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LAMPIRAN

Lampiran 1. Jadwal penelitian

No.	Kegiatan	Bulan ke								
		4	5	6	7	8	9	10	11	12
1.	Studi Literatur									
2.	Penentuan rumusan masalah dan tujuan dalam penelitian									
3.	Seminar Proposal									
4.	Persiapan alat dan bahan peneiltian									
5.	Pembuatan specimen untuk pengujian									
6.	Pembuatan larutan garam dan larutan perendaman									
7.	Proses sel galvanik dan observasi mikroskop									
8.	Proses Pack Carburizing									
9.	Proses hardness test dan pengujian struktur mikro									

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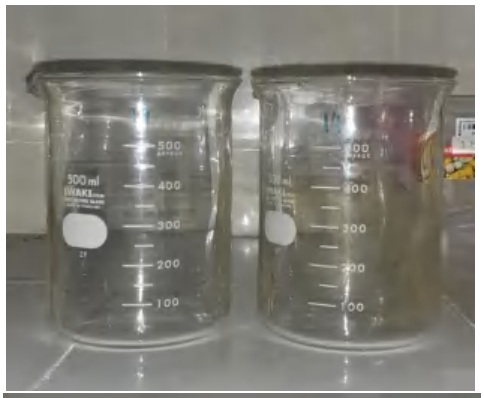
Lampiran 2. Alat dan Bahan

ALAT



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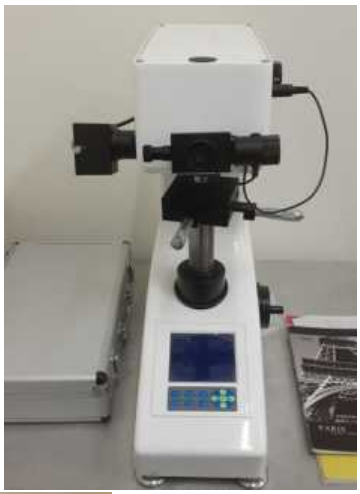

BAHAN

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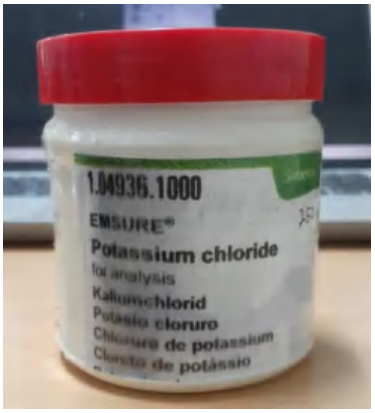

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Lampiran 3. Galvanic treatment proses

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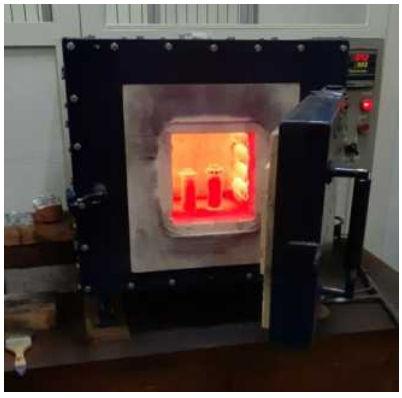
Lampiran 4. Pack carburizing proses



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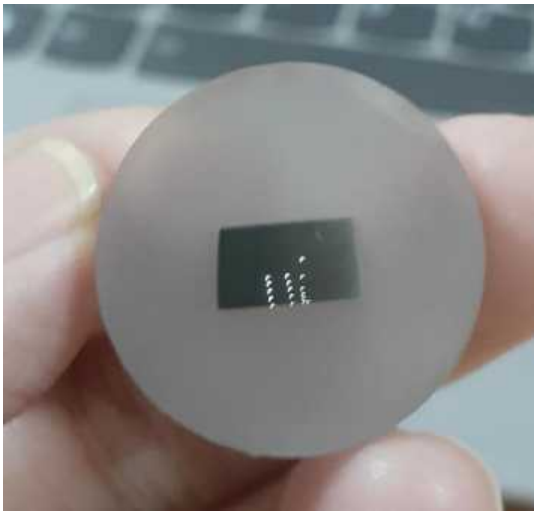
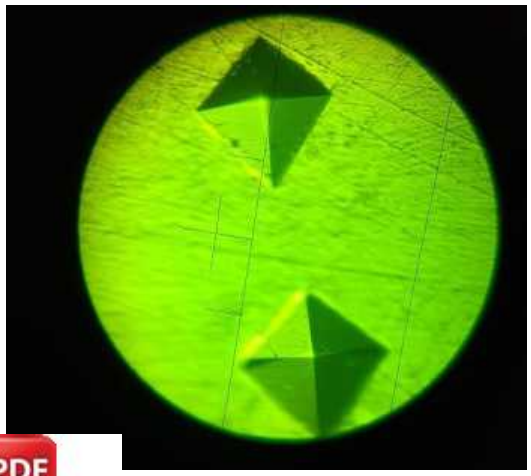
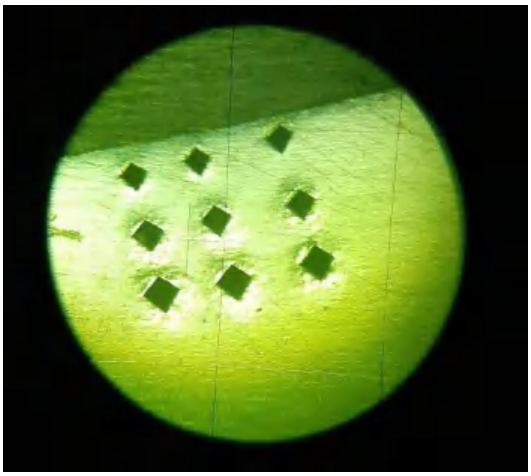
Lampiran 5. Pengujian kekerasan







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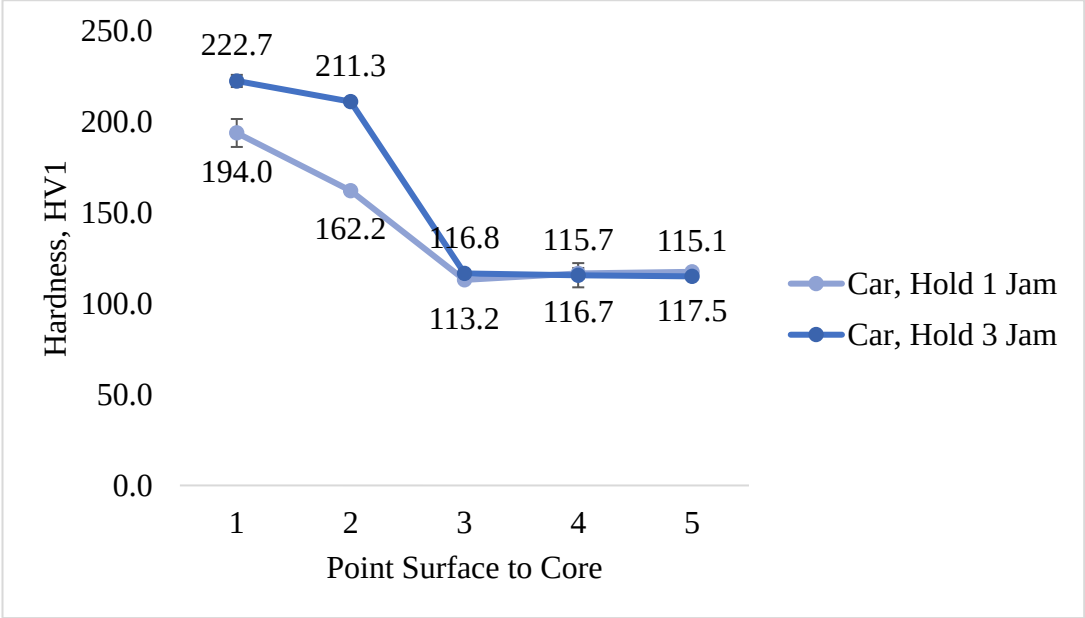
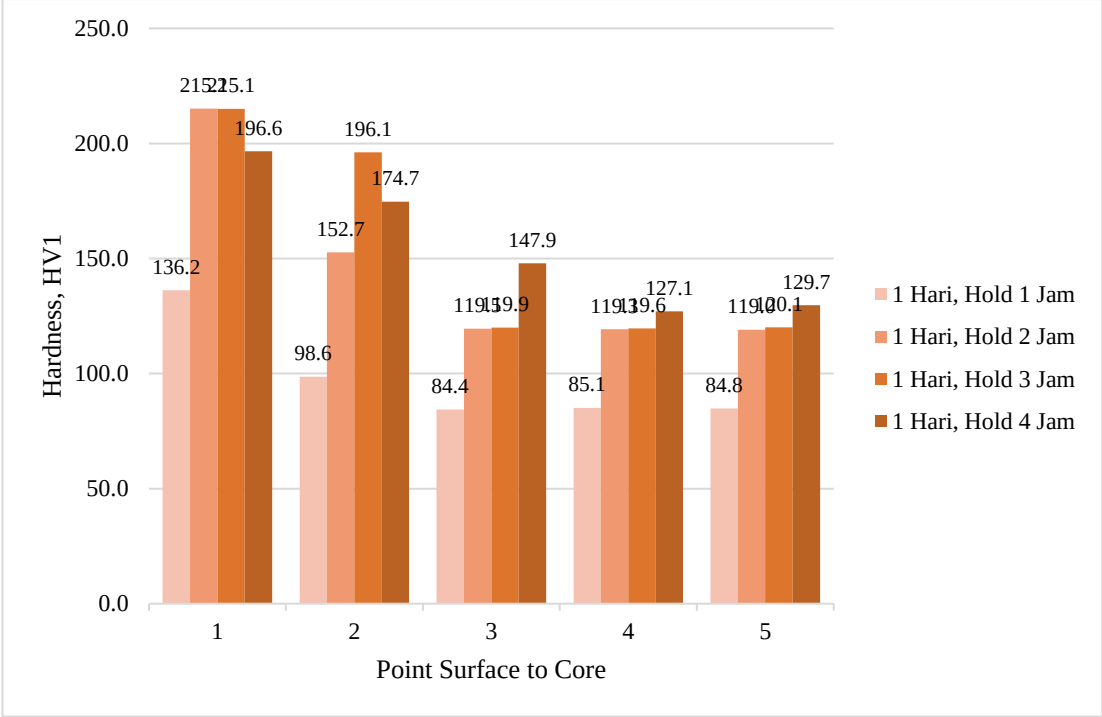
Lampiran 6. Grafik hasil pengujian kekerasan



