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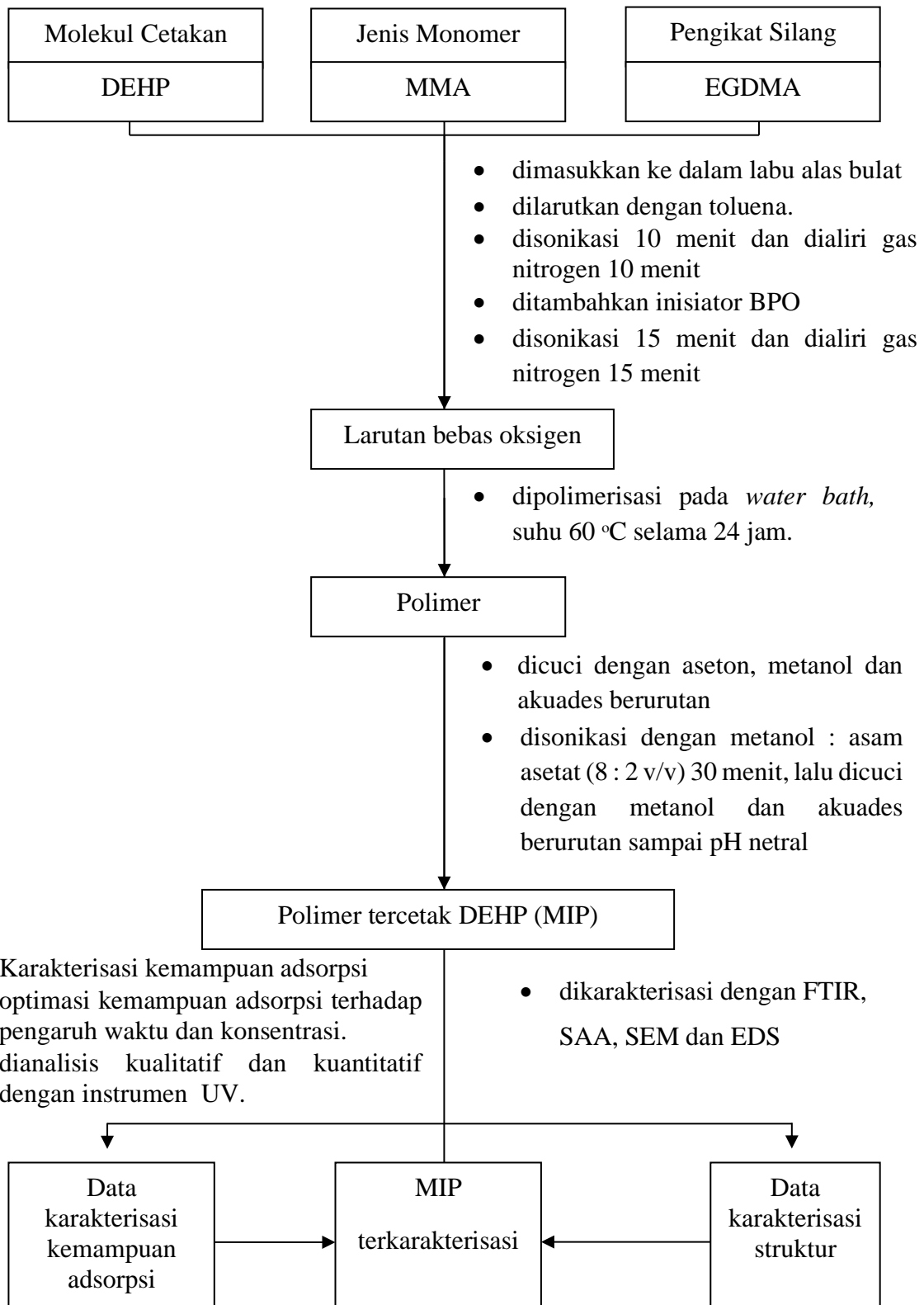
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Lampiran 1. Skema Sintesis Polimer Bercetakan Molekul DEHP Menggunakan Metode Polimerisasi Presipitasi

Molekul Cetakan	Jenis Monomer	Pengikat Silang
DEHP	MMA	EGDMA

- dimasukkan ke dalam labu alas bulat
- dilarutkan dengan toluena.
- disonikasi 10 menit dan dialiri gas nitrogen 10 menit
- ditambahkan inisiator BPO
- disonikasi 15 menit dan dialiri gas nitrogen 15 menit

Larutan bebas oksigen

- dipolimerisasi pada *water bath,* suhu 60 ^{o}C selama 24 jam.

Polimer

- dicuci dengan aseton, metanol dan akuades berurutan
- disonikasi dengan metanol : asam asetat (8 : 2 v/v) 30 menit, lalu dicuci dengan metanol dan akuades berurutan sampai pH netral

Polimer tercetak DEHP (MIP)

Karakterisasi kemampuan adsorpsi
- optimasi kemampuan adsorpsi terhadap pengaruh waktu dan konsentrasi.
- dianalisis kualitatif dan kuantitatif dengan instrumen UV.

- dikarakterisasi dengan FTIR, SAA, SEM dan EDS

Data karakterisasi kemampuan adsorpsi	MIP terkarakterisasi	Data karakterisasi struktur

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

Lampiran 2. Bagan Alir Prosedur Kerja

1. Sintesis MIP_DEHP_MMA-co-EGDMA dan NIP_MMA-co-EDGMA

Cairan DEHP

- dipipet sebanyak 0,3945 mL (1 mmol) ke dalam labu alas bulat
- ditambahkan monomer MMA sebanyak 0,4260 mL (4 mmol)
- didiamkan selama 5 menit
- ditambahkan pengikat silang EGDMA sebanyak 1,5088 mL (8 mmol)
- ditambahkan pelarut porogen toluena sebanyak 50 mL
- didiamkan selama 15 menit
- disonikasi selama 15 menit
- dialiri gas nitrogen selama 15 menit
- ditambahkan inisiator BPO sebanyak 0,2423 g (1 mmol)
- disonikasi selama 15 menit
- dialiri gas nitrogen selama 15 menit

Larutan bebas oksigen

- dipolimerisasi dengan cara dimasukkan ke dalam *water bath* selama 24 jam dengan suhu 60 ℃

Polimer

- dicuci dengan aseton, metanol, dan akuades secara berurutan
- disonikasi dengan campuran metanol : asam asetat (8;2 v/v) selama 30 menit

Filtrat

- diuji kualitatif dan kuantitaf dengan instrumen spektrofotometer UV pada Panjang gelombang 262,6 nm.

Data

Polimer tercetak molekul DEHP

- dicuci dengan metanol dan akuades secara beurutan hingga pH netral
- dikeringkan

