

LAMPIRAN



LAMPIRAN A
HASIL PENGUJIAN KOMPOSISI
KIMIA



Lampiran A.1 : Hasil Pengujian Komposisi Kimia 0% Sr

Run	Fe7	Cu	Mn	Mg	Zn	Ti4	Cr1	Ni6	Si	Al3	Be3	Bg1	Ca3	Co1	AL%	Li2	Na1
P1	Sb5	Sr	V5	Zr3													
1)	0.36526 0.00256	1.06578 -0.00067	0.06250 (-0.00027)	1.00180 0.01570	0.07994 0.00737	0.15077	0.01531	0.76176	14.08965	95.86700	(-0.00003)	36.02800	0.01326	0.00213	82.3483	(-0.00083)	(-0.00022)
2)	0.36232 0.00251	1.09890 -0.00020	0.06218 (-0.00028)	1.01085 0.01570	0.08582 0.01615	0.15013	0.01505	0.76188	14.07615	94.32200	(-0.00003)	35.56900	0.01352	0.00214	82.3283	(-0.00088)	(-0.00022)
Avg	0.36379 0.00253	1.09234 -0.00044	0.06234 (-0.00027)	1.00632 0.01570	0.08283 0.01176	0.15045	0.01518	0.76182	14.08290	95.09450	(-0.00003)	35.79850	0.01339	0.00213	82.3383	(-0.00086)	(-0.00022)
Sd	0.00208 0.00003	0.00928 0.00033	0.00023 0.00001	0.00640 0.00000	0.00423 0.00621	0.00046	0.00018	0.00009	0.00954		0.00000		0.00018	0.00001	0.0142	0.00003	0.00000
Sd%	0.57167 1.37074	0.84934 -76.35547	0.36122 -3.09823	0.63604 0.00127	5.11105 52.82415	0.30296	1.21319	0.01139	0.06775		-1.32275		1.37808	0.26531	0.0172	-3.95949	-0.38580

Lampiran A.2 : Hasil Pengujian Komposisi Kimia 0.126% Sr

9/22/2008 2:56:52 PM Sample: 0.12% SR EDWARD
 Program: ALGLAL Task: ALGLAL

Run	Fe7	Cu	Mn	Mg	Zn	Ti4	Cr1	Ni6	Si	Al3	Be3	Bg1	Ca3	Co1	AL%	Li2	Na1
P1	Sb5	Sr	V5	Zr3													
1)	0.43022 0.00265	1.17189 -0.00178	0.07099 0.12424	1.07133 0.01719	0.09032 0.00844	0.15822	0.01616	0.85809	13.94438	114.28900	(-0.00004)	39.26400	0.01358	0.00045	82.0236	(-0.00025)	0.00029
2)	0.44965 0.00317	1.21165 -0.00294	0.07622 0.12852	1.10959 0.01713	0.09626 0.00857	0.15633	0.01615	0.89447	14.06362	116.03800	(-0.00004)	39.64000	0.01384	0.00068	81.7584	(-0.00028)	0.00002
Avg	0.43943 0.00292	1.19177 -0.00236	0.07361 0.12638	1.09046 0.01716	0.09329 0.00851	0.15727	0.01615	0.87628	14.00400	115.17850	(-0.00004)	39.45200	0.01371	0.00057	81.8910	(-0.00027)	0.00015
Sd	0.01303 0.00036	0.02811 0.00082	0.00370 0.00302	0.02706 0.00004	0.00420 0.00010	0.00134	0.00001	0.02572	0.06432		0.00000		0.00019	0.00016	0.1875	0.00003	0.00019
Sd%	2.94450 12.26370	2.35898 -34.78834	5.02638 2.39176	2.48123 0.22981	4.50128 1.12033	0.84961	0.05765	2.93530	0.60211		-0.20645		1.36894	26.36498	0.2290	-9.90485	125.75544

Lampiran A.3 : Hasil Pengujian Komposisi Kimia 0.208% Sr

9/22/2008 2:52:54 PM Sample: 0.19 % SR EDWARD
 Program: ALGLAL Task: ALGLAL

Run	Fe7	Cu	Mn	Mg	Zn	Ti4	Cr1	Ni6	Si	Al3	Be3	Bg1	Ca3	Co1	AL%	Li2	Na1
P1	Sb5	Sr	V5	Zr3													
1>	0.41901	1.11748	0.06669	1.02058	0.08879	0.15461	0.01520	0.83007	13.90550	115.14700	(-0.00004	40.51300	0.01365	0.00039	82.1287	(-0.00020	0.00004
	0.00321	-0.00282	0.21435	0.01675	0.00801												
2>	0.42504	1.15175	0.06968	1.04775	0.08756	0.15645	0.01592	0.85288	13.95029	113.88100	(-0.00004	40.17300	0.01342	0.00053	81.9990	(-0.00023	0.00003
	0.00299	-0.00286	0.20446	0.01704	0.00835												
3>	0.41952	1.12732	0.06845	1.04146	0.08707	0.15700	0.01557	0.81772	14.08021	114.70500	(-0.00004	39.92000	0.01339	0.00042	81.9408	(-0.00019	0.00006
	0.00301	-0.00236	0.20544	0.01699	0.00820												
Avg	0.42119	1.13218	0.06827	1.03659	0.08781	0.15602	0.01556	0.83358	13.97866	114.57767	(-0.00004	40.20200	0.01349	0.00045	82.0228	(-0.00021	0.00004
	0.00307	-0.00268	0.20809	0.01693	0.00818												
Sd	0.00334	0.01765	0.00150	0.01422	0.00089	0.00125	0.00036	0.01784	0.09075		0.00000		0.00014	0.00008	0.0962	0.00002	0.00001
	0.00012	0.00028	0.00545	0.00015	0.00017												
Sd%	0.79287	1.55879	2.20306	1.37183	1.01149	0.90085	2.31750	2.13971	0.64917		-1.77082		1.05040	16.88638	0.1173	-12.01888	34.28781
	3.82910	-10.43714	2.61837	0.90943	2.11746												

Lampiran A.4 : Hasil Pengujian Komposisi Kimia 0.284% Sr

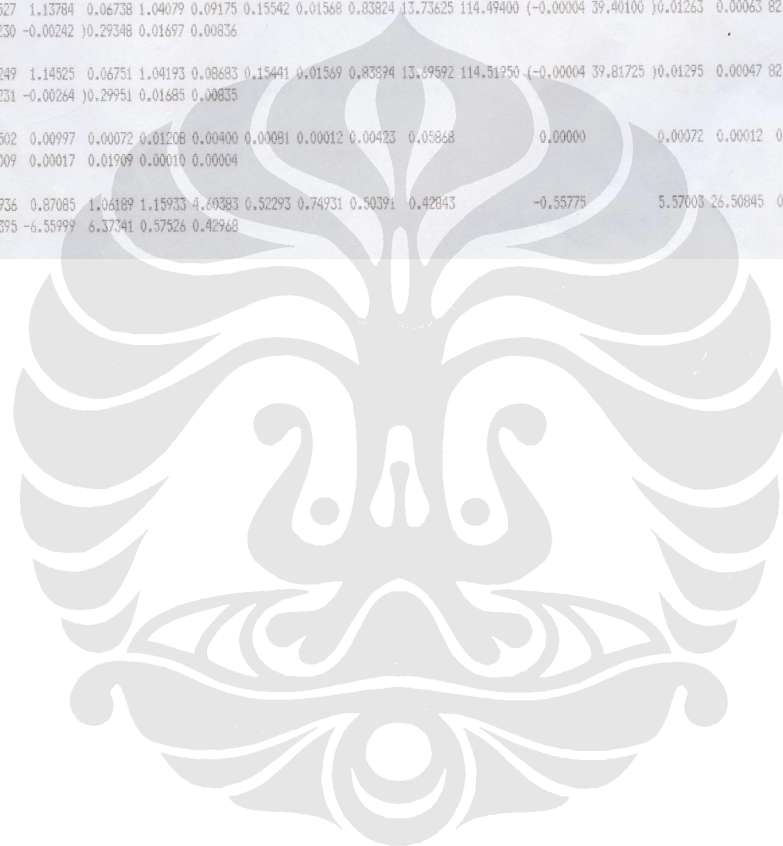
9/22/2008 3:13:06 PM Sample: 0.26 % SR EDWARD
 Program: ALGLAL Task: ALGLAL

Run	Fe7	Cu	Mn	Mg	Zn	Ti4	Cr1	Ni6	Si	Al3	Be3	Bg1	Ca3	Co1	AL%	Li2	Na1
P1	Sb5	Sr	V5	Zr3													
1>	0.41565	1.12060	0.06588	1.03776	0.08783	0.15664	0.01527	0.80431	13.76362	115.23100	(-0.00004	39.25700	0.01274	0.00065	82.2290	(-0.00024	(-0.00004
	0.00318	-0.00178	0.26385	0.01696	0.00812												
2>	0.41609	1.10550	0.06799	1.02531	0.08790	0.15823	0.01531	0.79687	14.05896	114.03500	(-0.00004	37.06800	0.01509	0.00056	81.9075	(-0.00018	0.00000
	0.00547	-0.00299	0.31723	0.01711	0.00813												
3>	0.44972	1.22108	0.07334	1.11792	0.09097	0.15338	0.01573	0.88468	13.62758	113.37400	(-0.00004	36.93800	0.01256	0.00056	82.0558	(-0.00021	(-0.00000
	0.00356	-0.00359	0.27155	0.01693	0.00847												
Avg	0.42715	1.14906	0.06907	1.06033	0.08890	0.15608	0.01544	0.82862	13.81672	114.21333	(-0.00004	37.75433	0.01346	0.00059	82.0641	(-0.00021	(-0.00002
	0.00407	-0.00279	0.28421	0.01700	0.00824												
Sd	0.01954	0.06283	0.00384	0.05026	0.00179	0.00247	0.00026	0.04869	0.22054		0.00000		0.00141	0.00005	0.1610	0.00003	0.00002
	0.00123	0.00092	0.02886	0.00009	0.00020												
Sd%	4.57506	5.46792	5.56643	4.74025	2.01275	1.58399	1.65742	5.87641	1.59617		-1.73238		10.50473	8.92031	0.1961	-14.95894	-152.47927
	30.25178	-33.02421	10.15304	0.54589	2.41779												