HARDNESS BERDASARKAN VARIASI CARBURIZING TIME



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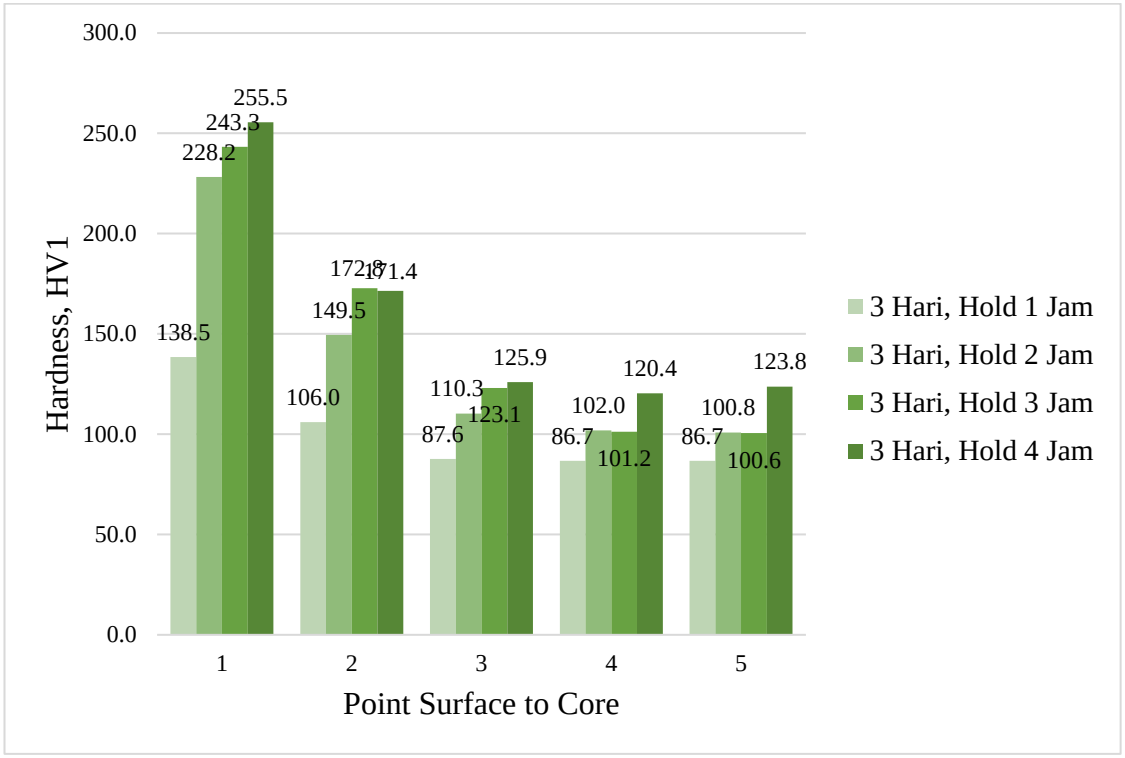

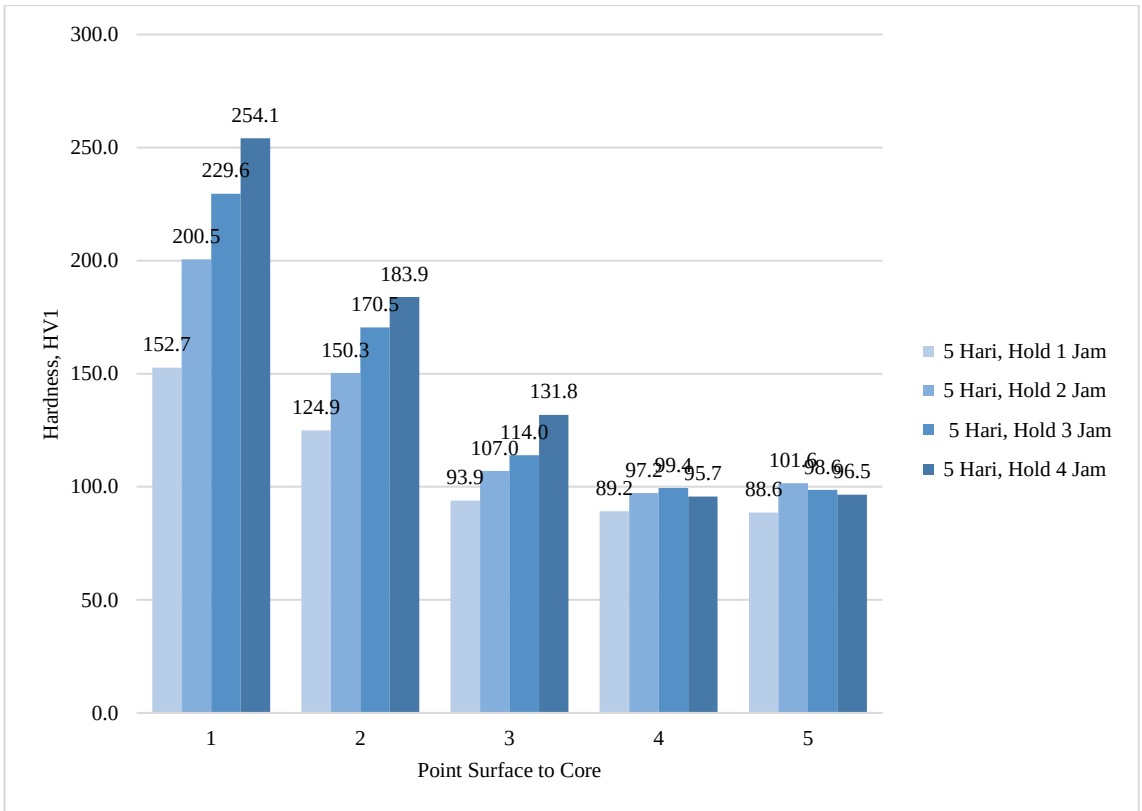

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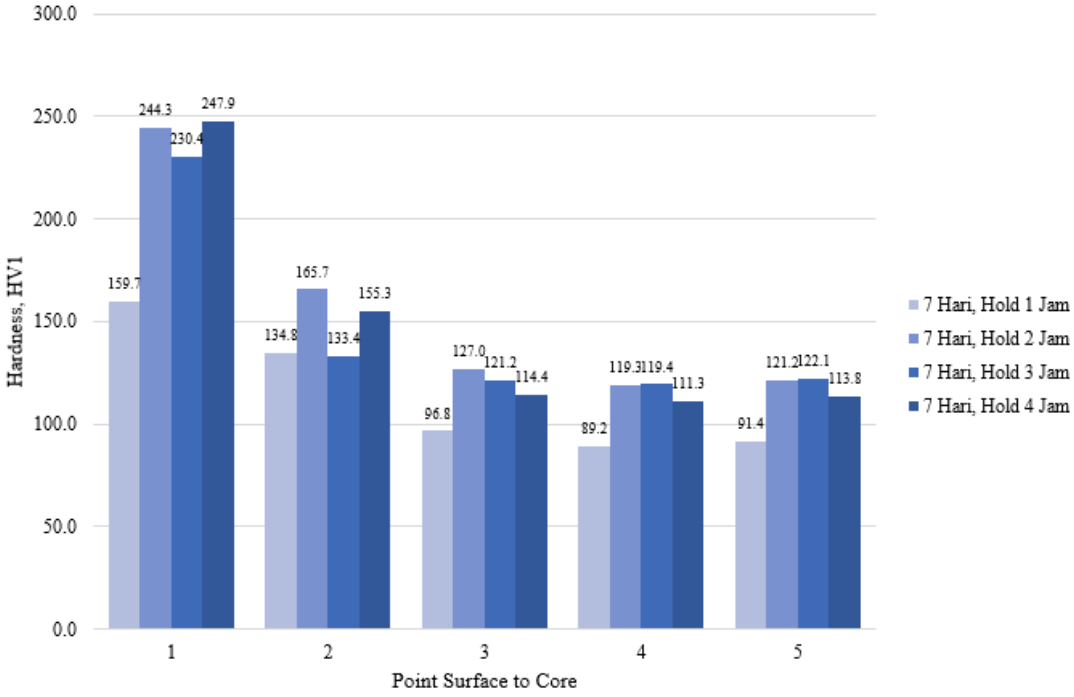
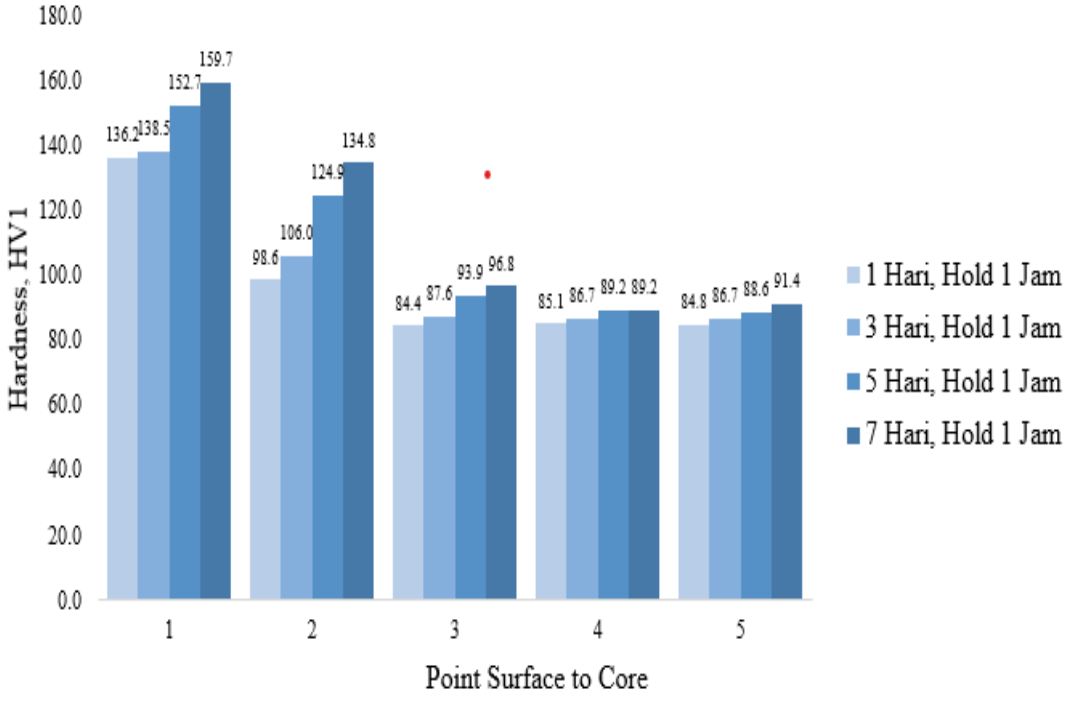


HARDNESS BERDASARKAN VARIASI HARI



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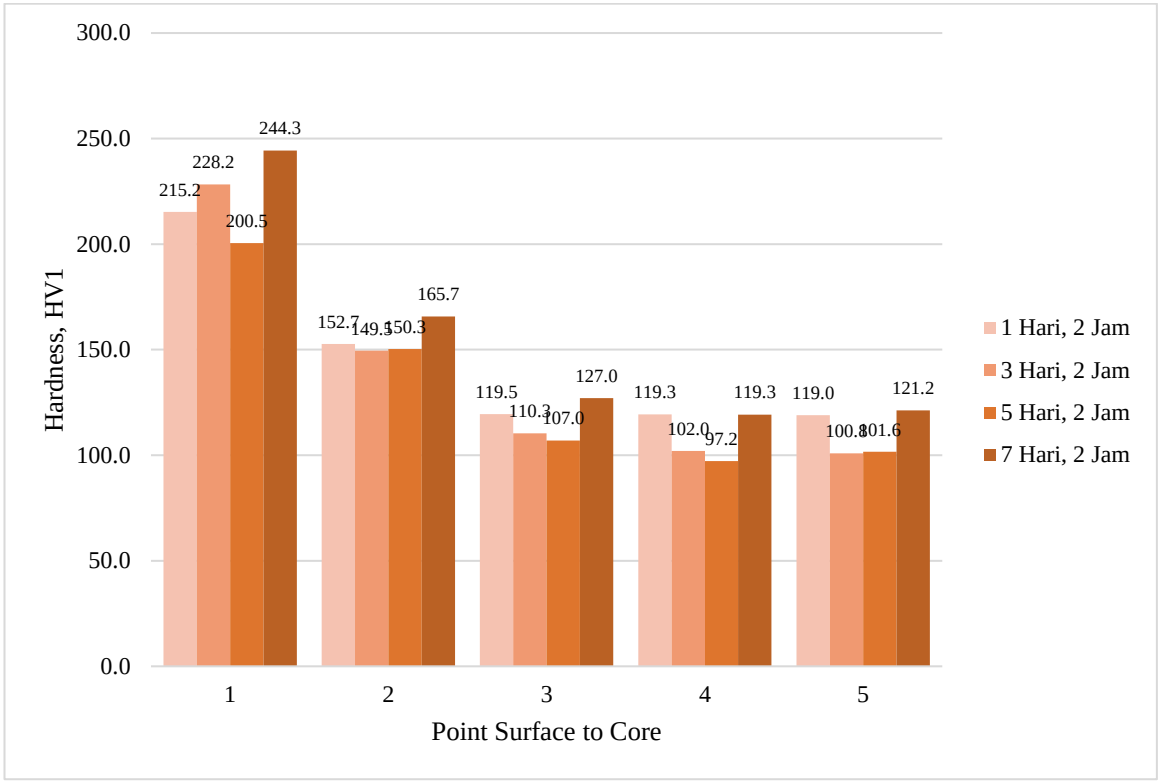

