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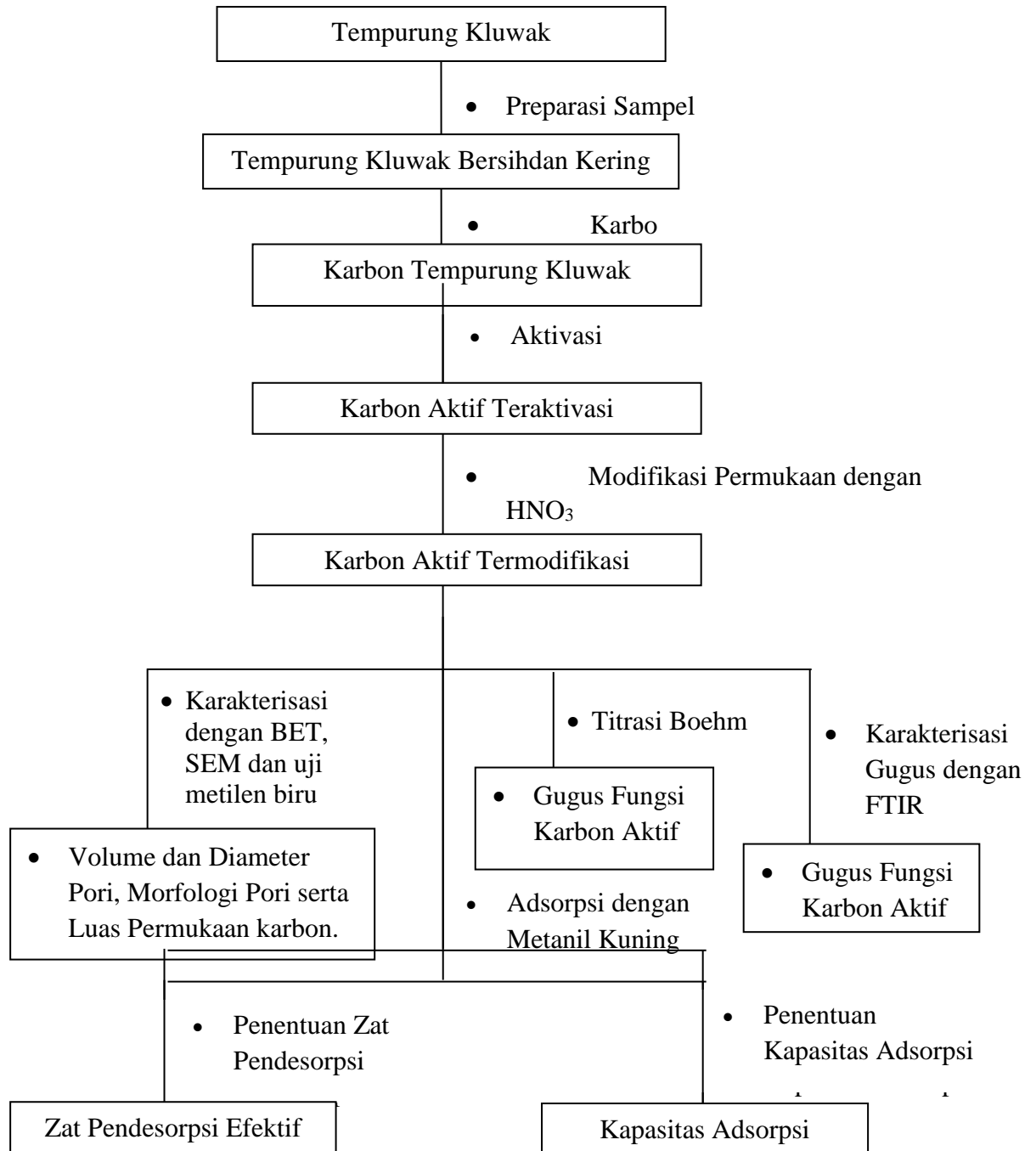


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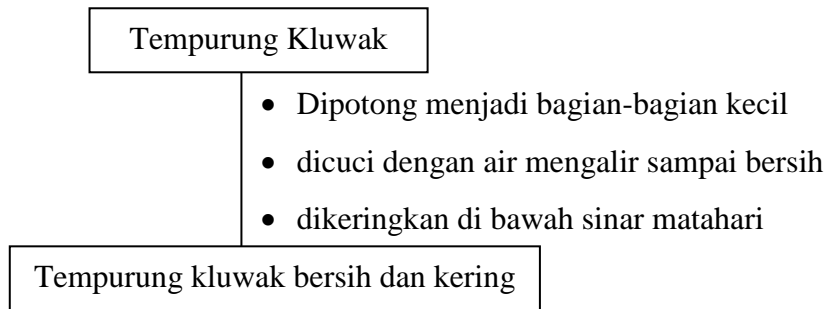


