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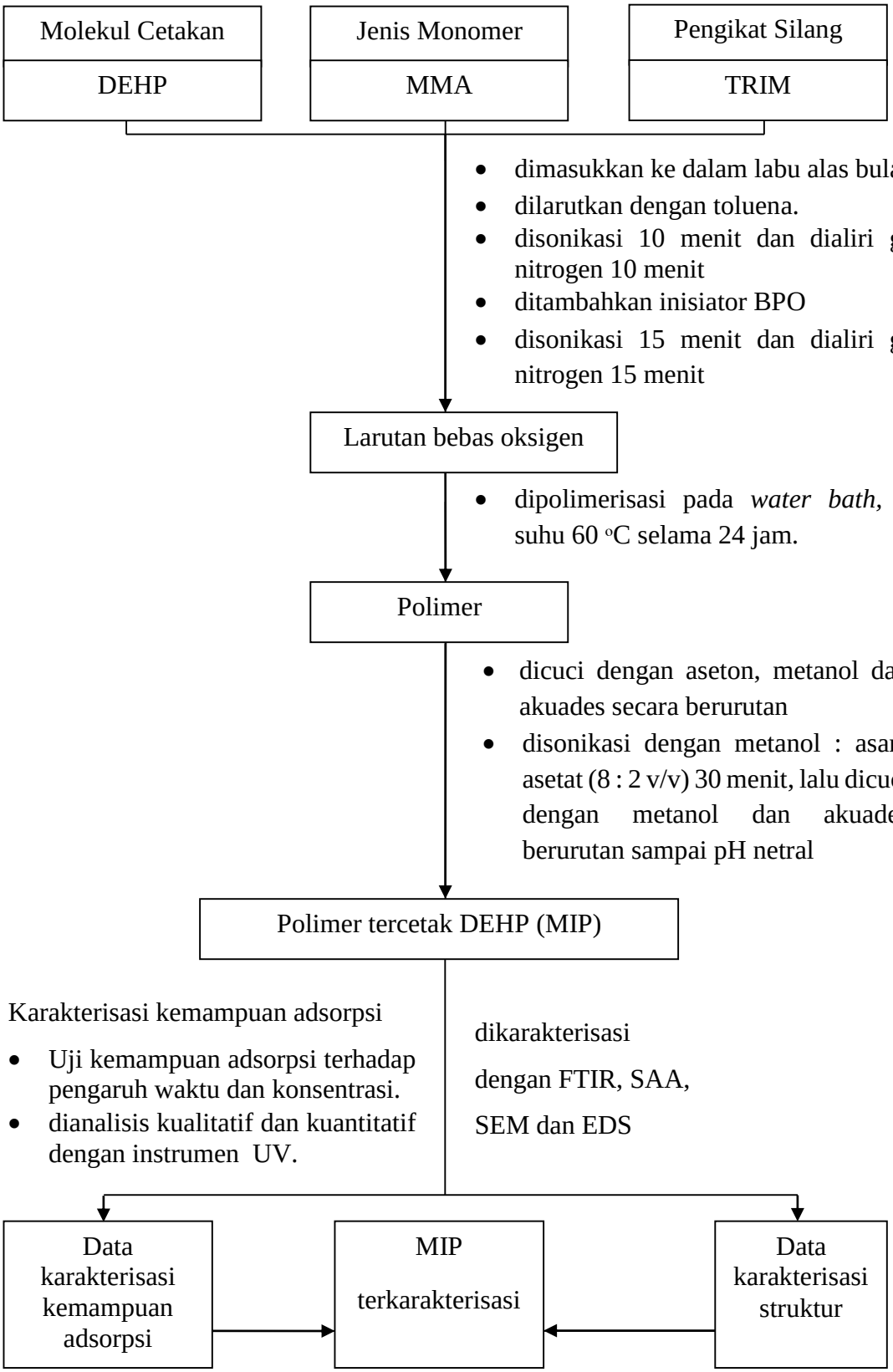
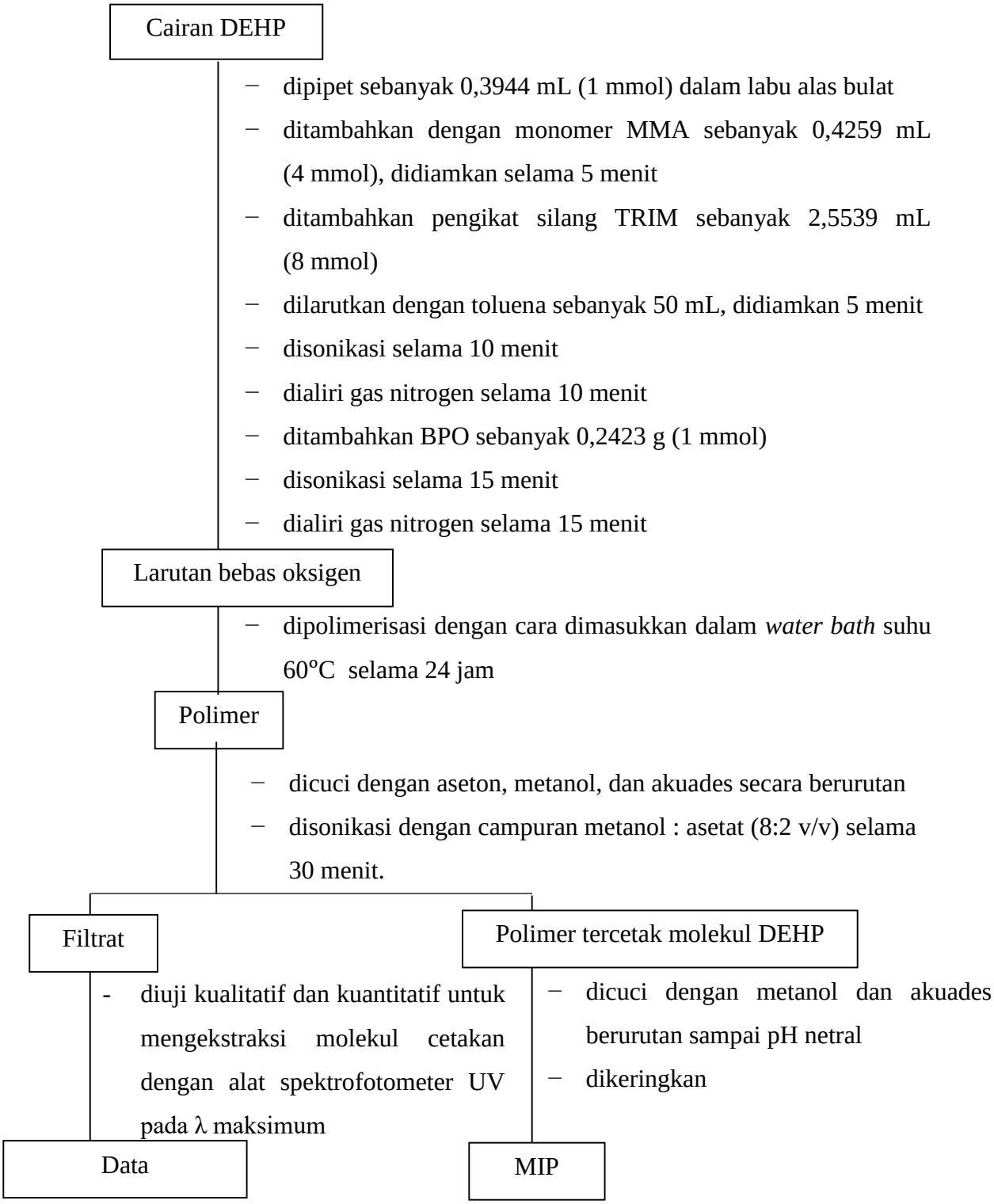
Lampiran 1. Skema Sintesis Polimer Bercetakan Molekul DEHP menggunakan Metode Polimerisasi Presipitasi



Catatan: Sintesis NIP dibuat dengan metode yang sama, tapi tanpa DEHP dan proses ekstraksi.

Lampiran 2. Bagan Alir Prosedur Penelitian

1. Sintesis MIP dan NIP



Catatan : Sintesis NIP dibuat dengan metode yang sama, tetapi tanpa menggunakan molekul cetakan (DEHP)

2. Pembuatan Larutan Standar DEHP 100 mgL^{-1}

Cairan DEHP

- dipipet sebanyak 0,001 mL ke dalam labu ukur 10 mL
- ditambahkan metanol sampai tanda batas.
- dihomogenkan.

