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LAMPIRAN

LAMPIRAN 1

TABEL DAN GRAFIK HASIL PENGUJIAN

Tabel A.1 Data pengujian kekasaran *burn anodizing* pada aluminium foil

Tegangan (Volt)	**Konsentrasi (M)**	**kekasaran Sa (µm)**
Tanpa *Anodizing*		0.262
8	2	1.392
	3	0.525
10	2	0.813
	3	0.443
12	2	1.160
	3	0.190
14	2	0.862
	3	0.402
16	2	0.516
	3	0.117

Tabel A.2 Data pengujian kekasaran *non burn anodizing* pada aluminium foil

Tegangan (Volt)	**Konsentrasi (M)**	**kekasaran Sa (µm)**
Tanpa *Anodizing*		0.262
8	2	0.374
	3	0.493
10	2	1.680
12	2	1.031
14	2	0.763
16	2	0.721

Tabel A.3 Hubungan variasi tegangan pada temperatur dan waktu *anodizing* dengan konsentrasi larutan 2 M

Tegangan (Volt)	Temperatur		Waktu *Anodizing* (Menit)
	Awal	Akhir	
8	28	28,5	1.25.57
10	28	29	58.53
12	29	29,5	40.3
14	29	30	32.05
16	30	31	20.29

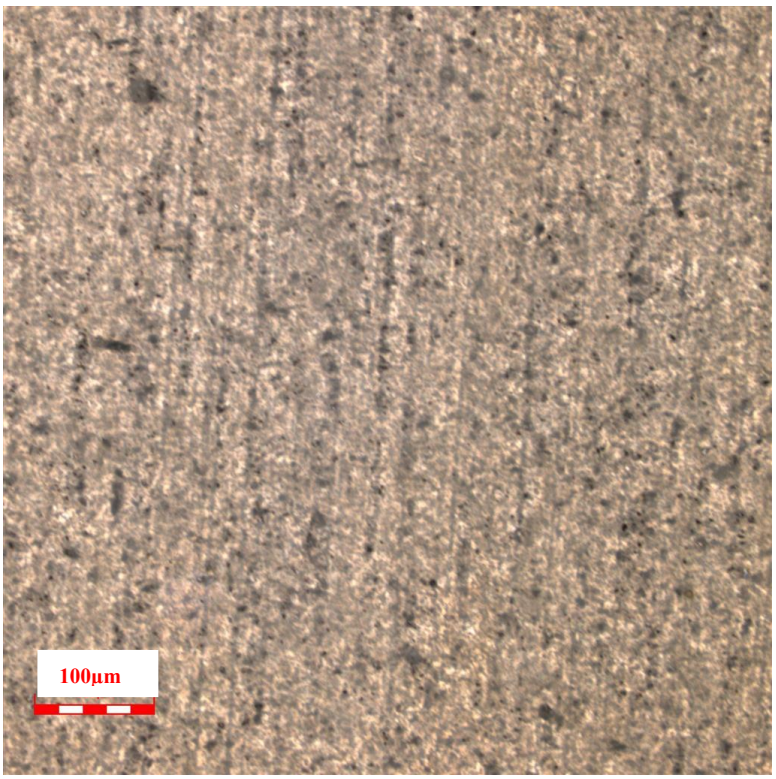
Tabel A.4 Hubungan variasi tegangan pada temperatur dan waktu *anodizing* dengan konsentrasi larutan 3 M

Tegangan (Volt)	Temperatur		Waktu Anodizing (Menit)
	Awal	Akhir	
8	28	29	1.00.42
10	29	31	42.09
12	31	33	38.04
14	32	34	24.28
16	34	35	15.30

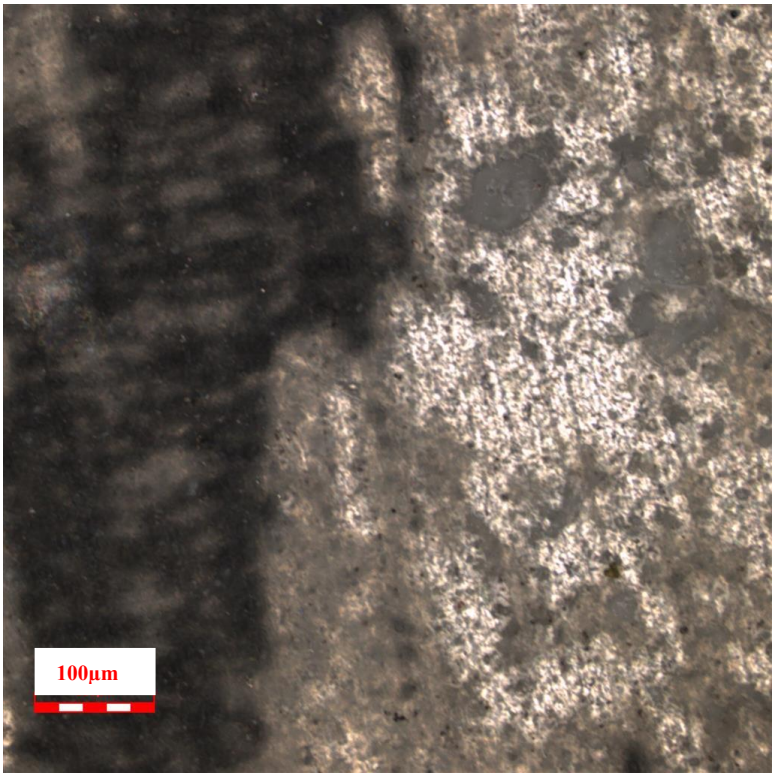
Tabel A.5 Luas area *burn anodizing*

Variasi Tegangan (V)	Konsentrasi (M)	Luas Area *Burn*
8	2	4%
10		17%
12		20%
14		55%
16		57%
8	3	21%
10		46%
12		75%
14		79%
16		95%

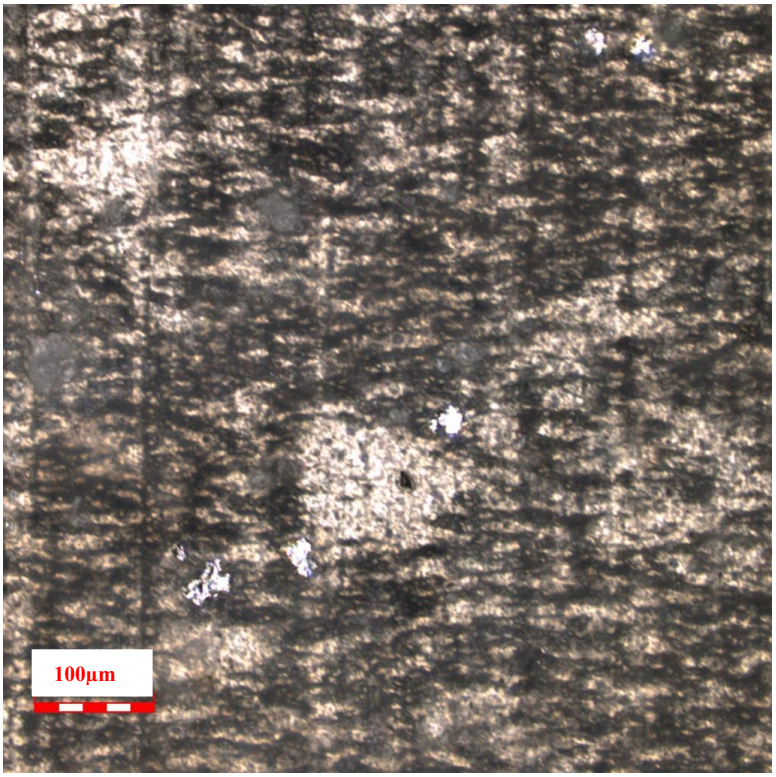
Gambar A.1 Struktur mikro sampel tanpan perlakuan (*non anodizing*)



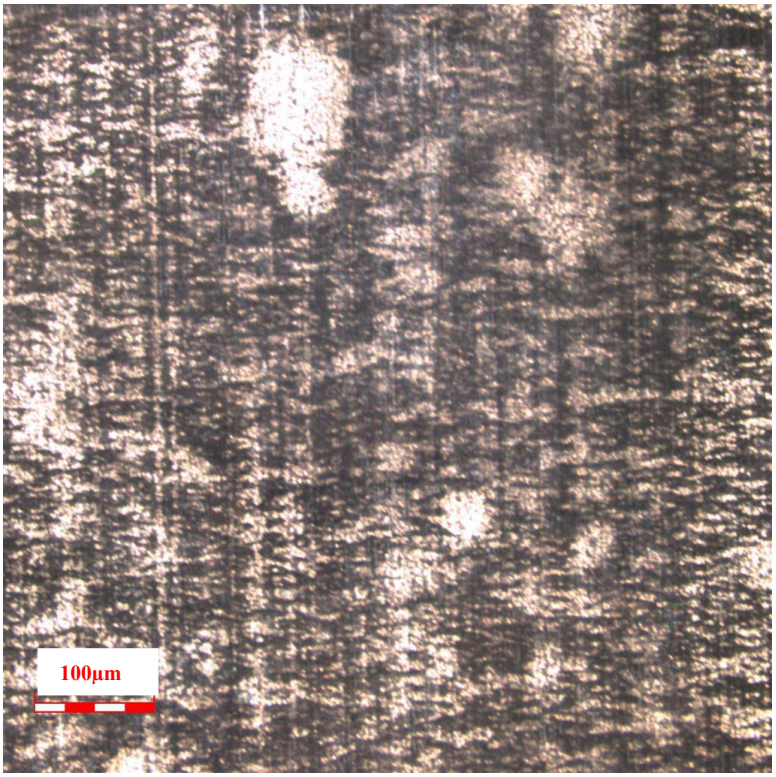
Gambar A.2 Struktur mikro aluminium foil pada tegangan 8 volt dengan konsentrasi 2 molar