Lampiran 1. Skema Prosedur Kerja

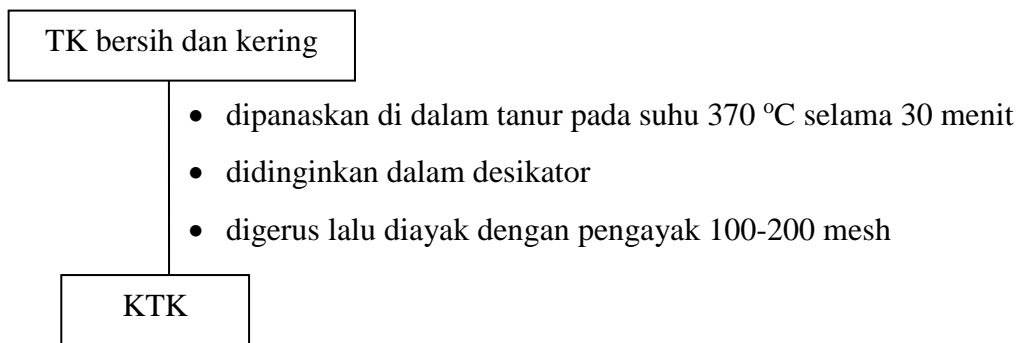
a. Diagram Alir Penelitian



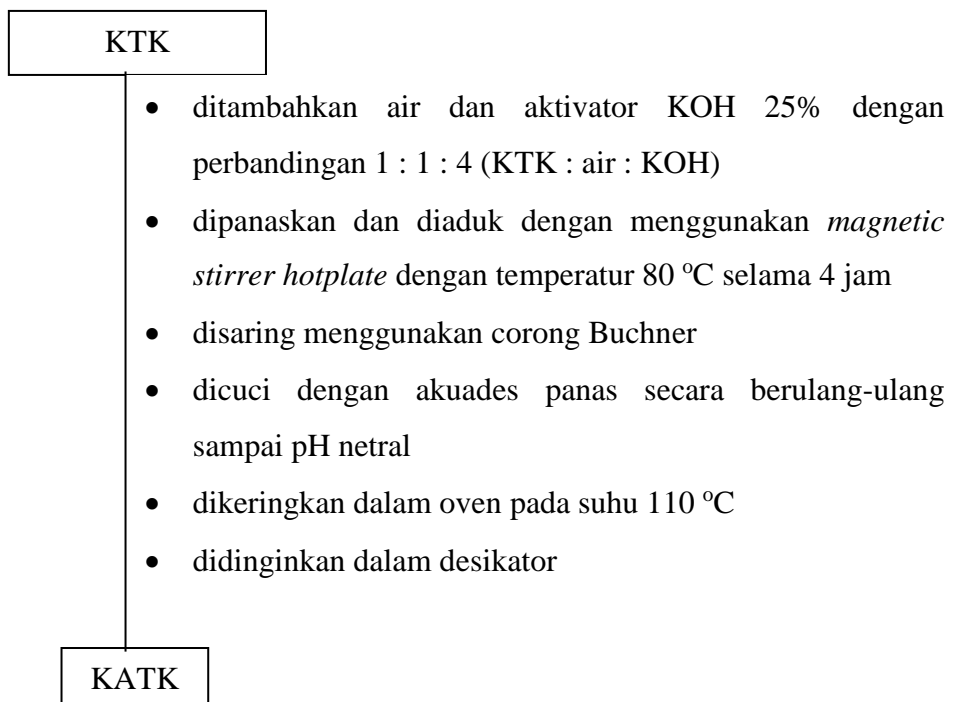
b. Skema Preparasi Sampel



c. Karbonisasi



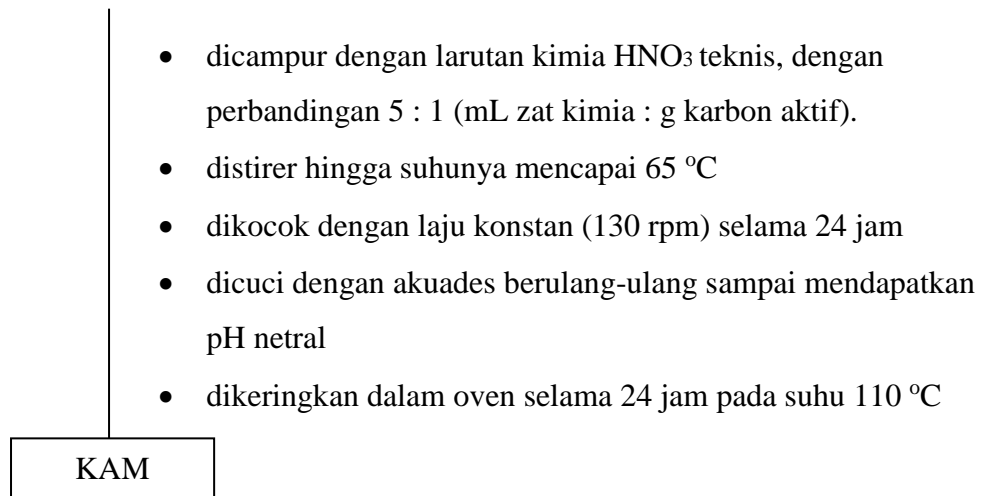
d. Aktivasi



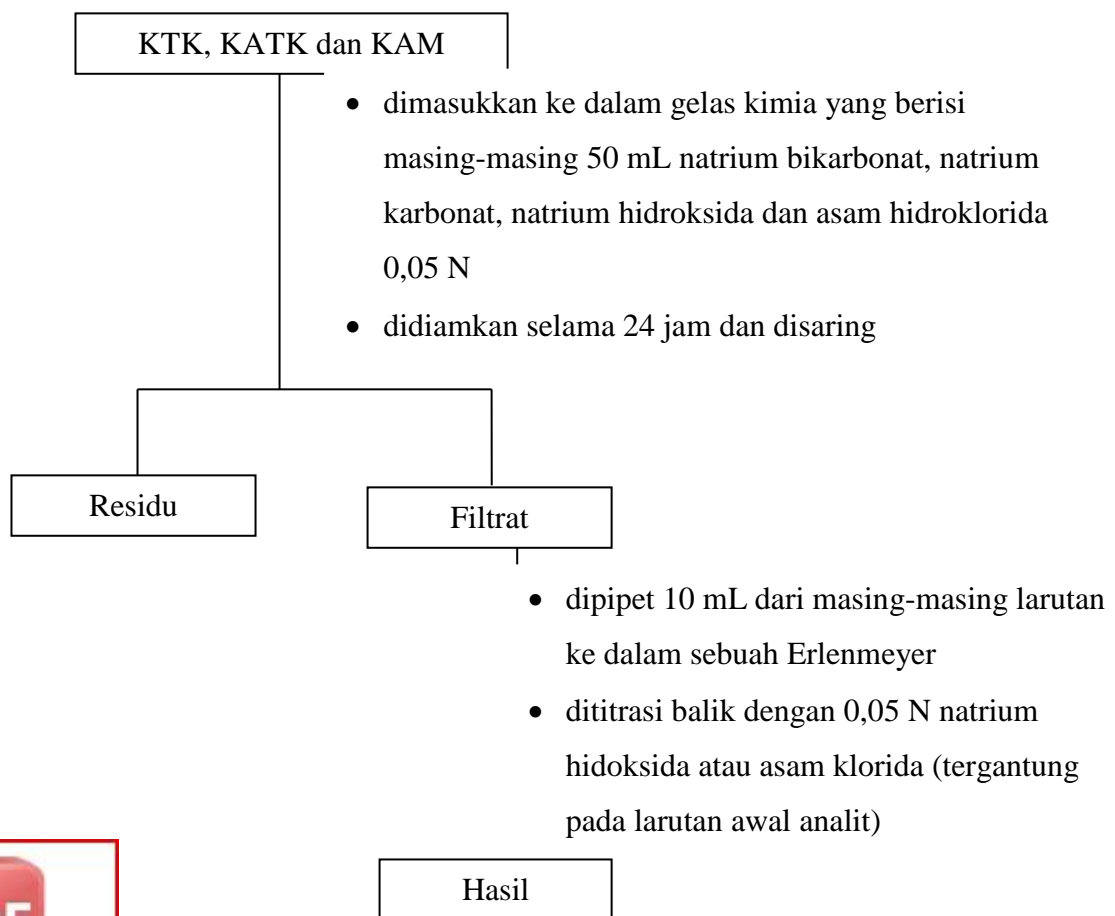
Modifikasi Permukaan

KATK



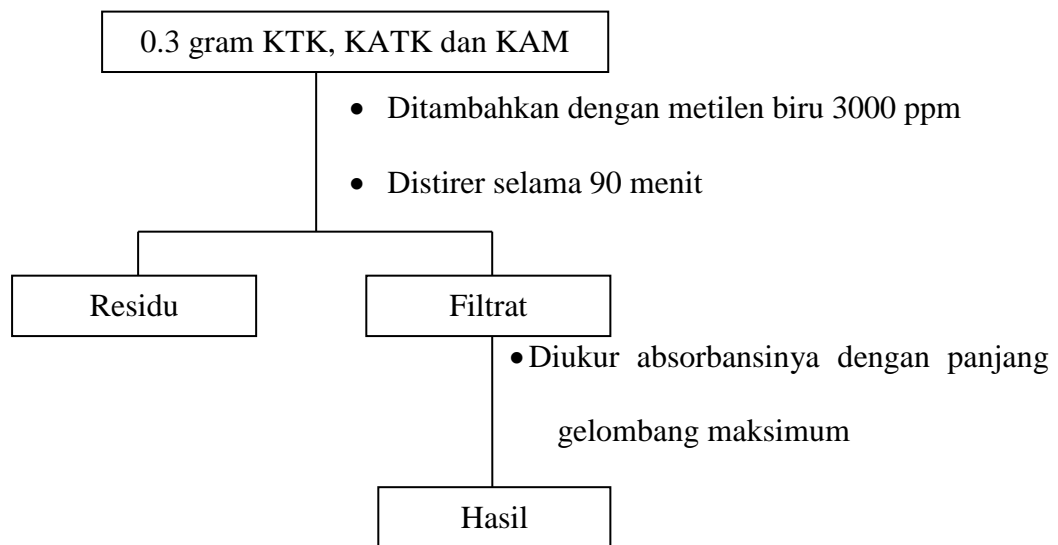


f. Skema Kerja Titrasi Boehm

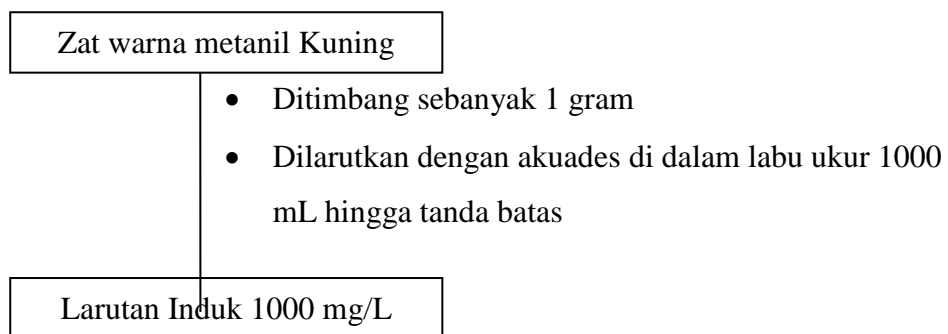


Skema Kerja Luas Permukaan dengan Metilen Biru

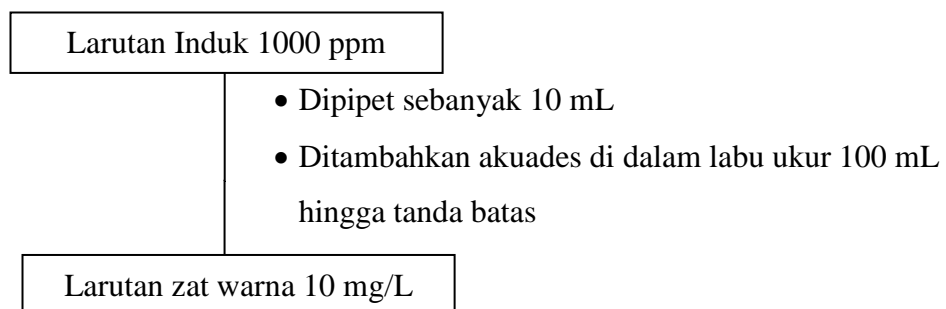




h. Pembuatan Larutan Induk 1000 ppm

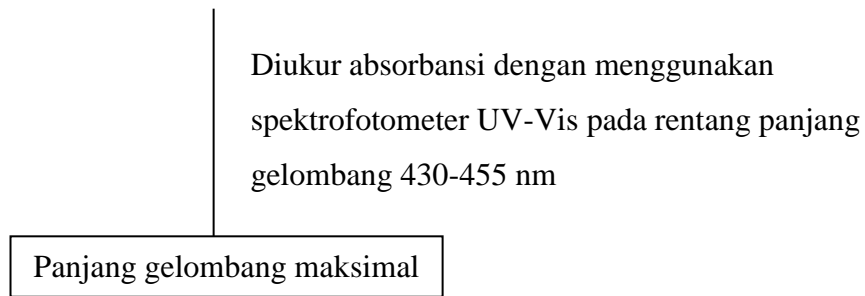


i. Pembuatan Larutan Zat Warna 10 ppm



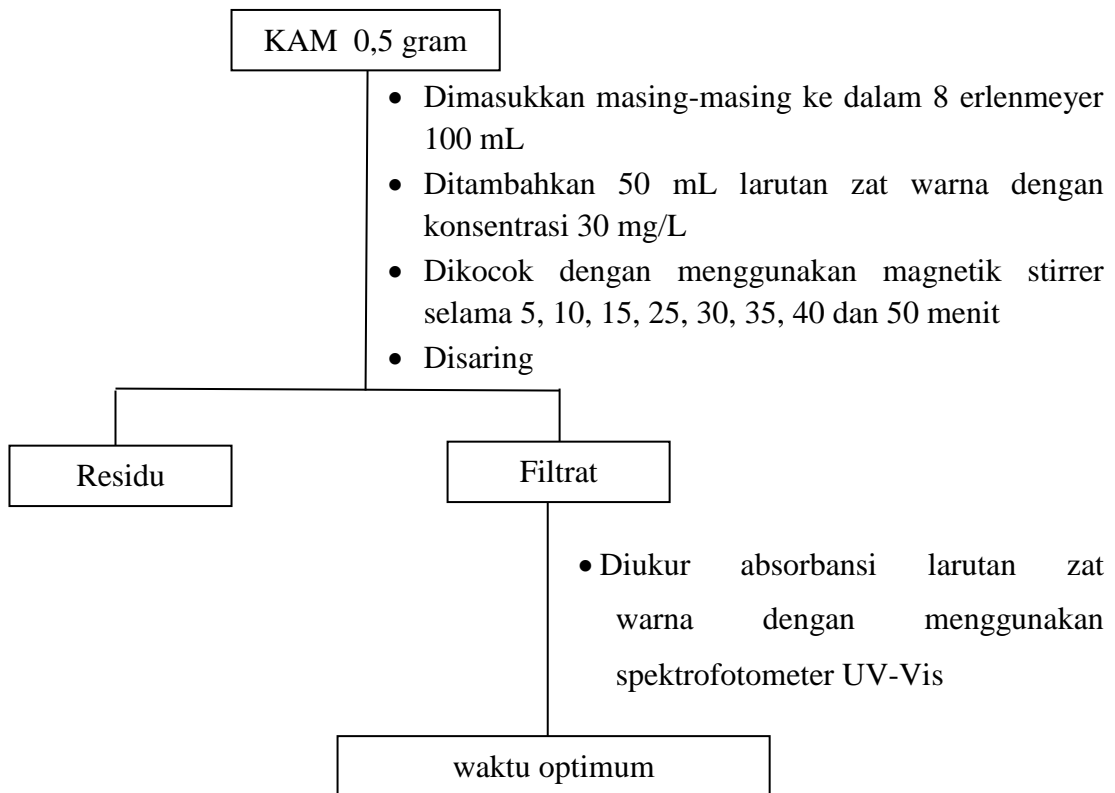
Penentuan Panjang Gelombang Maksimum

Larutan zat warna 10 ppm

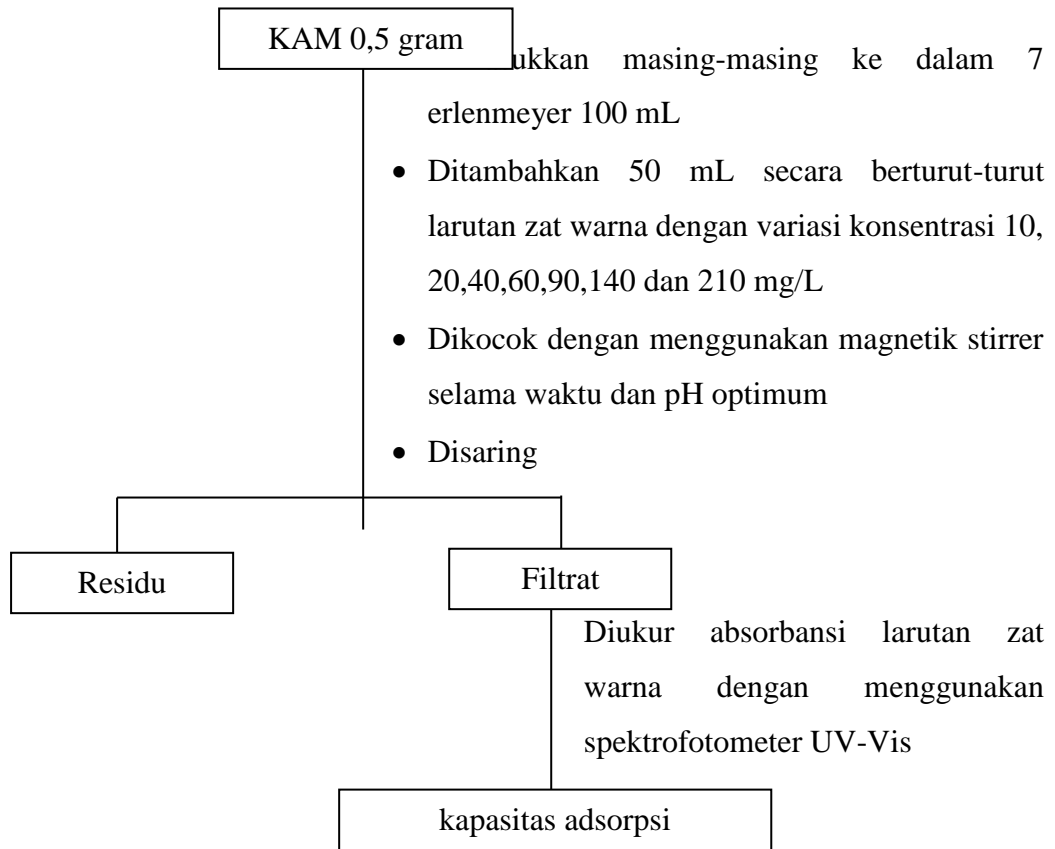


k. Penentuan Waktu

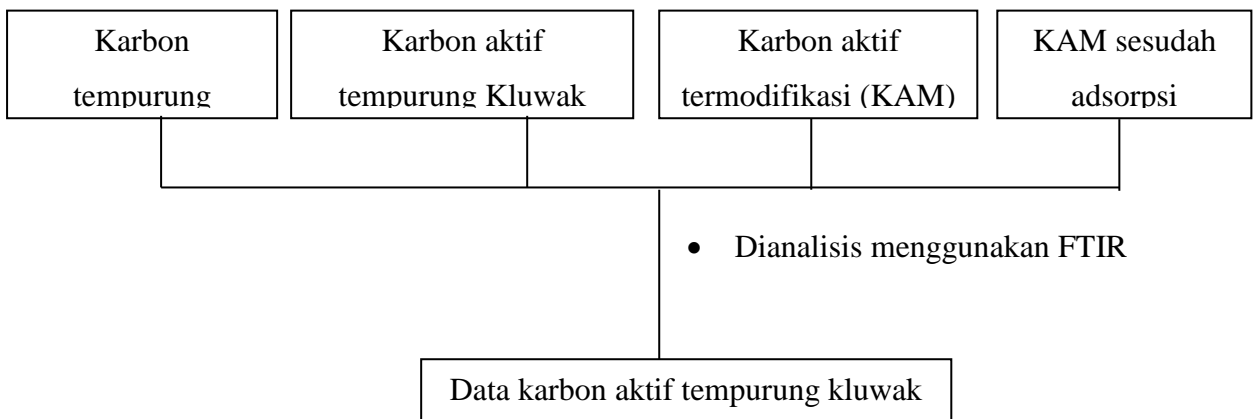
Kontak Optimum



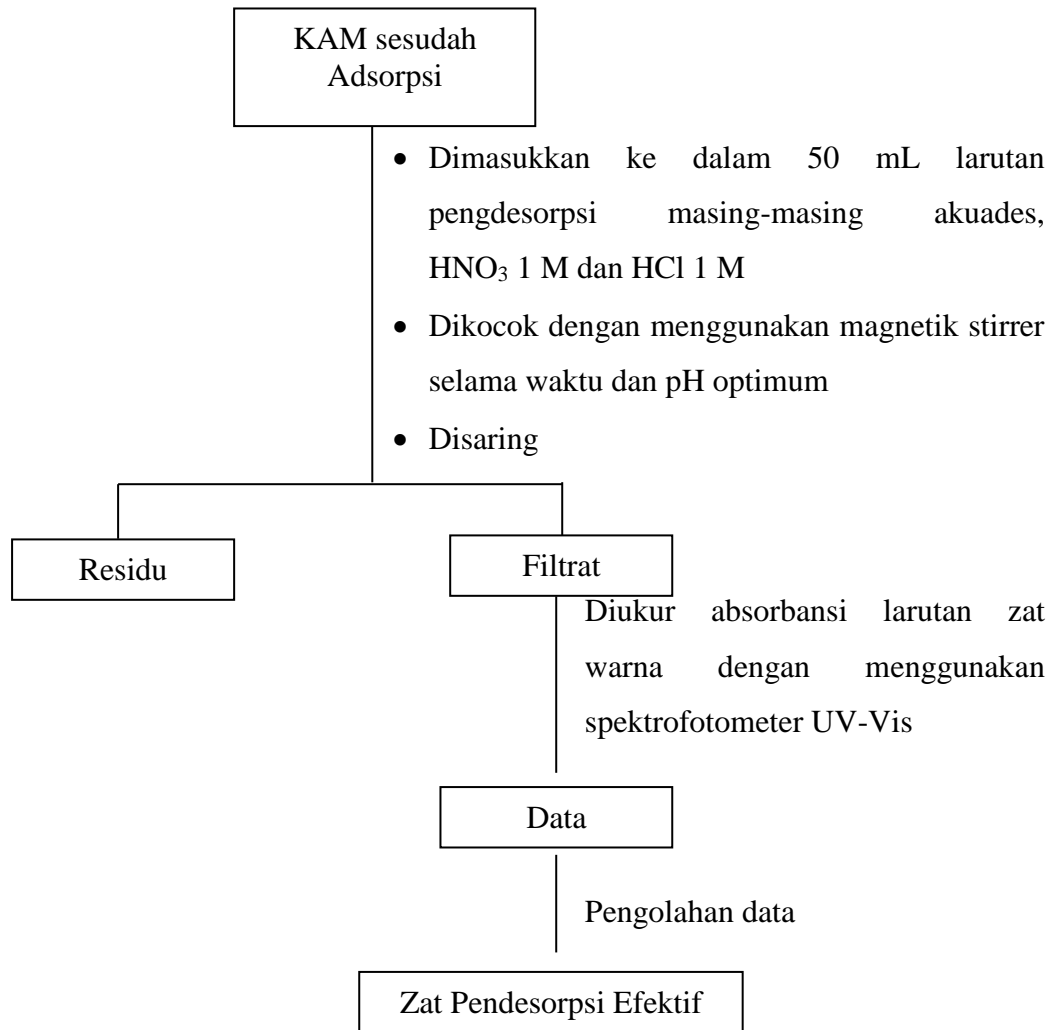
1. Penentuan Kapasitas Adsorpsi



m. Karakterisasi Gugus dengan FTIR



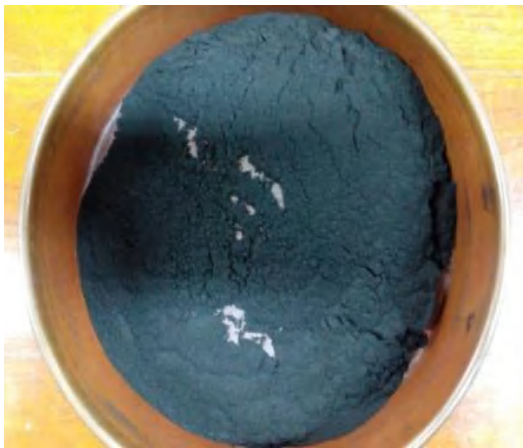
n. Desorpsi



Lampiran 2. Dokumentasi Kegiatan Penelitian



Gambar 1. Sampel Tempurung Kluwak **Gambar 2.** KTK



Gambar 3. KTK yang telah diayak dengan pengayak 100 mesh



Gambar 4. Proses aktivasi karbon tempurung kluwak



5. Proses penyaringan KATK



Gambar 6. KATK



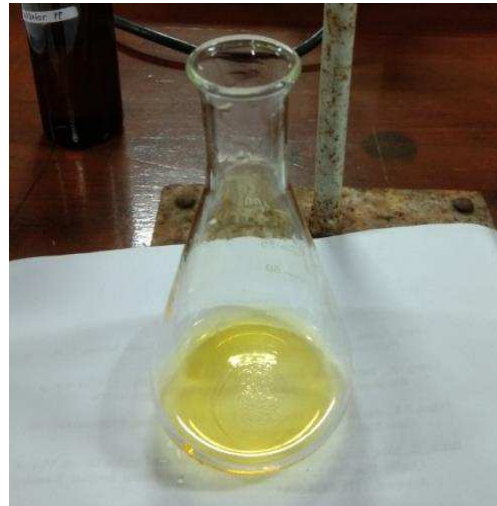
Gambar 7. Proses modifikasi dengan HNO_3