Lampiran A.5 : Hasil Pengujian Komposisi Kimia 0.299% Sr

9/22/2008 3:02:50 PM Sample: 0.33 % SR EDWARD
 Program: ALGLAL Task: ALGLAL

Run	Fe7	Cu	Mn	Mg	Zn	Ti4	Cr1	Ni6	Si	Al3	Be3	Bg1	Ca3	Co1	AL%	Li2	Na1
	P1	Sb5	Sr	V3	Zr3												
1>	0.42302	1.14366	0.06784	1.03476	0.08773	0.15413	0.01585	0.84202	13.70414	114.95400	(-0.00004	40.11300	0.01233	0.00046	82.2049	(-0.00023	0.00015
	0.00220	-0.00275	0.28464	0.01685	0.00831												
2>	0.41526	1.13974	0.06658	1.03285	0.08219	0.15459	0.01588	0.83323	13.73270	114.78300	(-0.00004	40.20700	0.01284	0.00044	82.1970	(-0.00025	0.00018
	0.00233	-0.00280	0.29240	0.01685	0.00840												
3>	0.42642	1.15976	0.06825	1.05933	0.08566	0.15350	0.01564	0.84226	13.61058	113.84700	(-0.00004	39.54800	0.01398	0.00034	82.2119	(-0.00026	0.00023
	0.00242	-0.00259	0.32753	0.01673	0.00835												
4>	0.42527	1.13784	0.06738	1.04079	0.09175	0.15542	0.01569	0.83394	13.73625	114.49400	(-0.00004	39.40100	0.01263	0.00063	82.1595	(-0.00022	0.00023
	0.00230	-0.00242	0.29346	0.01697	0.00836												
Avg	0.42249	1.14525	0.06751	1.04193	0.08683	0.15441	0.01569	0.83394	13.39592	114.51950	(-0.00004	39.81725	0.01295	0.00047	82.1933	(-0.00024	0.00020
	0.00231	-0.00264	0.29951	0.01685	0.00835												
Sd	0.00502	0.00997	0.00072	0.01208	0.00400	0.00081	0.00012	0.00423	0.05868		0.00000		0.00072	0.00012	0.0234	0.00002	0.00004
	0.00009	0.00017	0.01909	0.00010	0.00004												
sd%	1.18936	0.87085	1.06189	1.15933	4.60383	0.52293	0.74931	0.50391	0.42843		-0.55775		5.57003	26.50845	0.0284	-6.27777	19.17092
	3.98395	-6.55999	6.37341	0.57526	0.42968												



LAMPIRAN B
HASIL PENGUJIAN KEKERASAN
DAN KEAUSAN



Lampiran B.1 : Data Hasil Pengujian Kekerasan

Kadar Sr Target (%)	Kadar Sr Aktual (%)	Kekerasan (HRB)					Hardness Average (HRB)
		I	II	III	IV	V	
0%	0%	42.3	44.2	40.1	41.5	38.3	41.3
0.12%	0.126%	45	42.5	40.9	45.3	48.3	44.4
0.19%	0.208%	50.6	43.7	43.7	44.4	43.7	45.2
0.26%	0.284%	45.5	44.2	43.6	43.1	42.6	43.8
0.33%	0.299%	52.1	46.2	46.3	50	46.8	48.3

Kadar Sr Target (%)	Kadar Sr Aktual (%)	Standar Deviasi	% Kesalahan Relatif
0%	0%	2.23	5.40%
0.12%	0.126%	2.84	6.40%
0.19%	0.208%	3.02	6.68%
0.26%	0.284%	1.12	2.56%
0.33%	0.299%	2.64	5.46%

Perhitungan % Kesalahan Relatif :

$$\S \text{ Sampel Kadar Sr Aktual } 0\% = \frac{2.23}{41.3} \times 100\% = 5.40\%$$

$$\S \text{ Sampel Kadar Sr Aktual } 0.126\% = \frac{2.84}{44.4} \times 100\% = 6.40\%$$

$$\S \text{ Sampel Kadar Sr Aktual } 0.208\% = \frac{3.02}{45.2} \times 100\% = 6.68\%$$

$$\S \text{ Sampel Kadar Sr Aktual } 0.284\% = \frac{1.12}{43.8} \times 100\% = 2.56\%$$

$$\S \text{ Sampel Kadar Sr Aktual } 0.299\% = \frac{2.64}{48.3} \times 100\% = 5.46\%$$

Lampiran B.2 : Data Hasil Pengujian Keausan

No	Kadar Sr %	Lebar Celah Terabrasi b (mm)				Rata - Rata b (mm)	Volume Terabrasi (mm ³)	Laju Aus (mm ³ /mm)
		b1	b2	b3	b4			
1	0 %	6.578	5.671	5.809	5.197	5.814	3.275	3.27 x 10 ⁻⁵
2	0.126 %	5.856	5.116	4.733	4.058	4.941	2.010	2.01 x 10 ⁻⁵
3	0.208 %	5.043	4.108	5.391	4.577	4.780	1.820	1.82 x 10 ⁻⁵
4	0.284 %	5.687	4.48	4.898	5.525	5.147	2.273	2.27 x 10 ⁻⁵
5	0.299 %	3.488	4.144	4.623	4.777	4.258	1.287	1.28 x 10 ⁻⁵

Kadar Sr Target (%)	Kadar Sr Aktual (%)	Standar Deviasi	% Kesalahan Relatif
0%	0%	0.573	9.85%
0.12%	0.126%	0.751	15.20%
0.19%	0.208%	0.558	11.67%
0.26%	0.284%	0.560	10.88%
0.33%	0.299%	0.580	13.62%

Perhitungan % Kesalahan Relatif :

$$\S \text{ Sampel Kadar Sr Aktual } 0\% = \frac{0.573}{5.814} \times 100\% = 9.85\%$$

$$\S \text{ Sampel Kadar Sr Aktual } 0.126\% = \frac{0.751}{4.941} \times 100\% = 15.20\%$$

$$\S \text{ Sampel Kadar Sr Aktual } 0.208\% = \frac{0.558}{4.780} \times 100\% = 11.67\%$$

$$\S \text{ Sampel Kadar Sr Aktual } 0.284\% = \frac{0.560}{5.147} \times 100\% = 10.88\%$$

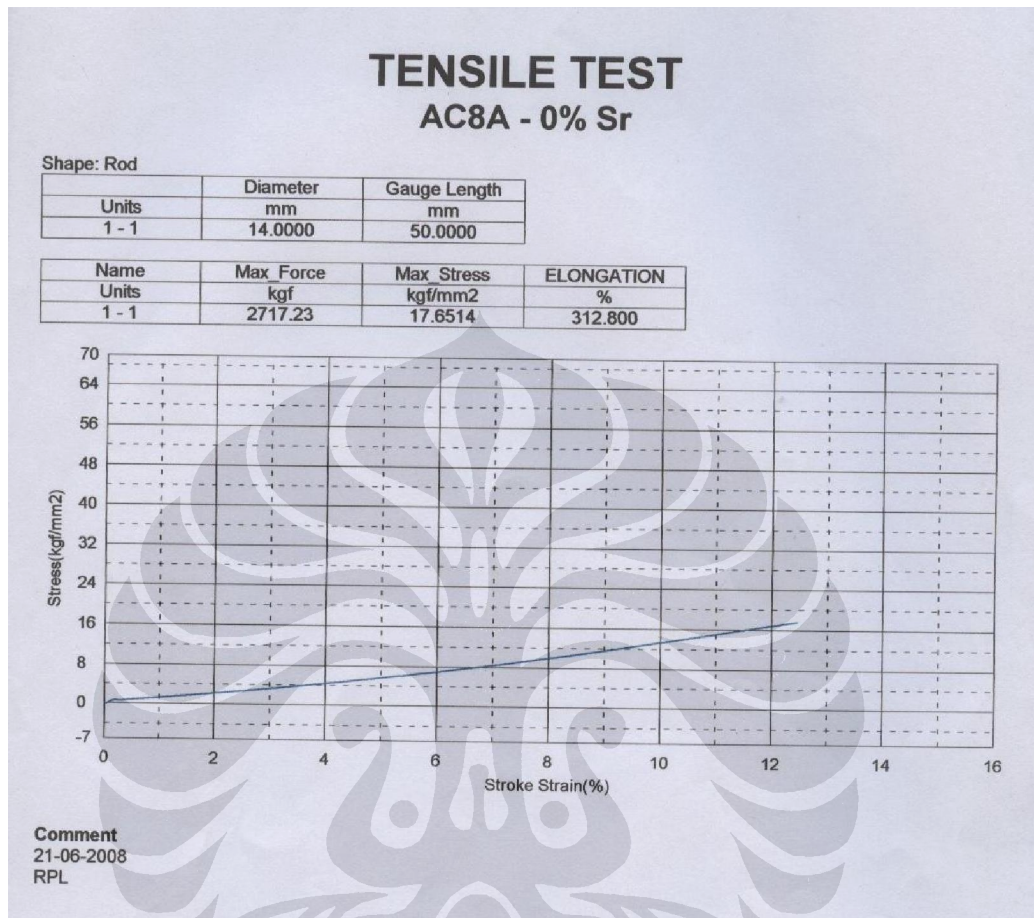
$$\S \text{ Sampel Kadar Sr Aktual } 0.299\% = \frac{0.580}{4.258} \times 100\% = 13.62\%$$