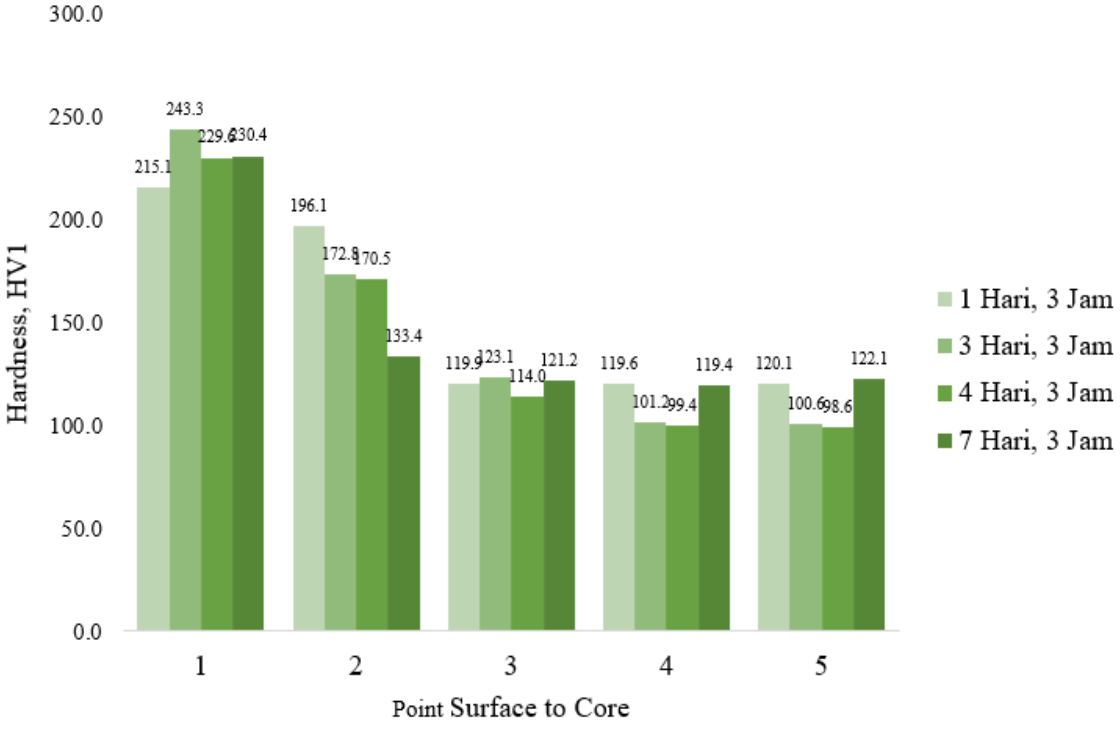

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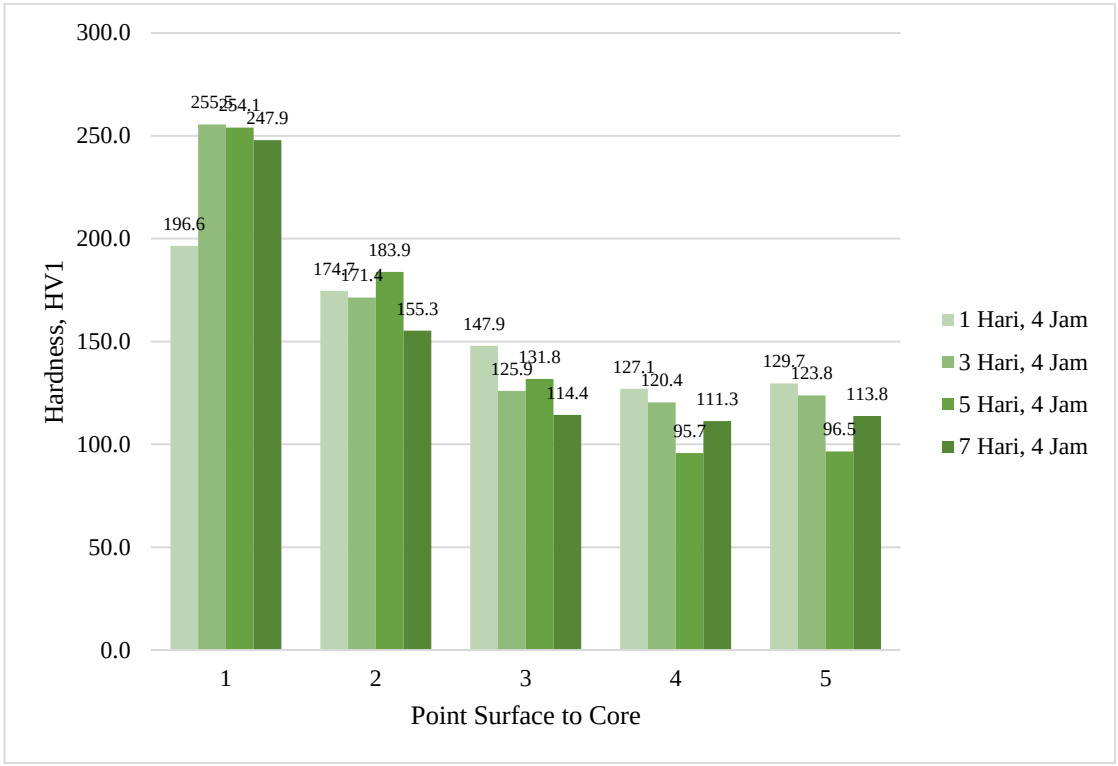

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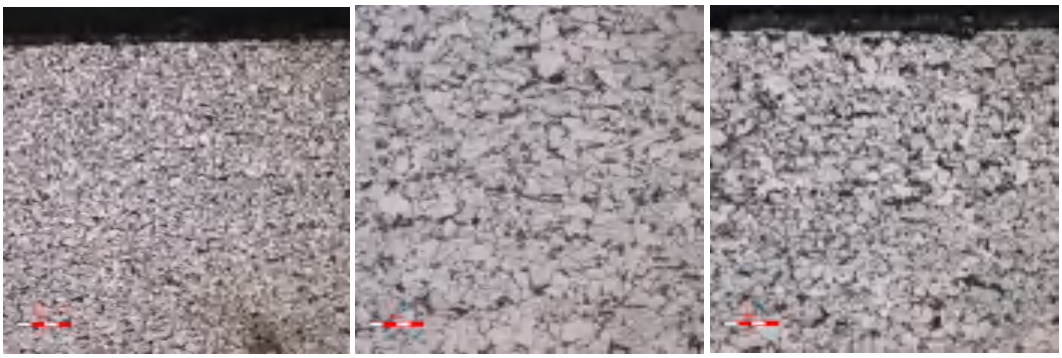
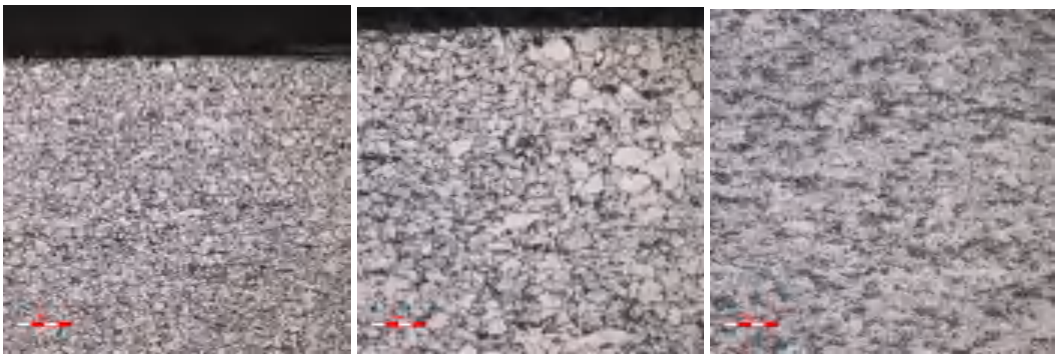
Lampiran 7. Hasil pengujian metalografi

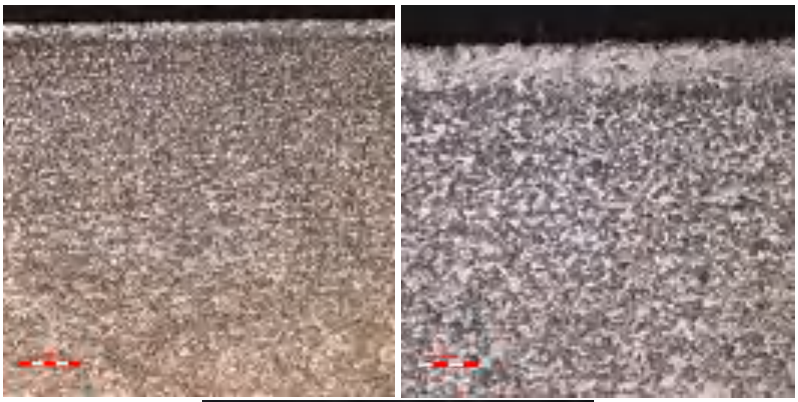
Microstructure raw material (ASTM-A36)