Gambar 8. Proses penyaringan modifikasi dengan HNO_3



Gambar 9. KAM



Gambar 10. Standarisasi HCl sebelum di titrasi



11. Standarisasi HCl setelah ditrasi



Gambar 12. Hasil titrasi Boehm asam total



Gambar 13. Hasil titrasi Boehm basa total



Gambar 14. Hasil karakterisasi dengan metilen biru



Gambar 15. Larutan metilen biru



Gambar 16. Proses Stirrer dengan multistirer



Gambar 17. Larutan metanil kuning 10 ppm (waktu optimum)



Gambar 18. Larutan untuk proses kapasitas adsorpsi



Gambar 19. Proses penyaringan untuk tahap kapasitas adsorpsi



Gambar 20. Hasil larutan setelah di saring dan selanjutnya di ukur

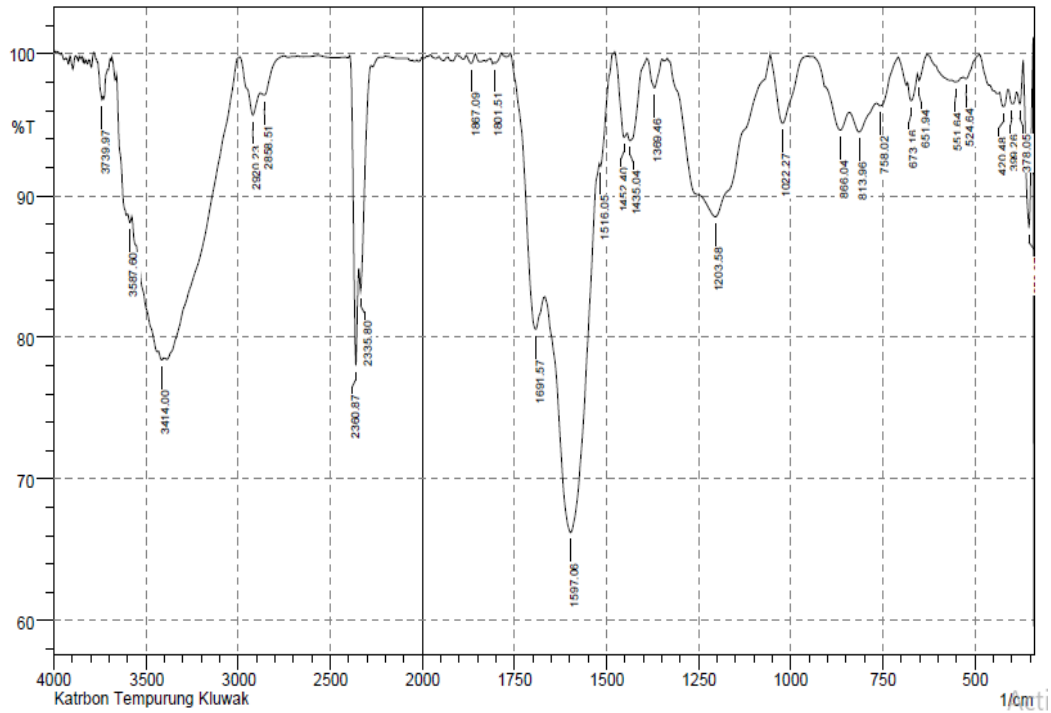


Gambar 21. Proses desorpsi



Gambar 22. Hasil proses desorpsi

Lampiran 3. Hasil FTIR



No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	352.97	87.706	11.681	368.4	343.33	0.86	0.796
2	378.05	96.497	1.819	385.76	368.4	0.199	0.08
3	399.26	96.501	0.919	408.91	385.76	0.319	0.054
4	420.48	96.293	1.107	432.05	408.91	0.332	0.067
5	524.64	98.26	0.337	530.42	487.99	0.172	0.019
6	551.64	98.043	0.201	563.21	530.42	0.263	0.015
7	651.94	98.14	0.659	655.8	628.79	0.113	0.03
8	673.16	96.716	1.493	682.8	655.8	0.316	0.114
9	758.02	96.362	0.691	767.67	707.88	0.589	0.101
10	813.96	94.502	1.597	839.03	767.67	1.451	0.252
11	866.04	94.639	2.214	943.19	840.96	1.347	0.379
12	1022.27	95.126	4.847	1055.06	954.76	1.035	1.009
13	1203.58	88.515	11.223	1334.74	1056.99	8.314	8
14	1369.46	97.609	2.066	1390.68	1348.24	0.256	0.197
15	1435.04	93.878	1.331	1442.75	1390.68	0.793	0.167
16	1452.4	94.133	1.646	1477.47	1444.68	0.509	0.112
17	1516.05	92.071	1.055	1519.91	1485.19	0.643	0.075
18	1597.06	66.218	21.099	1666.5	1519.91	17.657	9.156
19	1691.57	80.578	6.554	1761.01	1668.43	4.934	1.17
20	1801.51	99.381	0.116	1803.44	1784.15	0.031	0.01
21	1867.09	99.365	0.608	1880.6	1855.52	0.041	0.038
22	2335.8	83.248	3.257	2343.51	2277.93	2.539	0.34
23	2360.87	78.033	11.613	2393.66	2345.44	2.853	1.099
24	2858.51	97.124	0.539	2877.79	2752.42	0.734	0.078
25	2920.23	95.695	2.49	2991.59	2879.72	1.321	0.591
26	3414	78.405	0.264	3433.29	3406.29	2.827	0.026
27	3587.6	88.098	0.458	3603.03	3579.88	1.243	0.024
28	3739.97	96.78	0.702	3763.12	3734.19	0.28	0.054



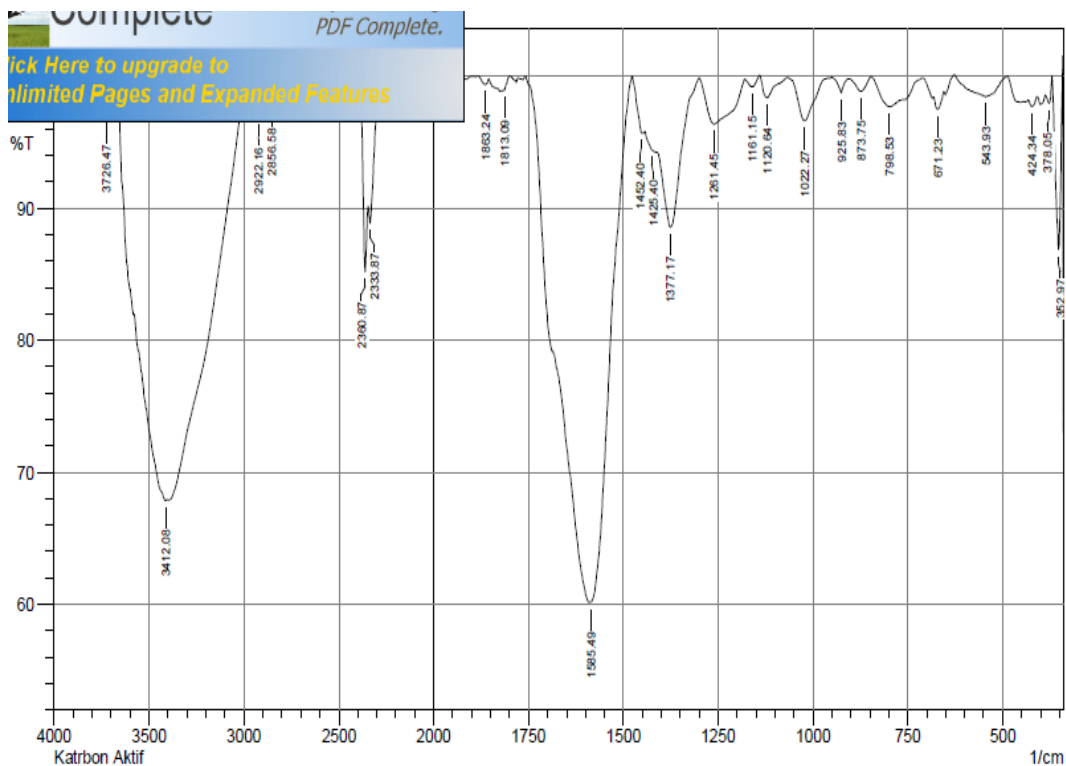
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No. of Scans;

Resolution;

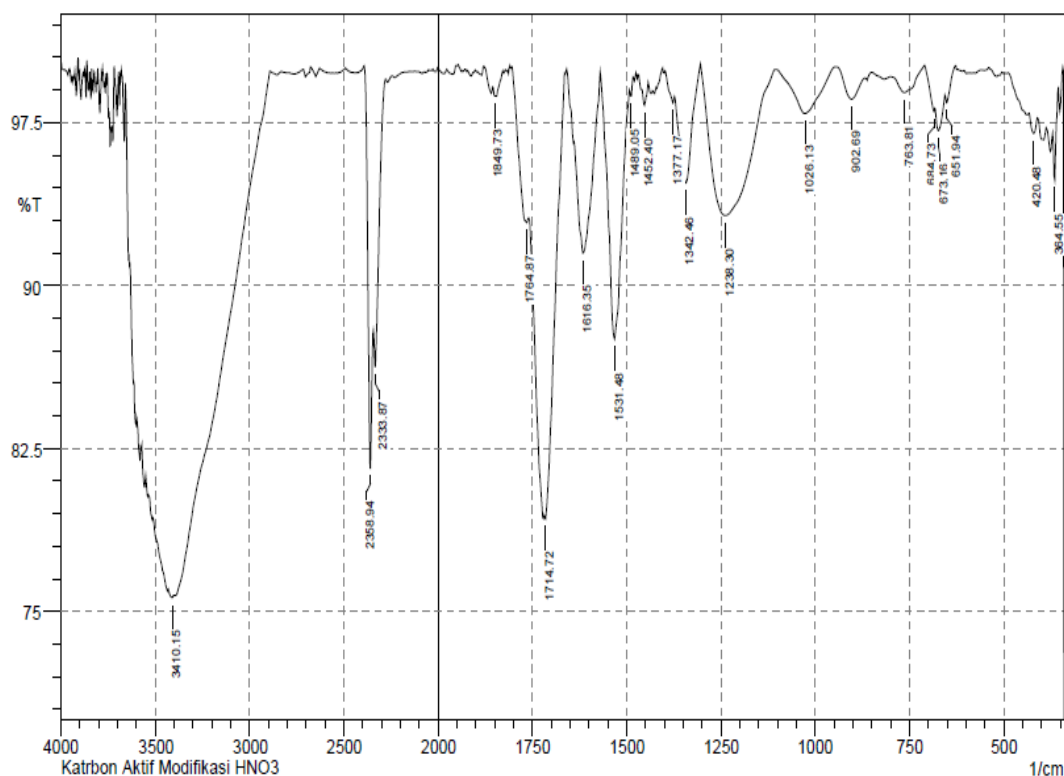
Apodization;



No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	352.97	86.891	12.192	368.4	343.33	0.906	0.81
2	378.05	97.962	1.446	387.69	370.33	0.118	0.067
3	424.34	97.733	0.568	432.05	410.84	0.191	0.036
4	543.93	98.457	1.617	626.87	487.99	0.554	0.605
5	671.23	97.518	1.112	682.8	655.8	0.24	0.082
6	798.53	97.706	2.226	844.82	709.8	0.796	0.747
7	873.75	98.858	1.062	906.54	846.75	0.162	0.139
8	925.83	98.763	1.104	950.91	906.54	0.1	0.075
9	1022.27	96.644	3.233	1066.64	962.48	0.703	0.645
10	1120.64	98.384	1.658	1139.93	1068.56	0.246	0.247
11	1161.15	99.204	0.731	1180.44	1139.93	0.081	0.071
12	1261.45	96.383	3.469	1300.02	1180.44	1.246	1.161
13	1377.17	88.572	7.66	1417.68	1300.02	3.18	1.655
14	1425.4	94.405	0.149	1442.75	1423.47	0.434	0.015
15	1452.4	95.706	0.586	1477.47	1448.54	0.298	0.025
16	1585.49	60.139	39.601	1745.58	1477.47	30.683	30.299
17	1813.09	98.97	0.159	1815.02	1801.51	0.032	0.002
18	1863.24	99.396	0.475	1880.6	1855.52	0.043	0.034
19	2333.87	88.878	2.796	2343.51	2279.86	1.543	0.251
20	2360.87	85.161	8.297	2391.73	2345.44	1.767	0.713
21	2856.58	98.299	0.623	2881.65	2792.93	0.359	0.066
22	2922.16	96.871	2.174	2991.59	2881.65	0.862	0.49
23	3412.08	67.87	0.532	3577.95	3406.29	23.37	1.483
24	3726.47	97.027	0.806	3730.33	3718.76	0.115	0.017



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 No. of Scans;
 Resolution;
 Apodization;



No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	364.55	94.848	2.958	370.33	354.9	0.217	0.086
2	420.48	97.001	0.812	432.05	410.84	0.252	0.049
3	651.94	98.413	0.524	655.8	628.87	0.093	0.021
4	673.16	97.127	1.24	682.8	655.8	0.275	0.092
5	684.73	98.008	0.284	709.8	682.8	0.115	0.013
6	783.81	98.877	0.942	800.46	709.8	0.255	0.204
7	902.69	98.577	1.208	943.19	867.97	0.265	0.201
8	1026.13	97.91	2.087	1103.28	945.12	0.709	0.708
9	1238.3	93.216	6.891	1303.88	1105.21	3.522	3.576
10	1342.46	94.723	4.5	1371.39	1305.81	0.87	0.677
11	1377.17	98.405	0.473	1398.39	1373.32	0.111	0.033
12	1452.4	98.277	0.9	1460.11	1442.75	0.099	0.038
13	1489.05	98.719	0.509	1492.9	1483.26	0.043	0.013
14	1531.48	87.54	11.73	1568.13	1492.9	2.27	2.026
15	1616.35	91.491	8.404	1658.78	1570.08	1.874	1.832
16	1714.72	79.256	1.625	1718.58	1684.57	2.873	0.246
17	1764.87	92.891	0.847	1803.44	1761.01	0.862	0.179
18	1849.73	98.716	0.109	1855.52	1847.81	0.038	0.002
19	2333.87	86.219	3.006	2341.58	2277.93	1.924	0.269
20	2358.94	81.594	10.251	2391.73	2343.51	2.313	0.959
21	3410.15	75.631	0.175	3431.36	3404.38	3.259	0.022

Comment;

