LAMPIRAN 1

HASIL PENGUJIAN KOMPOSISI

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❖ **Data mentah hasil pengujian komposisi *as-cast* paduan aluminium tuang AC4B**

Unsur paduan	Komposisi AC4B Tanpa Penambahan Ti	Komposisi AC4B Penambahan 0.02 wt% Ti	Komposisi AC4B Penambahan 0.03 wt % Ti
Si	9,412	8.879	8.748
Cu	2,837	2.663	2.557
Mg	0,222	0.138	0.13
Zn	0,712	0.562	0.55
Fe	0,658	0.949	0.91
Mn	0,242	0.82	0.261
Ni	0,049	0.071	0.062
Ti	**0,029**	**0.048**	**0.058**
Pb	0,124	0.074	0.073
Sn	0,043	0.023	0.25
Cr	0,021	0.025	0.027
Al	Remains	Remains	Remains

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LAMPIRAN 2
HASIL PENGUJIAN KEKERASAN

Studi pengaruh penambahan..., Muhammad Husni Harion, FT UI, 2008

Data mentah hasil pengujian kekersan *as-cast* sampel *cylinder head* pada bagian tipis dan tebal, disertai standar deviasi dan persentase kesalahan relatif.

HASIL PENGUJIAN KEKERASAN BAGIAN TIPIS

Komposisi Ti (wt%)	No urut titik	X	Y	rata-rata	Nilai kekerasan BHN	Nilai Rata-rata Kekerasn BHN	S.Dev
0%	1	0.62	0.691	0.6555	91.63	**87.48**	2.49
	2	0.676	0.681	0.6785	85.45		
	3	0.681	0.674	0.6775	85.71		
	4	0.672	0.672	0.672	87.13		
	5	0.683	0.663	0.673	86.87		
0.019%	1	0.647	0.632	0.6395	96.32	**90.25**	3.92
	2	0.67	0.64	0.655	91.77		
	3	0.679	0.665	0.672	87.13		
	4	0.685	0.661	0.673	86.87		
	5	0.663	0.666	0.6645	89.14		
0.029%	1	0.64	0.66	0.65	93.20	**92.73**	2.63
	2	0.635	0.65	0.6425	95.42		
	3	0.633	0.657	0.645	94.67		
	4	0.654	0.658	0.656	91.49		
	5	0.652	0.679	0.6655	88.87		

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HASIL PENGUJIAN KEKERASAN BAGIAN TEBAL

Komposisi Ti (wt%)	No urut titik	X	Y	rata-rata	Nilai kekerasan BHN	Nilai Rata-rata Kekerasn BHN	S.DEV
0%	1	0.701	0.66	0.681	84.95	**83.22**	2.88
	2	0.697	0.715	0.706	78.85		
	3	0.687	0.693	0.690	82.59		
	4	0.669	0.68	0.675	86.48		
	5	0.682	0.691	0.687	83.45		
0.019%	1	0.685	0.695	0.690	82.59	**85.04**	3.19
	2	0.7	0.687	0.694	81.75		
	3	0.67	0.676	0.673	86.87		
	4	0.68	0.685	0.683	84.44		
	5	0.663	0.663	0.663	89.54		
0.029%	1	0.666	0.667	0.667	88.60	**87.78**	2.32
	2	0.666	0.665	0.666	88.87		
	3	0.674	0.661	0.668	88.33		
	4	0.679	0.692	0.686	83.70		
	5	0.659	0.668	0.664	89.41		

	Kesalahan Relatif (%)	
Variabel Ti (wt %)	**Bagian Tipis**	**Bagian Tebal**
0	2.9	3.5
0.019	4.3	3.8
0.029	2.8	2.6

Contoh cara perhitungan % kesalahan relatif kekerasan untuk 0 wt % Ti pada bagian tipis :

$$\% \text{ kesalahan relatif} = \frac{2.49}{87.48} x100\% = 2.9\%$$

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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	

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LAMPIRAN 3

HASIL PENGUJIAN KEKUATAN TARIK

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❖ **Data mentah hasil pengujian tarik untuk tiap variasi wt. % Ti disertai standar deviasi dan kesalahan relatif**

Penambahan Ti	No.urut	Do (mm)	A0 (mm2)	Gauge length	Pmaks (kg/mm2)	ΔL	UTS (kg/mm2)	elongasi (%)
0	1	15.1	178.99	50	1300	0.25	7.26	0.5
	2	15.1	178.99	50	2350	0.5	13.13	1
	3	14.7	169.63	50	3100	0.5	18.27	0.5
Rata-rata							**12.89**	**0.67**
STDEV							4.50	0.24
0.019%	1	14.8	171.95	50	2900	0.5	16.87	1
	2	14.7	169.63	50	2300	0.5	13.56	1
	3	14.8	171.95	50	2450	0.25	14.25	0.5
Rata-rata							**14.89**	**0.83**
STDEV							1.42	0.24
0.029%	1	15	176.63	50	2875	1	16.28	2
	2	14.5	165.05	50	3000	0.75	18.18	1.5
	3	15.7	193.49	50	2700	0.5	13.95	1
Rata-rata							**16.14**	**1.5**
STDEV							1.73	0.41

	Kesalahan ralatif (%)	
Variasi Ti (wt %)	**Kekuatan Tarik**	**Elongasi**
0	35%	35%
0.019	10%	28%
0.029	11%	27%

Contoh cara perhitungan % kesalahan relatif kekuatan tarik untuk 0 wt % Ti :

% Kesalahan relatif : $\frac{4.5}{12.89} x100\% = 35\%$

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Tanpa Penambahan
Titanium

Sumbu X : 2.5 mm/cm
Sumbu Y : 500 kg/cm

ε (Strain)

σ (Stress)

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Penambahan 0.019 wt %
Titanium

Sumbu X : 2.5 mm/cm
Sumbu Y : 500 kg/cm

σ (Stress)

ε (Strain)