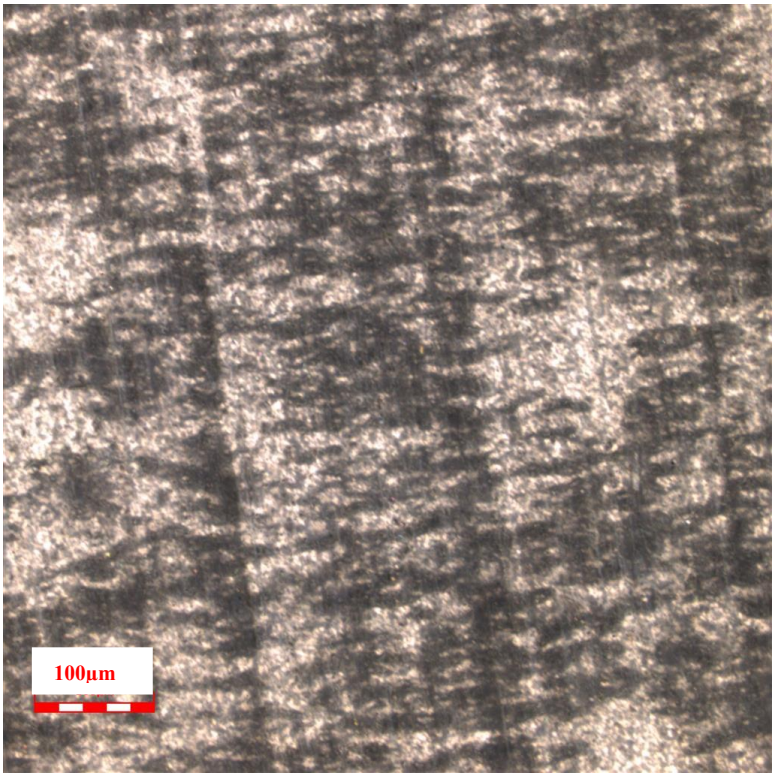
Gambar A.3 Struktur mikro aluminium foil pada tegangan 10 volt dengan konsentrasi 2 molar



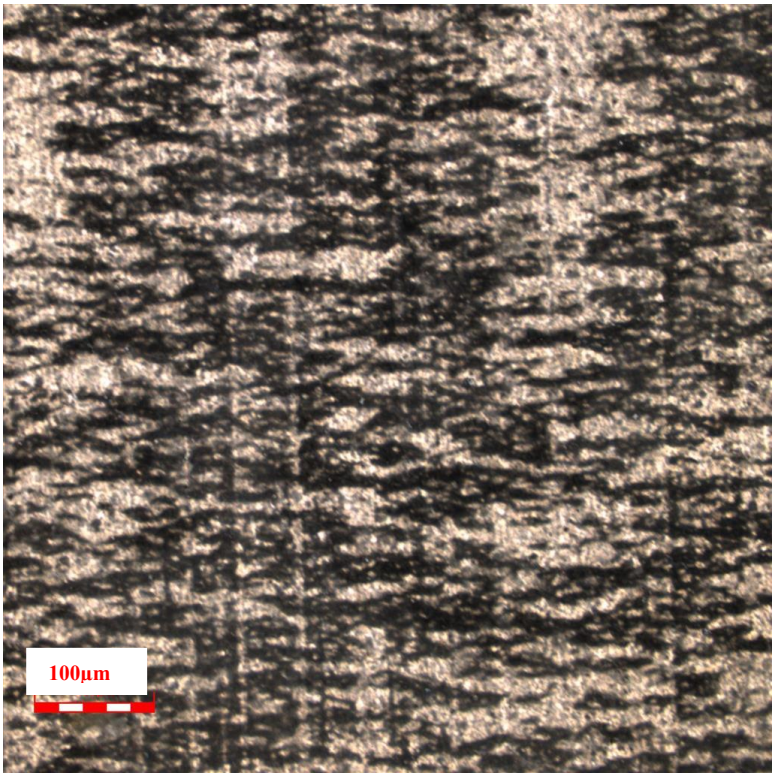
Gambar A.4 Struktur mikro aluminium foil pada tegangan 12 volt dengan konsentrasi 2 molar



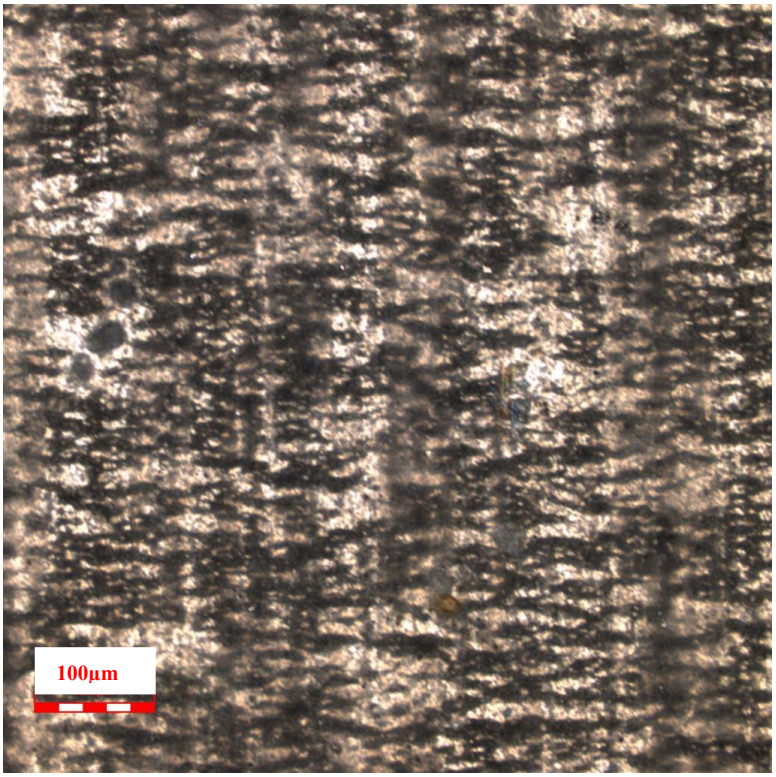
Gambar A.5 Struktur mikro aluminium foil pada tegangan 14 volt dengan konsentrasi 2 molar



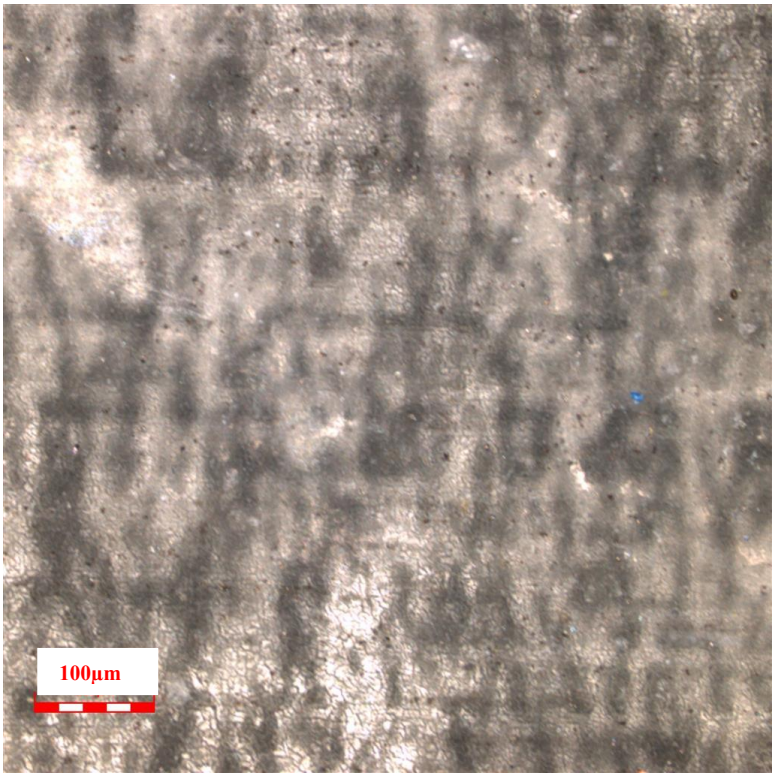
Gambar A.6 Struktur mikro aluminium foil pada tegangan 16 volt dengan konsentrasi 2 molar