MIP

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

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

```
┌─────────────────────┐
│     Cairan DEHP     │
└─────────────────────┘
         │
         │   − dipipet sebanyak 0,0010 ml ke dalam labu ukur 10 ml
         │   − ditambahkan metanol sampai tanda batas.
         │   − dihomogenkan.
┌───────────────────────────────────┐
│  Larutan Standar DEHP 100 mgL⁻¹   │
└───────────────────────────────────┘
         │   − diencerkan hingga konsentrasinya menjadi  3, 6, 9, 12, 15
         │     dan 18  mgL⁻¹
┌─────────────────────┐
│  Deret Standar DEHP │
└─────────────────────┘
```
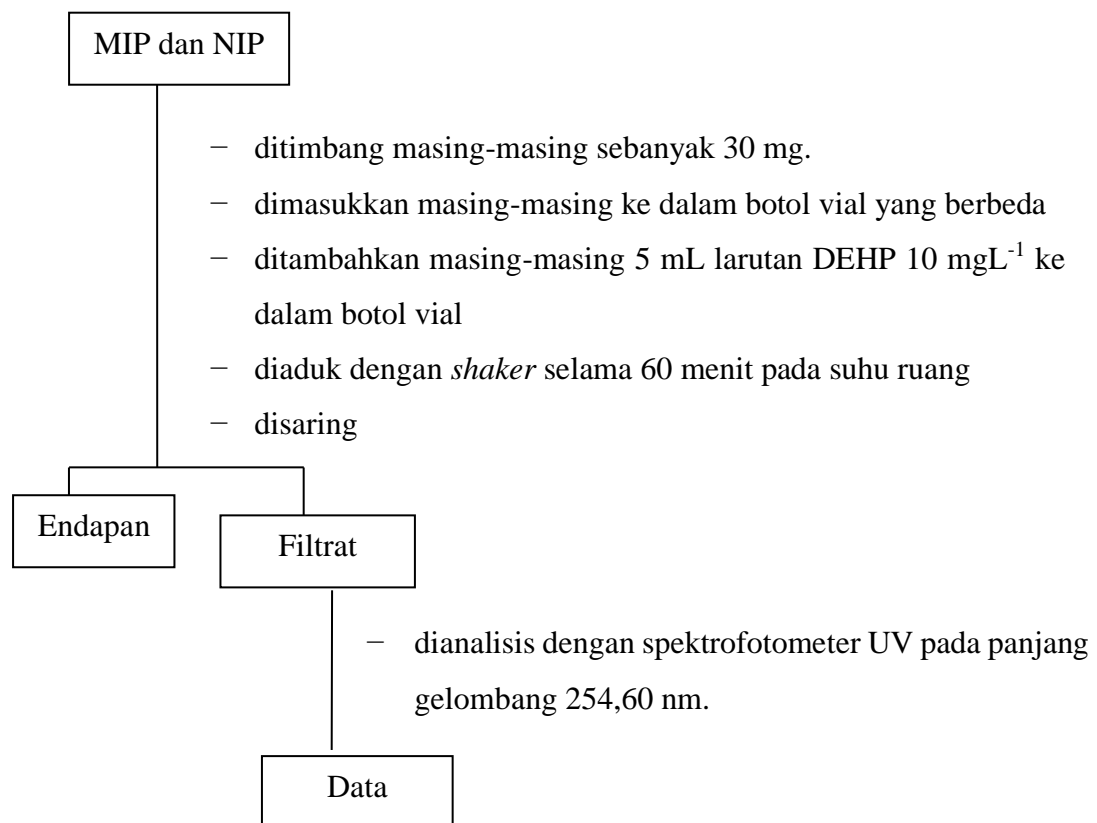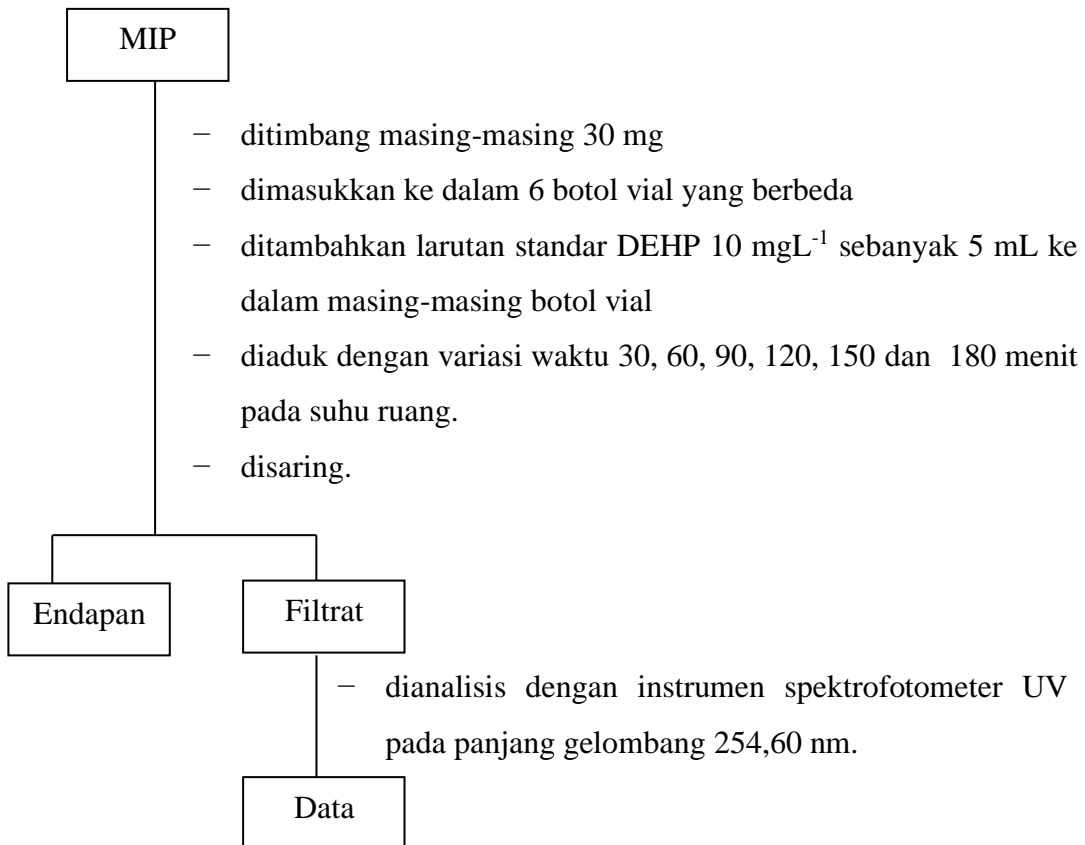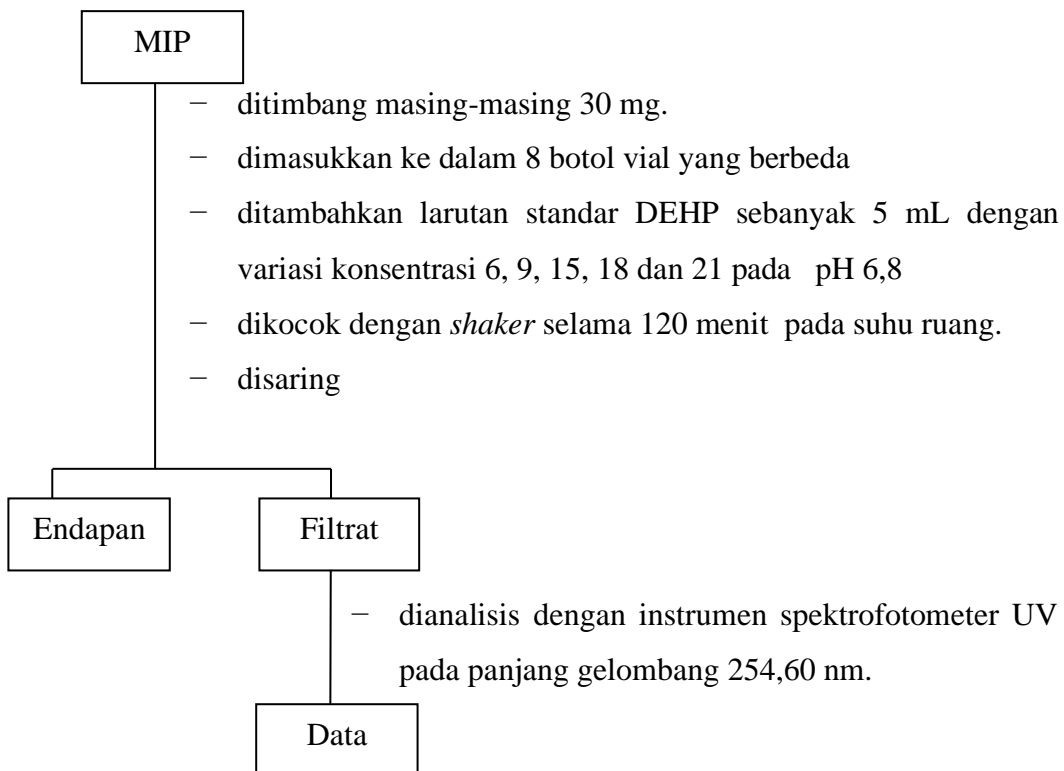
3. Uji Kemampuan Adsorpsi MIP_DEHP_MMA-co-EGDMA dan NIP_MMA-co-EDGMA

```
┌─────────────────┐
│   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 shaker selama 60 menit pada suhu ruang
         │   − disaring
     ┌───────┴────────┐
┌──────────┐   ┌──────────┐
│ Endapan  │   │ Filtrat  │
└──────────┘   └──────────┘
                    │   − dianalisis dengan spektrofotometer UV pada panjang
                    │     gelombang 254,60 nm.
               ┌──────────┐
               │   Data   │
               └──────────┘
```