Microstructure baja A36 galvanic treatment 7 hari



Microstructure baja A36 pack carburizing, holding time 1 jam



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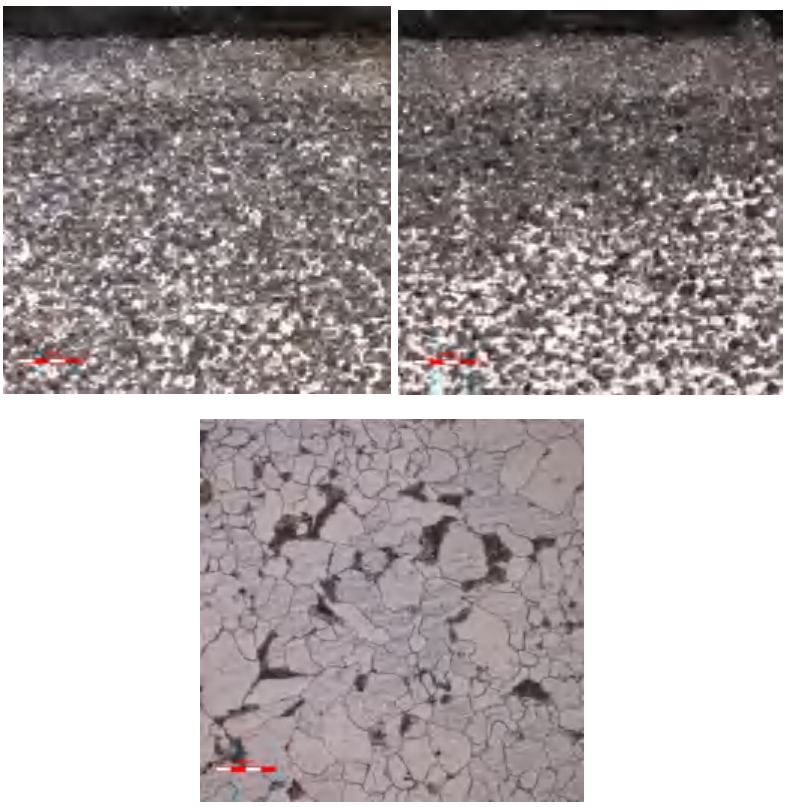
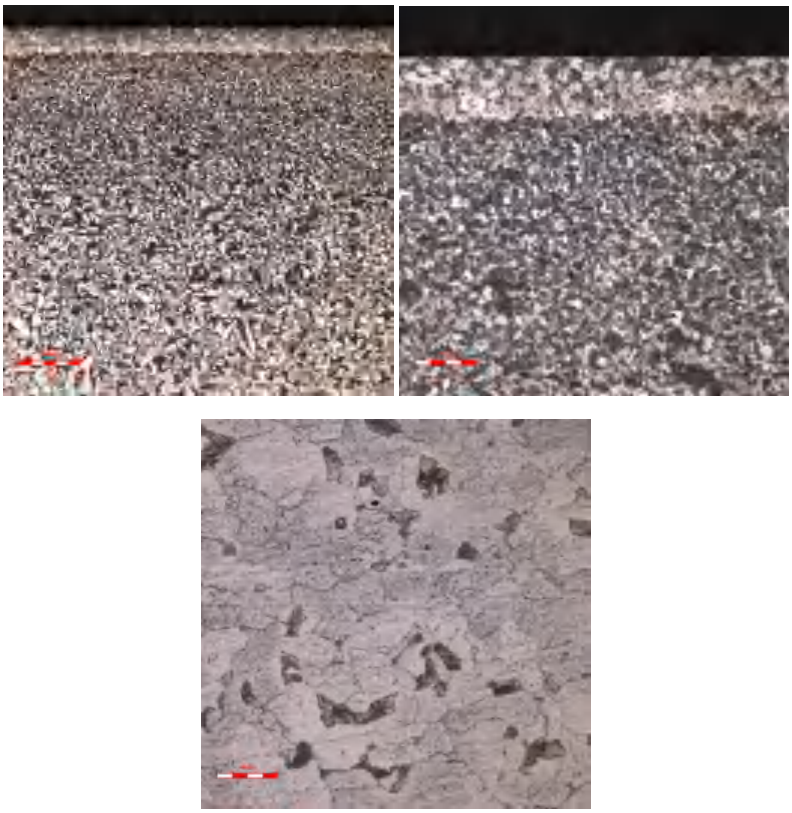
Microstructure baja A36 pack carburizing, holding time 2 jam



Microstructure baja A36 pack carburizing, holding time 3 jam



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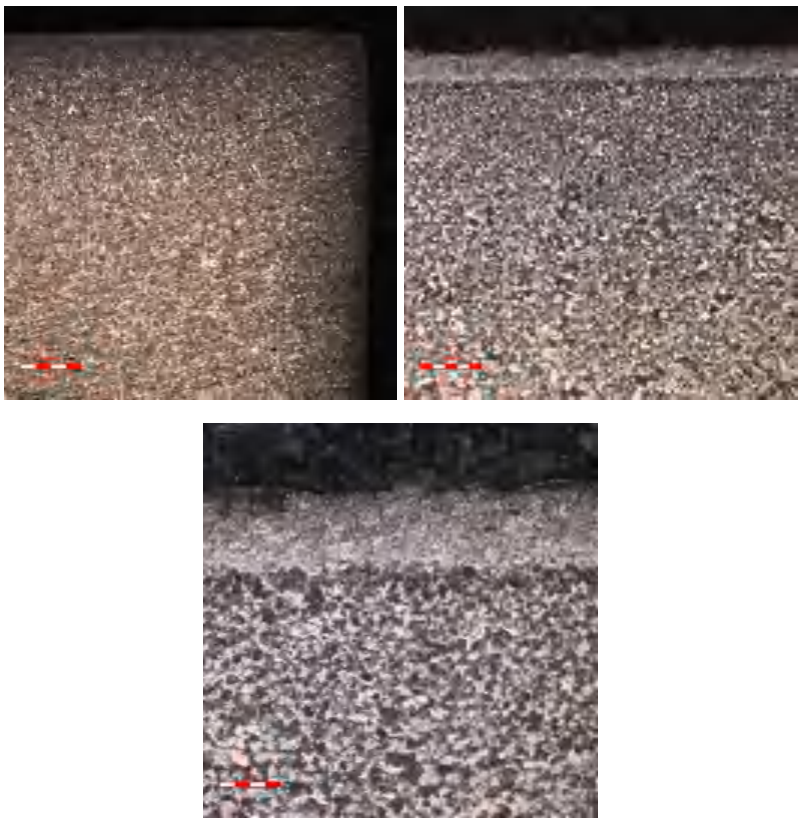
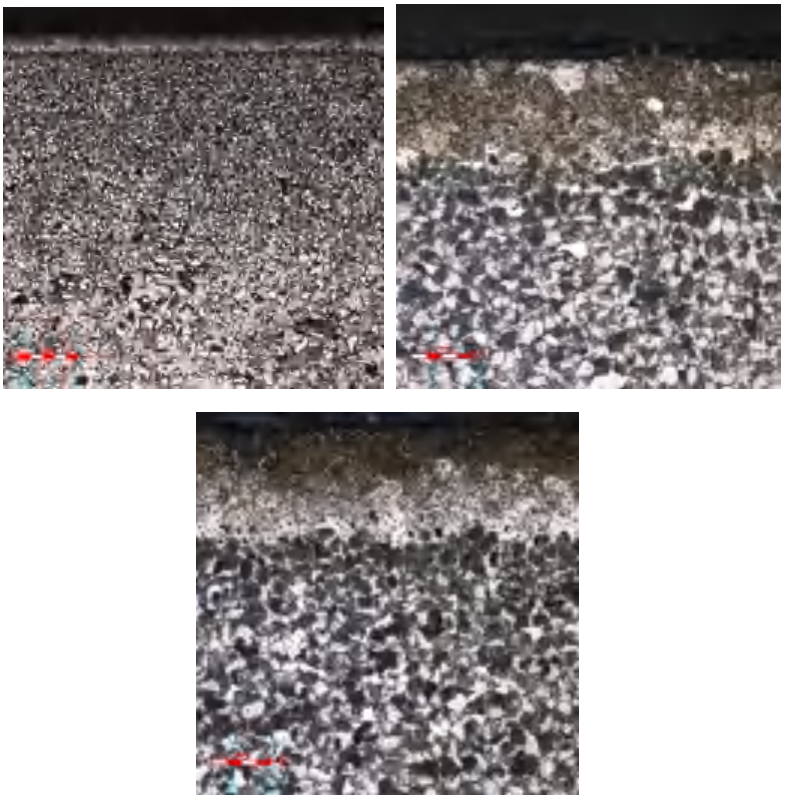
Microstructure baja A36 pack carburizing, holding time 4 jam



Microstructure galvanic treatment 1 Hari carburizing time 2 Jam



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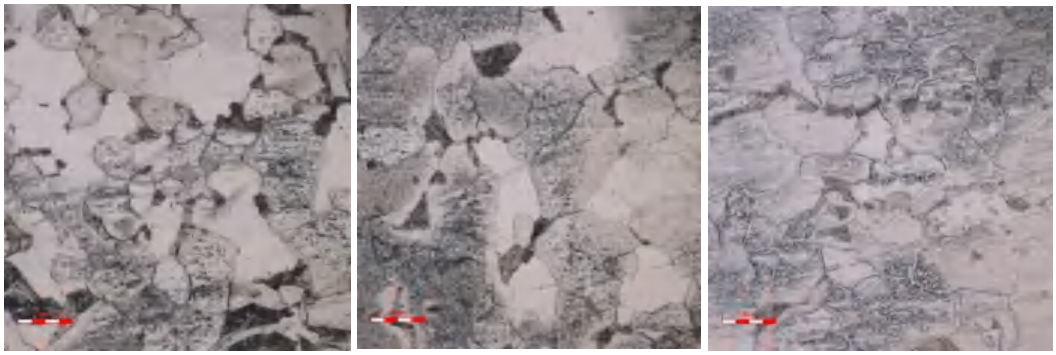
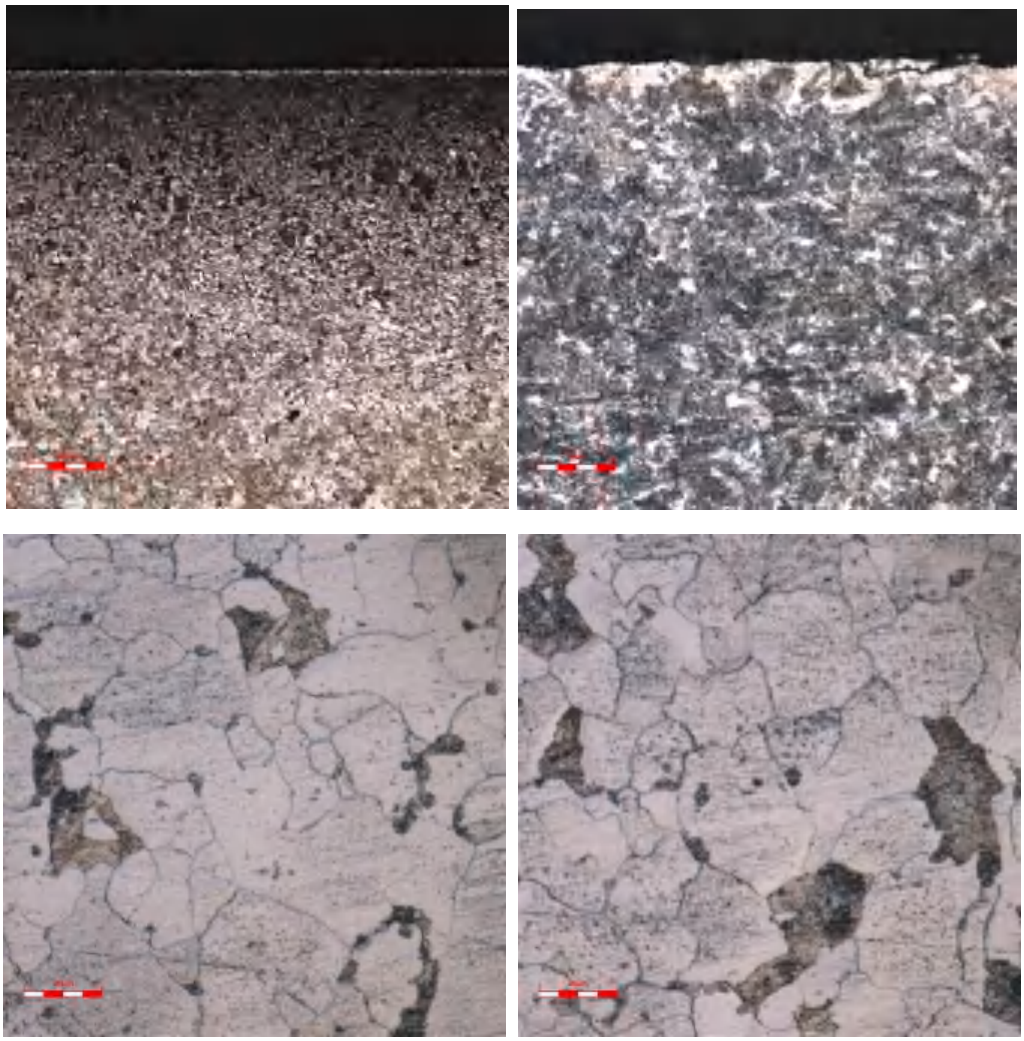