Larutan Standar DEHP 100 mgL^{-1}

- divariasikan konsentrasinya menjadi 3, 6, 9, 12, 15, 18, 21 dan 24 mgL^{-1}

Deret Standar DEHP

3. Uji Kemampuan Adsorpsi MIP dan NIP

MIP dan NIP

- ditimbang masing-masing sebanyak 30 mg.
- dimasukkan masing-masing ke dalam botol vial yang berbeda
- ditambahkan masing-masing 5 mL larutan DEHP 10 mgL^{-1} ke dalam botol vial
- diaduk dengan alat *shaker* selama 60 menit pada suhu ruang
- disaring

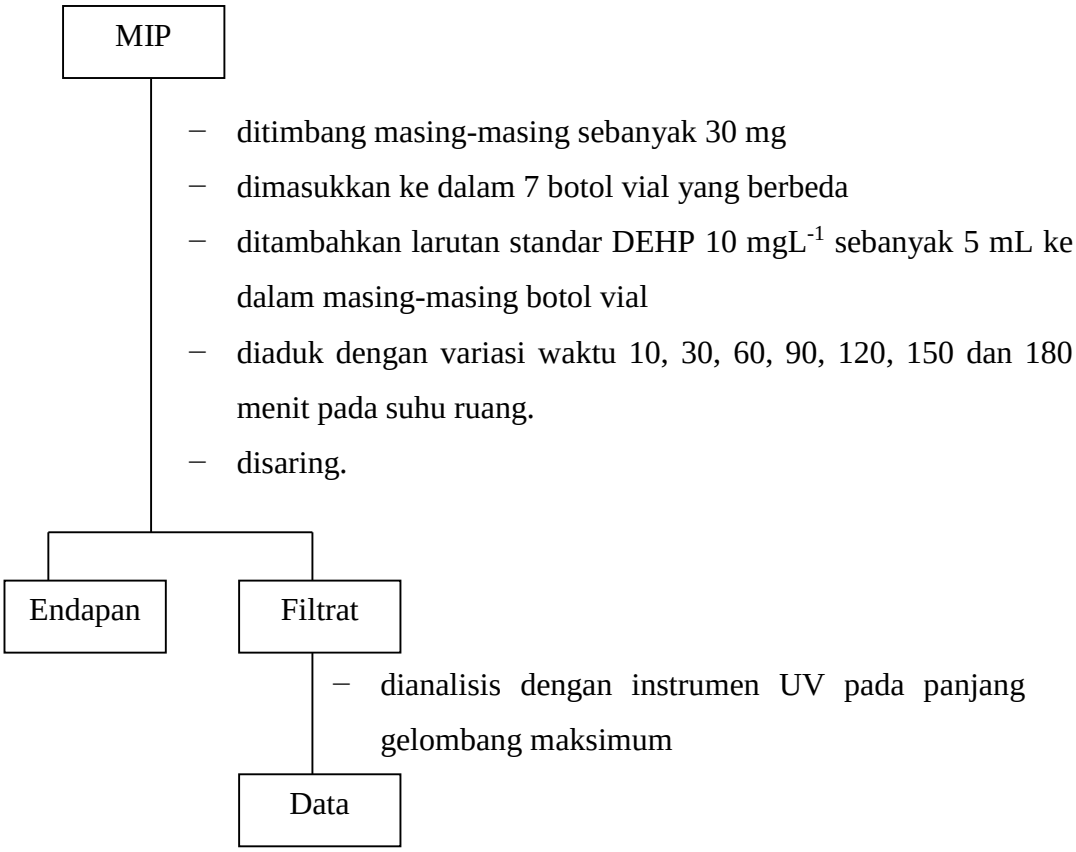
Endapan

Filtrat

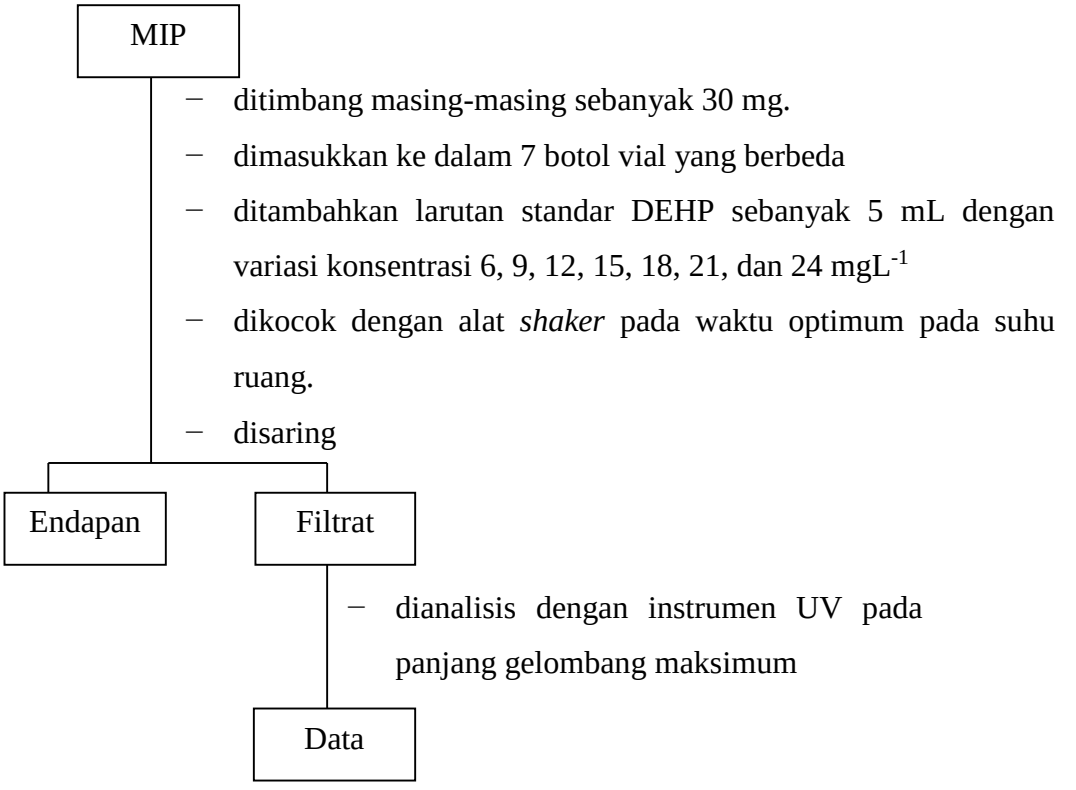
- dianalisis dengan spektrofotometer UV pada panjang gelombang maksimum

Data

4. Pengaruh Waktu terhadap Kemampuan Adsorpsi MIP



5. Pengaruh Konsentrasi terhadap Kemampuan Adsorpsi MIP

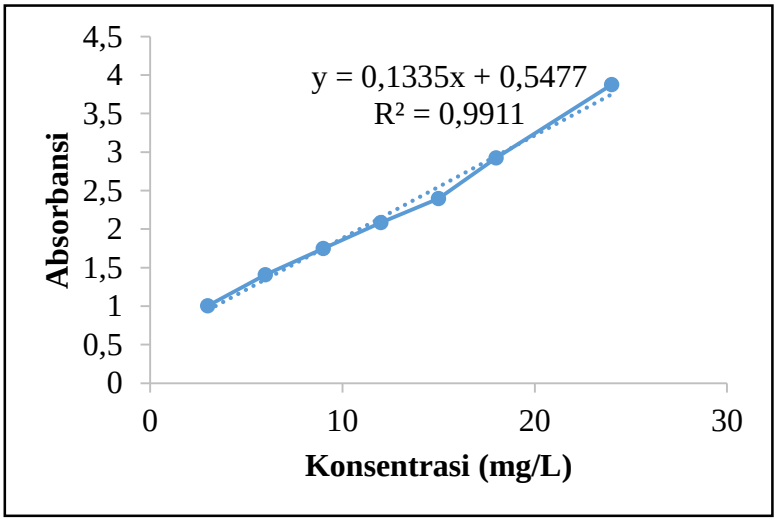


Lampiran 3. Data Spektrofotometer UV-Vis

1. Data absorbansi larutan standar DEHP

No.	Sampel	Konsentrasi (mgL^{-1})	Absorbansi
1	DEHP 1	3	1,005
2	DEHP 2	6	1,409
3	DEHP 3	9	1,75
4	DEHP 4	12	2,084
5	DEHP 5	15	2,398
6	DEHP 6	18	2,924
7	DEHP 7	24	3,875

2. Kurva hubungan antara absorbansi Vs konsentrasi larutan standar DEHP



3. Data absorbansi kemampuan adsorpsi MIP dan NIP

No.	Sampel	Absorbansi	q_e (mg/g)	Δq_e (mg/g)
1	Adsorpsi DEHP oleh MIP	1,478	0,5052	0,2871
2	Adsorpsi DEHP oleh NIP	1,708	0,2181	

4. Data absorbansi adsorpsi DEHP oleh MIP terhadap pengaruh waktu

No.	Sampel	Waktu (menit)	Absorbansi
1	DEHP	10	1,623
2	DEHP	30	1,67
3	DEHP	60	1,627
4	DEHP	90	1,589
5	DEHP	120	1,619
6	DEHP	150	1,621
7	DEHP	180	1,621