4. Pengaruh Waktu terhadap Adsorpsi MIP_DEHP_MMA-co-EGDMA

MIP

- ditimbang masing-masing 30 mg
- dimasukkan ke dalam 6 botol vial yang berbeda
- ditambahkan larutan standar DEHP 10 mgL^{-1} sebanyak 5 mL ke dalam masing-masing botol vial
- diaduk dengan variasi waktu 30, 60, 90, 120, 150 dan 180 menit pada suhu ruang.
- disaring.

Endapan   Filtrat

- dianalisis dengan instrumen spektrofotometer UV pada panjang gelombang 254,60 nm.

Data

5. Pengaruh Konsentrasi terhadap Adsorpsi MIP_DEHP_MMA-co-EGDMA

MIP

- ditimbang masing-masing 30 mg.
- dimasukkan ke dalam 8 botol vial yang berbeda
- ditambahkan larutan standar DEHP sebanyak 5 mL dengan variasi konsentrasi 6, 9, 15, 18 dan 21 pada pH 6,8
- dikocok dengan *shaker* selama 120 menit pada suhu ruang.
- disaring

Endapan   Filtrat

- dianalisis dengan instrumen spektrofotometer UV pada panjang gelombang 254,60 nm.

Data

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	1,750
4	DEHP 4	12	2,084
5	DEHP 5	15	2,398
6.	DEHP 6	18	2,924

2. Kurva hubungan antara absorbansi Vs konsentrasi larutan standar DEHP
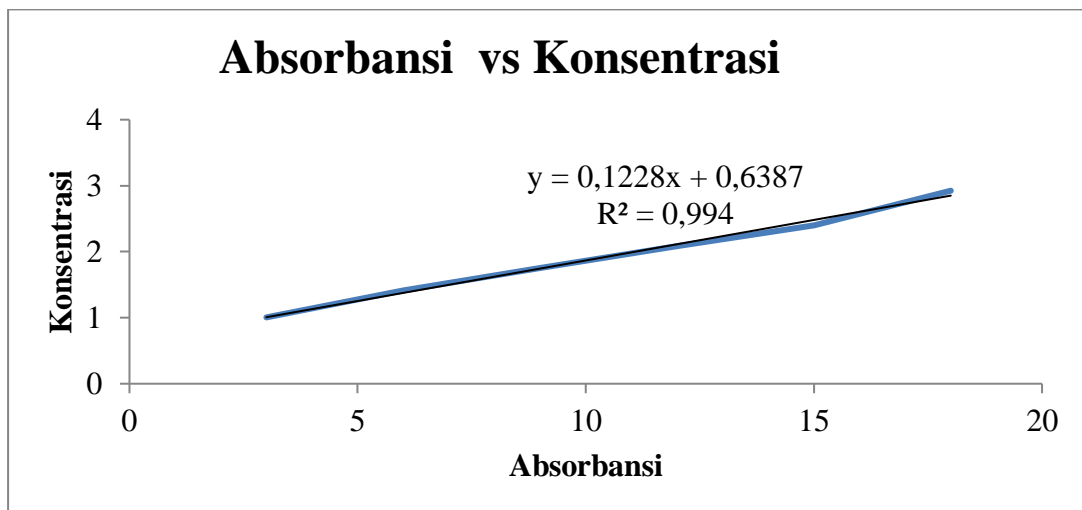
3. Data absorbansi kemampuan adsorpsi MIP dan NIP

No.	Sampel	Absorbansi	C_e	q_e (mg/g)	Δq_e (mg/g)
1	Adsorpsi DEHP oleh MIP	1,438	6,5089	0,5818	0,3895
2	Adsorpsi DEHP oleh NIP	1,725	8,8460	0,1923	

4. Data absorbansi adsorpsi DEHP oleh MIP terhadap pengaruh waktu

No.	Sampel	Waktu (menit)	Absorbansi
1	DEHP	30	1,585
2	DEHP	60	1,473
3	DEHP	90	1,438
4	DEHP	120	1,410
5	DEHP	150	1,434
6	DEHP	180	1,455

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	**0,619843**	-0,20772	0
2	30	7,706026	0,382329	0,237514	-0,62431	78,46645
3	60	6,793974	0,534338	0,085505	-1,06801	112,2885
4	90	6,508958	0,58184	0,038003	-1,42019	154,6816
5	120	6,280945	**0,619843**	0	0	193,5975
6	150	6,476384	0,587269	0,032574	-1,48713	255,4195
7	180	6,647394	0,558768	0,061075	-1,21413	322,1375

Catatan:

q_t adalah q_e pada waktu t

q_c adalah q_t pada waktu optimum

6. Data absorbansi adsorpsi DEHP oleh MIP terhadap pengaruh konsentrasi

No.	Sampel	Konsentrasi (mgL^{-1})	Absorbansi
1	DEHP	6	0,899
2	DEHP	9	1,098
3	DEHP	15	1,399
4	DEHP	18	1,553
5	DEHP	21	1,739

7. Data persamaan isoterm 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	6	2,11970684	0,646716	0,326276	-0,18929	0,471763	1,546275
2	MIP_DEHP	9	3,740228013	0,876629	0,572898	-0,05718	0,267363	1,140734
3	MIP_DEHP	15	6,191368078	1,468105	0,791787	0,166757	0,161515	0,68115
4	MIP_DEHP	18	7,445439739	1,759093	0,87189	0,245289	0,13431	0,568475
5	MIP_DEHP	21	8,96009772	2,00665	0,952313	0,302472	0,116060	0,498343

