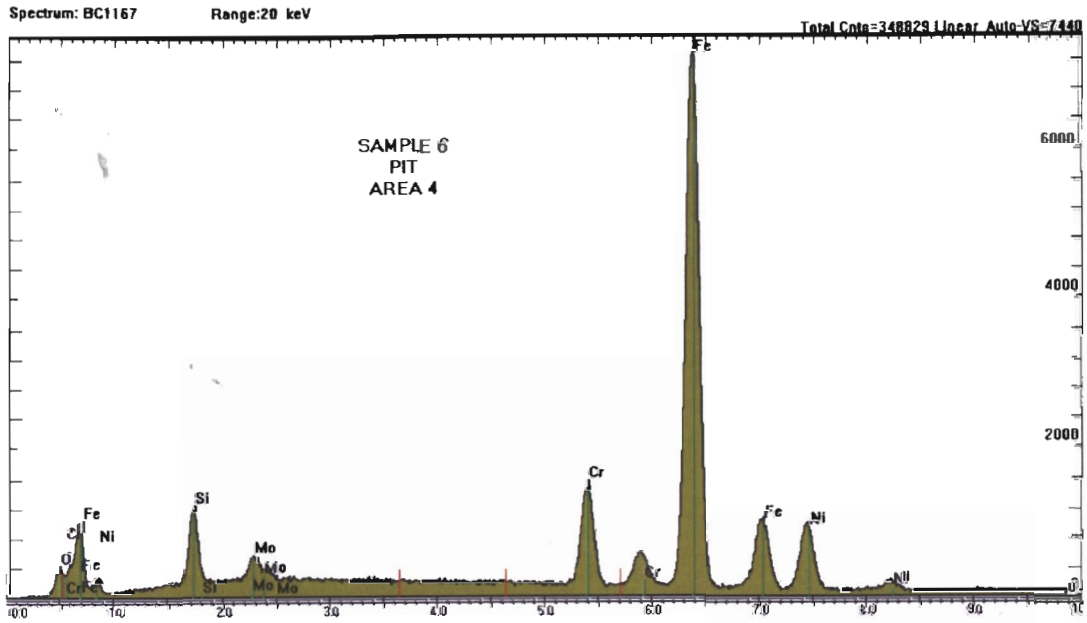
TITLE **PROJECT**

Continued From Page 104

Area 4. EDS



GENERAL CONDITIONS

Result File	: BC1167
File Version	: 1
Background Method	: Fit
Decon Method	: Gaussian
Decon ChiSquared	: 5.75
Analysis Date	: 7-JUL-2006
Microscope	: SEM
Comments	:SAMPLE 6 PIT AREA 4

ANALYSIS CONDITIONS

Quant. Method	: ZAF/ASAP
Acquire Time	: 200 secs
Normalization Factor	: 100.00

SAMPLE CONDITIONS

kV	: 20.0
Beam Current	: 150.0 picoAmps
Working Distance	: 29.5 mm
Tilt Angle	: 0.0 Degrees
Takeoff Angle	: 35.0 Degrees
Solid Angle*BeamCurrent	: 0.8

Element	Line	Weight%	K-Ratio	Cnts/s	Atomic%
Si	Ka	4.51	0.0234	49.83	8.70
Cr	Ka	8.78	0.1000	99.39	9.14
Fe	Ka	70.26	0.6952	532.56	68.14
Ni	Ka	13.20	0.1199	67.69	12.18
Mo	La	3.25	0.0238	17.17	1.84
Total		100.00			

Continued To Page 106

SIGNATURE Michael D. Ad DATE 7/17/06

DISCLOSED TO AND UNDERSTOOD BY DATE

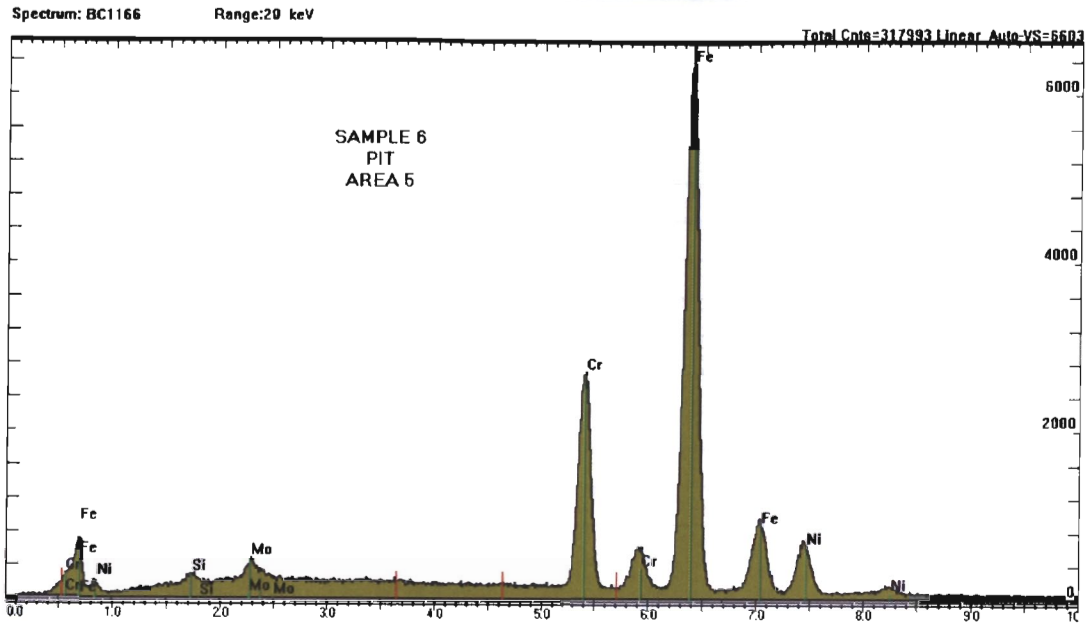
PROPRIETARY INFORMATION

TITLE

PROJECT

Continued From Page 105

Area 5 EDS



GENERAL CONDITIONS

Result File	: BC1166
File Version	: 1
Background Method	: Fit
Decon Method	: Gaussian
Decon ChiSquared	: 3.21
Analysis Date	: 7-JUL-2006
Microscope	: SEM
Comments	: SAMPLE 6 PIT AREA 5