5. Data penentuan kinetika adsorpsi orde satu semu dan orde dua semu

No.	Waktu	C_e (mgL^{-1})	q_t (mg/g)	q_e-q_t	Log (q_e-q_t)	t/q_t
1	0	0	0	0,36667	-0,43572	0
2	30	8,4067	0,26554	0,10112	-0,99514	112,97602
3	60	8,0846	0,31923	0,04744	-1,32384	187,95463
4	90	7,8	**0,36667**	0	0	245,45454
5	120	8,0247	0,32921	0,03745	-1,42651	364,50511
6	150	8,0397	0,32672	0,03995	-1,39848	459,11348
7	180	8,0397	0,32672	0,03995	-1,39848	550,93618

Catatan:

qt adalah qe pada waktu t

qe adalah qt pada waktu optimum

6. Data absorbansi adsorpsi DEHP oleh MIP terhadap pengaruh konsentrasi

No.	Sampel	Konsentrasi (mgL^{-1})	Absorbansi
1	DEHP	12	1,101
2	DEHP	15	1,383
3	DEHP	18	1,64
4	DEHP	21	1,872
5	DEHP	24	2,092

7. Data persamaan isotermal Langmuir dan Freundlich

No.	Sampel	Konsentrasi (mgL^{-1})	C_e (mgL^{-1})	q_e (mg/g)	Log C_e	Log q_e	$1/C_e$	$1/q_e$
1	MIP_DEHP	12	4,1445	1,3092	0,6174	0,1170	0,2412	0,7638
2	MIP_DEHP	15	6,2569	1,4571	0,7963	0,1635	0,1598	0,6862
3	MIP_DEHP	18	8,1820	1,6363	0,9128	0,2138	0,1222	0,6111
4	MIP_DEHP	21	9,9198	1,8466	0,9965	0,2663	0,1008	0,5415
5	MIP_DEHP	24	11,5677	2,0720	1,0632	0,3163	0,0864	0,4826

Lampiran 4. Perhitungan

1. Nilai konsentrasi adsorpsi DEHP oleh MIP dan NIP

$y = 0,1335x + 0,5477$

a. Adsorpsi DEHP oleh MIP

$y = 1,478$

$y = 0,1335x + 0,5477$

$1,478 = 0,1335x + 0,5477$

$x = \frac{1,478 - 0,5477}{0,1335}$

$x = 6,9685 \text{ mgL}^{-1}$

b. Adsorpsi DEHP oleh NIP

$y = 1,708$

$y = 0,1335x + 0,5477$

$1,708 = 0,1335x + 0,5477$

$x = \frac{1,708 - 0,5477}{0,1335}$

$x = 8,6913 \text{ mgL}^{-1}$

2. Nilai Kemampuan Adsorpsi DEHP oleh MIP dan NIP

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

Diketahui: $C_o = 10 \text{ mgL}^{-1}$ $W = 0,03$ g

$V = 0,005$ L C_e = Konsentrasi setelah adsorpsi

a. Kemampuan Adsorpsi DEHP oleh MIP

$q_e = \frac{(10 - 6,9685)\, 0,005}{0,03}$

$$q_e = \frac{0,0151575}{0,03}$$

$$q_e = 0,5052 \text{ mg/g}$$

b. Kemampuan Adsorpsi DEHP oleh NIP

$$q_e = \frac{(10 - 8,6913)\ 0,005}{0,03}$$

$$q_e = \frac{0,0065435}{0,03}$$

$$q_e = 0,2181 \text{ mg/g}$$

3. Nilai konsentrasi adsorpsi dan kemampuan adsorpsi DEHP oleh MIP terhadap pengaruh waktu

Waktu (menit)	y (absorbansi)	x (konsentrasi) (mgL^{-1})	q_e (mg/g)
30	1,67	8,4067	0,2655
60	1,627	8,0846	0,3192
90	1,589	7,8	0,3667
120	1,619	8,0247	0,3292
150	1,621	8,0397	0,3267
180	1,621	8,0397	0,3267

Contoh perhitungan konsentrasi adsorpsi dan kemampuan adsorpsi DEHP oleh MIP terhadap pengaruh waktu:

a. Konsentrasi Adsorpsi DEHP oleh MIP 30 menit

$$y = 0,1335x + 0,5477$$

$$y = 1,67$$

$$y = 0,1335x + 0,5477$$

$$1,67 = 0,1335x + 0,5477$$

$$x = \frac{1,67 - 0,5477}{0,1335}$$

$$x = 8,4067 \text{ mgL}^{-1}$$

b. Kemampuan Adsorpsi DEHP oleh MIP 30 menit

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

Diketahui: C_o = 10 mgL^{-1} W = 0,03 g

C_e = Konsentrasi setelah adsorpsi V = 0,005 L

$$q_e = \frac{(10 - 8,4067)\ 0,005}{0,03}$$

$$q_e = \frac{0,0079665}{0,03}$$

$$q_e = 0,2655 \text{ mg/g}$$

4. Nilai konsentrasi adsorpsi dan kemampuan adsorpsi DEHP oleh MIP terhadap pengaruh konsentrasi

Konsentrasi awal (mgL^{-1})	**y (absorbansi)**	**x (konsentrasi) (mgL^{-1})**	**q_e (mg/g)**
12	1,101	4,1445	1,3092
15	1,383	6,2569	1,4571
18	1,64	8,1820	1,6363
21	1,872	9,9198	1,8466
24	2,092	11,5677	2,0720

Contoh perhitungan konsentrasi adsorpsi dan kemampuan adsorpsi DEHP oleh MIP terhadap pengaruh konsentrasi:

a. Adsorpsi DEHP oleh MIP 12 mgL^{-1}

$$y = 0,1335x + 0,5477$$

$$y = 1,101$$

$y = 0{,}1335x + 0{,}5477$

$1{,}101 = 0{,}1335x + 0{,}5477$

$x = \frac{1{,}101 - 0{,}5477}{0{,}1335}$

$x = 4{,}1445\ mgL^{-1}$

b. Kemampuan Adsorpsi DEHP oleh MIP 12 mgL^{-1}

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

Diketahui: C_o = konsentrasi awal W = 0,03 g

C_e = Konsentrasi setelah adsorpsi V = 0,005 L

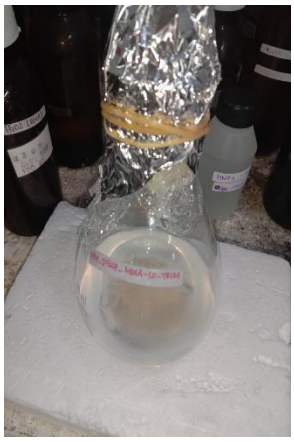
$q_e = \frac{(12 - 4{,}1445)\ 0{,}005}{0{,}03}$

$q_e = \frac{0{,}0392775}{0{,}03}$

$q_e = 1{,}3092\ mg/g$

Lampiran 5. Foto Hasil Penelitian

Proses persiapan alat dan bahan



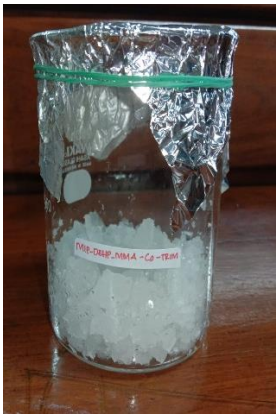
Proses pencampuran bahan dan prapolimerisasi

Sonikasi

Pengaliran gas nitrogen untuk menghilangkan gas oksigen

Polimerisasi dalam *waterbath*

Polimer terbentuk berwarna putih

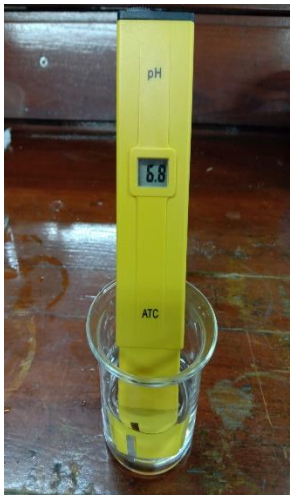


Pengeringan polimer

Proses pencucian polimer dengan aseton, metanol, dan akuades agar bersih dari pengotor

Proses ekstraksi (sonikasi)