lampiran 4. Perhitungan

1. **Nilai konsentrasi adsorpsi DEHP oleh MIP dan NIP**

   $y = 0,1228x + 0,6387$

   a. **Adsorpsi DEHP oleh MIP**

   $y \quad = 1,438$

   $y \quad = 0,1228x + 0,6387$

   $1,438 = 0,1228x + 0,6387$

   $x \quad = \dfrac{1,438 - 0,6387}{0,1228}$

   $x \quad = 6,5089 \text{ mgL}^{-1}$

   b. **Adsorpsi DEHP oleh NIP**

   $y \quad = 1,725$

   $y \quad = 0,1228x + 0,6387$

   $1,725 = 0,1228x + 0,6387$

   $x \quad = \dfrac{1,725 - 0,6387}{0,1228}$

   $x \quad = 8,8460 \text{ mgL}^{-1}$

2. **Nilai Kemampuan Adsorpsi DEHP oleh MIP dan NIP**

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

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

   $\qquad\qquad\qquad\quad V \quad = 0,005 \text{ L}$

   a. **Kemampuan Adsorpsi DEHP oleh MIP**

   $q_e \quad = \dfrac{(10 - 6,5089)\, 0,005}{0,03}$

$$q_e = 0,5818 \text{ mg/g}$$

b. Kemampuan Adsorpsi DEHP oleh NIP

$$q_e = \frac{(10 - 8,846)\ 0,005}{0,03}$$

$$q_e = 0,1923 \text{ mg/g}$$

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

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

$$y = 0,1228x + 0,6387$$

a. Adsorpsi DEHP oleh MIP 120 menit

$$y = 1,410$$

$$y = 0,1228x + 0,6387$$

$$1,410 = 0,1228x + 0,6387$$

$$x = \frac{1,410 - 0,6387}{0,1228}$$

$$x = 6,2809 \text{ mgL}^{-1}$$

b. Kemampuan Adsorpsi DEHP oleh MIP 120 menit

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

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

$V = 0,005 \text{ L}$

$$q_e = \frac{(10 - 6{,}2809)\,0{,}005}{0{,}03}$$

$$q_e = 0{,}6198 \text{ mg/g}$$

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

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

$$y = 0{,}1228x + 0{,}6387$$

a. **Adsorpsi DEHP oleh MIP 6 mgL^{-1}**

$$y = 0{,}899$$

$$y = 0{,}1228x + 0{,}6387$$

$$0{,}899 = 0{,}1228x + 0{,}6387$$

$$x = \frac{0{,}899 - 0{,}6387}{0{,}1228}$$

$$x = 2{,}1197 \text{ mgL}^{-1}$$

b. **Kemampuan Adsorpsi DEHP oleh MIP 6 mgL^{-1}**

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

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

V = 0,005 L

$$q_e = \frac{(6 - 2{,}1197)\,0{,}005}{0{,}03}$$

$$q_e = 0{,}6467 \text{ mg/g}$$

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*

Proses ekstraksi (sonikasi)

Pencucian polimer dengan akuades

Penentuan pH

Penimbangan polimer hasil sintesis
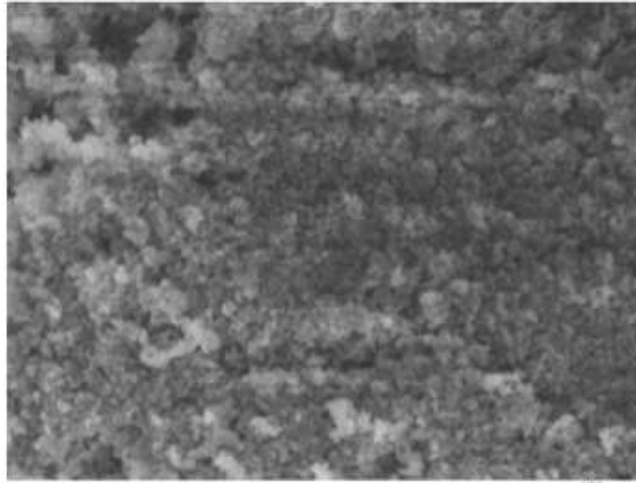
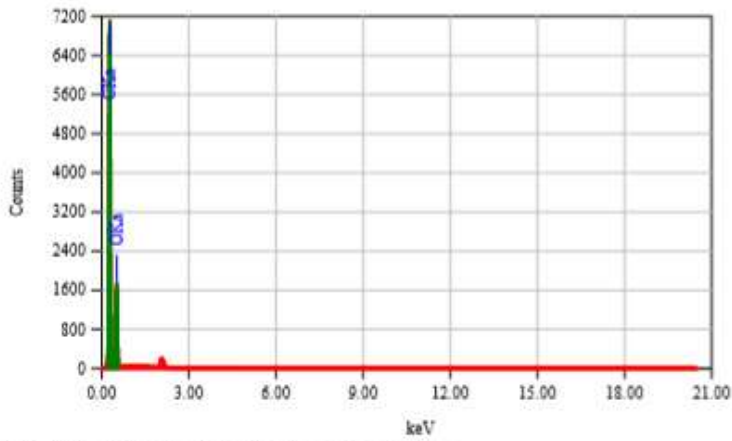Pembuatan deret standar DEHP

Uji kemampuan adsorpsi MIP dan NIP

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

Lampiran 6. Karakterisasi EDS

1. NIP_MMA-co-EGDMA

Title   : IMG1

-
Instrument   : 6510(LA)
Volt   : 10.00 kV
Mag.   : x 3,000
Date   : 2022/02/09
Pixel   : 512 x 384

Acquisition Parameter
Instrument   : 6510(LA)
Acc. Voltage : 10.0 kV
Probe Current: 1.00000 nA
PHA mode   : T3
Real Time   : 50.54 sec
Live Time   : 50.00 sec
Dead Time   : 1 %
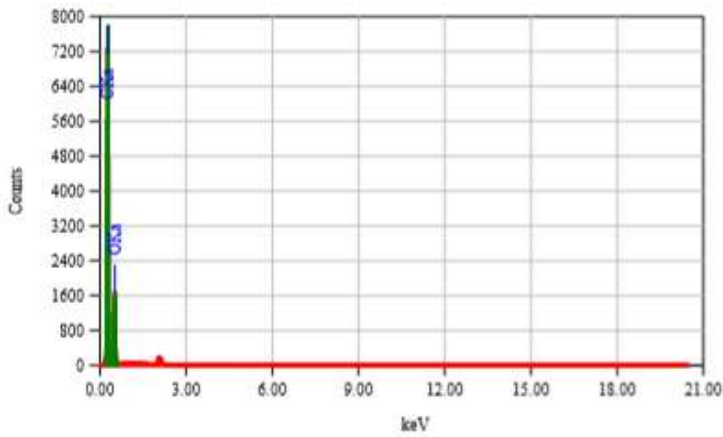Counting Rate: 1445 cps
Energy Range : 0 - 20 keV

ZAF Method Standardless Quantitative Analysis
Fitting Coefficient : 0.0289

Element	(keV)	Mass%	Sigma	Atom%	Compound	Mass%	Cation	K
C K	0.277	72.70	0.05	78.01				79.0486
O K	0.525	27.30	0.11	21.99				20.9514
Total		100.00		100.00				

2. MIP_DEHP_MMA-co-EGDMA(BE)
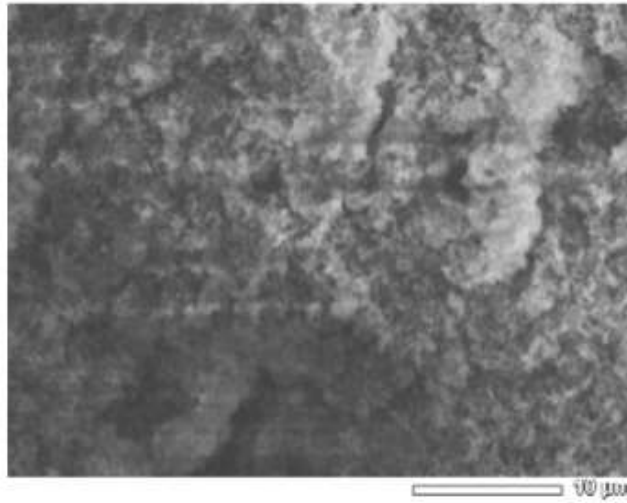
Title   : IMG1

-
Instrument   : 6510(LA)
Volt   : 10.00 kV
Mag.   : x 3,000
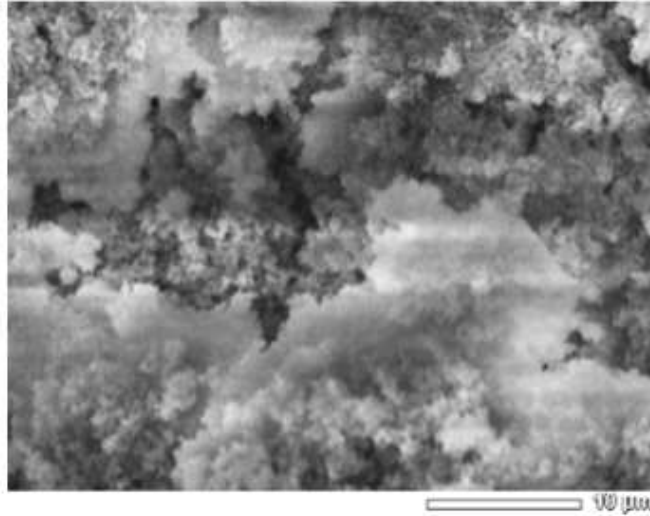Date   : 2022/02/09
Pixel   : 512 x 384

