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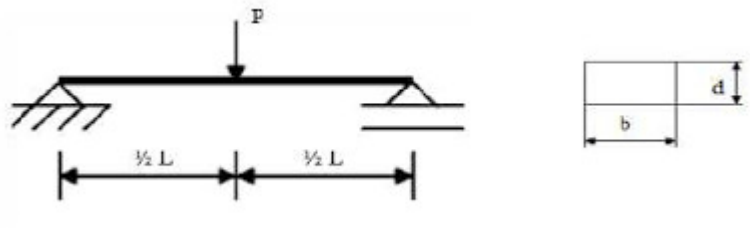
Lampiran 1

Perhitungan Pengujian Bending



Rumus bending:

$$\sigma = \frac{3PL}{2bd^2}$$

Keterangan:

σ = Tegangan Lentur (MPa)

P = Beban/gaya yang terjadi (N)

L = Jarak point/span (mm)

b = Lebar spesimen (mm)

d = Ketebalan Spesimen (mm)

- Temperature 500°C
- Kecepatan 2mm/min
- Jarak tumpuan 34 mm

89Mg – 10Zn – 1Ca:	**93Mg – 6Zn – 1Ca:**	**97Mg – 2Zn – 1Ca:**
➢ Panjang = 71,6 mm ➢ Lebar = 21 mm ➢ Tebal = 5,1 mm ➢ Jarak tumpuan = 34 mm ➢ Max Force = 260,735 N ➢ Max Disp = 0,28210 mm	➢ Panjang = 71,8 mm ➢ Lebar = 20,9 mm ➢ Tebal = 5,1 mm ➢ Jarak tumpuan = 34 mm ➢ Max Force = 256,430 N ➢ Max Disp = 0,31177 mm	➢ Panjang = 71,6 mm ➢ Lebar = 21,1 mm ➢ Tebal = 6,1 mm ➢ Jarak tumpuan = 34 mm ➢ Max Force = 328,402 N ➢ Max Disp =0,30707 mm

Perhitungan *bending*:

1. 89Mg – 10Zn – 1Ca

$$\sigma = \frac{3PL}{2bd^2}$$

$$\sigma = \frac{3.260,734.34}{2.21.5,1^2}$$

$$\sigma = \frac{26594,97}{45881,64}$$

$$\sigma = 0,579 \text{ Mpa}$$

2. 93Mg – 6Zn – 1Ca

$$\sigma = \frac{3PL}{2bd^2}$$

$$\sigma = \frac{3.256,430.34}{2.20,9.5,1^2}$$

$$\sigma = \frac{26155,86}{45445,712}$$

$$\sigma = 0,575 \text{MPa}$$

3. 97 Mg – 2Zn – 1Ca

$$\sigma = \frac{3PL}{2bd^2}$$

$$\sigma = \frac{3.328,402.34}{2.21,1.6,1^2}$$

$$\sigma = \frac{33497,004}{66265,056}$$

$$\sigma = 0,506 \text{ MPa}$$

- Temperature 600℃
- Kecepatan 2mm/min
- Jarak tumpuan 34 mm

89Mg – 10Zn – 1Ca:	**93Mg – 6Zn – 1Ca:**	**97Mg – 2Zn – 1Ca:**
➢ Panjang = 70,2 mm	➢ Panjang = 70,2 mm	➢ Panjang = 70,4 mm
➢ r = 20,6 mm	➢ Lebar = 20,3 mm	➢ Lebar = 21,1 mm
➢ l = 4,7 mm	➢ Tebal = 4,9 mm	➢ Tebal = 4,9 mm
➢ tumpuan = 34 mm	➢ Jarak tumpuan = 34 mm	➢ Jarak tumpuan = 34 mm

➢ Max Force = 1394,32 N ➢ Max Disp = 0,62797 mm	➢ Max Force = 1845,53 N ➢ Max Disp = 0,79113 mm	➢ Max Force = 1698,02 N ➢ Max Disp =1,20410 mm

Perhitungan bending:

1. 89Mg – 10Zn – 1Ca

$$\sigma = \frac{3PL}{2bd^2}$$

$$\sigma = \frac{3.1394,32.34}{2.20,6.4,7^2}$$

$$\sigma = \frac{142220,64}{910,108}$$

$$\sigma = 156,268 \text{ Mpa}$$

2. 93Mg – 6Zn – 1Ca

$$\sigma = \frac{3PL}{2bd^2}$$

$$\sigma = \frac{3.1845,53.34}{2.20,3.4,9^2}$$

$$\sigma = \frac{188244,06}{974,806}$$

$$\sigma = 193,109 \text{ MPa}$$

3. 97 Mg – 2Zn – 1Ca

$$\sigma = \frac{3PL}{2bd^2}$$

$$\sigma = \frac{3.1698,02.34}{2.21,1\ .4,9^2}$$

$$\sigma = \frac{173198,04}{1013,222}$$

$$\sigma = 170,938 \text{ MPa}$$

Lampiran 2

Proses pembuatan cetakan sampel

Gambar 1 Pengukuran titik tengah

Gambar 2 Pengeboran awal untuk menandai batas ukuran sampel

Gambar 3 Pengeboran sampai membentuk ukuran sampel

Gambar 4 Skrap dudukan centakan sampel

Gambar 5 Pengukuran untuk mengetahui ukuran

Gambar 6 Skrap awal bagian tengah cetakan sampel

Gambar 7 Skrap bagian pinggir sampel

Gambar 8 Skrap bagian pinggir sampel

Gambar 9 Penghalusan bagian tengah cetakan sampel

Gambar 10 Finishing cetekan sampel

Gambar 11 Cetakan sampel saat di satukan

Gambar 12 Cetakan sampel perbagian

Lampiran 3

Proses sintering 500℃ dan 600℃

Gambar 1 Tungku yang digunakan

Gambar 2 Perletakan sampel dalam tabung

Gambar 3 Menutup tabung sampel

Gambar 4 Mengkunci tabung sampel

Gambar 5 Proses peletakan tabung ke dalam tungku

Gambar 6 Menutup bagian atas dengan blaket anti api dan plat

Gambar 7 Argon yang digunakan

Gambar 8 Temperatur di 100℃

Gambar 9 Temperature di 200°C

Gambar 10 Temperature di 300°C

Gambar 12 Temperature di 400°C

Gambar 11 Temperatur di 500°C

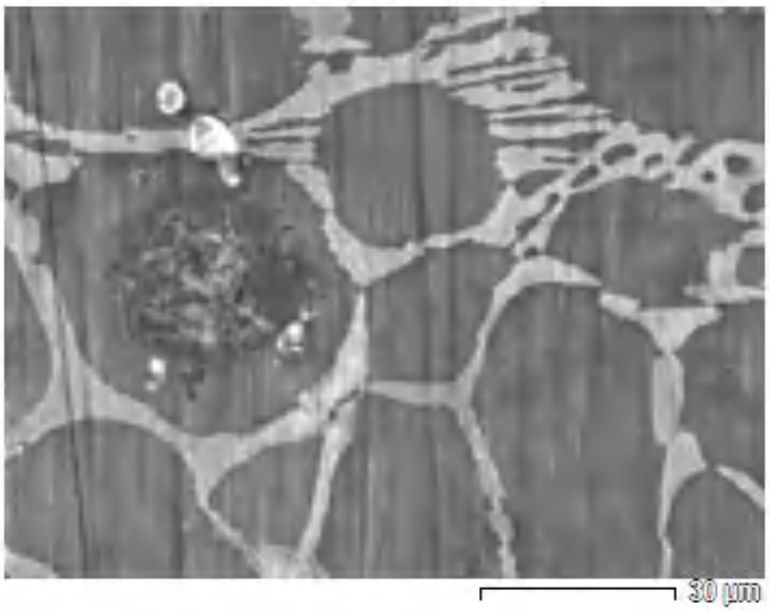
Gambar 13 Temperature di 600℃

Lampiran 4

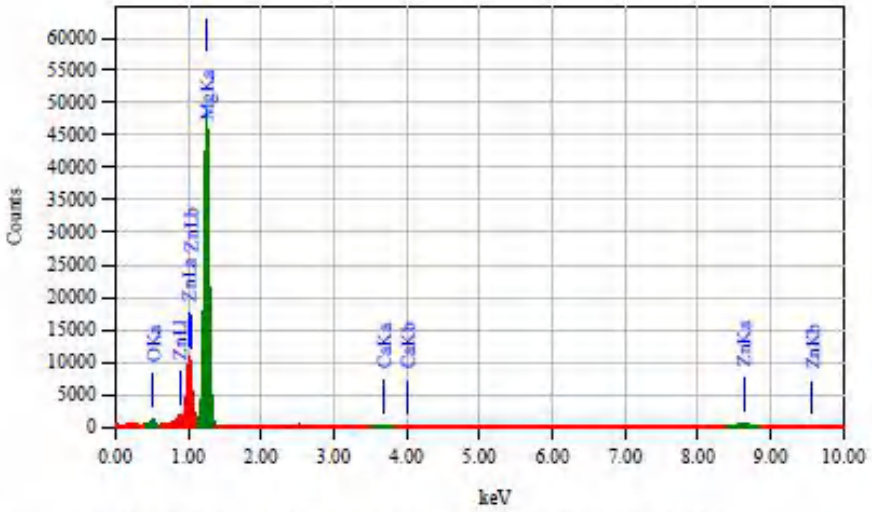
Hasil EDS sampel paduan 89Mg-10Zn-1Ca dengan temperature sintering 600℃ (Senyawa)

View001

JEOL 1/1



Title	: IMG1
Instrument	: JCM-6000PLUS
Volt	: 15.00 kV
Mag.	: x 1,000
Date	: 2023/05/23
Pixel	: 512 x 384



Acquisition Parameter
Instrument : JCM-6000PLUS
Acc. Voltage : 15.0 kV
Probe Current: 1.00000 nA
PHA mode : T3
Real Time : 51.79 sec
Live Time : 50.00 sec
Dead Time : 3 %
Counting Rate: 13985 cps
Energy Range : 0 - 20 keV

Thin Film Standardless Standardless Quantitative Analysis(Oxide)
Fitting Coefficient : 0.0574
Total Oxide : 24.0

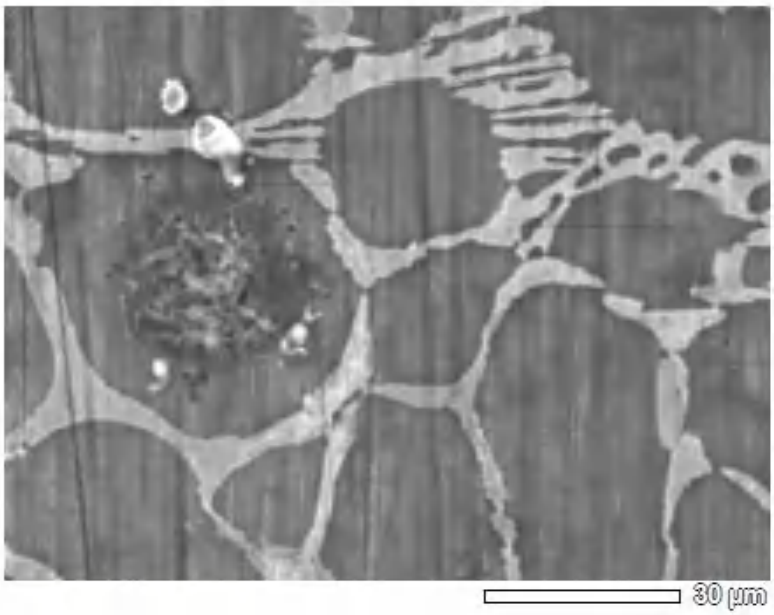
Element	(keV)	Mass%	Counts	Sigma	Mol%	Compound	Mass%	Cation	K
O		36.49					ND		
Mg K (Ref.)	1.253	50.63	336966.44	0.21	91.33	MgO	83.96	21.92	1.0000
Ca K*	3.690	0.10	346.25	0.02	0.10	CaO	0.13	0.03	1.8335
	8.630	12.78	8986.50	0.24	8.57	ZnO	15.91	2.06	9.4654
		100.00			100.00		100.00	24.00	

Lampiran 5

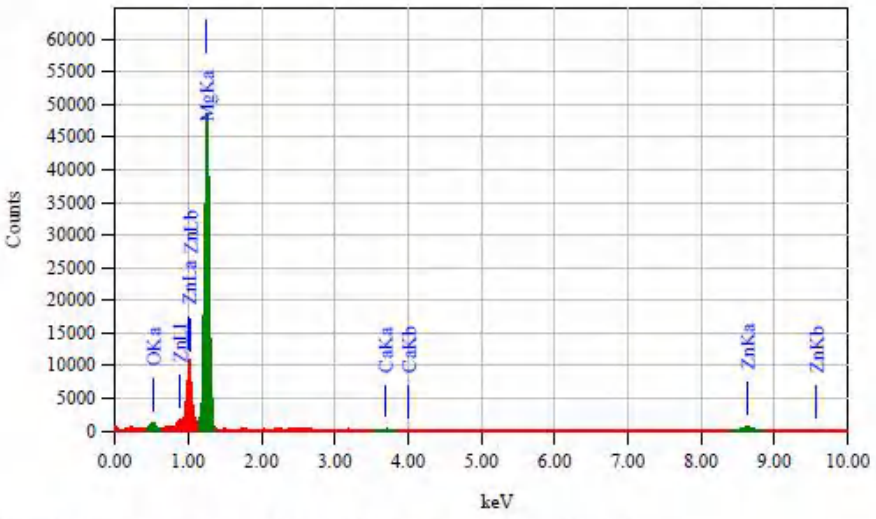
Hasil EDS sampel paduan 89Mg-10Zn-1Ca dengan temperature sintering 600℃ (Unsur)

View001

JEOL 1/1



Title	: IMG1
Instrument	: JCM-6000PLUS
Volt	: 15.00 kV
Mag.	: x 1,000
Date	: 2023/05/23
Pixel	: 512 x 384



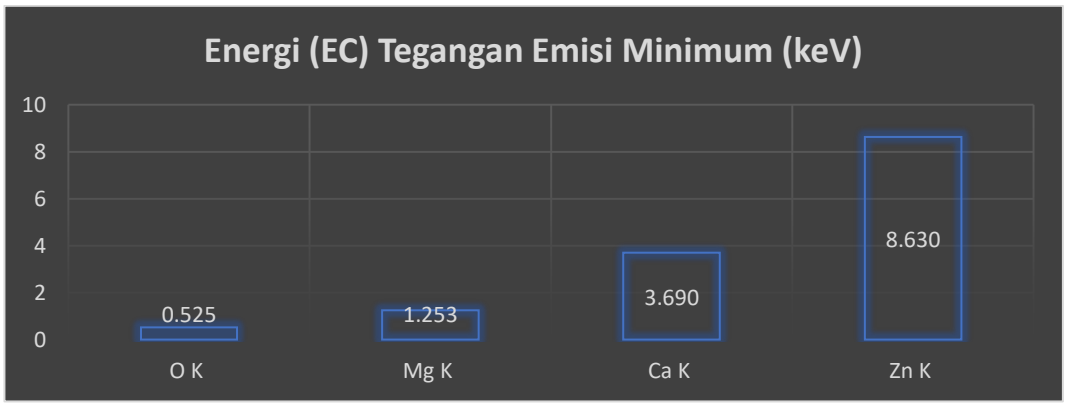
Acquisition Parameter
Instrument : JCM-6000PLUS
Acc. Voltage : 15.0 kV
Probe Current: 1.00000 nA
PHA mode : T3
Real Time : 51.79 sec
Live Time : 50.00 sec
Dead Time : 3 %
Counting Rate: 13985 cps
Energy Range : 0 - 20 keV

