



## **LAMPIRAN 1 : HASIL PENGUJIAN KOMPOSISI KIMIA**

- Pengujian Spektrometri Sebelum Penambahan 0.019 wt.% Ti
- Pengujian Spektrometri Penambahan 0.019 wt.% Ti ( mulai pengamatan proses *fading*, menit ke-0 dan akhir pengamatan proses *fading*, menit ke-120)

### Pengujian Spektrometri Sebelum Penambahan 0.019 wt.% Ti

Unsur	Komposisi hasil penambahan 0 wt.% Ti	Komposisi hasil penambahan 0.019 wt.% Ti	Komposisi standar JIS H 5202	Komposisi standar AC4B PT.X
Si	9,412	8.879	7.0 – 10.0	7.0 – 10.0
Cu	2,837	2.663	2.0 – 4.0	2.0 – 4.0
Mg	0,222	0.138	0.5 max	0.5 max
Zn	0,712	0.562	1.0 max	1.0 max
Fe	0,658	0.949	1.0 max	1.0 max
Mn	0,242	0.282	0.5 max	0.5 max
Ni	0,049	0.071	0.3 max	0.35max
<b>Ti</b>	<b>0,029</b>	<b>0.048</b>	<b>0.2 max</b>	<b>0.2 max</b>
Pb	0,124	0.074	-	0.2 max
Sn	0,043	0.023	-	0.1 max
Cr	0,021	0.025	-	0.2 max
Al	Sisa	Sisa	Sisa	Sisa

### Pengujian Spektrometri Penambahan 0.019 wt.% Ti ( mulai pengamatan proses *fading*, menit ke-0 dan akhir pengamatan proses *fading*, menit ke-120)

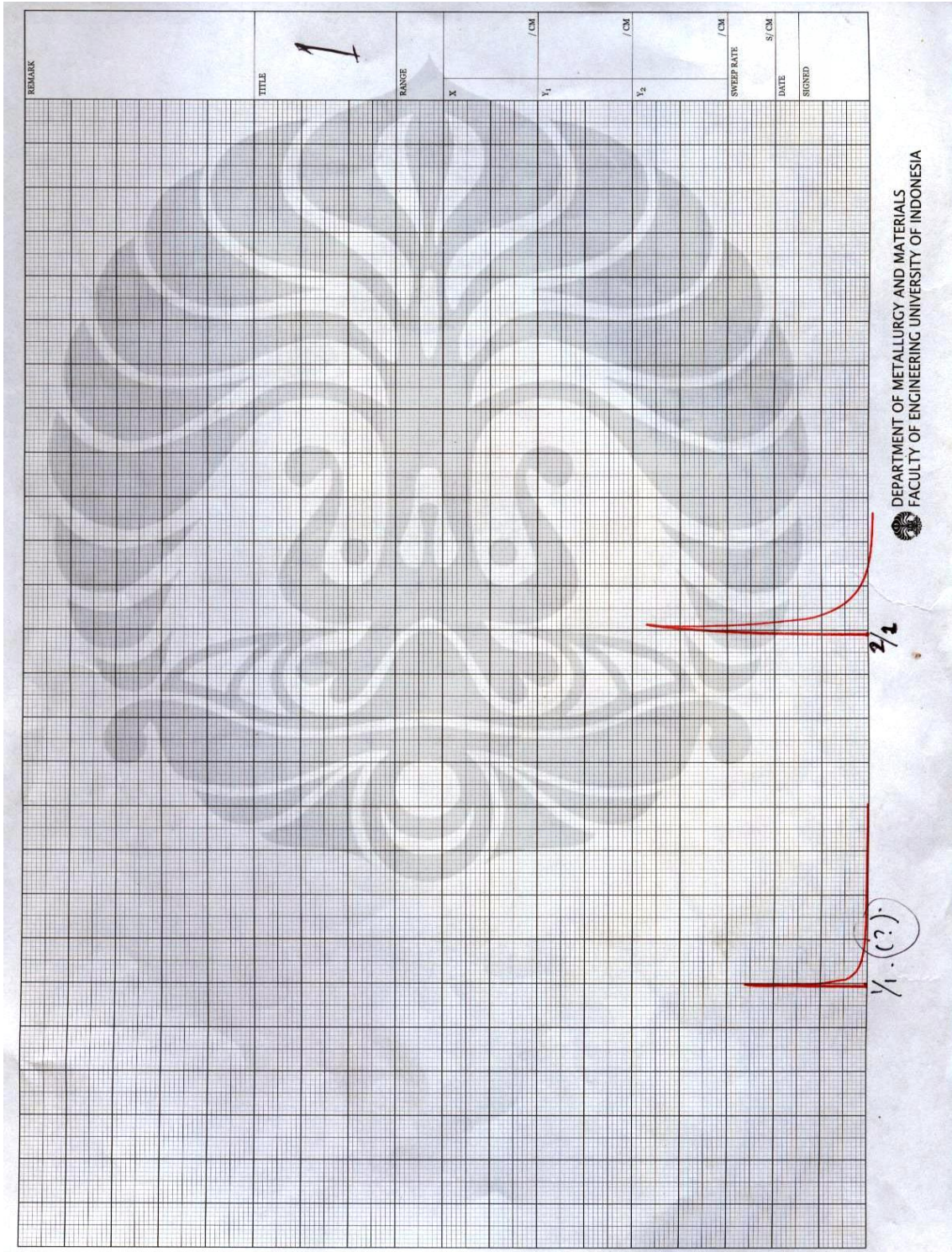
Unsur	Awal penambahan 0.019 wt.% Ti (menit ke-0)	Akhir dari pengamatan proses <i>fading</i> (menit ke-120)	Komposisi standar JIS H 5202	Komposisi standar AC4B PT.X
Si	8.879	9.540	7.0 – 10.0	7.0 – 10.0
Cu	2.663	2.670	2.0 – 4.0	2.0 – 4.0
Mg	0.138	0.141	0.5 max	0.5 max
Zn	0.562	0.264	1.0 max	1.0 max
Fe	0.949	0.966	1.0 max	1.0 max
Mn	0.282	0.290	0.5 max	0.5 max
Ni	0.071	0.045	0.3 max	0.35 max
<b>Ti</b>	<b>0.048</b>	<b>0.044</b>	<b>0.2 max</b>	<b>0.2 max</b>
Pb	0.074	0.056	-	0.2 max
Sn	0.023	0.010	-	0.1 max
Cr	0.025	0.019	-	0.2 max
Al	Sisa	Sisa	Sisa	Sisa