LAMPIRAN C

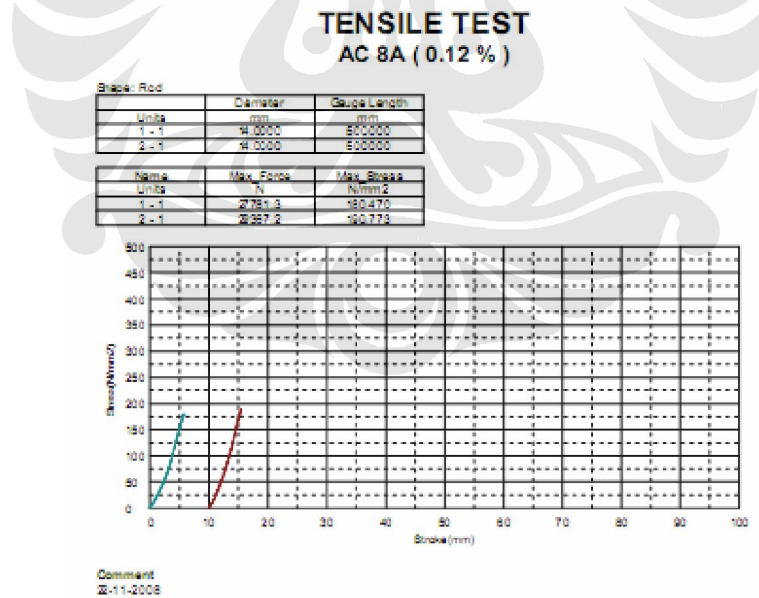
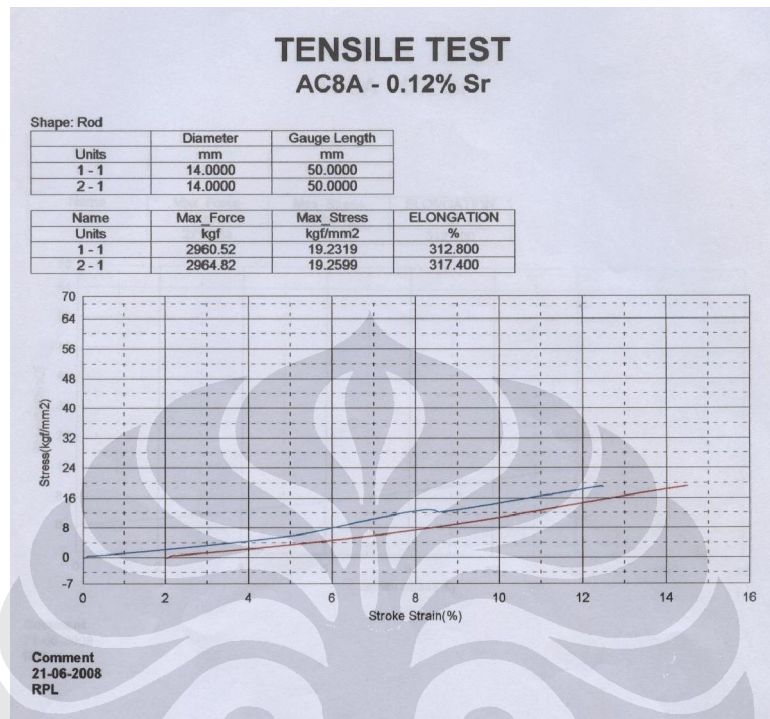
HASIL PENGUJIAN TARIK



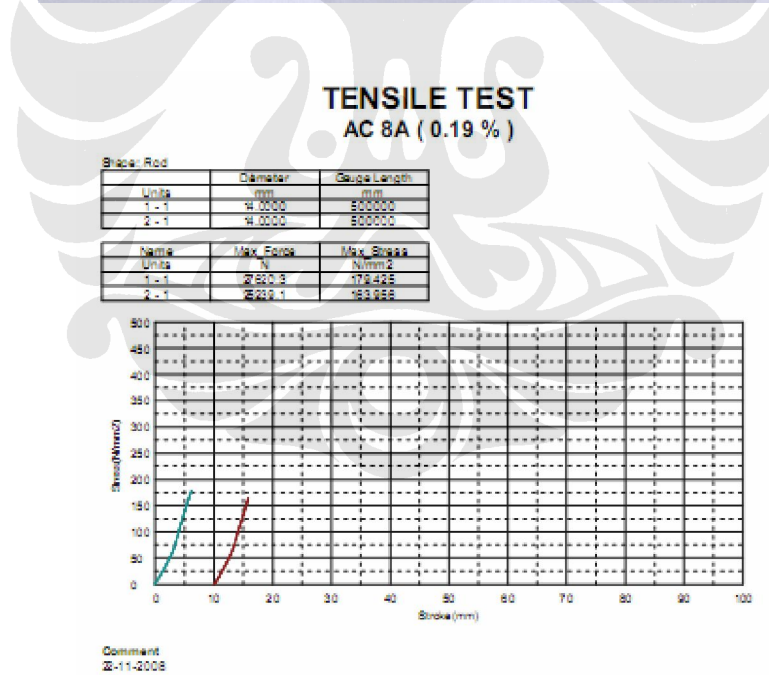
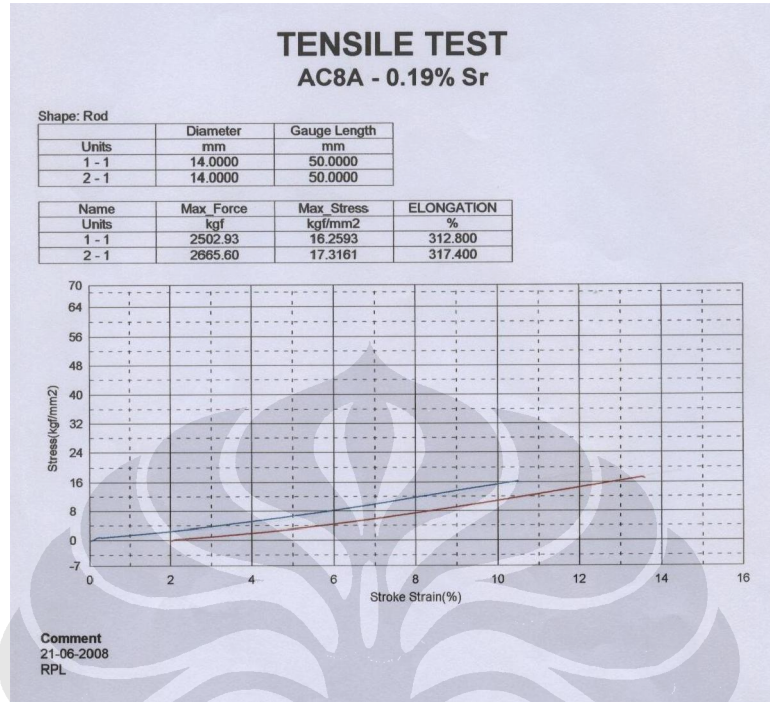
Lampiran C.1 : Hasil Pengujian Tarik 0% Sr



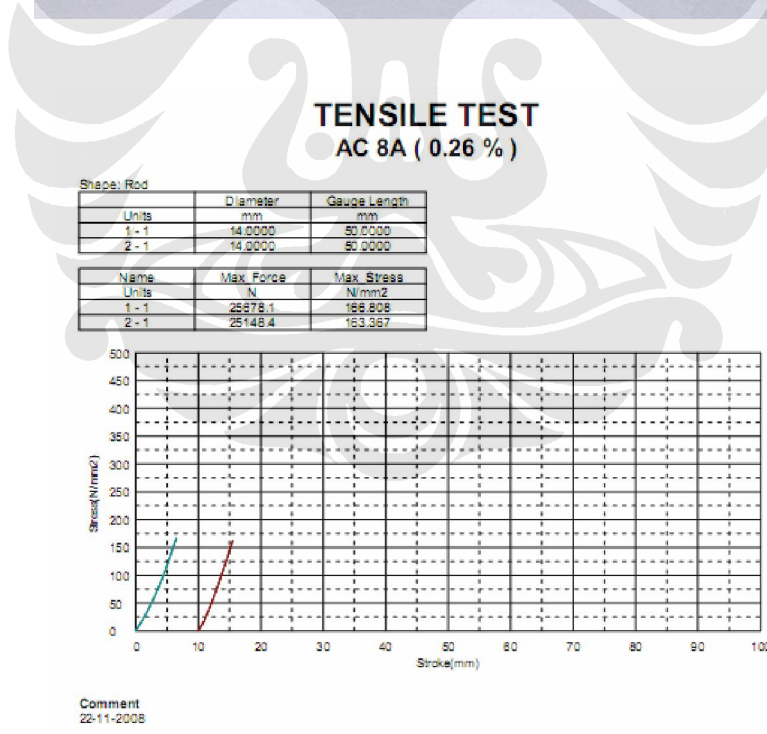
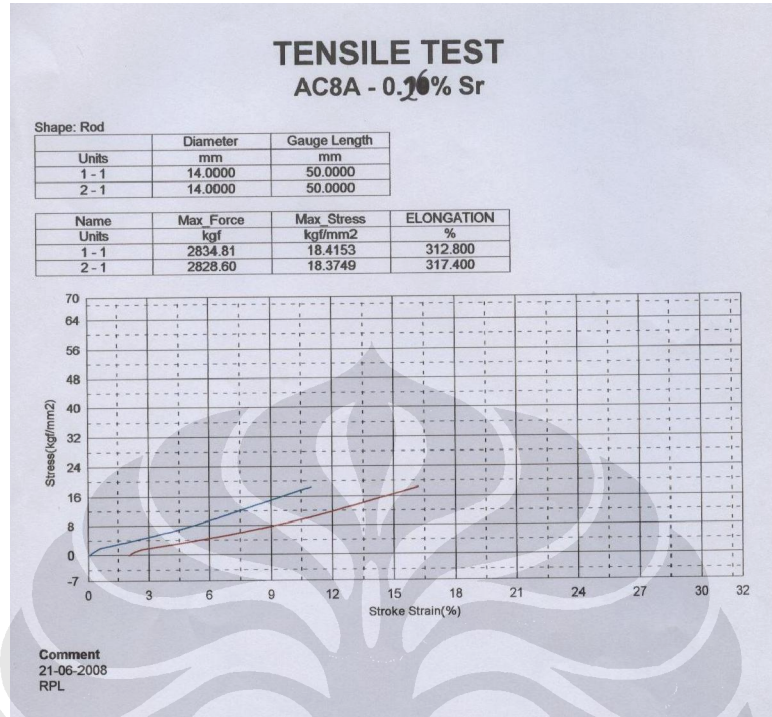
Lampiran C.2 : Hasil Pengujian Tarik 0.126% Sr