Acquisition Parameter
Instrument   : 6510(LA)
Acc. Voltage : 10.0 kV
Probe Current: 1.00000 nA
PHA mode   : T3
Real Time   : 50.62 sec
Live Time   : 50.00 sec
Dead Time   : 1 %
Counting Rate: 1519 cps
Energy Range : 0 - 20 keV

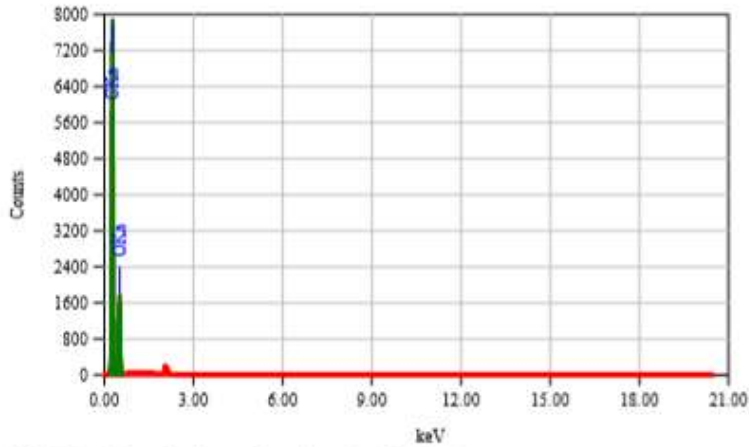ZAF Method Standardless Quantitative Analysis
Fitting Coefficient : 0.0307

Element	(keV)	Mass%	Sigma	Atom%	Compound	Mass%	Cation	K
C K	0.277	74.70	0.22	79.73				81.2299
O K	0.525	25.30	0.28	20.27				18.7700
Total		100.00		100.00				

3. MIP_DEHP_MMA-co-EGDMA(TE)

Title   : IMG1

-
Instrument : 6510(LA)
Volt   : 10.00 kV
Mag.   : x 3,000
Date   : 2022/02/09
Pixel   : 512 x 384

Acquisition Parameter
Instrument   : 6510(LA)
Acc. Voltage : 10.0 kV
Probe Current: 1.00000 nA
PHA mode   : T3
Real Time   : 50.59 sec
Live Time   : 50.00 sec
Dead Time   : 1 %
Counting Rate: 1556 cps
Energy Range : 0 - 20 keV

ZAF Method Standardless Quantitative Analysis
Fitting Coefficient : 0.0320

Element	(keV)	Mass%	Sigma	Atom%	Compound	Mass%	Cation	K
C K	0.277	71.42	0.21	76.48				80.9237
O K	0.525	28.58	0.28	23.52				19.0764
Total		100.00		100.00				

Lampiran 7. Karakterisasi FTIR

1. Spektrum Metil Metakrilat

Metil metakrilat (MMA)
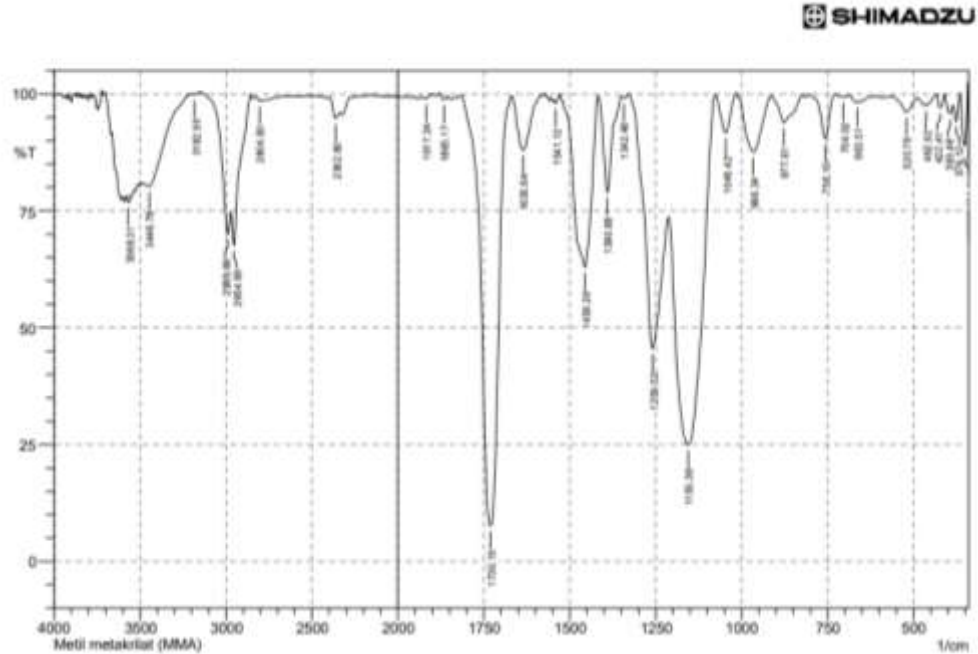
No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	351.04	87.56	13.926	364.55	341.4	0.722	0.848
2	376.12	94.238	4.408	385.76	364.55	0.313	0.197
3	393.48	95.78	2.501	410.84	385.76	0.298	0.159
4	422.41	97.112	2.808	432.05	410.84	0.184	0.176
5	462.92	97.471	0.81	487.99	455.2	0.274	0.072
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	912.53	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

Comment;

Metil metakrilat (MMA)

Date/Time; 2/14/2022 3:11:17 PM
No. of Scans;
Resolution;
Apodization:

2. Sepktrum NIP_MMA-co-EGDMA

⊕ SHIMADZU

NIP-MMA-Co-EGDMA
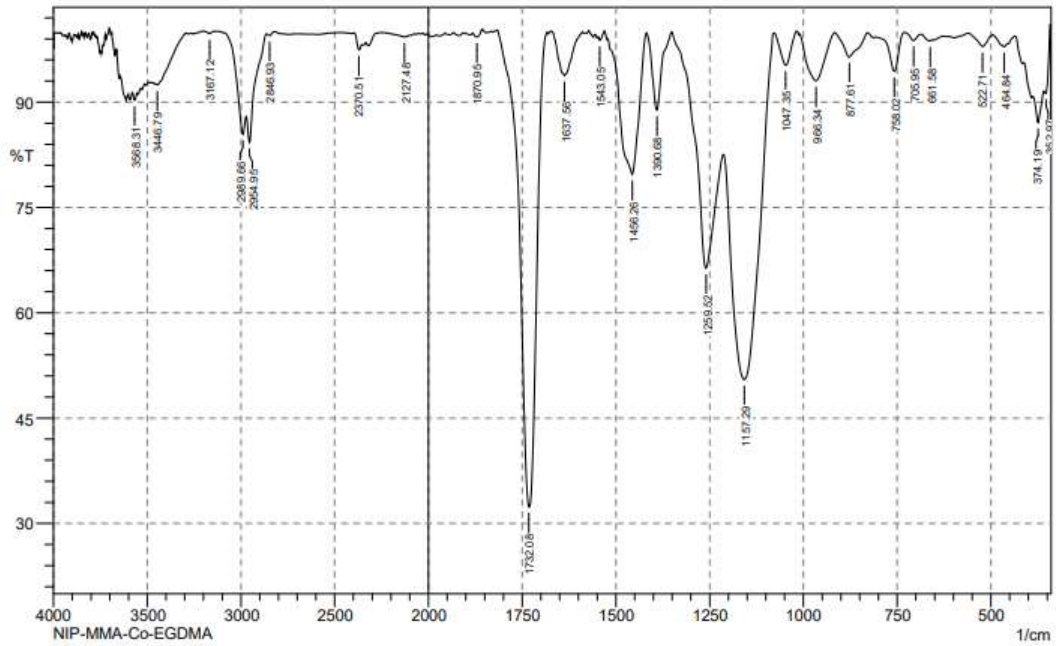
No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	352.97	91.28	3.465	358.76	341.4	0.471	0.181
2	374.19	87.108	3.934	387.69	360.69	1.354	0.255
3	464.84	97.888	0.726	495.71	455.2	0.258	0.072
4	522.71	97.936	1.757	561.29	495.71	0.315	0.233
5	661.58	98.71	0.33	682.8	655.8	0.12	0.033
6	705.95	98.787	0.972	731.02	688.59	0.121	0.082
7	758.02	94.371	5.281	800.46	731.02	0.742	0.612
8	877.61	96.423	3.468	916.19	829.39	0.737	0.695
9	966.34	93.032	6.706	1008.77	916.19	1.654	1.555
10	1047.35	95.252	4.726	1078.21	1018.41	0.643	0.636
11	1157.29	50.495	39.228	1213.23	1078.21	23.346	17.766
12	1259.52	66.346	21.862	1350.17	1215.15	11.172	5.433
13	1390.68	88.884	11.03	1417.68	1352.1	1.373	1.352
14	1456.26	79.727	19.646	1519.91	1419.61	5.29	4.961
15	1543.05	98.796	0.678	1546.91	1529.55	0.049	0.027
16	1637.56	93.783	6.222	1670.35	1591.27	1.099	1.096
17	1732.08	32.362	67.692	1815.02	1683.86	20.115	20.164
18	1870.95	99.299	0.789	1882.52	1857.45	0.045	0.057
19	2127.48	99.271	0.5	2250.93	2077.33	0.306	0.162
20	2370.51	97.45	1.347	2395.59	2355.08	0.287	0.109
21	2846.93	99.458	0.362	2862.36	2821.86	0.054	0.028
22	2954.95	84.264	5.579	2972.31	2864.29	3.607	0.622
23	2989.66	85.424	4.015	3093.82	2974.23	3.398	0.526
24	3167.12	99.753	0.358	3205.69	3136.25	0.008	0.042
25	3446.79	92.476	0.77	3460.3	3296.35	3.018	0.306
26	3568.31	90.283	1.067	3579.88	3554.81	1.056	0.07

Comment;
NIP-MMA-Co-EGDMA

Date/Time; 2/14/2022 2:34:22 PM
No. of Scans;
Resolution;
Apodization;

3. Spektrum MIP_DEHP_MMA-co-EGDMA(BE)

MIP-DEHP (BE) RISNA
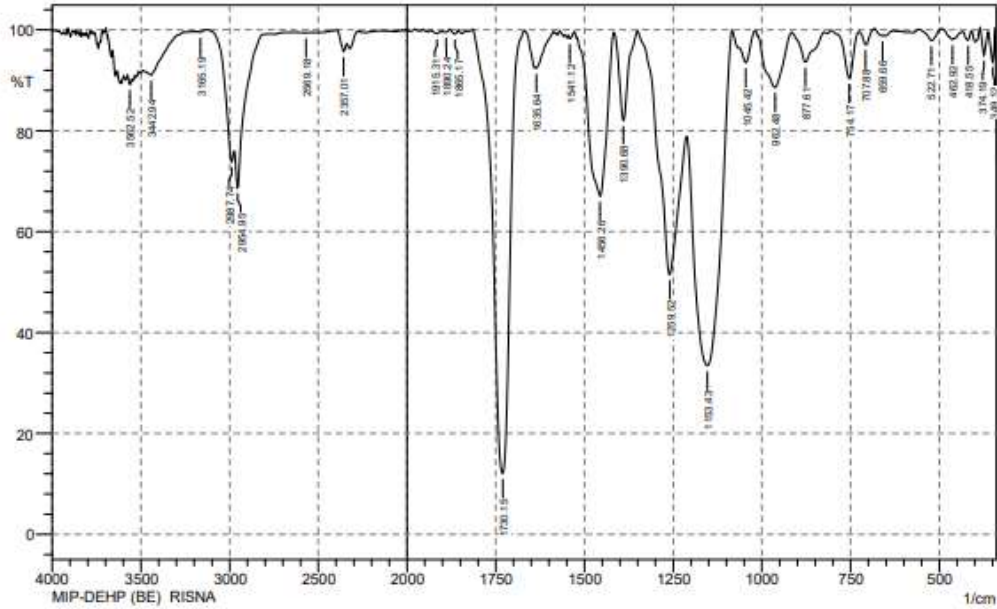
No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	349.12	93.725	6.432	362.62	341.4	0.315	0.317
2	374.19	95.002	4.944	385.76	362.62	0.254	0.248
3	418.55	97.987	1.717	433.98	408.91	0.135	0.101
4	462.92	98.075	0.704	495.71	455.2	0.164	0.047
5	522.71	97.893	2.305	557.43	495.71	0.233	0.284
6	659.66	98.836	0.286	682.8	655.8	0.078	0.032
7	707.88	97.092	2.81	725.23	682.8	0.248	0.241
8	754.17	90.435	9.283	802.39	727.16	1.252	1.171
9	877.61	93.605	5.896	914.26	825.53	1.317	1.128
10	962.48	88.636	11.053	1018.41	916.19	2.975	2.843
11	1045.42	93.55	6.323	1083.99	1020.34	0.985	0.95
12	1153.43	33.469	54.998	1211.3	1085.92	35.77	29.315
13	1259.52	51.523	34.402	1350.17	1213.23	17.993	10.772
14	1390.68	82.045	17.526	1415.75	1352.1	2.285	2.174
15	1450.20	67.071	32.430	1527.62	1417.60	9.395	9.100
16	1541.12	98.306	0.739	1544.98	1529.55	0.085	0.034
17	1635.64	92.423	7.253	1668.43	1589.34	1.374	1.252
18	1730.15	12.11	87.817	1813.09	1670.35	35.639	35.602
19	1865.17	99.221	0.859	1880.6	1855.52	0.043	0.054
20	1890.24	99.549	0.261	1896.03	1880.6	0.021	0.013
21	1915.31	99.281	0.465	1930.74	1907.6	0.049	0.028
22	2357.01	95.749	2.356	2395.59	2339.65	0.605	0.264
23	2569.18	99.449	0.076	2632.83	2536.39	0.218	0.018
24	2954.95	68.727	9.905	2974.23	2808.36	9.76	1.313
25	2987.74	73.85	3.996	3116.97	2976.16	6.446	0.456
26	3165.19	99.553	0.269	3188.33	3134.33	0.061	0.025
27	3442.94	91.051	1	3458.37	3257.77	3.8	0.167
28	3562.52	89.196	1.286	3576.02	3552.88	1.084	0.083

Comment;
MIP-DEHP (BE) RISNA

Date/Time; 2/14/2022 2:58:48 PM
No. of Scans;

Resolution;
Apodization;