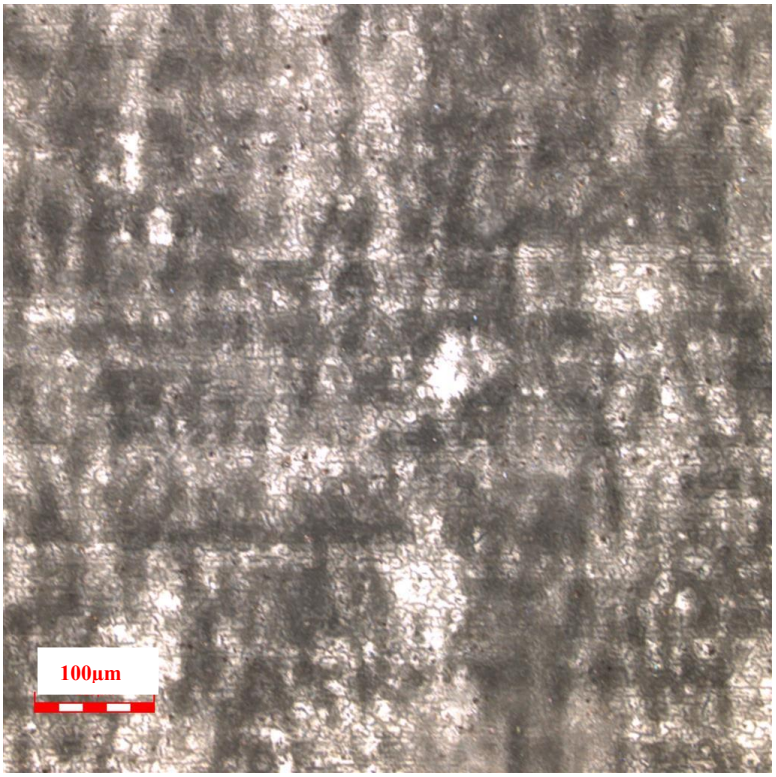
Gambar A.7 Struktur mikro aluminium foil pada tegangan 8 volt dengan konsentrasi 3 molar



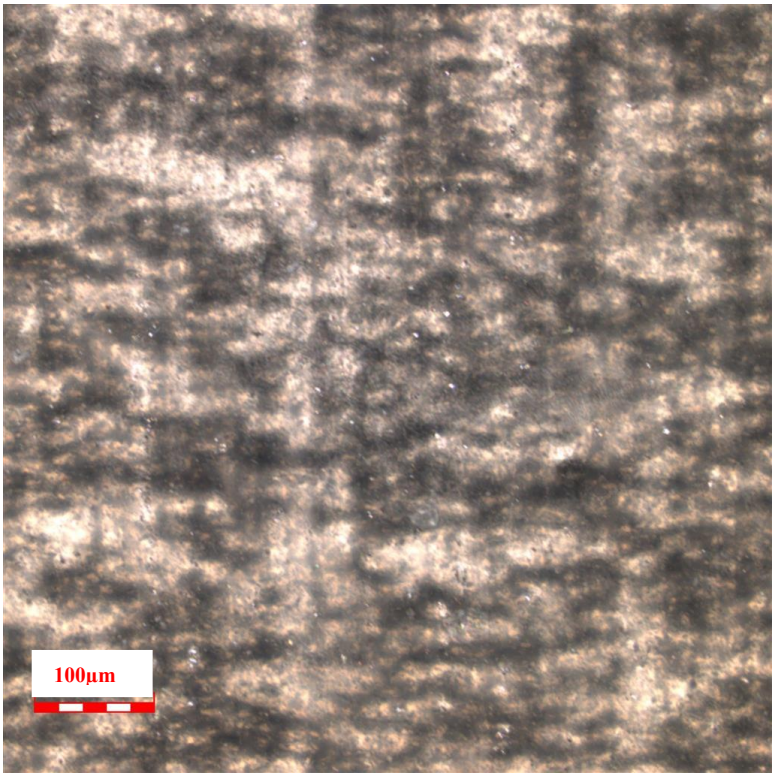
Gambar A.8 Struktur mikro aluminium foil pada tegangan 10 volt dengan konsentrasi 3 molar



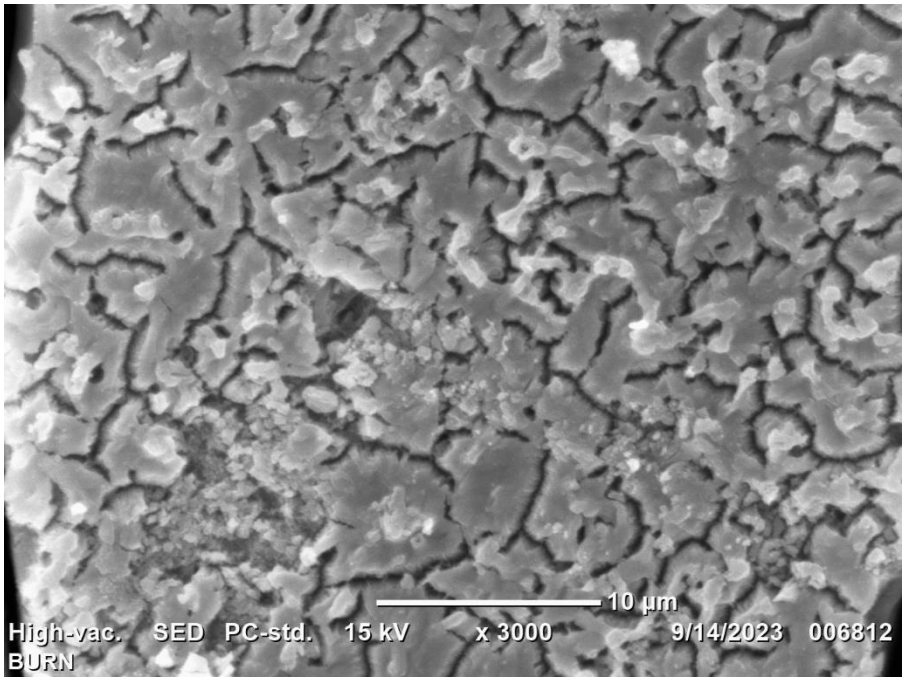
Gambar A.9 Struktur mikro aluminium foil pada tegangan 12 volt dengan konsentrasi 3 molar



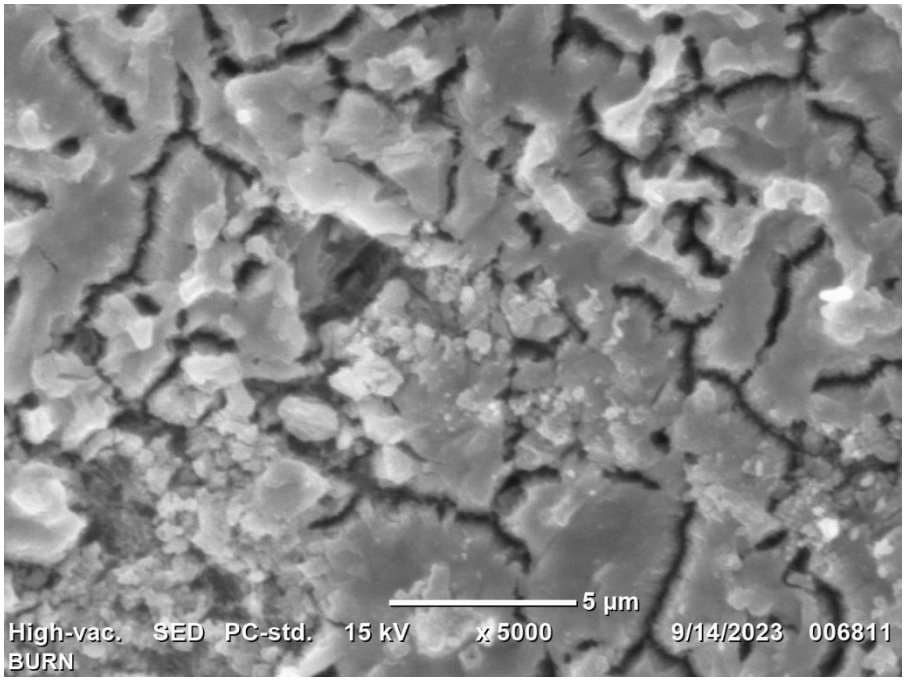
Gambar A.10 Struktur mikro aluminium foil pada tegangan 14 volt dengan konsentrasi 3 molar



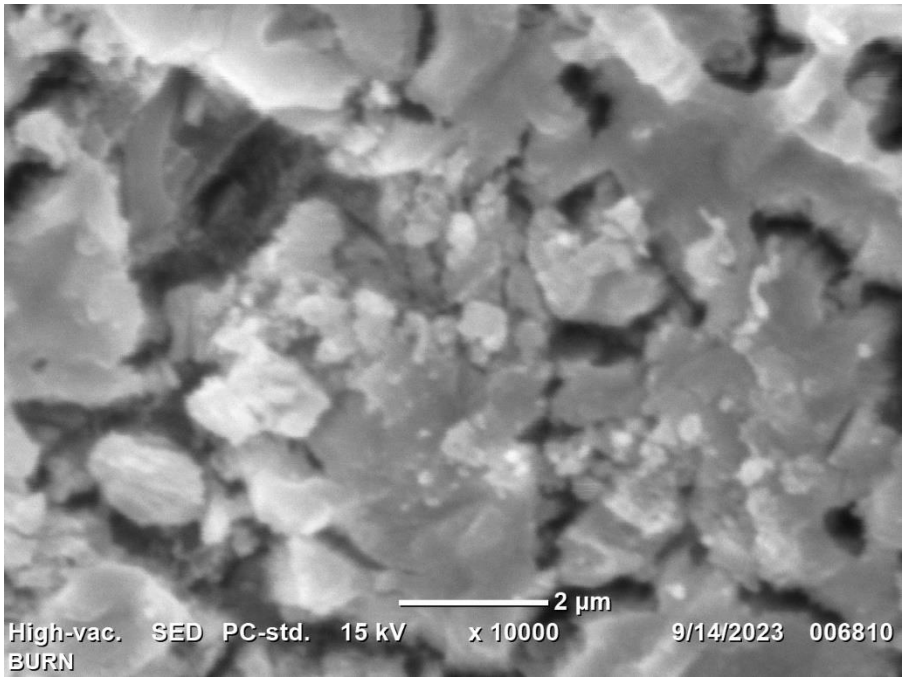
Gambar A.11 Struktur mikro aluminium foil pada tegangan 16 volt dengan konsentrasi 3 molar