ANALYSIS CONDITIONS

Quant. Method	: ZAF/ASAP
Acquire Time	: 200 secs
Normalization Factor	: 100.00

SAMPLE CONDITIONS

kV	: 20.0
Beam Current	: 150.0 picoAmps
Working Distance	: 29.5 mm
Tilt Angle	: 0.0 Degrees
TakeOff Angle	: 35.0 Degrees
Solid Angle*BeamCurrent	: 0.8

Element	Line	Weight%	K-Ratio	Cnts/s	Atomic%
Si	Ka	0.62	0.0032	6.22	1.23
Cr	Ka	17.72	0.2002	179.86	18.96
Fe	Ka	69.42	0.6768	468.68	69.13
Ni	Ka	9.74	0.0883	45.05	9.23
Mo	La	2.50	0.0188	12.31	1.45
Total		100.00			

Continued To Page

SIGNATURE Michael D. [illegible]

DATE 7/17/06

DISCLOSED TO AND UNDERSTOOD BY

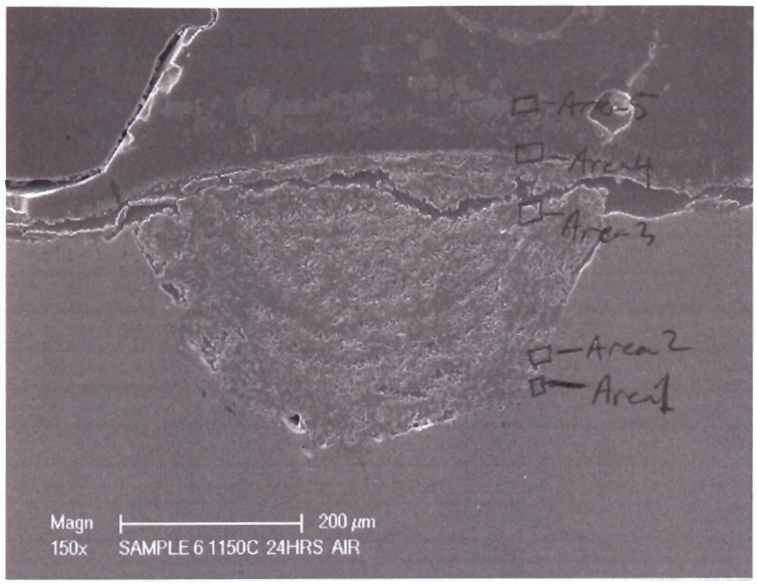
DATE

~~PROPRIETARY INFORMATION~~
4/8/10

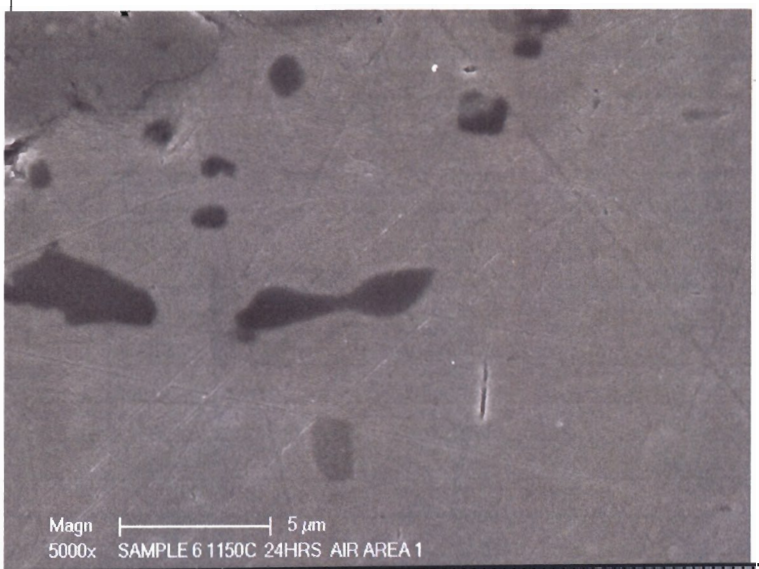
TITLE **PROJECT**

Continued From Page

DETAILED PITTING



Oxide Sample 6



GENERAL CONDITIONS

Result File	: BC1186
File Version	: 1
Background Method	: Fit
Decon Method	: Gaussian
Decon ChiSquared	: 3.69
Analysis Date	: 17-JUL-2006
Microscope	: SEM
Comments	:SAMPLE 6 1150C 24HRS AIR AREA 1