4. Spektrum MIP_DEHP_MMA-co-EGDMA(TE)

MIP-DEHP (TE) AGDNA RISNA
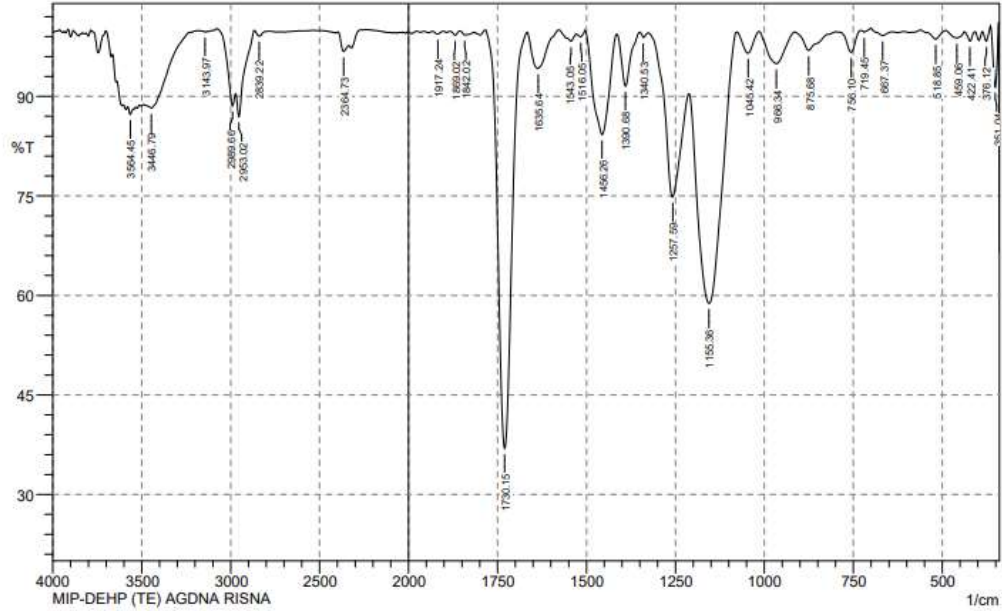
No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	351.04	91.454	9.48	364.55	341.4	0.457	0.546
2	376.12	98.328	1.855	387.69	364.55	0.079	0.097
3	422.41	98.343	1.398	437.84	406.98	0.119	0.084
4	459.06	98.799	1.017	489.92	437.84	0.178	0.141
5	518.85	98.62	1.342	561.29	489.92	0.187	0.177
6	667.37	99.149	0.557	686.66	644.22	0.104	0.05
7	719.45	99.679	0.38	729.09	700.16	0.01	0.025
8	756.1	96.637	3.225	798.53	729.09	0.417	0.368
9	875.68	96.917	2.793	916.19	798.53	0.727	0.581
10	966.34	94.939	4.8	1014.56	916.19	1.261	1.149
11	1045.42	96.493	3.248	1078.21	1014.56	0.521	0.449
12	1155.36	58.807	35.494	1211.3	1078.21	16.85	13.884
13	1257.59	74.854	19.169	1325.1	1213.23	6.841	4.25
14	1340.53	98.865	0.755	1350.17	1327.03	0.074	0.034
15	1390.68	91.563	7.909	1413.82	1352.1	1.091	0.959
16	1456.26	84.227	15.356	1502.55	1415.75	3.62	3.467
17	1516.05	98.963	0.747	1529.55	1504.48	0.08	0.046
18	1543.05	98.302	1.266	1579.7	1529.55	0.205	0.141
19	1635.64	94.198	5.512	1664.57	1579.7	1.161	1.083
20	1730.15	36.94	62.9	1782.23	1666.5	15.915	15.825
21	1842.02	99.271	0.52	1855.52	1815.02	0.094	0.051
22	1869.02	99.213	0.614	1882.52	1855.52	0.053	0.033
23	1917.24	99.387	0.42	1932.67	1901.81	0.052	0.026
24	2364.73	96.753	1.818	2397.52	2337.72	0.582	0.233
25	2839.22	99.112	0.157	2866.22	2833.43	0.086	0.019
26	2953.02	86.959	5.198	2972.31	2868.15	2.996	0.742
27	2989.66	88.577	3.248	3076.46	2974.23	2.325	0.389
28	3143.97	99.686	0.328	3184.48	3078.39	0.059	0.082
29	3446.79	88.213	2.119	3489.23	3186.4	7.69	0.833
30	3564.45	87.274	1.116	3577.95	3535.52	2.383	0.105

Comment;
MIP-DEHP (TE) AGDNA RISNA

Date/Time; 2/14/2022 2:53:01 PM
No. of Scans;
Resolution;
Apodization;

Lampiran 8. Karakterisasi SAA

Sample: MIP_DEHP_MMA-Co-EGDMA (TE)
Operator: Sarah
Submitter: 30391
File: C:\TriStar II 3020\data\SAMP...\MIP_DEHP_MMA-Co-EGDMA-TE.SMP

Started: 3/9/2022 7:18:50 AM	Analysis Adsorptive: N2
Completed: 3/9/2022 3:44:43 PM	Analysis Bath Temp.: -195.850 °C
Report Time: 3/11/2022 8:06:12 AM	Thermal Correction: No
Sample Mass: 0.2472 g	Warm Free Space: 10.9362 cm³ Measured
Cold Free Space: 31.1208 cm³	Equilibration Interval: 5 s
Low Pressure Dose: None	Sample Density: 1.000 g/cm³
Automatic Degas: No	

Summary Report

Surface Area

Single point surface area at P/Po = 0.301670275: 139.5321 m²/g

BET Surface Area: 142.2770 m²/g

t-Plot Micropore Area: 25.8335 m²/g

t-Plot External Surface Area: 116.4435 m²/g

BJH Adsorption cumulative surface area of pores
between 1.7000 nm and 300.0000 nm diameter: 77.613 m²/g

BJH Desorption cumulative surface area of pores
between 1.7000 nm and 300.0000 nm diameter: 92.3961 m²/g

D-H Adsorption cumulative surface area of pores
between 1.7000 nm and 300.0000 nm diameter: 92.274 m²/g

D-H Desorption cumulative surface area of pores
between 1.7000 nm and 300.0000 nm diameter: 83.3038 m²/g

Pore Volume

Single point adsorption total pore volume of pores
less than 171.8057 nm diameter at P/Po = 0.988719820: 0.261657 cm³/g

t-Plot micropore volume: 0.013350 cm³/g

BJH Adsorption cumulative volume of pores
between 1.7000 nm and 300.0000 nm diameter: 0.222877 cm³/g

BJH Desorption cumulative volume of pores
between 1.7000 nm and 300.0000 nm diameter: 0.223517 cm³/g

Pore Size

Adsorption average pore width (4V/A by BET): 7.35626 nm

BJH Adsorption average pore diameter (4V/A): 11.4866 nm

BJH Desorption average pore diameter (4V/A): 9.6765 nm

D-H Adsorption average pore diameter (4V/A): 9.9777 nm

D-H Desorption average pore diameter (4V/A): 10.3201 nm

TriStar II 3020 2.00   TriStar II 3020 Version 2.00   Unit   Serial #: 1108   Page 3
                                        1 Port 2

Sample: MIP_DEHP_MMA-Co-EGDMA (TE)
Operator: Sarah
Submitter: 30391
      File: C:\TriStar II 3020\data\SAMP...\MIP_DEHP_MMA-Co-EGDMA-TE.SMP

Started: 3/9/2022 7:18:50 AM   Analysis Adsorptive: N2
Completed: 3/9/2022 3:44:43 PM   Analysis Bath Temp.: -195.850 °C
Report Time: 3/11/2022 8:06:12 AM   Thermal Correction: No
Sample Mass: 0.2472 g   Warm Free Space: 10.9362 cm³ Measured
Cold Free Space: 31.1208 cm³   Equilibration Interval: 5 s
Low Pressure Dose: None   Sample Density: 1.000 g/cm³
Automatic Degas: No