Microstructure galvanic treatment 3 hari carburizing time 2 jam



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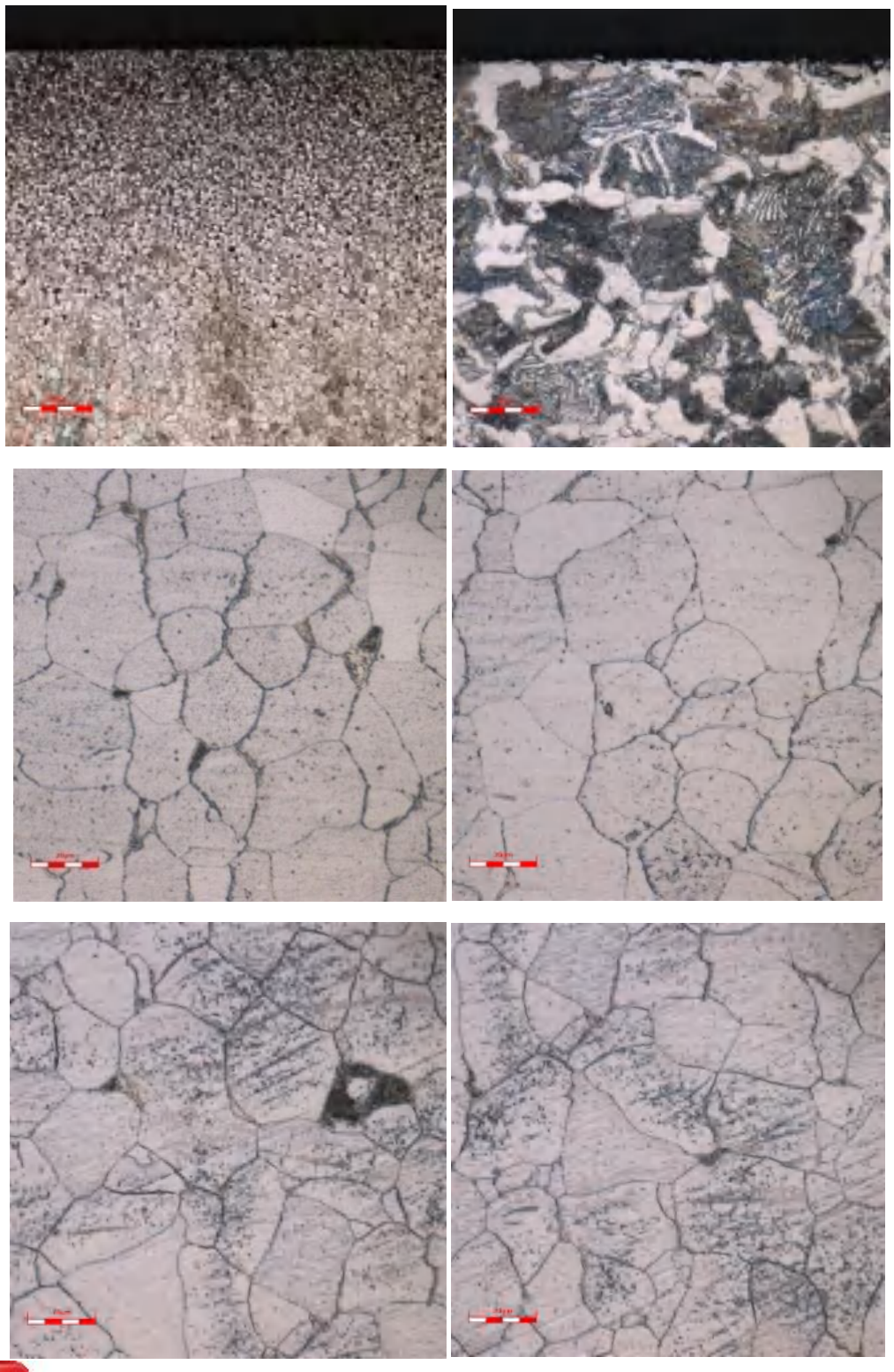
Microstructure galvanic treatment 5 Hari carburizing time 2 Jam



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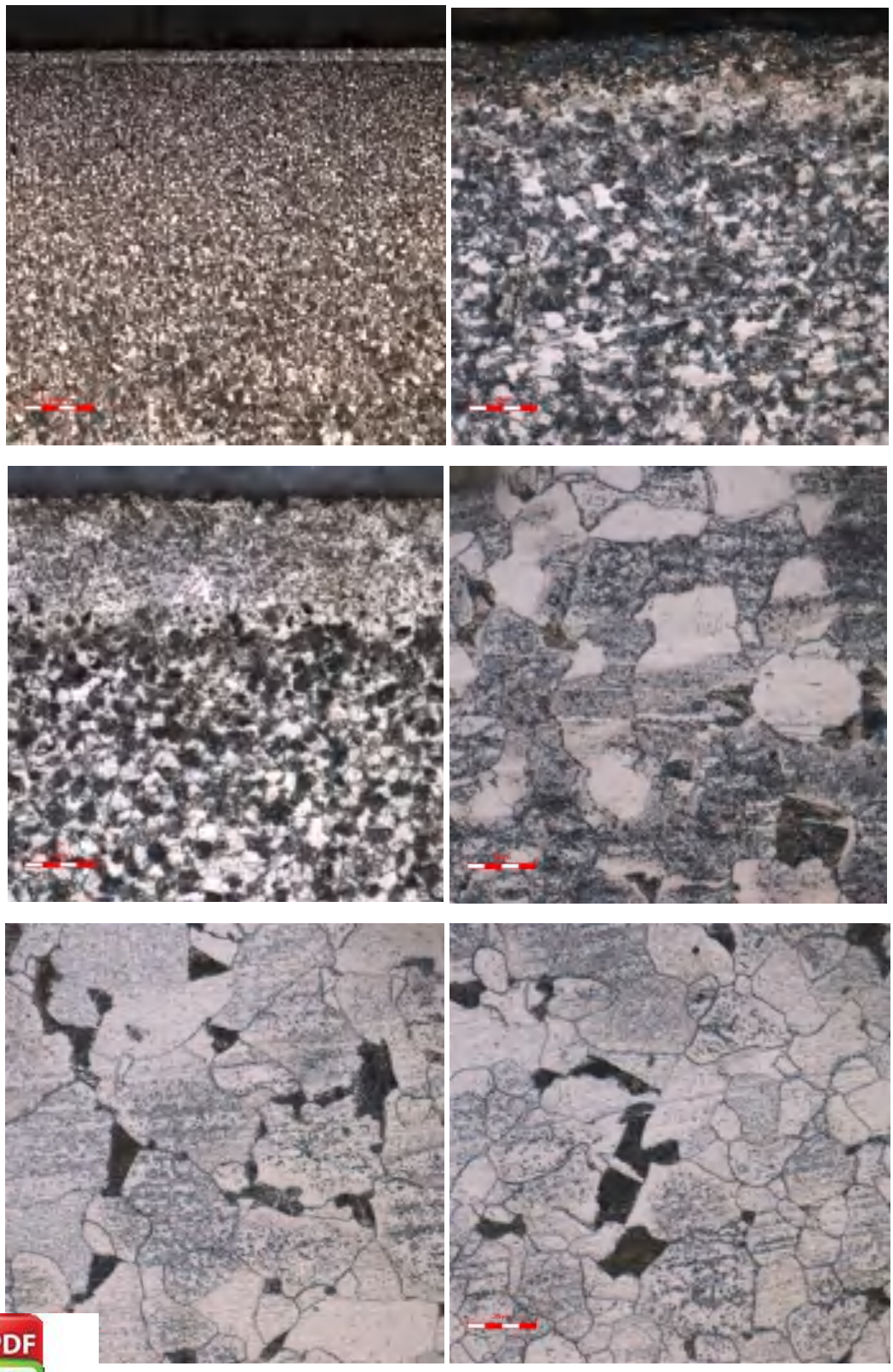
Microstructure galvanic treatment 7 hari carburizing time 2 jam



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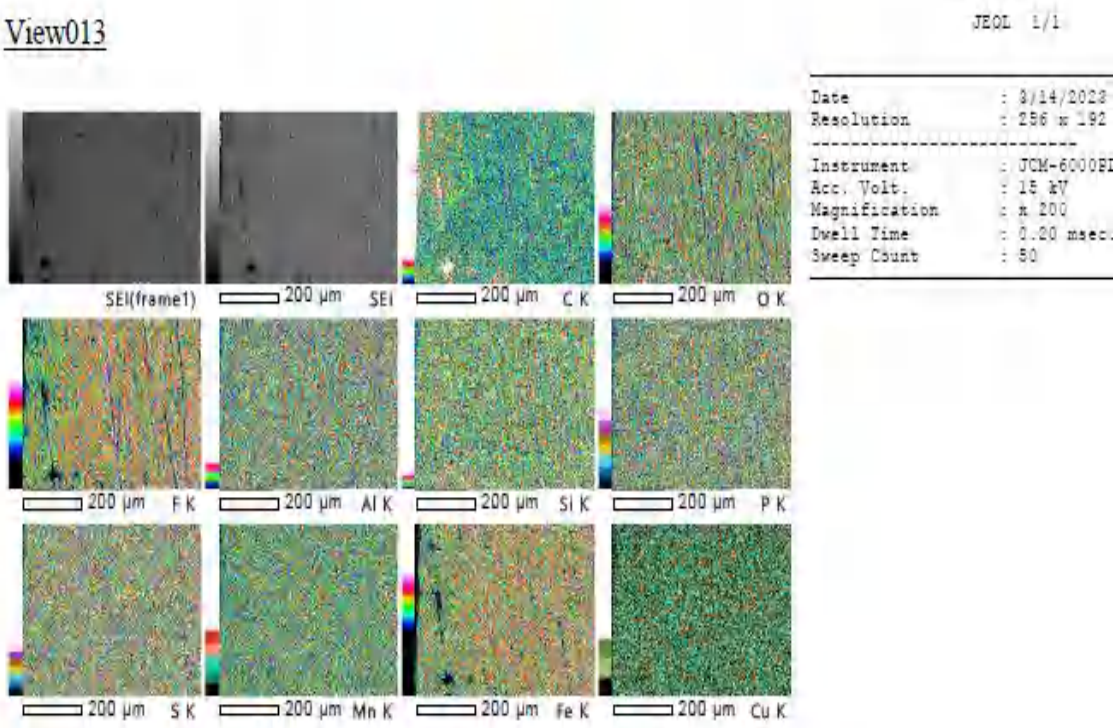
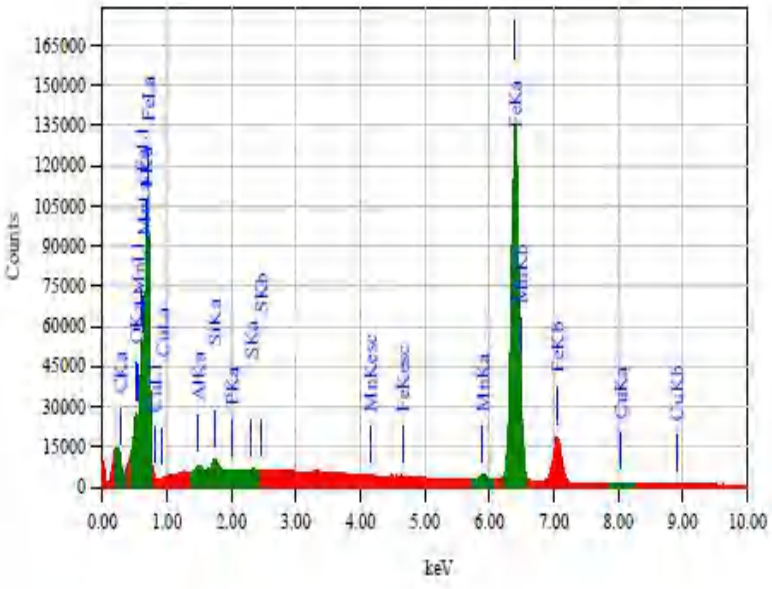
Lampiran 8. Hasil pengujian EDS

