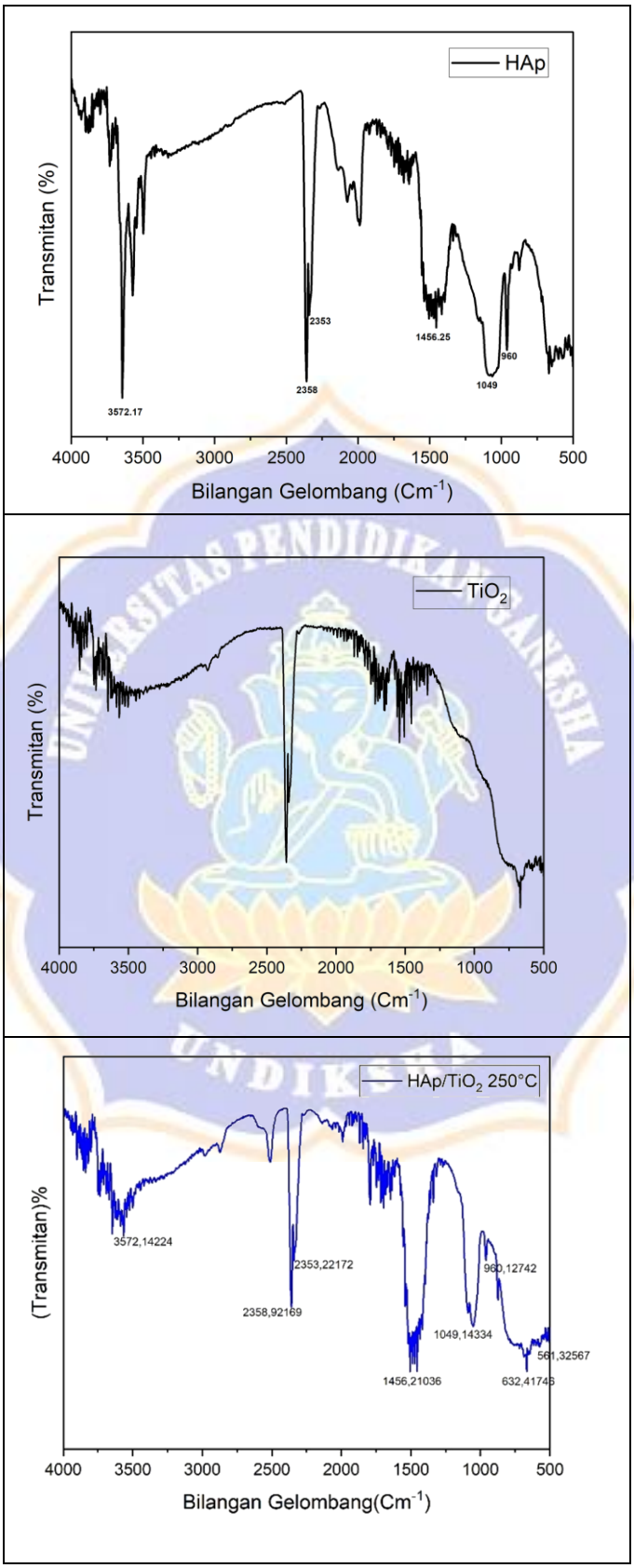
LAMPIRAN

Lampiran 1. Data Hasil FTIR



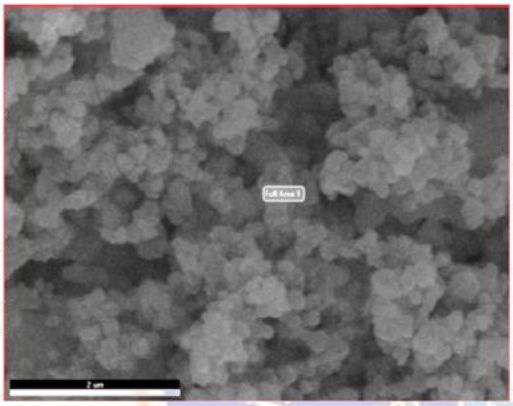
Lampiran 2. Data Hasil SEM-EDX

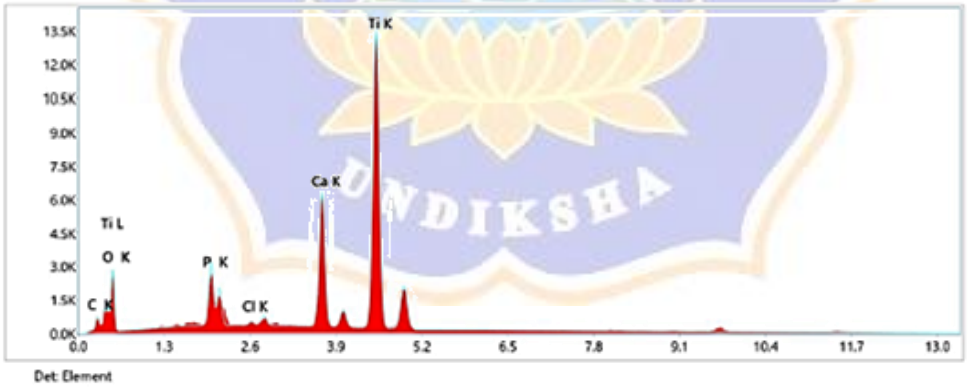
EDAX APEX

LSUMP 775

Author: Lab Mineral dan Material Maju FMIPA UM
Creation: 07/12/2024 10:42:06 AM
Sample Name: B351