Pencucian polimer dengan akuades

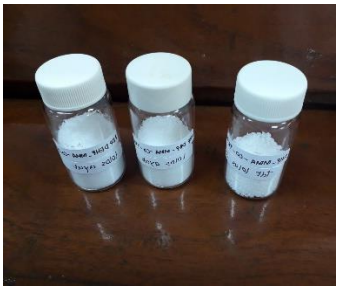


Penentuan pH

Penimbangan polimer hasil sintesis

Pembuatan deret standar DEHP

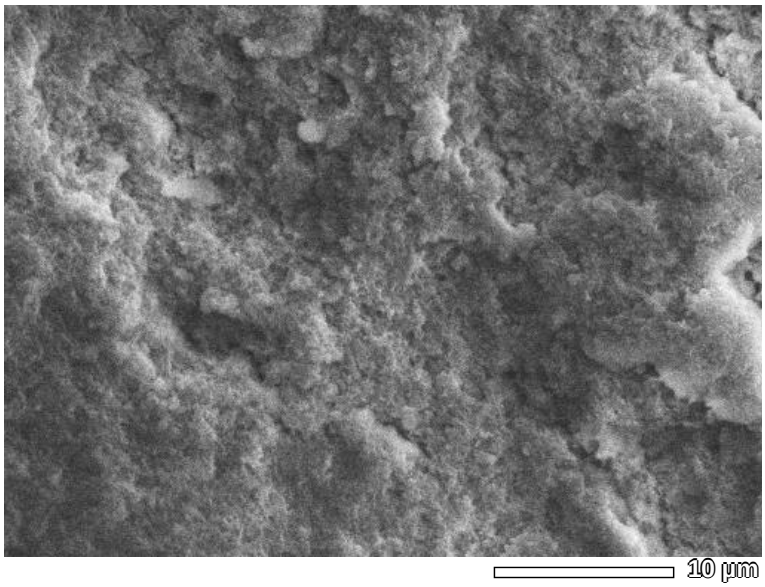
Pengocokan dengan alat *shaker* untuk pengaruh waktu dan konsentrasi terhadap adsorpsi DEHP



Polimer hasil sintesis MIP_DEHP_MMA-co-TRIM dan NIP_MMA-co-TRIM disimpan

Lampiran 6. Karakterisasi EDS

1. NIP_MMA-co-TRIM



Title : IMG1

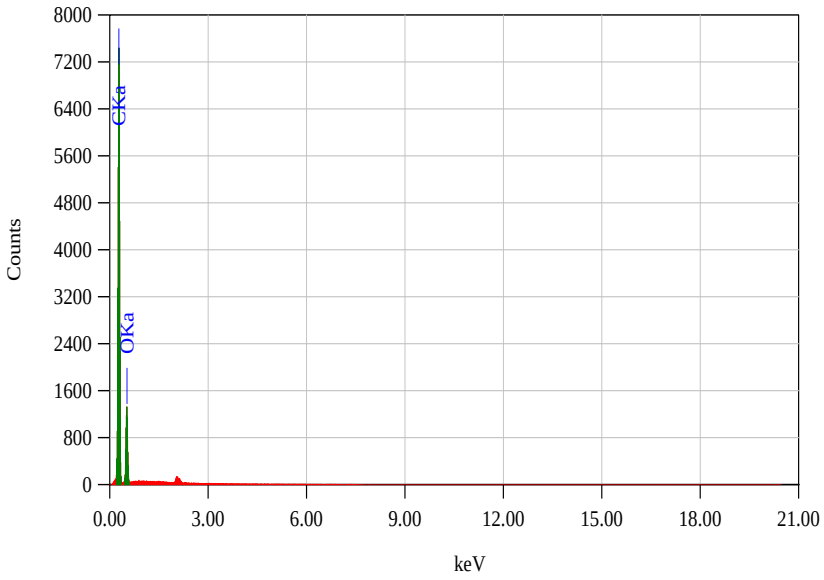
Instrument : 6510(LA)

Volt : 10.00 kV

Mag. : x 3,000

Date : 2022/03/07

Pixel : 512 x 384



Acquisition Parameter

Instrument : 6510(LA)

Acc. Voltage : 10.0 kV

Probe Current: 1.00000 nA

PHA mode : T3

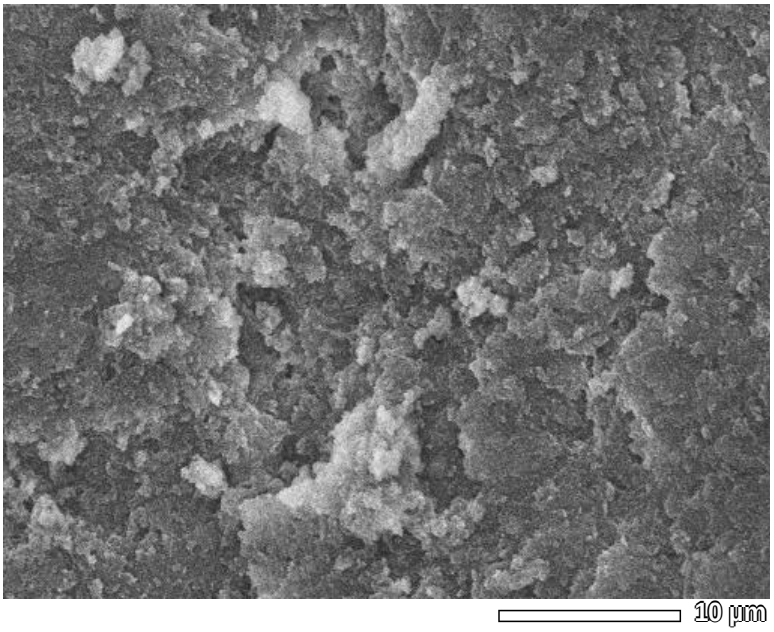
Real Time : 50.52 sec

ZAF Method Standardless Quantitative Analysis

Fitting Coefficient : 0.0248

Element	(keV)	Mass%	Sigma	Atom%	Compound	Mass%	Cation	K
C K	0.277	77.85	0.23	82.40				84.4386
O K	0.525	22.15	0.28	17.60				15.5614
Total		100.00		100.00				

2. MIP_DEHP_MMA-co-TRIM(BE)



Title : IMG1

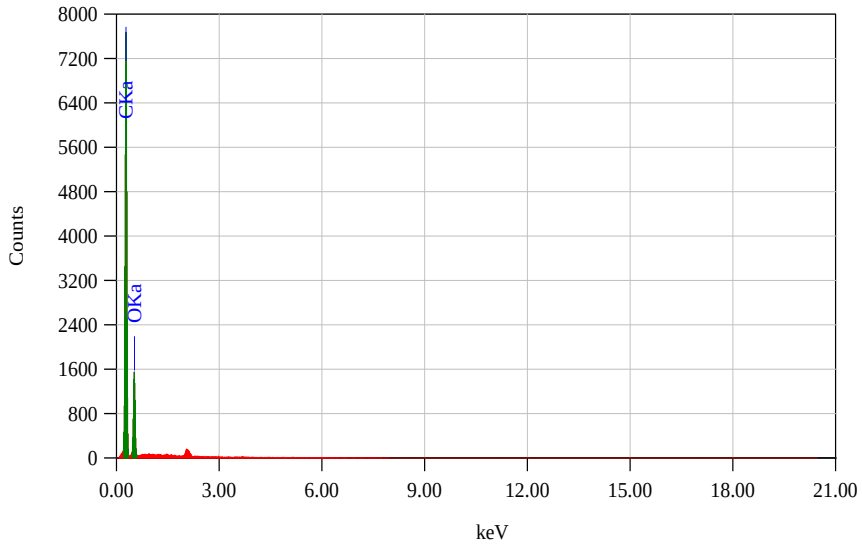
Instrument : 6510(LA)

Volt : 10.00 kV

Mag. : x 3,000

Date : 2022/03/07

Pixel : 512 x 384



Acquisition Parameter

Instrument : 6510(LA)

Acc. Voltage : 10.0 kV

Probe Current: 1.00000 nA

PHA mode : T3

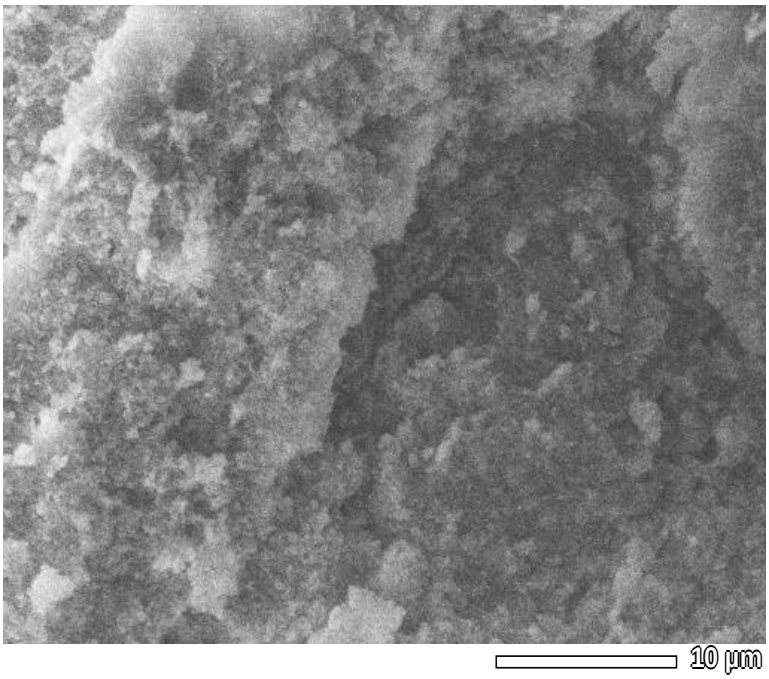
Real Time : 50.53 sec

ZAF Method Standardless Quantitative Analysis

Fitting Coefficient : 0.0290

Element	(keV)	Mass%	Sigma	Atom%	Compound	Mass%	Cation	K
C K	0.277	75.59	0.04	80.49				82.1645
O K	0.525	24.41	0.08	19.51				17.8355
Total		100.00		100.00				