Mapping spesimen pack carburizing galvanic treatmen 3 hari 2 jam





Acquisition Parameter
Instrument : JCM-6000PLUS
Acc. Voltage : 15.0 kV
Probe Current: 1.00000 nA
PHA mode : T3
Real Time : 491.52 sec
Live Time : 466.89 sec
Dead Time : 4 %
Counting Rate: 15266 cps
Energy Range : 0 - 20 keV

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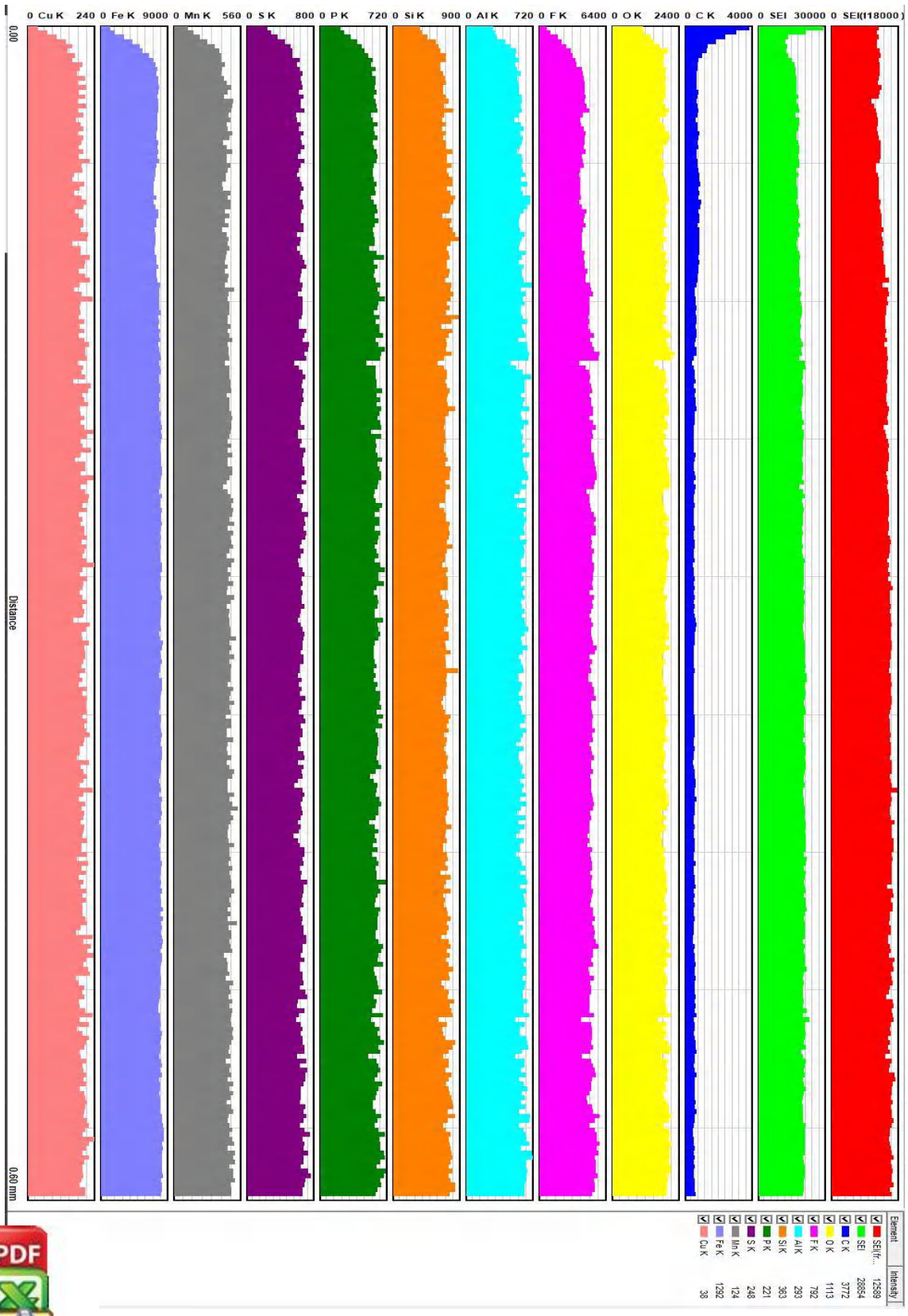
Spektrum mapping spesimen pack carburizing galvanic treatment



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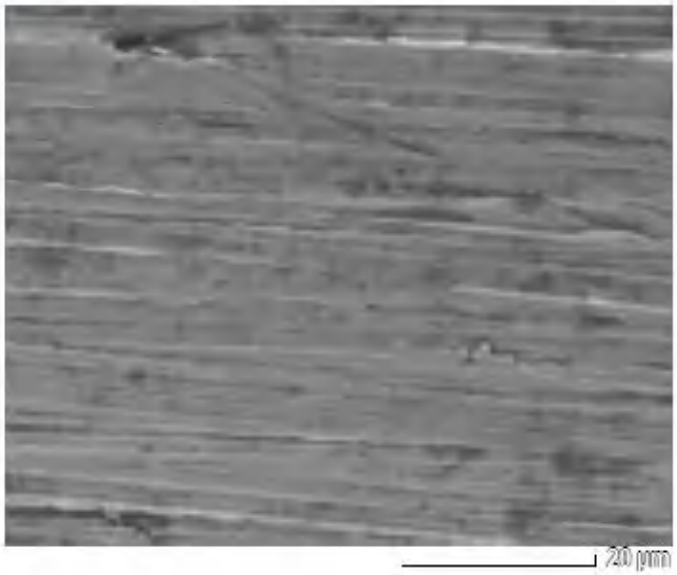
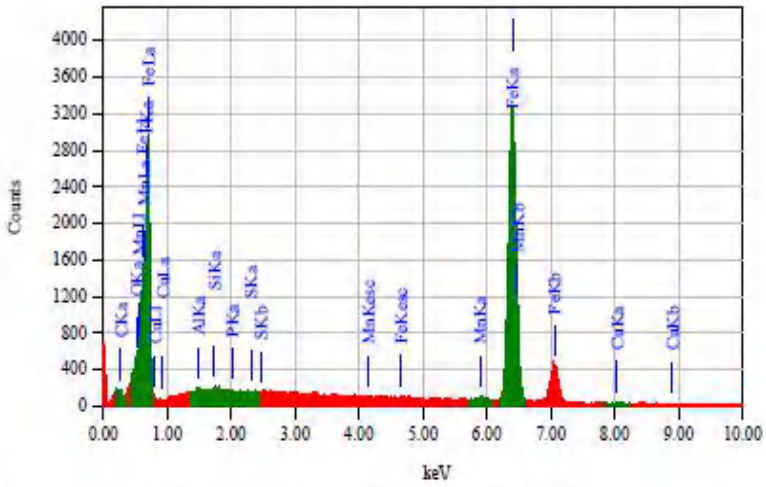
Hasil pengujian komposisi specimen raw material (A36)

View011

JEOL 1/1

Title	: IMG1
Instrument	: JCM-6000PLUS
Volt	: 15.00 kV
Mag.	: x 1,700
Date	: 2023/03/14
Pixel	: 512 x 384





Acquisition Parameter
Instrument : JCM-6000PLUS
Acc. Voltage : 15.0 kV
Probe Current: 1.00000 nA
PHA mode : T3
Real Time : 51.16 sec
Live Time : 50.00 sec
Dead Time : 2 %
Counting Rate: 3688 cps
Energy Range : 0 - 20 keV

Thin Film Standardless Standardless Quantitative Analysis
Fitting Coefficient : 0.0383

Element		(keV)	Mass%	Counts	Sigma	Atom%	Compound	Mass%	Cation	K
C K		0.277	0.17	90.17	0.01	0.77				0.8276
O K		0.525	0.00	3.86	0.02	0.01				0.3202
F K		0.677	0.33	508.61	0.05	0.96				0.2905
Al K		1.486	0.21	367.84	0.03	0.43				0.2536
Si K		1.739	0.11	182.69	0.03	0.21				0.2602
P K		2.013	0.01	20.31	0.02	0.03				0.3088
S K			ND			ND				
Mn K		5.894	1.09	554.63	0.09	1.09				0.8735
Fe K	(Ref.)	6.398	97.81	43543.66	0.65	96.28				1.0000
Cu K		8.040	0.27	66.00	0.09	0.23				1.8074
Total			100.00			100.00				

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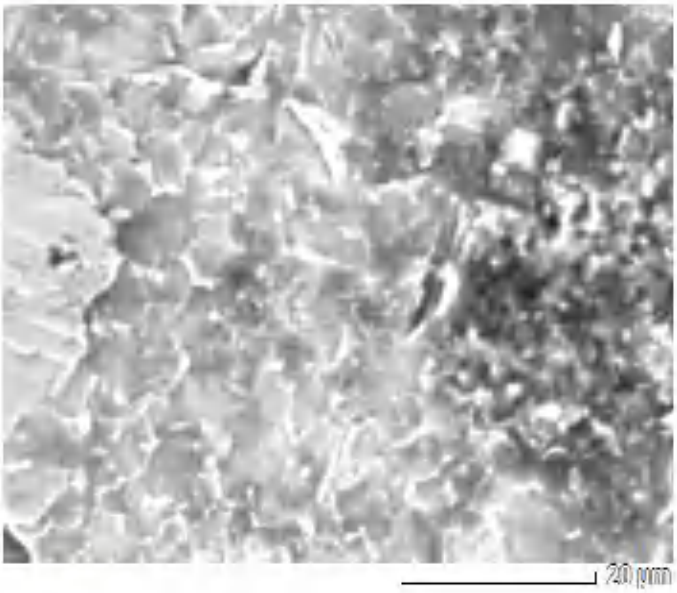
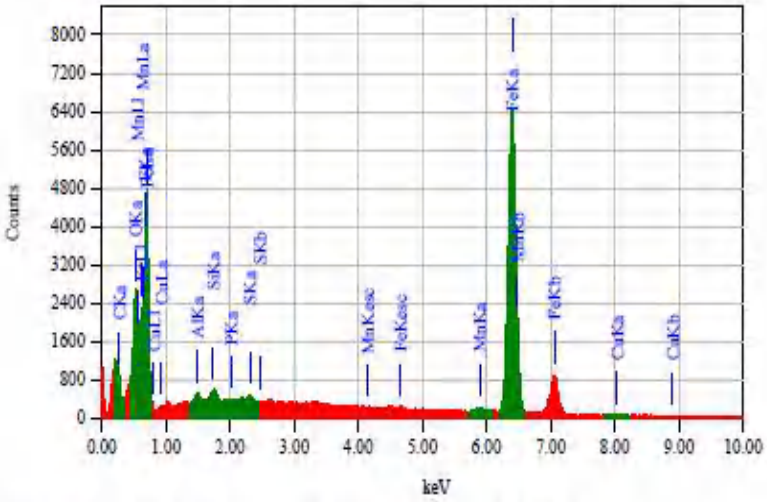
Hasil pengujian komposisi specimen galvanic treatment

