

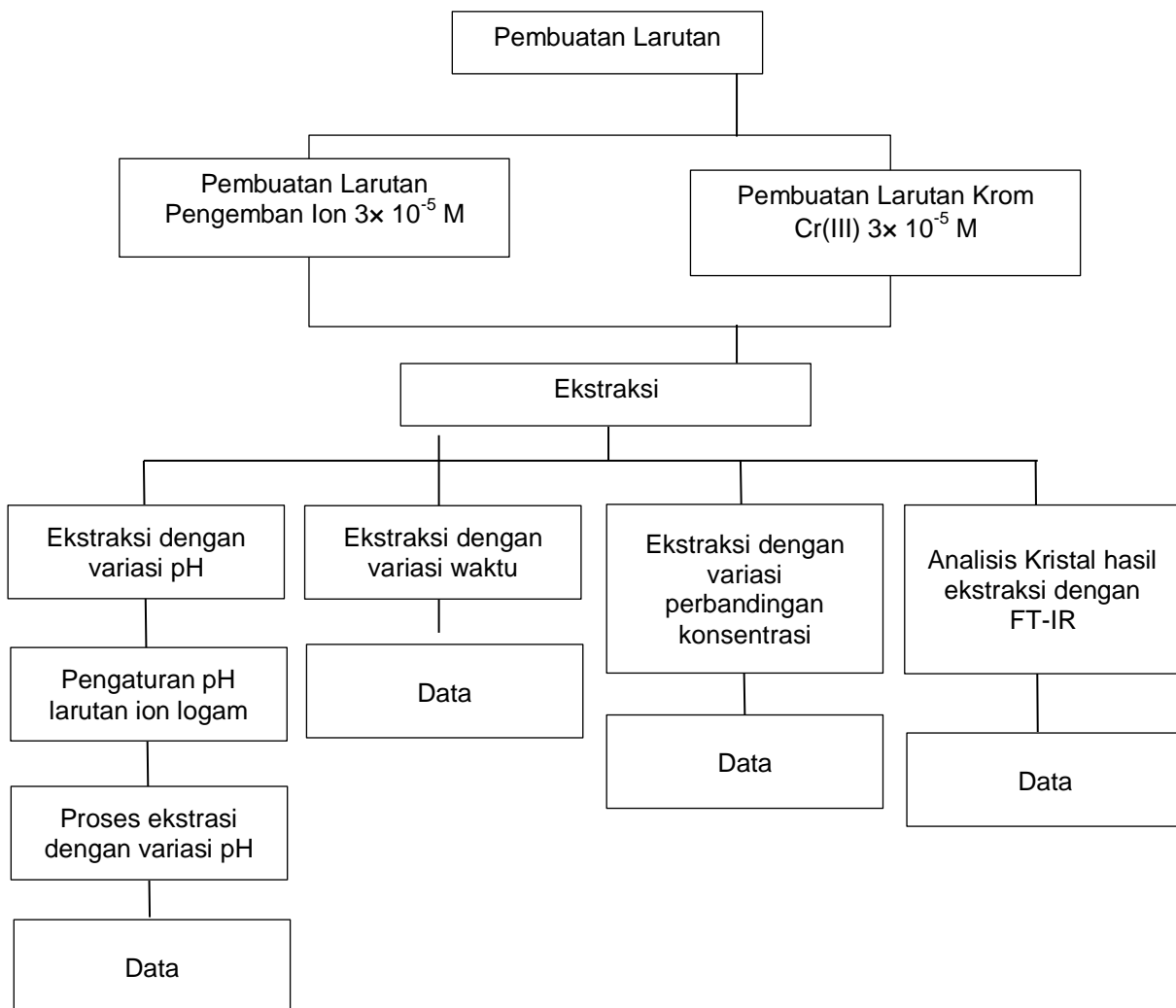
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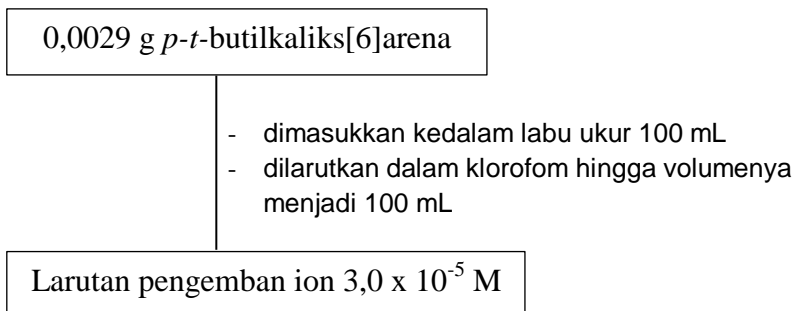
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## Lampiran 1. Diagram Alir