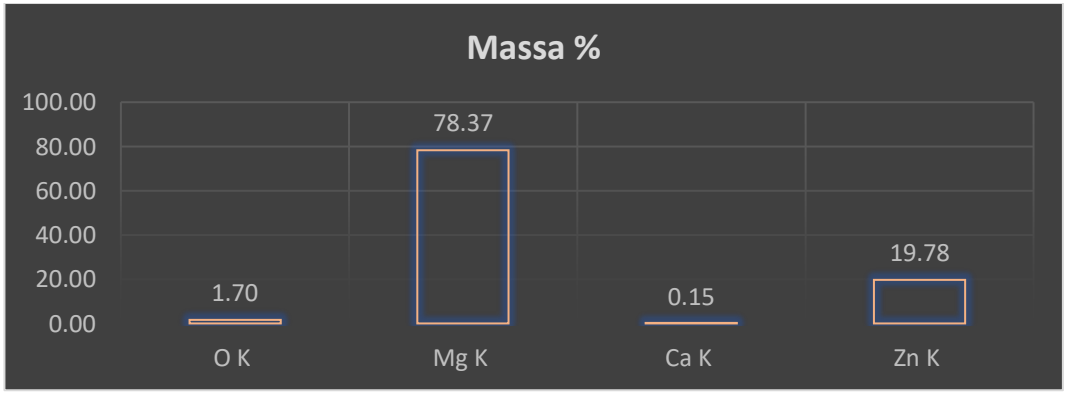
Thin Film Standardless Standardless Quantitative Analysis
Fitting Coefficient : 0.0574

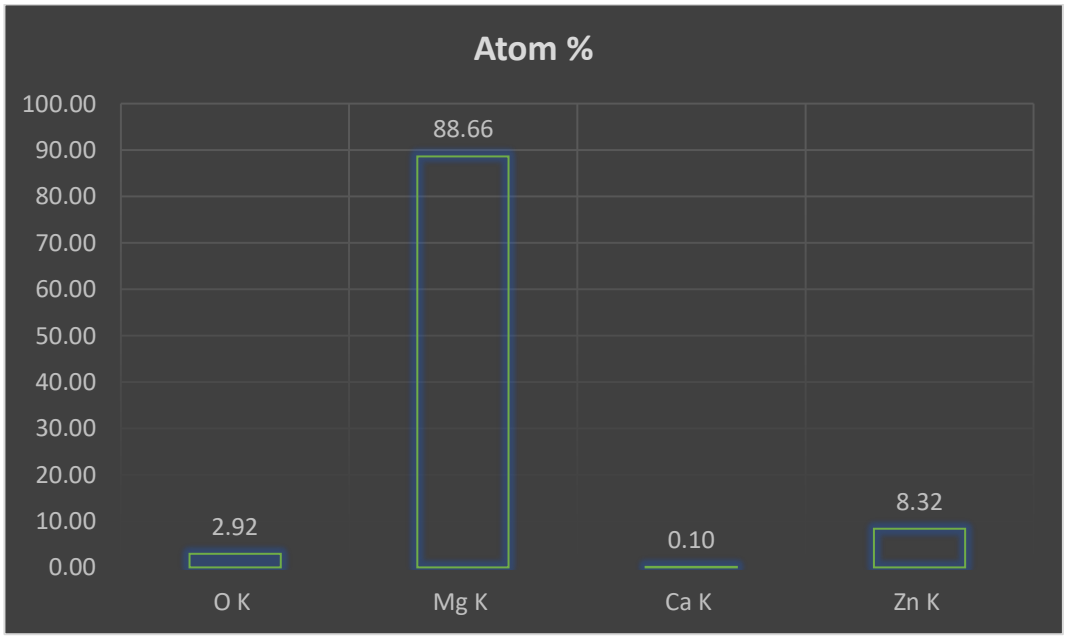
Element		(keV)	Mass%	Counts	Sigma	Atom%	Compound	Mass%	Cation	K
O	K	0.525	1.70	5492.18	0.03	2.92				1.3311
Mg	K (Ref.)	1.253	78.37	336966.44	0.20	88.66				1.0000
Ca	K*	3.690	0.15	346.25	0.02	0.10				1.8335
Zn	K	8.630	19.78	8986.50	0.30	8.32				9.4654
			100.00			100.00				

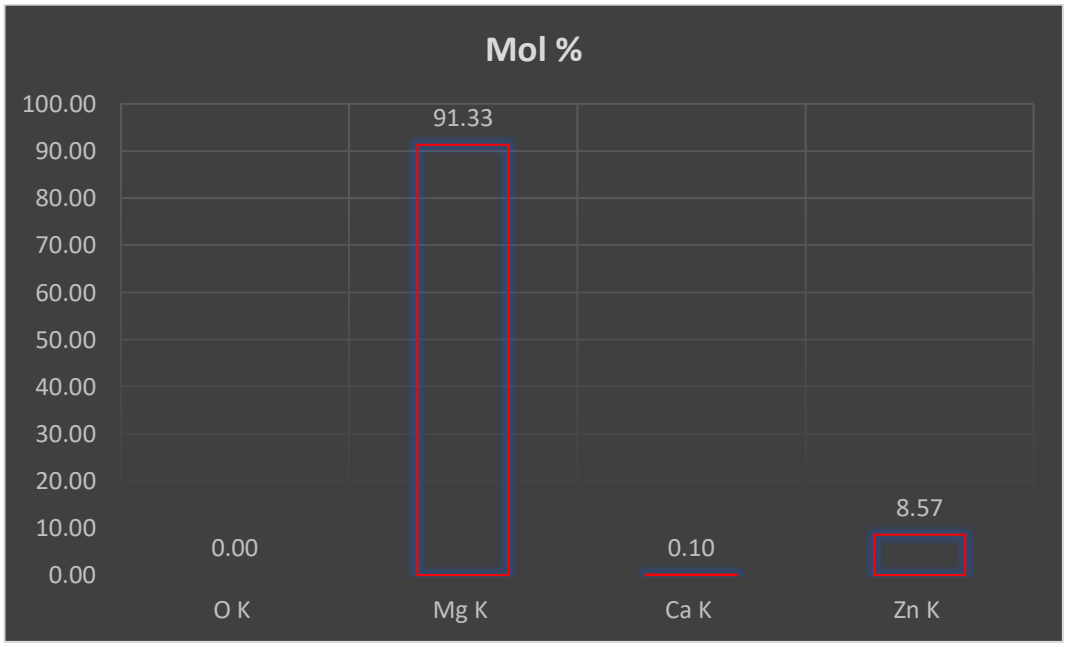
Table 1. Deskripsi Energy (E_C) Tegangan Emisi Minimum, persentase massa, persentase atom, dan persentase mol masing-masing unsur

No	Element	Ec Tegangan Emisi Minimum (keV)	Massa %	Atom %	Mol %
1	O K	0,525	1,70	2,92	-
2	Mg K	1,253	78,37	88,66	91,33
3	Ca K	3,690	0,15	0,10	0,10
4	Zn K	8,630	19,78	8,32	8,57
	TOTAL	**14,098**	**100**	**100**	**100**



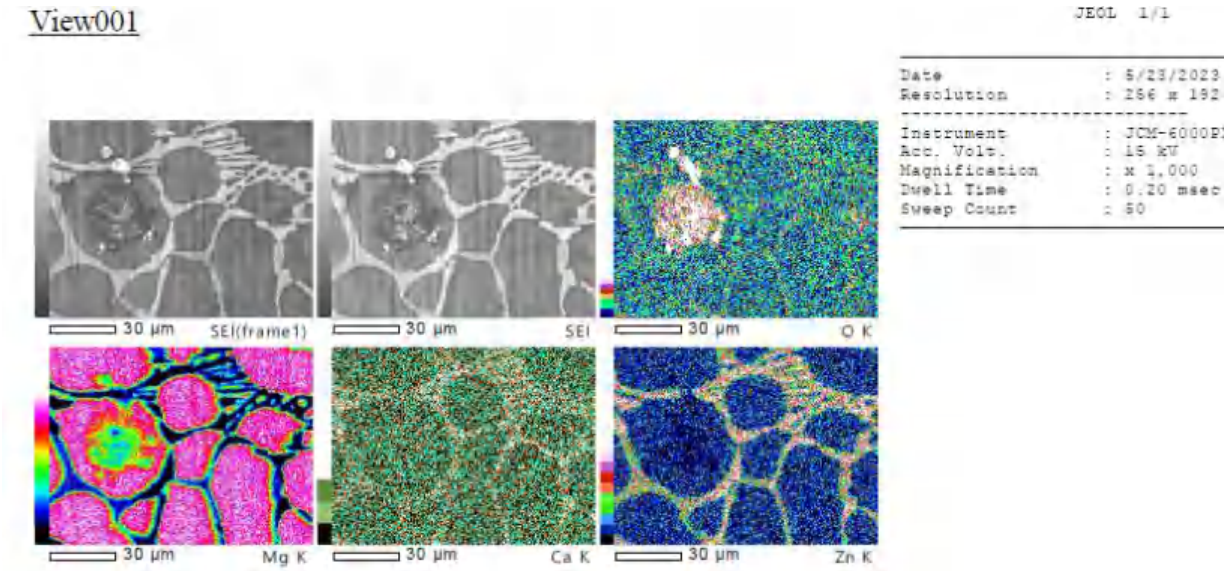


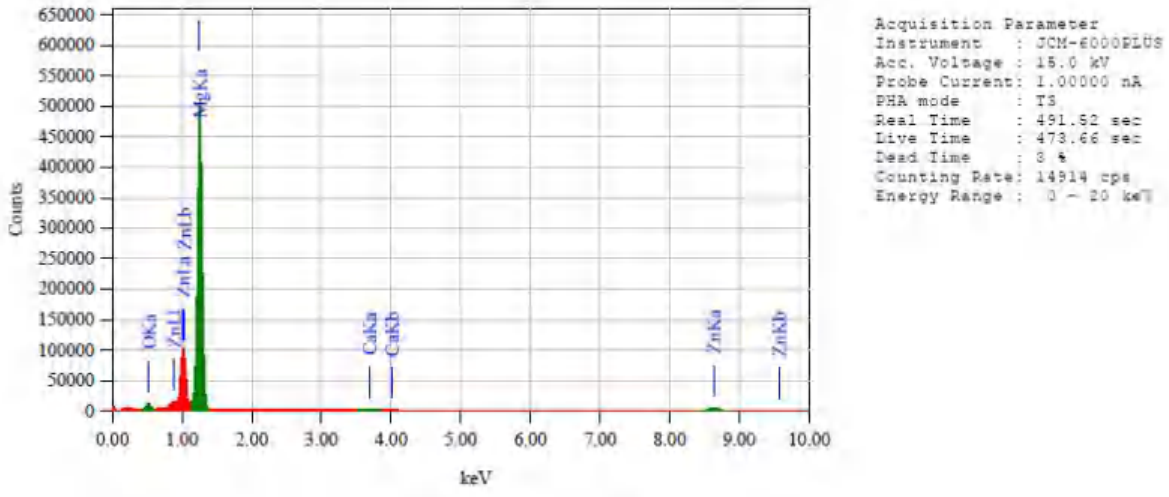




Lampiran 6

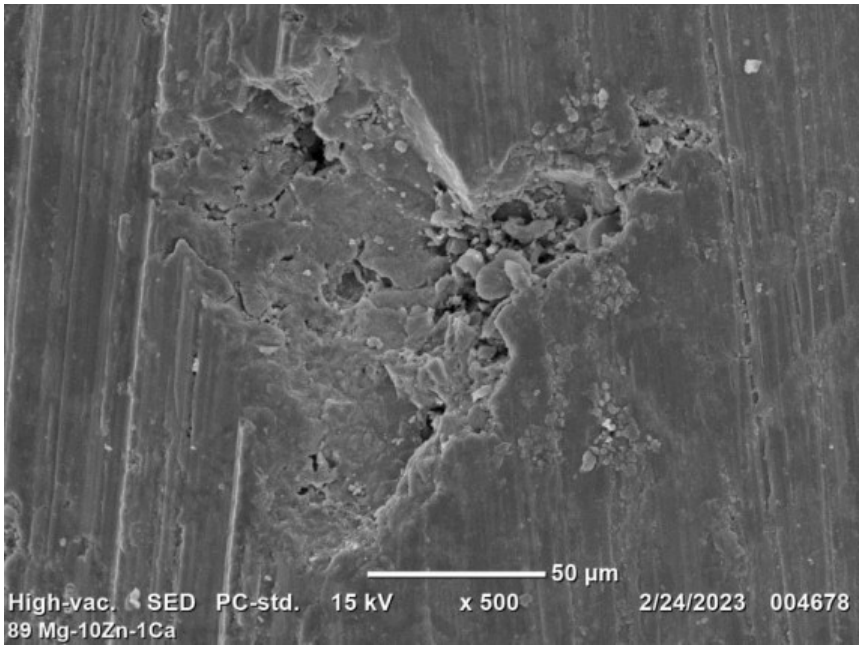
Hasil dari spektrum mapping sampel paduan 89Mg-10Zn-1Ca dengan temperature sintering 600°C



