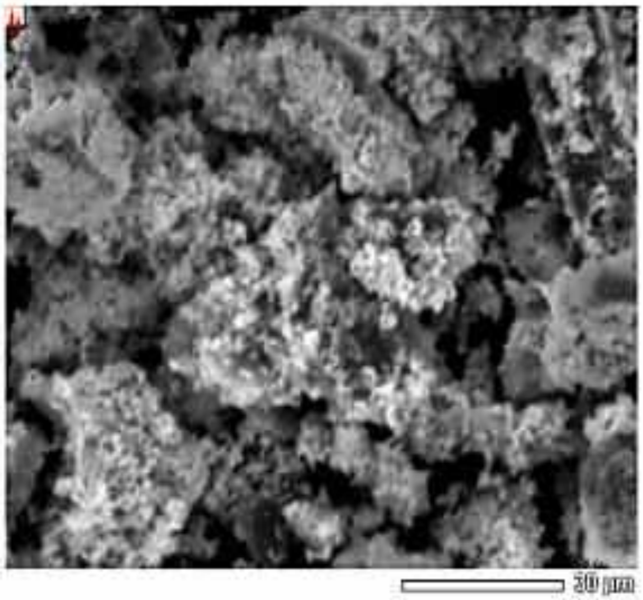
Element	(keV)	Mass%	Counts	Sigma	Atom%	Compound	Mass%	Cation	K
C K (Ref.)	0.277	90.76	15469.61	0.46	92.90				1.0000
O K	0.525	9.24	4067.99	0.16	7.10				0.3869
Total		100.00			100.00				

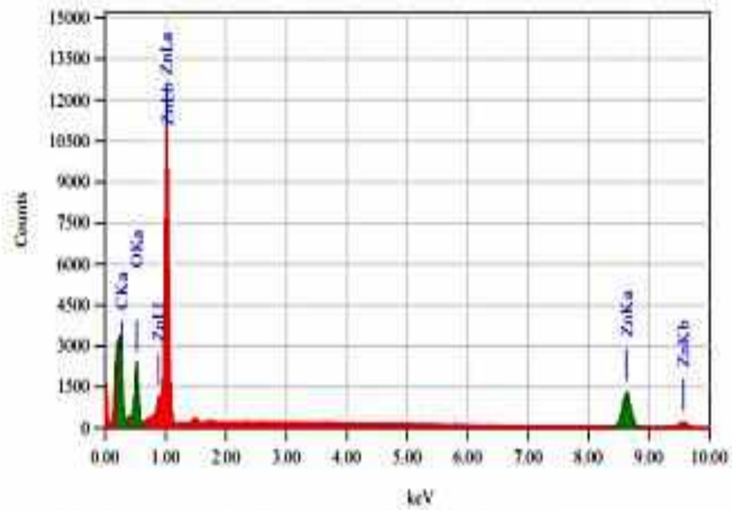
d) ZnO-RGO

View005

JEOL 1/1

Title	: IMG1
Instrument	: JCM-6000PLUS
Volt	: 15.00 kV
Mag.	: x 1,000
Date	: 2023/12/19
Pixel	: 512 x 384





Acquisition Parameter

Instrument	: JCM-6000PLUS
Acc. Voltage	: 15.0 kV
Probe Current	: 1.00000 nA
PHA mode	: T3
Real Time	: 51.92 sec
Live Time	: 50.00 sec
Dead Time	: 3 %
Counting Rate	: 6867 cps
Energy Range	: 0 - 20 keV

Thin Film Standardless Standardless Quantitative Analysis
Fitting Coefficient : 0.1993

Element	(keV)	Mass%	Counts	Sigma	Atom%	Compound	Mass%	Cation	K
C K	0.277	5.09	3144.75	0.06	19.12				0.3635
O K	0.525	7.21	11513.50	0.08	20.34				0.1406
Zn K (Ref.)	8.630	87.71	19707.14	0.30	60.54				1.0000
Total		100.00			100.00				