## **LAMPIRAN 2: HASIL PENGUJIAN TARIK**

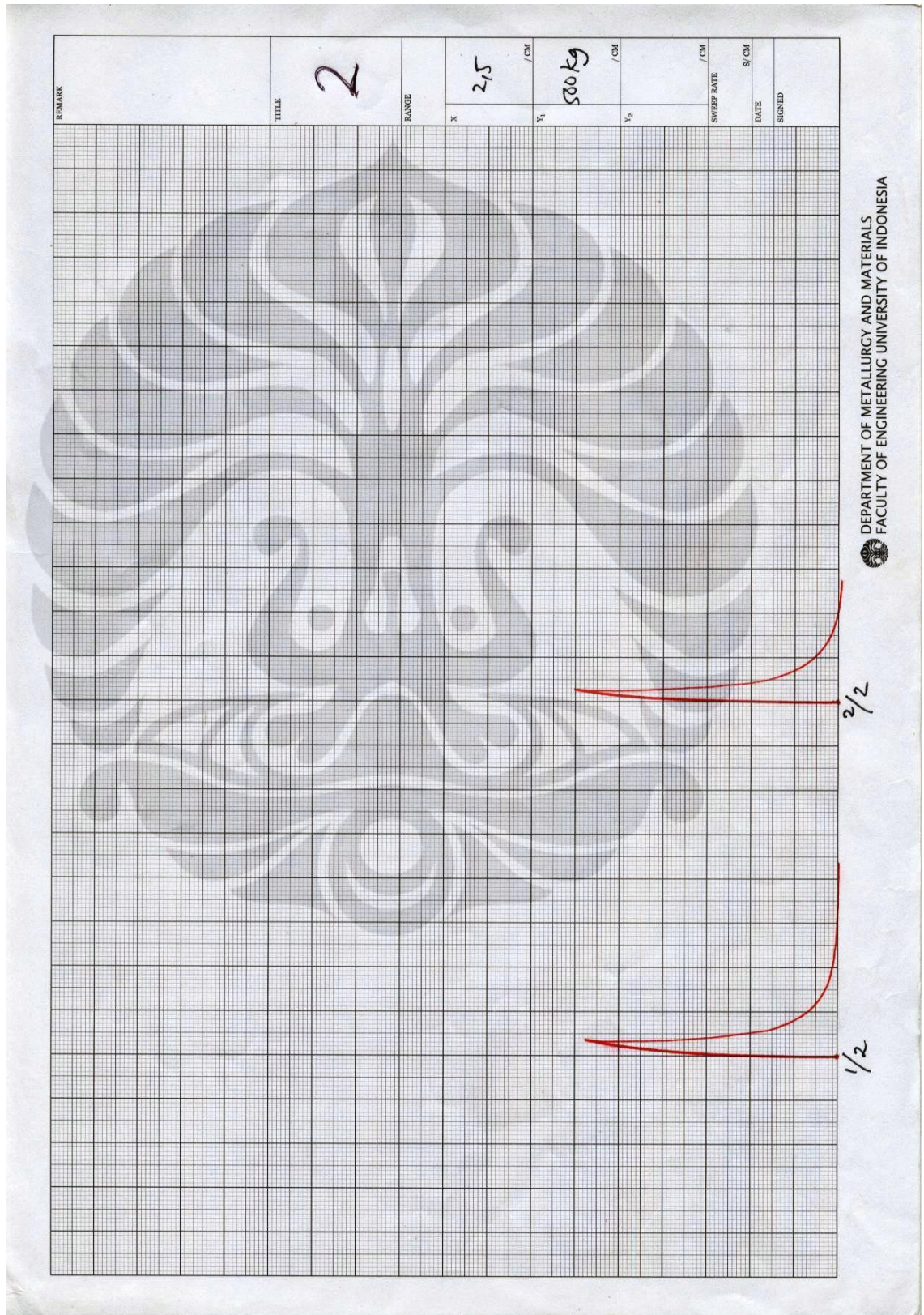
- Pengujian Tarik Sebelum Penambahan 0.019 wt.% Ti
- Pengujian Tarik Sesudah Penambahan 0.019 wt.% Ti  
( Mulai Pengamatan Proses *Fading*, Menit ke-0)
- Pengujian Tarik Sesudah Penambahan 0.019 wt.% Ti  
(Akhir Pengamatan *Fading*, Menit-120)

# Pengujian Tarik Sebelum Penambahan 0.019 wt.% Ti (0 wt.% Ti)





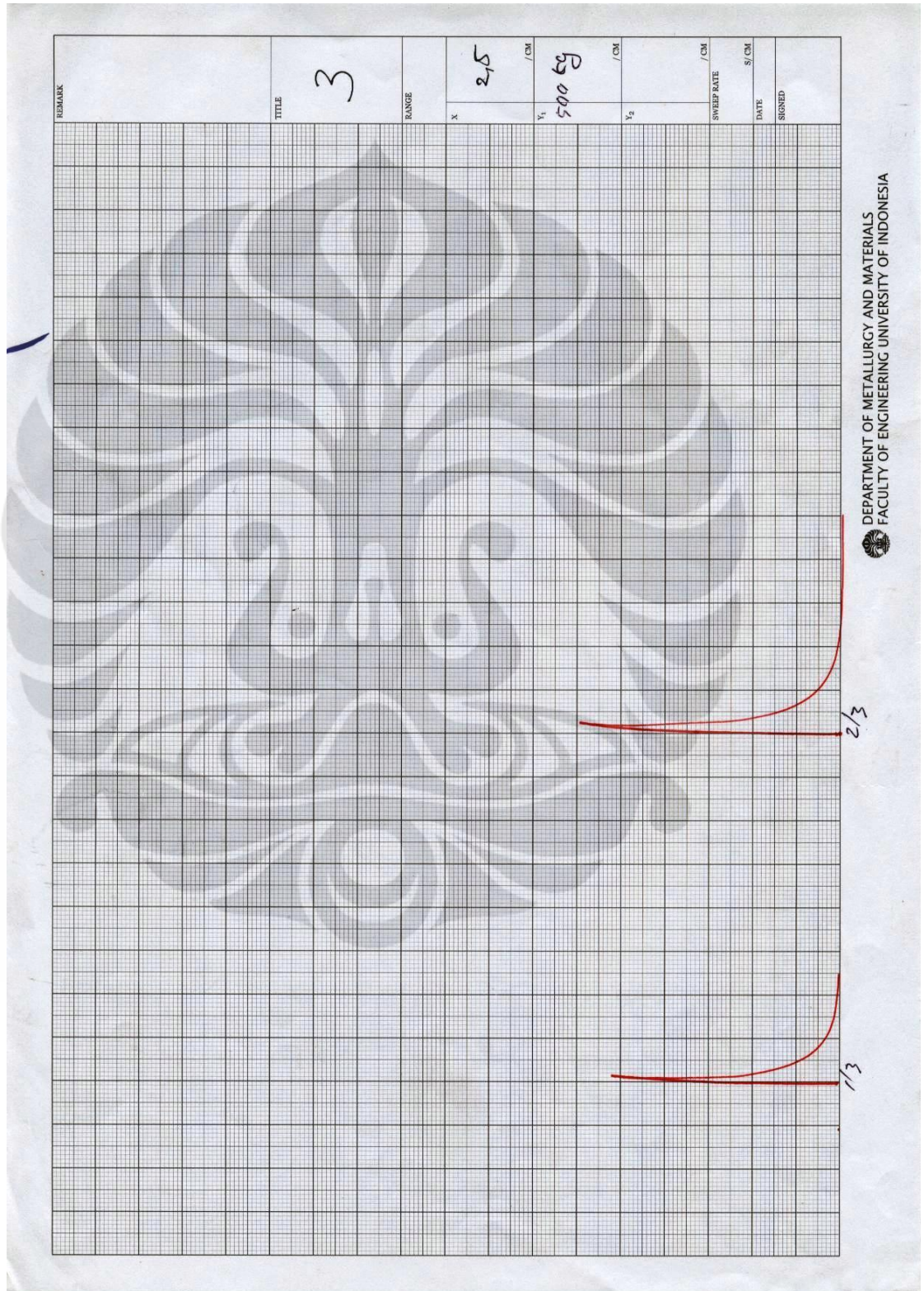
# Pengujian Tarik Sesudah Penambahan 0.019 wt.% Ti ( Mulai Pengamatan Proses *Fading*, Menit ke-0)