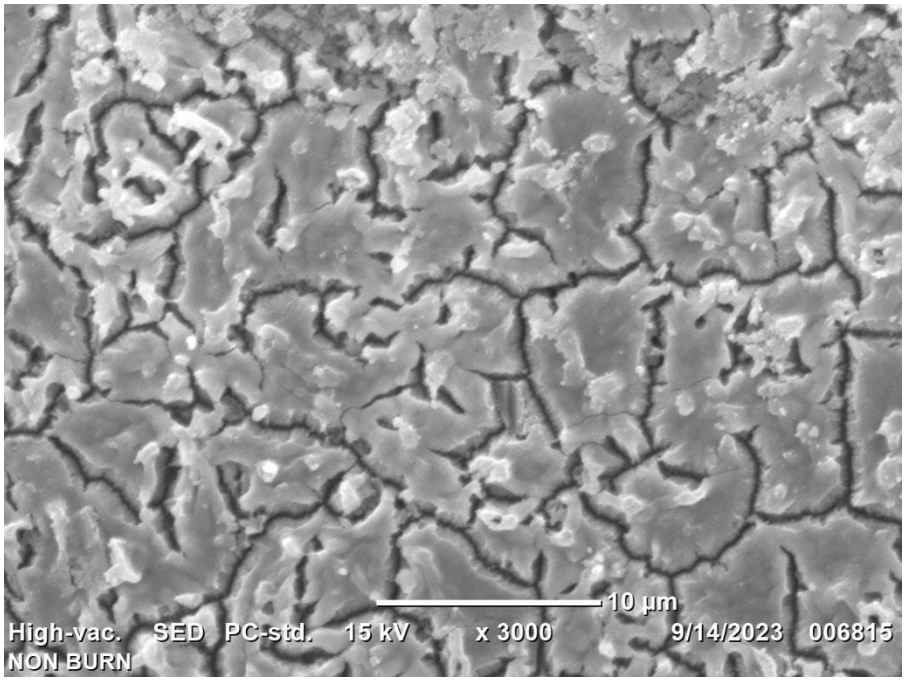
Gambar A.12 Hasil uji *Scanning Electron Microscopy* (SEM) *burn anodizing* (3000x)



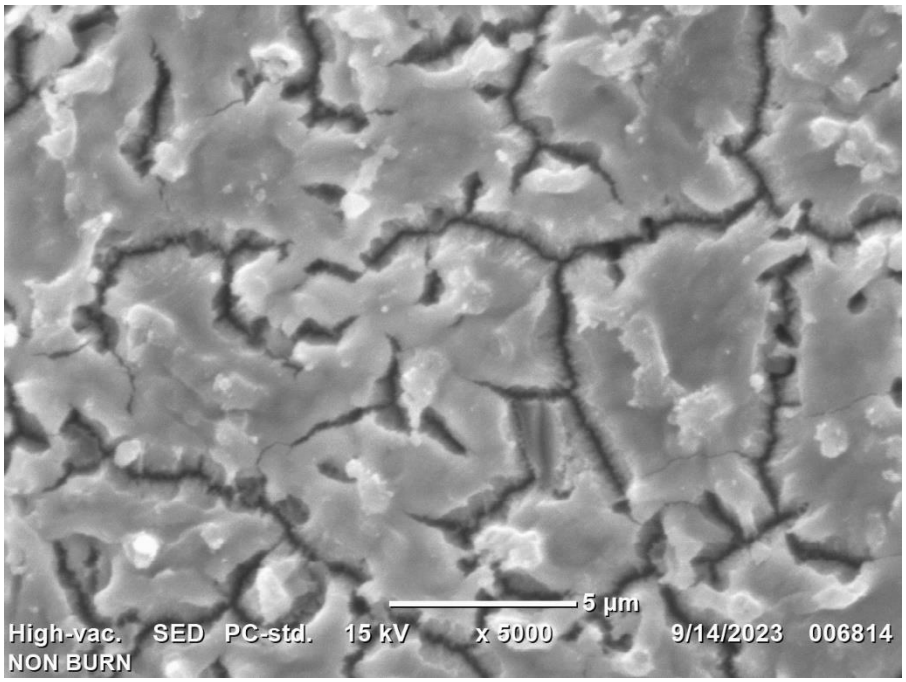
Gambar A.13 Hasil uji *Scanning Electron Microscopy* (SEM) *burn anodizing* (5000x)



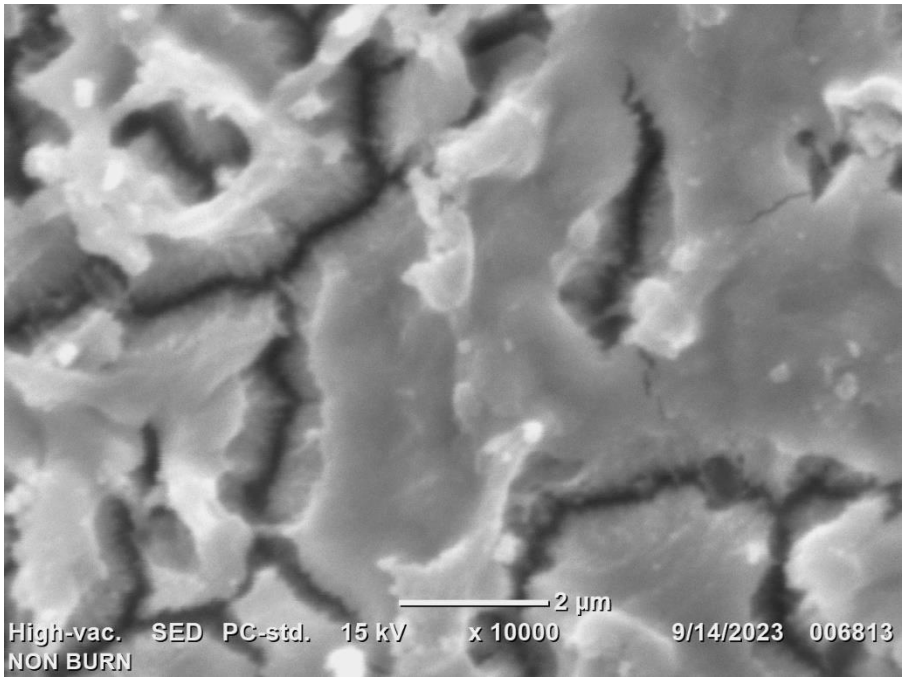
Gambar A.14 Hasil uji *Scanning Electron Microscopy* (SEM) *burn anodizing* (10000x)



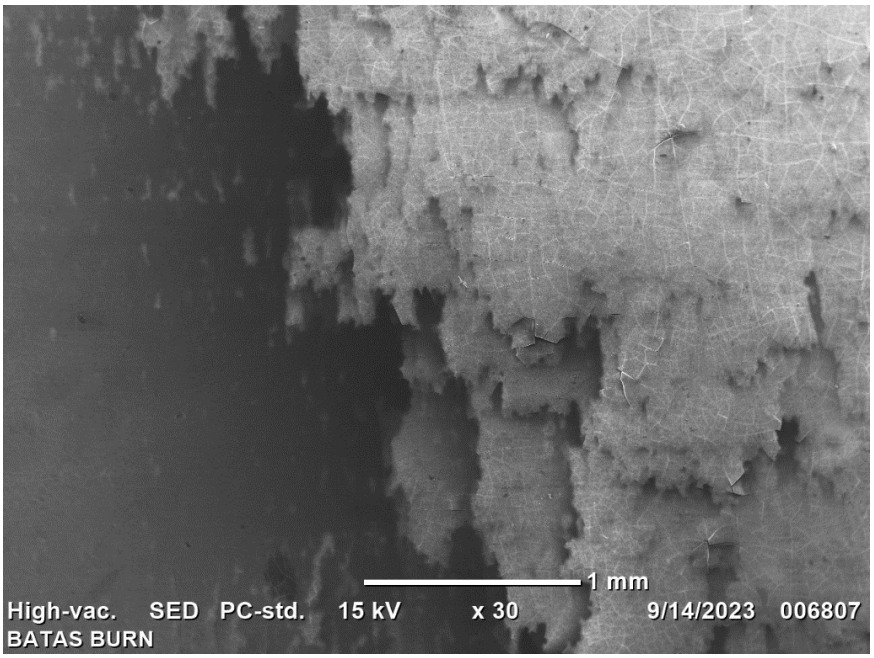
Gambar A.15 Hasil uji *Scanning Electron Microscopy* (SEM) *non burn anodizing* (3000x)



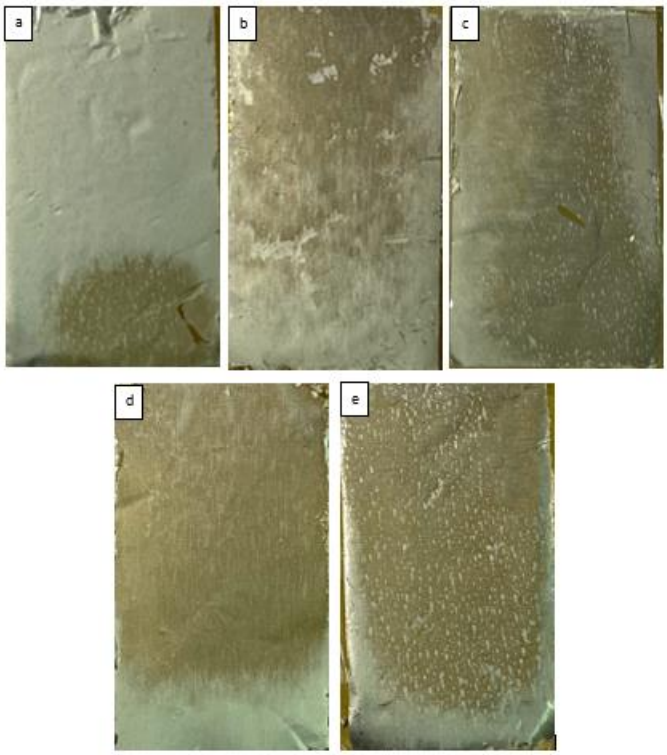
Gambar A.16 Hasil uji *Scanning Electron Microscopy* (SEM) *non burn anodizing* (5000x)