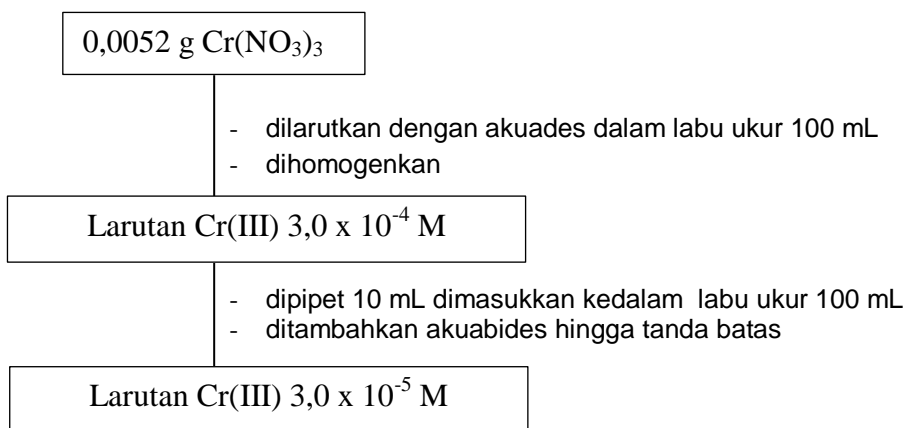


## Lampiran 2. Bagan Kerja

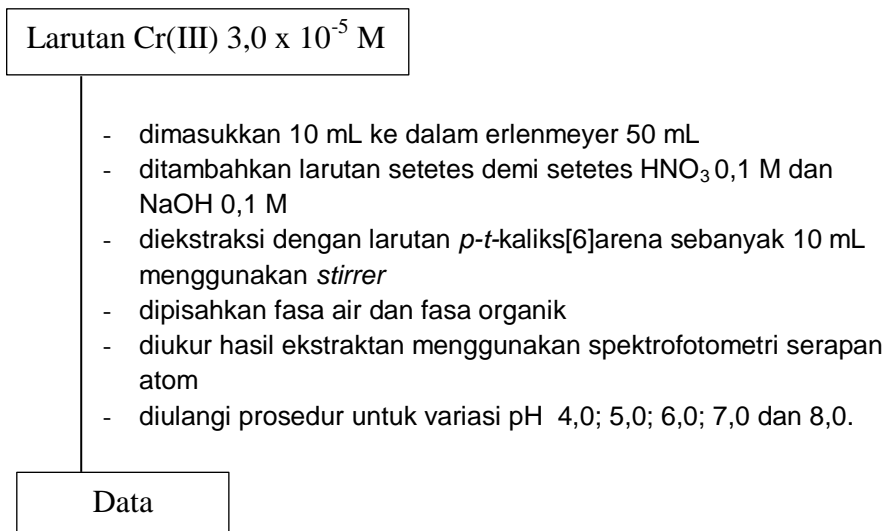
### a. Pembuatan larutan pengemban ion



### b. Pembuatan Larutan Induk Cr(III) $3,0 \times 10^{-4}$



### c. Ekstraksi dengan variasi pH



## d. Ekstraksi dengan variasi waktu

Larutan Cr(III)  $3,0 \times 10^{-5}$  M

- dimasukkan 10 mL ke dalam erlenmeyer 50 mL
- diekstraksi dengan larutan *p-t*-kaliks[6]arena sebanyak 10 mL menggunakan *stirrer* pada pH optimum selama 5 menit
- dipisahkan fasa organik
- diukur ekstrak menggunakan spektrofotometri serapan atom
- diulangi prosedur untuk variasi waktu 5, 10, 15, 20 dan 25 menit

Data

e. Pembuatan larutan Cr(III)  $1,0 \times 10^{-5}$ ;  $2,0 \times 10^{-5}$ ;  $3,0 \times 10^{-5}$  M

Larutan Cr(III)  $3,0 \times 10^{-4}$

- dipipet sebanyak 50 mL dimasukkan kedalam labu ukur 100 mL
- ditambahkan akuabides sampai tanda batas, Dihomogenkan

Larutan Cr(III)  $3,0 \times 10^{-5}$  M

- dipipet sebanyak 3,33 mL dimasukkan kedalam labu ukur 100 mL
- ditambahkan akuabides sampai tanda batas, dihomogenkan

Larutan Cr(III)  $2,0 \times 10^{-5}$  M

- dipipet sebanyak 1,67 mL dimasukkan kedalam labu ukur 100 mL
- ditambahkan akubides hingga tanda batas, homogenkan

Larutan Cr(III)  $1,0 \times 10^{-5}$  M

## f. Ekstraksi dengan variasi perbandingan konsentrasi

Larutan Cr(III)  $3,0 \times 10^{-5}$  M

- dimasukkan 10 mL ke dalam erlenmeyer 50 mL
- diekstraksi dengan larutan *p-t*-kaliks[6]arena sebanyak 10 mL menggunakan *stirrer* pada pH optimum selama 15 menit
- dipisahkan fasa air dan organik
- diukur ekstrak menggunakan spektrofotometri UV-Vis 2600 Shimadzu
- diulangi prosedur untuk variasi perbandingan konsentrasi 0,33, 0,5, 2 dan 3.