DEPARTMENT OF METALLURGY AND MATERIALS  
FACULTY OF ENGINEERING UNIVERSITY OF INDONESIA

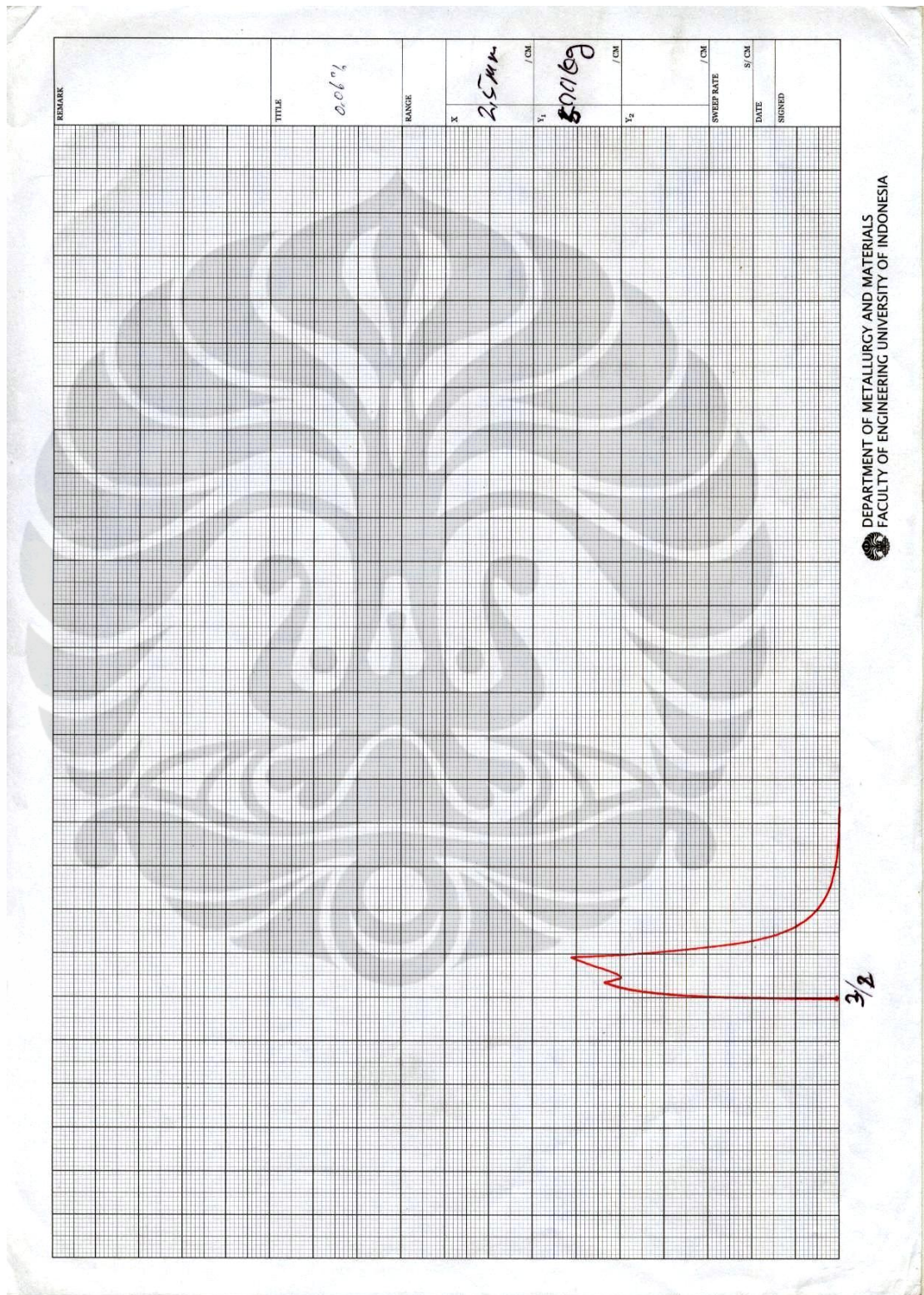


## Pengujian Tarik Sesudah Penambahan 0.019 wt.% Ti (Akhir Pengamatan *Fading*, Menit-120)



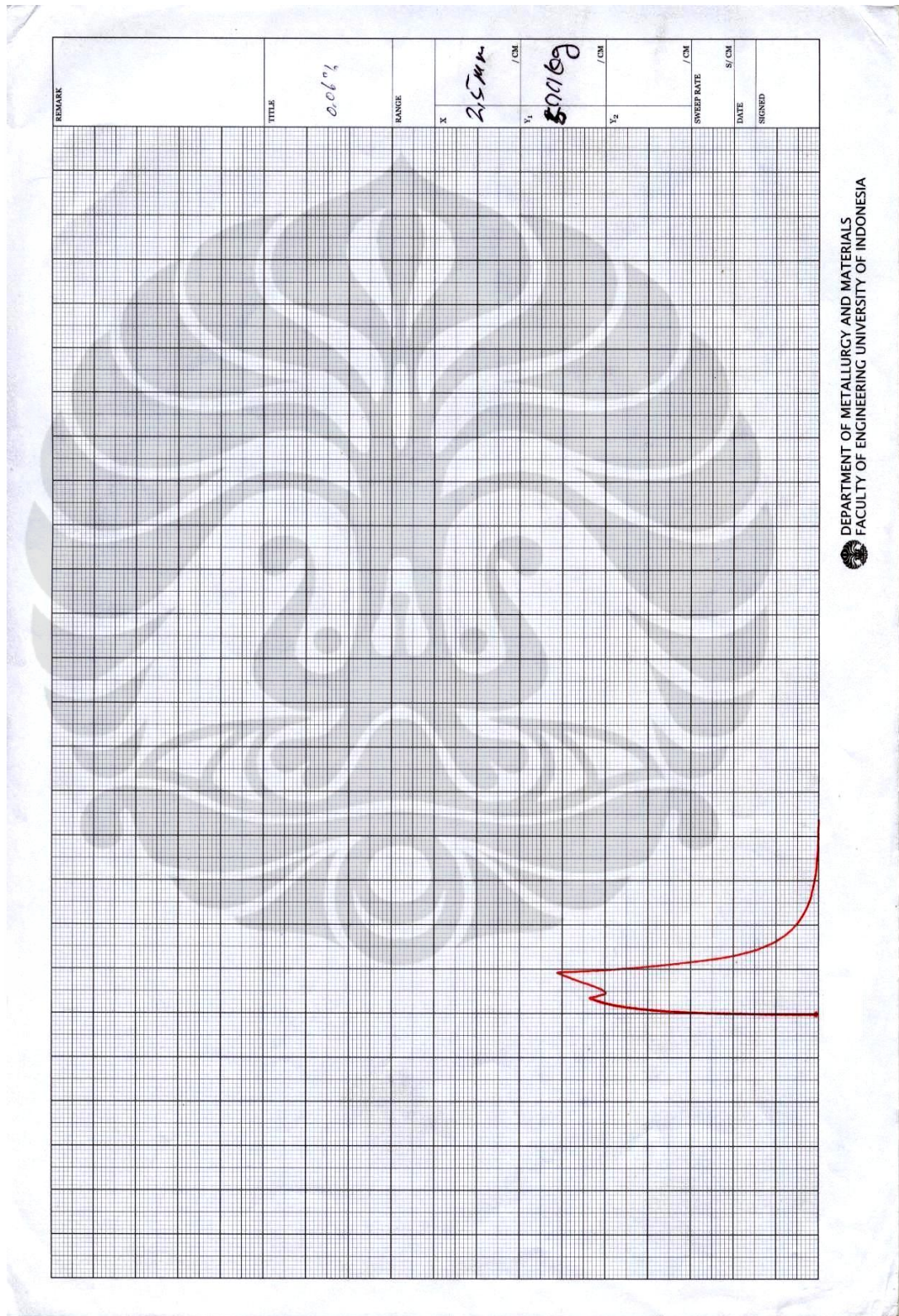


**Pengujian Tarik Sesudah Penambahan 0.019 wt.% Ti ( Mulai Pengamatan Proses *Fading*, Menit ke-0, sampel ke-3)**



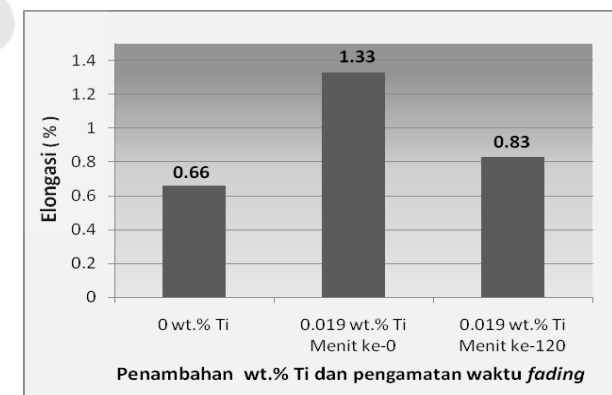
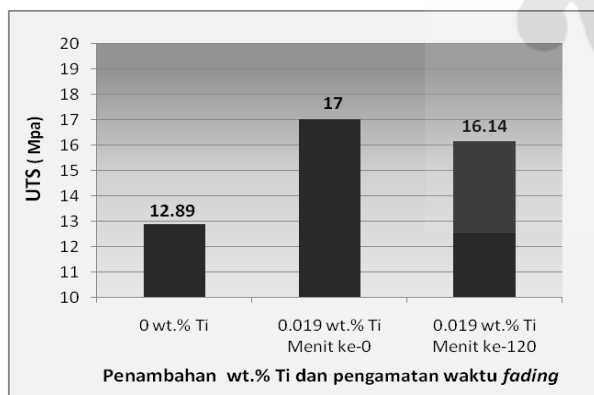


# Pengujian Tarik Sesudah Penambahan 0.019 wt.% Ti (Akhir Pengamatan *Fading*, Menit-120, sampel ke-3)





Hasil Uji Tarik								
Penambahan wt.% Ti	No.urut sampel	Do (mm)	A0 (mm <sup>2</sup> )	Gauge length	Pmaks (kg/mm <sup>2</sup> )	ΔL	UTS (kg/mm <sup>2</sup> )	elongasi (%)
0 wt.% Ti	1/1	15.1	178.99	50	1300	0.25	7.26	0.5
	2/1	15.1	178.99	50	2350	0.5	13.13	1
	3/1	14.7	169.63	50	3100	0.5	18.27	0.5
Rata-rata					2250	1	<b>12.89</b>	<b>0.66666667</b>
STDEV					738.241153		4.50	0.24
Penyimpangan					0.33		0.35	0.35
0.019 wt.% Ti, Menit ke-0	1/2	15	176.63	50	2900	0.75	16.42	2
	2/2	14.5	165.05	50	3000	0.5	18.18	1.5
	3/2	15	176.63	50	2900	0.5	16.42	0.5
Rata-rata					2933.333333	0.25	<b>17.00</b>	<b>1.333333333</b>
STDEV					47.14045208		0.83	0.62
Penyimpangan					0.02		0.05	0.47
0.019 wt.% Ti, Menit ke-120	1/3	15	176.63	50	2700	0.5	15.29	0.5
	2/3	15	176.63	50	2950	0.5	16.70	1
	3/3	15	176.63	50	2900	0.5	16.42	1
Rata-rata					2850	0.04	<b>16.14</b>	<b>0.83</b>
STDEV					108.01		0.61	0.24
Penyimpangan					0.04		0.04	0.28