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Penambahan 0.029 wt %
Titanium

Sumbu X : 2.5 mm/cm
Sumbu Y : 500 kg/cm

σ (Stress)

ε (Strain)

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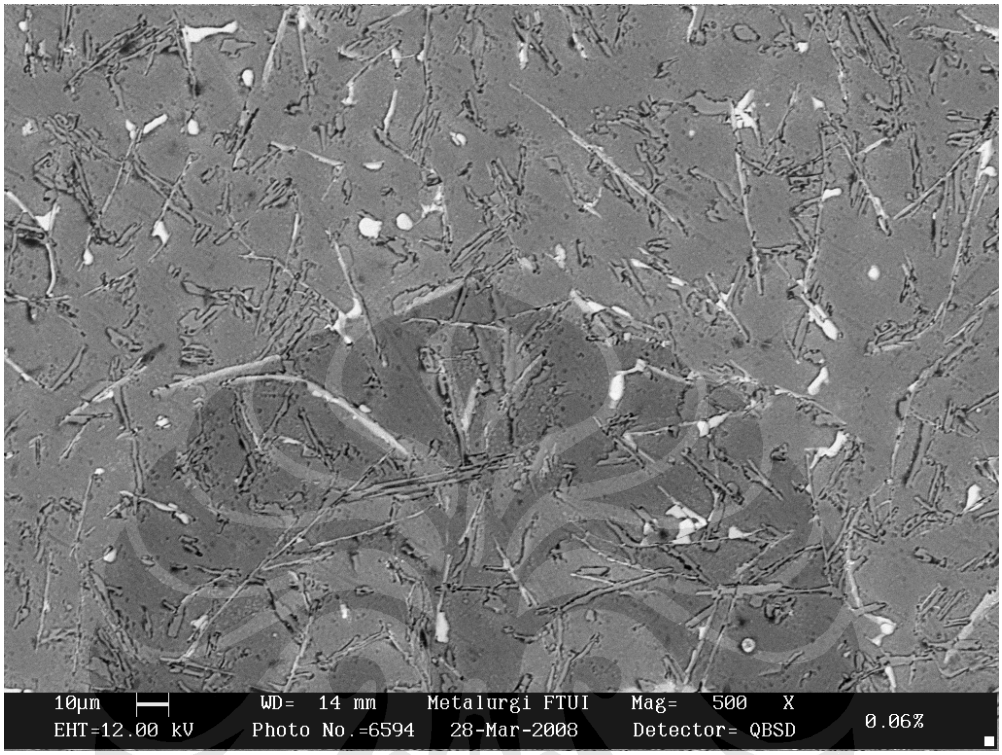
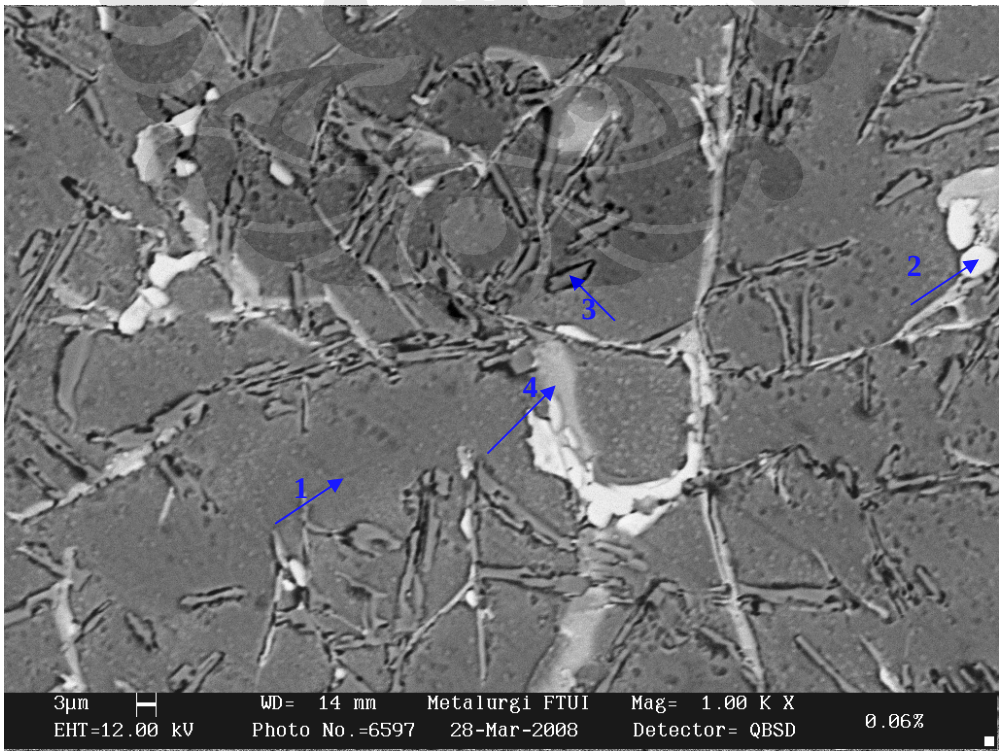
LAMPIRAN 4
HASIL PENGUJIAN SEM/EDS

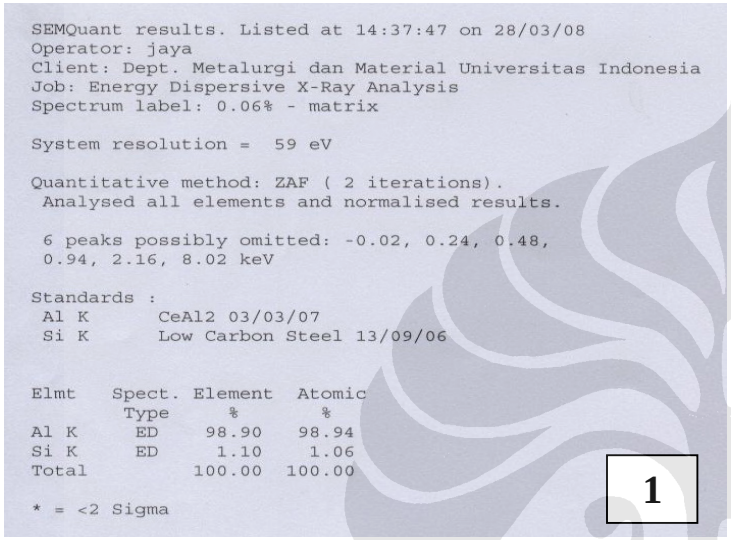
Studi pengaruh penambahan..., Muhammad Husni Harion, FT UI, 2008