Data

Analisis Kompleks *p-t*-butilkaliks[6]arena dengan ion logam Cr(III) menggunakan FT-IR

Larutan Cr(III)  $3,0 \times 10^{-5}$  M

- dimasukkan 10 mL ke dalam erlenmeyer 50 mL
- diatur pH hingga 6 menggunakan  $\text{HNO}_3$  0,1 M
- diekstraksi dengan larutan *p-t*-kaliks[6]arena sebanyak 10 mL menggunakan *stirrer* selama 10 menit
- dipisahkan fasa organik
- ditambahkan  $\text{Na}_2\text{SO}_4$  sambil diputar secara perlahan
- didiamkan selama 10 menit
- dituang ke dalam gelas kimia lain dan didiamkan hingga terbentuk kristal
- dianalisis menggunakan FT-IR Prestige-21 Shimadzu

Hasil

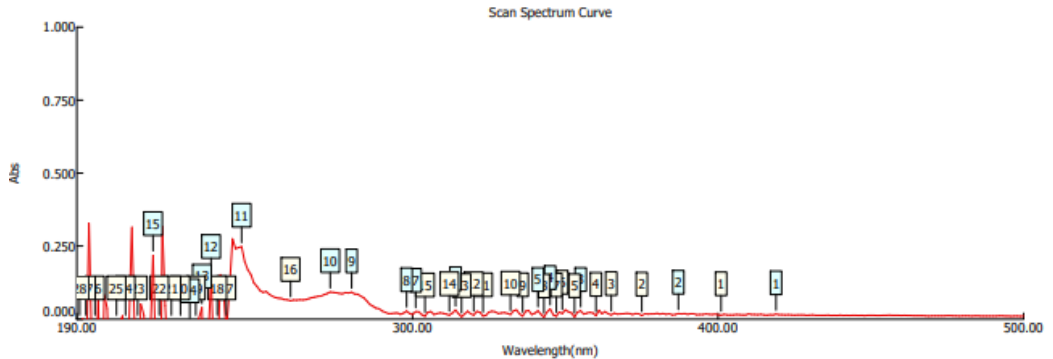
## Lampiran 3. Data Spektrum UV-Vis

### 1. Spektrum UV-Vis *p-t*-butilkaliks[6]arena tanpa penambahan logam

Kaliks 3 UYA.spd

Kaliks 3 UYA.spd

Spectrum



Comment :

No.	P/V	Wavelength(nm)	Abs
1	Peak	389.00	0.006
2	Peak	382.00	0.007
3	Peak	378.00	0.007
4	Peak	372.00	0.008
5	Peak	369.00	0.010
6	Peak	340.00	0.012
7	Peak	335.00	0.015
8	Peak	331.00	0.013
9	Peak	328.00	0.014
10	Peak	302.00	0.013
11	Peak	280.00	0.049
12	Peak	274.00	0.046
13	Peak	242.00	0.172
14	Peak	226.00	0.254
15	Peak	219.00	0.236
16	Peak	215.00	0.342
17	Peak	212.00	0.287
18	Peak	208.00	0.282
19	Peak	205.00	0.092
20	Peak	199.00	0.094
21	Peak	194.00	0.262
1	Valley	358.00	0.000
2	Valley	353.00	-0.001
3	Valley	349.00	-0.001
4	Valley	346.00	0.002
5	Valley	342.00	-0.002
6	Valley	320.00	-0.002
7	Valley	316.00	-0.003
8	Valley	312.00	0.000
9	Valley	304.00	-0.005
10	Valley	300.00	-0.004
11	Valley	296.00	-0.004
12	Valley	262.00	0.026
13	Valley	238.00	0.003
14	Valley	235.00	-0.130

#### ● Instrument Performance

Model : UV-VIS Spectrophotometer

Number : 28-1650-01-1349

Spectral Bandwidth : 1.00 nm

#### ● Scan Spectrum Performance

Scan Range : 190.00 to 500.00 nm

Measure Mode : Abs

Interval : 1.00 nm

Speed : Fast

Data File : E:\Kaliks 2 UYA.spd

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Data Type : Original

Method File:

#### ● Analyse Note

Analyser : Administrator

Sample Name :