### **LAMPIRAN 3: HASIL PENGUJIAN KEKERASAN**

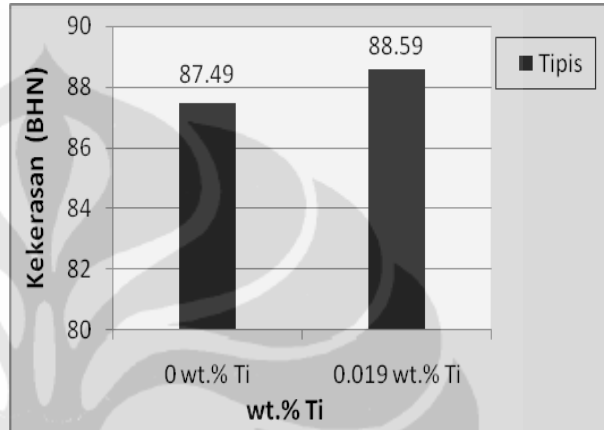
- Pengujian Kekerasan Sebelum dan Sesudah (Menit ke-30) Penambahan 0.019 wt.% Ti pada Sampel Tipis dan Tebal dari *cylinder head*
- Pengujian Kekerasan Sampel Tipis dari *cylinder head* di Setiap Variabel Waktu *Fading* Penambahan 0.019 wt.% Ti
- Pengujian Kekerasan Sampel Tebal dari *cylinder head* di Setiap Variabel Waktu *Fading* Penambahan 0.019 wt.% Ti
- Konversi Nilai Kekerasan *Brinell* ke *Rockwell*



**Pengujian Kekerasan Sebelum dan Sesudah (Menit ke-30 )  
Penambahan 0.019 wt.% Ti pada Sampel Tipis dan Tebal dari  
*cylinder head***

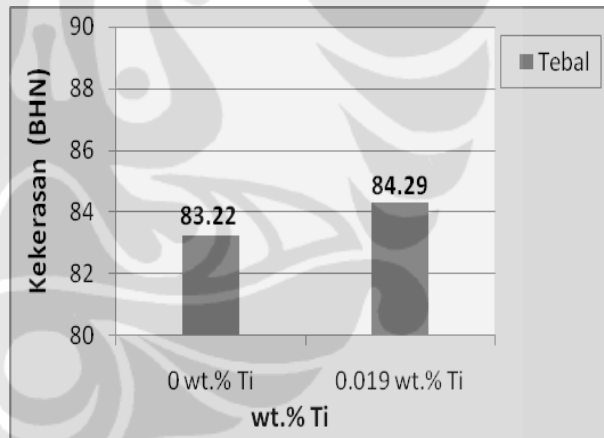
**Tipis**

wt.% Ti	HRB
0 wt.% Ti	87.49
0.019 wt.% Ti	88.59



**Tebal**

wt.% Ti	HRB
0 wt.% Ti	83.22
0.019 wt.% Ti	84.29



**Pengujian Kekerasan Sampel Tipis dari *cylinder head* di Setiap Variabel Waktu *Fading* Penambahan 0.019 wt.% Ti**

**TIPIS 0.019 wt.% Ti**

30 menit	titik	d1	d2	(d1+d2)/2	brinell	stdev	err
	1	0.657	0.663	0.66	90.37436	0.004243	0.006428
	2	0.679	0.668	0.6735	86.74692	0.007778	0.011549
	3	0.68	0.665	0.6725	87.00815	0.010607	0.015772
	4	0.679	0.657	0.668	88.19824	0.015556	0.023288
	5	0.643	0.675	0.659	90.65196	0.022627	0.034336
				<b>0.6666</b>	<b>88.59593</b>		

60 menit	titik	d1	d2	(d1+d2)/2	brinell	stdev	err
	1	0.69	0.683	0.6865	83.4541	0.00495	0.00721
	2	0.692	0.677	0.6845	83.94851	0.010607	0.015495
	3	0.67	0.679	0.6745	86.48685	0.006364	0.009435
	4	0.692	0.685	0.6885	82.964	0.00495	0.007189
	5	0.689	0.678	0.6835	84.19734	0.007778	0.01138
				<b>0.6835</b>	<b>84.21016</b>		

90 menit	titik	d1	d2	(d1+d2)/2	brinell	stdev	err
	1	0.689	0.699	0.694	81.63799	0.007071	0.010189
	2	0.67	0.678	0.674	86.61674	0.005657	0.008393
	3	0.695	0.653	0.674	86.61674	0.029698	0.044063
	4	0.685	0.676	0.6805	84.95043	0.006364	0.009352
	5	0.676	0.67	0.673	86.87739	0.004243	0.006304
				<b>0.6791</b>	<b>85.33986</b>		

120 menit	titik	d1	d2	(d1+d2)/2	brinell	stdev	err
	1	0.693	0.67	0.6815	84.69829	0.016263	0.023864
	2	0.7	0.689	0.6945	81.519	0.007778	0.0112
	3	0.68	0.686	0.683	84.32216	0.004243	0.006212
	4	0.705	0.68	0.6925	81.9965	0.017678	0.025527
	5	0.687	0.68	0.6835	84.19734	0.00495	0.007242
				<b>0.687</b>	<b>83.34666</b>		



**Pengujian Kekerasan Sampel Tebal dari *cylinder head* di Setiap Variabel Waktu *Fading* Penambahan 0.019 wt.% Ti**

**TEBAL 0.019 .wt.% Ti**

30 menit	titik	d1	d2	(d1+d2)/2	brinell	stdev	Err
	1	0.684	0.681	0.6825	84.44726	0.002121	0.003108
	2	0.679	0.7	0.6895	82.72054	0.014849	0.021536
	3	0.701	0.68	0.6905	82.47815	0.014849	0.021505
	4	0.68	0.677	0.6785	85.45804	0.002121	0.003126
	5	0.68	0.67	0.675	86.35725	0.007071	0.010476
				<b>0.6832</b>	<b>84.29225</b>		

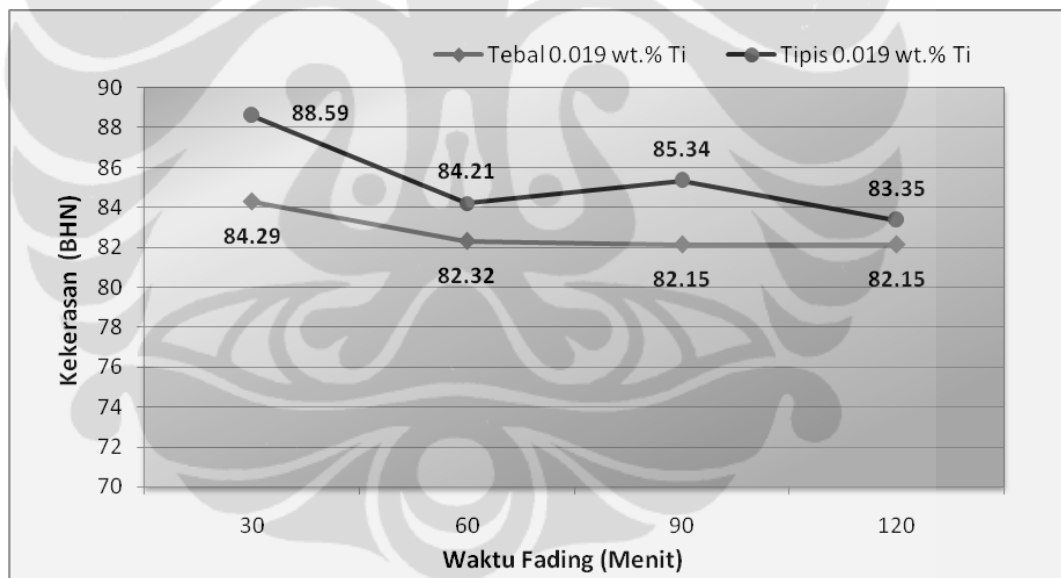
60 menit	titik	d1	d2	(d1+d2)/2	brinell	stdev	Err
	1	0.683	0.691	0.687	83.33117	0.005657	0.008234
	2	0.69	0.701	0.6955	81.2818	0.007778	0.011184
	3	0.7	0.705	0.7025	79.64962	0.003536	0.005033
	4	0.675	0.68	0.6775	85.71354	0.003536	0.005219
	5	0.701	0.687	0.694	81.63799	0.009899	0.014264
				<b>0.6913</b>	<b>82.32282</b>		