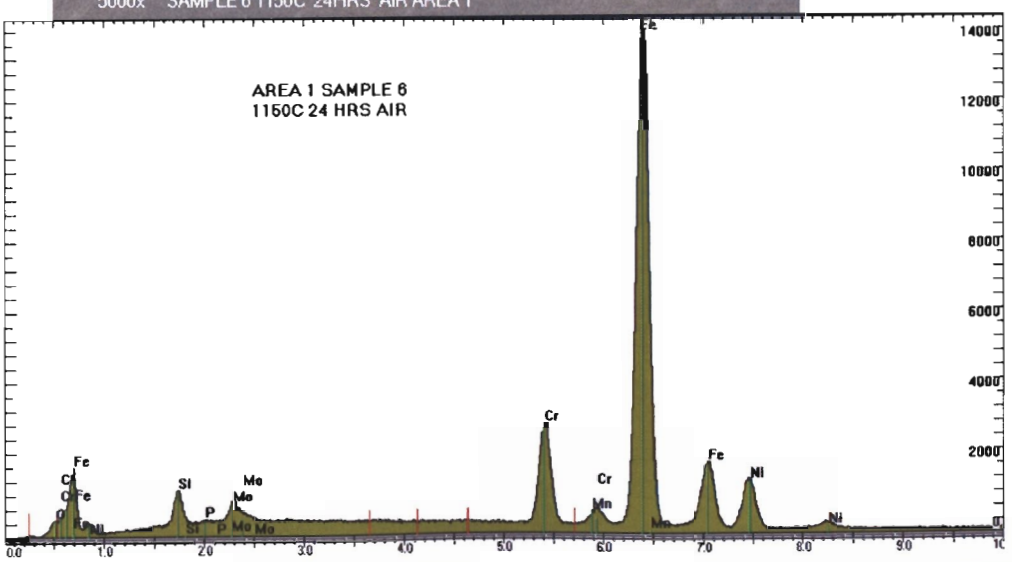
ANALYSIS CONDITIONS

Quant. Method	: ZAF/ASAP
Acquire Time	: 200 secs
Normalization Factor	: 100.00

SAMPLE CONDITIONS

kV	: 20.0
Beam Current	: 150.0 picoAmps
Working Distance	: 29.5 mm
Tilt Angle	: 0.0 Degrees
TakeOff Angle	: 35.0 Degrees
Solid Angle*BeamCurrent	: 0.8

Element	Line	Weight%	K-Ratio	Cnts/s	Atomic%
Si	Ka	2.32	0.0119	48.49	4.55
P	Ka	0.12	0.0007	2.78	0.22
Cr	Ka	9.07	0.1046	197.93	9.62
Mn	Ka	0.40	0.0041	6.78	0.41
Fe	Ka	73.92	0.7316	1067.21	73.03
Ni	Ka	11.05	0.1002	107.67	10.38
Mo	La	3.11	0.0230	31.69	1.79
Total		99.99			



Area 1
SEM+EDS

Continued To Page 108

SIGNATURE Michael D. [illegible]

DATE 7/17/06

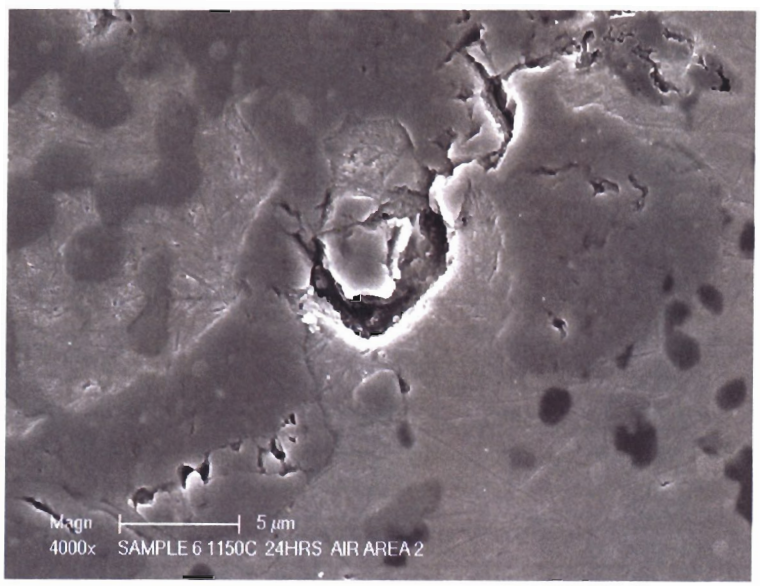
DISCLOSED TO AND UNDERSTOOD BY

DATE

~~PROPRIETARY INFORMATION~~
4/8/10 NO

TITLE **PROJECT**

Continued From Page 107 Area 2 SEM + EDS



GENERAL CONDITIONS

Result File : BC1187
File Version : 1
Background Method : Fit
Decon Method : Gaussian
Decon ChiSquared : 12.13
Analysis Date : 17-JUL-2006
Microscope : SEM
Comments :SAMPLE 6 1150C 24HRS AIR AREA 2