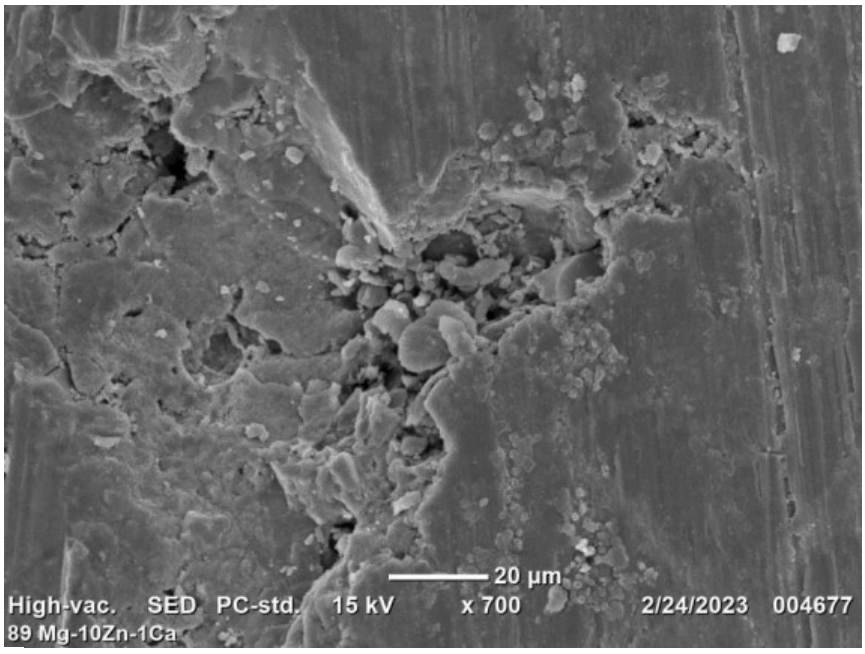


Lampiran 7

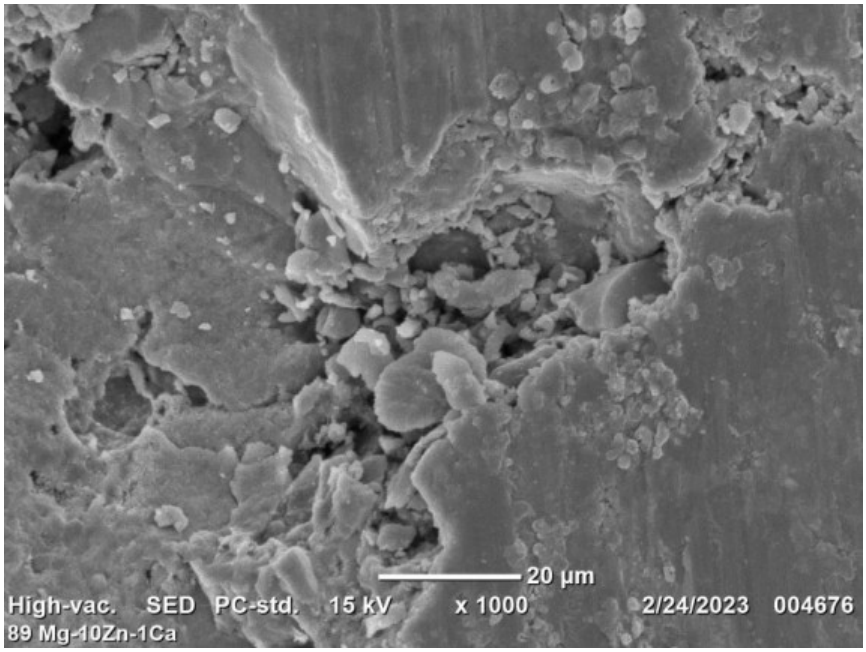
Hasil Foto SEM sampel paduan 89Mg-10Zn-1Ca dengan temperature sintering 500℃



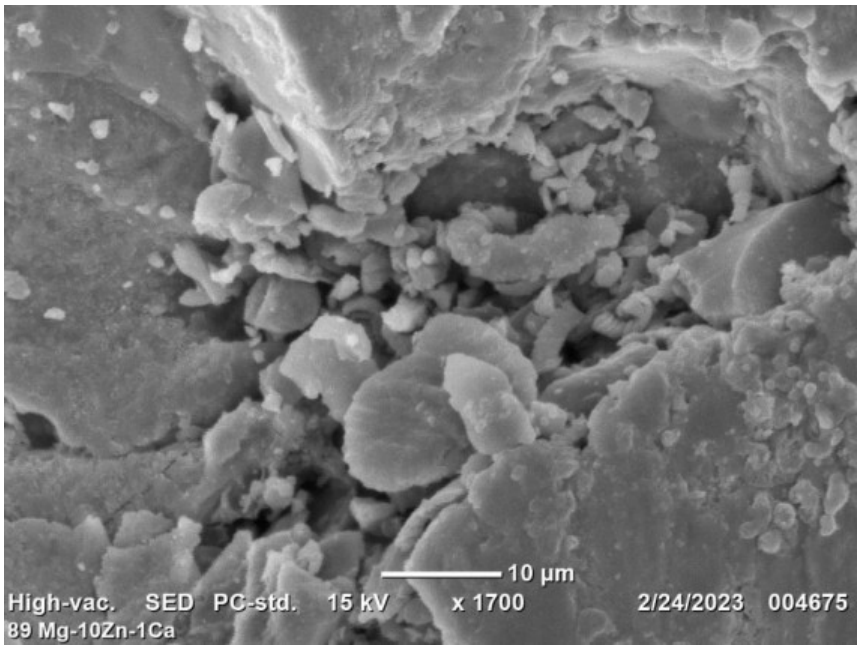
Hasil SEM pembesaran 500x



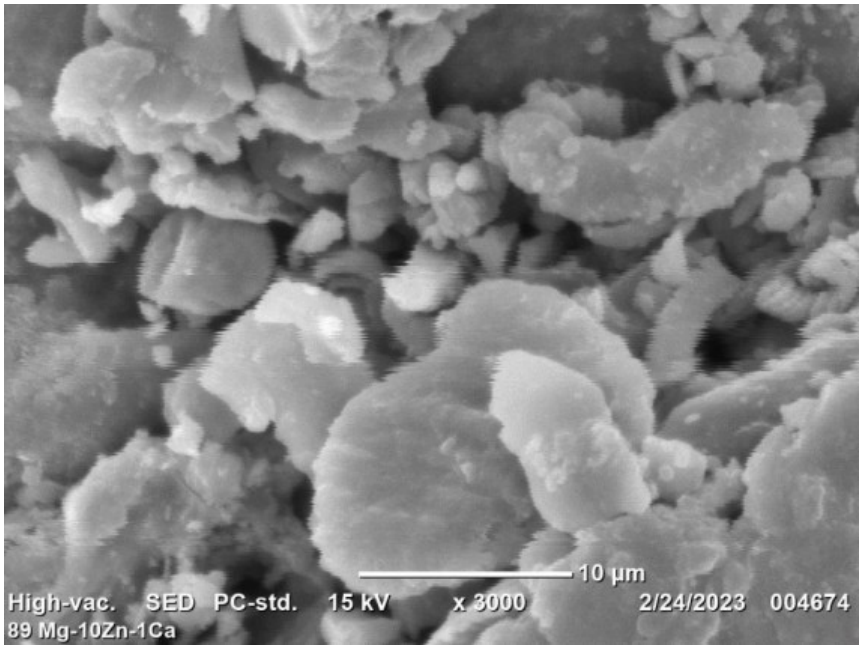
Hasil SEM pembesaran 700x



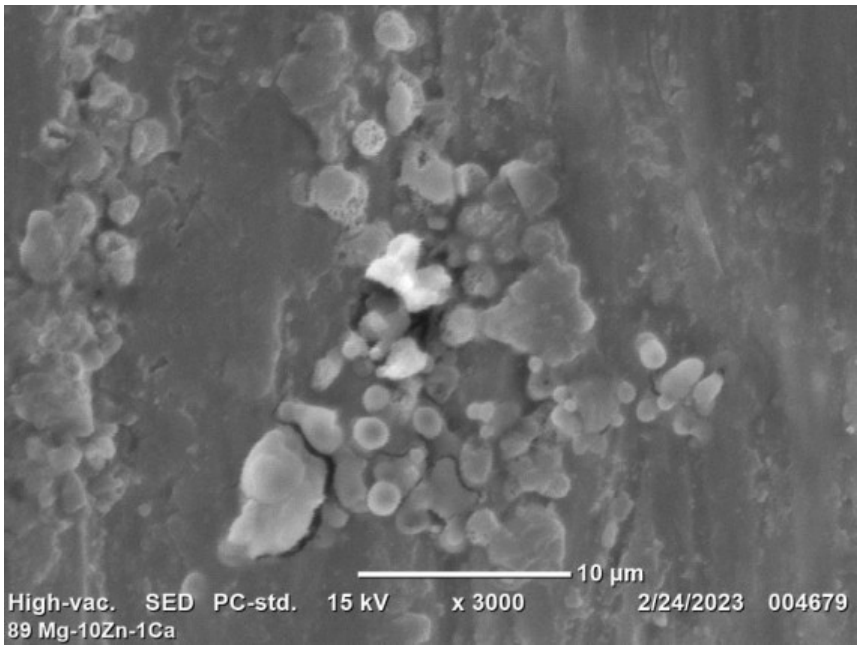
Hasil SEM pembesaran 1000x



Hasil SEM pembesaran 1700x



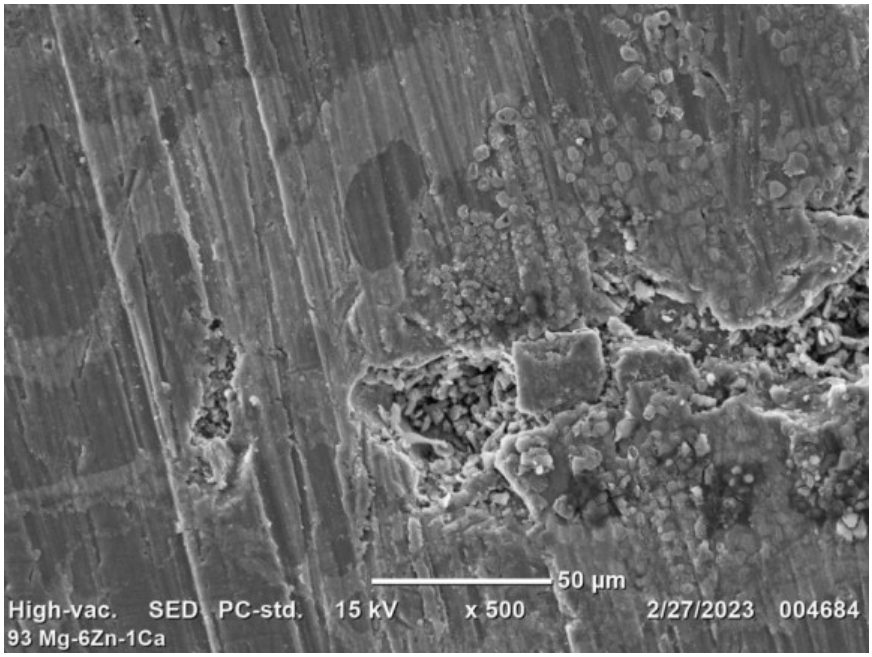
Hasil SEM pembesaran 3000x



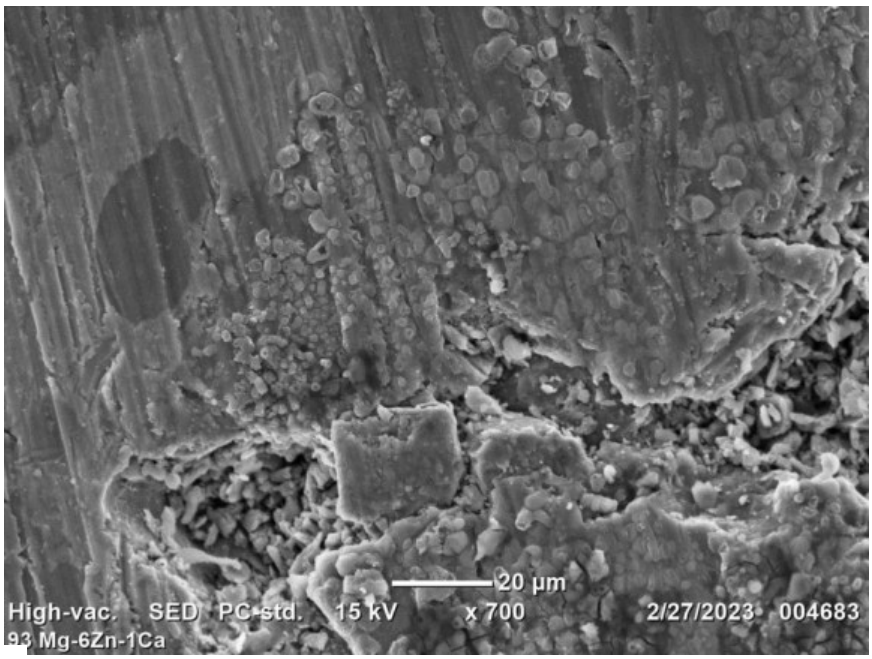
Hasil SEM pembesaran 3000x

Lampiran 8

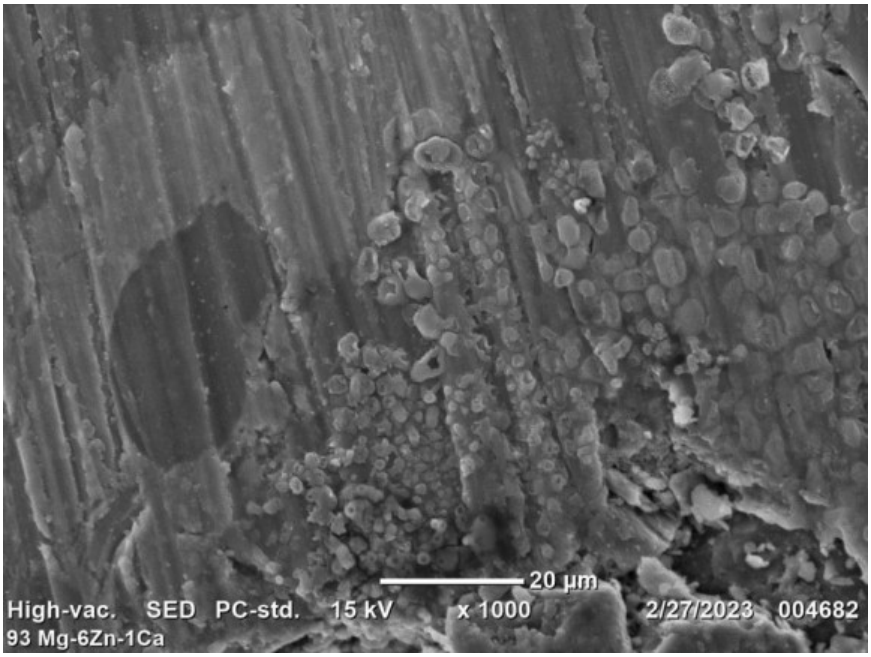
Hasil Foto SEM sampel paduan 93Mg-6Zn-1Ca dengan temperature sintering 500℃