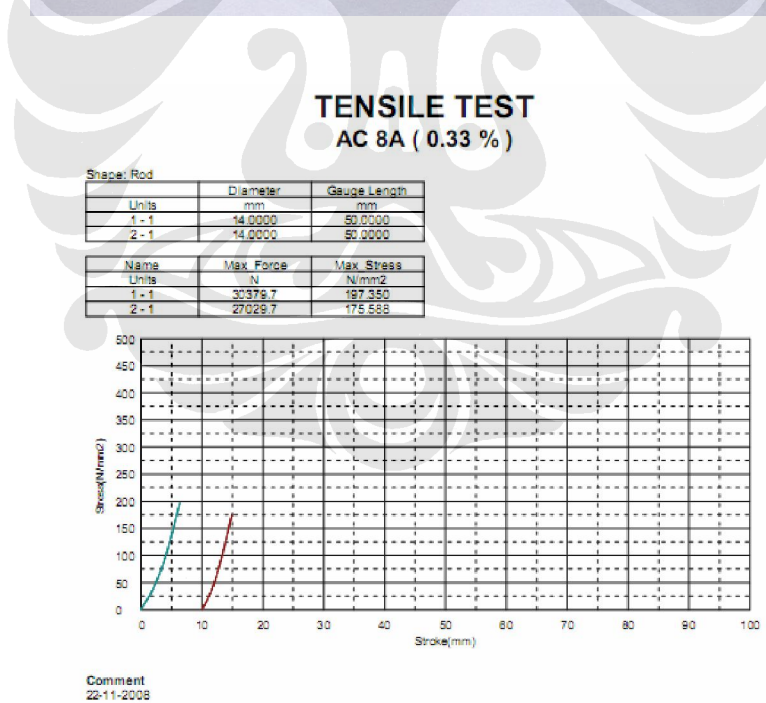
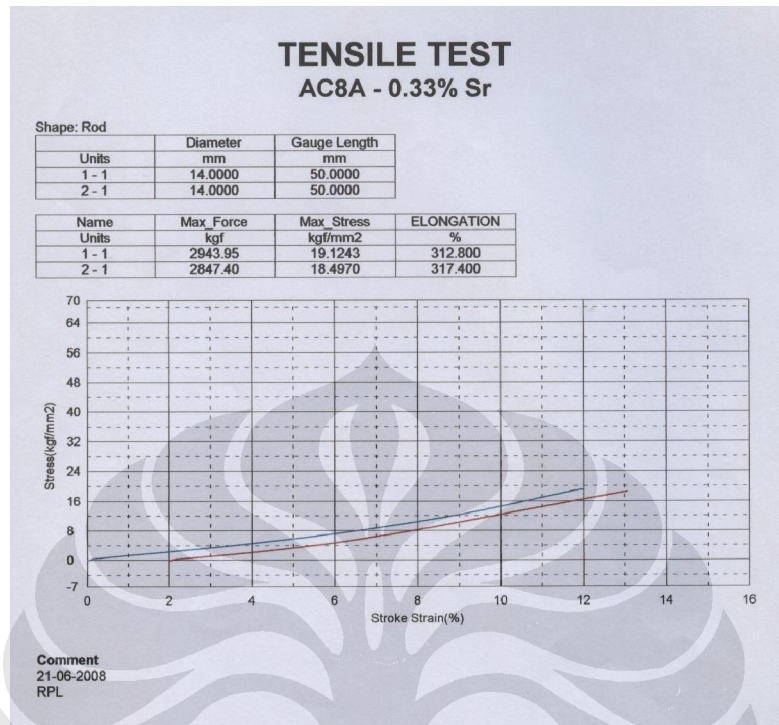
Lampiran C.3 : Hasil Pengujian Tarik 0.208% Sr



Lampiran C.4 : Hasil Pengujian Tarik 0.284% Sr



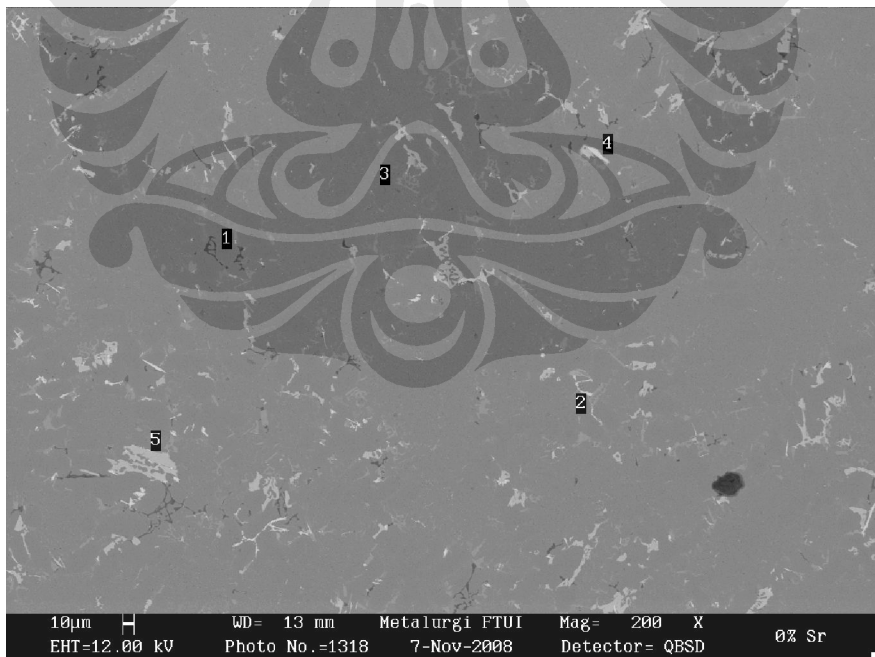
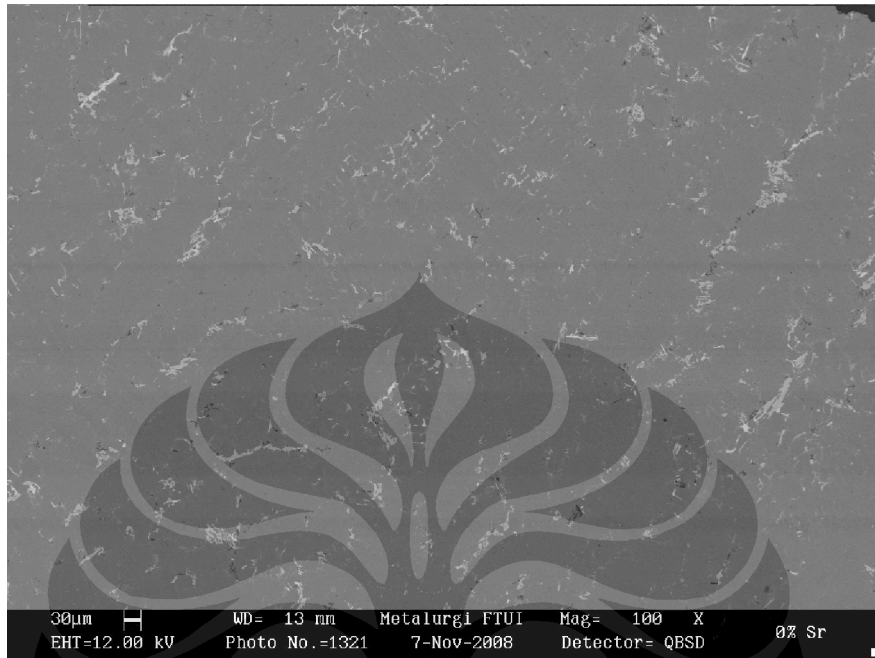
Lampiran C.5 : Hasil Pengujian Tarik 0.299% Sr



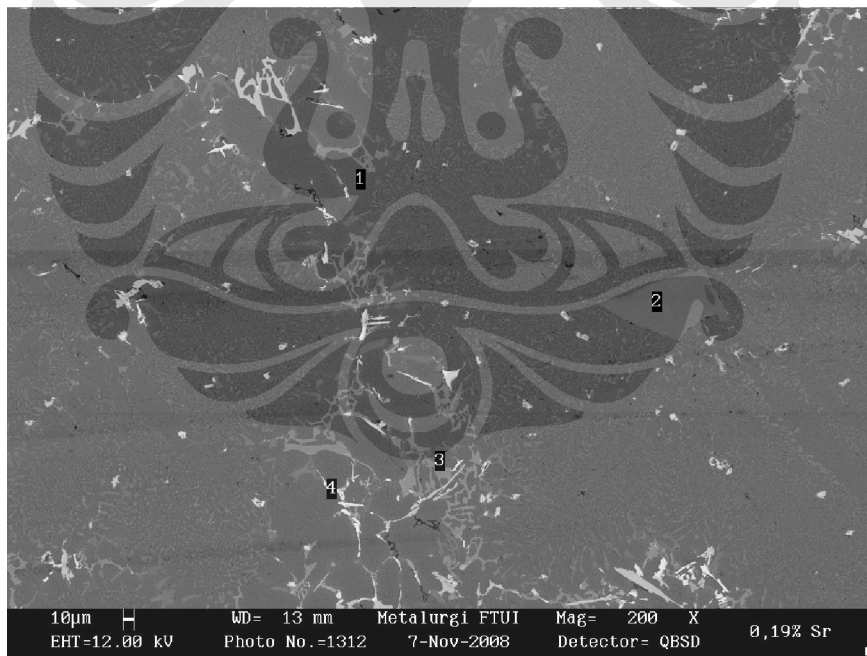
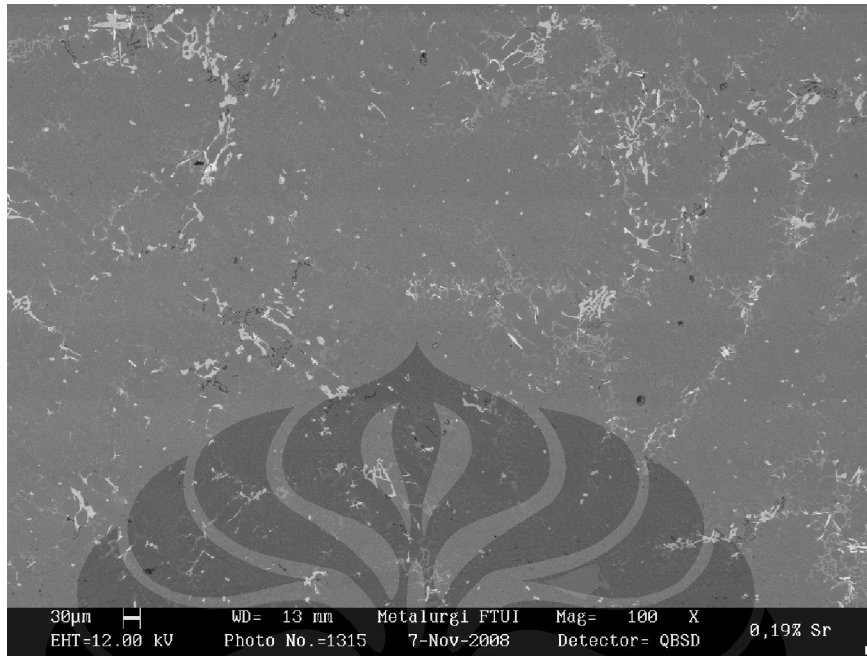
LAMPIRAN D
HASIL PENGAMATAN SEM
DAN PENGUJIAN EDX