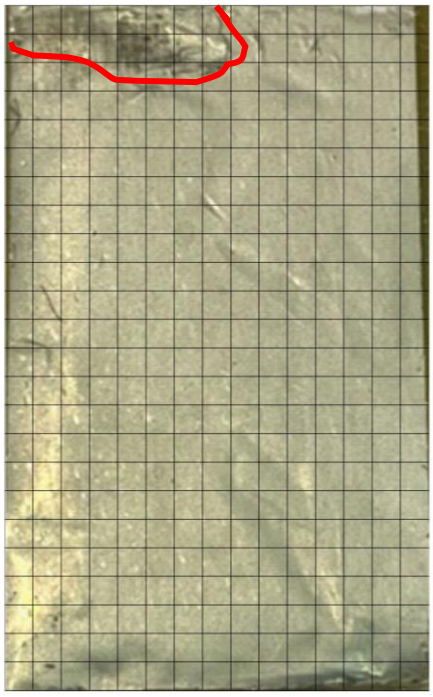
Gambar A.17 Hasil uji *Scanning Electron Microscopy* (SEM) *non burn anodizing* (1000x)



Gambar A.18 Hasil uji *Scanning Electron Microscopy* (SEM) batas *non burn anodizing* dan *burn anodizing*(30x)



Gambar A.19 Foto makro permukaan aluminium foil hasil anodizing dengan variasi tegangan pada konsentrasi larutan elektrolit 3 molar (a) 8 volt, (b) 10 volt, (c) 12 volt, (d) 14 volt, dan (e) 16 volt.

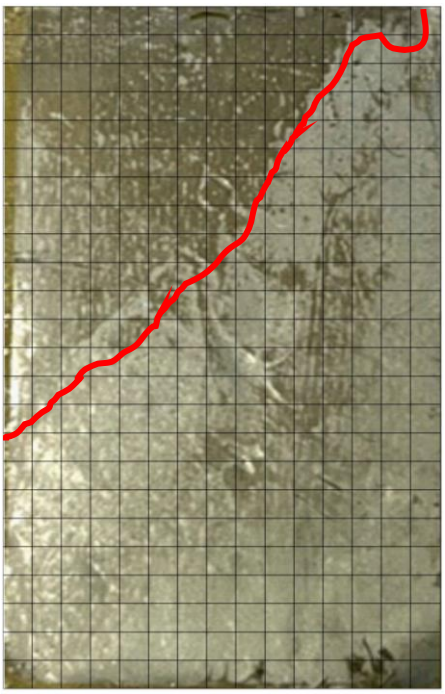


$$\text{Luas Area Burn} = \frac{17}{360} \times 100\% = 4\%$$

Gambar A.20 Luas Permukaan aluminium foil hasil *anodizing* pada tegangan 8 volt dengan konsentrasi 2 M

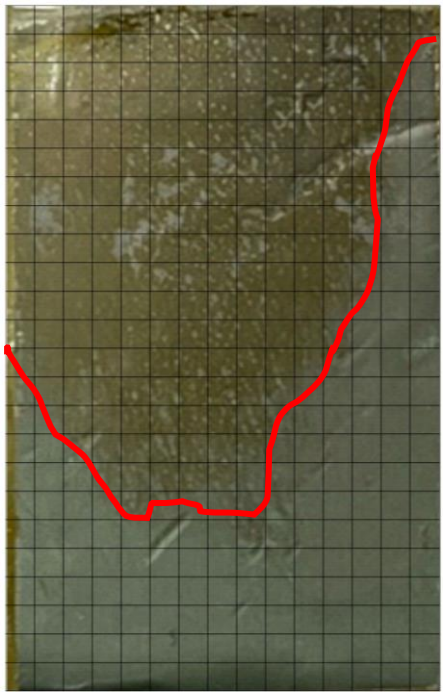
$$\text{Luas Area Burn} = \frac{62}{360} \times 100\% = 17\%$$

Gambar A.21 Luas Permukaan aluminium foil hasil *anodizing* pada tegangan 10 volt dengan konsentrasi 2 M



$$\text{Luas Area Burn} = \frac{75}{360} \times 100\% = 20\%$$

Gambar A.22 Luas Permukaan aluminium foil hasil *anodizing* pada tegangan 12 volt dengan konsentrasi 2 M



$$\text{Luas Area Burn} = \frac{198}{360} \times 100\% = 55\%$$

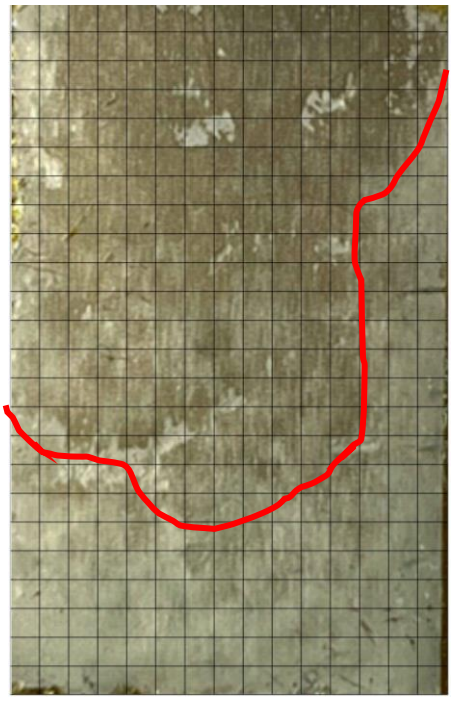
Gambar A.23 Luas Permukaan aluminium foil hasil *anodizing* pada tegangan 14 volt dengan konsentrasi 2 M

$$\text{Luas Area Burn} = \frac{206}{360} \times 100\% = 57\%$$

Gambar A.24 Luas Permukaan aluminium foil hasil *anodizing* pada tegangan 16 volt dengan konsentrasi 2 M

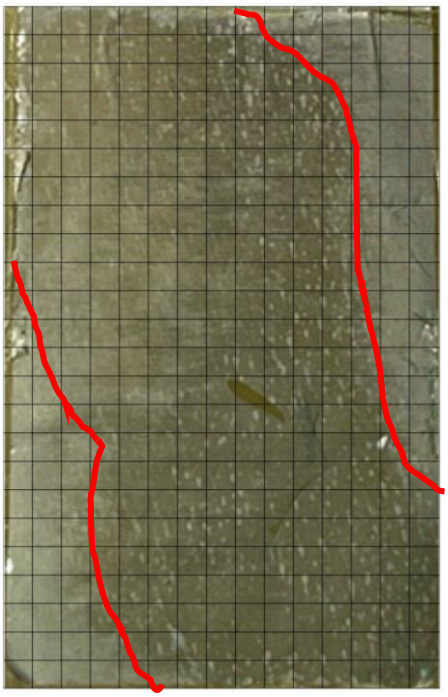
$$\text{Luas Area Burn} = \frac{76}{360} \times 100\% = 21\%$$

Gambar A.25 Luas Permukaan aluminium foil hasil *anodizing* pada tegangan 8 volt dengan konsentrasi 3 M



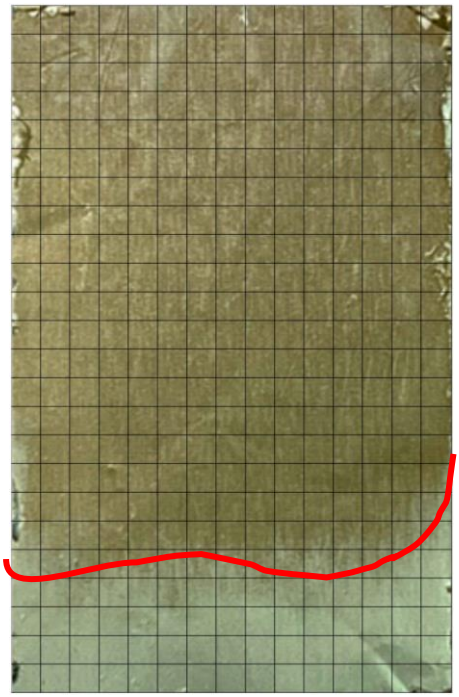
$$\text{Luas Area Burn} = \frac{169}{360} \times 100\% = 46\%$$

Gambar A.26 Luas Permukaan aluminium foil hasil *anodizing* pada tegangan 10 volt dengan konsentrasi 3 M



$$\text{Luas Area Burn} = \frac{275}{360} \times 100\% = 75\%$$

Gambar A.27 Luas Permukaan aluminium foil hasil *anodizing* pada tegangan 12 volt dengan konsentrasi 3 M