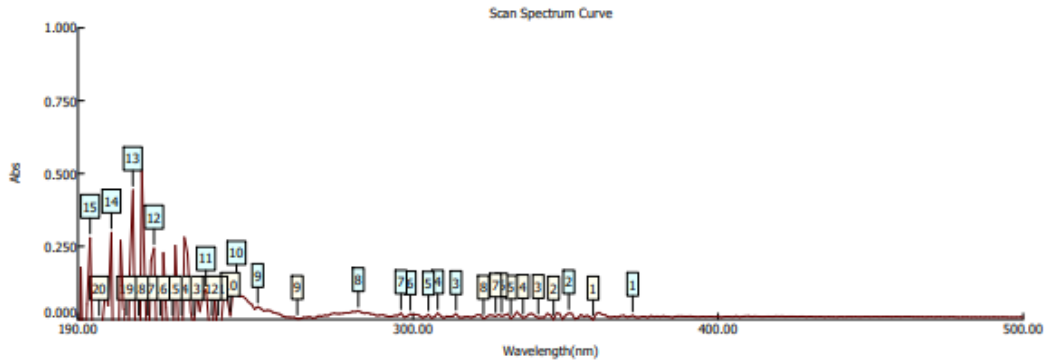


## 2. Spektrum UV-Vis *p-t*-butilkaliks[6]arena dengan penambahan ion logam Cr(III) dengan perbandingan 1:1

LOGAM UYA 1\_1.spd

LOGAM UYA 1\_1.spd

Spectrum



Comment :

No.	P/V	Wavelength(nm)	Abs
1	Peak	372.00	0.013
2	Peak	351.00	0.021
3	Peak	314.00	0.018
4	Peak	308.00	0.021
5	Peak	305.00	0.016
6	Peak	299.00	0.017
7	Peak	296.00	0.021
8	Peak	282.00	0.029
9	Peak	249.00	0.043
10	Peak	242.00	0.121
11	Peak	232.00	0.100
12	Peak	215.00	0.243
13	Peak	208.00	0.444
14	Peak	201.00	0.298
15	Peak	194.00	0.280
1	Valley	359.00	-0.004
2	Valley	346.00	-0.001
3	Valley	341.00	0.005
4	Valley	336.00	0.005
5	Valley	332.00	0.003
6	Valley	329.00	0.011
7	Valley	327.00	0.009
8	Valley	323.00	0.002
9	Valley	262.00	0.001
10	Valley	240.00	0.012
11	Valley	236.00	-0.087
12	Valley	234.00	-0.050
13	Valley	228.00	-0.024
14	Valley	224.00	-0.207
15	Valley	221.00	-0.192
16	Valley	217.00	-0.695
17	Valley	213.00	-0.233
18	Valley	210.00	-0.489
19	Valley	206.00	-0.396
20	Valley	197.00	-0.331

### ● Instrument Performance

Model : UV-VIS Spectrophotometer  
 Number : 28-1650-01-1349  
 Spectral Bandwidth : 1.00 nm

### ● Scan Spectrum Performance

Scan Range : 190.00 to 500.00 nm  
 Measure Mode : Abs  
 Interval : 1.00 nm  
 Speed : Fast  
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 Method File :

### ● Analyse Note

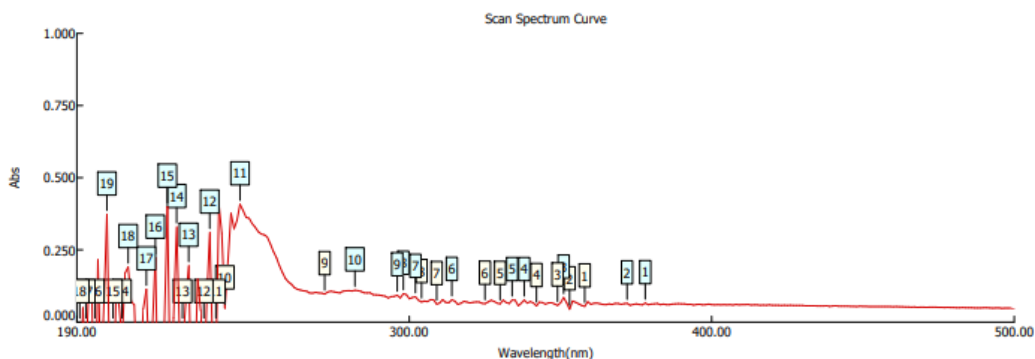
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 Sample Name :

### 3. Spektrum UV-Vis *p-t*-butilkaliks[6]arena dengan penambahan ion logam Cr(III) dengan perbandingan 1:2

LOGAM UYA 1\_2.spd

LOGAM UYA 1\_2.spd

Spectrum



Comment :

No.	P/V	Wavelength(nm)	Abs
1	Peak	378.00	0.065
2	Peak	372.00	0.065
3	Peak	351.00	0.085
4	Peak	338.00	0.076
5	Peak	334.00	0.076
6	Peak	314.00	0.077
7	Peak	302.00	0.087
8	Peak	298.00	0.098
9	Peak	296.00	0.093
10	Peak	282.00	0.110
11	Peak	244.00	0.408
12	Peak	234.00	0.310
13	Peak	227.00	0.195
14	Peak	223.00	0.329
15	Peak	220.00	0.400
16	Peak	216.00	0.223
17	Peak	213.00	0.113
18	Peak	207.00	0.191
19	Peak	200.00	0.372
1	Valley	358.00	0.054
2	Valley	353.00	0.044
3	Valley	349.00	0.058
4	Valley	342.00	0.056
5	Valley	330.00	0.063
6	Valley	325.00	0.063
7	Valley	309.00	0.062
8	Valley	304.00	0.069
9	Valley	272.00	0.097
10	Valley	239.00	0.047
11	Valley	236.00	-0.137
12	Valley	232.00	-0.238
13	Valley	225.00	-0.100
14	Valley	205.00	-0.068
15	Valley	202.00	-0.367
16	Valley	196.00	-0.482