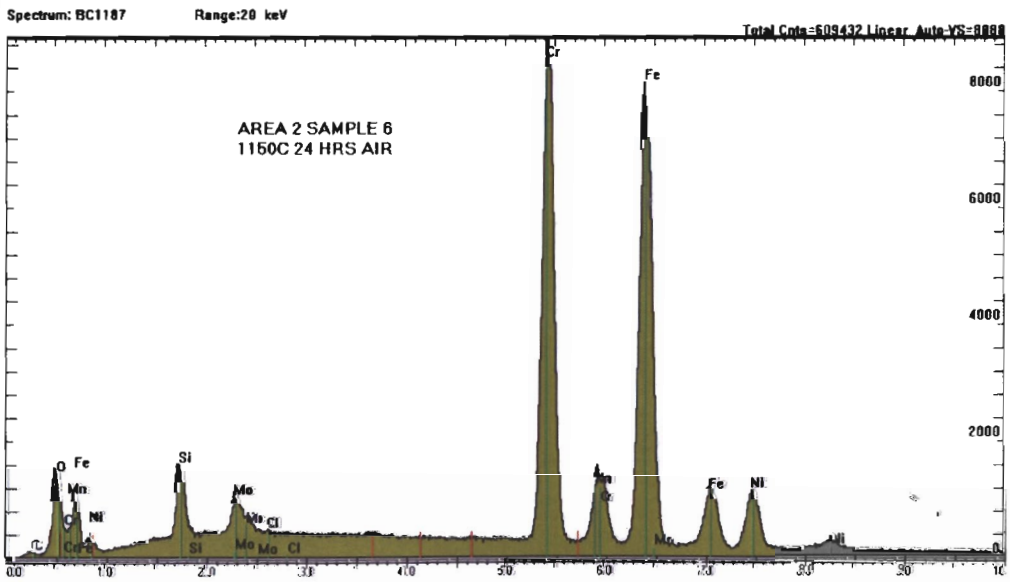
ANALYSIS CONDITIONS

Quant. Method : ZAF/ASAP
Acquire Time : 200 secs
Normalization Factor: 100.00

SAMPLE CONDITIONS

kV : 20.0
Beam Current : 150.0 picoAmps
Working Distance : 29.5 mm
Tilt Angle : 0.0 Degrees
TakeOff Angle : 35.0 Degrees
Solid Angle*BeamCurrent: 0.8

Element	Line	Weight%	K-Ratio	Cnts/s	Atomic%
Si	Ka	3.43	0.0183	62.21	6.45
Cl	Ka	0.15	0.0012	3.53	0.23
Cr	Ka	34.84	0.3739	592.68	35.43
Mn	Ka	1.61	0.0160	22.38	1.55
Fe	Ka	50.44	0.4750	580.44	47.75
Ni	Ka	9.53	0.0866	77.95	8.58
Total		100.00			



Continued To Page 109

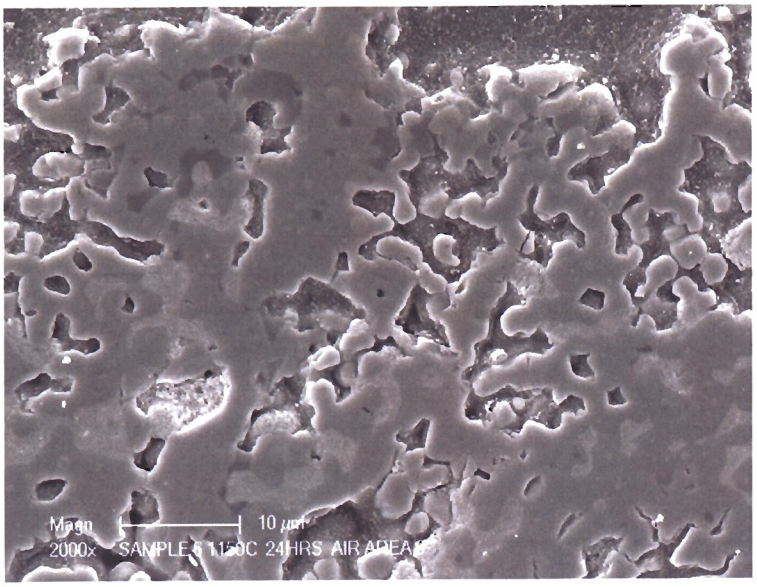
SIGNATURE: Michael D. [illegible] DATE: 7/17/06

DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10

TITLE **PROJECT**

Continued From Page 108 Area 3 SEM+EDS



GENERAL CONDITIONS

Result File : BC1188
File Version : 1
Background Method : Fit
Decon Method : Gaussian
Decon ChiSquared : 6.50
Analysis Date : 17-JUL-2006
Microscope : SEM
Comments :SAMPLE 6 1150C 24HRS AIR