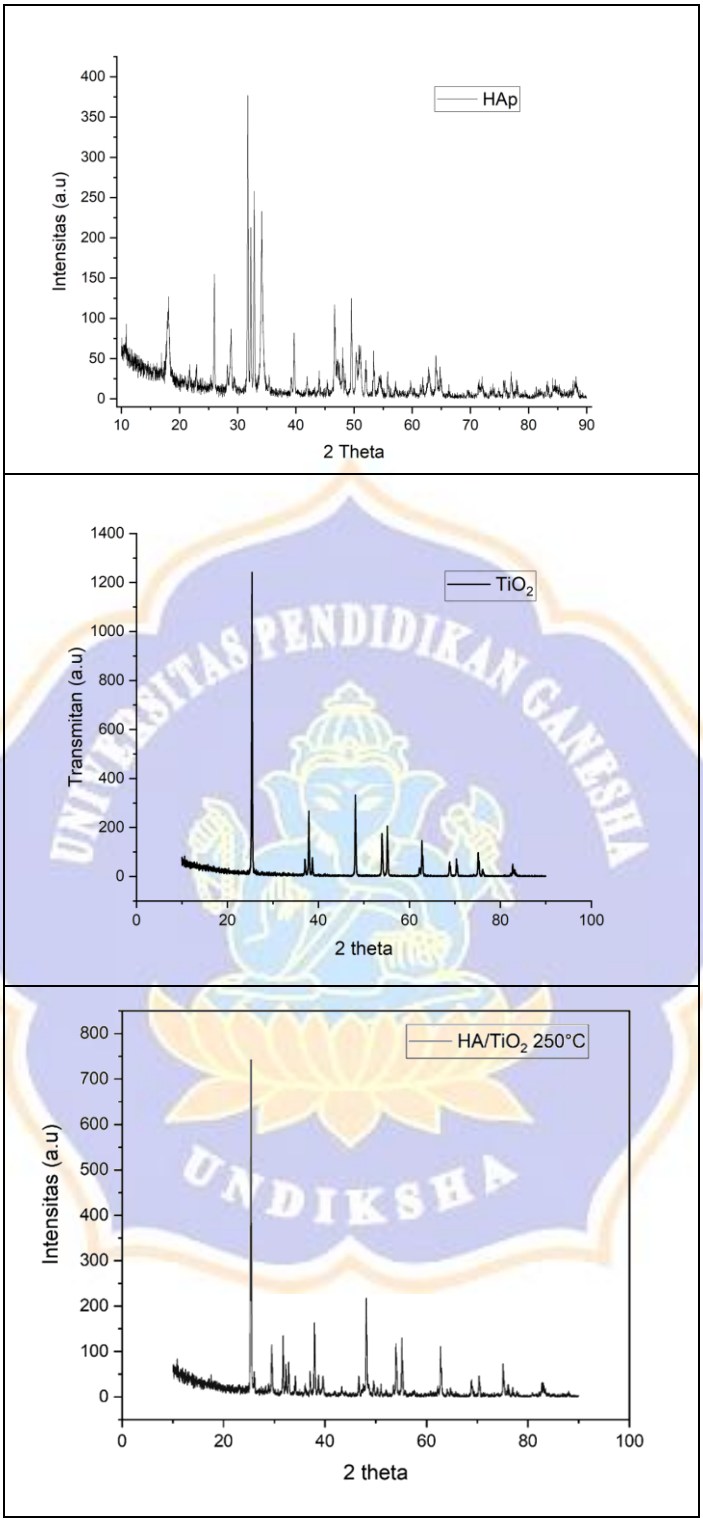
Area 2





Element	Weight %	Atomic %
C K	3.4	7.5
O K	31.9	53.4
P K	4.1	3.5
Cl K	0.3	0.2
Ca K	14.3	9.5
Ti K	46.2	25.8

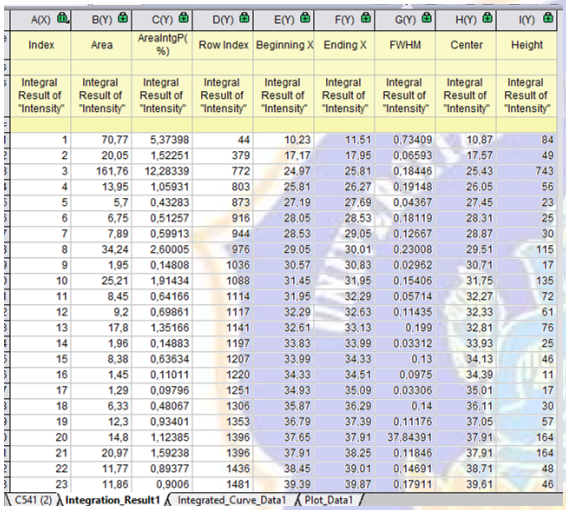
Lampiran 3. Data Hasil XRD



Tabel Derajat Kristalinitas

Sampel	Posisi Peak($°2Th$)	FWHM ($°2Th$)	Derajat Kristalinitas (%)
HAp	31.75	0,1848	61,37 %
TiO_2	25.39	0,1378	73,21 %
HAp-TiO_2	25.43	1,8535	57,31 %

* Contoh menghitung Derajat Kristalinitas pada HAp-TiO_2 yang dikalsinasi pada suhu 250ºC



	A(X)	B(Y)	C(Y)	D(Y)	E(Y)	F(Y)	G(Y)	H(Y)	I(Y)
	Index	Area	AreaIntgP(%)	Row Index	Beginning X	Ending X	FWHM	Center	Height
	Integral Result of "Intensity"	Integral Result of "Intensity"	Integral Result of "Intensity"	Integral Result of "Intensity"	Integral Result of "Intensity"	Integral Result of "Intensity"	Integral Result of "Intensity"	Integral Result of "Intensity"	Integral Result of "Intensity"
1	1	70,77	5,37398	44	10,23	11,51	0,73409	10,87	84
2	2	20,05	1,52251	379	17,17	17,95	0,06593	17,57	49
3	3	161,76	12,28339	772	24,97	25,81	0,18446	25,43	743