#### ● Instrument Performance

Model : UV-VIS Spectrophotometer  
 Number : 28-1650-01-1349  
 Spectral Bandwidth : 1.00 nm

#### ● Scan Spectrum Performance

Scan Range : 190.00 to 500.00 nm  
 Measure Mode : Abs  
 Interval : 1.00 nm  
 Speed : Fast  
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 Method File :

#### ● Analyse Note

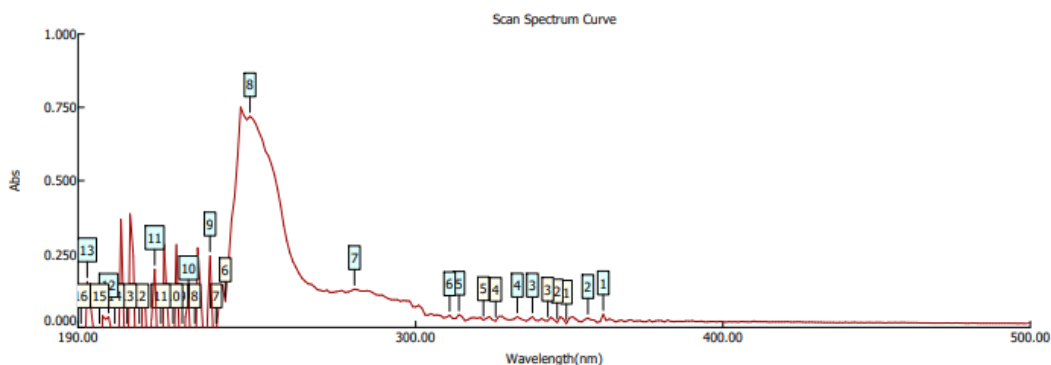
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 Sample Name :

#### 4. Spektrum UV-Vis *p-t*-butilkaliks[6]arena dengan penambahan ion logam Cr(III) dengan perbandingan 1:3

LOGAM UYA 1\_3.spd

LOGAM UYA 1\_3.spd

Spectru



Comment :

No.	P/V	Wavelength(nm)	Abs
1	Peak	361.00	0.044
2	Peak	356.00	0.032
3	Peak	338.00	0.036
4	Peak	333.00	0.036
5	Peak	314.00	0.043
6	Peak	311.00	0.041
7	Peak	280.00	0.130
8	Peak	246.00	0.720
9	Peak	233.00	0.245
10	Peak	226.00	0.096
11	Peak	215.00	0.198
12	Peak	200.00	0.036
13	Peak	193.00	0.156
1	Valley	349.00	0.012
2	Valley	346.00	0.016
3	Valley	343.00	0.022
4	Valley	326.00	0.021
5	Valley	322.00	0.024
6	Valley	238.00	0.089
7	Valley	235.00	-0.020
8	Valley	228.00	-0.258
9	Valley	224.00	-0.342
10	Valley	221.00	-0.243
11	Valley	217.00	-0.647
12	Valley	210.00	-0.531
13	Valley	206.00	-0.343
14	Valley	202.00	-0.595
15	Valley	197.00	-0.394
16	Valley	191.00	-0.488

#### ● Instrument Performance

Model : UV-VIS Spectrophotometer  
 Number : 28-1650-01-1349  
 Spectral Bandwidth : 1.00 nm

#### ● Scan Spectrum Performance

Scan Range : 190.00 to 500.00 nm  
 Measure Mode : Abs  
 Interval : 1.00 nm  
 Speed : Fast  
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 Method File:

#### ● Analyse Note

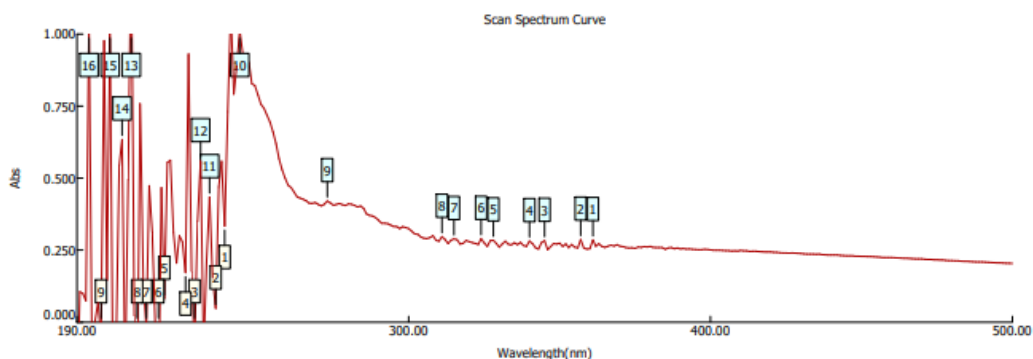
Analyser : Administrator  
 Sample Name :