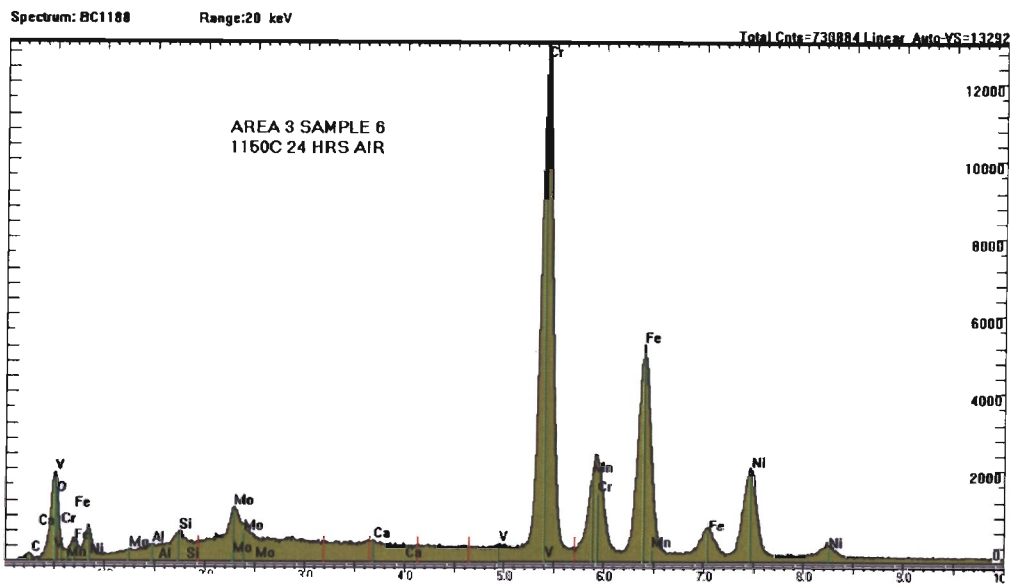
ANALYSIS CONDITIONS

Quant. Method : ZAF/ASAP
Acquire Time : 200 secs
Normalization Factor: 100.00

SAMPLE CONDITIONS

kV : 20.0
Beam Current : 150.0 picoAmps
Working Distance : 29.5 mm
Tilt Angle : 0.0 Degrees
TakeOff Angle : 35.0 Degrees
Solid Angle*BeamCurrent: 0.8

Element	Line	Weight%	K-Ratio	Cnts/s	Atomic%
Mg	Ka	0.12	0.0003	1.37	0.26
Al	Ka	0.22	0.0009	3.73	0.45
Si	Ka	0.80	0.0043	17.55	1.56
Ca	Ka	0.09	0.0010	2.69	0.13
V	Ka	0.23	0.0023	4.94	0.25
Cr	Ka	44.78	0.4622	878.99	47.16
Mn	Ka	4.52	0.0449	75.39	4.50
Fe	Ka	27.80	0.2598	380.84	27.25
Ni	Ka	17.12	0.1587	171.45	15.97
Mo	La	4.32	0.0334	46.20	2.47
Total		100.00			



Continued To Page 110

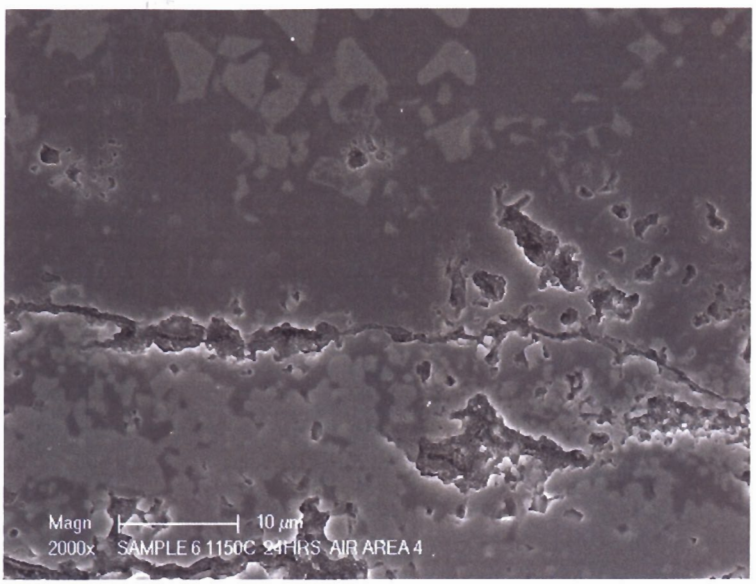
SIGNATURE Michael D. [illegible] DATE 7/17/06

DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10

TITLE **PROJECT**

Continued From Page 109 Area 4 SEM + EDS



GENERAL CONDITIONS

Result File : BC1189
File Version : 1
Background Method : Fit
Decon Method : Gaussian
Decon ChiSquared : 4.57
Analysis Date : 17-JUL-2006
Microscope : SEM
Comments :SAMPLE 6 1150C 24HRS AIR AREA 4

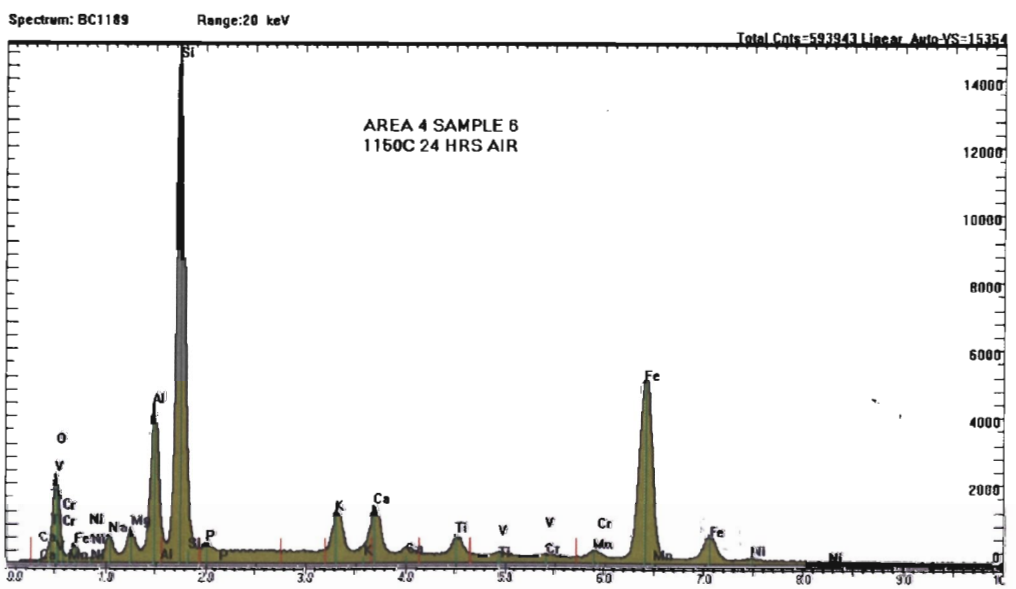
ANALYSIS CONDITIONS

Quant. Method : ZAF/ASAP
Acquire Time : 200 secs
Normalization Factor: 100.00

SAMPLE CONDITIONS

kV : 20.0
Beam Current : 150.0 picoAmps
Working Distance : 29.5 mm
Tilt Angle : 0.0 Degrees
TakeOff Angle : 35.0 Degrees
Solid Angle*BeamCurrent: 0.8