3. MIP_DEHP_MMA-co-TRIM(TE)



Title : IMG1

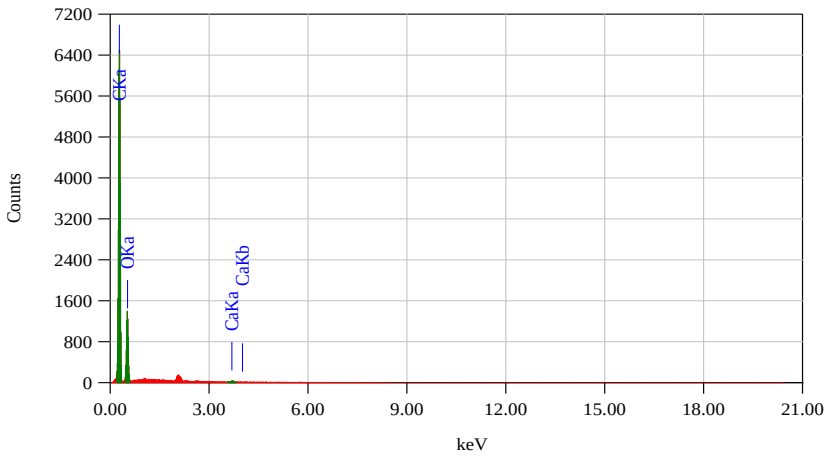
Instrument : 6510(LA)

Volt : 10.00 kV

Mag. : x 3,000

Date : 2022/03/07

Pixel : 512 x 384



Acquisition Parameter

Instrument : 6510(LA)

Acc. Voltage : 10.0 kV

Probe Current: 1.00000 nA

PHA mode : T3

Real Time : 50.50 sec

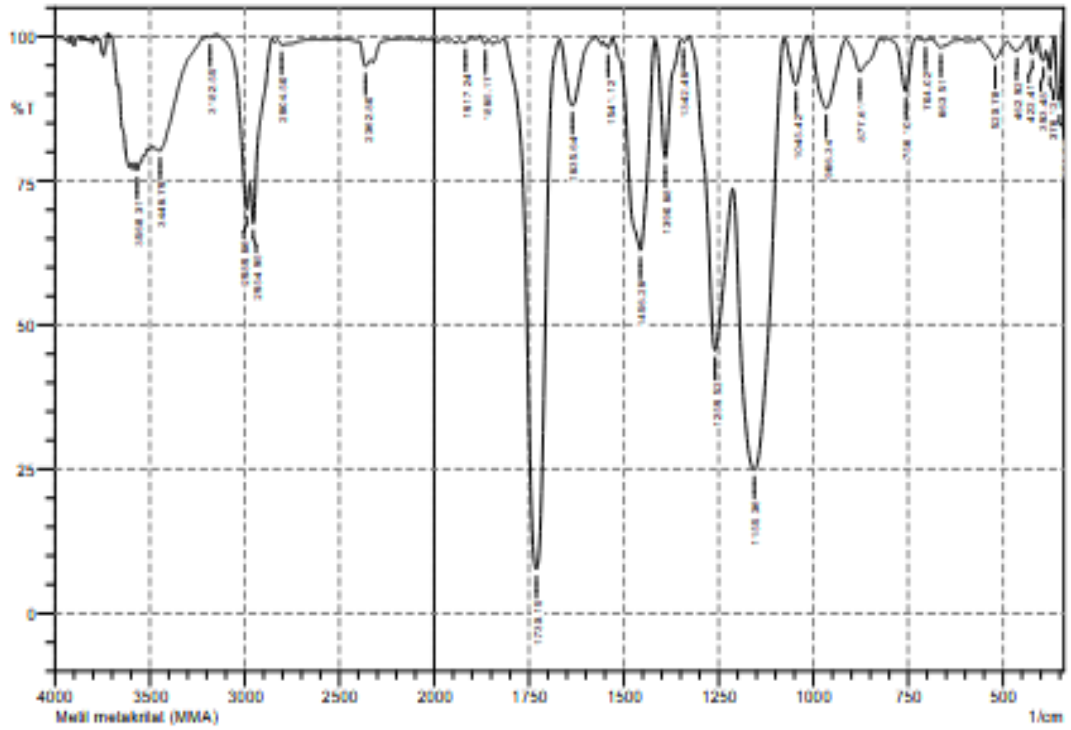
ZAF Method Standardless Quantitative Analysis

Fitting Coefficient : 0.0268

Element	(keV)	Mass%	Sigma	Atom%	Compound	Mass%	Cation	K
C K	0.277	74.73	0.04	79.93				81.2207
O K	0.525	24.81	0.09	19.92				18.2278
Ca K	3.690	0.46	0.04	0.15				0.5515
Total		100.00		100.00				