## 5. Spektrum UV-Vis *p-t*-butilkaliks[6]arena dengan penambahan ion logam Cr(III) dengan perbandingan 2:1

LOGAM UYA 2\_1.spd

LOGAM UYA 2\_1.spd

Spectrum



Comment :

No.	P/V	Wavelength(nm)	Abs
1	Peak	361.00	0.286
2	Peak	357.00	0.287
3	Peak	345.00	0.283
4	Peak	340.00	0.282
5	Peak	328.00	0.284
6	Peak	324.00	0.289
7	Peak	315.00	0.289
8	Peak	311.00	0.297
9	Peak	273.00	0.420
10	Peak	244.00	1.014
11	Peak	234.00	0.435
12	Peak	231.00	0.560
13	Peak	208.00	1.345
14	Peak	205.00	0.634
15	Peak	201.00	1.011
16	Peak	194.00	1.038
1	Valley	239.00	0.334
2	Valley	236.00	0.047
3	Valley	229.00	-0.091
4	Valley	226.00	0.172
5	Valley	219.00	0.081
6	Valley	217.00	-0.354
7	Valley	213.00	-0.024
8	Valley	210.00	-0.285
9	Valley	198.00	-0.055

### ● Instrument Performance

Model : UV-VIS Spectrophotometer

Number : 28-1650-01-1349

Spectral Bandwidth : 1.00 nm

### ● Scan Spectrum Performance

Scan Range : 190.00 to 500.00 nm

Measure Mode : Abs

Interval : 1.00 nm

Speed : Fast

Data File : E:\LOGAM UYA 2\_1.spd

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Method File:

### ● Analyse Note

Analyser : Administrator

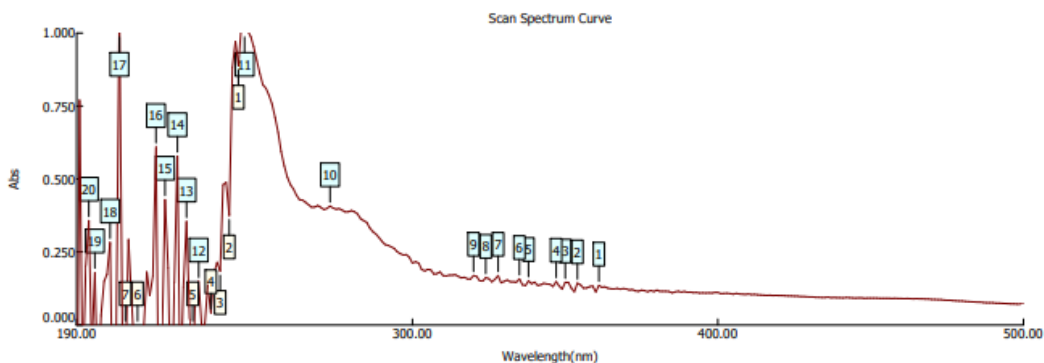
Sample Name :

## 6. Spektrum UV-Vis *p-t*-butilkaliks[6]arena dengan penambahan ion logam Cr(III) dengan perbandingan 3:1

LOGAM UYA 3\_1.spd

LOGAM UYA 3\_1.spd

Spectrum



Comment :

No.	P/V	Wavelength(nm)	Abs
1	Peak	361.00	0.135
2	Peak	354.00	0.143
3	Peak	350.00	0.146
4	Peak	347.00	0.149
5	Peak	338.00	0.151
6	Peak	335.00	0.158
7	Peak	328.00	0.169
8	Peak	324.00	0.162
9	Peak	320.00	0.169
10	Peak	273.00	0.407
11	Peak	245.00	1.061
12	Peak	230.00	0.149
13	Peak	226.00	0.354
14	Peak	223.00	0.579
15	Peak	219.00	0.430
16	Peak	216.00	0.610
17	Peak	204.00	1.078
18	Peak	201.00	0.283
19	Peak	196.00	0.180
20	Peak	194.00	0.358
1	Valley	243.00	0.888
2	Valley	240.00	0.375
3	Valley	237.00	0.184
4	Valley	234.00	0.041
5	Valley	228.00	-0.197
6	Valley	210.00	-0.128
7	Valley	206.00	-0.169

### ● Instrument Performance

Model : UV-VIS Spectrophotometer  
 Number : 28-1650-01-1349  
 Spectral Bandwidth : 1.00 nm