View017

JEOL 1/1



Title	: IMG1
Instrument	: JCM-6000PLUS
Volt	: 15.00 kV
Mag.	: x 1,700
Date	: 2023/03/14
Pixel	: 512 x 384



Acquisition Parameter
Instrument : JCM-6000PLUS
Acc. Voltage : 15.0 kV
Probe Current: 1.00000 nA
PHA mode : T3
Real Time : 51.76 sec
Live Time : 50.00 sec
Dead Time : 3 %
Counting Rate: 7962 cps
Energy Range : 0 - 20 keV

Thin Film Standardless Standardless Quantitative Analysis
Fitting Coefficient : 0.0456

Element		(keV)	Mass%	Counts	Sigma	Atom%	Compound	Mass%	Cation	K
C K		0.277	0.54	609.32	0.02	2.27				0.8276
O K		0.525	3.34	9662.67	0.04	10.45				0.3202
P K		0.677	0.19	613.32	0.03	0.51				0.2905
Al K		1.486	0.34	1232.00	0.02	0.63				0.2536
Si K		1.739	0.39	1389.12	0.03	0.70				0.2602
P K		2.013	0.04	129.58	0.02	0.07				0.3088
S K		2.307	0.26	744.62	0.02	0.41				0.3267
Mn K		5.894	1.12	1190.84	0.06	1.02				0.8735
Fe K	[Ref.]	6.398	93.48	86501.48	0.44	83.72				1.0000
Cu K		8.040	0.29	146.16	0.07	0.22				1.8074
Total			100.00			100.00				

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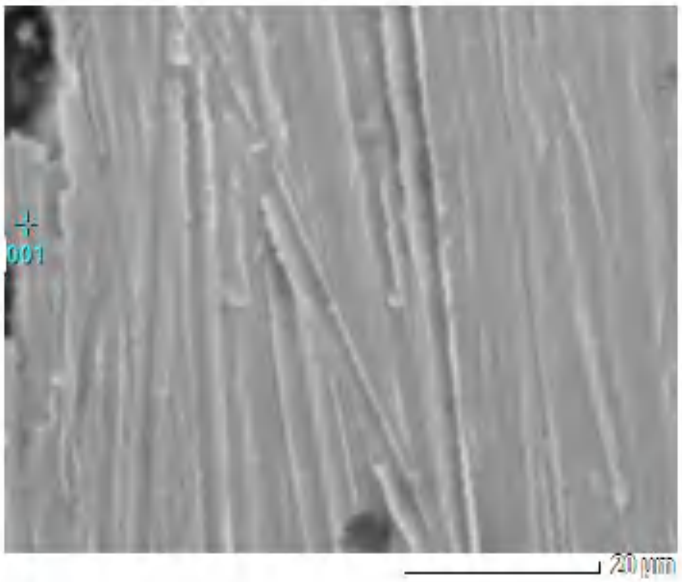
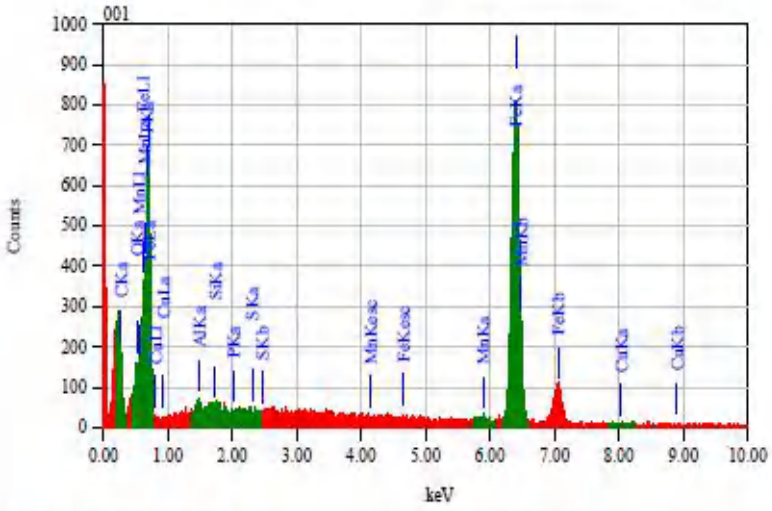
Hasil pengujian komposisi spesimen galvanic treatment pack carburizing

View001

JEOL 1/1

Title	: IMG1
Instrument	: JCM-6000PLUS
Volt	: 15.00 kV
Mag.	: x 1,700
Date	: 2023/03/13
Pixel	: 512 x 384





Acquisition Parameter
Instrument : JCM-6000PLUS
Acc. Voltage : 15.0 kV
Probe Current: 1.00000 nA
PHA mode : T3
Real Time : 50.22 sec
Live Time : 50.00 sec
Dead Time : 0 %
Counting Rate: 1039 cps
Energy Range : 0 - 20 keV

Thin Film Standardless Standardless Quantitative Analysis
Fitting Coefficient : 0.1565

Element		(keV)	Mass%	Counts	Sigma	Atom%	Compound	Mass%	Cation	K
C	K	0.277	2.12	288.48	0.08	8.88				0.8276
O	K	0.525	0.45	159.27	0.06	1.42				0.3202
F	K	0.677	0.77	298.81	0.10	2.04				0.2905
Al	K	1.486	0.44	195.29	0.07	0.82				0.2536
Si	K	1.739	0.17	72.37	0.06	0.30				0.2602
P	K		ND			ND				
S	K	2.307	0.10	34.51	0.05	0.16				0.3267
Mn	K	5.894	0.86	111.34	0.16	0.79				0.8735
Fe	K	(Ref.) 6.398	94.68	10654.60	1.27	85.27				1.0000
Cu	K	8.040	0.40	24.89	0.19	0.32				1.8074
Total			100.00			100.00				

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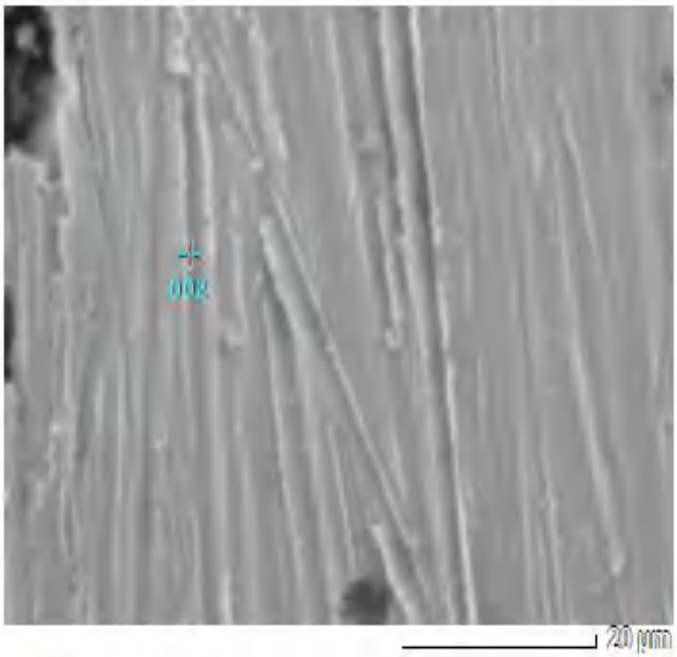
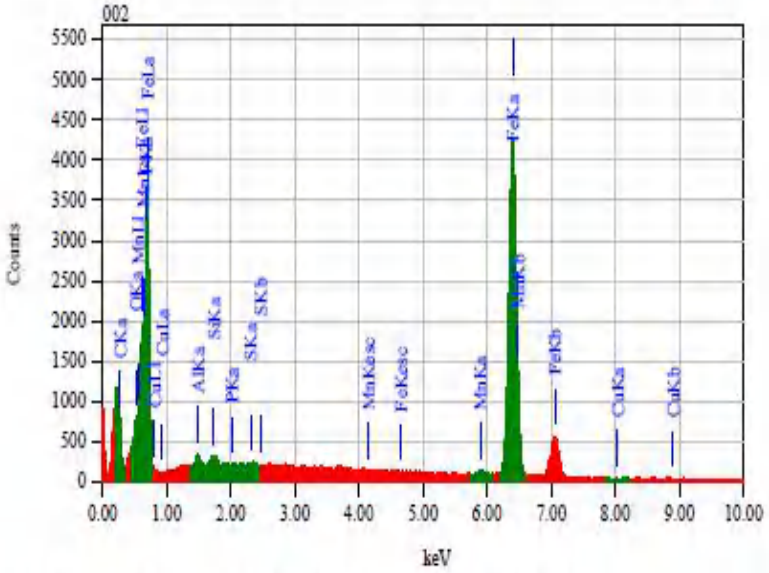
View001

JEOL 1/1



Title	: IMG1
Instrument	: JCM-6000PLUS
Volt	: 15.00 kV
Mag.	: x 1,700
Date	: 2023/03/13
Pixel	: 512 x 384



Acquisition Parameter

Instrument	: JCM-6000PLUS
Acc. Voltage	: 15.0 kV
Probe Current	: 1.00000 nA
PHA mode	: T3
Real Time	: 51.00 sec
Live Time	: 50.00 sec
Dead Time	: 1 %
Counting Rate	: 5126 cps
Energy Range	: 0 - 20 keV

Thin Film Standardless Standardless Quantitative Analysis

Fitting Coefficient : 0.0616

Element	(keV)	Mass%	Counts	Sigma	Atom%	Compound	Mass%	Cation	K
C K	0.277	1.43	1029.33	0.03	6.21				0.8276
O K	0.525	0.31	572.48	0.02	1.00				0.3202
F K	0.677	0.09	177.56	0.04	0.24				0.2905
Al K	1.486	0.43	1010.75	0.03	0.83				0.2536
Si K	1.739	0.25	578.58	0.03	0.47				0.2602
P K	2.013	0.00	3.81	0.02	0.00				0.3088
S K	2.307	0.12	210.98	0.02	0.19				0.3267
Mn K	5.894	0.99	675.14	0.07	0.94				0.8735
Fe K (Ref.)	6.398	96.39	57469.82	0.56	90.12				1.0000
		ND			ND				
		100.00			100.00				