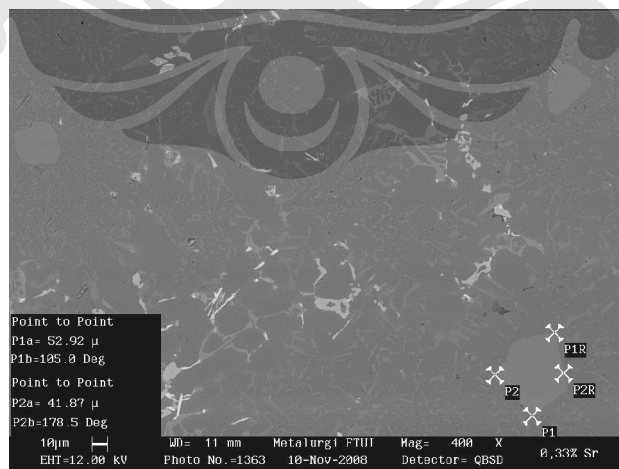
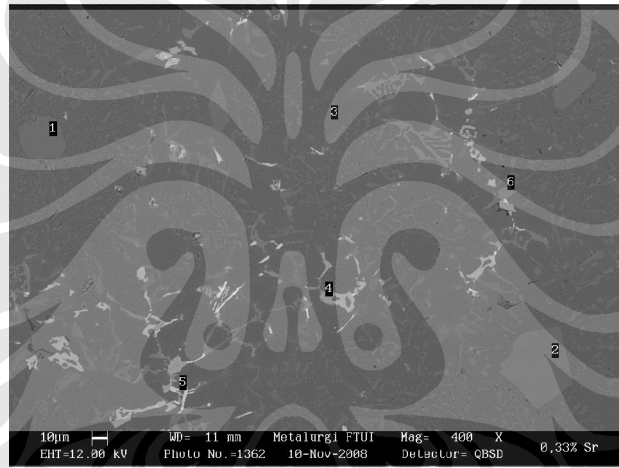
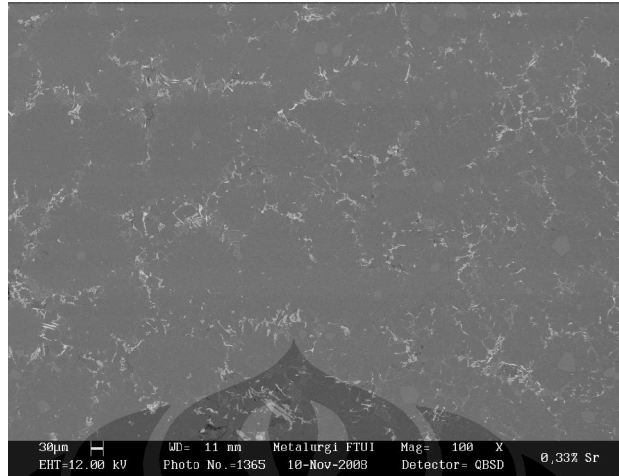
Lampiran D.1 : Hasil Foto SEM 0% Sr



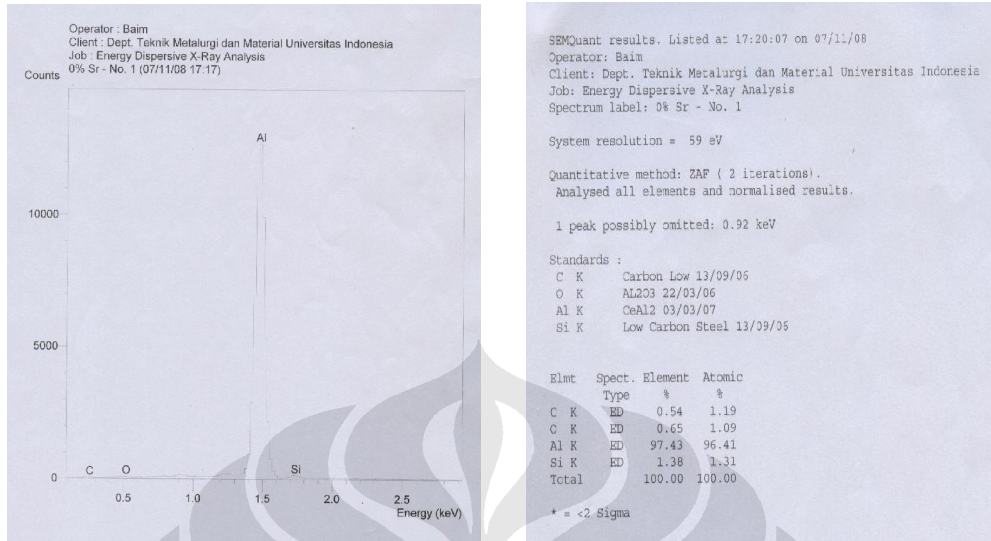
Lampiran D.2 : Hasil Foto SEM 0.208% Sr



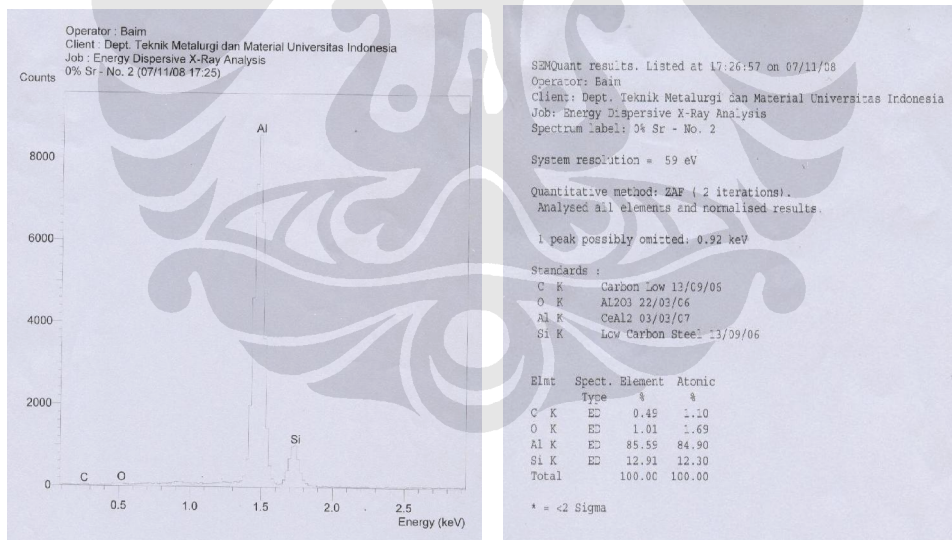
Lampiran D.3 : Hasil Foto SEM 0.299% Sr



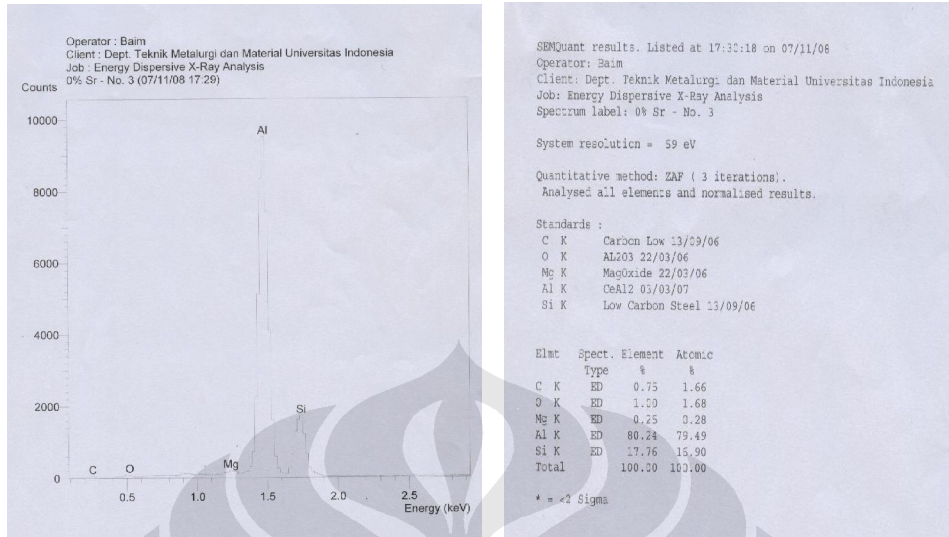
Lampiran D.4 (i) : Hasil Uji EDX 0% Sr Titik No.1