### ● Scan Spectrum Performance

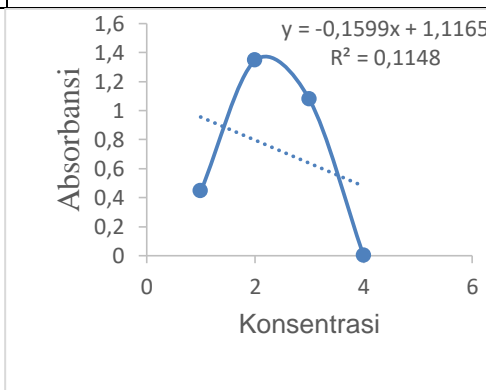
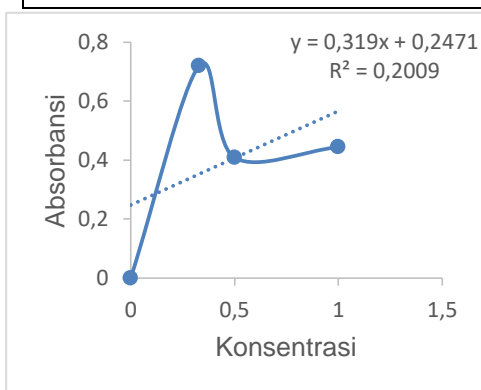
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### ● Analyse Note

Analysier : Administrator  
 Sample Name :

**Lampiran 4.** Perbandingan konsentrasi *p-t*-butilkaliks[6]arena dan ion logam

Perbandingan L : M	Absorbansi
0	0
1:3	0,720
1:2	0,408
1:1	0,444
2:1	1,345
3:1	1,078