90 menit	titik	d1	d2	(d1+d2)/2	brinell	stdev	Err
	1	0.7	0.69	0.729	73.89064	0.007071	0.0097
	2	0.68	0.686	0.683	84.32216	0.004243	0.006212
	3	0.682	0.7	0.691	82.35734	0.012728	0.01842
	4	0.686	0.678	0.682	84.57264	0.005657	0.008295
	5	0.676	0.68	0.678	85.58565	0.002828	0.004172
				<b>0.6926</b>	<b>82.14569</b>		

120 menit	titik	d1	d2	(d1+d2)/2	brinell	stdev	Err
	1	0.697	0.71	0.7035	79.42042	0.009192	0.013067
	2	0.705	0.695	0.7	80.22692	0.007071	0.010102
	3	0.706	0.708	0.707	78.62586	0.001414	0.002
	4	0.7	0.701	0.7005	80.11097	0.000707	0.001009
	5	0.694	0.707	0.7005	80.11097	0.009192	0.013123
				<b>0.7023</b>	<b>79.69903</b>		

**Perbandingan Kekerasan Sampel Tipis dan Tebal dari *cylinder head* di Setiap Variabel Waktu *Fading* Penambahan 0.019 wt.%Ti**

Waktu Fading	BHN Tipis	BHN Tebal
30	88.59	84.29
60	84.21	82.32
90	85.34	82.15
120	83.35	82.15





## Hardness Conversion Table

Approximate Hardness Equivalents Covering Range of Rockwell C and  
Rockwell B Scales

VPN	ROCKWELL SCALES															BRINELL	
DPH HV/10	A	B	C	D	E	F	G	H	K	15N	30N	45N	15T	30T	45T	BHN 500kg	BHN 3000kg
113	41	63			95	93	22		76				81	59	37	99	112
112	41	62			95	92	21		75				81	58	36	98	110
111	40	61			94	92	19		74				81	57	35	96	108
110	40	60			93	91	18		73				81	57	34	95	107
108	39	59			93	91	16		72				80	56	32	94	106
107	39	58			92	90	15		71				80	55	31	92	104
106	38	57			91	90	13		71				80	55	30	91	102
105	38	56			91	89	12		70				79	54	29	90	101
104	38	55			90	88	10		69				79	53	28	89	99
103	37	54			90	88	9		68				79	53	27	87	
102	37	53			89	87	7		67				78	52	26	86	
101	36	52			88	87	6		66				78	51	25	85	
100	36	51			88	86	4		65				78	51	24	84	
100	35	50			87	86	3		65				77	50	23	83	
99	35	49			87	85			64				77	49	22	82	
98	35	48			86	85			63				77	49	21	81	
97	34	47			85	84			62				76	48	20	80	
96	34	46			85	83			61				76	47	19	79	
95	33	45			84	83			60				76	46	18	79	
95	33	44			84	82			59				75	46	17	78	
94	32	43			83	82			58				75	45	16	77	
DPH HV/10	A	B	C	D	E	F	G	H	K	15N	30N	45N	15T	30T	45T	BHN 500kg	BHN 3000kg
VPN	ROCKWELL SCALES															BRINELL	

Skala yang digunakan :

- Beban BHN : 500 kg
- Rockwell Scales : B

Nilai BHN Hasil Penelitian : 81 – 89 BHN

Standar PT.X : 45 – 65 HRB / Rockwell Scales : B



**LAMPIRAN 4 :**  
**HASIL PENGUKURAN *DENDRITE ARM***  
***SPACING (DAS)***

- Pengukuran DAS Sebelum dan Sesudah (Menit ke-30) Penambahan 0.019 wt.% Ti pada Sampel Tipis dan Tebal dari *cylinder head*
- Pengukuran DAS Sampel Tipis dari *cylinder head* di Setiap Variabel Waktu *Fading* Penambahan 0.019 wt.% Ti
- Pengukuran DAS Sampel Tebal dari *cylinder head* di Setiap Variabel Waktu *Fading* Penambahan 0.019 wt.% Ti

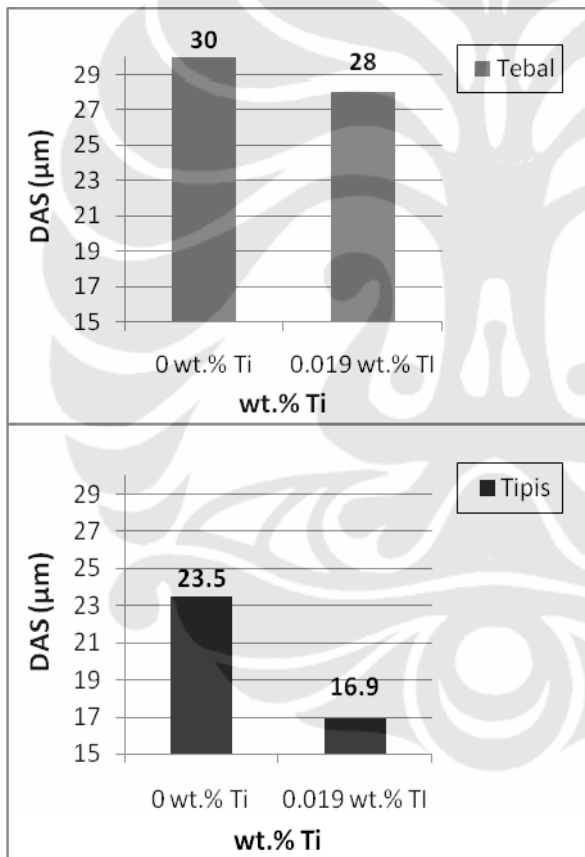
**Pengukuran DAS Sebelum dan Sesudah (Menit ke-30)  
Penambahan 0.019 wt.% Ti pada Sampel Tipis dan Tebal dari  
*cylinder head***

**TIPIS**

wt.% Ti	DAS
0 wt.% Ti	23.5
0.019 wt.% Ti	16.9

**TEBAL**

wt.% Ti	DAS
0 wt.% Ti	30
0.019 wt.% Ti	28





**Pengukuran DAS Sampel Tipis dari *cylinder head* di Setiap Variabel Waktu  
Fading Penambahan 0.019 wt.% Ti**

Menit ke-30	Mikron	Menit ke-60	Mikron	Menit ke-90	Mikron	Menit ke-120	Mikron
	18.056		18.444		18.889		17.122
	15.889		17.126		18.88		17.122
	16.889		18.444		18.224		16
	16.167		16.666		17.669		17.666
	15.278		18.224		17.886		18.668
	17.667		19.68		18.112		18.668
	19.222		18.012		17.666		18.112
	17.056		18.012		17.056		17.011
	16.333		16.444		16.888		17.056
	16.444		17.012		16.011		16
rata - rata	<b>16.90</b>	rata - rata	<b>17.81</b>	rata - rata	<b>17.73</b>	rata - rata	<b>17.34</b>
stdev	<b>1.157607</b>	stdev	<b>0.9906</b>	stdev	<b>0.8940</b>	stdev	<b>0.948947</b>
Err	<b>0.068497</b>	Err	<b>0.0556</b>	Err	<b>0.0504</b>	Err	<b>0.0547</b>

**Pengukuran DAS Sampel Tipis dari *cylinder head* di Setiap Variabel Waktu  
Fading Penambahan 0.019 wt.% Ti**

Menit ke-30	Mikron	Menit ke-60	Mikron	Menit ke-90	Mikron	Menit ke-120	Mikron
	25.889		30		32.334		32.352
	26.833		26.111		34.667		32.3
	24.722		32.886		29.113		28.352
	24.889		29		30.111		30.464
	31.889		30.126		29.223		28.111
	29.833		32.223		28.8		30.228
	33.111		30.228		27		29.666
	29.111		27.446		29.666		30.912
	27.222		29.666		29.111		29
	30.333		33.111		28		29.666
rata - rata	<b>28.38</b>	rata - rata	<b>30.05</b>	rata - rata	<b>29.81</b>	rata - rata	<b>30.11</b>
stdev	<b>2.9185</b>	stdev	<b>2.2620</b>	stdev	<b>2.2006</b>	stdev	<b>1.4651</b>
Err	<b>0.1028</b>	Err	<b>0.075269</b>	Err	<b>0.0738</b>	Err	<b>0.04867</b>