Aktif Modifikasi HNO3

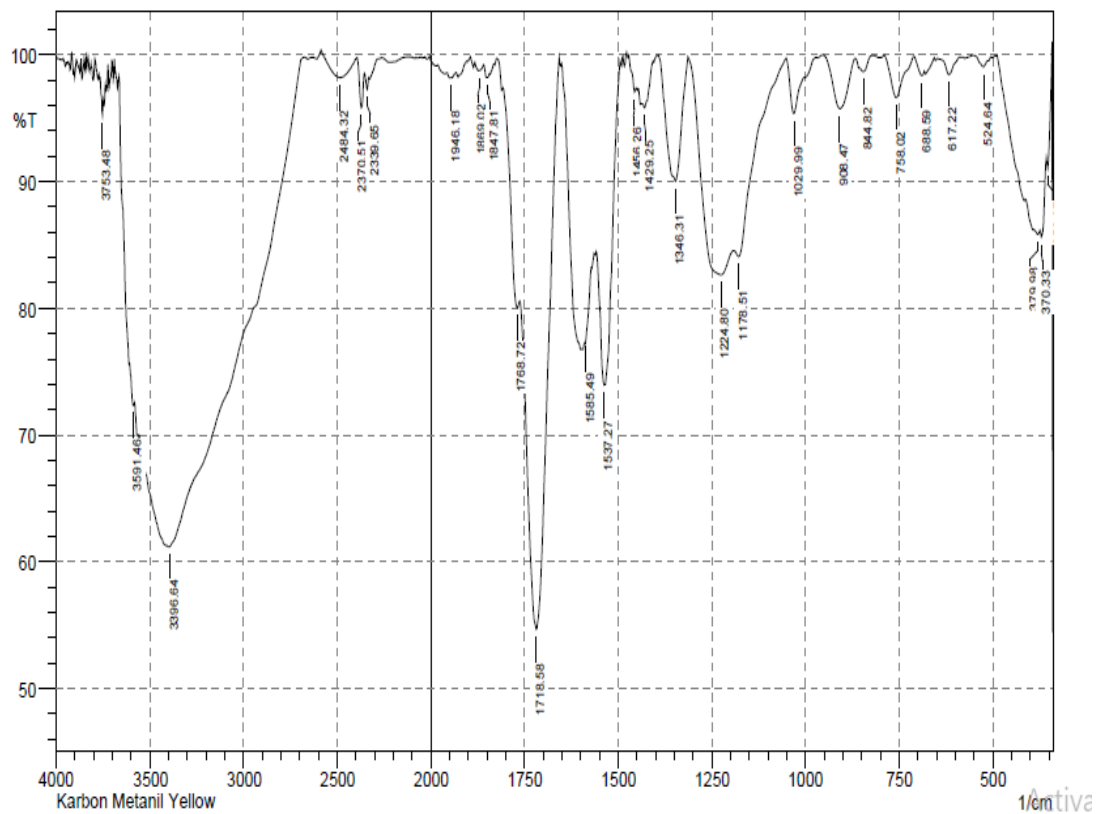
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No. of Scans;

Resolution;

Apodization;





	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	352.97	91.066	3.111	356.83	341.4	0.408	0.159
2	370.33	85.64	1.108	372.26	358.76	0.774	0.091
3	379.98	85.842	0.339	389.62	374.19	1.011	0.015
4	524.64	99.054	0.844	549.71	505.35	0.097	0.079
5	617.22	98.448	1.329	648.08	588.29	0.195	0.137
6	688.59	98.374	0.59	711.73	682.8	0.127	0.04
7	758.02	96.626	3.31	788.89	711.73	0.57	0.546
8	844.82	98.674	0.635	856.39	821.68	0.124	0.044
9	908.47	95.763	4.088	952.84	867.97	0.832	0.778
10	1029.99	95.379	4.394	1051.2	972.12	0.722	0.647
11	1178.51	84.078	1.752	1190.08	1053.13	4.392	0.187
12	1224.8	82.637	6.077	1311.59	1192.01	7.162	2.676
13	1346.31	90.022	9.881	1392.61	1313.52	2	1.97
14	1429.25	95.829	0.782	1433.11	1406.11	0.327	0.067
15	1456.26	97.088	0.986	1471.69	1450.47	0.166	0.041
16	1537.27	73.943	15.107	1556.55	1494.83	4.918	2.63
17	1585.49	77.189	0.595	1587.42	1564.27	2.077	0.003
18	1718.58	54.646	33.948	1762.94	1656.85	16	11.058
19	1768.72	80.032	2.009	1805.37	1764.87	2.442	0.263
20	1847.81	98.215	0.477	1859.38	1843.95	0.101	0.024
21	1869.02	98.767	0.08	1870.95	1859.38	0.055	0.004
22	1946.18	98.195	0.402	1955.82	1932.67	0.169	0.027
23	2339.65	97.259	1.063	2355.08	2331.94	0.216	0.052
24	2370.51	95.829	3.218	2393.66	2355.08	0.415	0.275
25	2484.32	98.209	1.818	2584.61	2395.59	0.904	0.937
26	3396.64	61.175	0.108	3398.57	2675.27	83.851	6.727
27	3591.46	72.393	0.608	3608.81	3587.6	2.802	0.029
28	3753.48	95.273	1.723	3766.98	3747.69	0.29	0.066



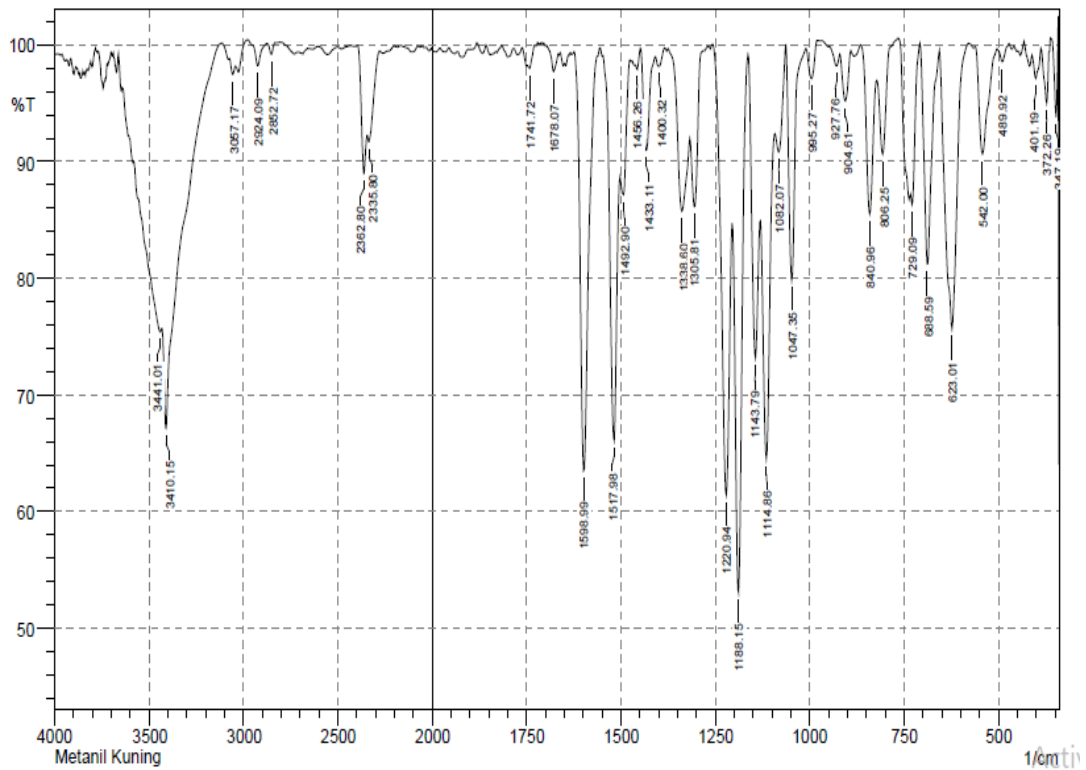
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No. of Scans;

Resolution;

Apodization;



	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	347.19	93.814	8.145	362.62	341.4	0.187	0.327
2	372.26	95.008	5.245	387.69	362.62	0.265	0.281
3	401.19	97.133	2.226	410.84	387.69	0.188	0.129
4	489.92	98.564	1.278	503.42	472.56	0.095	0.077
5	542	90.634	9.075	559.36	505.35	1.114	1.037
6	623.01	75.672	24.119	655.8	580.57	3.957	3.903
7	688.59	81.221	18.311	705.95	657.73	1.974	1.858
8	729.09	86.327	2.868	732.95	707.88	0.79	0.052
9	806.25	90.618	7.346	821.68	765.74	0.801	0.497
10	840.96	85.482	12.76	864.11	823.6	1.361	1.074
11	904.61	95.184	4.171	920.05	891.11	0.369	0.286
12	927.76	98.203	1.18	966.34	920.05	0.122	0.075
13	995.27	97.106	2.926	1010.7	979.84	0.201	0.206
14	1047.35	79.851	20.095	1062.78	1010.7	1.726	1.695
15	1082.07	90.822	4.131	1091.71	1062.78	0.825	0.332
16	1114.86	64.513	23.525	1130.29	1093.64	4.192	2.29
17	1143.79	73.193	17.251	1161.15	1132.21	2.604	1.434
18	1188.15	53.078	36.858	1203.58	1163.08	5.292	3.785
19	1220.94	61.432	27.983	1255.66	1205.51	5.163	3.293
20	1305.81	86.117	7.692	1315.45	1280.73	1.148	0.535
21	1338.6	85.734	9.125	1373.32	1317.38	2.045	0.974
22	1400.32	98.165	1.064	1408.04	1384.89	0.128	0.063
23	1433.11	90.96	8.469	1448.54	1408.04	0.787	0.671
24	1456.26	97.891	1.002	1462.04	1448.54	0.089	0.029
25	1492.9	87.168	5.355	1502.55	1477.47	0.995	0.314
26	1517.98	66.096	25.561	1546.91	1504.48	3.67	2.379
27	1598.99	63.519	35.606	1622.13	1564.27	4.625	4.395
28	1678.07	97.73	1.748	1697.36	1666.5	0.158	0.102
29	1741.72	97.998	0.768	1747.51	1728.22	0.105	0.031
30	2335.8	91.682	1.409	2343.51	2277.93	1.32	0.184
31	2362.8	88.972	6.046	2393.66	2345.44	1.443	0.569
32	2852.72	99.188	0.962	2875.86	2831.5	0.05	0.079
33	2924.09	98.199	2.068	2978.09	2875.86	0.185	0.308

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34	3057.17	97.485	0.974	3074.53	3043.67	0.272	0.069
35	3410.15	67.118	10.166	3431.36	3115.04	18.696	2.064
36	3441.01	75.407	1.031	3579.88	3433.29	13.147	0.814

Comment;

Metanil Kuning

Resolution;

Apodization;

User; Kimia Terpadu



Lampiran 4. Hasil Analisis dengan Metode Titrasi Boehm

V. Sampel (Vs) (mL)	V. Titran NaHCO ₃ (Vp) (mL)	Normal NaHCO ₃	Normal HCl	V. HCl (mL)	Normal NaOH	V. NaOH (mL)	Massa Karbon (g)	n Karboksilat (meq/g)
50	5	0.0503	0.0466	10	0.0573	4.6	0.1008	4.869047619
50	5	0.0503	0.0466	10	0.0573	4.6	0.1005	4.88358209
50	5	0.0503	0.0466	10	0.0573	4.8	0.1012	5.982213439
50	5	0.0503	0.0466	10	0.0573	4.8	0.1017	5.95280236
50	5	0.0503	0.0466	10	0.0573	4.8	0.1004	6.029880478
50	5	0.0503	0.0466	10	0.0573	4.9	0.1056	6.275568182
50	5	0.0503	0.0466	10	0.0573	4.9	0.1043	6.353787152
Rata-Rata								5.763840189

Contoh perhitungan pada n karboksilat karbon aktif

$$n_{\text{karboksilat}} = \frac{[V_{\text{NaHCO}_3} N_{\text{NaHCO}_3} - (N_{\text{HCl}} V_{\text{HCl}} - N_{\text{NaOH}} V_{\text{NaOH}})] \frac{V_p}{V_s}}{w}$$

$$n_{\text{karboksilat}} = \frac{[5 \times 0.0503 - (0.0466 \times 10 - 0.0573 \times 4.6)] \frac{50}{5}}{0.1008}$$



4.869047619

V. Sampel (Vs) (mL)	V. Titran Na ₂ CO ₃ (Vp)	Normal Na ₂ CO ₃	Normal HCl	V. HCl (mL)	Normal NaOH	V. NaOH (mL)	Massa Karbon (g)	n Lakton (meq/g)
50	5	0.05014	0.0466	10	0.0573	4.8	0.1026	0.953564467
50	5	0.05014	0.0466	10	0.0573	4.8	0.1012	1.019579966
50	5	0.05014	0.0466	10	0.0573	4.8	0.1013	-0.084878789
50	5	0.05014	0.0466	10	0.0573	4.8	0.1018	-0.084433008
50	5	0.05014	0.0466	10	0.0573	4.9	0.1021	0.382460364
50	5	0.05014	0.0466	10	0.0573	4.8	0.1012	-0.372406126
50	5	0.05014	0.0466	10	0.0573	4.9	0.1015	0.096459153
Rata-Rata								0.272906575

Contoh perhitungan pada n Lakton karbon aktif

$$n_{\text{lakton}} = \frac{[V_{\text{Na}_2\text{CO}_3} N_{\text{Na}_2\text{CO}_3} - (N_{\text{HCl}} V_{\text{HCl}} - N_{\text{NaOH}} V_{\text{NaOH}})] \frac{V_p}{V_s}}{w} - n_{\text{karboksilat}}$$

$$n_{\text{lakton}} = \frac{[5 \times 0.05014 - (0.0466 \times 10 - 0.0573 \times 4.8)] \frac{50}{5}}{0.1026} - 5.763840189$$

$$n_{\text{lakton}} = 0.953564467$$



V. Sampel (Vs) (mL)	V. Titran NaOH (Vp) (mL)	Normal NaOH	Normal HCl	V. HCl (mL)	Normal NaOH	V. NaOH (mL)	Massa Karbon (g)	n Lakton (meq/g)
50	5	0.0573	0.0466	10	0.0573	4.1	0.1017	-0.372267936
50	5	0.0573	0.0466	10	0.0573	4.2	0.1009	0.158284922
50	5	0.0573	0.0466	10	0.0573	4.4	0.1011	1.285652492
50	5	0.0573	0.0466	10	0.0573	4.3	0.1082	0.313700889
50	5	0.0573	0.0466	10	0.0573	4.4	0.1056	0.464553097
50	5	0.0573	0.0466	10	0.0573	4.2	0.1014	0.12839613
50	5	0.0573	0.0466	10	0.0573	4.4	0.1011	0.732740836
Rata-Rata								0.387294347

Contoh perhitungan pada n fenol karbon aktif

$$n_{\text{fenol}} = \frac{[V_{\text{NaOH}} N_{\text{NaOH}} - (N_{\text{HCl}} V_{\text{HCl}} - N_{\text{NaOH}} V_{\text{NaOH}})] \frac{V_p}{V_s}}{w} - n_{\text{karboksilat}} - n_{\text{lakton}}$$

$$n_{\text{fenol}} = \frac{[5 \times 0.0573 - (0.0466 \times 10 - 0.0573 \times 4.2)] \frac{50}{5}}{0.1009} - 5.763840189 - 0.272906575$$

0.158284922



V. Sampel (Vs) (mL)	V. Titran NaOH (Vp) (mL)	Norma IHCl	Normal NaOH	V. NaOH (mL)	Normal HCl	V. HCl (mL)	Massa Karbon (g)	n Lakton (meq/g)
50	5	0.0466	0.0573	7.5	0.0466	4.3	0.1055	0.344075829
50	5	0.0466	0.0573	7.5	0.0466	4.2	0.1045	-0.098564593
50	5	0.0466	0.0573	7.5	0.0466	4.2	0.1049	-0.098188751
50	5	0.0466	0.0573	7.5	0.0466	4.3	0.1033	0.351403679
50	5	0.0466	0.0573	7.5	0.0466	4.2	0.1032	-0.099806202
50	5	0.0466	0.0573	7.5	0.0466	4.2	0.105	-0.098095238
Rata-Rata								0.050137454