Hasil Pengamatan SEM *as-cast* aluminium AC4B dengan penambahan 0.019 wt % Ti etsa HF 0.5 %





Studi pengaruh penambahan..., Muhammad Husni Harion, FT UI, 2008



```
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.

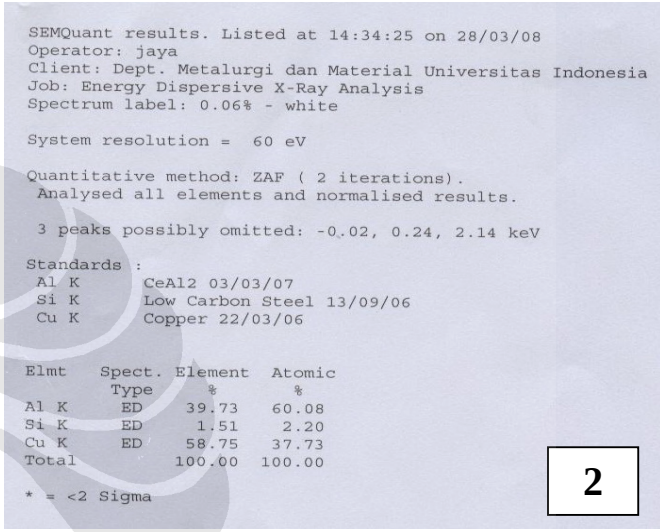
 6 peaks possibly omitted: -0.02, 0.24, 0.48,
 0.94, 2.16, 8.02 keV

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


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

* = <2 Sigma
```

1



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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

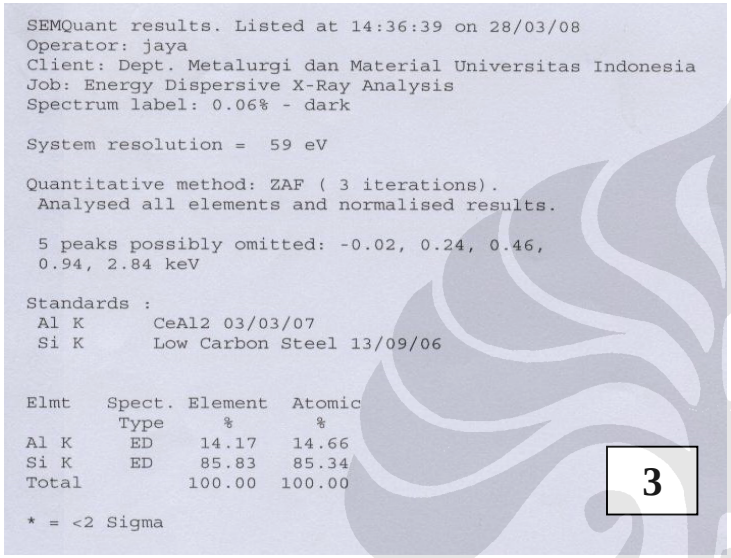
Standards :
 Al K       CeAl2 03/03/07
 Si K       Low Carbon Steel 13/09/06
 Cu K       Copper 22/03/06


Elmt   Spect.  Element  Atomic
       Type      %        %
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
```

2

Studi pengaruh penambahan..., Muhammad Husni Harion, FT UI, 2008



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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.

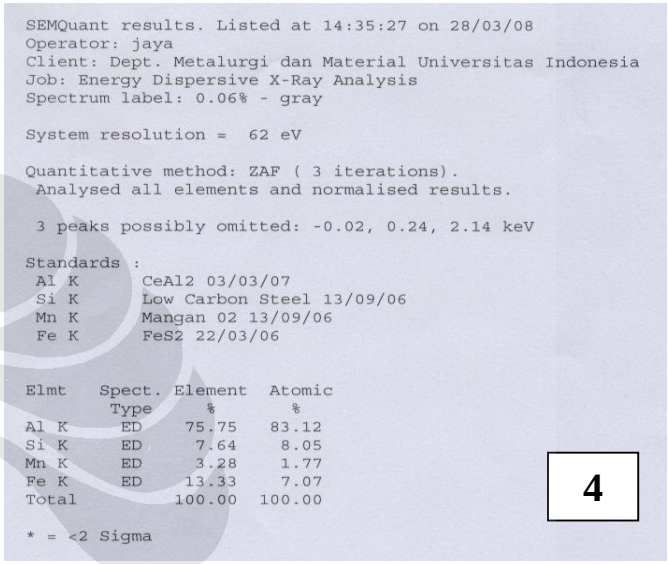
 5 peaks possibly omitted: -0.02, 0.24, 0.46,
 0.94, 2.84 keV

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


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

* = <2 Sigma
```

3



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SEMQuant results. Listed at 14:35:27 on 28/03/08
Operator: jaya
Client: Dept. Metalurgi dan Material Universitas Indonesia
Job: Energy Dispersive X-Ray Analysis
Spectrum label: 0.06% - gray

System resolution =  62 eV

Quantitative method: ZAF ( 3 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
 Mn K       Mangan 02 13/09/06
 Fe K       FeS2 22/03/06


Elmt    Spect.  Element   Atomic
         Type      %         %
Al K      ED     75.75     83.12
Si K      ED      7.64      8.05
Mn K      ED      3.28      1.77
Fe K      ED     13.33      7.07
Total           100.00    100.00