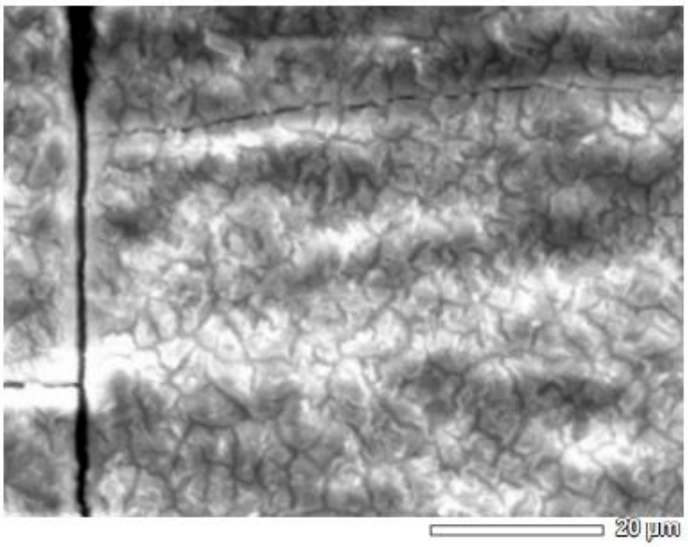


$$\text{Luas Area Burn} = \frac{285}{360} \times 100\% = 79\%$$

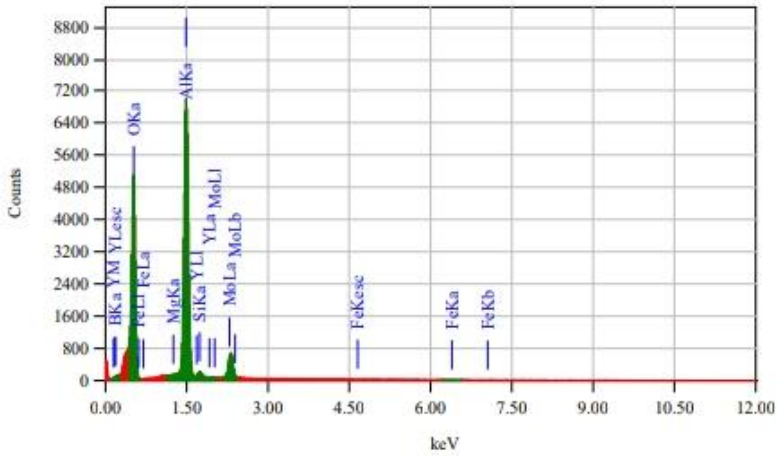
Gambar A.28 Luas Permukaan aluminium foil hasil *anodizing* pada tegangan 14 volt dengan konsentrasi 3 M

$$\text{Luas Area Burn} = \frac{345}{360} \times 100\% = 95\%$$

Gambar A.29 Luas Permukaan aluminium foil hasil *anodizing* pada tegangan 16 volt dengan konsentrasi 3 M



Title	: IMG1
Instrument	: JCM-6000PLUS
Volt	: 15.00 kV
Mag.	: x 1,500
Date	: 2023/09/14
Pixel	: 512 x 384



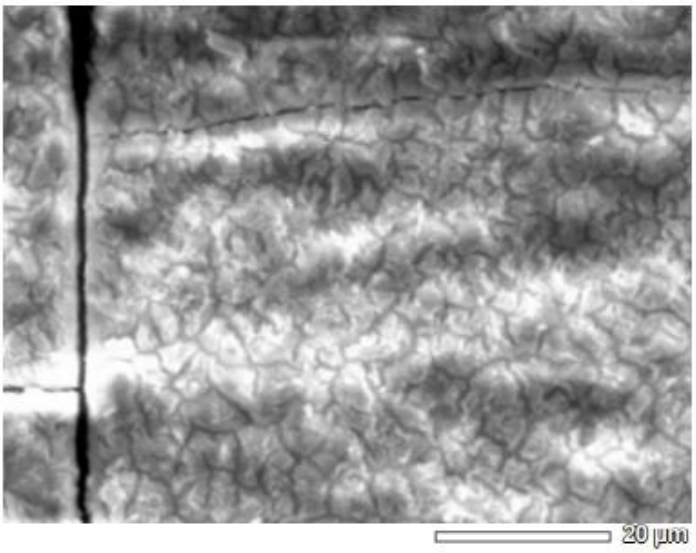
Acquisition Parameter

Instrument	: JCM-6000PLUS
Acc. Voltage	: 15.0 kV
Probe Current	: 1.00000 nA
PHA mode	: T3
Real Time	: 50.44 sec
Live Time	: 50.00 sec
Dead Time	: 0 %
Counting Rate	: 3081 cps
Energy Range	: 0 - 20 keV

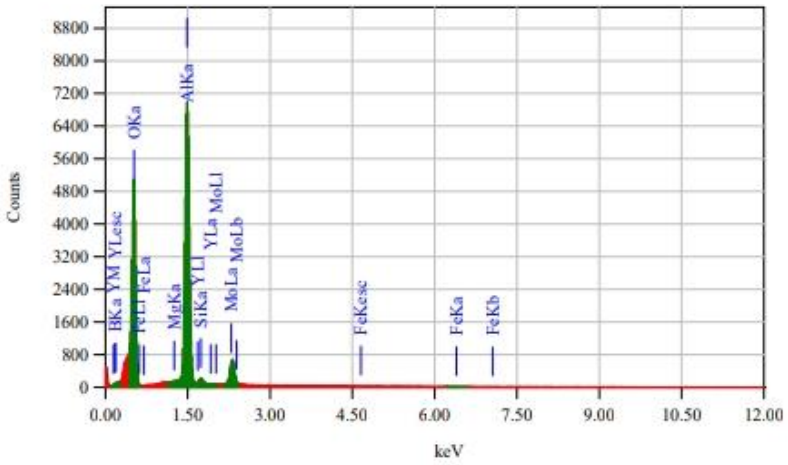
Thin Film Standardless Standardless Quantitative Analysis(Oxide)
Fitting Coefficient : 0.1061
Total Oxide : 24.0

Element	(keV)	Mass%	Counts	Sigma	Mol%	Compound	Mass%	Cation	K
B K*	0.183	3.35	260.57	0.16	15.69	B2O3	10.79	2.54	19.1560
O		46.77					ND		
Mg K	1.253	0.12	186.08	0.04	0.49	MgO	0.20	0.04	0.9485
Al K* (Ref.)	1.486	35.84	53395.96	0.45	67.23	Al2O3	67.71	10.90	1.0000
Si K	1.739	0.72	1052.18	0.09	2.61	SiO2	1.55	0.21	1.0258
Fe K	6.398	0.13	49.10	0.05	0.24	FeO	0.17	0.02	3.9430
Y L	1.922	0.10	32.55	0.13	0.05	Y2O3	0.12	0.01	4.4209
Mo L*	2.293	12.97	4222.68	0.38	13.69	MoO3	19.46	1.11	4.5778
Total		100.00			100.00		100.00	14.84	

Gambar A.30 Hasil uji *Energy Dispersive X-ray Spectroscopy* (EDS) *Burn anodizing* (senyawa)



Title	: IMG1
Instrument	: JCM-6000PLUS
Volt	: 15.00 kV
Mag.	: x 1,500
Date	: 2023/09/14
Pixel	: 512 x 384

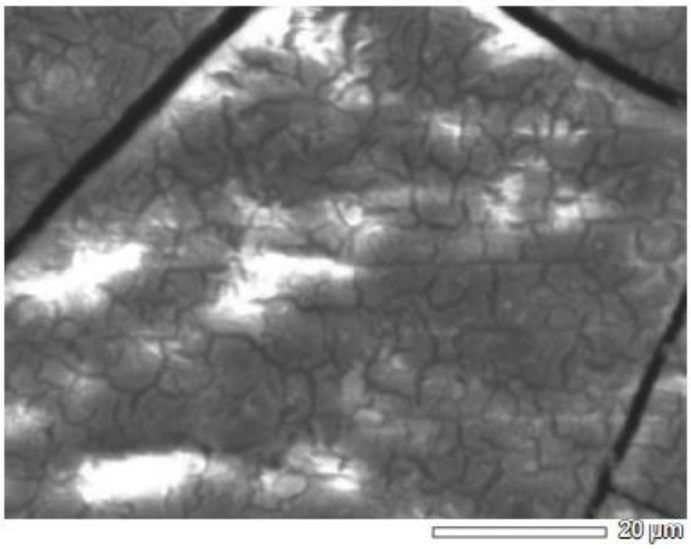


Acquisition Parameter	
Instrument	: JCM-6000PLUS
Acc. Voltage	: 15.0 kV
Probe Current	: 1.00000 nA
PHA mode	: T3
Real Time	: 50.44 sec
Live Time	: 50.00 sec
Dead Time	: 0 %
Counting Rate	: 3081 cps
Energy Range	: 0 - 20 keV

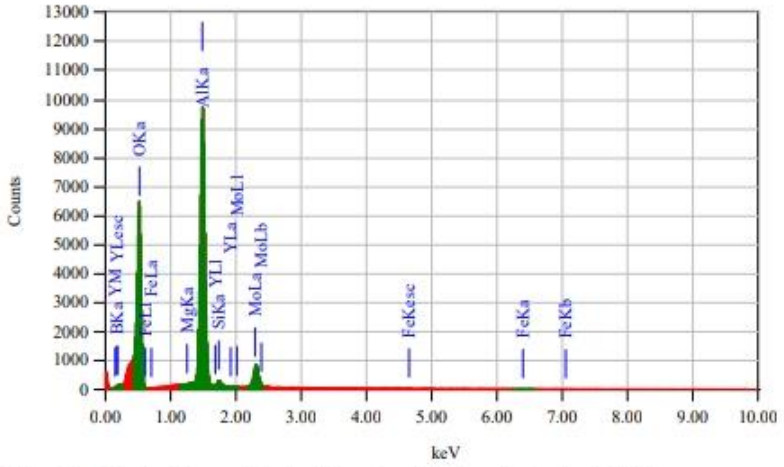
Thin Film Standardless Standardless Quantitative Analysis
Fitting Coefficient : 0.1061