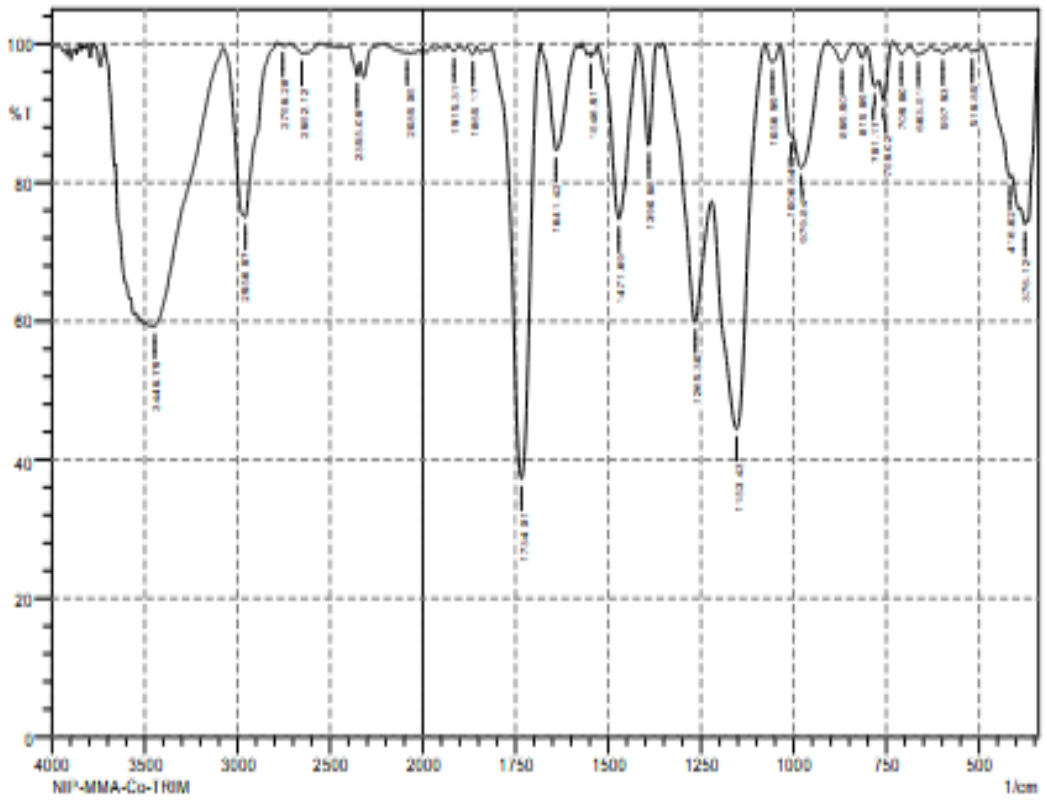
Lampiran 7. Karakterisasi FTIR

1. Spektrum Monomer MMA



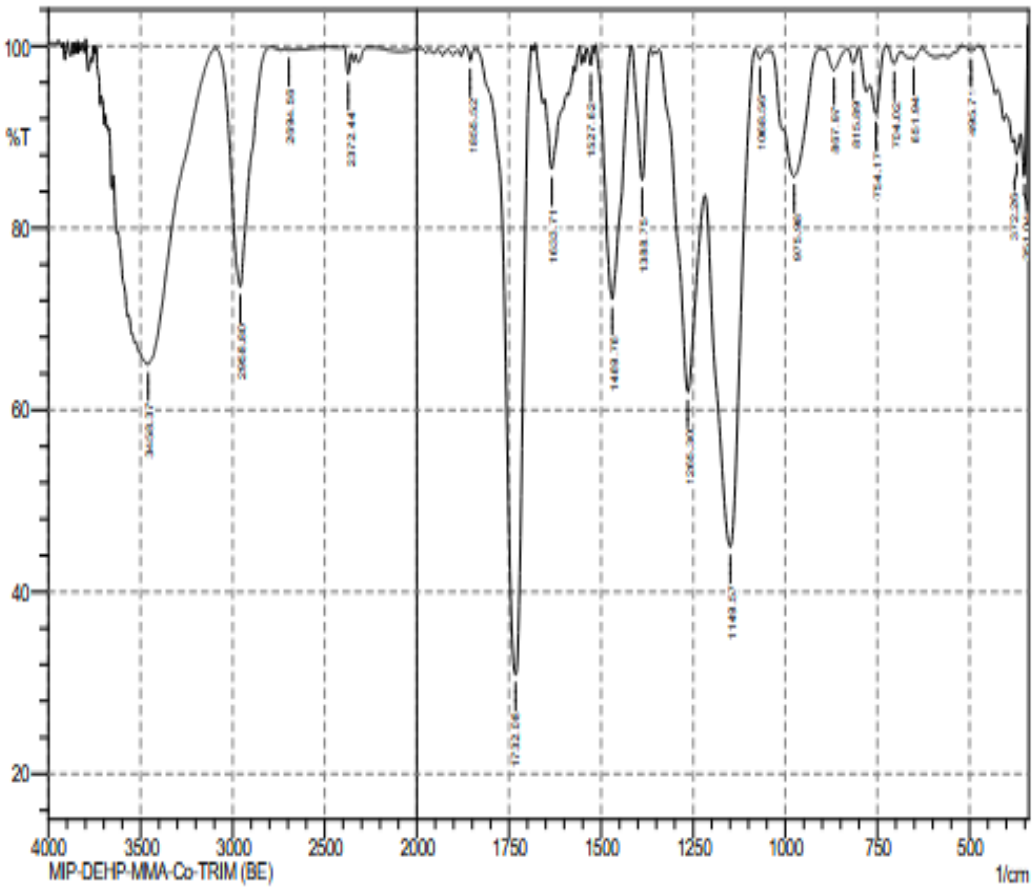
No.	Peak	Intencity	Corr. Intencity	Base (H)	Base (L)	Area	Corr. Area
1	351.04	87.56	13.926	364.55	341.4	0.722	0.848
2	376.12	94.238	4.408	385.76	364.55	0.313	0.197
3	393.48	95.78	2.501	410.84	385.76	0.298	0.159
4	422.41	97.112	2.808	432.05	410.84	0.184	0.176
5	462.92	97.471	0.81	487.99	455.2	0.274	0.072
6	520.78	96.086	3.256	563.21	487.99	0.683	0.475
7	663.51	98.138	0.666	682.8	655.8	0.17	0.056
8	704.02	99.303	0.304	715.59	690.52	0.058	0.016
9	756.1	90.517	9.28	802.39	727.16	1.18	1.111
10	877.61	93.878	5.746	912.33	825.53	1.313	1.182
11	966.34	87.56	11.789	1006.84	914.26	2.999	2.751
12	1045.42	91.69	8.284	1076.28	1018.41	1.126	1.117
13	1155.36	24.936	59.596	1211.3	1078.21	45.218	36.375
14	1259.52	45.581	38.795	1327.03	1213.23	18.989	11.339
15	1342.46	99.092	0.566	1348.24	1327.03	0.051	0.03
16	1390.68	78.95	20.546	1415.75	1350.17	2.781	2.638
17	1456.26	62.906	36.253	1519.91	1417.68	10.702	10.268
18	1541.12	98.051	1.011	1546.91	1529.55	0.097	0.043
19	1635.64	88.049	11.528	1666.5	1581.63	2.275	2.134
20	1730.15	7.664	91.911	1815.02	1670.35	43.294	43.039
21	1865.17	98.8	0.976	1880.6	1857.45	0.074	0.062
22	1917.24	98.993	0.644	1930.74	1903.74	0.084	0.042
23	2362.8	94.789	2.675	2393.66	2335.8	0.989	0.355
24	2804.5	98.483	0.943	2827.64	2659.84	0.706	0.31
25	2954.95	67.618	10.245	2970.38	2856.58	8.43	1.328
26	2989.66	70.012	7.133	3145.9	2972.31	8.205	0.95
27	3182.55	99.826	0.296	3192.19	3147.83	-0.018	0.02
28	3446.79	80.207	1.226	3460.3	3194.12	10.241	0.301
29	3568.31	76.803	1.373	3577.95	3554.81	2.577	0.103

2. Spektrum NIP_MMA-co-TRIM



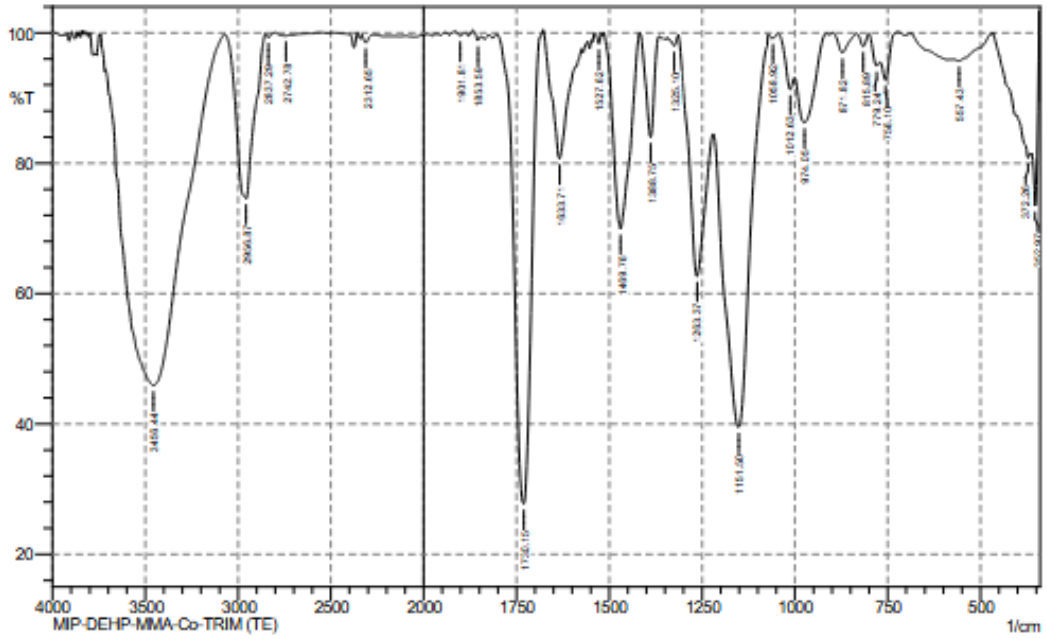
	Peak	Intencity	Corr. Intencity	Base (H)	Base (L)	Area	Corr. Area
1	376.12	73.987	0.982	387.69	372.26	1.947	0.047
2	416.62	80.672	1.848	487.99	410.84	3.708	0.176
3	518.85	98.917	0.284	532.35	514.99	0.061	0.016
4	597.93	98.705	0.449	605.65	578.64	0.12	0.028
5	663.51	98.41	0.654	682.8	653.87	0.15	0.05
6	709.8	98.57	1.375	732.95	690.52	0.131	0.126
7	758.02	91.906	4.787	771.53	732.95	0.794	0.369
8	781.17	93.811	2.476	802.39	771.53	0.554	0.172
9	815.89	97.928	1.9	837.11	802.39	0.15	0.129
10	869.9	97.409	2.759	906.54	837.11	0.342	0.395
11	979.84	82.147	7.956	1002.98	908.47	4.575	1.851
12	1006.84	86.785	0.841	1035.77	1004.91	1.056	0.095
13	1066.99	97.361	2.531	1078.21	1035.77	0.284	0.265
14	1153.43	44.414	43.624	1220.94	1078.21	26.401	18.536
15	1265.3	59.883	24.979	1350.17	1222.87	14.563	7.346
16	1390.68	85.368	14.485	1417.68	1371.39	1.477	1.445
17	1471.69	74.653	25.073	1527.62	1419.61	6.161	6.032
18	1546.91	98.168	0.594	1552.7	1544.98	0.054	0.012
19	1641.42	84.609	15.259	1681.93	1587.42	3.235	3.17
20	1734.01	37.22	62.455	1813.09	1683.86	20.253	20.054
21	1865.17	98.525	1.141	1880.6	1855.52	0.11	0.074
22	1915.31	99.011	0.697	1928.82	1901.81	0.081	0.046
23	2085.05	98.731	0.092	2102.41	2077.33	0.135	0.007
24	2365.08	95.409	2.672	2395.59	2337.72	0.686	0.314
25	2652.12	98.627	1.436	2721.56	2557.61	0.515	0.563
26	2756.28	99.823	0.022	2789.07	2754.35	0	-0.001
27	2966.87	75.012	24.455	3072.6	2802.57	14.747	14.121
28	3446.79	59.233	1.099	3456.44	3074.53	40.736	0.815