Isotherm Tabular Report

Relative Pressure (P/Po)	Absolute Pressure (mmHg)	Quantity Adsorbed (cm³/g STP)	Elapsed Time (h:min)	Saturation Pressure (mmHg)
				760.000000
0.010735923	8.159302	22.3764	01:32	
0.110444440	83.937775	36.9178	02:41	
0.228115463	173.367752	42.8814	03:01	
0.301670275	229.269409	45.8992	03:08	
0.417319649	317.162933	50.5245	03:16	
0.504498130	383.418579	54.4095	03:24	
0.602681812	458.038177	59.3828	03:32	
0.697820884	530.343872	65.4439	03:39	
0.801705370	609.296082	75.5959	03:48	
0.910139064	691.705688	100.5730	04:06	
0.988719820	751.427063	169.1600	04:17	
0.906069866	688.613098	108.2093	04:38	
0.797481497	606.085938	80.7517	04:54	
0.696869700	529.620972	71.0542	05:01	
0.598514075	454.870697	65.1856	05:07	
0.498106424	378.560883	60.7135	05:12	
0.395757294	300.775543	56.3194	05:17	
0.301050266	228.798203	52.9149	05:21	
0.195287363	148.418396	48.9818	05:28	
0.112907420	85.809639	45.1997	05:36	
0.010065489	7.649772	33.2746	06:12	

Sample: MIP_DEHP_MMA-Co-EGDMA (TE)
Operator: Sarah
Submitter: 30391
File: C:\TriStar II 3020\data\SAMP...\MIP_DEHP_MMA-Co-EGDMA-TE.SMP

Started: 3/9/2022 7:18:50 AM
Completed: 3/9/2022 3:44:43 PM
Report Time: 3/11/2022 8:06:12 AM
Sample Mass: 0.2472 g
Cold Free Space: 31.1208 cm³
Low Pressure Dose: None
Automatic Degas: No

Analysis Adsorptive: N2
Analysis Bath Temp.: -195.850 °C
Thermal Correction: No
Warm Free Space: 10.9362 cm³ Measured
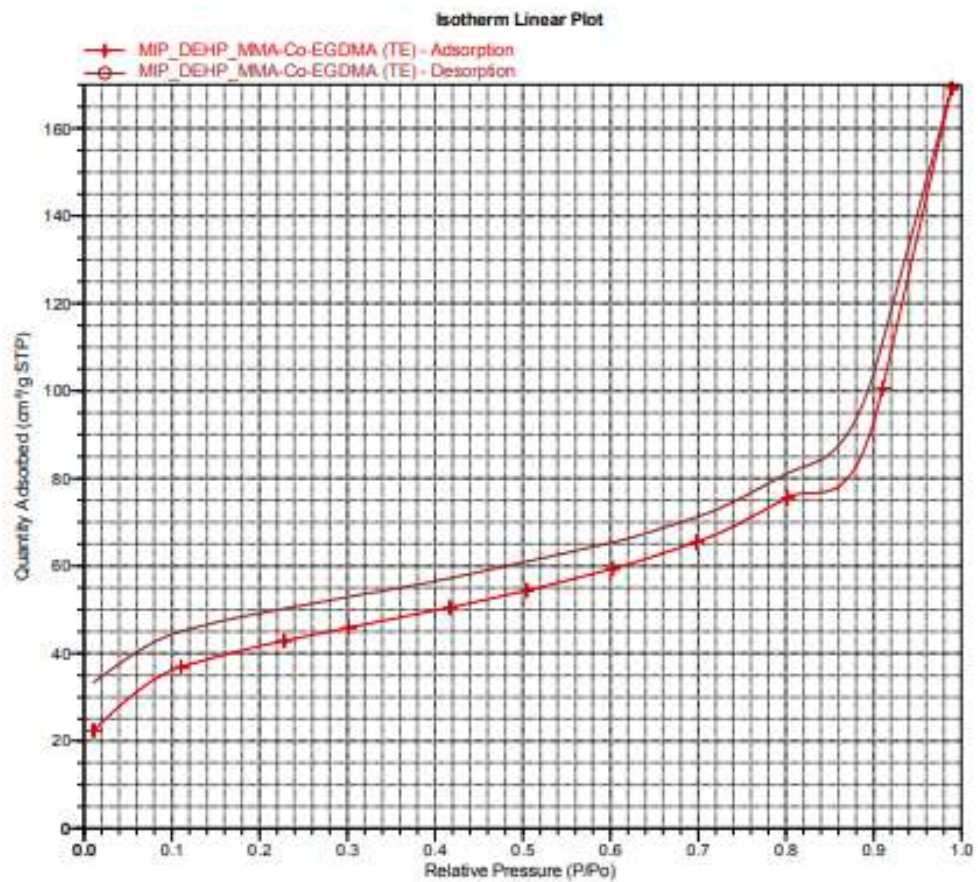Equilibration Interval: 5 s
Sample Density: 1.000 g/cm³

Isotherm Linear Plot

Sample: MIP_DEHP_MMA-Co-EGDMA (TE)
Operator: Sarah
Submitter: 30391
File: C:\TriStar II 3020\data\SAMP...\MIP_DEHP_MMA-Co-EGDMA-TE.SMP

Started: 3/9/2022 7:18:50 AM
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Analysis Adsorptive: N2
Analysis Bath Temp.: -195.850 °C
Thermal Correction: No
Warm Free Space: 10.9362 cm³ Measured
Equilibration Interval: 5 s
Sample Density: 1.000 g/cm³

BJH Adsorption Pore Distribution Report
Faas Correction
Harkins and Jura
$t = [\ 13.99 / (\ 0.034 - \log(P/Po)\ )\ ]\ ^\wedge 0.5$

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)
171.7 - 22.8	25.0	0.131951	0.131951	21.099	21.099
22.8 - 10.6	12.5	0.045184	0.177134	14.482	35.581
10.6 - 6.9	7.9	0.015461	0.192595	7.839	43.420
6.9 - 5.1	5.7	0.008315	0.200910	5.837	49.257
5.1 - 3.9	4.4	0.006669	0.207579	6.129	55.385
3.9 - 3.2	3.5	0.005232	0.212812	6.014	61.400
3.2 - 2.4	2.7	0.006013	0.218825	8.876	70.275
2.4 - 2.1	2.2	0.004052	0.222877	7.337	77.613

Lampiran 9. Contoh Perhitungan Nilai Kapasitas Adsorpsi berdasarkan Model Persamaan Isoterm Adsorpsi Langmuir dan Isoterm Adsorpsi Freundlich

1.   **Isoterm Adsorpsi Langmuir**

Persamaan:

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

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

Berdasarkan model isoterm Langmuir diperoleh persamaan garis:

$$y = 2{,}9583x + 0{,}2086$$

$\frac{1}{q_m}$ = 0,2086   maka, q_m = $\frac{1}{0{,}1979}$ = 4,7938

$\frac{1}{q_m K_L}$ = 2,9583   maka, K_L = $\frac{1}{2{,}9583 \text{ x } 4{,}7938}$ = 0,0705

2.   **Isoterm 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 = Konstanta Freundlich menyatakan tingkat adsorpsi (mg/g)
$\frac{1}{n}$ = Konstanta Freundlich menyatakan faktor heterogenitas
n = Intensitas adsorpsi

Berdasarkan model isoterm Freundlich diperoleh persamaan garis:
$$y = 0{,}8173x - 0{,}481$$

$\frac{1}{n}$ = 0,8173   maka, $n = \frac{1}{0{,}8173} = 1{,}2235$

$\log K_F$ = -0,481
K_F = Inv. log (-0,481)
K_F = 0,3303 mg/g.

Lampiran 10. Perhitungan nilai K_1 dari persamaan orde satu semu dan nilai K_2 dari persamaan 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

     $\log q_e$ = -0,6903
     q_e = 0,2040

   - $K_1/2{,}303$ = Slope
     K_1 = Slope x 2,303
     K_1 = -0,0027 x 2,303
     K_1 = -0,0062

2. **Penentuan K_2 dari persamaan orde dua semu**

   Persamaan orde satu semu:

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

   - $1/q_e$ = Slope
     q_e = 1/Slope
     q_e = 1/1,6063
     q_e = 0,6225

   - $1/K_2 q_e^2$ = Intercept
     K_2 = 1/Intercept x q_e^2
     K_2 = 1/17,432x $(0{,}6225)^2$
     K_2 = 0,0222