Contoh perhitungan pada n Basa Total karbon aktif

$$n_{total\ basa} = \frac{[V_{HCl}N_{HCl} - (N_{NaOH}V_{NaOH} - N_{HCl}V_{HCl})] \frac{V_p}{V_s}}{w}$$

$$n_{total\ basa} = \frac{[5 \times 0.0466 - (0.0573 \times 7.5 - 0.0466 \times 4.3)] \frac{50}{5}}{0.1055}$$

44075829



V. Sampel (Vs) (mL)	V. Titran NaHCO ₃ (Vp) (mL)	Normal NaHCO ₃	Normal HCl	V. HCl (mL)	Normal NaOH	V. NaOH (mL)	Massa Karbon (g)	n Karboksilat (meq/g)
50	5	0.0503	0.053	10	0.0462	11.5	0.1045	24.19138756
50	5	0.0503	0.053	10	0.0462	11.4	0.1054	23.54648956
50	5	0.0503	0.053	10	0.0462	11.5	0.1034	24.44874275
50	5	0.0503	0.053	10	0.0462	11.4	0.1022	24.28375734
50	5	0.0503	0.053	10	0.0462	11.5	0.1025	24.66341463
50	5	0.0503	0.053	10	0.0462	11.5	0.1002	25.22954092
Rata-Rata								24.39388879

Contoh perhitungan pada n karboksilat karbon aktif termodifikasi

$$n_{\text{karboksilat}} = \frac{[V_{\text{NaHCO}_3} N_{\text{NaHCO}_3} - (N_{\text{HCl}} V_{\text{HCl}} - N_{\text{NaOH}} V_{\text{NaOH}})] \frac{V_p}{V_s}}{w}$$

$$n_{\text{karboksilat}} = \frac{[5 \times 0.0503 - (0.053 \times 10 - 0.0462 \times 11.5)] \frac{50}{5}}{0.1045}$$

24.19138756



V. Sampel (Vs) (mL)	V. Titran Na ₂ CO ₃ (Vp) (mL)	Normal Na ₂ CO ₃	Normal HCl	V. HCl (mL)	Normal NaOH	V. NaOH (mL)	Massa Karbon (g)	n Lakton (meq/g)
50	5	0.0501	0.053	10	0.0462	12	0.1024	2.654315565
50	5	0.0501	0.053	10	0.0462	11.9	0.1023	2.873842792
50	5	0.0501	0.053	10	0.0462	11.9	0.1019	2.075300433
50	5	0.0501	0.053	10	0.0462	11.9	0.1025	2.085023149
50	5	0.0501	0.053	10	0.0462	12.1	0.1022	2.686878908
50	5	0.0501	0.053	10	0.0462	12	0.1021	1.695042823
Rata-Rata								2.345067278

Contoh perhitungan pada n Lakton karbon aktif termodifikasi

$$n_{\text{lakton}} = \frac{[V_{\text{Na}_2\text{CO}_3} \cdot N_{\text{Na}_2\text{CO}_3} - (N_{\text{HCl}} \cdot V_{\text{HCl}} - N_{\text{NaOH}} \cdot V_{\text{NaOH}})] \cdot \frac{V_p}{V_s}}{w} - n_{\text{karboksilat}}$$

$$n_{\text{lakton}} = \frac{[5 \times 0.0501 - (0.053 \times 10 - 0.0462 \times 12)] \cdot \frac{50}{5}}{0.1024} - 24.39388879$$



4315565

V. Sampel (Vs) (mL)	V. Titran NaOH (Vp) (mL)	Normal NaOH	Normal HCl	V. HCl (mL)	Normal NaOH	V. NaOH (mL)	Massa Karbon (g)	n Lakton (meq/g)
50	5	0.0462	0.053	10	0.0462	12.6	0.1049	0.143810698
50	5	0.0462	0.053	10	0.0462	12.8	0.1046	1.529954451
50	5	0.0462	0.053	10	0.0462	12.6	0.105	0.439766344
50	5	0.0462	0.053	10	0.0462	12.7	0.1052	0.982930539
50	5	0.0462	0.053	10	0.0462	12.8	0.1049	0.520059175
50	5	0.0462	0.053	10	0.0462	12.5	0.1047	-0.324774763
Rata-Rata								0.548624407

Contoh perhitungan pada n fenol

$$n_{\text{fenol}} = \frac{[V_{\text{NaOH}} \cdot N_{\text{NaOH}} - (N_{\text{HCl}} \cdot V_{\text{HCl}} - N_{\text{NaOH}} \cdot V_{\text{NaOH}})] \cdot \frac{V_p}{V_s}}{w} - n_{\text{karboksilat}} - n_{\text{lakton}}$$

$$n_{\text{fenol}} = \frac{[5 \times 0.0462 - (0.053 \times 10 - 0.0462 \times 12.6)] \cdot \frac{50}{5}}{0.1049} - 24.39388879 - 2.345067278$$

$$n_{\text{fenol}} = 0.143810698$$



V. Sampel (Vs) (mL)	V. Titran NaOH (Vp) (mL)	Normal HCl	Normal NaOH	V. NaOH (mL)	Normal HCl	V. HCl (mL)	Massa Karbon (g)	n Lakton (meq/g)
50	5	0.053	0.0462	10	0.053	3.75	0.1054	0.166034156
50	5	0.053	0.0462	10	0.053	3.6	0.1057	-0.586565752
50	5	0.053	0.0462	10	0.053	3.7	0.1048	-0.085877863
50	5	0.053	0.0462	10	0.053	3.8	0.1055	0.417061611
50	5	0.053	0.0462	10	0.053	3.77	0.1049	0.267874166
50	5	0.053	0.0462	10	0.053	3.7	0.1051	-0.085632731
Rata-Rata								0.015482265

Contoh perhitungan pada n basa total

$$n_{total\ basa} = \frac{[V_{HCl}N_{HCl} - (N_{NaOH}V_{NaOH} - N_{HCl}V_{HCl})] \frac{V_p}{V_s}}{w}$$

$$n_{total\ basa} = \frac{[5 \times 0.053 - (0.0462 \times 10 - 0.053 \times 3.75)] \frac{50}{5}}{0.1054}$$

$$n_{total\ basa} = 0.166034156$$



Lampiran 5. Analisa dengan Metode SEM



KEMENTERIAN RISET TEKNOLOGI DAN PENDIDIKAN TINGGI
UNIVERSITAS DIPONEGORO
UPT LABORATORIUM TERPADU
Jalan Prof. Soedarto, SH Tembalang Semarang Kotak Pos 1269
Telepon (024) 76918147- Faksimile (024) 76918148, Website : <http://labterpadu.undip.ac.id>
E-mail : labterpadu@live.undip.ac.id

SURAT KETERANGAN HASIL ANALISIS SAMPEL

Kode sampel : SP-X-534
Nama Pemesan : Rida Solehah
Alamat : Makassar
Jenis Analisis : Analisis SEM
Jenis sampel : Serbuk

Untuk citra morfologi permukaan serbuk dengan perbesaran 2.000x, 5.000x, 7.500x, 10.000x. Hasil lengkap terlampir.

Catatan:

Laboratorium Terpadu Universitas Diponegoro Semarang tidak bertanggungjawab terhadap penyalahgunaan hasil analisis. Hasil analisis tersebut hanya berlaku untuk sampel yang dikirimkan ke Laboratorium Terpadu Universitas Diponegoro Semarang.

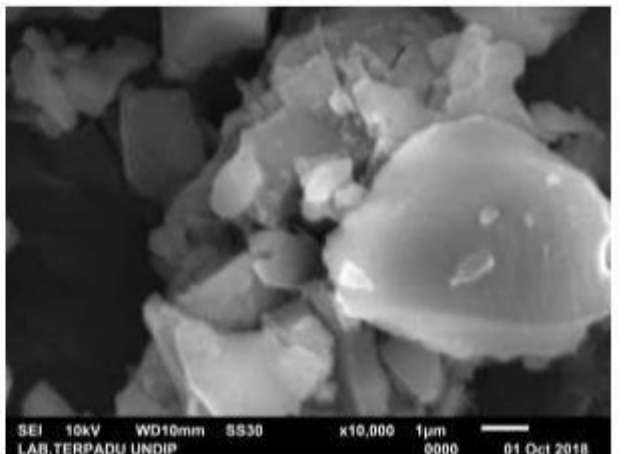
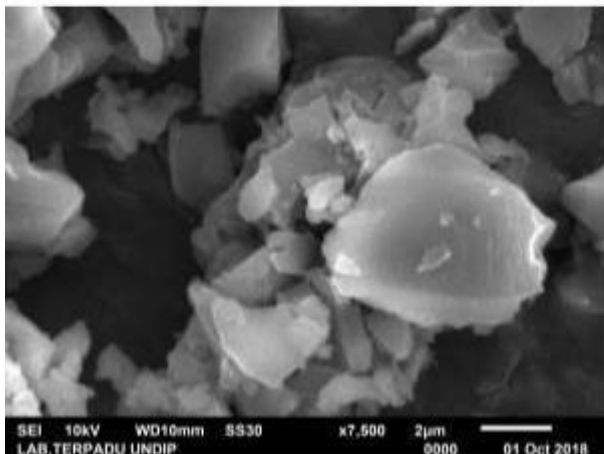
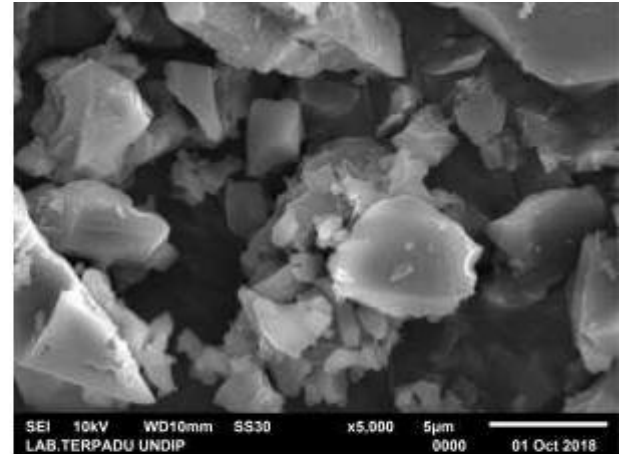
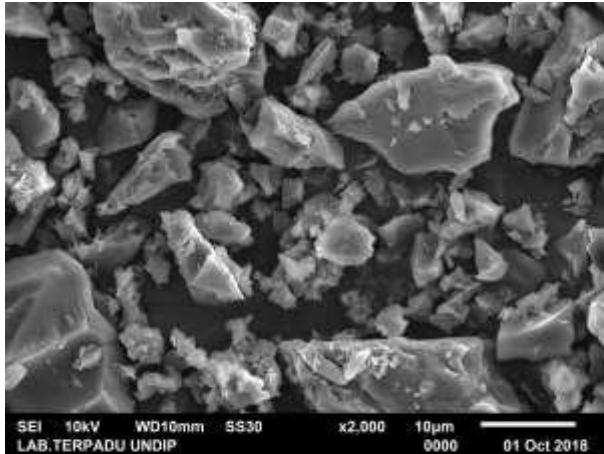
Semarang, 1 Oktober 2018
Ketua Bidang Pengujian dan Sertifikasi

Dr. Meiny Suzery, MS.
NIP. 196005101989032001



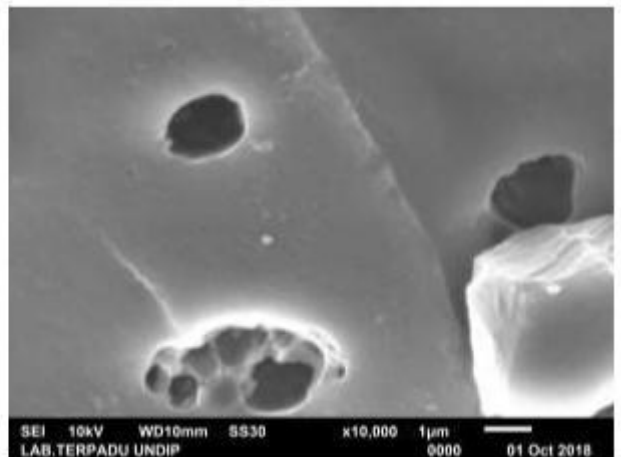
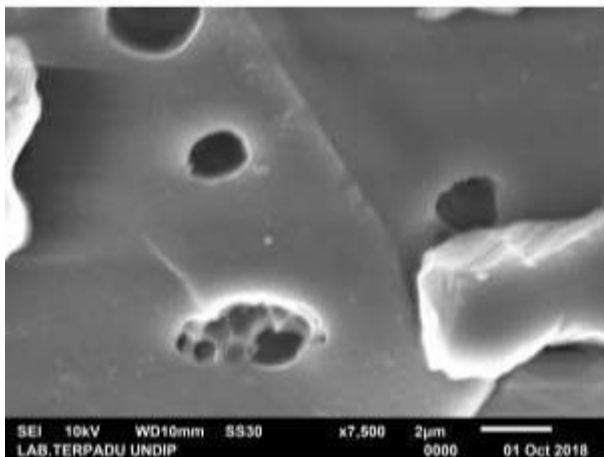
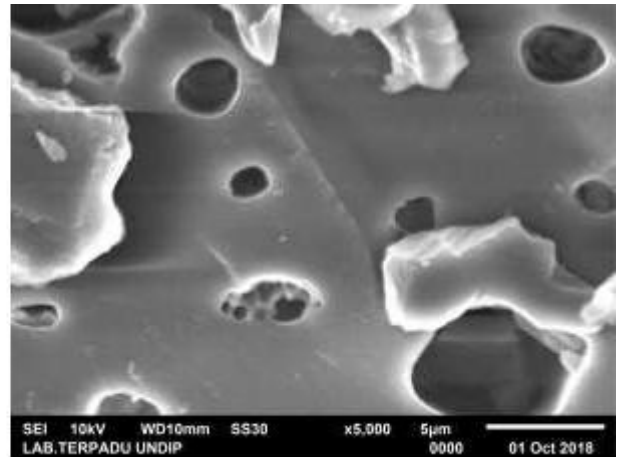
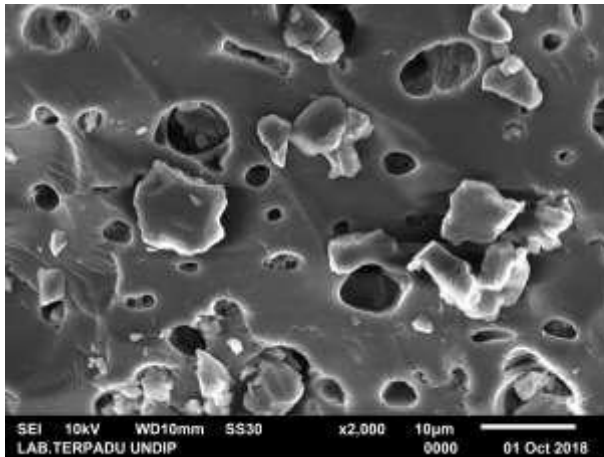