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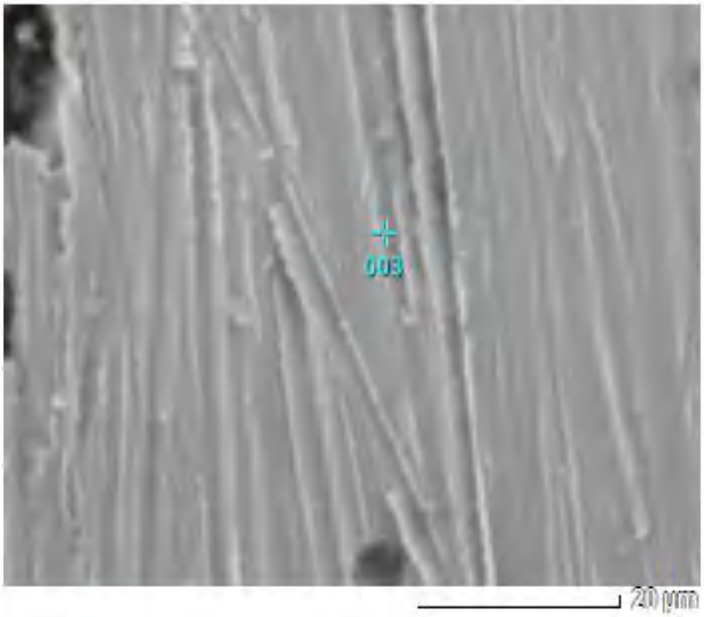
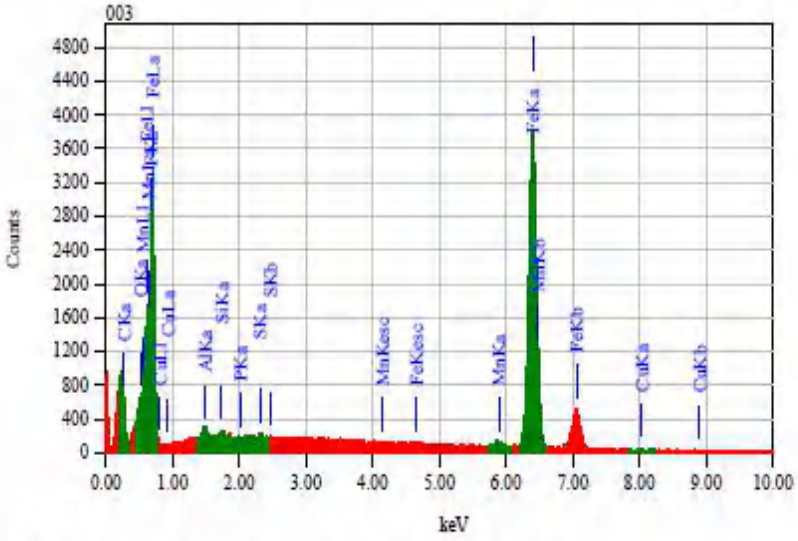
View001

JEOL 1/1



Title	: IMG1
Instrument	: JCM-6000PLUS
Volt	: 15.00 kV
Mag.	: x 1,700
Date	: 2023/03/13
Pixel	: 512 x 384



Acquisition Parameter
Instrument : JCM-6000PLUS
Acc. Voltage : 15.0 kV
Probe Current: 1.00000 nA
PHA mode : T3
Real Time : 50.87 sec
Live Time : 50.00 sec
Dead Time : 1 %
Counting Rate: 4519 cps
Energy Range : 0 - 20 keV

Thin Film Standardless Standardless Quantitative Analysis
Fitting Coefficient : 0.0606

Element		(keV)	Mass%	Counts	Sigma	Atom%	Compound	Mass%	Cation	K
C	K	0.277	1.19	765.79	0.03	5.26				0.8276
O	K	0.525	0.12	200.44	0.02	0.40				0.3202
F	K	0.677	0.12	223.54	0.04	0.34				0.2905
Al	K	1.486	0.41	863.53	0.03	0.81				0.2536
Si	K	1.739	0.17	339.01	0.03	0.31				0.2602
P	K		ND			ND				
S	K	2.307	0.15	239.83	0.02	0.24				0.3267
Mn	K	5.894	1.25	757.17	0.08	1.20				0.8735
Fe	K (Ref.)	6.398	96.39	51162.44	0.59	91.27				1.0000
Cu	K	8.040	0.20	58.75	0.08	0.17				1.8074
Total			100.00			100.00				

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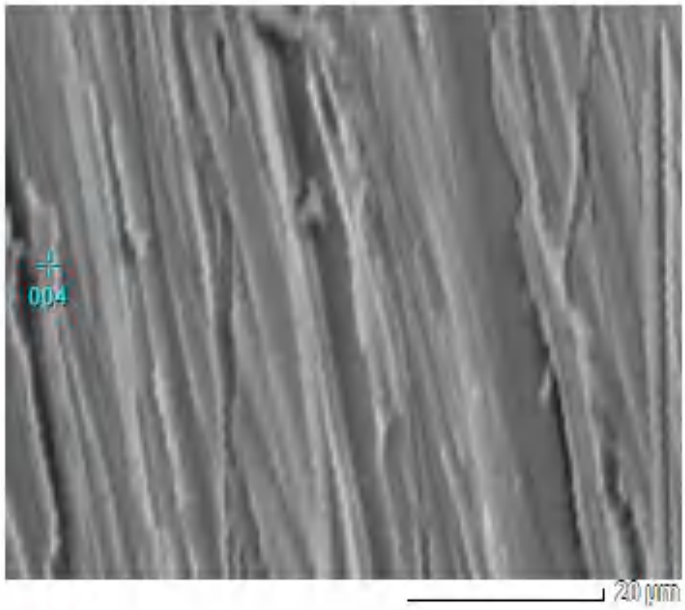
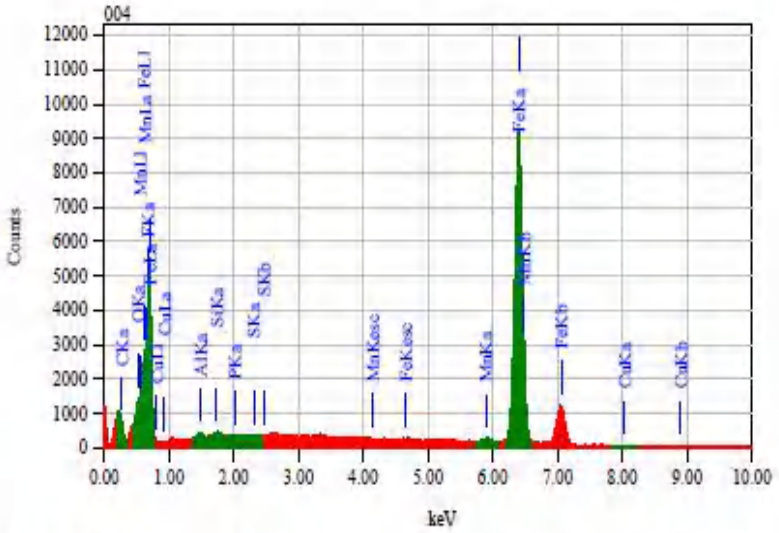
View007

JEOL 1/1



Title	: IMG1
Instrument	: JCM-6000PLUS
Volt	: 15.00 kV
Mag.	: x 1,700
Date	: 2023/03/13
Pixel	: 512 x 384



Acquisition Parameter

Instrument	: JCM-6000PLUS
Acc. Voltage	: 15.0 kV
Probe Current	: 1.00000 nA
PHA mode	: T3
Real Time	: 52.05 sec
Live Time	: 50.00 sec
Dead Time	: 3 %
Counting Rate	: 9165 cps
Energy Range	: 0 - 20 keV

Thin Film Standardless Standardless Quantitative Analysis
Fitting Coefficient : 0.0334

Element		(keV)	Mass%	Counts	Sigma	Atom%	Compound	Mass%	Cation	K
C	K	0.277	0.38	578.40	0.01	1.71				0.8276
O	K	0.525	0.54	2123.15	0.02	1.82				0.3202
F	K	0.677	0.14	622.97	0.02	0.41				0.2905
Al	K	1.486	0.22	1079.85	0.02	0.43				0.2536
Si	K	1.739	0.16	783.07	0.02	0.31				0.2602
P	K	2.013	0.02	83.04	0.01	0.04				0.3088
S	K	2.307	0.01	28.42	0.01	0.01				0.3267
Mn	K	5.894	0.94	1363.41	0.05	0.93				0.8735
Fe	K	(Ref.) 6.398	97.53	122939.94	0.39	94.29				1.0000
Cu	K	8.040	0.06	42.07	0.05	0.05				1.8074
Total			100.00			100.00				

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trial version
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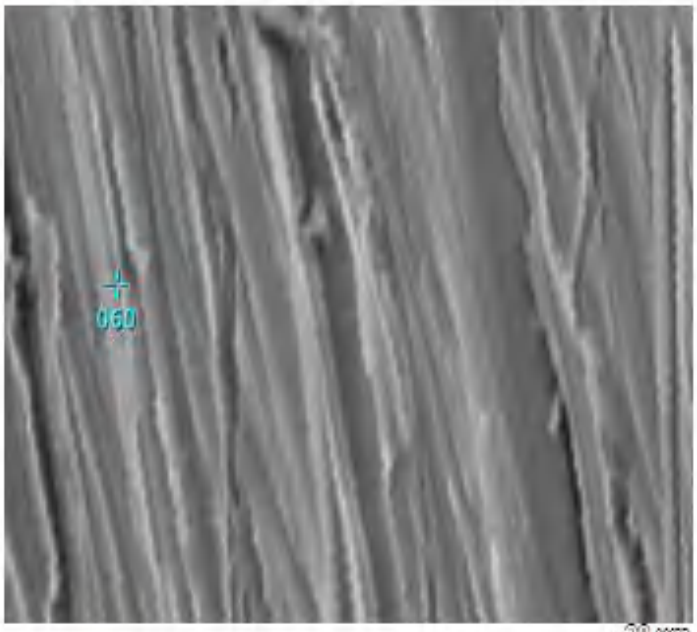
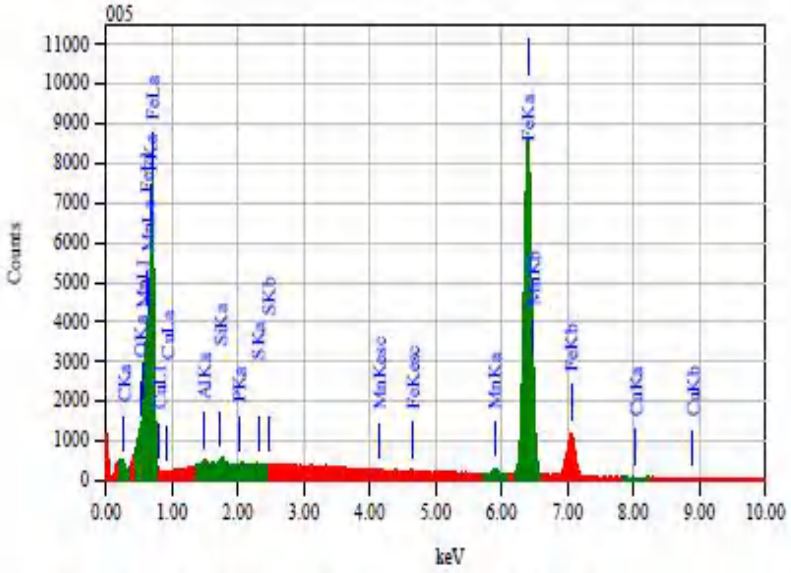
View007

JEOL 1/1



Title	: IMG1
Instrument	: JCM-6000PLUS
Volt	: 15.00 kV
Mag.	: x 1,700
Date	: 2023/03/13
Pixel	: 512 x 384



Acquisition Parameter

Instrument	: JCM-6000PLUS
Acc. Voltage	: 15.0 kV
Probe Current	: 1.00000 nA
PHA mode	: T3
Real Time	: 51.99 sec
Live Time	: 50.00 sec
Dead Time	: 3 %
Counting Rate	: 947.0 cps
Energy Range	: 0 - 20 keV

Thin Film Standardless Standardless Quantitative Analysis
Fitting Coefficient : 0.0262

Element		(keV)	Mass%	Counts	Sigma	Atom%	Compound	Mass%	Cation	K
C	K	0.277	0.18	253.66	0.01	0.82				0.8276
O	K		ND			ND				
F	K	0.677	0.09	355.04	0.03	0.25				0.2905
Al	K	1.486	0.21	978.33	0.02	0.43				0.2536
Si	K	1.739	0.19	867.83	0.02	0.38				0.2602
P	K	2.013	0.00	0.80	0.01	0.00				0.3088
S	K	2.307	0.07	236.86	0.01	0.11				0.3267
Mn	K	5.894	1.16	1571.87	0.05	1.17				0.8735
Fe	K	[Ref.] 6.398	98.10	115699.48	0.40	96.84				1.0000
			ND			ND				
			100.00			100.00				

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