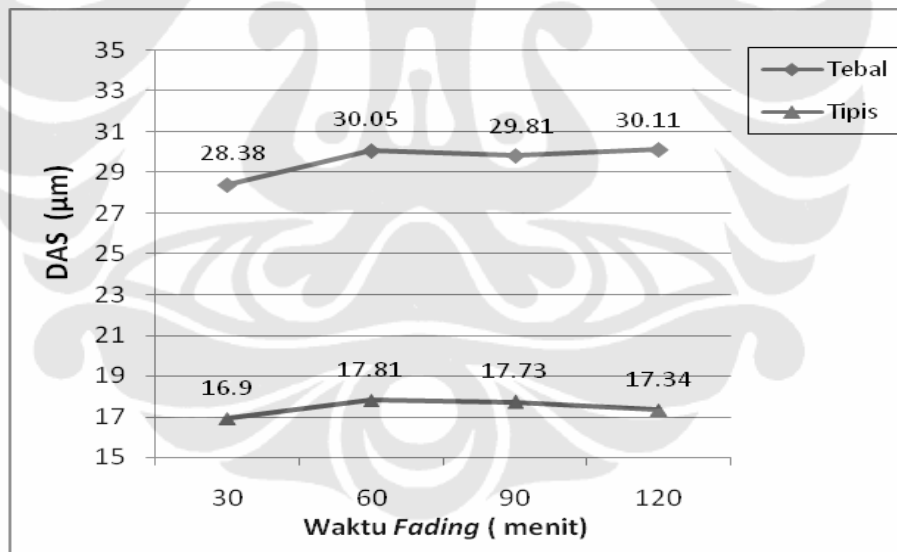
**Perbandingan Nilai DAS Sampel Tipis dan Tebal dari *cylinder head* di Setiap Variabel Waktu *Fading* Penambahan 0.019 wt.%Ti**

**Tipis**

Waktu Fading	Rata2
30	16.9
60	17.81
90	17.73
120	17.34

**Tebal**

Waktu Fading	Rata2
30	28.38
60	30.05
90	29.81
120	30.11



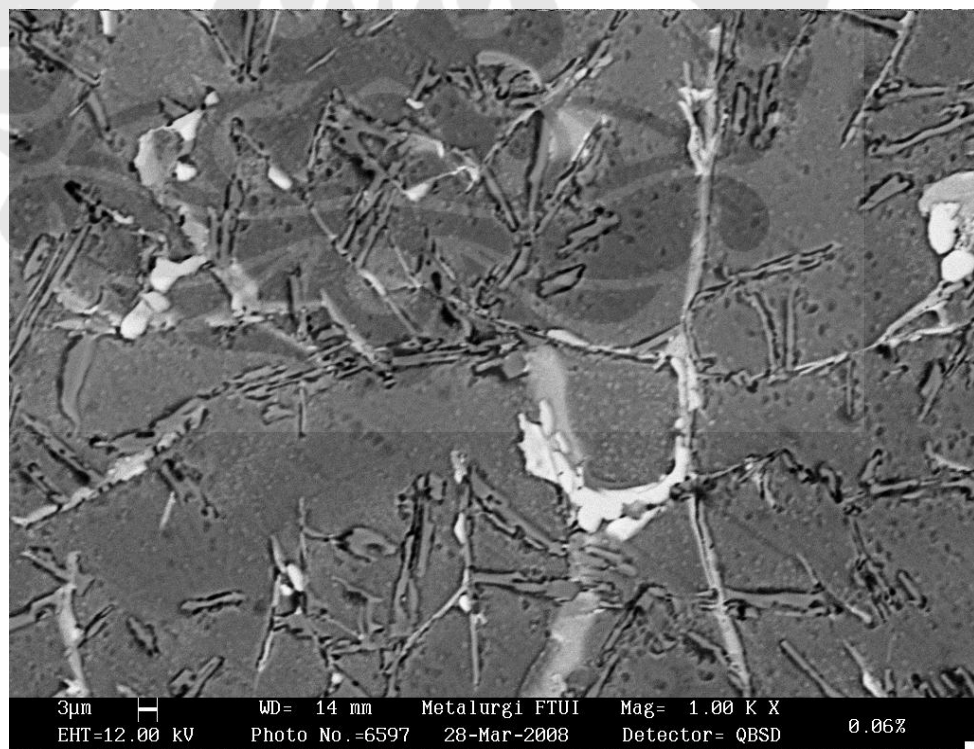
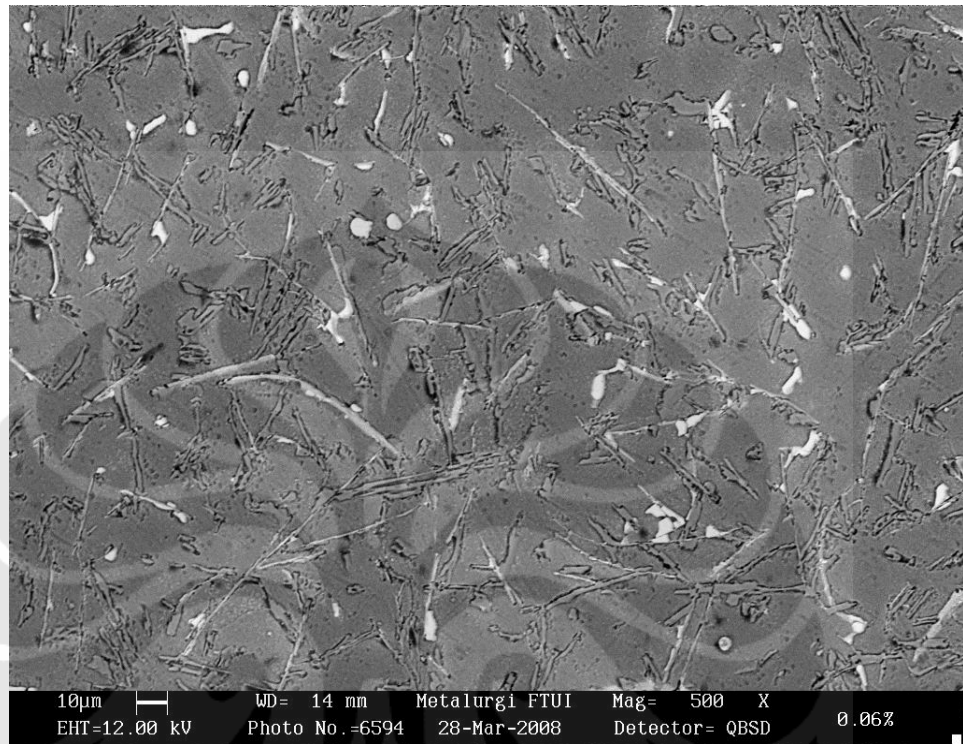


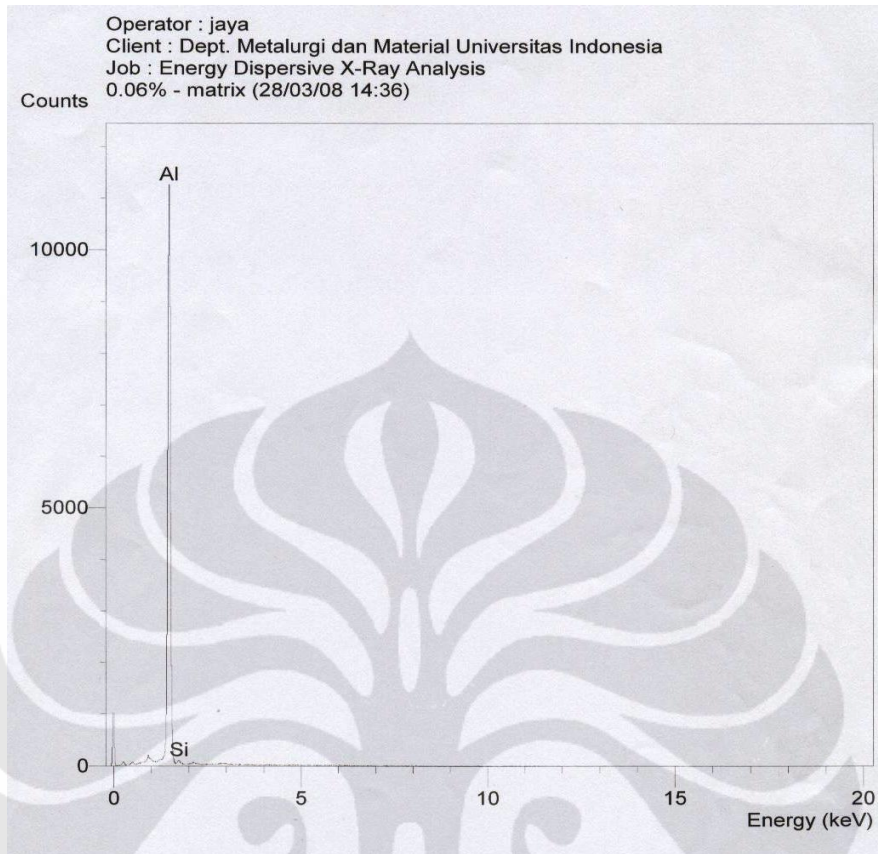
**LAMPIRAN 5:  
HASIL PENGAMATAN SEM/EDS**