* = <2 Sigma
```

4

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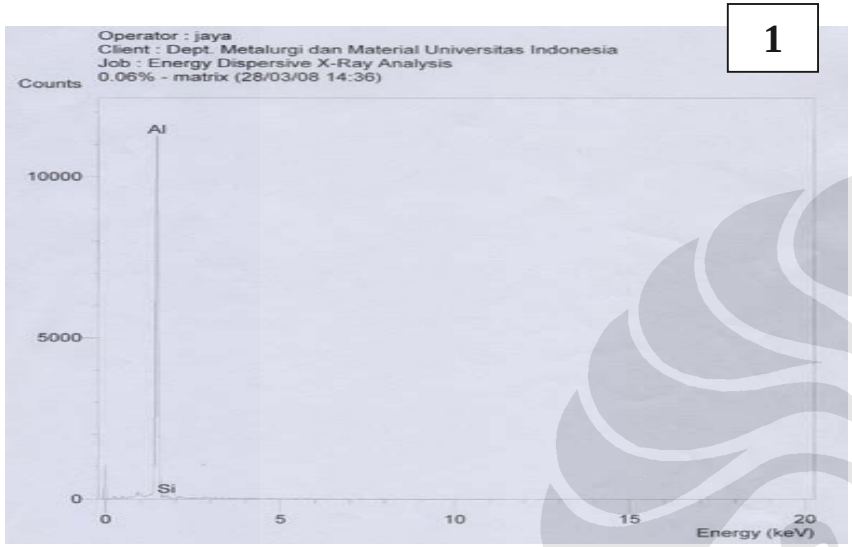

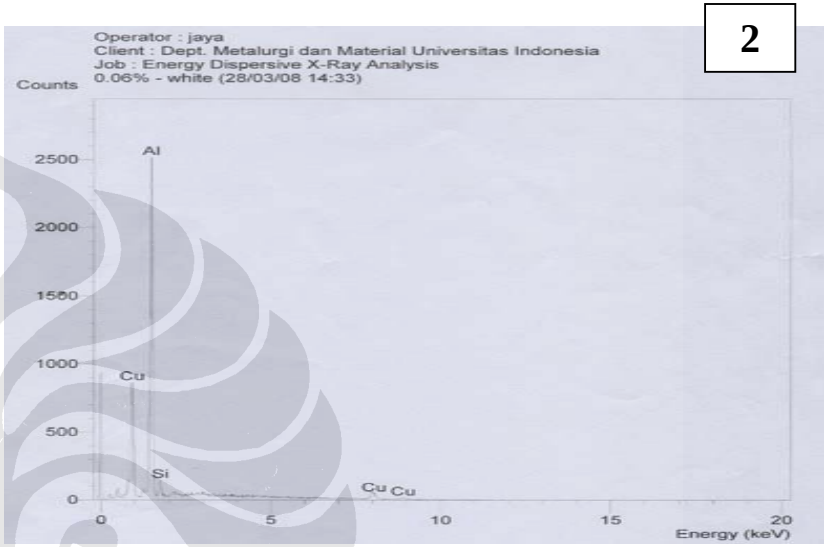

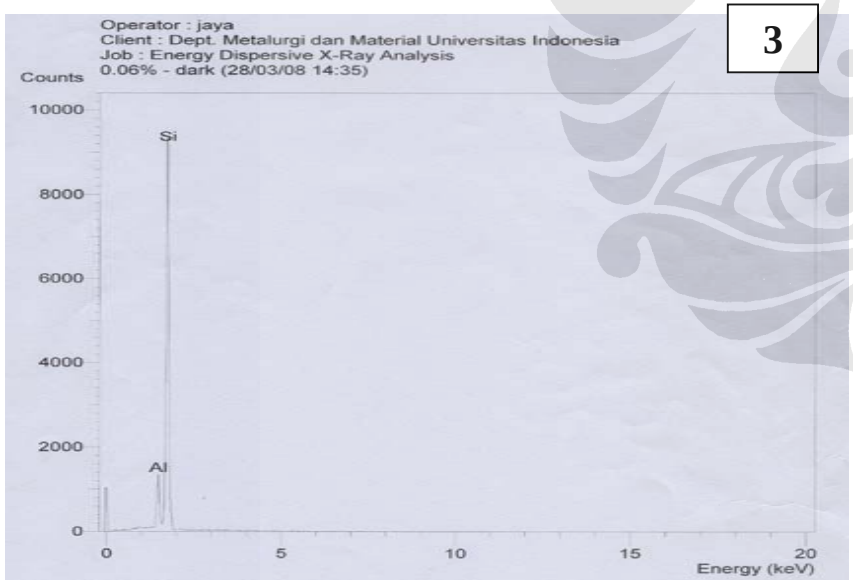

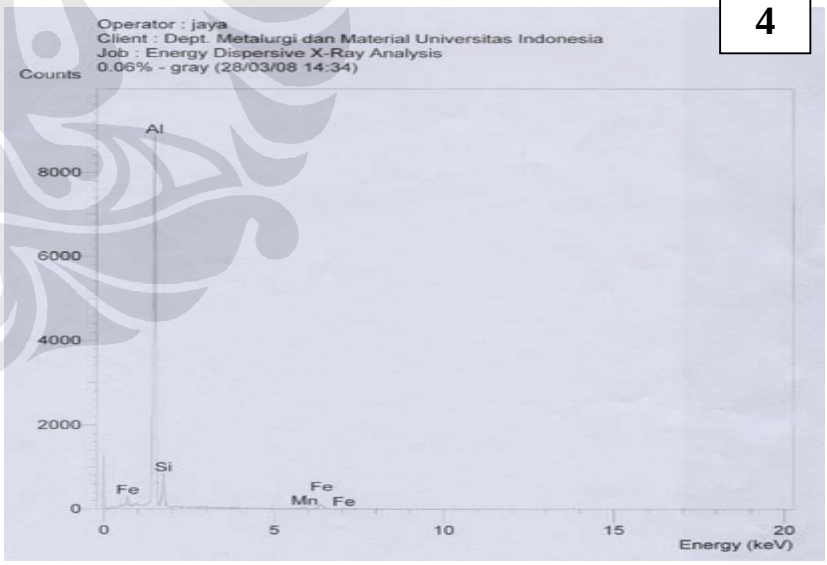

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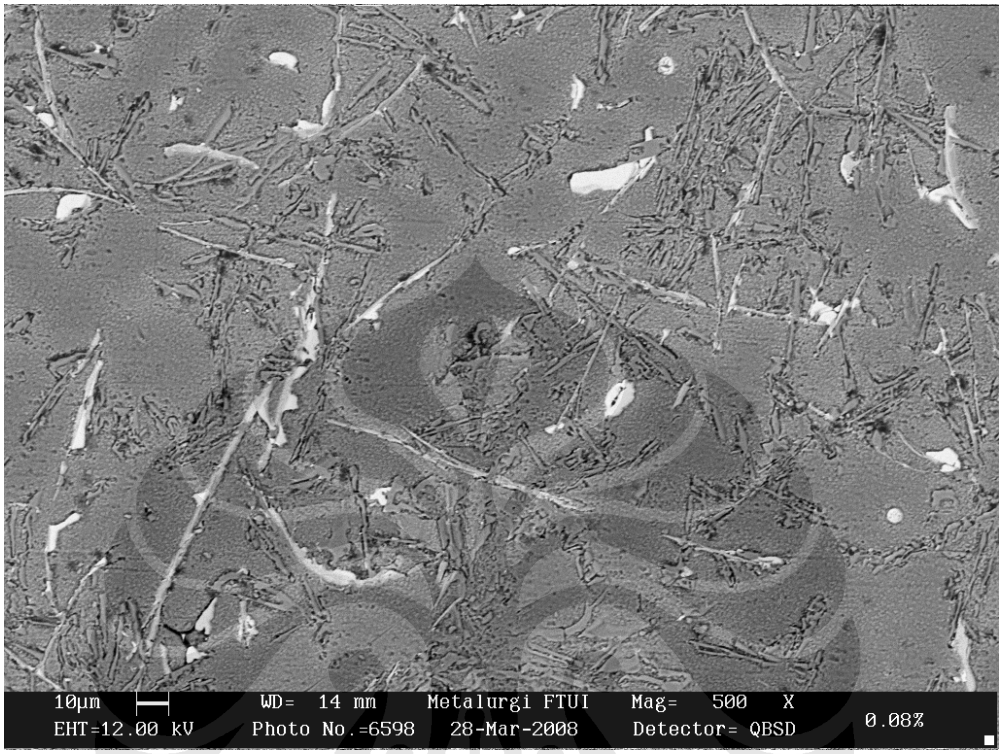
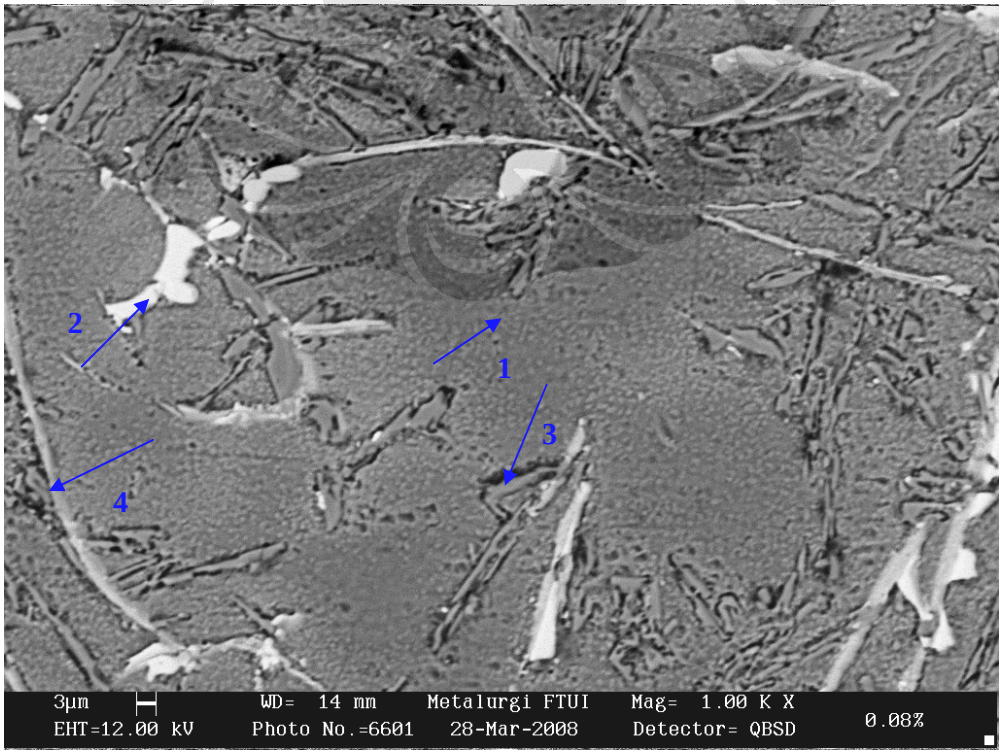
Hasil Pengamatan SEM *as-cast* aluminium AC4B dengan penambahan 0.029 wt % Ti etsa HF 0.5 %





SEMQuant results. Listed at 14:51:13 on 28/03/08
Operator: jaya
Client: Dept. Metalurgi dan Material Universitas Indonesia
Job: Energy Dispersive X-Ray Analysis
Spectrum label: 0.08% - matrix

System resolution = 62 eV

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

2 peaks possibly omitted: -0.02, 0.24 keV

Standards :
Mg K MagOxide 22/03/06
Al K CeAl2 03/03/07
Si K Low Carbon Steel 13/09/06
Ti K Titanium Oxide 19/05/06
Mn K Mangan 02 13/09/06
Fe K FeS2 22/03/06
Cu K Copper 22/03/06

Elmt	Spect. Type	Element %	Atomic %
Mg K	ED	-1.51*	-1.84*
Al K	ED	85.35	93.47
Si K	ED	1.32	1.38
Ti K	ED	0.47*	0.29*
Mn K	ED	0.17*	0.09*
Fe K	ED	-0.06*	-0.03*
Cu K	ED	14.27	6.63
Total		100.00	100.00

* = <2 Sigma

1

SEMQuant results. Listed at 14:45:26 on 28/03/08
Operator: jaya
Client: Dept. Metalurgi dan Material Universitas Indonesia
Job: Energy Dispersive X-Ray Analysis
Spectrum label: 0.08% - white

System resolution = 60 eV

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

4 peaks possibly omitted: -0.02, 0.24, 0.48, 2.16 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	34.28	54.81
Si K	ED	0.66	1.02
Cu K	ED	65.06	44.17
Total		100.00	100.00

* = <2 Sigma

2

SEMQuant results. Listed at 14:48:34 on 28/03/08
Operator: jaya
Client: Dept. Metalurgi dan Material Universitas Indonesia
Job: Energy Dispersive X-Ray Analysis
Spectrum label: 0.08% - dark

System resolution = 59 eV

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

5 peaks possibly omitted: -0.02, 0.24, 0.48, 2.14, 3.48 keV

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

Elmt	Spect. Type	Element %	Atomic %
Al K	ED	2.44	2.54