**Hasil Uji Citra SEM sbb:
Karbon Aktif Tempurung Kluwak**





**Hasil Uji Citra SEM sbb:
Karbon Aktif Termodifikasi HNO_3**





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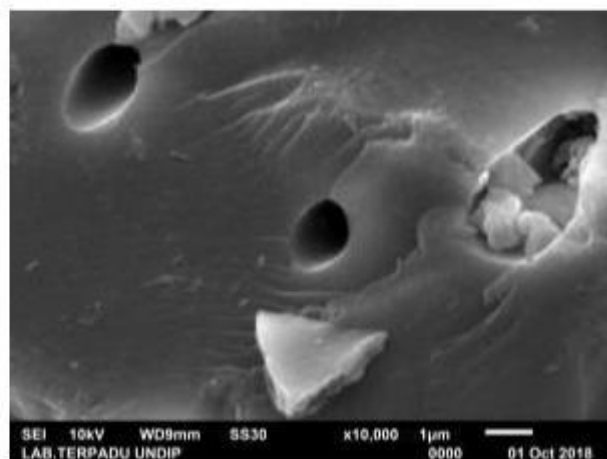
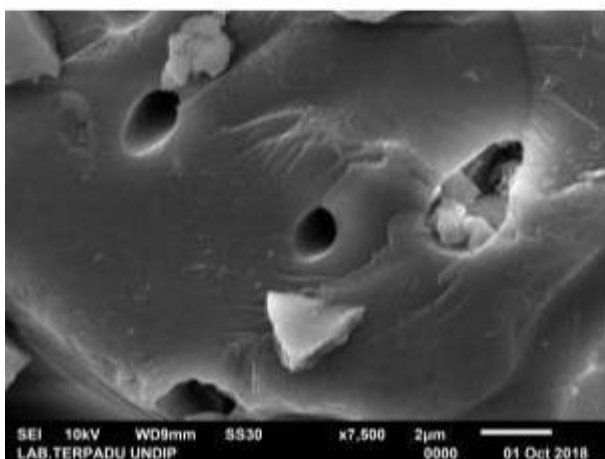
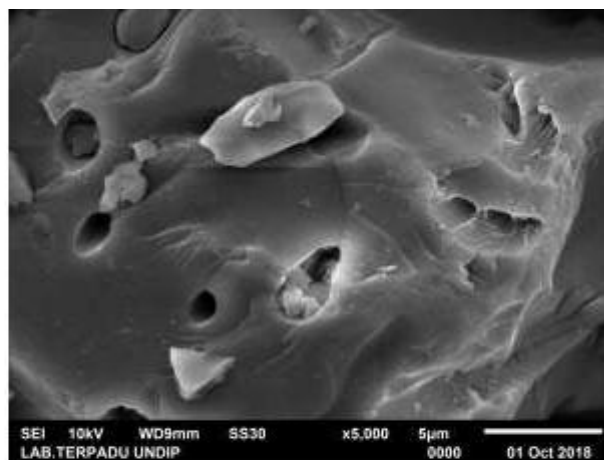
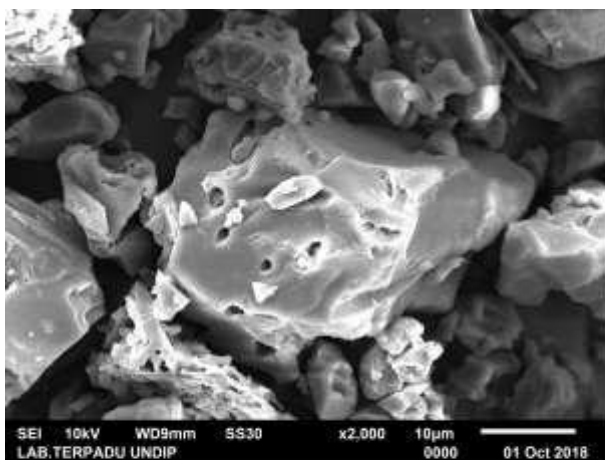
Jalan Prof. Soedarto, SH Tembalang Semarang Kotak Pos 1269

Telepon (024) 76918147- Faksimile (024) 76918148, Website :

<http://labterpadu.undip.ac.id>;

E-mail : labterpadu@live.undip.ac.id

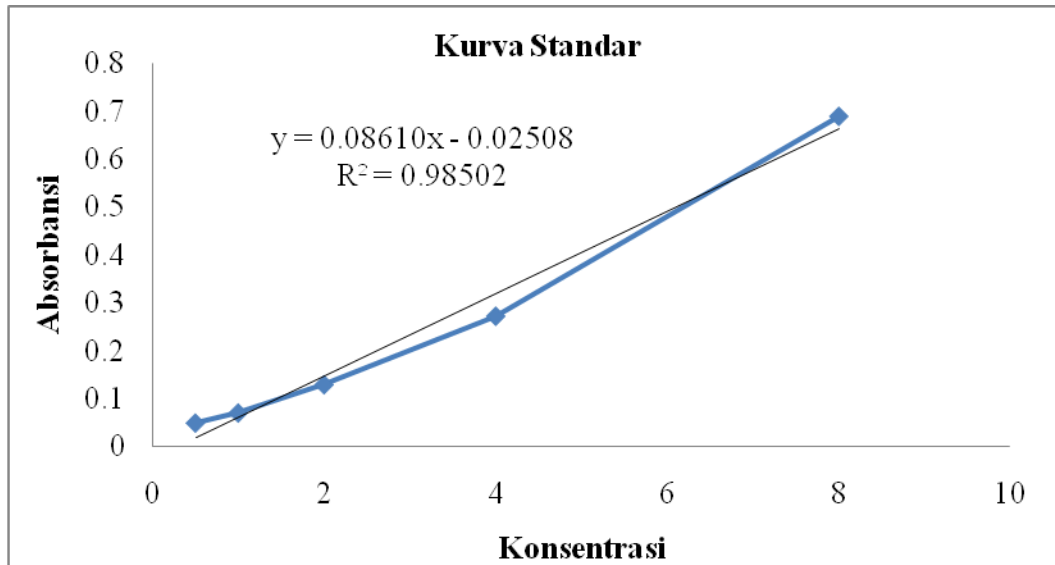
Hasil Uji Citra SEM sbb: Karbon Sesudah Adsorpsi



Lampiran 6. Penentuan Luas Permukaan dengan Metilen Biru

Standar Metilen Biru

Konsentrasi	Absorbansi
0.5	0.049
1	0.07
2	0.129
4	0.272
8	0.689



Data Penentuan Luas Permukaan Karbon Aktif dari Tempurung Kluwak

Absorbansi	Co (mg/L)	FP	Ce (mg/L)	Wa (g)	qe (mg/g)	S (m ² /g)
1.95	2349.686	10	223.5679443	0.3025	176.9406181	654.7300
2.222	2349.686		2.869686411	0.3038	193.1218503	714.6050
2.333	2349.686	2	41,22926829	0.3061	188.5378261	697.6429



Optimization Software:
www.balesio.com

$$q_e = \frac{(C_o - C_e)V}{W}$$

Contoh perhitungan jumlah metilen biru yang diadsorpsi (q_e) pada:

$$q_e = \frac{(2349.686 - 2.86968411) \frac{\text{mg}}{\text{L}}}{0.3038 \text{ g}} \times 0,025 \text{ L}$$

$$= 193.1218503 \text{ mg/g}$$

$$S = \frac{X_m \cdot N \cdot a}{M_r}$$

Contoh perhitungan luas permukaan adsorben (S) pada:

$$S = \frac{(193.1218503 \times 6,02 \times 197)}{320,5 \text{ g/mol}}$$

$$= 714.6050 \text{ (m}^2\text{/g)}.$$



Lampiran 7. Hasil Analisis BJH

Quantachrome NovaWin - Data Acquisition and Reduction for NOVA instruments

©1994-2010, Quantachrome Instruments
version 11.0



Analysis

Operator:nova
Sample ID: KTK
Sample Desc:
Sample weight: 0.1355 g
Outgas Time: 3.0 hrs
Analysis gas: Nitrogen
Press. Tolerance: 0.050/0.050 (ads/des)
Analysis Time: 481.8 min
Cell ID: 62

Date:2018/09/20

Filename:
Comment:
Sample Volume: 0.03474 cc
OutgasTemp: 300.0 C
Bath Temp: 77.3 K
Equil time: 120/120 sec (ads/des)
End of run: 2018/09/20 1:03:11

Report

Operator:nova
Date:9/24/2018

Sample Density: 3.9 g/cc

Equil timeout: 240/240 sec (ads/des)

Instrument: Nova Station A

F/W version: 0.00

BJH Pore Size Distribution Adsorption

Data Reduction Parameters Data

t-Method	Calc. method: de Boer		
BJH/DH method	Moving pt. avg.: off	Ignoring P-tags below 0.35 P/Po	
Adsorbate	Nitrogen	Temperature	77.350K
	Molec. Wt.: 28.013 g	Cross Section:	16.200 Å ²
	Contact Angle: 0.0 degrees	Surf. Tension:	8.850 erg/cm ²
		Liquid Density:	0.808 g/cc

BJH Pore Size Distribution Adsorption Data

Diameter	Pore Volume	Pore Surf Area	dV(d)	dS(d)	dV(logd)	dS(logd)
[Å]	[cc/g]	[m ² /g]	[cc/Å/g]	[m ² /Å/g]	[cc/g]	[cc/g]
31.4480	5.0660e-04	6.4436e-01	2.2609e-04	2.8757e-01	1.6365e-02	2.0815e+01
33.7029	1.3172e-03	1.6064e+00	3.5722e-04	4.2396e-01	2.7711e-02	3.2888e+01
35.9895	2.2228e-03	2.6129e+00	3.9307e-04	4.3688e-01	3.2563e-02	3.6191e+01
38.5117	3.2606e-03	3.6909e+00	3.7872e-04	3.9336e-01	3.3569e-02	3.4867e+01
41.6063	4.4991e-03	4.8815e+00	3.5910e-04	3.4523e-01	3.4382e-02	3.3055e+01
44.9633	5.6870e-03	5.9383e+00	3.6382e-04	3.2366e-01	3.7651e-02	3.3495e+01
48.7264	6.9650e-03	6.9874e+00	2.9991e-04	2.4620e-01	3.3628e-02	2.7605e+01
53.3936	8.7364e-03	8.3145e+00	3.4918e-04	2.6159e-01	4.2897e-02	3.2136e+01
58.5965	1.0092e-02	9.2396e+00	2.5413e-04	1.7348e-01	3.4264e-02	2.3390e+01
64.1588	1.1733e-02	1.0263e+01	2.8347e-04	1.7673e-01	4.1849e-02	2.6091e+01
71.1457	1.3209e-02	1.1093e+01	1.8038e-04	1.0141e-01	2.9517e-02	1.6595e+01
80.1906	1.4741e-02	1.1857e+01	1.5456e-04	7.7096e-02	2.8502e-02	1.4217e+01
91.8973	1.7131e-02	1.2897e+01	1.7698e-04	7.7032e-02	3.7381e-02	1.6271e+01
103.8269	1.8801e-02	1.3541e+01	1.6131e-04	6.2144e-02	3.8531e-02	1.4844e+01
117.8947	2.0398e-02	1.4083e+01	8.9828e-05	3.0477e-02	2.4339e-02	8.2578e+00
143.7227	2.2192e-02	1.4582e+01	5.2965e-05	1.4741e-02	1.7446e-02	4.8556e+00
188.1612	2.3910e-02	1.4947e+01	3.1227e-05	6.6383e-03	1.3432e-02	2.8555e+00
258.3460	2.6221e-02	1.5305e+01	2.7068e-05	4.1910e-03	1.5954e-02	2.4702e+00
428.0373	2.9250e-02	1.5588e+01	1.1927e-05	1.1145e-03	1.1401e-02	1.0654e+00
1231.3583	3.3423e-02	1.5723e+01	3.0847e-06	1.0020e-04	7.7818e-03	2.5279e-01

BJH adsorption summary

Surface Area = 15.723 m²/g
Pore Volume = 0.028 cc/g
Pore Diameter Dv(d) = 35.990 Å



Optimization Software:
www.balesio.com

**Quantachrome NovaWin - Data Acquisition and Reduction
for NOVA instruments**

©1994-2010, Quantachrome Instruments
version 11.0



Analysis

Operator: nova
Sample ID: KATK
Sample Desc:
Sample weight: 0.1046 g
Outgas Time: 3.0 hrs
Analysis gas: Nitrogen
Press. Tolerance: 0.050/0.050 (ads/des)
Analysis Time: 485.6 min
Cell ID: 32

Date: 2018/09/20

Filename: C:\QCdata\Physisorb\KATK.qps
Comment:
Sample Volume: 0.02682 cc
OutgasTemp: 300.0 C
Bath Temp: 77.3 K
Equil time: 120/120 sec (ads/des)
End of run: 2018/09/20 1:06:55

Report

Operator: nova
Date: 9/24/2018
Sample Density: 3.9 g/cc
Equil timeout: 240/240 sec (ads/des)
Instrument: Nova Station B
F/W version: 0.00

BJH Pore Size Distribution Adsorption

Data Reduction Parameters Data

t-Method	Calc. method: de Boer		
BJH/DH method	Moving pt. avg.: off		
Adsorbate	Nitrogen	Ignoring P-tags below 0.35 P/Po	
	Molec. Wt.: 28.013 g	Temperature 77.350K	Liquid Density: 0.808 g/cc
	Contact Angle: 0.0 degrees	Cross Section: 16.200 Å ²	Surf. Tension: 8.850 erg/cm ²

BJH Pore Size Distribution Adsorption Data

Diameter	Pore Volume	Pore Surf Area	dV(d)	dS(d)	dV(logd)	dS(logd)
[Å]	[cc/g]	[m ² /g]	[cc/Å/g]	[m ² /Å/g]	[cc/g]	[cc/g]
31.5838	3.5766e-04	4.5296e-01	1.5483e-04	1.9609e-01	1.1255e-02	1.4254e+01
33.7806	1.0030e-03	1.2171e+00	3.0972e-04	3.6674e-01	2.4083e-02	2.8517e+01
35.8909	1.6931e-03	1.9862e+00	3.2289e-04	3.5986e-01	2.6677e-02	2.9731e+01
38.6911	2.8301e-03	3.1617e+00	3.2832e-04	3.3942e-01	2.9230e-02	3.0219e+01
42.0003	4.2172e-03	4.4827e+00	4.3962e-04	4.1868e-01	4.2495e-02	4.0471e+01
45.2493	4.9130e-03	5.0978e+00	2.0818e-04	1.8403e-01	2.1680e-02	1.9165e+01
49.1325	6.6756e-03	6.5328e+00	3.9845e-04	3.2439e-01	4.5047e-02	3.6674e+01
53.6435	7.8476e-03	7.4067e+00	2.5486e-04	1.9004e-01	3.1461e-02	2.3459e+01
58.6399	9.2071e-03	8.3341e+00	2.5202e-04	1.7191e-01	3.4004e-02	2.3195e+01
64.5853	1.0573e-02	9.1797e+00	2.1019e-04	1.3018e-01	3.1232e-02	1.9343e+01
71.5708	1.1783e-02	9.8564e+00	1.6197e-04	9.0524e-02	2.6668e-02	1.4905e+01
80.0508	1.3356e-02	1.0642e+01	1.6577e-04	8.2830e-02	3.0519e-02	1.5250e+01
91.7744	1.4946e-02	1.1335e+01	1.1393e-04	4.9657e-02	2.4029e-02	1.0473e+01
104.8761	1.6272e-02	1.1841e+01	1.0826e-04	4.1292e-02	2.6114e-02	9.9601e+00
120.5241	1.7696e-02	1.2314e+01	7.4777e-05	2.4817e-02	2.0709e-02	6.8729e+00
149.2373	1.9476e-02	1.2791e+01	4.6379e-05	1.2431e-02	1.5849e-02	4.2480e+00
192.2098	2.1344e-02	1.3179e+01	3.9265e-05	8.1713e-03	1.7289e-02	3.5979e+00
254.7244	2.2907e-02	1.3425e+01	2.0176e-05	3.1683e-03	1.1742e-02	1.8439e+00
409.8326	2.5141e-02	1.3643e+01	9.6001e-06	9.3698e-04	8.8104e-03	8.5990e-01
1007.1011	2.8420e-02	1.3773e+01	3.4086e-06	1.3538e-04	7.2618e-03	2.8842e-01