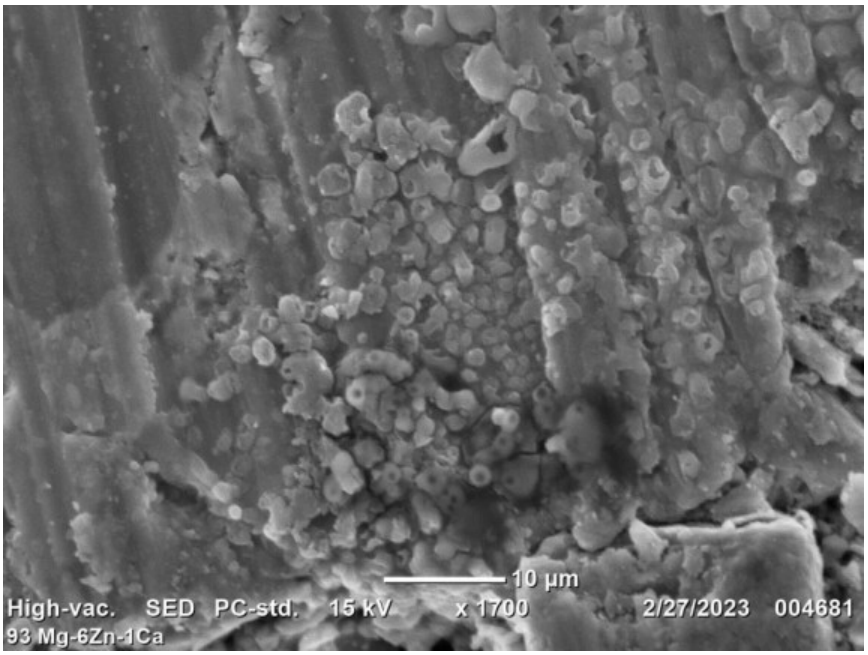
Hasil SEM pembesaran 500x



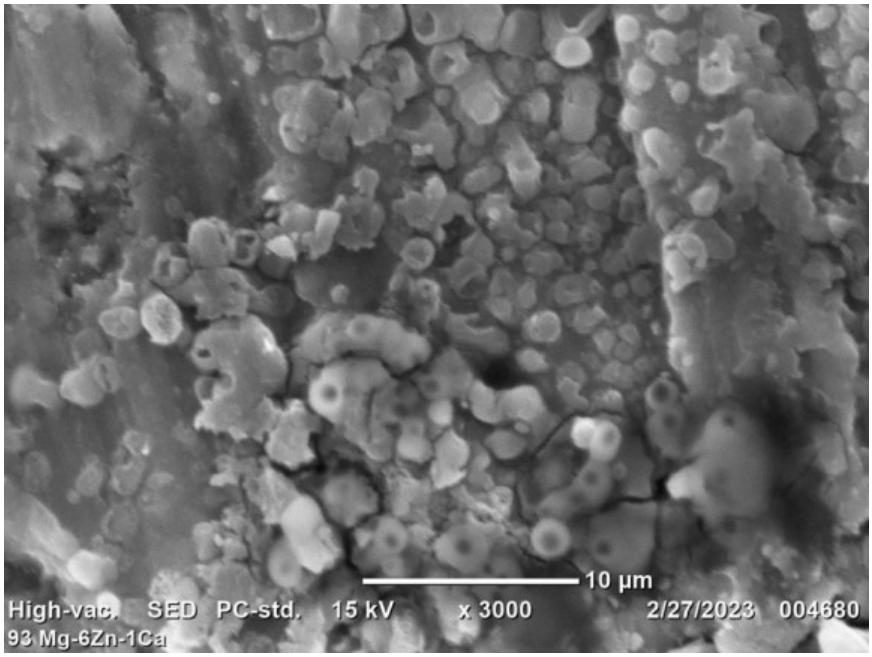
Hasil SEM pembesaran 700x



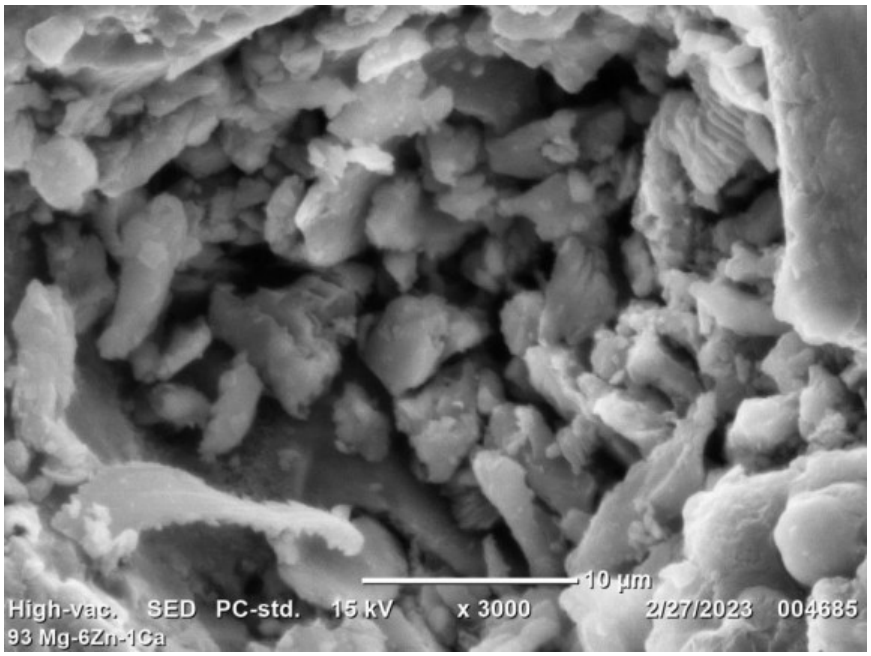
Hasil SEM pembesaran 1000x



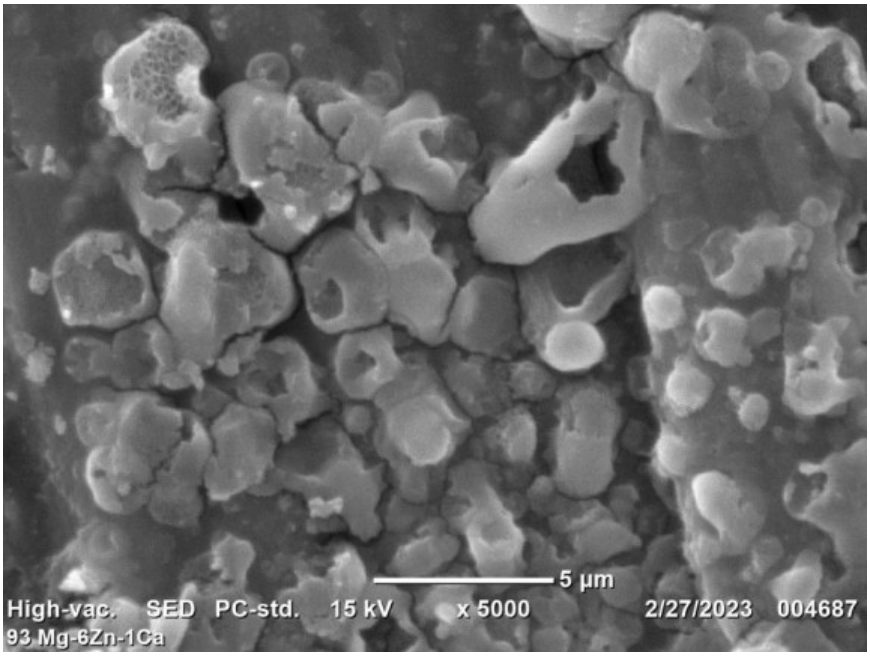
Hasil SEM pembesaran 1700x



Hasil SEM pembesaran 3000x



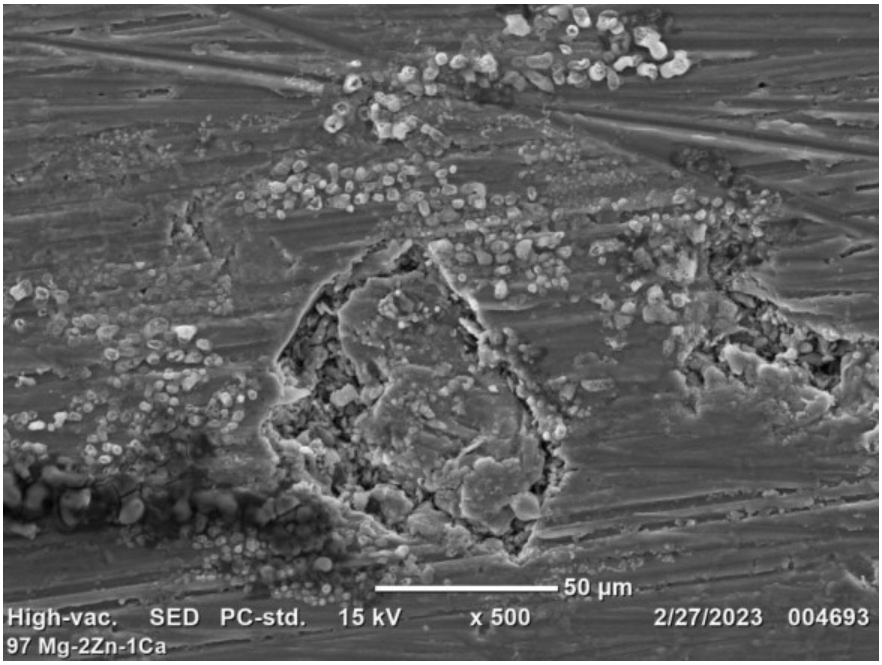
Hasil SEM pembesaran 3000x



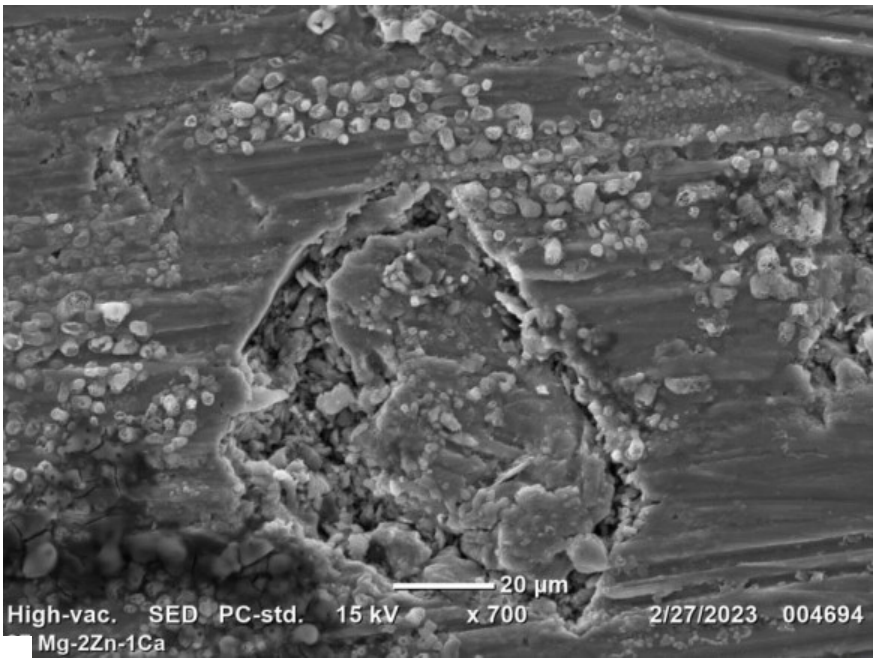
Hasil SEM pembesaran 5000x

Lampiran 9

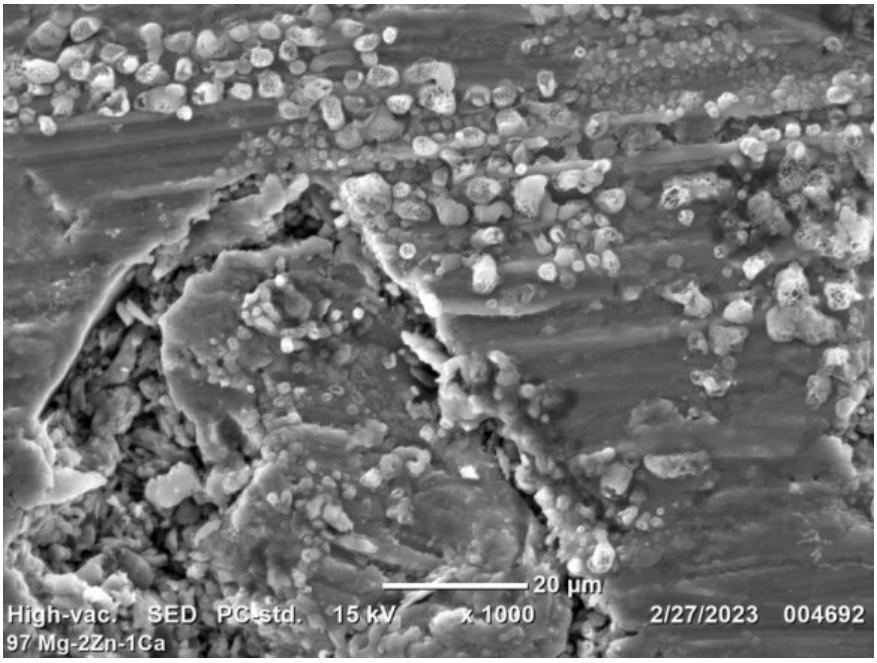
Hasil Foto SEM sampel paduan 97Mg-2Zn-1Ca dengan temperature sintering 500℃