Element	Line	Weight%	K-Ratio	Cnts/s	Atomic%
Na	Ka	3.02	0.0099	29.33	4.60
Mg	Ka	2.73	0.0123	40.13	3.93
Al	Ka	11.51	0.0627	215.85	14.93
Si	Ka	35.54	0.2124	720.58	44.29
P	Ka	1.06	0.0052	16.38	1.20
K	Ka	3.54	0.0291	73.70	3.17
Ca	Ka	3.98	0.0351	82.09	3.48
Ti	Ka	1.88	0.0165	32.39	1.37
V	Ka	0.06	0.0005	0.92	0.04
Cr	Ka	0.28	0.0027	4.24	0.19
Mn	Ka	1.04	0.0093	13.05	0.66
Fe	Ka	34.80	0.3194	389.45	21.81
Ni	Ka	0.57	0.0051	4.62	0.34
Total		100.01			



Continued To Page 111

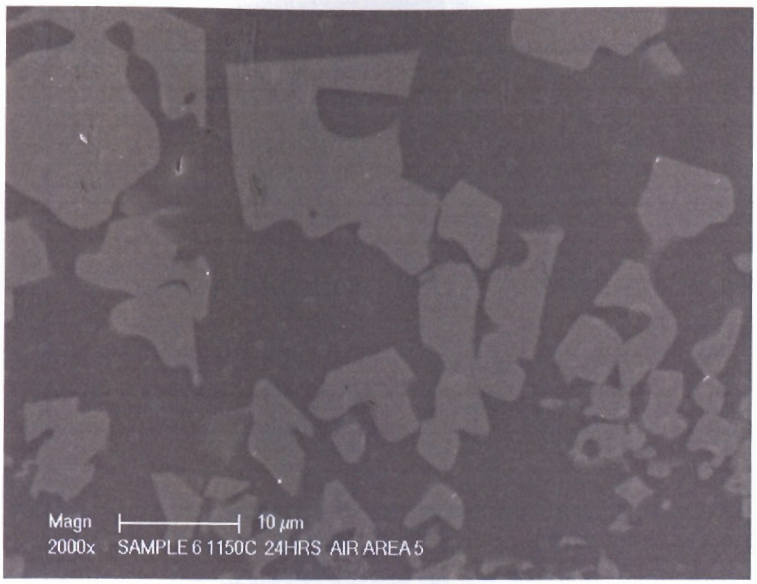
SIGNATURE Michael D. [illegible] DATE 7/17/06

DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 [illegible]

TITLE **PROJECT**

Continued From Page 110 Area 5 SEM + EDS



GENERAL CONDITIONS

Result File	: BC1190
File Version	: 1
Background Method	: Fit
Decon Method	: Gaussian
Decon ChiSquared	: 6.54
Analysis Date	: 17-JUL-2006
Microscope	: SEM
Comments	:SAMPLE 6 1150C 24HRS AIR AREA 5

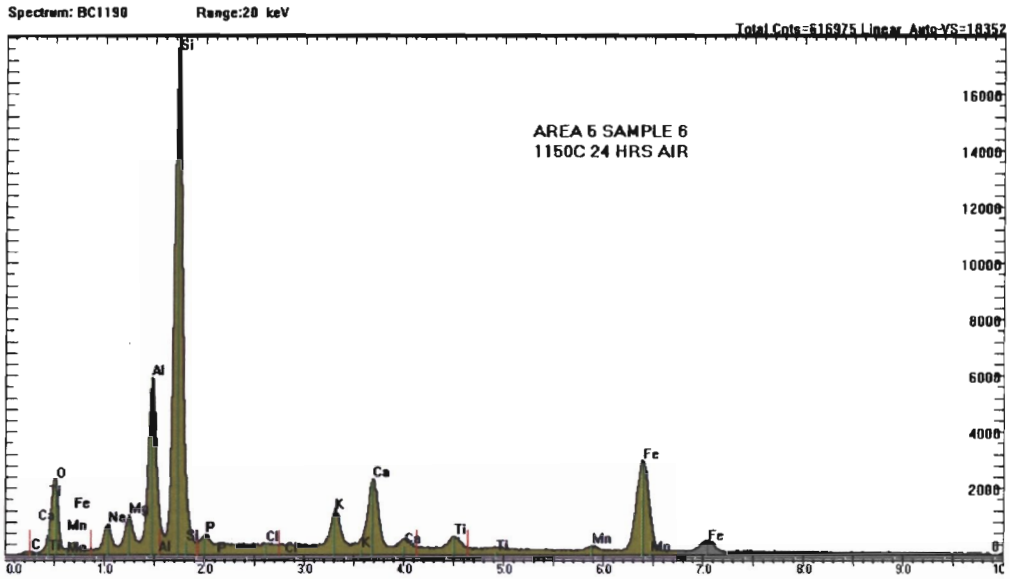
ANALYSIS CONDITIONS

Quant. Method	: ZAF/ASAP
Acquire Time	: 200 secs
Normalization Factor	: 100.00

SAMPLE CONDITIONS

kV	: 20.0
Beam Current	: 150.0 picoAmps
Working Distance	: 29.5 mm
Tilt Angle	: 0.0 Degrees
TakeOff Angle	: 35.0 Degrees
Solid Angle*BeamCurrent	: 0.8