3. Spektrum MIP_DEHP_MMA-co-TRIM(BE)



No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	351.04	85.72	11.127	362.62	341.4	0.977	0.613
2	372.26	88.041	1.943	378.05	362.62	0.785	0.083
3	495.71	99.427	0.311	501.49	476.42	0.034	0.02
4	651.94	98.534	0.359	655.8	628.79	0.102	0.016
5	704.02	98.047	1.665	727.16	682.8	0.188	0.134
6	754.17	92.556	4.681	769.6	727.16	0.792	0.383
7	815.89	98.103	1.719	831.32	800.46	0.139	0.115
8	867.97	97.367	2.37	893.04	831.32	0.376	0.306
9	975.98	85.673	7.738	1004.91	904.61	3.875	1.807
10	1068.56	98.584	1.016	1082.07	1053.13	0.115	0.064
11	1149.57	44.931	46.679	1217.08	1082.07	24.421	19.13
12	1265.3	61.942	27.649	1342.46	1219.01	12.717	7.733
13	1388.75	85.274	14.567	1417.68	1367.53	1.631	1.602
14	1469.76	72.116	27.962	1514.12	1419.61	6.629	6.658
15	1527.62	97.827	2.05	1537.27	1521.84	0.078	0.07
16	1633.71	86.439	7.691	1651.07	1593.2	2.428	0.953
17	1732.08	30.948	68.994	1834.3	1689.64	22.685	22.8
18	1855.52	98.378	1.41	1867.09	1843.95	0.076	0.055
19	2372.44	96.904	2.629	2395.59	2357.01	0.286	0.219
20	2694.56	99.554	0.073	2717.7	2675.27	0.075	0.006
21	2958.8	73.538	26.307	3091.89	2802.57	14.451	14.258
22	3458.37	64.993	0.451	3462.22	3093.82	29.008	0.482

4. Spektrum MIP_DEHP_MMA-co-TRIM(TE)



No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	352.97	73.428	14.188	360.69	343.33	1.67	0.786
2	372.26	80.786	1.293	401.19	368.4	2.543	0.083
3	557.43	95.702	0.626	572.86	509.21	1.018	0.109
4	756.1	92.726	4.306	771.53	725.23	0.759	0.306
5	779.24	94.9	1.692	802.39	771.53	0.423	0.105
6	815.89	97.905	1.952	833.25	802.39	0.154	0.135
7	871.82	96.947	2.985	896.9	833.25	0.404	0.381
8	974.05	86.219	9.002	1001.06	914.26	3.274	1.944
9	1012.63	91.295	3.575	1045.42	1001.06	0.954	0.253
10	1058.92	99.145	0.646	1072.42	1045.42	0.064	0.04
11	1151.5	39.483	52.014	1219.01	1072.42	28.684	23.295
12	1263.37	62.642	28.828	1313.52	1220.94	10.426	6.912
13	1325.1	97.962	1.334	1336.67	1313.52	0.14	0.068
14	1388.75	83.949	15.724	1417.68	1367.53	1.771	1.707
15	1469.76	69.919	29.994	1514.12	1419.61	7.324	7.286
16	1527.62	98.325	1.659	1539.2	1521.84	0.059	0.058
17	1633.71	80.668	16.839	1676.14	1591.27	4.246	3.278
18	1730.15	27.71	72.466	1801.51	1678.07	23.176	23.241
19	1853.59	98.797	0.985	1867.09	1845.88	0.045	0.036
20	1901.81	99.557	0.587	1915.31	1888.31	0.017	0.034
21	2312.65	98.493	1.237	2333.87	2268.29	0.234	0.157
22	2742.78	99.539	0.246	2800.64	2717.7	0.116	0.063
23	2837.29	99.282	0.636	2852.72	2812.21	0.071	0.058
24	2956.87	74.566	25.256	3068.75	2854.65	12.871	12.702
25	3456.44	45.89	48.03	3691.75	3070.68	108.799	94.831

Lampiran 8. Karakterisasi SAA

micromeritics

Sample: MIP_DEHP_MMA-Co-TRIM-TE
Operator: Sarah
Submitter: 31751
File: C:\TriStar II 3020\data\SAMPLE...\MIP_DEHP_MMA-Co-TRIM-TE.SMP

Started: 3/14/2022 9:40:26 AM
Completed: 3/14/2022 5:30:13 PM
Report Time: 3/15/2022 7:31:58 AM
Sample Mass: 0.6237 g
Cold Free Space: 30.8575 cm³
Low Pressure Dose: None
Automatic Degas: No

Analysis Adsorptive: N2
Analysis Bath Temp.: -195.850 °C
Thermal Correction: No
Warm Free Space: 10.7681 cm³ Measured
Equilibration Interval: 5 s
Sample Density: 1.000 g/cm³

Summary Report

Surface Area

Single point surface area at P/Po = 0.306373034: 199.6509 m²/g

BET Surface Area: 202.7984 m²/g

t-Plot Micropore Area: 34.7041 m²/g

t-Plot External Surface Area: 168.0943 m²/g

BJH Adsorption cumulative surface area of pores between 1.7000 nm and 300.0000 nm diameter: 148.380 m²/g

BJH Desorption cumulative surface area of pores between 1.7000 nm and 300.0000 nm diameter: 151.8901 m²/g

D-H Adsorption cumulative surface area of pores between 1.7000 nm and 300.0000 nm diameter: 134.503 m²/g

D-H Desorption cumulative surface area of pores between 1.7000 nm and 300.0000 nm diameter: 137.4044 m²/g

Pore Volume

Single point adsorption total pore volume of pores less than 171.1660 nm diameter at P/Po = 0.988677015: 0.282521 cm³/g

t-Plot micropore volume: 0.018739 cm³/g

BJH Adsorption cumulative volume of pores between 1.7000 nm and 300.0000 nm diameter: 0.247281 cm³/g

BJH Desorption cumulative volume of pores between 1.7000 nm and 300.0000 nm diameter: 0.247484 cm³/g

Pore Size

Adsorption average pore width (4V/A by BET): 5.57245 nm

BJH Adsorption average pore diameter (4V/A): 6.6662 nm

BJH Desorption average pore diameter (4V/A): 6.5175 nm

D-H Adsorption average pore diameter (4V/A): 7.1100 nm

D-H Desorption average pore diameter (4V/A): 6.8245 nm

Sample: MIP_DEHP_MMA-Co-TRIM-TE
Operator: Sarah
Submitter: 31751
File: C:\TriStar II 3020\data\SAMPE...\MIP_DEHP_MMA-Co-TRIM-TE.SMP

Started: 3/14/2022 9:40:26 AM
Completed: 3/14/2022 5:30:13 PM
Report Time: 3/15/2022 7:31:58 AM
Sample Mass: 0.6237 g
Cold Free Space: 30.8575 cm³
Low Pressure Dose: None
Automatic Degas: No

Analysis Adsorptive: N2
Analysis Bath Temp.: -195.850 °C
Thermal Correction: No
Warm Free Space: 10.7681 cm³ Measured
Equilibration Interval: 5 s
Sample Density: 1.000 g/cm³

Isotherm Tabular Report

Relative Pressure (P/Po)	Absolute Pressure (mmHg)	Quantity Adsorbed (cm³/g STP)	Elapsed Time (h:min)	Saturation Pressure (mmHg)
				760.000000
0.011110380	8.443889	35.1251	01:46	
0.106383434	80.851410	52.6177	02:18	
0.212568042	161.551712	60.4731	02:36	
0.306373034	232.843506	66.1206	02:48	
0.408213525	310.242279	72.1187	03:01	
0.499270108	379.445282	77.7767	03:12	
0.606339264	460.817841	85.6554	03:28	
0.698766447	531.062900	94.4343	03:42	
0.796622909	605.433411	108.3832	03:58	
0.900972226	684.738892	141.2899	04:24	
0.988677015	751.394531	182.6486	04:32	
0.903439170	686.613770	161.1881	04:45	
0.803617939	610.749634	124.0456	05:21	
0.705377117	536.086609	103.5234	05:45	
0.601207854	456.917969	91.3260	06:05	
0.504063978	383.088623	83.3329	06:18	
0.411274759	312.568817	75.3211	06:31	
0.280240410	212.982712	67.8341	06:42	
0.207311931	157.557068	63.5403	06:52	
0.108587345	82.526382	56.4906	07:07	
0.010340583	7.858843	39.2173	07:48	