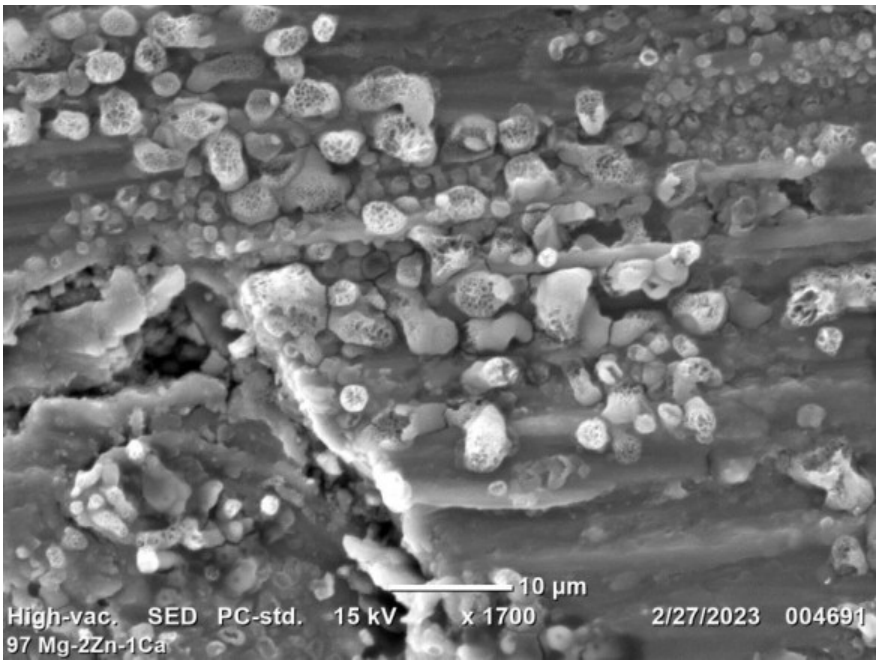
Hasil SEM pembesaran 500x



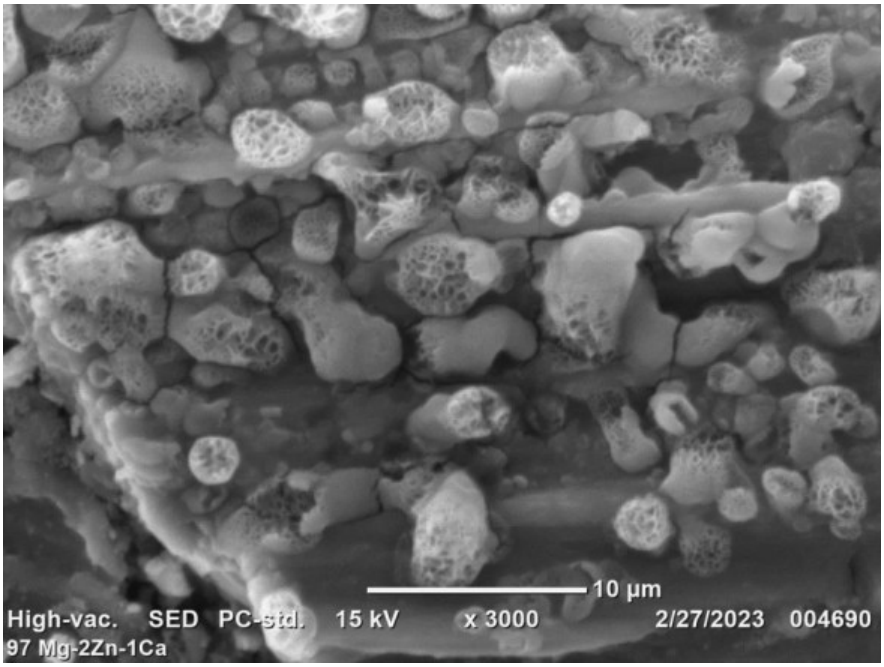
Hasil SEM pembesaran 700x



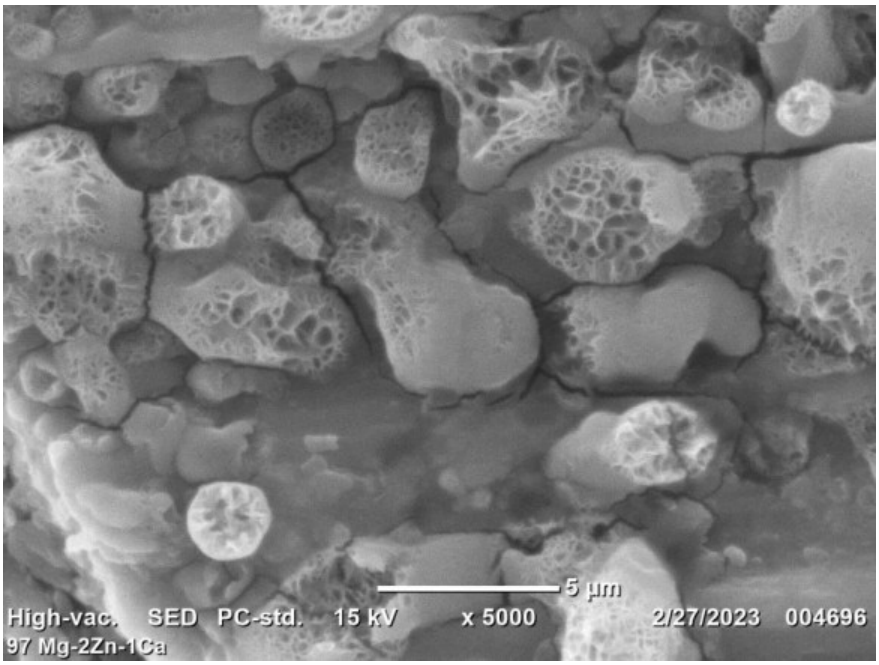
Hasil SEM pembesaran 1000x



Hasil SEM pembesaran 1700x



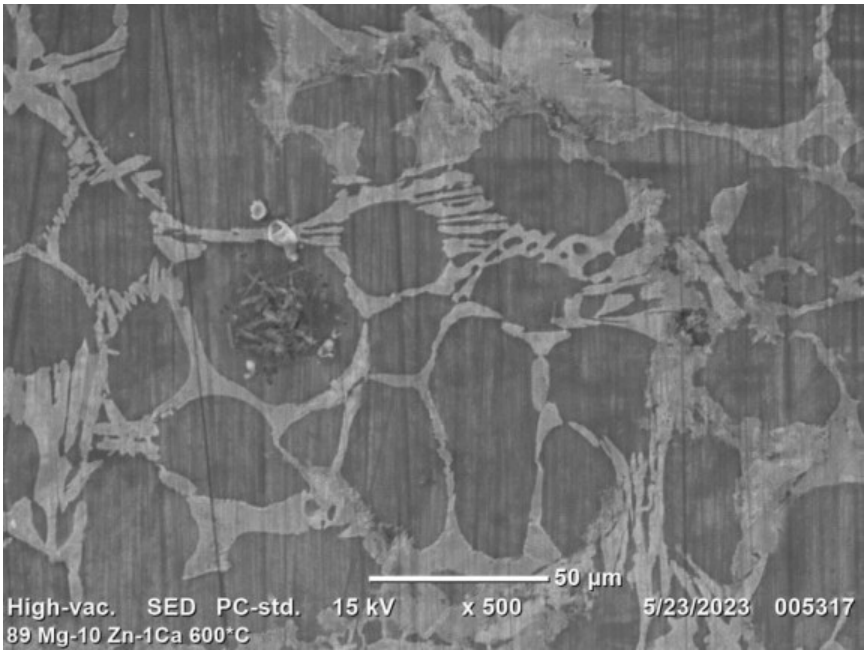
Hasil SEM pembesaran 3000x



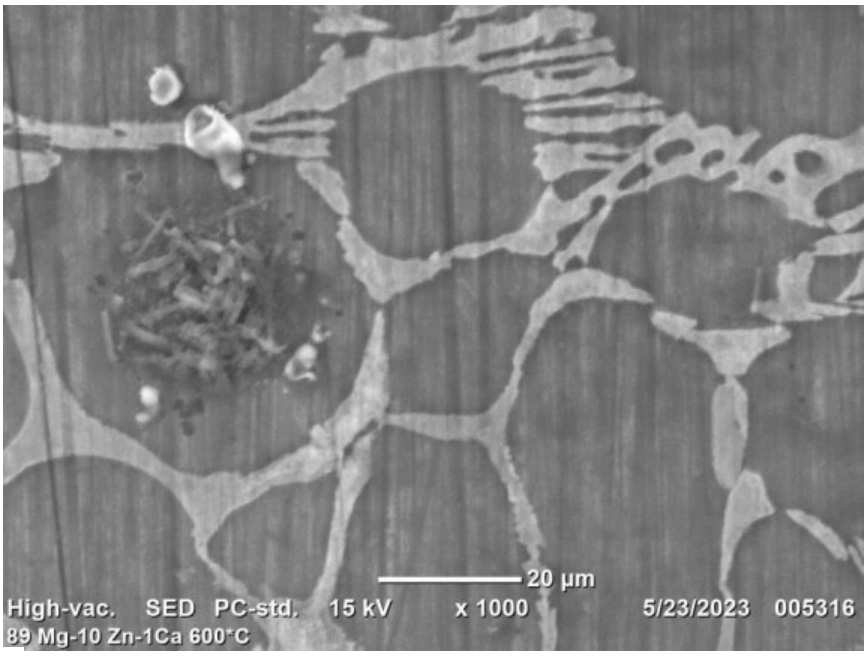
Hasil SEM pembesaran 5000x

Lampiran 10

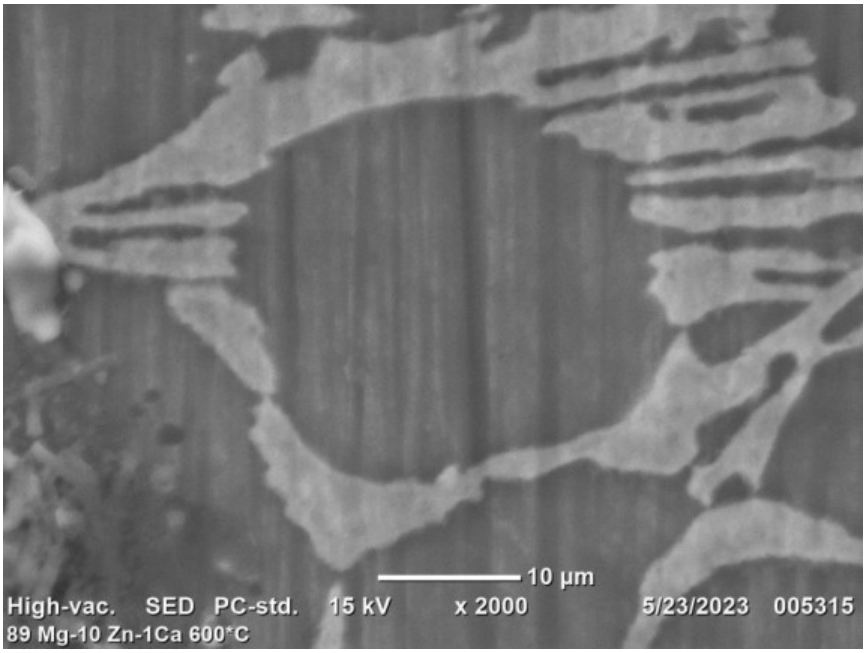
Hasil Foto SEM sampel paduan 89Mg-10Zn-1Ca dengan temperature sintering 600℃



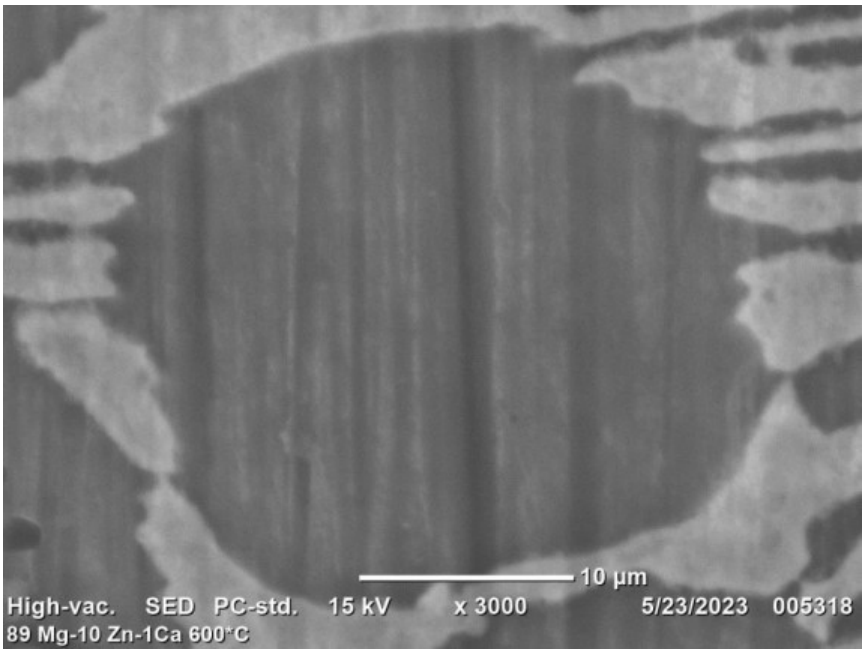
Hasil SEM pembesaran 500x



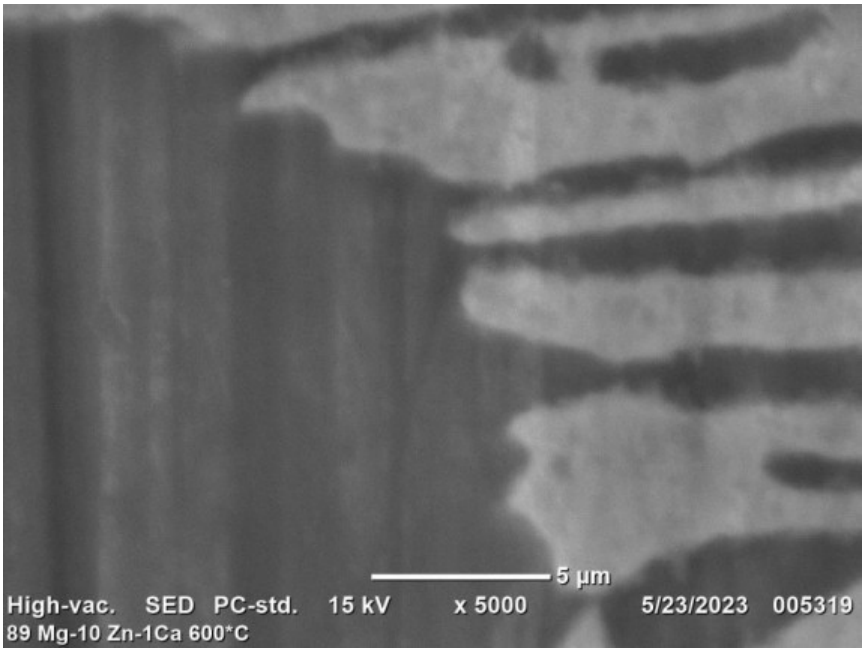
Hasil SEM pembesaran 1000x



Hasil SEM pembesaran 2000x



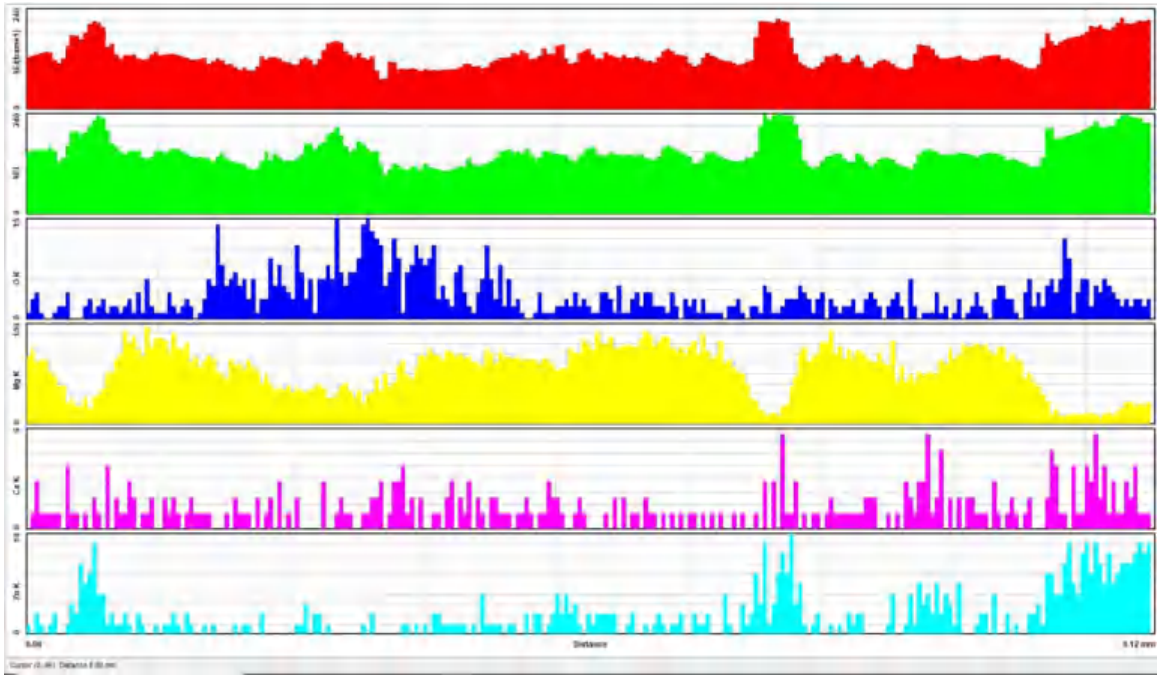
Hasil SEM pembesaran 3000x



Hasil SEM pembesaran 5000x

Lampiran 11

Keterangan unsur masing-masing warna sampel paduan 89Mg-10Zn-1Ca dengan temperature sintering 600℃