- **Hasil SEM/EDS Sampel Penambahan 0.019 wt.% Ti ( Sampel Tipis dari *Cylinderhead*, menit ke-30 )**



**Hasil SEM/EDS Sampel Penambahan 0.019 wt.% (Sampel Tipis dari  
*Cylinderhead*, menit ke-30), Perbesaran 500X dan 1000X**





SEMQuant results. Listed at 14:37:47 on 28/03/08  
 Operator: jaya  
 Client: Dept. Metalurgi dan Material Universitas Indonesia  
 Job: Energy Dispersive X-Ray Analysis  
 Spectrum label: 0.06% - matrix

System resolution = 59 eV

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

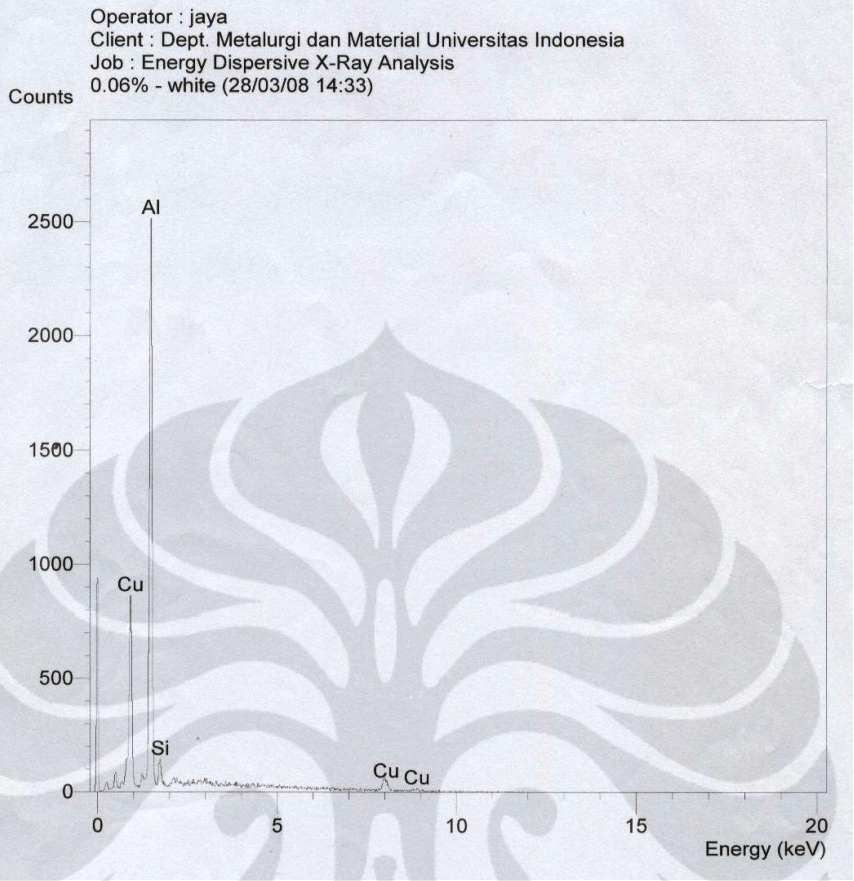
6 peaks possibly omitted: -0.02, 0.24, 0.48,  
 0.94, 2.16, 8.02 keV

Standards :

Al K CeAl2 03/03/07  
 Si K Low Carbon Steel 13/09/06

Elmt	Spect. Type	Element %	Atomic %
Al K	ED	98.90	98.94
Si K	ED	1.10	1.06
Total		100.00	100.00

\* = <2 Sigma



SEMQuant results. Listed at 14:34:25 on 28/03/08  
 Operator: jaya  
 Client: Dept. Metalurgi dan Material Universitas Indonesia  
 Job: Energy Dispersive X-Ray Analysis  
 Spectrum label: 0.06% - white

System resolution = 60 eV

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

3 peaks possibly omitted: -0.02, 0.24, 2.14 keV

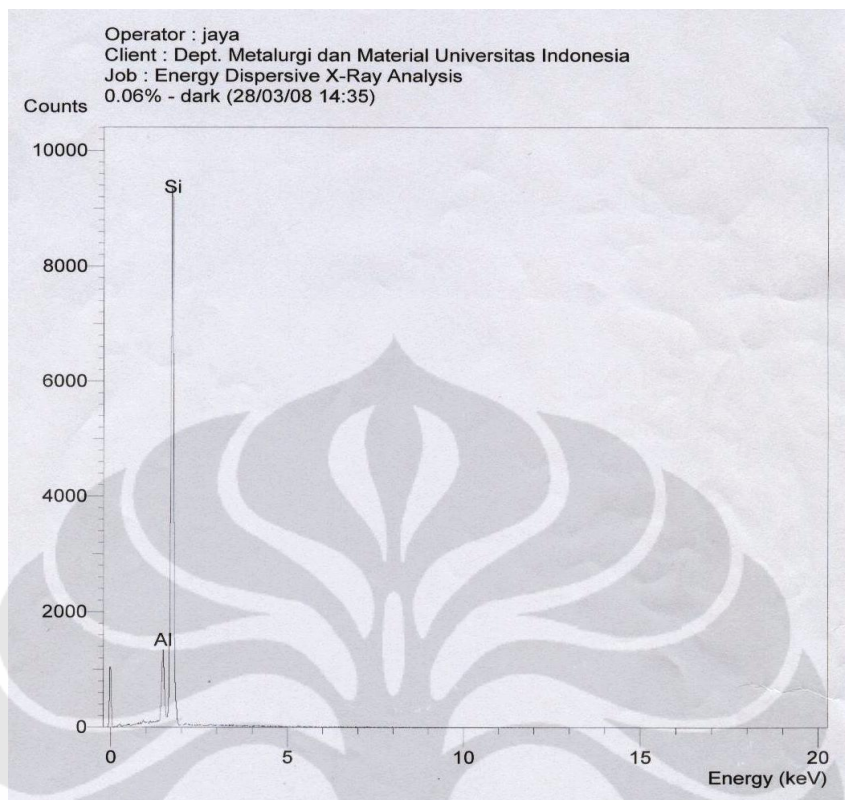
Standards :

Al K	CeAl2	03/03/07
Si K	Low Carbon Steel	13/09/06
Cu K	Copper	22/03/06

Elmt	Spect. Type	Element %	Atomic %
Al K	ED	39.73	60.08
Si K	ED	1.51	2.20
Cu K	ED	58.75	37.73
Total		100.00	100.00

\* = <2 Sigma





SEMQuant results. Listed at 14:36:39 on 28/03/08  
 Operator: jaya  
 Client: Dept. Metalurgi dan Material Universitas Indonesia  
 Job: Energy Dispersive X-Ray Analysis  
 Spectrum label: 0.06% - dark