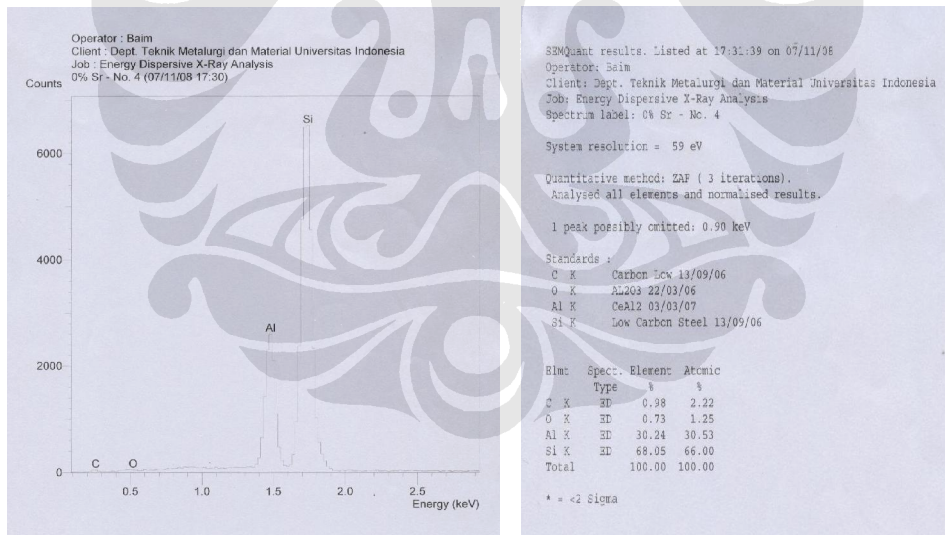
Lampiran D.4 (ii) : Hasil Uji EDX 0% Sr Titik No.2



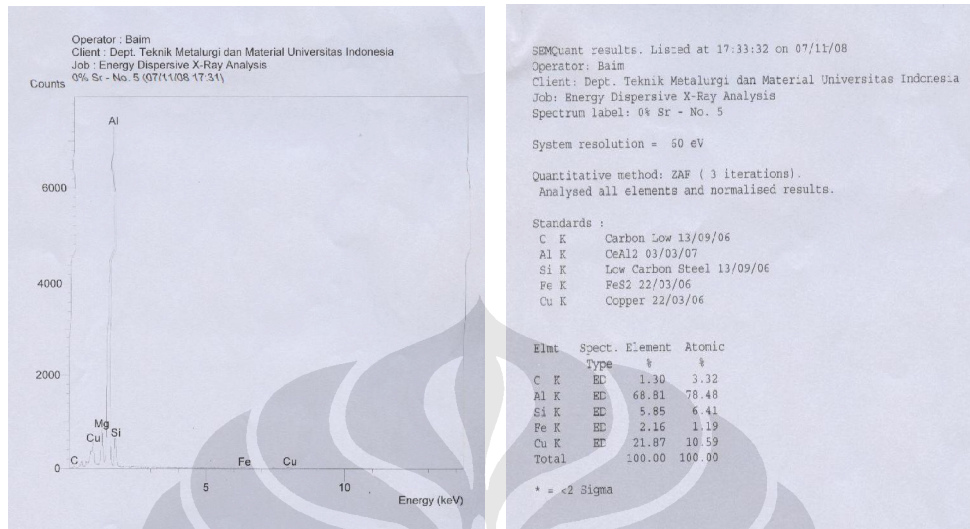
Lampiran D.4 (iii) : Hasil Uji EDX 0% Sr Titik No.3



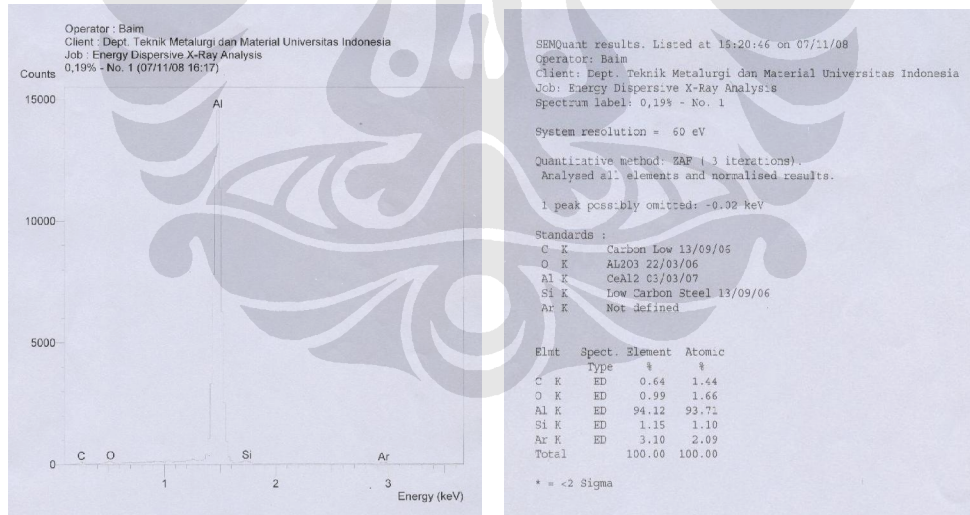
Lampiran D.4 (iv) : Hasil Uji EDX 0% Sr Titik No.4



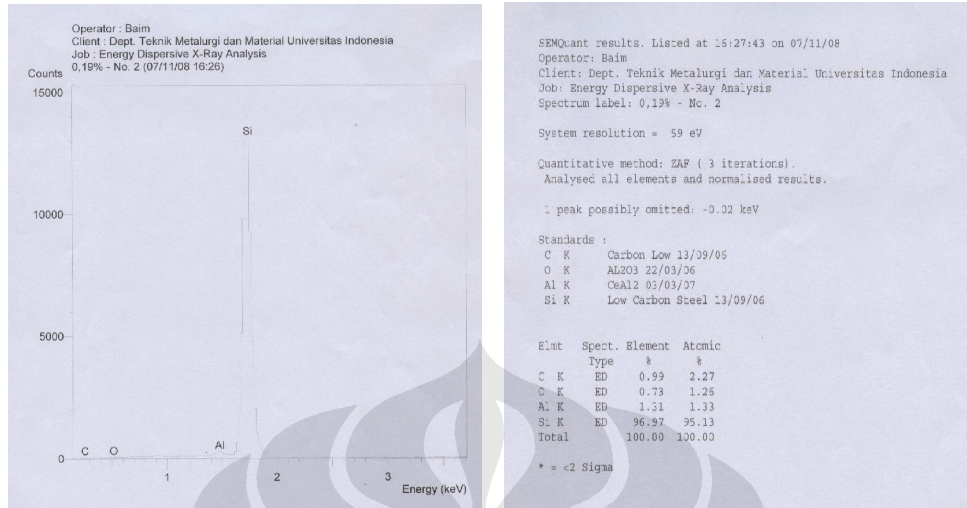
Lampiran D.4 (v) : Hasil Uji EDX 0% Sr Titik No.5



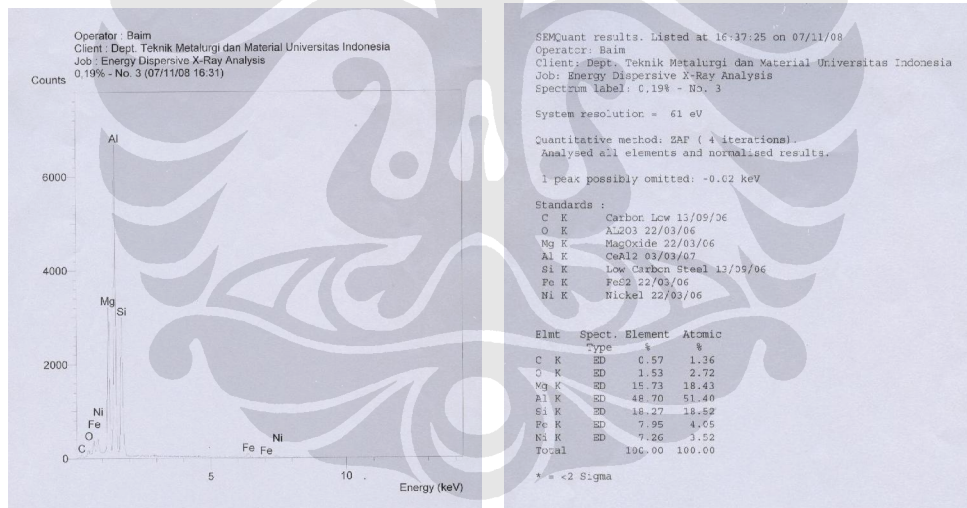
Lampiran D.5 (i) : Hasil Uji EDX 0.208% Sr Titik No.1



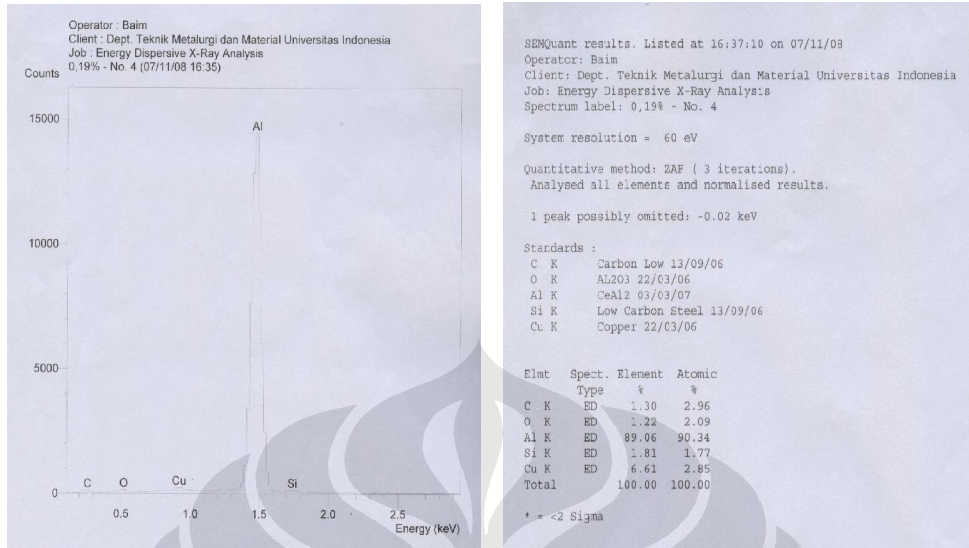
Lampiran D.5 (ii) : Hasil Uji EDX 0.208% Sr Titik No.2