Si K	ED	97.56	97.46
Total		100.00	100.00

* = <2 Sigma

3

SEMQuant results. Listed at 14:47:21 on 28/03/08
Operator: jaya
Client: Dept. Metalurgi dan Material Universitas Indonesia
Job: Energy Dispersive X-Ray Analysis
Spectrum label: 0.08% - gray

System resolution = 62 eV

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

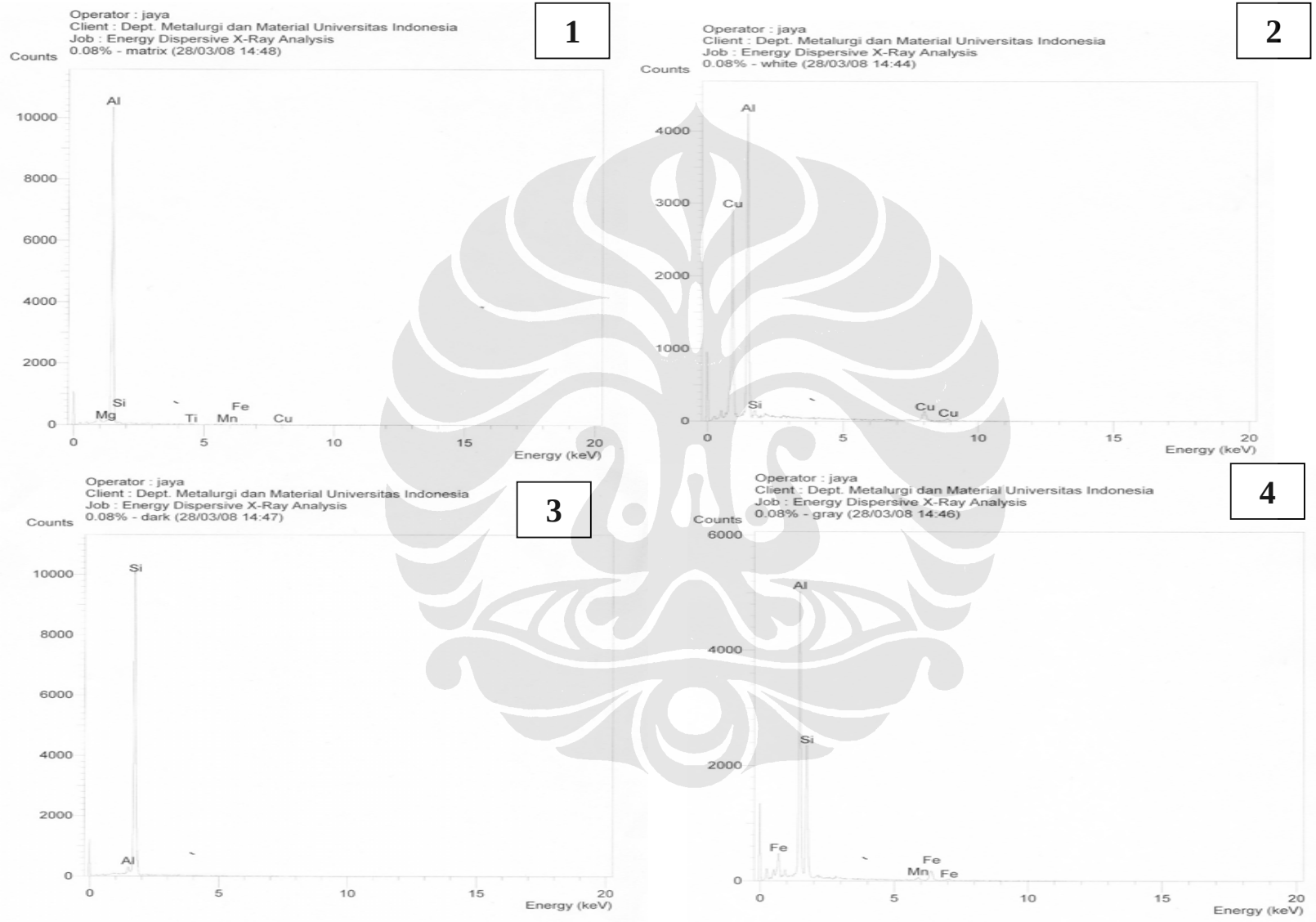
4 peaks possibly omitted: -0.02, 0.24, 2.84, 8.00 keV

Standards :
Al K CeAl2 03/03/07
Si K Low Carbon Steel 13/09/06
Mn K Mangan 02 13/09/06
Fe K FeS2 22/03/06

Elmt	Spect. Type	Element %	Atomic %
Al K	ED	49.61	59.38
Si K	ED	20.00	23.00
Mn K	ED	4.36	2.57
Fe K	ED	26.03	15.05
Total		100.00	100.00

* = <2 Sigma

4



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LAMPIRAN 5
CHECK SHEET

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CHECK SHEET

Temp melting :
Komposisi penghalus butir : 0%
Temp penambahan penghalus butir : -
Jenis Penghalus butir : -
Waktu GBF : 8 menit
Kelembaban : 80%
Berat aluminium cair : 450kg

No shot	No Dies	Temp Dies °C		Temp molten	Tekanan mesin	menit ke	Jenis cacat LPDC	Jenis Cacat Machining
		Upper	Lower					
1	26	201.5	335.9	707	250			
	25	191.8	345.3					
2	26	210.3	343.8	706	250			Bocor
	25	200.1	354.4					Bocor
3	26	213.9	345.8	707	250			
	25	202.3	356.5					
4	26	227.9	359.6	708	250			
	25	207.9	367.9					
5	26	223.9	349.8	708	250		Blow hole	
	25	210.6	369.4					
6	26	231.2	364.2	709	250			
	25	214.6	373.8					
7	26	239.7	369.7	709	250			
	25	226.4	380.1					
8	26	235	367.9	709	250			
	25	219.8	379.5					
9	26	238.1	372.9	709	250			
	25	221.9	384.4				Blow hole	
10	26	245.4	382.3	709	250			
	25	228.6	392					
11	26	246.8	382.9	709	250			
	25	231.3	390.8					
12	26	257	389	709	250			
	25	237.1	399.7					
13	26	256.9	386.6	710	250			
	25	236.6	395.2					
14	26	238.9	351.7	709	256			
	25	221.6	360.4					
15	26	254.6	231.3	707	256			
	25	376.7	384.4				inklusi pasir	
16	26	250.1	232.8	708	256			
	25	314.5	387.5					Bocor
17	26	260.7	239.6	708	256			

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	25	289.3	394.4					Bocor
18	26	253.9	238.1	709	256			