4	4	13,95	1,05931	803	25,81	26,27	0,19148	26,05	56
5	5	5,7	0,43283	873	27,19	27,69	0,04367	27,45	23
6	6	6,75	0,51257	916	28,05	28,53	0,18119	28,31	25
7	7	7,89	0,59913	944	28,53	29,05	0,12667	28,87	30
8	8	34,24	2,60005	976	29,05	30,01	0,23008	29,51	115
9	9	1,95	0,14808	1036	30,57	30,83	0,02962	30,71	17
10	10	25,21	1,91434	1088	31,45	31,95	0,15406	31,75	135
11	11	8,45	0,64166	1114	31,95	32,29	0,05714	32,27	72
12	12	9,2	0,69861	1117	32,29	32,63	0,11435	32,33	61
13	13	17,8	1,35166	1141	32,61	33,13	0,199	32,81	76
14	14	1,96	0,14883	1197	33,83	33,99	0,03312	33,93	25
15	15	8,38	0,63634	1207	33,99	34,33	0,13	34,13	46
16	16	1,45	0,11011	1220	34,33	34,51	0,0975	34,39	11
17	17	1,29	0,09796	1251	34,93	35,09	0,03306	35,01	17
18	18	6,33	0,48067	1306	35,87	36,29	0,14	36,11	30
19	19	12,3	0,93401	1353	36,79	37,39	0,11176	37,05	57
20	20	14,8	1,12385	1396	37,65	37,91	37,84391	37,91	164
21	21	20,97	1,59238	1396	37,91	38,25	0,11846	37,91	164
22	22	11,77	0,89377	1436	38,45	39,01	0,14691	38,71	48
23	23	11,86	0,9006	1481	39,39	39,87	0,17911	39,61	46