Element	Intensity
SEI(fr...	124
SEI	148
O K	1
Mg K	100
Ca K	0
Zn K	1

Lampiran 12

Hasil data XRD sampel paduan 89Mg-10Zn-1Ca dengan temperature sintering 500℃

*** Basic Data Process ***

Group : Standard
Data : 2302#22#3a

Strongest 3 peaks

no.	peak no.	2Theta (deg)	d (A)	I/I1	FWHM (deg)	Intensity (Counts)	Integrated Int (Counts)
1	65	63.2100	1.46987	100	0.06000	3	18
2	59	59.1900	1.55973	67	0.10000	2	17
3	3	16.8600	5.25440	33	0.00000	1	0

Peak Data List

peak no.	2Theta (deg)	d (A)	I/I1	FWHM (deg)	Intensity (Counts)	Integrated Int (Counts)
1	16.0600	5.51429	33	0.00000	1	0
2	16.3000	5.43363	33	0.00000	1	0
3	16.8600	5.25440	33	0.00000	1	0
4	17.2200	5.14535	33	0.00000	1	0
5	18.5600	4.77678	1	0.00000	0	0
6	19.6000	4.52560	1	0.00000	0	0
7	20.4000	4.34989	33	0.00000	1	0
8	20.8600	4.25500	1	0.00000	0	0
9	21.3000	4.16809	33	0.00000	1	0
10	22.7400	3.90730	33	0.00000	1	0
11	23.7200	3.74804	33	0.00000	1	0
12	24.2400	3.66880	33	0.00000	1	0
13	25.6000	3.47689	1	0.00000	0	0
14	26.2200	3.39607	33	0.00000	1	0
15	27.9200	3.19303	1	0.00000	0	0
16	28.2400	3.15757	33	0.00000	1	0
17	28.6600	3.11224	33	0.00000	1	0
18	29.4400	3.03154	33	0.00000	1	0
19	29.7400	3.00164	33	0.00000	1	0
20	30.6200	2.91735	33	0.00000	1	0
21	30.9400	2.88790	1	0.00000	0	0
22	31.5200	2.83607	33	0.00000	1	0
23	32.1000	2.78614	33	0.00000	1	0
24	33.1600	2.69946	33	0.00000	1	0
25	33.4200	2.67905	33	0.00000	1	0
26	34.7800	2.57734	1	0.00000	0	0
27	35.2200	2.54614	33	0.00000	1	0
28	36.0400	2.49007	33	0.00000	1	0
29	36.5200	2.45843	33	0.00000	1	0
30	36.7600	2.44293	33	0.00000	1	0
31	37.2200	2.41379	33	0.00000	1	0
32	38.3000	2.34817	33	0.00000	1	0
33	38.5600	2.33294	33	0.00000	1	0
34	39.2200	2.29518	33	0.00000	1	0
35	40.1200	2.24575	33	0.00000	1	0
36	41.0200	2.19853	33	0.00000	1	0
37	42.4000	2.13011	33	0.00000	1	0
38	42.7800	2.11206	33	0.00000	1	0
39	43.1000	2.09712	33	0.00000	1	0
40	44.0200	2.05540	33	0.00000	1	0
41	44.5800	2.03087	33	0.00000	1	0
42	47.7600	1.90281	33	0.00000	1	0
43	48.5200	1.87477	33	0.00000	1	0
44	48.9000	1.86108	1	0.00000	0	0
45	49.2200	1.84973	33	0.00000	1	0
46	49.9200	1.82542	33	0.00000	1	0
47	50.3600	1.81050	33	0.00000	1	0
48	50.7600	1.79716	1	0.00000	0	0
49	51.0800	1.78665	33	0.00000	1	0

peak no.	2Theta (deg)	d (A)	I/I1	FWHM (deg)	Intensity (Counts)	Integrated Int (Counts)
50	51.9400	1.75908	33	0.00000	1	0
51	52.8800	1.73000	33	0.00000	1	0
52	53.8400	1.70140	33	0.00000	1	0
53	54.5600	1.68063	33	0.00000	1	0
54	55.2200	1.66210	1	0.00000	0	0
55	56.4400	1.62903	1	0.00000	0	0
56	57.6800	1.59692	33	0.00000	1	0
57	58.6400	1.57305	33	0.00000	1	0
58	59.0200	1.56382	1	0.00000	0	0
59	59.1900	1.55973	67	0.10000	2	17
60	59.8200	1.54480	1	0.00000	0	0
61	60.4200	1.53089	33	0.00000	1	0
62	60.7600	1.52314	1	0.00000	0	0
63	61.3000	1.51101	33	0.00000	1	0
64	62.9000	1.47637	1	0.00000	0	0
65	63.2100	1.46987	100	0.06000	3	18
66	63.4200	1.46551	33	0.00000	1	0
67	63.6600	1.46056	33	0.00000	1	0
68	64.0000	1.45362	1	0.00000	0	0
69	64.5200	1.44315	33	0.00000	1	0
70	65.0000	1.43365	33	0.00000	1	0
71	66.0400	1.41357	33	0.00000	1	0
72	66.7800	1.39969	1	0.00000	0	0
73	67.1600	1.39269	33	0.00000	1	0
74	68.1800	1.37432	33	0.00000	1	0
75	69.0800	1.35860	1	0.00000	0	0
76	69.7200	1.34768	33	0.00000	1	0
77	71.2000	1.32326	33	0.00000	1	0
78	73.2600	1.29105	1	0.00000	0	0
79	74.3400	1.27495	33	0.00000	1	0
80	74.6400	1.27056	33	0.00000	1	0

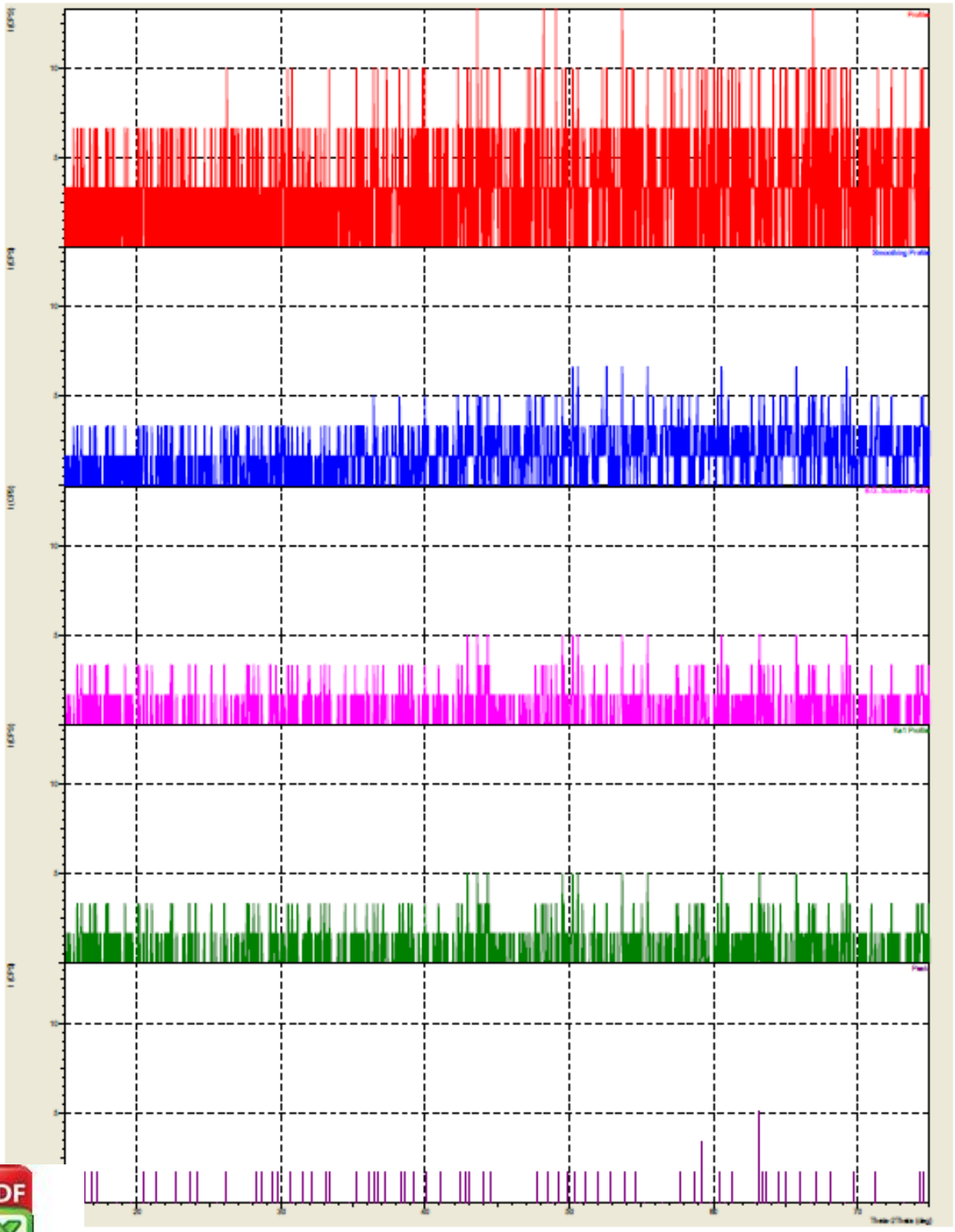
```
          ***  Basic Data Process  ***

# Data Infomation
          Group                : Standard
          Data                 : 2302#22#3a
          Sample Nmae          : padat
          Comment              :
          Date & Time          : 03-09-23 12:25:37

# Measurement Condition
    X-ray tube
          target               : Cu
          voltage              : 40.0 (kV)
          current              : 30.0 (mA)
    Slits
          Auto Slit            : not Used
          divergence slit      :   1.00000 (deg)
          scatter slit         :   1.00000 (deg)
          receiving slit       :   0.30000(mm)
    Scanning
          drive axis           : Theta-2Theta
          scan range           :   15.0000 - 75.0000 (deg)
          scan mode            : Continuous Scan
          scan speed           :    2.0000 (deg/min)
          sampling pitch       :    0.0200 (deg)
          preset time          :    0.60 (sec)

# Data Process Condition
    Smoothing                  [ AUTO ]
          smoothing points     : 3
    B.G.Subtruction            [ AUTO ]
          sampling points      : 5
          repeat times         : 30
    Ka1-a2 Separate            [ MANUAL ]
          Ka1 a2 ratio         : 50 (%)
    Peak Search                [ AUTO ]
          differential points  : 5
          FWHM threhold        : 0.050 (deg)
          intensity threhold   : 30 (par mil)
          FWHM ratio  (n-1)/n  : 2
    System error Correction    [ NO ]
    Precise peak Correction    [ NO ]
```

< Group: Standard Data: 2302#22#3a >



Lampiran 13

Hasil data XRD sampel paduan 93Mg-6Zn-1Ca dengan temperature sintering 500℃

*** Basic Data Process ***

Group : Standard
Data : 2302#22#3b

Strongest 3 peaks

no.	peak no.	2Theta (deg)	d (A)	I/I1	FWHM (deg)	Intensity (Counts)	Integrated Int (Counts)
1	42	53.4900	1.71170	100	0.06000	3	16
2	4	16.1700	5.47703	67	0.10000	2	18
3	58	62.2700	1.48978	67	0.10000	2	16

Peak Data List

peak no.	2Theta (deg)	d (A)	I/I1	FWHM (deg)	Intensity (Counts)	Integrated Int (Counts)
1	15.2200	5.81668	33	0.00000	1	0
2	15.6600	5.65423	33	0.00000	1	0
3	15.9200	5.56247	33	0.00000	1	0
4	16.1700	5.47703	67	0.10000	2	18
5	16.4800	5.37469	33	0.00000	1	0
6	17.0200	5.20536	33	0.00000	1	0
7	19.2400	4.60946	33	0.00000	1	0
8	19.5800	4.53018	33	0.00000	1	0
9	21.7400	4.08471	33	0.00000	1	0
10	23.0400	3.85709	33	0.00000	1	0
11	24.0400	3.69886	33	0.00000	1	0
12	27.0000	3.29970	33	0.00000	1	0
13	27.4400	3.24778	33	0.00000	1	0
14	28.3200	3.14883	33	0.00000	1	0
15	29.1400	3.06206	33	0.00000	1	0
16	29.4000	3.03557	33	0.00000	1	0
17	29.7800	2.99769	33	0.00000	1	0
18	30.6200	2.91735	33	0.00000	1	0
19	31.1200	2.87160	33	0.00000	1	0
20	31.7200	2.81864	33	0.00000	1	0
21	35.4800	2.52808	1	0.00000	0	0
22	36.3000	2.47283	1	0.00000	0	0
23	36.9000	2.43398	33	0.00000	1	0
24	37.2600	2.41129	33	0.00000	1	0
25	39.2200	2.29518	33	0.00000	1	0
26	39.4400	2.28289	33	0.00000	1	0
27	40.4800	2.22660	33	0.00000	1	0
28	40.8000	2.20987	1	0.00000	0	0
29	41.3800	2.18023	33	0.00000	1	0
30	41.7600	2.16126	33	0.00000	1	0
31	43.7400	2.06791	33	0.00000	1	0
32	44.9400	2.01544	1	0.00000	0	0
33	45.9400	1.97387	33	0.00000	1	0
34	46.6200	1.94665	33	0.00000	1	0
35	47.0400	1.93024	33	0.00000	1	0
36	50.0000	1.82269	33	0.00000	1	0
37	50.8600	1.79386	33	0.00000	1	0
38	51.8200	1.76287	33	0.00000	1	0
39	52.6400	1.73732	33	0.00000	1	0
40	52.8200	1.73182	33	0.00000	1	0
41	53.1800	1.72094	33	0.00000	1	0
42	53.4900	1.71170	100	0.06000	3	16
43	53.7200	1.70491	1	0.00000	0	0
44	54.1400	1.69267	33	0.00000	1	0
45	55.0200	1.66766	1	0.00000	0	0
46	55.6800	1.64945	33	0.00000	1	0
47	56.1200	1.63756	33	0.00000	1	0
48	56.6800	1.62270	1	0.00000	0	0
49	57.2000	1.60918	33	0.00000	1	0

peak no.	2Theta (deg)	d (A)	I/I1	FWHM (deg)	Intensity (Counts)	Integrated Int (Counts)
50	57.8400	1.59289	33	0.00000	1	0
51	58.0400	1.58787	33	0.00000	1	0
52	58.3000	1.58141	1	0.00000	0	0
53	58.7200	1.57109	1	0.00000	0	0
54	59.2200	1.55902	33	0.00000	1	0
55	60.1400	1.53735	33	0.00000	1	0
56	60.5400	1.52814	33	0.00000	1	0
57	61.8200	1.49954	33	0.00000	1	0
58	62.2700	1.48978	67	0.10000	2	16
59	62.3800	1.48742	1	0.00000	0	0
60	62.6600	1.48144	1	0.00000	0	0
61	63.1200	1.47175	33	0.00000	1	0
62	63.8600	1.45647	33	0.00000	1	0
63	65.7400	1.41929	1	0.00000	0	0
64	66.7200	1.40081	33	0.00000	1	0
65	67.9200	1.37895	33	0.00000	1	0
66	69.6400	1.34904	33	0.00000	1	0
67	71.2400	1.32262	33	0.00000	1	0
68	71.6200	1.31653	33	0.00000	1	0
69	73.2400	1.29136	1	0.00000	0	0
70	73.6800	1.28473	33	0.00000	1	0