BJH adsorption summary

Surface Area = 13.773 m²/g
Pore Volume = 0.033 cc/g
Pore Diameter Dv(d) = 42.000 Å



Optimization Software:
www.balesio.com

Analysis

Operator:nova
Sample ID: KTM-HNO3
Sample Desc:
Sample weight: 0.056 g
Outgas Time: 3.0 hrs
Analysis gas: Nitrogen
Press. Tolerance: 0.050/0.050 (ads/des)
Analysis Time: 434.0 min
Cell ID: 90

Date:2018/09/28

Filename: C:\QCdata\Physisorb\KTM-HNO3.qps
Comment:
Sample Volume: 0.014359 cc
OutgasTemp: 300.0 C
Bath Temp: 77.3 K
Equil time: 120/120 sec (ads/des)
End of run: 2018/09/28 1:10:44

Report

Operator:nova
Date:9/28/2018
Sample Density: 3.9 g/cc
Equil timeout: 240/240 sec (ads/des)
Instrument: Nova Station A
F/W version: 0.00

BJH Pore Size Distribution Adsorption

Data Reduction Parameters Data

t-Method	Calc. method: de Boer		
BJH/DH method	Moving pt. avg.: off	Ignoring P-tags below 0.35 P/Po	
Adsorbate	Nitrogen	Temperature 77.350K	
	Molec. Wt.: 28.013 g	Cross Section: 16.200 Å²	Liquid Density: 0.808 g/cc
	Contact Angle: 0.0 degrees	Surf. Tension: 8.850 erg/cm²	

BJH Pore Size Distribution Adsorption Data

Diameter	Pore Volume	Pore Surf Area	dV(d)	dS(d)	dV(logd)	dS(logd)
[Å]	[cc/g]	[m²/g]	[cc/Å/g]	[m²/Å/g]	[cc/g]	[cc/g]
31.4548	9.7444e-04	1.2392e+00	5.8107e-04	7.3892e-01	4.2075e-02	5.3505e+01
33.5918	1.5709e-03	1.9494e+00	2.2968e-04	2.7350e-01	1.7757e-02	2.1144e+01
36.1210	3.0836e-03	3.6246e+00	6.1452e-04	6.8051e-01	5.1091e-02	5.6.578e+01
38.7018	4.3514e-03	4.9349e+00	4.6956e-04	4.8531e-01	4.1828e-02	4.3231e+01
41.6595	5.8533e-03	6.3770e+00	4.6708e-04	4.4848e-01	4.4782e-02	4.2999e+01
45.2537	8.8102e-03	8.9906e+00	7.4428e-04	6.5787e-01	7.7505e-02	6.8507e+01
49.2531	1.1756e-02	1.1383e+01	7.3172e-04	5.9425e-01	8.2938e-02	6.7357e+01
53.5866	1.5227e-02	1.3974e+01	7.4794e-04	5.5830e-01	9.2228e-02	6.8844e+01
58.6768	1.8563e-02	1.6248e+01	6.0218e-04	4.1050e-01	8.1299e-02	5.5421e+01
64.4038	2.2380e-02	1.8619e+01	6.4531e-04	4.0079e-01	9.5629e-02	5.9393e+01
71.3018	2.4615e-02	1.9873e+01	2.8366e-04	1.5913e-01	4.6524e-02	2.6100e+01
79.7067	2.7624e-02	2.1383e+01	3.3695e-04	1.6910e-01	6.1777e-02	3.1002e+01
90.1440	3.0967e-02	2.2866e+01	2.7988e-04	1.2419e-01	5.8009e-02	2.5740e+01
104.3263	3.4505e-02	2.4223e+01	2.1548e-04	8.2618e-02	5.1656e-02	1.9806e+01
123.7082	3.7883e-02	2.5315e+01	1.5118e-04	4.8881e-02	4.2945e-02	1.3886e+01
145.6544	4.0487e-02	2.6030e+01	1.2085e-04	3.3189e-02	4.0458e-02	1.1111e+01
187.2293	4.5374e-02	2.7074e+01	7.9331e-05	1.6948e-02	3.3890e-02	7.2402e+00
246.5307	5.1719e-02	2.8104e+01	1.1130e-04	1.8059e-02	6.2898e-02	1.0205e+01
389.7998	5.7064e-02	2.8652e+01	2.3287e-05	2.3897e-03	2.0283e-02	2.0814e+00
1964.0459	5.9855e-02	2.8709e+01	9.5612e-07	1.9472e-05	3.3562e-03	6.8353e-02

BJH adsorption summary

Surface Area = 28.709 m²/g
Pore Volume = 0.060 cc/g
Pore Diameter Dv(d) = 53.587 Å



Optimization Software:
www.balesio.com

Analysis

Operator:nova
Sample ID: KTK
Sample Desc:
Sample weight: 0.1355 g
Outgas Time: 3.0 hrs
Analysis gas: Nitrogen
Press. Tolerance: 0.050/0.050 (ads/des)
Analysis Time: 481.8 min
Cell ID: 62

Date:2018/09/20

Filename: C:\QCdata\Physisorb\KTK.qps
Comment:
Sample Volume: 0.03474 cc
OutgasTemp: 300.0 C
Bath Temp: 77.3 K
Equil time: 120/120 sec (ads/des)
End of run: 2018/09/20 1:03:11

Report

Operator:nova
Date:9/24/2018
Sample Density: 3.9 g/cc
Equil timeout: 240/240 sec (ads/des)
Instrument: Nova Station A
F/W version: 0.00

BJH Pore Size Distribution Desorption

Data Reduction Parameters Data

t-Method	Calc. method: de Boer	Ignoring P-tags below 0.35 P/Po
BJH/DH method	Moving pt. avg.: off	Temperature 77.350k
Adsorbate	Nitrogen	Cross Section: 16.200 Å²
	Molec. Wt.: 28.013 g	Liquid Density: 0.808 g/cc
	Contact Angle: 0.0 degrees	Surf. Tension: 8.850 erg/cm²

BJH Pore Size Distribution Desorption Data

Diameter	Pore Volume	Pore Surf Area	dV(d)	dS(d)	dV(logd)	dS(logd)
[Å]	[cc/g]	[m²/g]	[cc/Å/g]	[m²/Å/g]	[cc/g]	[cc/g]
35.7508	2.5421e-03	2.8443e+00	4.1209e-04	4.6107e-01	3.3839e-02	3.7861e+01
43.0412	4.9517e-03	5.0836e+00	2.8644e-04	2.6620e-01	2.8297e-02	2.6298e+01
53.0545	7.3817e-03	6.9156e+00	2.0922e-04	1.5774e-01	2.5457e-02	1.9193e+01
67.3547	9.7998e-03	8.3517e+00	1.4236e-04	8.4545e-02	2.1961e-02	1.3042e+01
90.1134	1.2866e-02	9.7126e+00	1.0745e-04	4.7697e-02	2.2109e-02	9.8136e+00
131.9086	1.5495e-02	1.0510e+01	4.7747e-05	1.4479e-02	1.4289e-02	4.3330e+00
281.0287	1.8698e-02	1.0966e+01	1.3171e-05	1.8747e-03	7.9617e-03	1.1332e+00
1155.1452	2.2197e-02	1.1087e+01	2.3250e-06	8.0508e-05	5.1793e-03	1.7935e-01

BJH desorption summary

Surface Area = 11.087 m²/g
Pore Volume = 0.022 cc/g
Pore Diameter Dv(d) = 35.751 Å



Analysis

Operator:nova
Sample ID: KATK
Sample Desc:
Sample weight: 0.1046 g
Outgas Time: 3.0 hrs
Analysis gas: Nitrogen
Press. Tolerance: 0.050/0.050 (ads/des)
Analysis Time: 485.6 min
Cell ID: 32

Date:2018/09/20

Filename: C:\QCdata\Physisorb\KATK.qps
Comment:
Sample Volume: 0.02682 cc
OutgasTemp: 300.0 C
Bath Temp: 77.3 K
Equil time: 120/120 sec (ads/des)
End of run: 2018/09/20 1:06:55

Report

Operator:nova
Date:9/24/2018
Sample Density: 3.9 g/cc
Equil timeout: 240/240 sec (ads/des)
Instrument: Nova Station B
F/W version: 0.00

BJH Pore Size Distribution Desorption

Data Reduction Parameters Data

t-Method	Calc. method: de Boer		
BJH/DH method	Moving pt. avg.: off	Ignoring P-tags below 0.35 P/Po	
Adsorbate	Nitrogen	Temperature 77.350K	
	Molec. Wt.: 28.013 g	Cross Section: 16.200 Å ²	Liquid Density: 0.808 g/cc
	Contact Angle: 0.0 degrees	Surf. Tension: 8.850 erg/cm ²	

BJH Pore Size Distribution Desorption Data

Diameter	Pore Volume	Pore Surf Area	dV(d)	dS(d)	dV(logd)	dS(logd)
[Å]	[cc/g]	[m ² /g]	[cc/Å/g]	[m ² /Å/g]	[cc/g]	[cc/g]
35.8862	2.4050e-03	2.6807e+00	3.7789e-04	4.2121e-01	3.1143e-02	3.4714e+01
43.2639	5.1083e-03	5.1801e+00	3.2216e-04	2.9786e-01	3.1993e-02	2.9579e+01
52.8136	7.3592e-03	6.8848e+00	2.1020e-04	1.5920e-01	2.5474e-02	1.9293e+01
66.4510	9.4238e-03	8.1276e+00	1.2463e-04	7.5019e-02	1.8970e-02	1.1419e+01
88.7357	1.1529e-02	9.0766e+00	7.5173e-05	3.3886e-02	1.5231e-02	6.8659e+00
130.6693	1.3397e-02	9.6484e+00	3.3437e-05	1.0236e-02	9.9053e-03	3.0322e+00
301.1225	1.5903e-02	9.9812e+00	8.7912e-06	1.1678e-03	5.6094e-03	7.4513e-01
965.8164	1.7428e-02	1.0044e+01	1.4605e-06	6.0490e-05	2.9022e-03	1.2020e-01

BJH desorption summary

Surface Area = 10.044 m²/g
Pore Volume = 0.017 cc/g
Pore Diameter Dv(d) = 35.886 Å



Analysis

Operator:nova
Sample ID: KTM-HNO3
Sample Desc:
Sample weight: 0.056 g
Outgas Time: 3.0 hrs
Analysis gas: Nitrogen
Press. Tolerance: 0.050/0.050 (ads/des)
Analysis Time: 434.0 min
Cell ID: 90

Date:2018/09/28

Filename:
Comment:
Sample Volume: 0.014359 cc
OutgasTemp: 300.0 C
Bath Temp: 77.3 K
Equil time: 120/120 sec (ads/des)
End of run: 2018/09/28 1:10:44

Report

Operator:nova
Date:9/28/2018
C:\QCdata\Physisorb\KTM-HNO3.qps
Sample Density: 3.9 g/cc
Equil timeout: 240/240 sec (ads/des)
Instrument: Nova Station A
F/W version: 0.00

BJH Pore Size Distribution Desorption

Data Reduction Parameters Data

t-Method	Calc. method: de Boer		
BJH/DH method	Moving pt. avg.: off	Ignoring P-tags below 0.35 P/Po	
Adsorbate	Nitrogen	Temperature	77.350K
	Molec. Wt.: 28.013 g	Cross Section:	16.200 Å ²
	Contact Angle: 0.0 degrees	Surf. Tension:	8.850 erg/cm ²
		Liquid Density:	0.808 g/cc

BJH Pore Size Distribution Desorption Data

Diameter	Pore Volume	Pore Surf Area	dV(d)	dS(d)	dV(logd)	dS(logd)
[Å]	[cc/g]	[m ² /g]	[cc/Å/g]	[m ² /Å/g]	[cc/g]	[cc/g]
35.9082	5.4111e-03	6.0277e+00	8.9069e-04	9.9218e-01	7.3467e-02	8.1839e+01
42.8974	1.1500e-02	1.1706e+01	7.7046e-04	7.1842e-01	7.5887e-02	7.0761e+01
52.6887	1.6908e-02	1.5811e+01	4.6306e-04	3.5154e-01	5.5948e-02	4.2474e+01
67.1805	2.0983e-02	1.8237e+01	2.3545e-04	1.4019e-01	3.6219e-02	2.1565e+01
89.5538	2.5426e-02	2.0222e+01	1.6192e-04	7.2325e-02	3.3127e-02	1.4796e+01
131.0012	2.9591e-02	2.1494e+01	7.5100e-05	2.2931e-02	2.2311e-02	6.8124e+00
251.3498	3.8398e-02	2.2895e+01	4.7545e-05	7.5664e-03	2.6223e-02	4.1731e+00
1883.7477	3.9748e-02	2.2924e+01	4.3814e-07	9.3036e-06	1.3521e-03	2.8710e-02

BJH desorption summary

Surface Area = 22.924 m²/g
Pore Volume = 0.040 cc/g
Pore Diameter Dv(d) = 35.908 Å



Analysis

Operator:nova
Sample ID: KTK
Sample Desc:
Sample weight: 0.1355 g
Outgas Time: 3.0 hrs
Analysis gas: Nitrogen
Press. Tolerance: 0.050/0.050 (ads/des)
Analysis Time: 481.8 min
Cell ID: 62

Date:2018/09/20

Filename: C:\QCdata\Physisorb\KTK.qps
Comment:
Sample Volume: 0.03474 cc
OutgasTemp: 300.0 C
Bath Temp: 77.3 K
Equil time: 120/120 sec (ads/des)
End of run: 2018/09/20 1:03:11

Report

Operator:nova
Date:9/24/2018
Sample Density: 3.9 g/cc
Equil timeout: 240/240 sec (ads/des)
Instrument: Nova Station A
F/W version: 0.00

Isotherm

Data Reduction Parameters Data

Adsorbate	Nitrogen	Temperature	77.350k
	Molec. Wt.: 28.013 g	Cross Section:	16.200 Å ²
		Liquid Density:	0.808 g/cc

Isotherm Data

Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]
2.31600e-02	0.8967	4.93968e-01	4.3073	9.64071e-01	16.7477
5.93380e-02	0.9732	5.28409e-01	4.8591	9.89844e-01	19.3004
9.41970e-02	1.0056	5.57408e-01	5.3746	9.49875e-01	17.1600
1.23188e-01	1.0834	5.90771e-01	5.9481	8.68362e-01	15.4031
1.62312e-01	1.1927	6.24979e-01	6.6986	7.96456e-01	14.1268
1.90915e-01	1.3133	6.55691e-01	7.3024	7.19844e-01	12.7420
2.20362e-01	1.4492	6.84162e-01	8.0082	6.42456e-01	11.6668
2.50004e-01	1.6047	7.17611e-01	8.6867	5.62819e-01	10.6263
2.80716e-01	1.8565	7.50129e-01	9.3995	4.82648e-01	9.6236
3.11815e-01	2.1561	7.84469e-01	10.4791	4.06369e-01	8.6149
3.41906e-01	2.4226	8.05241e-01	11.2366	3.30617e-01	7.6647
3.72610e-01	2.7230	8.33169e-01	11.9988	2.53827e-01	6.5707
4.05012e-01	3.0404	8.69401e-01	12.8977	1.74973e-01	5.5145
4.35212e-01	3.4316	9.03889e-01	13.7983	9.51670e-02	4.3501
4.63396e-01	3.8418	9.32142e-01	15.0322		