$$Y_{(1)} = 0,319x + 0,2471$$

$$Y_{(2)} = -0,1599x - 1,1165$$

$$Y_{(1)} = Y_{(2)}$$

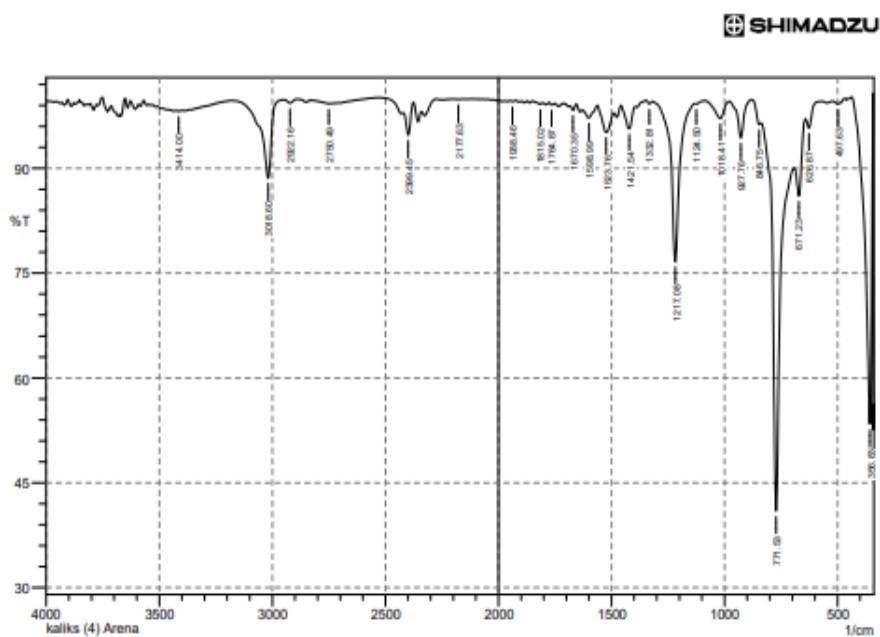
$$0,319x + 0,2471 = -0,1599x - 1,1165$$

$$0,319 + 0,1599x = 1,1165 - 0,2471$$

$$0,4789x = 0,8694$$

$$x = 1,8154$$

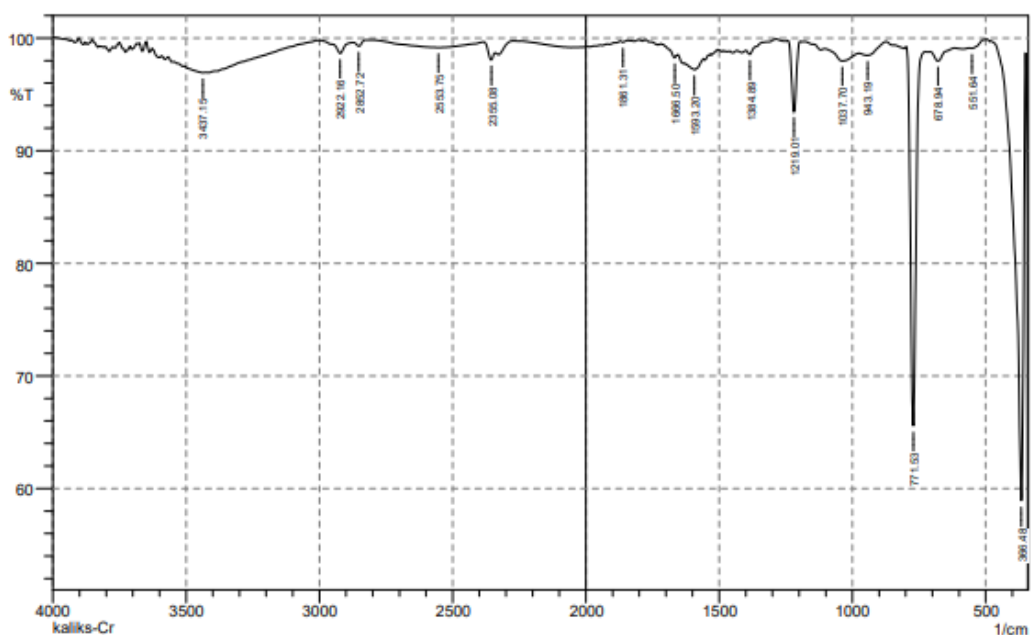
## Lampiran 5. Data Hasil FT-IR

1. FT-IR *p-t*-butilkaliks[6]arena

No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	356.83	53.388	38.237	435.91	345.26	8.078	6.081
2	497.63	99.22	0.278	520.78	484.13	0.099	0.023
3	626.87	95.785	1.81	642.3	569	0.58	0.04
4	671.23	86.054	6.778	690.52	642.3	2.061	0.686
5	771.53	40.979	52.576	837.11	692.44	15.064	10.61
6	846.75	96.287	0.945	879.54	837.11	0.384	0.036
7	927.76	94.388	5.309	977.91	879.54	0.86	0.729
8	1018.41	97.147	2.464	1087.85	977.91	0.674	0.496
9	1124.5	99.234	0.099	1132.21	1087.85	0.106	0.004
10	1217.08	76.672	22.731	1317.38	1132.21	5.001	4.528
11	1332.81	99.244	0.412	1348.24	1317.38	0.072	0.026
12	1421.54	95.669	3.238	1458.18	1394.53	0.746	0.446
13	1523.76	95.174	3.229	1560.41	1490.97	1.033	0.552
14	1598.99	97.233	1.378	1627.92	1560.41	0.6	0.203
15	1670.35	98.323	0.749	1685.79	1654.92	0.172	0.047
16	1764.87	99.087	0.265	1776.44	1751.36	0.086	0.015
17	1815.02	99.197	0.235	1847.81	1803.44	0.121	0.025
18	1938.46	99.566	0.124	1948.1	1923.03	0.039	0.006
19	2177.63	99.881	0.036	2202.71	2142.91	0.025	0.004
20	2399.45	94.791	3.866	2420.66	2376.3	0.608	0.354
21	2750.49	99.257	0.585	2829.57	2522.89	0.45	0.361
22	2922.16	99.335	0.524	2947.23	2887.44	0.092	0.057
23	3018.6	88.638	11.147	3178.69	2949.16	2.855	2.616
24	3414	98.197	0.066	3423.65	3396.64	0.209	0.004

2. FT-IR *p*-*t*-butilkaliks[6]arena penambahan ion logam Cr(III)

SHIMADZU



No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area
1	366.48	58.897	39.864	480.28	351.04	7.802	7.334
2	551.64	99.091	0.158	563.21	495.71	0.165	0.018
3	678.94	97.974	0.914	707.88	617.22	0.555	0.139
4	771.53	65.544	33.501	796.6	727.16	4.093	3.785
5	943.19	98.477	0.505	975.98	873.75	0.498	0.127
6	1037.7	97.966	0.878	1103.28	975.98	0.871	0.232
7	1219.01	93.485	6.263	1242.16	1195.87	0.595	0.544
8	1384.89	98.55	0.526	1400.32	1338.6	0.248	0.048
9	1593.2	97.2	0.756	1627.92	1558.48	0.756	0.133
10	1666.5	98.255	0.446	1716.65	1654.92	0.301	0.032
11	1861.31	99.636	0.126	1870.95	1843.95	0.034	0.007
12	2355.08	98.074	0.953	2384.02	2339.65	0.239	0.079
13	2553.75	99.162	0.565	2798.71	2385.95	1.079	0.616
14	2852.72	99.287	0.417	2873.94	2825.72	0.096	0.037
15	2922.16	98.646	1.038	2995.45	2873.94	0.33	0.173
16	3437.15	96.926	0.093	3508.52	3427.51	1.024	0.033



## Lampiran 6. Dokumentasi Penelitian



Pembuatan larutan pengemban ion (*p-t*-butilkaliks[6]arena  $3,0 \times 10^{-5}$  M



Ekstraksi menggunakan *magnetic stirrer*



Ekstraksi dengan Variasi pH



Ekstraksi dengan Variasi Waktu



Ekstraksi dengan Variasi Konsentrasi



Analisis menggunakan FT-IR  
Prestige-21



Analisis menggunakan UV-Vis  
2600 Shimadzu



Analisis menggunakan Spektrofotometri Serapan Atom