	25	360.7	371.8					
19	26	265.3	241.7	709	256			
	25	383.3	415.8					
20	26	262	239.3	709	256			
	25	384.9	399.2					
21	26	258.3	241.1	709	256			
	25	383.9	396.6					
22	26	270	249.2	710	256			
	25	398	401					
23	26	262.2	245.8	710	256			
	25	376.1	380.2					
24	26	270.1	249.2	709	256		shrinkage	
	25	385.6	395.8				Blow hole	
25	26	270.8	251.9	710	256			
	25	403.8	410.2					
26	26	269.9	253	709	262			
	25	401	409.5					Bocor
27	26	272.9	254	708	262			
	25	383.5	432.2					
28	26	274.4	259.3	707	262			
	25	400	409.1					
29	26	275	256.6	706	262			
	25	389.8	398.1					
30	26	276.9	258.7	705	262			
	25	394.6	402.4					Bocor
31	26	279.9	261	704	262		Blow hole	
	25	379.9	389.7					
32	26	279.3	258.3	703	262			
	25	399.4	412.3					
33	26	279.2	260.9	702	262			
	25	379.4	390.1					
34	26	288.5	262.7	703	262			
	25	405.4	416.1					
35	26	282.5	260.9	703	262			
	25	391.3	406.1					
36	26	282.2	263.3	703	268			
	25	385.9	395.6					
37	26	284.9	265.2	704	268			
	25	410.3	415.4					

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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	Tekanan	Menit ke	Jenis cacat	Jenis Cacat
		Upper	Lower	molten	mesin		LPDC	Machining
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)	
	25	245.4	396.5					Bocor
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	**30**		
	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			
	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		shrinkage (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		shrinkage (R)	
	25	268.9	415.9					
18	26	278.9	404.5	705	256			Bocor
	25	267.9	422.8					

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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			
	25	274.1	434.7				shrinkage (R)	
27	26	286.8	415.4	707	262			
	25	274.1	430.7					
28	26	288.1	417	707	262			
	25	274.2	427.3					
29	26	287.5	415.2	707	262			Bocor
	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			
	25	276.1	421.8				Misrun (R)	
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			
	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			
	25	262.5	407.9				shrinkage (R)	