System resolution = 59 eV

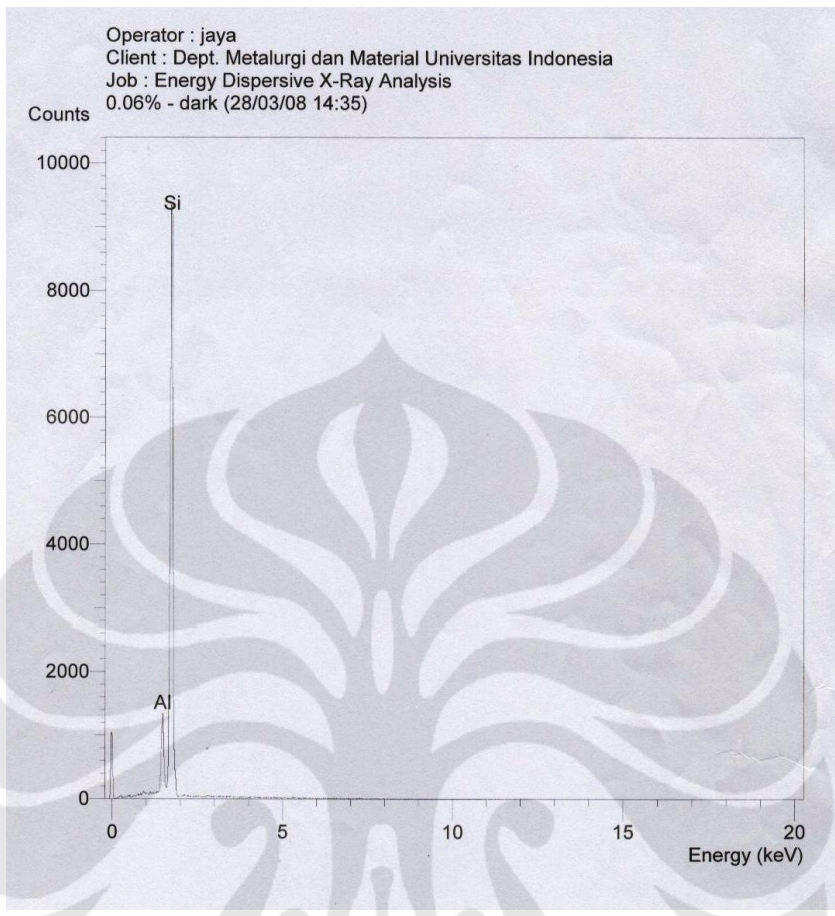
Quantitative method: ZAF ( 3 iterations).  
 Analysed all elements and normalised results.

5 peaks possibly omitted: -0.02, 0.24, 0.46,  
 0.94, 2.84 keV

Standards :  
 Al K CeAl2 03/03/07  
 Si K Low Carbon Steel 13/09/06

Elmt	Spect. Type	Element %	Atomic %
Al K	ED	14.17	14.66
Si K	ED	85.83	85.34
Total		100.00	100.00

\* = <2 Sigma



SEMQuant results. Listed at 14:36:39 on 28/03/08  
 Operator: jaya  
 Client: Dept. Metalurgi dan Material Universitas Indonesia  
 Job: Energy Dispersive X-Ray Analysis  
 Spectrum label: 0.06% - dark

System resolution = 59 eV

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

5 peaks possibly omitted: -0.02, 0.24, 0.46,  
 0.94, 2.84 keV

Standards :  
 Al K CeAl2 03/03/07  
 Si K Low Carbon Steel 13/09/06

Elmt	Spect. Type	Element %	Atomic %
Al K	ED	14.17	14.66
Si K	ED	85.83	85.34
Total		100.00	100.00

\* = <2 Sigma



**LAMPIRAN 6 :**

- **CHECK SHEET CYLINDER HEAD HASIL PENAMBAHAN 0.019 wt.% Ti PADA PROSES LPDC**

## CHECK SHEET

**Temp melting** : 800 °C  
**Komposisi + Grain refiner** : 0.019 wt.% Ti  
**Temp penambahan grain refiner** : 742 °C  
**Jenis Grain Refiner** : Coveral – 2815  
**Waktu GBF** : 8 menit  
**Humidity** : 72 %  
**Berat Molten** : 436 kg

No shot	No Dies	Temp Dies ©		Temp molten	Tekanan mesin	Menit ke	Jenis cacat LPDC	Jenis Cacat Machining
		Upper	Lower					
1	26	247.1	359	TRIAL	250	0		
	25	224.7	365.7					
2	26	255.6	361	TRIAL	250			
	25	243.4	381.3					
3	26	261.3	371.6	693	250			Bocor
	25	244.7	389.5					
4	26	261.5	371	694	250			Bocor
	25	244.7	393.4					
5	26	262.2	376.8	696	250		shrinkage (R)	Bocor
	25	245.4	396.5					
6	26	268.2	377.9	696	250			
	25	247.8	397.1					
7	26	270.4	382.4	697	250			
	25	250	404					
8	26	267.9	386.8	698	250			
	25	249.7	405.5					
9	26	270.5	390.9	698	250			
	25	250.7	404.7					
10	26	270.9	393.6	699	250	30		
	25	252.3	410.3					
11	26	271.9	393.9	700	250			
	25	255.8	414.8					
12	26	273.8	398.3	701	250			
	25	259.5	418					
13	26	280.8	405.7	701	250			
	25	263.7	421.8					
14	26	274.9	395.7	702	256			
	25	260.8	416					
15	26	272.9	399.1	702	256		Keropos (R)	
	25	261	414.2					
16	26	278.1	466.3	702	256	60		
	25	264.9	419.1					
17	26	282.5	406.7	703	256		Keropos (R)	
	25	268.9	415.9					




18	26	278.9	404.5	705	256			Bocor
	25	267.9	422.8					
19	26	276.8	400.9	705	256			
	25	267.6	421					
20	26	278	402.5	705	256			
	25	267.5	419.7					
21	26	282.8	407.1	705	256		shrinkage (R)	
	25	270	423.8					
22	26	282.7	407.8	706	256			
	25	269.8	420.8					
23	26	285.2	411.9	707	256	90		
	25	271.7	427.7					
24	26	285.5	413.9	707	256			
	25	271.9	429.7					
25	26	286.1	413.9	707	256			
	25	272.9	428.7					
26	26	287.4	417	707	256		shrinkage (R)	
	25	274.1	434.7					
27	26	286.8	415.4	707	262			
	25	274.1	430.7					
28	26	288.1	417	707	262			Bocor
	25	274.2	427.3					
29	26	287.5	415.2	707	262			
	25	273.6	425.6					
30	26	286.1	416.6	707	262	120		
	25	273	425.6					
31	26	289.2	416.2	707	262		Misrun (R)	
	25	276.1	421.8					
32	26	288.5	418.2	707	262			
	25	274.2	426.8					
33	26	288.5	417.4	707	262			
	25	273.6	430.4					
34	26	284.6	412.9	706	262			
	25	270.9	427.3					
35	26	186.7	417.3	705	262		shrinkage (R)	
	25	271.8	429.9					
36	26	291	418.7	703	262			
	25	273.9	416.7					
37	26	290.2	415.1	704	262			
	25	273.2	425.5					
38	26	290.3	413.6	704	262			
	25	272.6	426.3					
39	26	277.1	407.3	705	262		shrinkage (R)	
	25	262.5	407.9					
40	26	280.7	414.6	705	268			
	25	265.9	425.9					

Keterangan : R = Reject

## LAMPIRAN 7 :

### TECHNICAL DATA SHEET COVERAL GR 2815

  
FOSECO

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Edition 01/05      Technical Data Sheet

## COVERAL\* GR 2815

Sodium Free Granulated Flux for Grain Refining of Aluminium and Aluminium Alloys

<b>General description</b>	COVERAL GR 2815 is a sodium free grain refining granulated flux suitable for Aluminium and Aluminium alloys including those containing alloying amounts of magnesium. It is a universal grain refiner based on titanium and boron. COVERAL GR 2815 when plunged into the melt reacts to form titanium diboride and aluminium boride. These finely dispersed species are highly efficient nuclei that promote a fine equiaxed grain growth during solidification. This grain structure ensures excellent feeding characteristics leading to optimum mechanical properties in the casting. This improvement in feeding properties is beneficial in sand casting application but is of particular benefit in gravity die casting where solidification rates are usually quite high.
<b>Advantages</b>	COVERAL GR 2815 is sodium free. COVERAL GR 2815 is dust free in use and emits low fume during application. Granulated fluxes can be used at reduced application rates compared to powder fluxes.
<b>Application</b>	Any dross present on the melt surface should be carefully removed. The required amount of COVERAL GR 2815 is then placed on the melt surface and plunged to the bottom of the melt using a clean and preheated plunging tool and stirred vigorously into the melt. After the reaction is complete the melt surface should be drossed off using a suitable skimming tool.  Any subsequent degassing by tablets or by FDU impeller treatment can be done without any detrimental effects to the grain refining efficiency.
<b>Application temperature</b>	700 °C and higher.
<b>Addition rate</b>	0.05 - 0.15 % of the metal weight, depending on alloy type.
<b>Packing</b>	25 Kg polyethylene lined multi-ply paper sacks.
<b>Storage</b>	Like all fluxes, COVERAL GR 2815 should be stored in a dry place. Close opened packages or storage bins securely after use.
<b>Labelling</b>	Xn Harmful.
<b>Health and safety</b>	For safety reasons this product must be used only in accordance with the instructions for use contained in this Technical Data Sheet. The Material Safety Data Sheet for this product is available on request.
<b>Further remarks</b>	The data given in this leaflet are only guide values and do not represent a specification. All rights to make technical changes to improve the product are reserved.

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