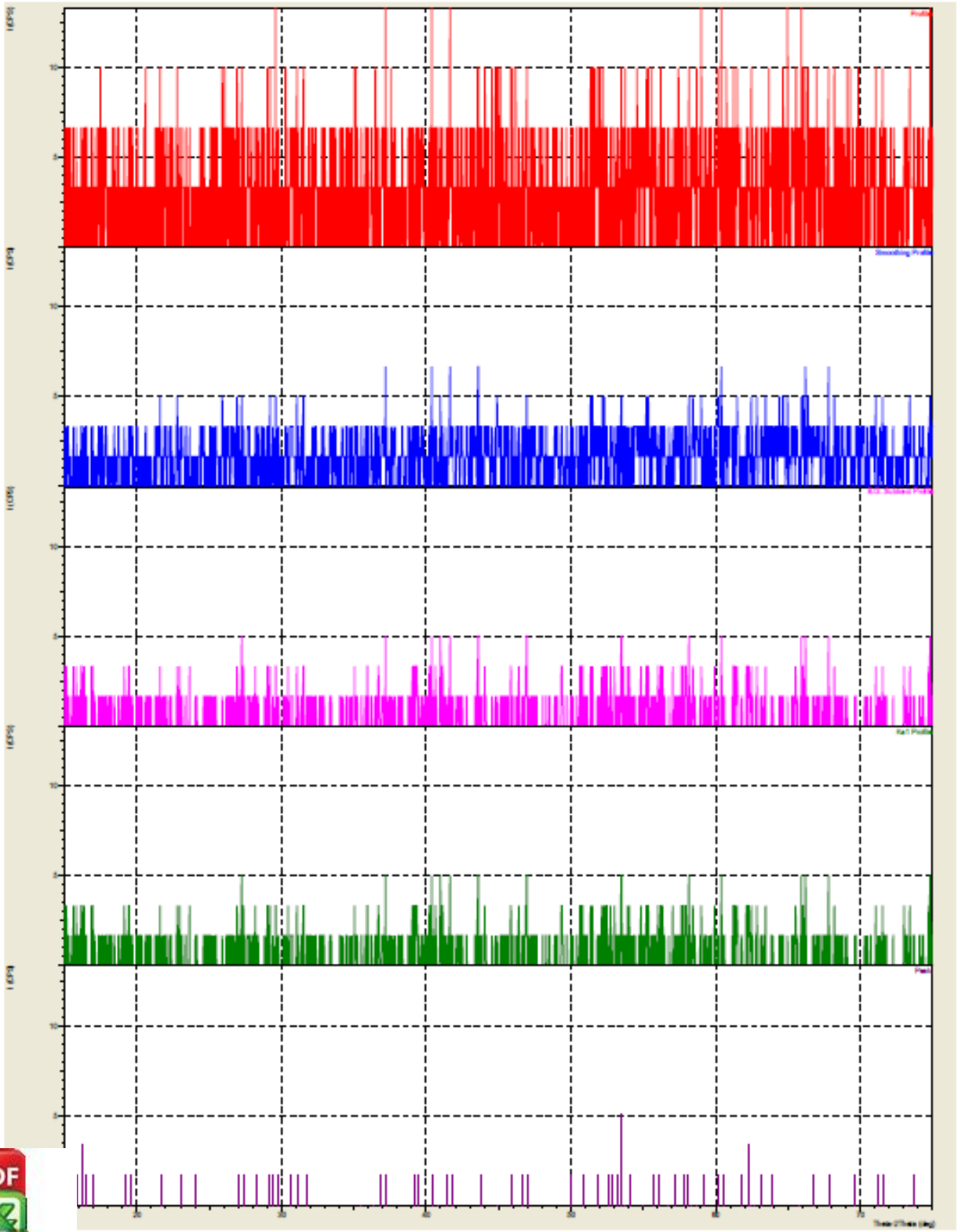
```
          ***  Basic Data Process  ***

# Data Infomation
          Group                : Standard
          Data                 : 2302#22#3b
          Sample Nmae          : padat
          Comment              :
          Date & Time          : 03-09-23 13:00:48

# Measurement Condition
    X-ray tube
          target               : Cu
          voltage              : 40.0 (kV)
          current              : 30.0 (mA)
    Slits
          Auto Slit            : not Used
          divergence slit      :   1.00000 (deg)
          scatter slit         :   1.00000 (deg)
          receiving slit       :   0.30000(mm)
    Scanning
          drive axis           : Theta-2Theta
          scan range           :   15.0000 - 75.0000 (deg)
          scan mode            : Continuous Scan
          scan speed           :    2.0000 (deg/min)
          sampling pitch       :    0.0200 (deg)
          preset time          :    0.60 (sec)

# Data Process Condition
    Smoothing                  [ AUTO ]
          smoothing points     : 3
    B.G.Subtruction            [ AUTO ]
          sampling points      : 5
          repeat times         : 30
    Ka1-a2 Separate            [ MANUAL ]
          Ka1 a2 ratio         : 50 (%)
    Peak Search                [ AUTO ]
          differential points  : 3
          FWHM threhold        : 0.050 (deg)
          intensity threhold   : 30 (par mil)
          FWHM ratio  (n-1)/n  : 2
    System error Correction    [ NO ]
    Precise peak Correction    [ NO ]
```

< Group: Standard Data: 2302#22#3b >



Lampiran 14

Hasil data XRD sampel paduan 97Mg-2Zn-1Ca dengan temperature sintering 500℃

*** Basic Data Process ***

Group : Standard
Data : 2302#22#3c

Strongest 3 peaks

no.	peak no.	2Theta (deg)	d (A)	I/I1	FWHM (deg)	Intensity (Counts)	Integrated Int (Counts)
1	22	39.7850	2.26388	100	0.09000	2	10
2	31	48.6600	1.86970	100	0.10000	2	15
3	3	16.8200	5.26680	50	0.00000	1	0

Peak Data List

peak no.	2Theta (deg)	d (A)	I/I1	FWHM (deg)	Intensity (Counts)	Integrated Int (Counts)
1	15.5600	5.69034	50	0.00000	1	0
2	16.5800	5.34250	50	0.00000	1	0
3	16.8200	5.26680	50	0.00000	1	0
4	17.3000	5.12174	50	0.00000	1	0
5	18.1600	4.88108	50	0.00000	1	0
6	20.3600	4.35835	50	0.00000	1	0
7	23.0800	3.85050	50	0.00000	1	0
8	23.9000	3.72021	50	0.00000	1	0
9	24.6800	3.60438	50	0.00000	1	0
10	25.3400	3.51197	50	0.00000	1	0
11	26.8800	3.31416	50	0.00000	1	0
12	27.5000	3.24083	50	0.00000	1	0
13	28.7800	3.09954	50	0.00000	1	0
14	29.8400	2.99180	50	0.00000	1	0
15	30.8800	2.89337	50	0.00000	1	0
16	32.9600	2.71538	50	0.00000	1	0
17	35.5000	2.52670	50	0.00000	1	0
18	37.2200	2.41379	50	0.00000	1	0
19	37.6400	2.38782	50	0.00000	1	0
20	38.0600	2.36243	50	0.00000	1	0
21	39.1400	2.29969	50	0.00000	1	0
22	39.7850	2.26388	100	0.09000	2	10
23	40.4000	2.23083	50	0.00000	1	0
24	42.1000	2.14459	50	0.00000	1	0
25	42.3200	2.13395	50	0.00000	1	0
26	43.4800	2.07967	50	0.00000	1	0
27	45.9800	1.97224	50	0.00000	1	0
28	46.3400	1.95776	50	0.00000	1	0
29	47.3000	1.92024	50	0.00000	1	0
30	47.9600	1.89534	50	0.00000	1	0
31	48.6600	1.86970	100	0.10000	2	15
32	48.9200	1.86037	50	0.00000	1	0
33	50.9200	1.79189	50	0.00000	1	0
34	52.7000	1.73548	50	0.00000	1	0
35	53.9600	1.69789	50	0.00000	1	0
36	54.1600	1.69210	50	0.00000	1	0
37	55.8200	1.64564	50	0.00000	1	0
38	56.9000	1.61695	50	0.00000	1	0
39	57.2600	1.60763	50	0.00000	1	0
40	59.1000	1.56190	50	0.00000	1	0
41	60.3800	1.53181	50	0.00000	1	0
42	61.4400	1.50790	50	0.00000	1	0
43	61.8200	1.49954	50	0.00000	1	0
44	64.5400	1.44275	1	0.00000	0	0
5	64.7600	1.43838	50	0.00000	1	0
6	65.4200	1.42546	50	0.00000	1	0
7	65.6000	1.42198	50	0.00000	1	0
8	65.7800	1.41853	50	0.00000	1	0
9	66.2800	1.40903	50	0.00000	1	0

peak no.	2Theta (deg)	d (A)	I/I1	FWHM (deg)	Intensity (Counts)	Integrated Int (Counts)
50	66.8200	1.39895	50	0.00000	1	0
51	68.1600	1.37468	50	0.00000	1	0
52	70.2800	1.33831	50	0.00000	1	0
53	71.4200	1.31972	50	0.00000	1	0
54	72.1400	1.30831	50	0.00000	1	0
55	73.3000	1.29045	50	0.00000	1	0

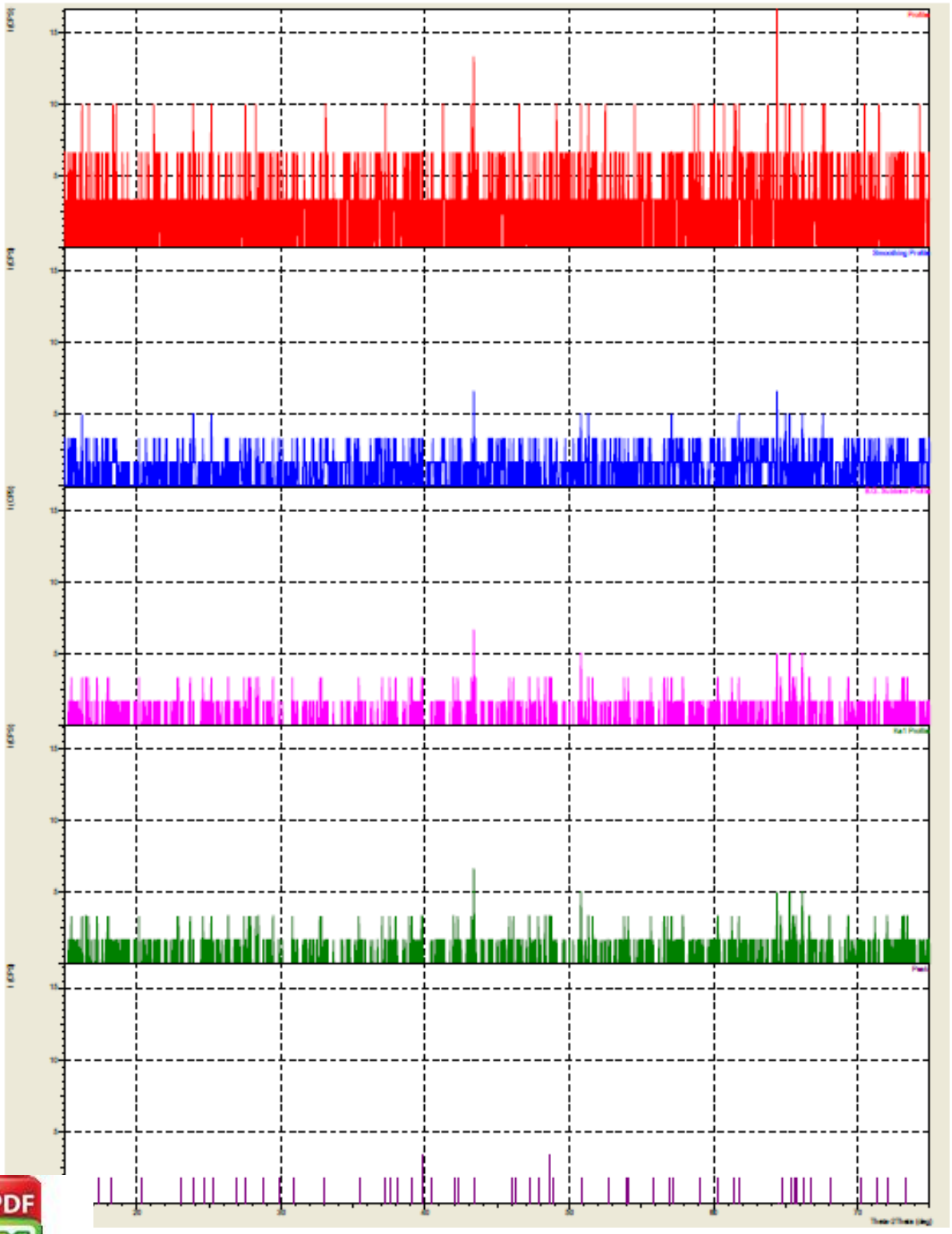
*** Basic Data Process ***

```
# Data Infomation
          Group                : Standard
          Data                 : 2302#22#3c
          Sample Nmae          : padat
          Comment              :
          Date & Time          : 03-09-23 13:33:26

# Measurement Condition
    X-ray tube
          target               : Cu
          voltage              : 40.0 (kV)
          current              : 30.0 (mA)
    Slits
          Auto Slit            : not Used
          divergence slit      :   1.00000 (deg)
          scatter slit         :   1.00000 (deg)
          receiving slit       :   0.30000(mm)
    Scanning
          drive axis           : Theta-2Theta
          scan range           :   15.0000 - 75.0000 (deg)
          scan mode            : Continuous Scan
          scan speed           :    2.0000 (deg/min)
          sampling pitch       :    0.0200 (deg)
          preset time          :    0.60 (sec)

# Data Process Condition
    Smoothing                  [ AUTO ]
          smoothing points     : 3
    B.G.Subtruction            [ AUTO ]
          sampling points      : 3
          repeat times         : 30
    Ka1-a2 Separate            [ MANUAL ]
          Ka1 a2 ratio         : 50 (%)
    Peak Search                [ AUTO ]
          differential points  : 3
          FWHM threhold        : 0.050 (deg)
          intensity threhold   : 30 (par mil)
          FWHM ratio  (n-1)/n  : 2
      'stem error Correction   [ NO ]
      'ecise peak Correction   [ NO ]
```