C541 (2) | Integration_Result1 | Integrated_Curve_Data1 | Plot_Data1

$$Derajat\ kristalinitas = \frac{fraksi\ luas\ kristalin}{fraksi\ luas\ kristalin\ + fraksi\ luas\ amorf}$$

$$Derajat\ Kristalinitas = \frac{754{,}71}{1316{,}79}$$

$$Derajat\ Kristalinitas = 57{,}314\%$$

Lampiran 4. Penentuan Konsentrasi

- Pembuatan larutan induk 1000 ppm

$$\frac{1000\ mg}{L} = \frac{1000\ mg}{1000\ mL} = \frac{1\ g}{1000\ mL}$$

- Pembuatan Larutan 12,5 ppm

$M_1 \times V_1 = M_2 \times V_2$

$100 \times V_1 = 12{,}5 \times 500$

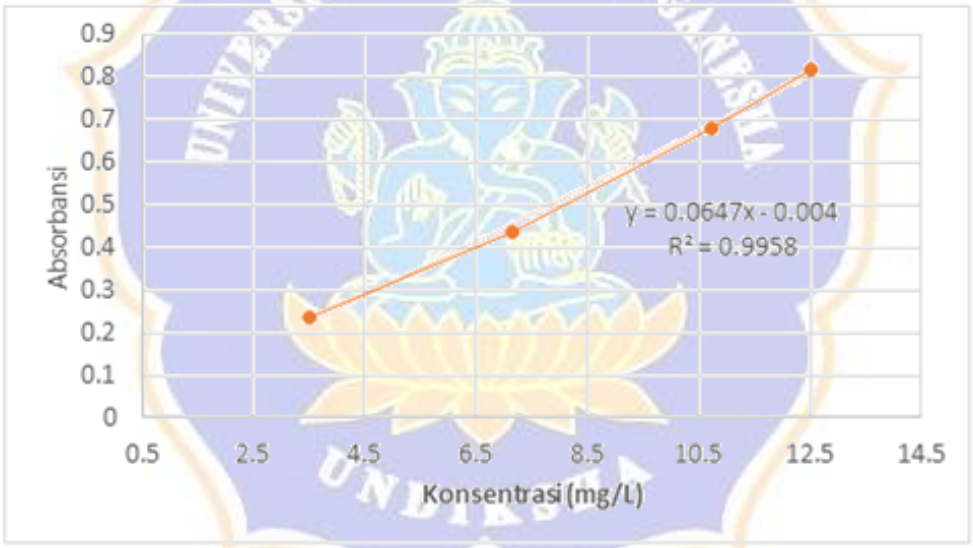
$V_1 = \frac{6{,}250}{100}$

$V_1 = 62{,}5\ mL$

Contoh pengenceran larutan diatas digunakan untuk proses fotodegradasi.

1. Kurva Larutan Standar

λmax= 463 nm



Lampiran 5. Penentuan Efesiensi Degradasi

*Data Variasi pH

Waktu (menit)	pH	Absorbansi		%E
		Awal	Akhir	
15	4	0,4429	0,3480333	21,41943253
30	4	0,4429	0,2745333	38,01460074
45	4	0,4429	0,2078667	53,0669075
60	4	0,4429	0,1279333	71,11462332
75	4	0,4429	0,0664667	84,99285015
90	4	0,4429	0,0358333	91,90938511
105	4	0,4429	0,0197667	95,53699104
120	4	0,4429	0,0149333	96,62828328