40	26	280.7	414.6	705	268			
	25	265.9	425.9					

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Temp melting : 786 C
Komposisi penghalus butir : 0.029%
Temp penambahan penghalus butir : 741 C
Jenis Penghalus butir : Coveral 2815
Waktu GBF : 8 menit
Kelembaban : 73%
Berat aluminium cair : 453.2 kg

No shot	No Dies	Temp Dies ©		Temp molten	Tekanan mesin	menit ke	Jenis cacat	Jenis Cacat
		Upper	Lower				LPDC	Machining
1	26	256.7	350.5	693	250	0-30		
	25	241.4	374.4					
2	26	255.6	361	693	250	0-30		
	25	243.4	381.3				shrinkage	
3	26	261.3	371.6	693	250	0-30		
	25	244.7	389.5					
4	26	261.5	371	694	250	0-30		
	25	244.7	393.4					
5	26	262.2	376.8	695	250	30-60		
	25	245.4	396.5					
6	26	268.2	377.9	695	250	30-60		Bocor
	25	247.8	397.1					
7	26	270.4	382.4	696	250	30-60		Bocor
	25	250	404					Bocor
8	26	267.9	386.8	696	250	30-60		Bocor
	25	249.7	405.5					
9	26	270.5	390.9	697	250	30-60		
	25	250.7	404.7					
10	26	270.9	393.6	697	250	30-60		
	25	252.3	410.3					
11	26	271.9	393.9	698	250	30-60		
	25	255.8	414.8					
12	26	273.8	398.3	698	256	60-90		
	25	259.5	418					
13	26	280.8	405.7	699	256	60-90		
	25	263.7	421.8					
14	26	274.9	395.7	699	256	60-90		
	25	260.8	416					
15	26	272.9	399.1	700	256	60-90		
	25	261	414.2					
16	26	278.1	466.3	700	256	60-90		
	25	264.9	419.1					
17	26	282.5	406.7	700	256	60-90		
	25	268.9	415.9					

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18	26	278.9	404.5	700	256	90-120		
	25	267.9	422.8					
19	26	276.8	400.9	701	256	90-120		
	25	267.6	421					
20	26	278	402.5	701	256	90-120		
	25	267.5	419.7					
21	26	282.8	407.1	702	256	90-120		
	25	270	423.8					
22	26	282.7	407.8	703	256	90-120		
	25	269.8	420.8					
23	26	285.2	411.9	703	256	90-120		
	25	271.7	427.7					
24	26	285.5	413.9	703	256	120-180		
	25	271.9	429.7					
25	26	286.1	413.9	704	262	120-180		
	25	272.9	428.7					
26	26	287.4	417	704	262	120-180		
	25	274.1	434.7					
27	26	286.8	415.4	704	262	120-180		
	25	274.1	430.7					
28	26	288.1	417	705	262	120-180		
	25	274.2	427.3					
29	26	287.5	415.2	705	262	120-180		
	25	273.6	425.6				shrinkage	