Element	(keV)	Mass%	Counts	Sigma	Atom%	Compound	Mass%	Cation	K
B K*	0.183	4.44	260.57	0.07	9.70				19.1560
O K	0.525	29.45	26215.10	0.20	43.45				1.2626
Mg K	1.253	0.16	186.08	0.03	0.15				0.9485
Al K* (Ref.)	1.486	47.50	53395.96	0.32	41.56				1.0000
Si K	1.739	0.96	1052.18	0.05	0.81				1.0258
Fe K	6.398	0.17	49.10	0.05	0.07				3.9430
Y L	1.922	0.13	32.55	0.14	0.03				4.4209
Mc L*	2.293	17.20	4222.68	0.34	4.23				4.5778
Total		100.00			100.00				

Gambar A.31 Hasil uji *Energy Dispersive X-ray Spectroscopy* (EDS) *Burn anodizing* (unsur)



Title	: IMG1
Instrument	: JCM-6000PLUS
Volt	: 15.00 kV
Mag.	: x 1,500
Date	: 2023/09/14
Pixel	: 512 x 384

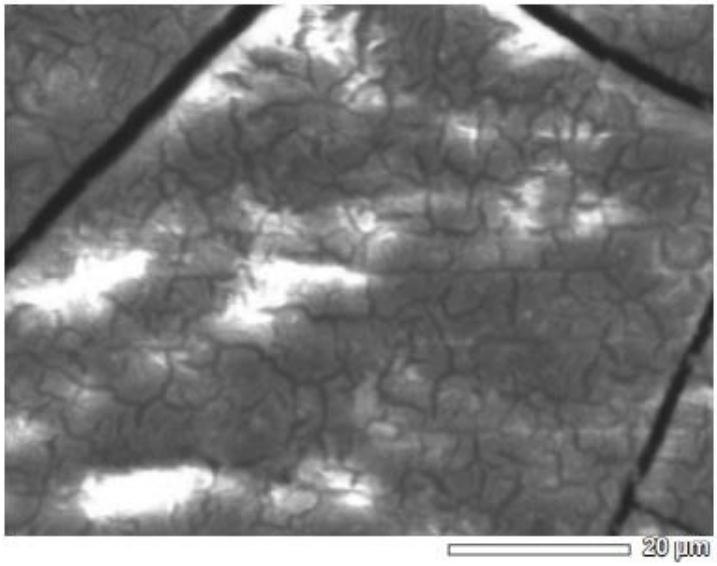


Acquisition Parameter	
Instrument	: JCM-6000PLUS
Acc. Voltage	: 15.0 kV
Probe Current	: 1.00000 nA
PHA mode	: T3
Real Time	: 50.59 sec
Live Time	: 50.00 sec
Dead Time	: 1 %
Counting Rate	: 4212 cps
Energy Range	: 0 - 20 keV

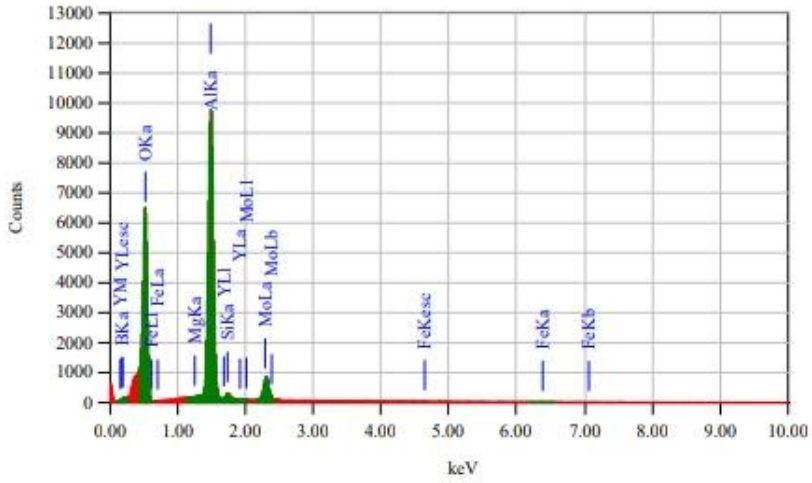
Thin Film Standardless Standardless Quantitative Analysis(Oxide)
Fitting Coefficient : 0.0969
Total Oxide : 24.0

Element		(keV)	Mass%	Counts	Sigma	Mol%	Compound	Mass%	Cation	K
B	K	0.183	3.80	419.46	0.14	17.68	B2O3	12.25	2.86	19.1560
O			47.23					ND		
Mg	K	1.253	0.06	133.50	0.03	0.25	MgO	0.10	0.02	0.9485
Al	K (Ref.)	1.486	35.50	74967.41	0.38	66.10	Al2O3	67.07	10.70	1.0000
Si	K	1.739	0.80	1640.68	0.08	2.85	SiO2	1.71	0.23	1.0258
Fe	K	6.398	0.01	3.86	0.03	0.01	FeO	0.01	0.00	3.9430
Y	L	1.922	0.20	96.58	0.11	0.11	Y2O3	0.26	0.02	4.4209
Mo	L	2.293	12.40	5720.14	0.31	12.99	MoO3	18.60	1.05	4.5778
Total			100.00			100.00		100.00	14.88	

Gambar A.32 Hasil uji *Energy Dispersive X-ray Spectroscopy* (EDS) *Non burn anodizing* (senyawa)



Title	: IMG1
Instrument	: JCM-6000PLUS
Volt	: 15.00 kV
Mag.	: x 1,500
Date	: 2023/09/14
Pixel	: 512 x 384



Acquisition Parameter
Instrument : JCM-6000PLUS
Acc. Voltage : 15.0 kV
Probe Current: 1.00000 nA
PHA mode : T3
Real Time : 50.59 sec
Live Time : 50.00 sec
Dead Time : 1 %
Counting Rate: 4212 cps
Energy Range : 0 - 20 keV

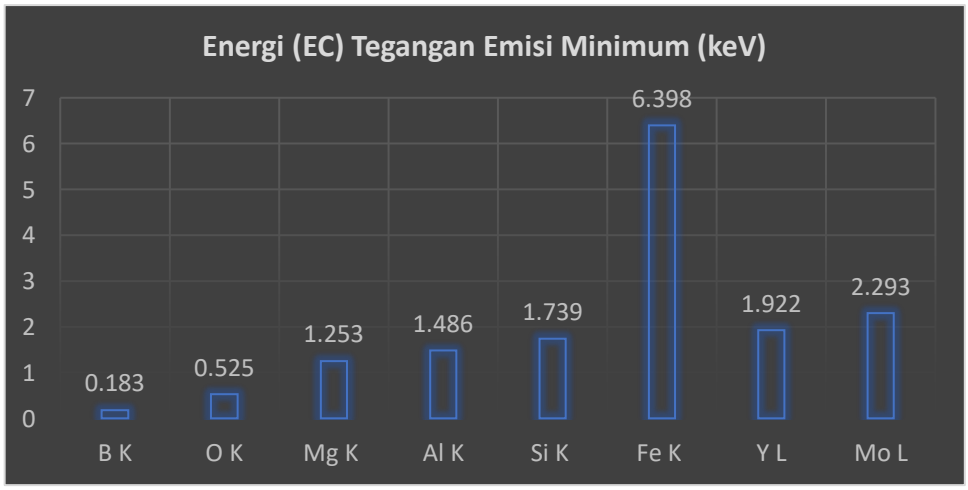
Thin Film Standardless Standardless Quantitative Analysis
Fitting Coefficient : 0.0969

Element		(keV)	Mass%	Counts	Sigma	Atom%	Compound	Mass%	Cation	K
B	K	0.183	5.20	419.46	0.06	11.34				19.1560
O	K	0.525	27.85	34065.27	0.17	41.02				1.2626
Mg	K	1.253	0.08	133.50	0.03	0.08				0.9485
Al	K (Ref.)	1.486	48.54	74967.41	0.27	42.40				1.0000
Si	K	1.739	1.09	1640.68	0.05	0.91				1.0258
Fe	K	6.398	0.01	3.86	0.03	0.00				3.9430
Y	L	1.922	0.28	96.58	0.12	0.07				4.4209
Mo	L	2.293	16.95	5720.14	0.28	4.16				4.5778
Total			100.00			100.00				

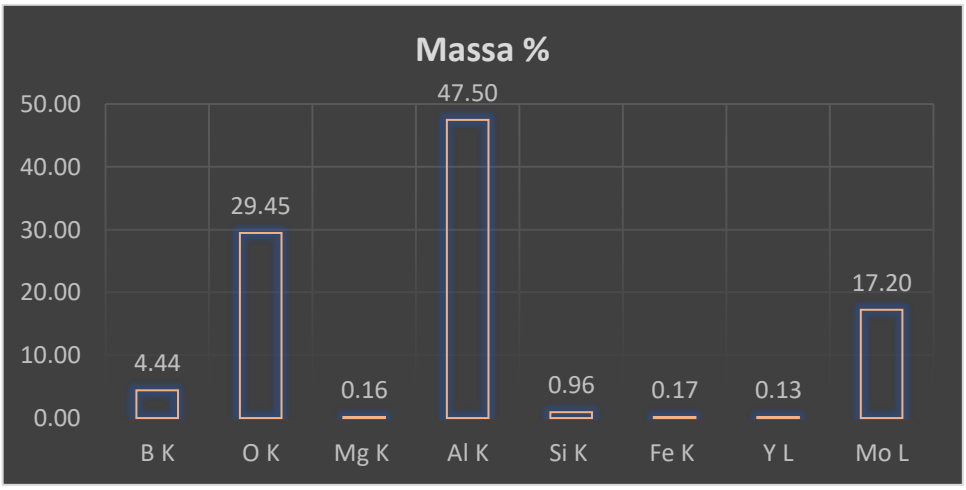
Gambar A.33 Hasil uji *Energy Dispersive X-ray Spectroscopy* (EDS) *Non burn anodizing* (unsur)