Keterangan:

t = waktu

Ce= absorbansi akhir *methylene orange*

Co= absorbansi awal *methylene orange*

E%= efesiensi degradasi zat warna *methylene orange*

Nilai efesiensi dapat dihitung dengan menggunakan persamaan rumus sebagai berikut

$$(\%)E = \frac{Co - Ce}{Co} \times 100\%$$

*

Contoh penentuan nilai efesiensi pada waktu 120 menit:

$$(\%)E = \frac{Co - Ce}{Co} \times 100\%$$

$$(\%)E = \frac{0{,}4429 - 0{,}014933}{0{,}4429} \times 100\%$$

$$\%E = 96{,}62\%$$

* Data Variasi Konsentrasi

Waktu (menit)	K (mg/L)	Absorbansi		%E
		Awal	Akhir	
15	12,5	0,7824	0,4926	37,03988
30	12,5	0,7824	0,345933	55,78562
45	12,5	0,7824	0,252733	67,69768
60	12,5	0,7824	0,194567	75,13207
75	12,5	0,7824	0,159833	79,5714
90	12,5	0,7824	0,143733	81,62918
105	12,5	0,7824	0,1405	82,04243
120	12,5	0,7824	0,1489	80,96881

Contoh penentuan nilai efesiensi pada waktu 105 menit:

$$(\%)E = \frac{Co - Ce}{Co} \times 100\%$$

$$(\%)E = \frac{0{,}7824 - 0{,}1405}{0{,}7824} \times 100\%$$

$$\%E = 82{,}04\%$$

*Data Variasi Massa

(menit)	Massa (g)	Awal	Akhir	%E
15	2	0,836233	0,670767	19,78714075
30	2	0,836233	0,5239	37,35002192
45	2	0,836233	0,367333	56,07286642
60	2	0,836233	0,289333	65,40040659
75	2	0,836233	0,194567	76,73296927
90	2	0,836233	0,139567	83,31008092
105	2	0,836233	0,131167	84,31458524
120	2	0,836233	0,114367	86,32359389

Contoh penentuan nilai efesiensi pada waktu 120 menit:

$$(\%)E = \frac{Co - Ce}{Co} \times 100\%$$

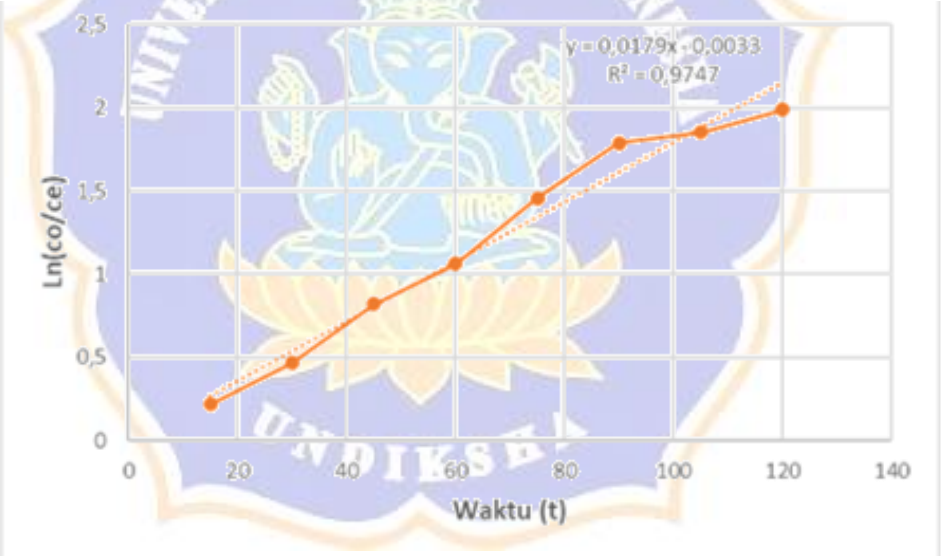
$$(\%)E = \frac{0{,}836233 - 0{,}114367}{0{,}836233} \times 100\%$$

$$\%E = 86{,}32\%$$

Lampiran 6. Kinetika Fotodegradasi

*HAp-TiO_2

menit (t)	Co	Ce	Ln(Co/Ce)
15	0,83623333	0,670766667	0,220486344
30	0,83623333	0,5239	0,467606855
45	0,83623333	0,367333333	0,82263798
60	0,83623333	0,289333333	1,061328255
75	0,83623333	0,194566667	1,458132817
90	0,83623333	0,139566667	1,790365297
105	0,83623333	0,131166667	1,852438902
120	0,83623333	0,114366667	1,98949802