Element	Line	Weight%	K-Ratio	Cnts/s	Atomic%
Na	Ka	3.51	0.0140	40.65	4.95
Mg	Ka	3.34	0.0176	56.07	4.46
Al	Ka	14.10	0.0859	289.22	16.95
Si	Ka	42.14	0.2631	873.30	48.68
P	Ka	1.51	0.0072	22.10	1.59
Cl	Ka	0.19	0.0012	3.51	0.17
K	Ka	3.61	0.0290	71.82	3.00
Ca	Ka	7.34	0.0630	143.96	5.95
Ti	Ka	1.72	0.0144	27.75	1.17
Mn	Ka	0.78	0.0068	9.26	0.46
Fe	Ka	21.76	0.1957	233.41	12.64
Total		100.00			



Continued To Page

SIGNATURE Michael D. [illegible] DATE 7/17/06

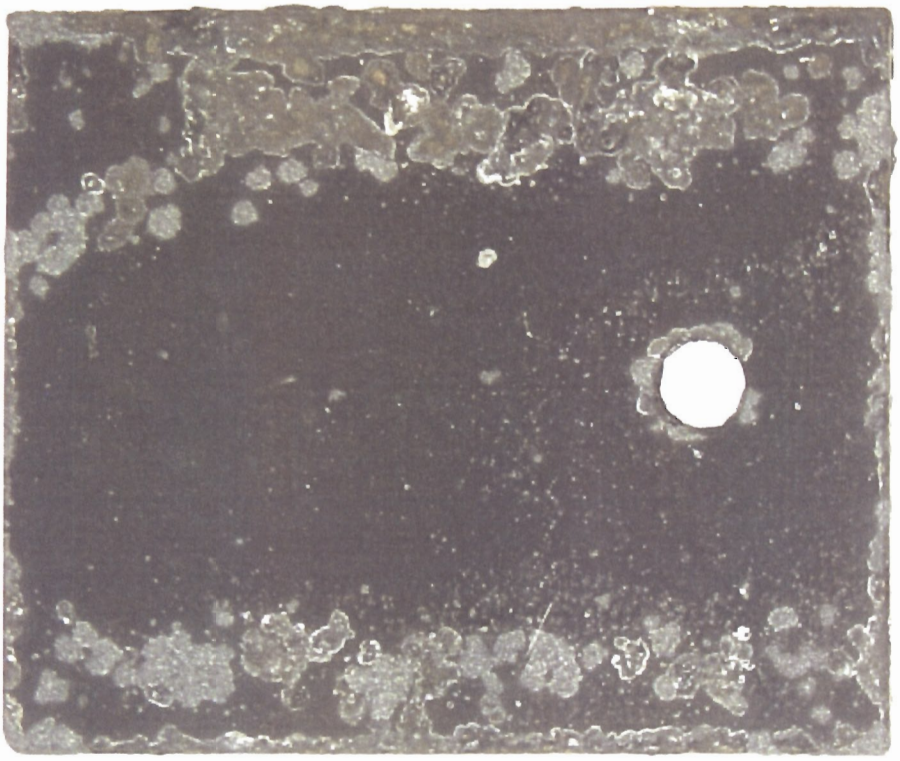
DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 [illegible]