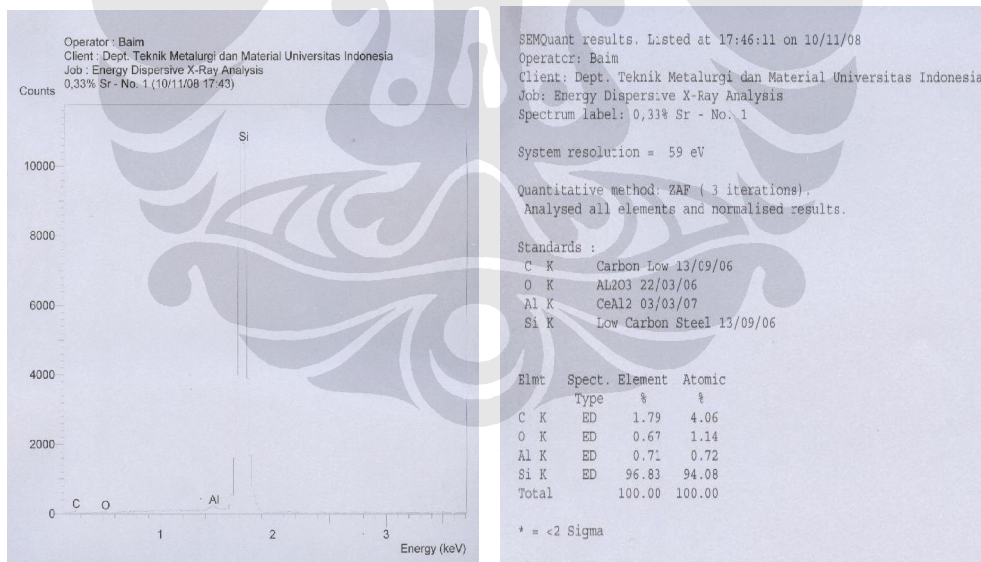
Lampiran D.5 (iii) : Hasil Uji EDX 0.208% Sr Titik No.3



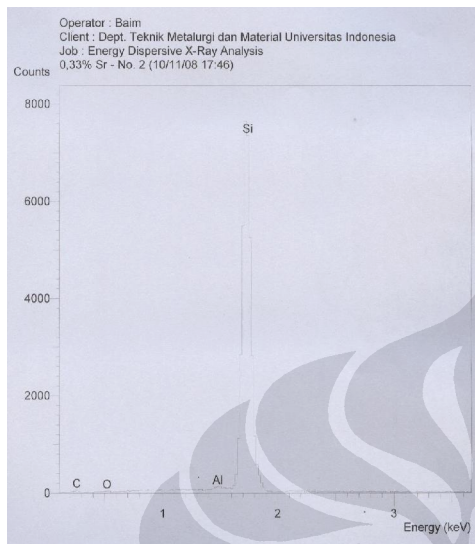
Lampiran D.5 (iv) : Hasil Uji EDX 0.208% Sr Titik No.4



Lampiran D.6 (i) : Hasil Uji EDX 0.299% Sr Titik No.1



Lampiran D.6 (ii) : Hasil Uji EDX 0.299% Sr Titik No.2



SEMQuant results. Listed at 17:48:09 on 10/11/08
Operator: Baim
Client: Dept. Teknik Metalurgi dan Material Universitas Indonesia
Job: Energy Dispersive X-Ray Analysis
Spectrum label: 0,33% Sr - No. 2

System resolution = 59 eV

Quantitative method: ZAF (3 iterations).
Analysed all elements and normalised results.

1 peak possibly omitted: 2.16 keV

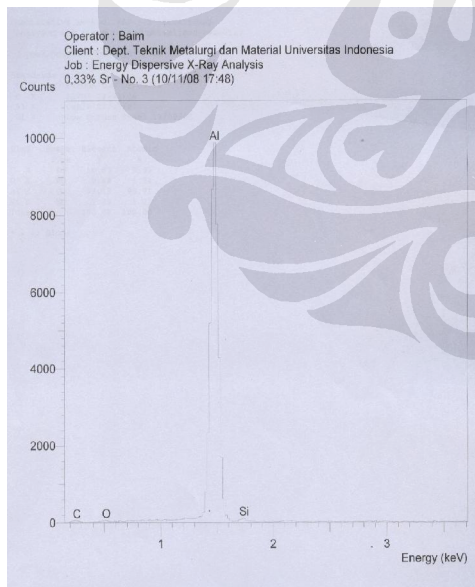
Standards :

C K Carbon Low 13/09/06
O K AL203 22/03/06
Al K CeAl2 03/03/07
Si K Low Carbon Steel 13/09/06

Elmt	Spect. Type	Element %	Atomic %
C K	ED	1.89	4.28
O K	ED	0.91	1.95
Al K	ED	0.52	0.52
Si K	ED	96.68	93.64
Total		100.00	100.00

* = <2 Sigma

Lampiran D.6 (iii) : Hasil Uji EDX 0.299% Sr Titik No.3



SEMQuant results. Listed at 17:50:36 on 10/11/08
Operator: Baim
Client: Dept. Teknik Metalurgi dan Material Universitas Indonesia
Job: Energy Dispersive X-Ray Analysis
Spectrum label: 0,33% Sr - No. 3

System resolution = 59 eV

Quantitative method: ZAF (2 iterations).
Analysed all elements and normalised results.

1 peak possibly omitted: 2.14 keV

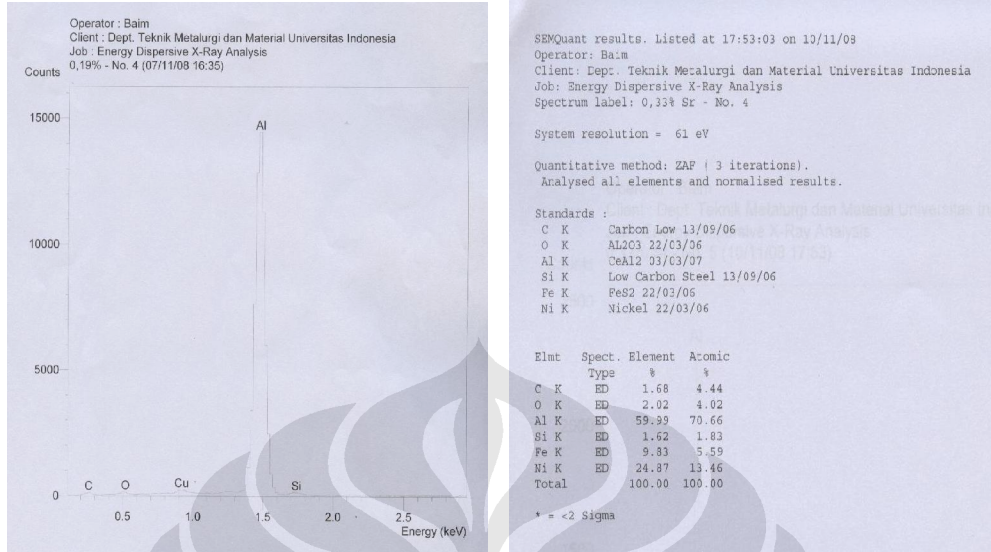
Standards :

C K Carbon Low 13/09/06
O K AL203 22/03/06
Al K CeAl2 03/03/07
Si K Low Carbon Steel 13/09/06

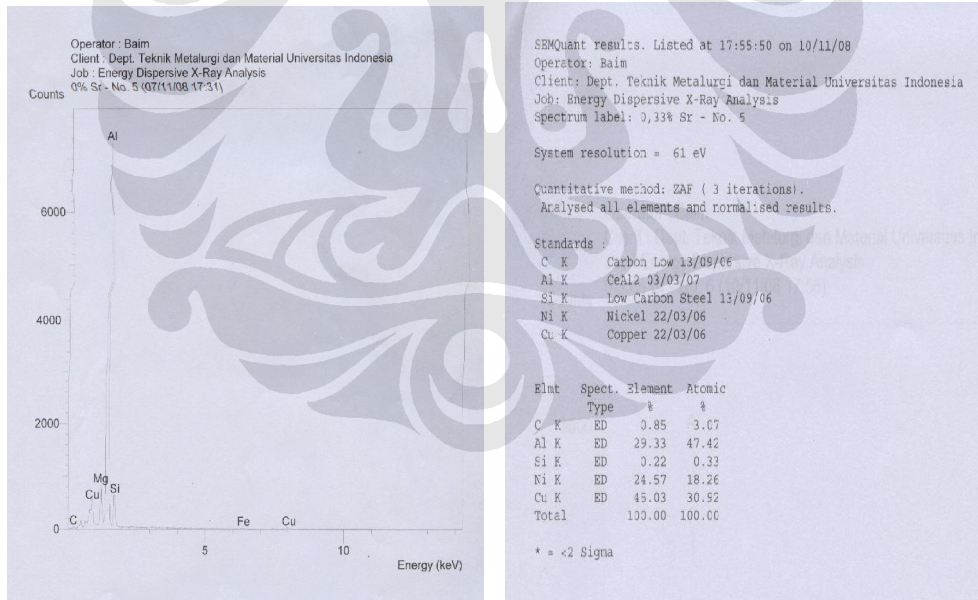
Elmt	Spect. Type	Element %	Atomic %
C K	ED	0.87	1.93
O K	ED	0.69	1.14
Al K	ED	97.15	95.71
Si K	ED	1.29	1.22
Total		100.00	100.00