30	26	286.1	416.6	706	262	180-210		
	25	273	425.6					
31	26	289.2	416.2	706	262	180-210		
	25	276.1	421.8					
32	26	288.5	418.2	707	262	180-210		
	25	274.2	426.8					
33	26	288.5	417.4	707	262	180-210		
	25	273.6	430.4				misrun	
34	26	284.6	412.9	708	262	180-210		Bocor
	25	270.9	427.3					
35	26	186.7	417.3	708	262	180-210		
	25	271.8	429.9					Bocor
36	26	291	418.7	708	262	180-210		
	25	273.9	416.7					
37	26	290.2	415.1	708	262	210-240		
	25	273.2	425.5					
38	26	290.3	413.6	709	268	210-240		
	25	272.6	426.3					Bocor
39	26	277.1	407.3	709	268	210-240		
	25	262.5	407.9					
40	26	280.7	414.6	708	268	210-240		Bocor
	25	265.9	425.9					

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LAMPIRAN 6
TECHNICAL DATA SHEET COVERAL GR 2815

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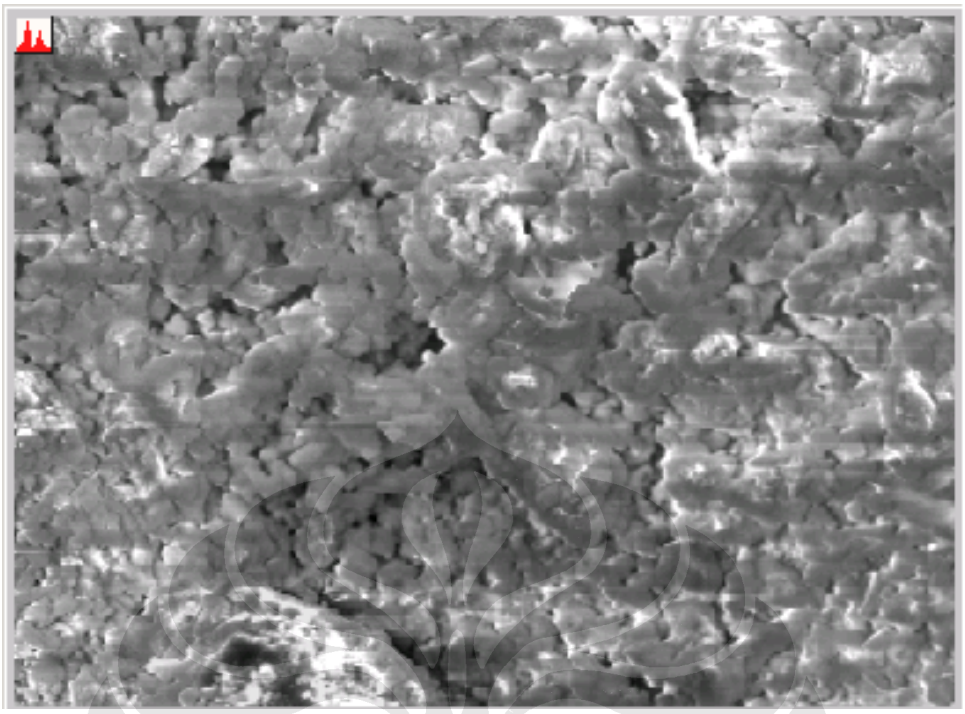

Element	Class.	(keV)	mass%
B K*			
O			16.58
F K		0.677	34.51
Na K		1.041	0.55
Cl K		2.621	1.62
K K		3.312	32.03
Ti K		4.508	14.72
Total			100.00

Gambar mikrostruktur dan tabel komposisi Coveral GR pada perbesaran 800X

F rata2 = 34,15 *wt.%*
Na rata2 = 0,55 *wt.%*
Cl rata2 = 1,34 *wt.%*
K rata2 = 32,84 *wt.%*
Ti rata2 = 14,95 *wt.%*

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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

General description

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 ttanium 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.

Advantages

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.

Application

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.

Application temperature

700 °C and higher.

Addition rate

0.05 - 0.15 % of the metal weight, depending on alloy type.

Packing

25 Kg polyethylene lined multi-ply paper sacks.

Storage

Like all fluxes, COVERAL GR 2815 should be stored in a dry place.
Close opened packages or storage bins securely after use.

Labelling

Xn Harmful.

Health and safety

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.

Further remarks

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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