Tabel A.5 *Deskripsi Energy* (E_C) Tegangan Emisi Minimum, persentase massa, persentase atom, dan persentase mol masing-masing unsur

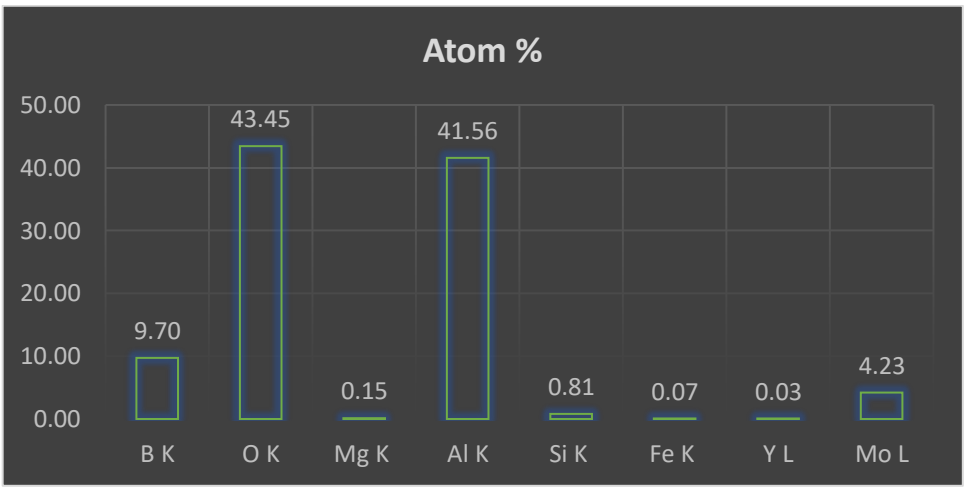
No	Element	Ec Tegangan Emisi Minimum (keV)	Massa %	Atom %	Mol %
1	B K	0.183	4.44	9.70	15.69
2	O K	0.525	29.45	43.45	-
3	Mg K	1.253	0.16	0.15	0.49
4	Al K	1.486	47.50	41.56	67.23
5	Si K	1.739	0.96	0.81	2.61
6	Fe K	6.398	0.17	0.07	0.24
7	Y L	1.922	0.13	0.03	0.05
8	Mo L	2.293	17.20	4.23	13.69
TOTAL		**15.799**	**100**	**100**	**100**



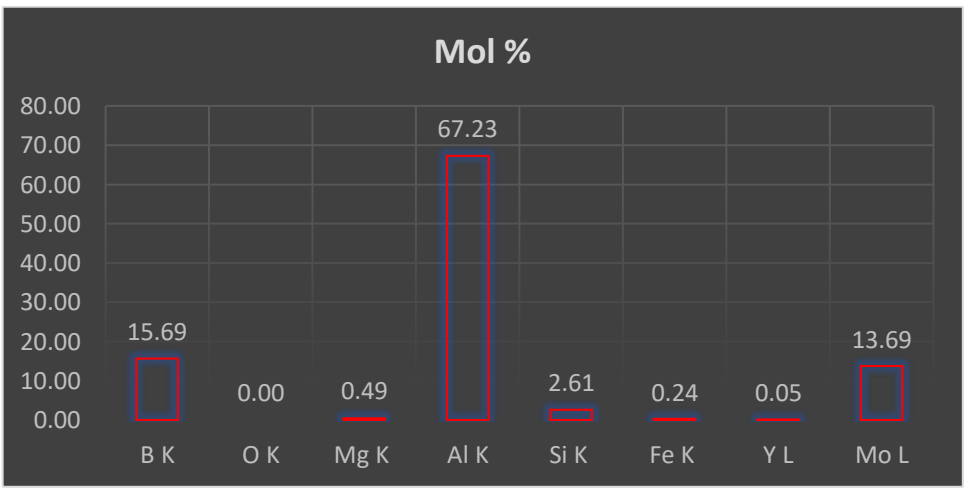
Gambar A.34 Grafik hubungan element dengan energy (E_C) tegangan emisi minimum (keV)



Gambar A.35 Grafik hubungan element dengan massa (%)



Gambar A.36 Grafik hubungan element dengan atom (%)



Gambar A.37 Grafik Hubungan Element dengan Mol (%)

Molaritas Larutan

$$M = \frac{n}{v} \text{ atau } M = \frac{10 \times \% \times \rho}{Mr}$$

Asam Sulfat (H_2SO_4)

$\% H_2SO_4 = 98\%$

$Mr\ H_2SO_4 = 98$

$\rho\ H_2SO_4 = 1.82$ Kg/L

Maka :

$$M\ \ H_2SO_4 = \frac{10 \times \% \times \rho}{Mr}$$

$$H_2SO_4 = \frac{10 \times 98\% \times 1.82}{98}$$

$H_2SO_4 = 18$ M

Pengenceran Larutan

$$M_1.V_1 = M_2.V_2$$

Maka :

1. 2 Molar dengan 2 liter

$2 \times 2000 = 18 \times V_2$

$V_2 = \frac{2 \times 2000}{18} = 222{,}2$ ml

Dikonversikan mililiter ke gram (ml × Density)

2 molar = 222,2 ml

= 222,2 × 1,82 = 406 gram

2. 3 Molar dengan 2 Liter

$3 \times 2000 = 18 \times V_2$

$V_2 = \frac{3 \times 2000}{18} = 333{,}3$ ml

Dikonversikan miiliter kke gram (ml × Density)

3 molar = 333,3 ml

= 333,3 × 1,82

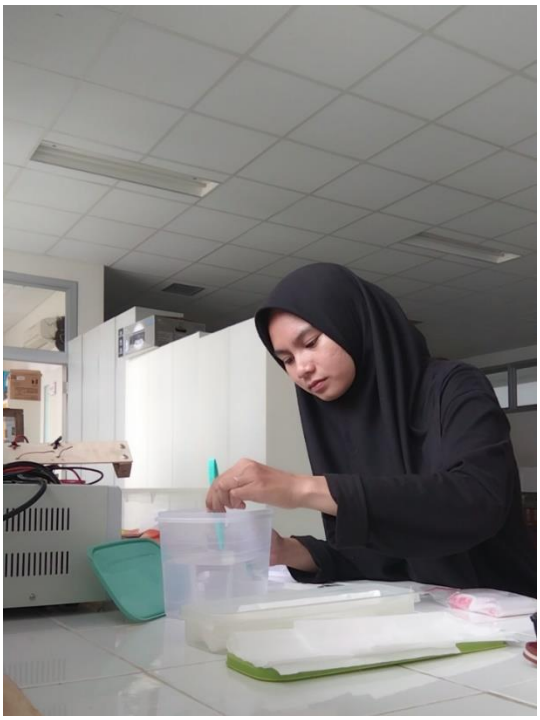
= 606 gram

Gambar A.38 Rumus Pencampuran Larutan

LAMPIRAN II

DOKUMENTASI PENELITIAN

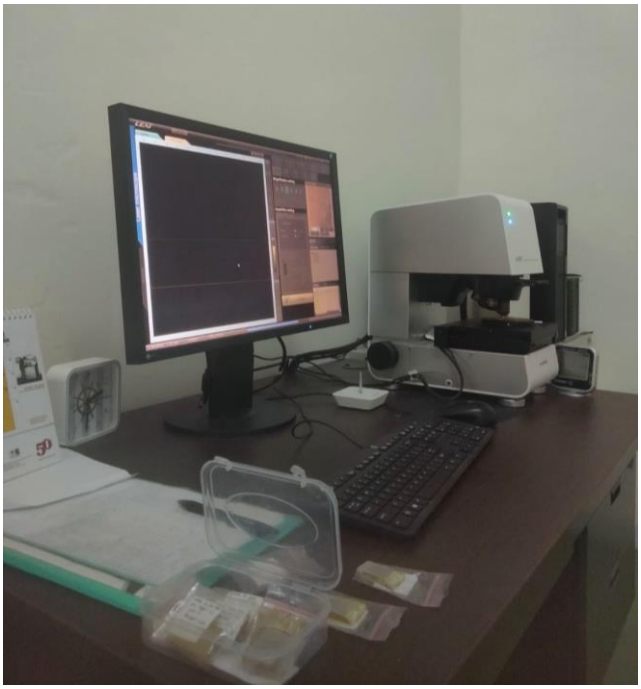
Gambar C.1 Proses pembuatan cetakan spesimen



Gambar C.2 Proses pembersihan spesimen (*cleaning*)

Gambar C.3 Proses pencampuran larutan sebelum dilakukan proses *anodizing*

Gambar C.4 Proses *anodizing*



Gambar C.5 Proses pengujian mikrostruktur dan kekasaran permukaan

Gambar C.6 Proses pengujian *Scanning Electron Microscopy* (SEM) dan *Energy Dispersive X-ray Spectroscopy* (EDS)