< Group: Standard Data: 2302#22#3c >



Lampiran 15

Fasa analisis XRD sampel paduan Mg-Zn-Ca dengan temperature sintering 500℃

Match! Phase Analysis Report

Matched Phases

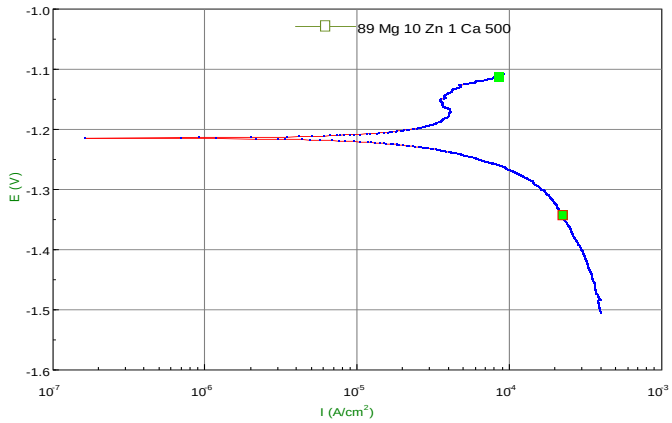
A: Magnesium	
Formula sum	Mg
Entry number	96-901-3062
Figure-of-Merit (FoM)	0.752774
Total number of peaks	16
Peaks in range	10
Peaks matched	10
Intensity scale factor	0.60
Space group	P 63/m m c
Crystal system	hexagonal
Unit cell	a= 3.2485 Å c= 5.2772 Å
I/Icor	4.14
Calc. density	1.673 g/cm³
Reference	Raynor G. V., Hume-Rothery W, "A technique for the X-ray powder photography of reactive metals and alloys with special reference to the lattice spacing of magnesium at high temperatures Locality: synthetic Sample: at T = 506.8 C Note: experiment", Journal of the Institute of Metals **65**, 477-485 (1939)

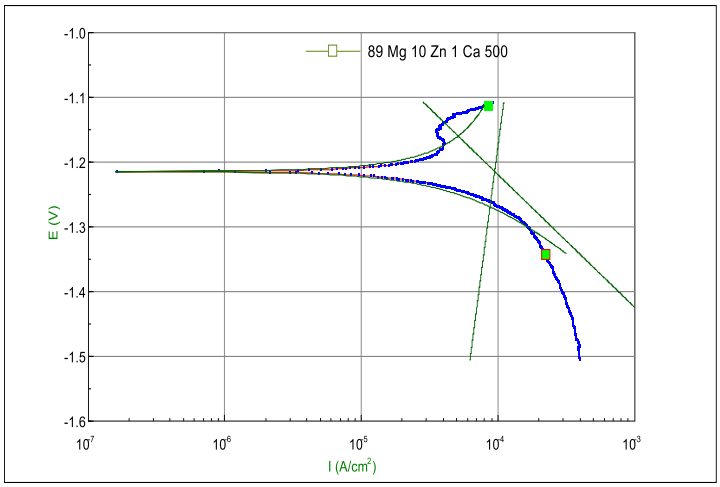
B: Calcium	
Formula sum	Ca
Entry number	96-901-2917
Figure-of-Merit (FoM)	0.775866
Total number of peaks	6
Peaks in range	3
Peaks matched	3
Intensity scale factor	0.66
Space group	I m -3 m
Crystal system	cubic
Unit cell	a= 3.5590 Å
I/Icor	10.03
Calc. density	2.951 g/cm³
Reference	Olijnyk H., Holzapfel W. B., "Phase transitions in alkaline earth metals under pressure Locality: synthetic Sample: P = 26.5 GPa", Physics Letters **100A**, 191-194 (1984)

C: Zinc	
Formula sum	Zn
Entry number	96-901-1600
Figure-of-Merit (FoM)	0.755671
Total number of peaks	12
Peaks in range	6
Peaks matched	6
Intensity scale factor	0.44
Space group	P 63/m m c
Crystal system	hexagonal
Unit cell	a= 2.6700 Å c= 4.9660 Å
I/Icor	10.94
Calc. density	7.083 g/cm³
Reference	Hull A. W., Davey W. P., "Graphical determination of hexagonal and tetragonal crystal structures from X-ray data Locality: synthetic", Physical Review **17**, 549-570 (1921)

Lampiran 16

Hasil data Polarisasi sampel paduan 89Mg-10Zn-1Ca dengan temperature sintering 500°C





ba (mV) = 1606.3

bc (mV) = 204.69

i0 (Amps/cm²) = 9.4829E-05

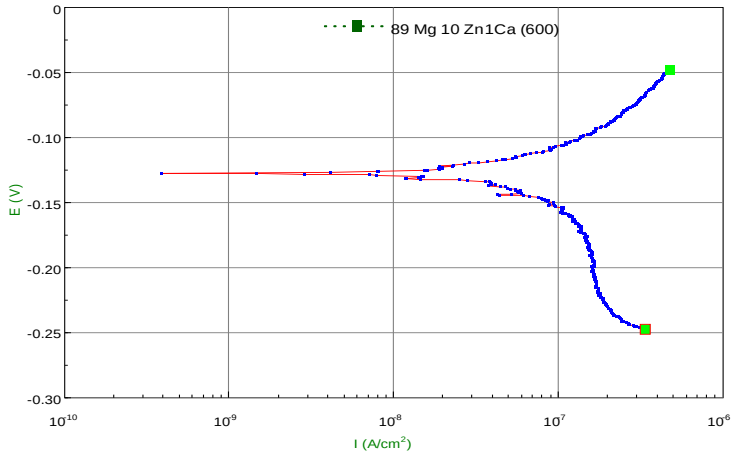
E0 (Volts) = -1.2153

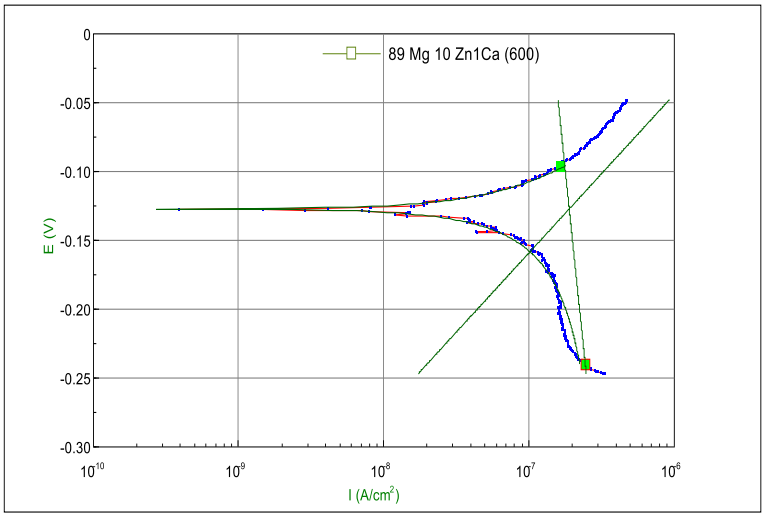
Corrosion rate(MPY) = 0.5359

Residual = 2.7584E-07

Lampiran 17

Hasil data Polarisasi sampel paduan 89Mg-10Zn-1Ca dengan temperature sintering 600°C





ba (mV) = 115.04

bc (mV) = 1023.4

i0 (Amps/cm²) = 1.9036E-07

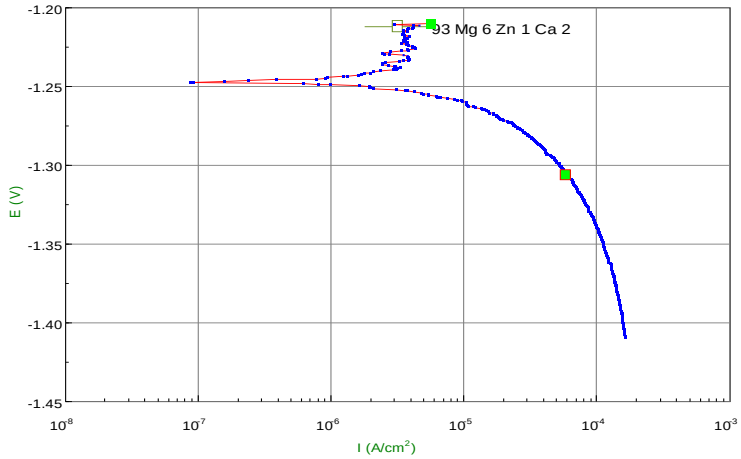
E0 (Volts) = -0.12758

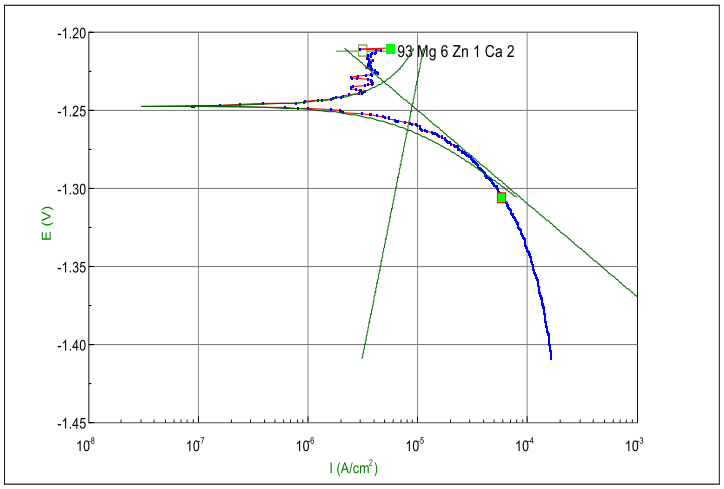
Corrosion rate(MPY) = 0.02925

4.8395E-14

Lampiran 18

Hasil data Polarisasi sampel paduan 93Mg-6Zn-1Ca dengan temperature sintering 600°C





ba (mV) = 355.07

bc (mV) = 59.672

i0 (Amps/cm²) = 8.9245E-06

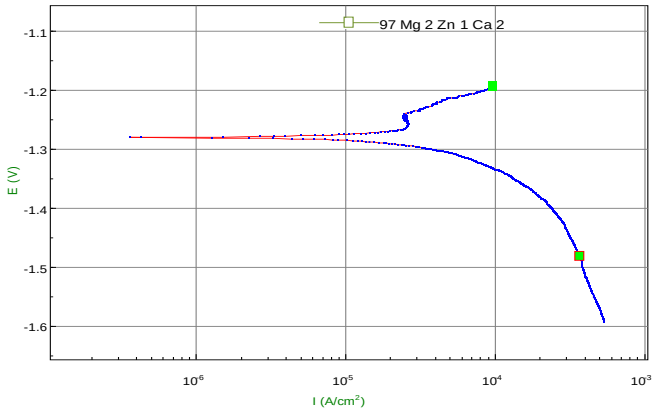
E0 (Volts) = -1.2474

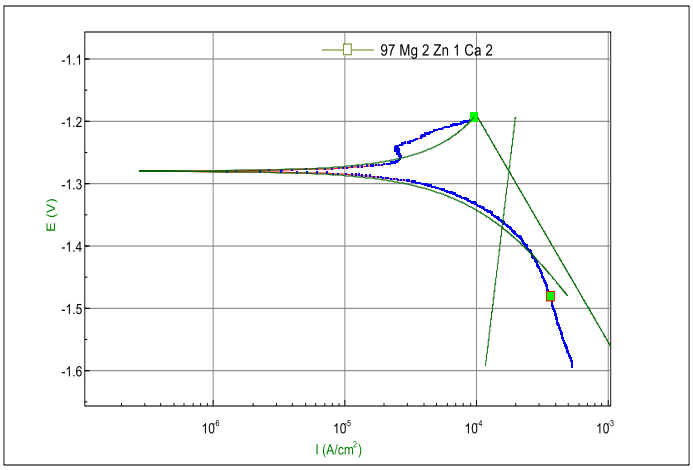
Corrosion rate(MPY) = 0.042309

: 5.1757E-09

Lampiran 19

Hasil data Polarisasi sampel paduan 97Mg-2Zn-1Ca dengan temperature sintering 600°C





ba (mV) = 1751

bc (mV) = 363.13

i0 (Amps/cm²) = 0.00017698

E0 (Volts) = -1.2807

Corrosion rate(MPY) = 0.56622

Residual = 3.2605E-05

Lampiran 20

Hasil data uji pH sampel paduan Mg-Zn-Ca dengan temperature sintering 500℃ dengan menggunakan Aquades (kontrol)

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Laman : www.poliupg.ac.id / E-Mail : pnup@poliupg.ac.id

SURAT KETERANGAN HASIL ANALISIS SAMPEL
Nomor : 003/HI-TK/PNUP/II/2023

Pengirim : Yuliana Simons / D022211003
Institusi : Teknik Mesin S2 Unhas
Jenis Sampel : Material (Paduan Mg-Zn-Ca)
Parameter Uji : pH
Tanggal Uji : 20 -23 Februari 2023

No	Kode Sampel	Lama perendaman	Hasil Uji (Nilai pH)
1.	89 Mg - 10 Zn – 1 Ca	72 Jam (3 hari, 3 malam)	9,60
2.	93 Mg - 6 Zn – 1 Ca	72 Jam (3 hari, 3 malam)	9,69
3.	97 Mg - 2 Zn – 1 Ca	72 Jam (3 hari, 3 malam)	9,60
4.	Aquabides (Kontrol)	-	8,98

Makassar, 23 Februari 2023
Ketua Jurusan Teknik Kimia

Dr. Ir. Herman Bangngalino, M.T
196108311990031002