Analysis

Operator:nova
Sample ID: KATK
Sample Desc:
Sample weight: 0.1046 g
Outgas Time: 3.0 hrs
Analysis gas: Nitrogen
Press. Tolerance: 0.050/0.050 (ads/des)
Analysis Time: 485.6 min
Cell ID: 32

Date:2018/09/20

Filename: C:\QCdata\Physisorb\KATK.qps
Comment:
Sample Volume: 0.02682 cc
OutgasTemp: 300.0 C
Bath Temp: 77.3 K
Equil time: 120/120 sec (ads/des)
End of run: 2018/09/20 1:06:55

Report

Operator:nova
Date:9/24/2018
Sample Density: 3.9 g/cc
Equil timeout: 240/240 sec (ads/des)
Instrument: Nova Station B
F/W version: 0.00

Isotherm

Data Reduction Parameters Data

Adsorbate	Nitrogen	Temperature	77.350K
	Molec. Wt.: 28.013 g	Cross Section:	16.200 Å ²
		Liquid Density:	0.808 g/cc

Isotherm Data

Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]
2.58730e-02	0.5487	4.99652e-01	3.5554	9.62032e-01	14.1222
5.97870e-02	0.6737	5.30720e-01	4.1166	9.86929e-01	16.1042
9.46240e-02	0.6874	5.60121e-01	4.4622	9.54682e-01	15.1827
1.23614e-01	0.7503	5.94299e-01	5.1758	8.67641e-01	13.7967
1.62917e-01	0.8536	6.25057e-01	5.6888	7.93153e-01	12.8911
1.89899e-01	0.9659	6.56086e-01	6.2754	7.15750e-01	11.9424
2.20959e-01	1.0808	6.87659e-01	6.8761	6.38455e-01	11.0537
2.51028e-01	1.2640	7.17874e-01	7.4267	5.64556e-01	10.1381
2.78149e-01	1.4807	7.49098e-01	8.1303	4.85207e-01	9.0853
3.11699e-01	1.6740	7.84702e-01	8.8721	4.06889e-01	8.1395
3.37836e-01	1.8759	8.08807e-01	9.4890	3.31920e-01	7.1310
3.74130e-01	2.1448	8.37480e-01	10.1752	2.54920e-01	6.0410
4.07369e-01	2.4049	8.75650e-01	11.0710	1.76609e-01	4.8494
4.35018e-01	2.7189	9.04044e-01	12.0257	9.52830e-02	3.5020
4.61256e-01	3.0413	9.30313e-01	12.8605		



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for NOVA instruments**
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version 11.0



Analysis

Operator: nova
Sample ID: KTM-HNO3
Sample Desc:
Sample weight: 0.056 g
Outgas Time: 3.0 hrs
Analysis gas: Nitrogen
Press. Tolerance: 0.050/0.050 (ads/des)
Analysis Time: 434.0 min
Cell ID: 90

Date: 2018/09/28

Filename: C:\QCdata\Physisorb\KTM-HNO3.qps
Comment:
Sample Volume: 0.014359 cc
OutgasTemp: 300.0 C
Bath Temp: 77.3 K
Equil time: 120/120 sec (ads/des)
End of run: 2018/09/28 1:10:44

Report

Operator: nova
Date: 9/28/2018
Sample Density: 3.9 g/cc
Equil timeout: 240/240 sec (ads/des)
Instrument: Nova Station A
F/W version: 0.00

Isotherm

Data Reduction Parameters Data

Adsorbate	Nitrogen	Temperature	77.350k
	Molec. Wt.: 28.013 g	Cross Section:	16.200 Å ²
		Liquid Density:	0.808 g/cc

Isotherm Data

Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]
2.65540e-02	0.5924	4.95765e-01	5.7857	9.60344e-01	30.9963
5.93460e-02	0.7674	5.27812e-01	6.5717	9.94377e-01	32.7405
9.42010e-02	0.7014	5.62760e-01	7.8531	9.40950e-01	31.8962
1.22555e-01	0.7738	5.93736e-01	9.1090	8.67750e-01	27.2399
1.57068e-01	0.8984	6.24836e-01	10.5571	7.94246e-01	25.1632
1.88448e-01	1.1185	6.56665e-01	11.9860	7.19789e-01	23.1128
2.19695e-01	1.3344	6.85547e-01	13.5817	6.40545e-01	21.2889
2.51897e-01	1.5846	7.17632e-01	14.6492	5.59525e-01	19.0709
2.82602e-01	1.9082	7.47251e-01	16.0187	4.83865e-01	16.7204
3.11561e-01	2.2696	7.78731e-01	17.5657	4.09182e-01	14.6084
3.43755e-01	2.8306	8.11476e-01	19.2433	3.27503e-01	12.2775
3.76934e-01	3.3247	8.43476e-01	20.8994	2.53130e-01	9.9915
4.01176e-01	3.8367	8.65732e-01	22.1989	1.77758e-01	7.5127
4.35884e-01	4.3617	9.04978e-01	24.7347	9.71170e-02	4.7359
4.65852e-01	5.1046	9.25435e-01	28.0241		

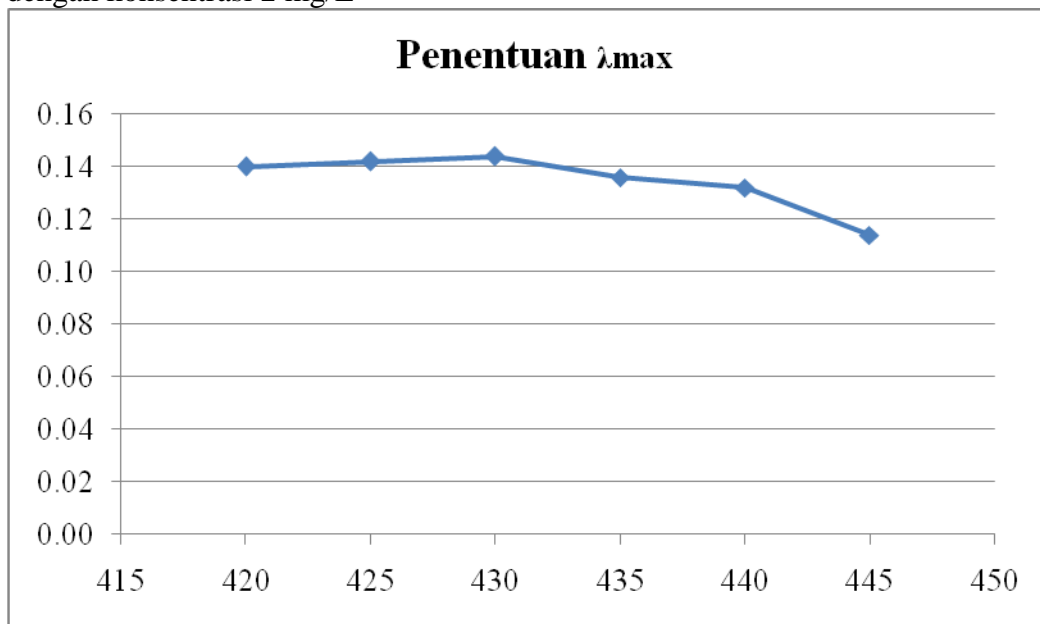


Lampiran 8. Data Penentuan Panjang Gelombang Maksimum metanil kuning dengan Konsentrasi 2 mg/L.

Hubungan antara Absorbansi dan Panjang Gelombang metanil kuning dengan konsentrasi 2 mg/L

Panjang Gelombang	Absorbansi
420	0,14
425	0,142
430	0,144
435	0,136
440	0,132
445	0,114

Kurva hubungan antara Absorbansi dan Panjang Gelombang metanil kuning dengan konsentrasi 2 mg/L

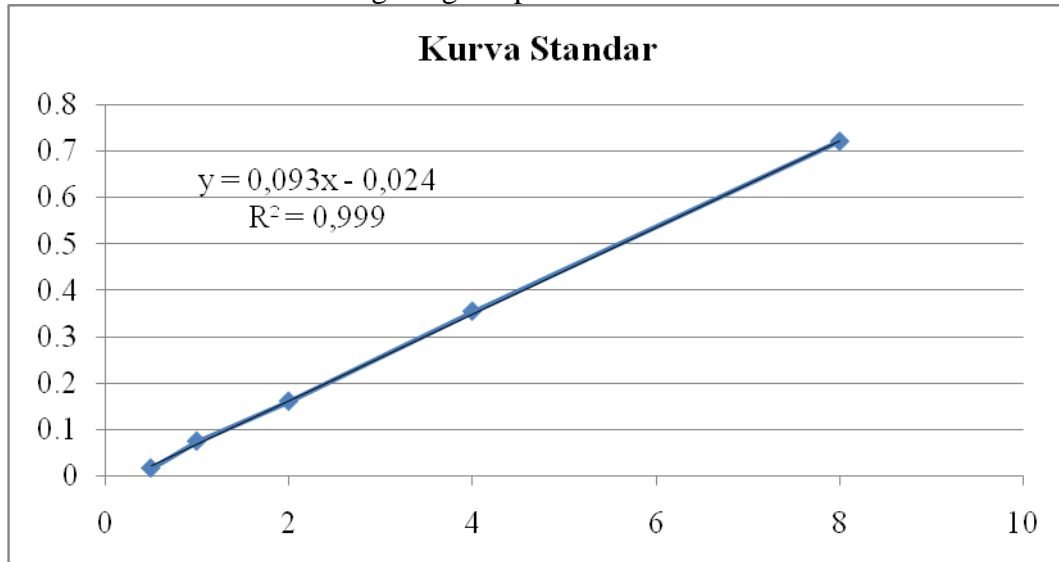


Lampiran 9. Data Absorbansi Kurva Standar Larutan metanil kuning

Hubungan antara Absorbansi dan konsentrasi metanil kuning

Konsentrasi	Absorbansi
0,5	0,016
1	0,074
2	0,16
4	0,354
8	0,72

Kurva standar metanil kuning dengan Spektrofotometer Uv-Vis



Lampiran 10. Penentuan Waktu Optimum Adsorpsi metanil kuning oleh Karbon Aktif Tempurung kluwak

Data Penentuan Waktu Optimum Adsorpsi metanil kuning oleh Karbon Aktif Termodifikasi

Waktu Kontak	Absorbansi	Ce (mg/L)	Co (mg/L)	Wa (g)	qe (mg/g)
5	0,2455	2,897849462	10	0,5036	0,70513806
10	0,243	2,870967742	10	0,50165	0,710558383
15	0,2265	2,693548387	10	0,5083	0,718714501
20	0,2215	2,639784946	10	0,504	0,730180065
30	0,2145	2,564516129	10	0,50075	0,742434735
35	0,225	2,677419355	10	0,5017	0,729776823
40	0,2245	2,672043011	10	0,50345	0,727774058
50	0,2305	2,73655914	10	0,50775	0,715257593

$$q_e = \frac{(C_o - C_e)V}{W}$$

Contoh perhitungan jumlah metanil kuning yang diadsorpsi (q_e) pada $t = 30$ menit

$$q_e = \frac{(10 - 2,564516129) \frac{\text{mg}}{\text{L}}}{0,50075 \text{ g}} \times 0,05 \text{ L}$$

$$= 0,742434735 \text{ mg/g}$$



Lampiran 11. Penentuan Kapasitas Adsorpsi Metanil Kuning oleh Karbon Aktif Termodifikasi

C_o (mg/L)	Absorbansi	FP	C_e (mg/L)	x/m atau q_e (mg/g)	C_e/q_e	Log C_e	Log q_e
7,7742	0,0560		0,8602	0,6810	1,2631	- 0,0654	-0,1668
18,8172	0,1830		2,2258	1,6366	1,3601	0,3475	0,2139
38,7097	0,3960		4,5161	3,3748	1,3382	0,6548	0,5282
56,9892	0,1250	5	8,0108	4,8542	1,6503	0,9037	0,6861
87,6344	0,2150	5	12,8495	7,4546	1,7237	1,1089	0,8724
137,0968	0,4320	5	24,5161	11,2423	2,1807	1,3895	1,0509
199,4624	0,4560	10	51,6129	14,5435	3,5489	1,7128	1,1627

$$q_e = \frac{(C_o - C_e)V}{W}$$

Contoh perhitungan jumlah metanil kuning yang diadsorpsi (q_e) pada konsentrasi 199,4623656

$$q_e = \frac{(199,4624 - 51,6129) \frac{\text{mg}}{\text{L}}}{0,5083 \text{ g}} \times 0,05 \text{ L}$$

$$= 14,5435 \text{ mg/g}$$



n 12. Contoh Perhitungannilai Q_o dan b

Persamaan isotermal adsorpsi Langmuir :

$$\frac{C_e}{q_e} = \frac{1}{Q_o b} + \frac{C_e}{Q_o}$$

Berdasarkan model isotermal Langmuir diperoleh persamaan garis :

$$y = 0,044x + 1,202$$

Dari persamaan garis tersebut, nilai *slope* = 0,044 dan *intercept* 1,202

$$\frac{1}{Q_o} = \text{kemiringan (slope)}$$

$$\frac{1}{Q_o} = \text{tg } \alpha$$

$$Q_o = \frac{1}{\text{slope}}$$

$$= \frac{1}{0,044}$$

$$= 22,7272 \text{ mg/g}$$

$$\frac{1}{Q_o b} = \text{intercept}$$

$$b = \frac{1}{Q_o \times \text{intercept}}$$

$$= \frac{1}{22,7272 \frac{\text{mg}}{\text{g}} \times 1,202 \text{ g/L}}$$

$$= 0,0366 \text{ L/mg}$$

Berdasarkan model isotermal Freundlich diperoleh persamaan garis :

$$0,766x - 0,041$$

Dari persamaan garis tersebut, nilai *slope* = 0,766 dan *intercept* = 0,041



intercept

s log intercept

log -0,041

$$= 0,9099\text{mg/g}$$

$$\frac{1}{n} = \text{kemiringan (slope)}$$

$$n = \frac{1}{\text{slope}}$$

$$= \frac{1}{0,766 \frac{\text{L}}{\text{g}}}$$

$$= 1,3054 \text{ g/L}$$



n 14. Desorpsi

Desorpsi	Kons. Sebelum	Setelah Desorpsi	Rasio Desorpsi
----------	---------------	------------------	----------------

	Desorpsi	Absorbansi	Konsentrasi	(%)
HCl	3,1118	0,0215	0,489247	15,72218383
HNO ₃		0,019	0,462366	14,85832757
H ₂ O		0,189	2,290323	73,60055287

$$\text{Rasio desorpsi} = \frac{\text{jumlah zat warna yang didesorpsi}}{\text{jumlah zat warna yang teradsorpsi}} \times 100\%$$

$$\text{Rasio desorpsi} = \frac{2,2903}{3,1118} \times 100\%$$

$$= 73,005 \%$$