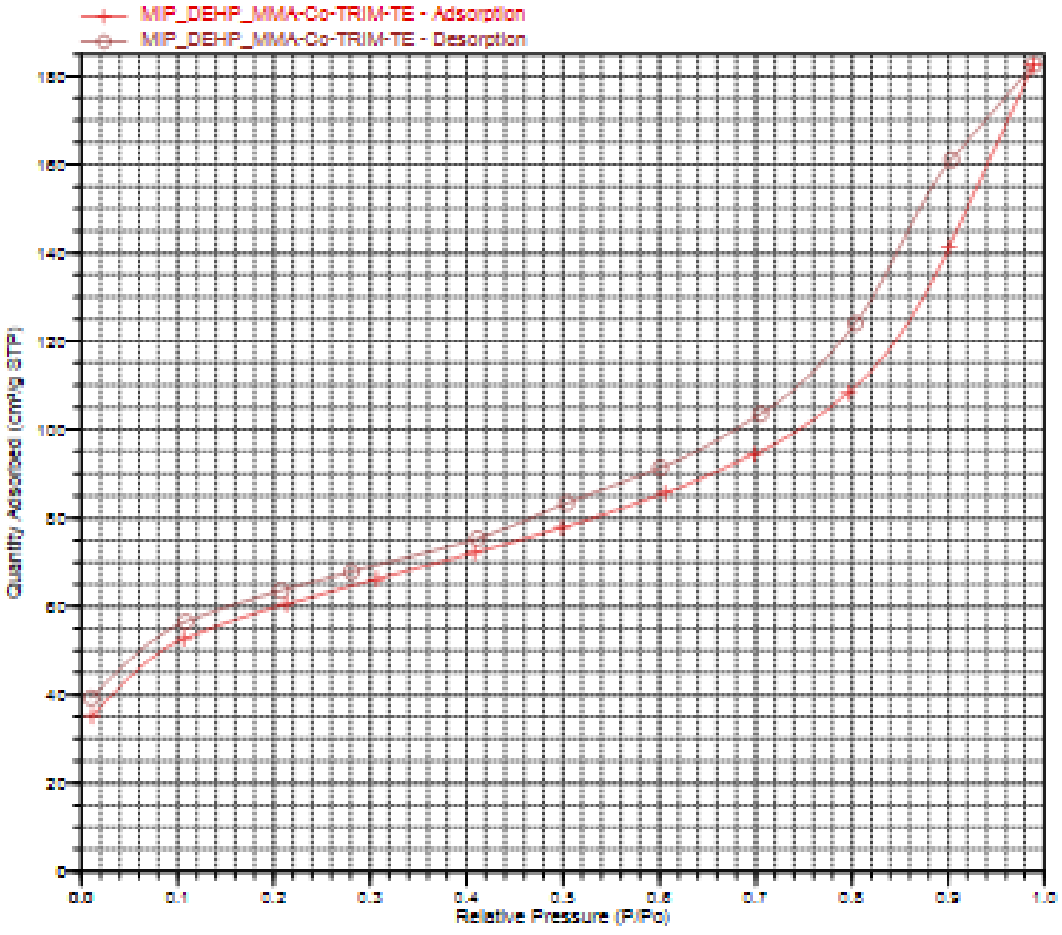
micromeritics

Sample: MIP_DEHP_MMA-Co-TRIM-TE
Operator: Sarah
Submitter: 31751
File: C:\TriStar II 3020\data\SAMPE...\MIP_DEHP_MMA-Co-TRIM-TE.SMP

Started: 3/14/2022 9:40:26 AM
Completed: 3/14/2022 5:30:13 PM
Report Time: 3/15/2022 7:31:58 AM
Sample Mass: 0.6237 g
Cold Free Space: 30.8575 cm³
Low Pressure Dose: None
Automatic Degas: No

Analysis Adsorptive: N2
Analysis Bath Temp.: -195.800 °C
Thermal Correction: No
Warm Free Space: 10.7681 cm³ Measured
Equilibration Interval: 5 s
Sample Density: 1.000 g/cm³

Isotherm Linear Plot



Sample: MIP_DEHP_MMA-Co-TRIM-TE
Operator: Serah
Submitter: 31751
File: C:\TriStar II 3020\data\SAMPE...\MIP_DEHP_MMA-Co-TRIM-TE.SMP

Started: 3/14/2022 9:40:26 AM
Completed: 3/14/2022 5:30:13 PM
Report Time: 3/15/2022 7:31:58 AM
Sample Mass: 0.6237 g
Cold Free Space: 30.8575 cm³
Low Pressure Dose: None
Automatic Degas: No

Analysis Adsorptive: N2
Analysis Bath Temp.: -195.850 °C
Thermal Correction: No
Warm Free Space: 10.7681 cm³ Measured
Equilibration Interval: 5 s
Sample Density: 1.000 g/cm³

BJH Adsorption Pore Distribution Report

Faas Correction
Harkins and Jura
t = [13.99 / (0.034 - log(P/Po))] ^ 0.5

Diameter Range: 1.7000 nm to 300.0000 nm
Adsorbate Property Factor: 0.95300 nm
Density Conversion Factor: 0.0015468
Fraction of Pores Open at Both Ends: 0.00

Pore Diameter Range (nm)	Average Diameter (nm)	Incremental Pore Volume (cm³/g)	Cumulative Pore Volume (cm³/g)	Incremental Pore Area (m²/g)	Cumulative Pore Area (m²/g)
171.1 - 20.9	22.7	0.081628	0.081628	14.378	14.378
20.9 - 10.4	12.2	0.067161	0.148789	21.934	36.312
10.4 - 7.0	8.0	0.025940	0.174729	13.014	49.326
7.0 - 5.3	5.8	0.015379	0.190107	10.525	59.851
5.3 - 4.0	4.4	0.013436	0.203543	12.155	72.006
4.0 - 3.2	3.5	0.009273	0.212816	10.558	82.564
3.2 - 2.6	2.8	0.010044	0.222860	14.287	96.850
2.6 - 2.1	2.3	0.009607	0.232467	17.031	113.881
2.1 - 1.5	1.7	0.014814	0.247281	34.499	148.380

Lampiran 9. Contoh Perhitungan Nilai K_1 dan K_2 berdasarkan Persamaan Orde Satu Semu dan Orde Dua Semu

1. Penentuan K_1 dari persamaan orde satu semu

Persamaan orde satu semu:

$$\log (q_e - q_t) = \log q_e - K_1\, t/2{,}303$$

- $\log q_e$ = Intercept
  q_e = Inv. log Intercept

  $\log q_e$ = -0,59
  q_e = 0,2570

- $K_1/2{,}303$ = Slope
  K_1 = Slope x 2,303
  K_1 = -0,0045 x 2,303
  K_1 = -0,0103

2. Penentuan K_2 dari persamaan orde dua semu

Persamaan orde dua semu:

$$t/q_t = 1/K_2\, q_e^2 + t/q_e$$

- $1/q_e$ = Slope
  q_e = 1/Slope
  q_e = 1/3,0019
  q_e = 0,3331

- $1/K_2 q_e^2$ = Intercept
  K_2 = 1/Intercept x q_e^2
  K_2 = 1/4,2449 x $(0{,}3331)^2$
  K_2 = 0,0261

Lampiran 10. Contoh Perhitungan Nilai Kapasitas Adsorpsi berdasarkan Model Persamaan Isotermal Langmuir dan Isotermal Freundlich

1. Isotermal Adsorpsi Langmuir

Persamaan:

$$\frac{1}{q_e} = \frac{1}{q_m K_L} x \frac{1}{C_e} + \frac{1}{q_m}$$

Keterangan:
C_e = Konsentrasi saat kesetimbangan (mg/L)
q_e = Jumlah zat teradsorpsi saat kesetimbangan (mg/g)
q_m = Kapasitas adsorpsi maksimum monolayer (mg/g)
K_L = Konstanta afinitas adsorpsi atau konstanta kesetimbangan (L/mg)

Berdasarkan model isotermal Langmuir diperoleh persamaan garis:

$$y = 1{,}7266x + 0{,}3717$$

$\frac{1}{q_m}$ = 0,3717 maka, $q_m = \frac{1}{0{,}3717} = 2{,}6903$

$\frac{1}{q_m K_L}$ = 1,7266 maka, $K_L = \frac{1}{1{,}7266 \times 2{,}6903} = 0{,}2153$

2. Isotermal Adsorpsi Freundlich

Persamaan:

$$\log q_e = \frac{1}{n} \log C_e + \log K_F$$

Keterangan:
C_e = Konsentrasi saat kesetimbangan (mg/L)
q_e = Jumlah zat teradsorpsi saat kesetimbangan (mg/g)
K_F = Kapasitas adsorpsi (mg/g)
$\frac{1}{n}$ = Konstanta Freundlich menyatakan faktor heterogenitas
n = Intensitas adsorpsi

Berdasarkan model isotermal Freundlich diperoleh persamaan garis:

$$y = 0{,}4397x - 0{,}1703$$

$\frac{1}{n}$ = = 0,4397 maka, $n = \frac{1}{0,4397} = 2,2742$

log K_F = - 0,1703
K_F = Inv. log (- 0,1703)
K_F = 0,6756