Keterangan:

t = waktu

Ce = absorbansi awal

Co = absorbansi akhir

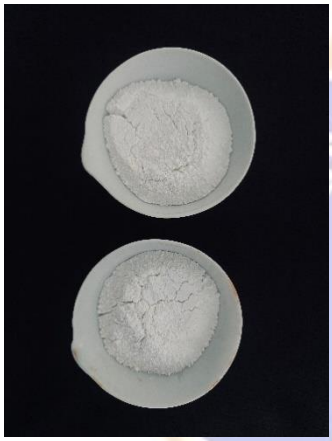
k = konstanta laju reaksi

Lampiran 7. Dokumentasi Penelitian

Proses Blender Cangkang Telur Ayam

Pengayakan hasil blender Cangkang Telur Ayam

Kalsinasi 1000°C



Hasil Kalsinasi CaO

Pembuatan HAp

Pengecekan pH sampel

Strirer HAp

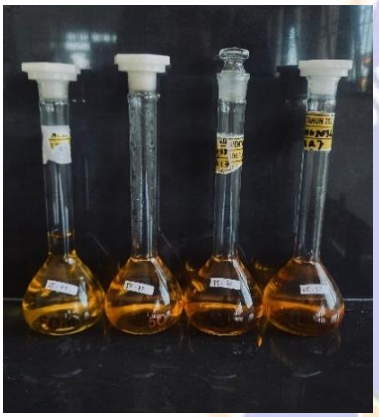
Proses Pengendapan Sampel

Dekantasi Sampel

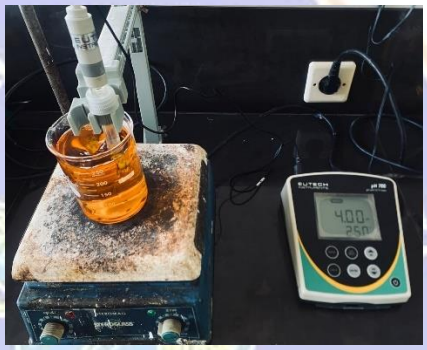
Penyaringan HAp-TiO_2

Kalsinasi suhu 250°C

HAp- TiO_2 250°C

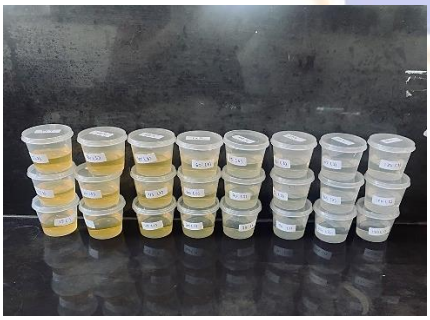


Pembuatan larutan kurva standar

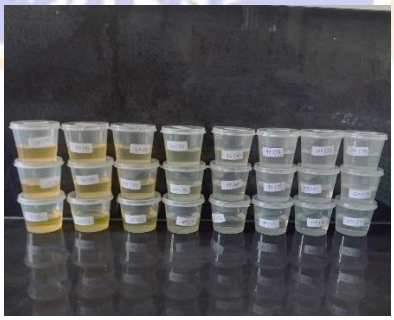


Penyesuaian pH

Proses fotodegradasi



pH 4



pH 5

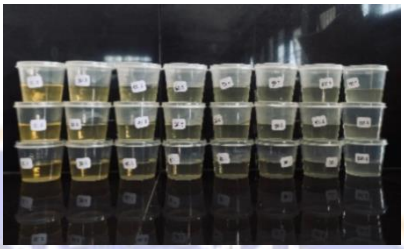
pH 6

pH 7

pH 8

pH 9

pH 10

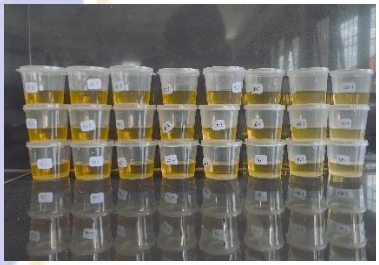


Konsentrasi 3,6 mg/L

Konsentrasi 7,2 mg/L

Konsentrasi 11 mg/L

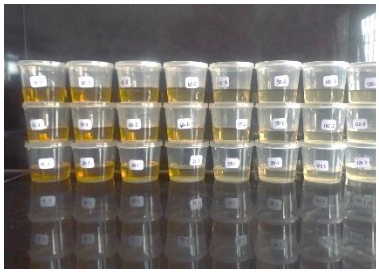
Konsentrasi 12,5 mg/L



Massa 0,5 gram

Massa 1 gram

Massa 1,5 gram



Massa 2 gram