* = <2 Sigma

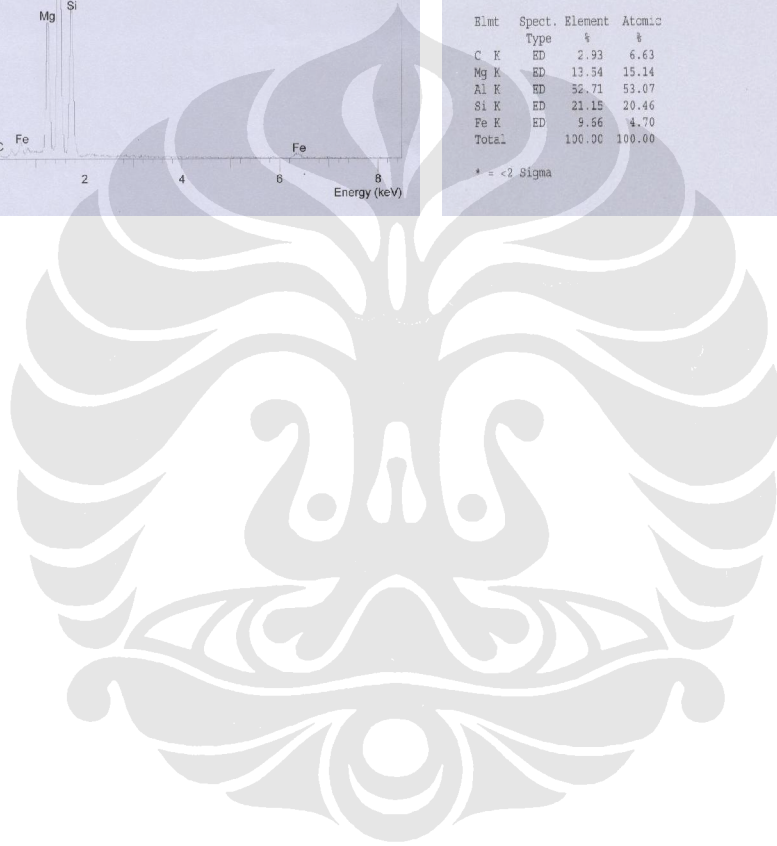
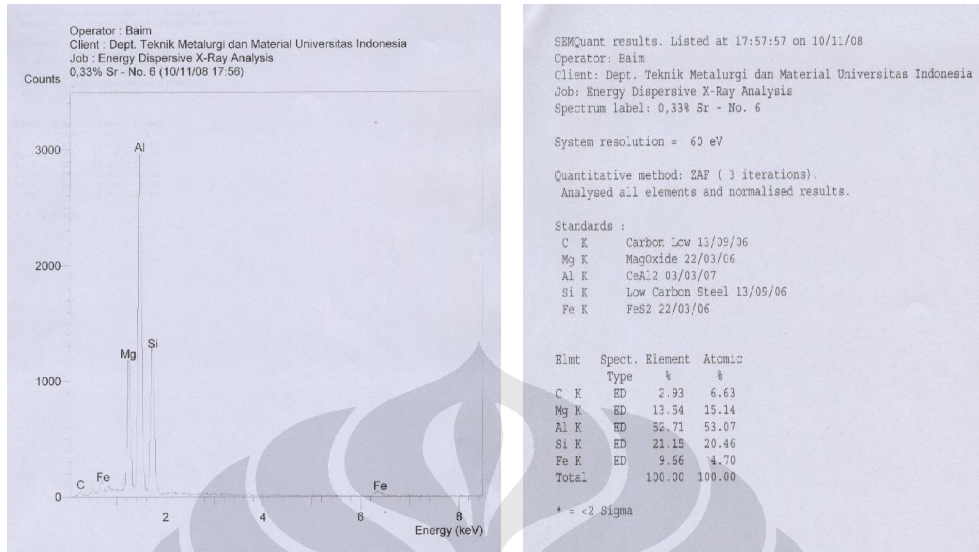
Lampiran D.6 (iv) : Hasil Uji EDX 0.299% Sr Titik No.4



Lampiran D.6 (v) : Hasil Uji EDX 0.299% Sr Titik No.5



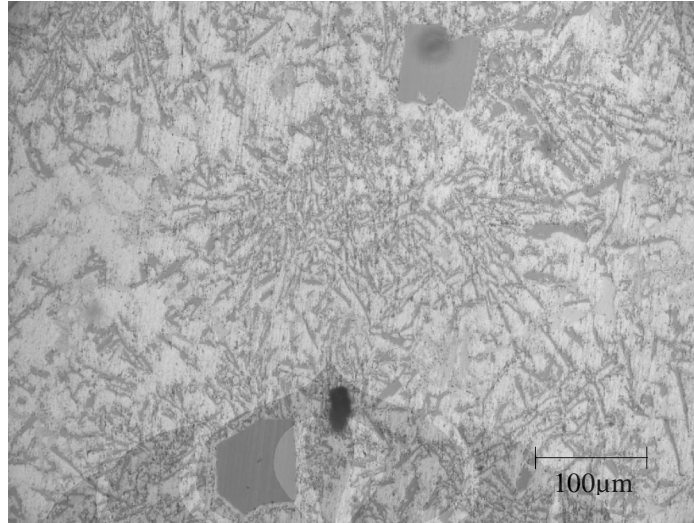
Lampiran D.6 (vi) : Hasil Uji EDX 0.299% Sr Titik No.6



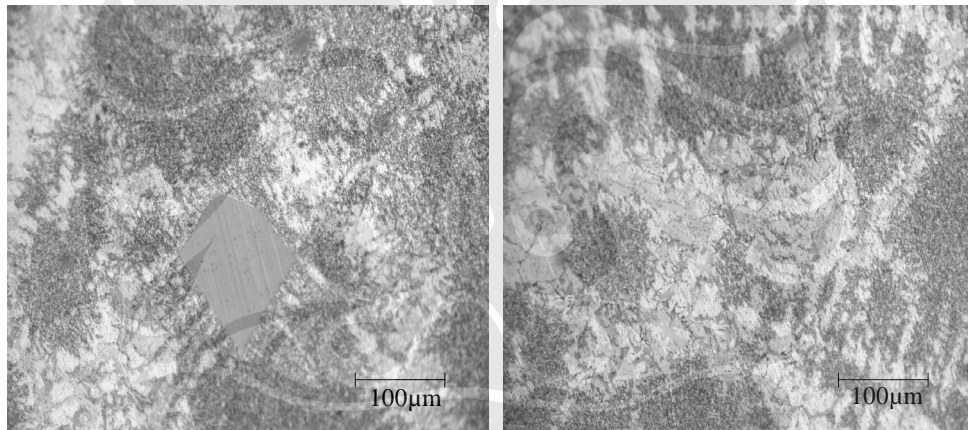
LAMPIRAN E
HASIL FOTO STRUKTUR MIKRO



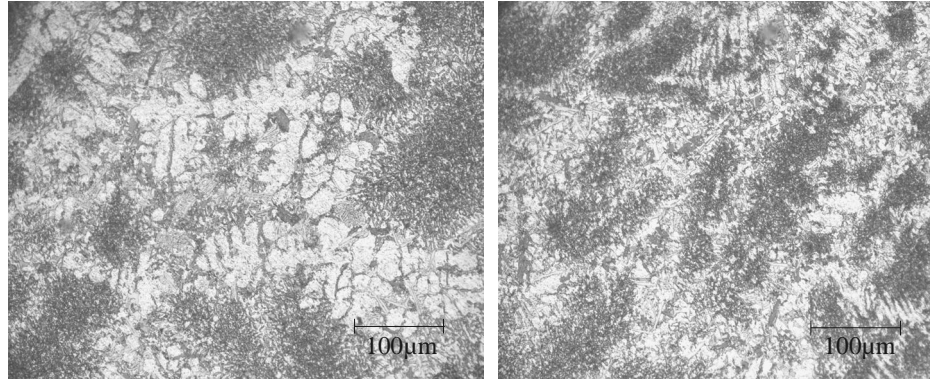
Lampiran E.1 : Hasil Foto Struktur Mikro 0% Sr (Perbesaran 450X)



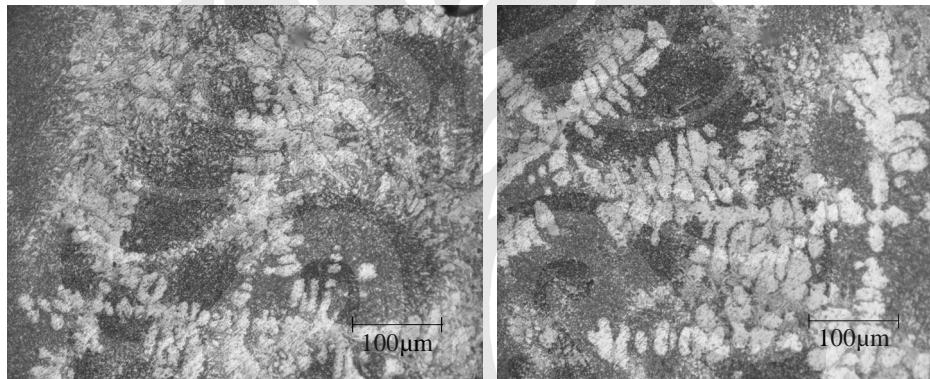
Lampiran E.2 : Hasil Foto Struktur Mikro 0.126% Sr (Perbesaran 450X)



Lampiran E.3 : Hasil Foto Struktur Mikro 0.208% Sr (Perbesaran 450X)



Lampiran E.4 : Hasil Foto Struktur Mikro 0.284% Sr (Perbesaran 450X)



Lampiran E.5 : Hasil Foto Struktur Mikro 0.299% Sr (Perbesaran 450X)