TITLE **PROJECT**

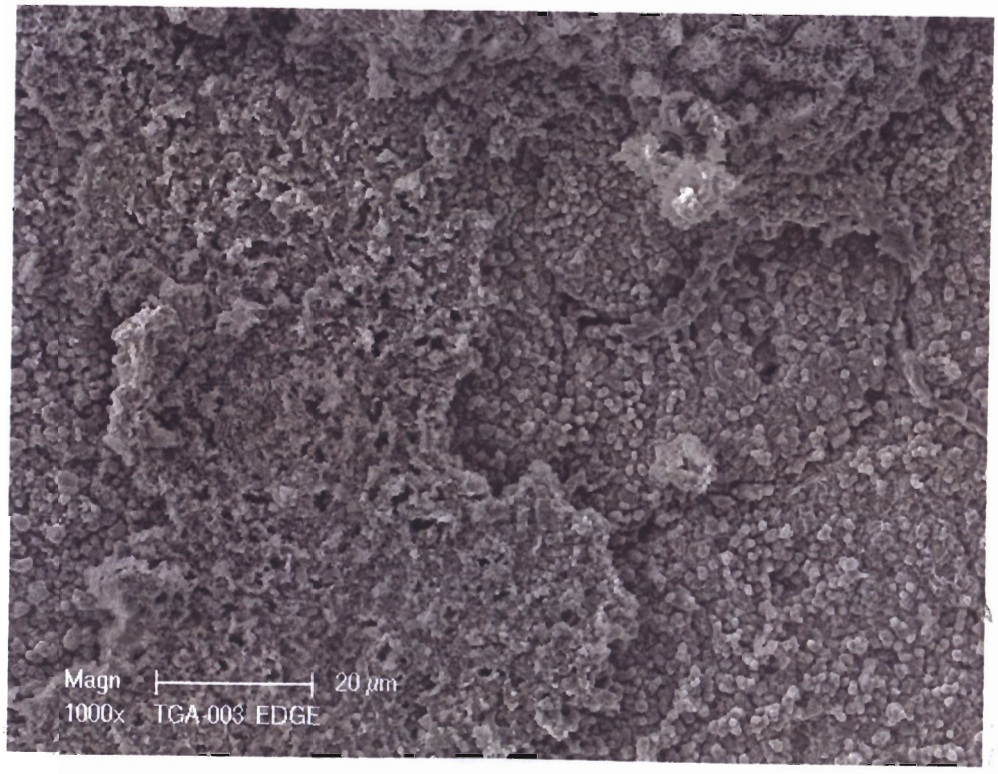
Continued From Page 88

TGA-003 Images



1000°C
13 hr
Air

Low Mag



SEM

Continued To Page 113

SIGNATURE Michael D. Hall DATE 7/21/06

DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10

TITLE **PROJECT**

Continued From Page 112 TGA-004

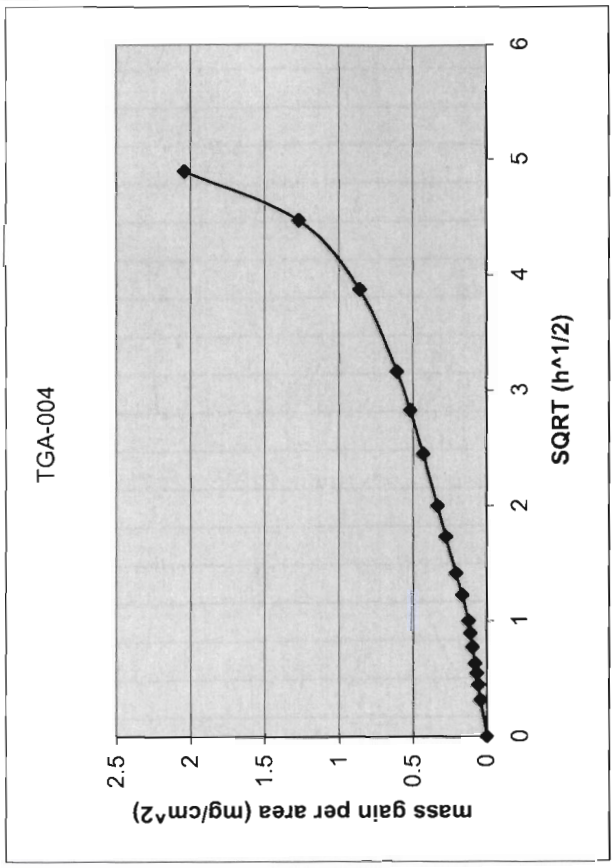
C-22 HH # 2277-3-3266

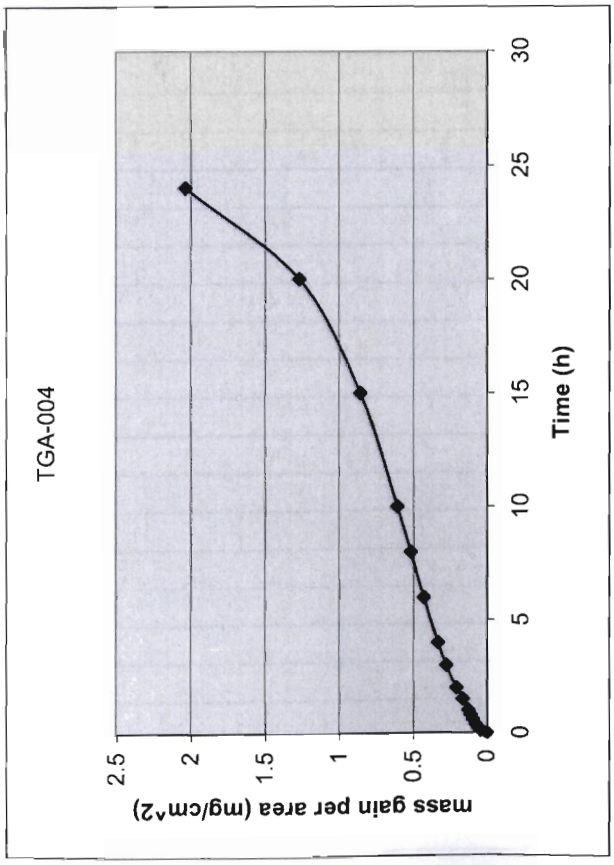
TGA: Thermo Cahn
Ther Mas 700
SN'd CEU22364

TGA-004

1000°C - 24 hr - Air
Rate 40°C / min
Method 1

Time (h)	SQRT (h^1/2)	Mass gain per area (mg/cm^2)
0	0	0
0.1	0.31622777	0.042577904
0.2	0.44721136	0.058895136
0.3	0.54772256	0.069858416
0.4	0.63245553	0.080821279
0.6	0.77459667	0.096629216
0.8	0.89442719	0.112180943
1	1	0.126203743
1.5	1.22474487	0.166997344
2	1.41421356	0.209576081
3	1.73205081	0.277904945
4	2	0.334250273
6	2.44948974	0.430878864
8	2.82842712	0.520623119
10	3.16227766	0.61139013
15	3.87298335	0.86099264
20	4.47213595	1.270201362
24	4.89897949	2.041444957





Continued To Page 114

SIGNATURE Michael D. [illegible] DATE 7/21/06

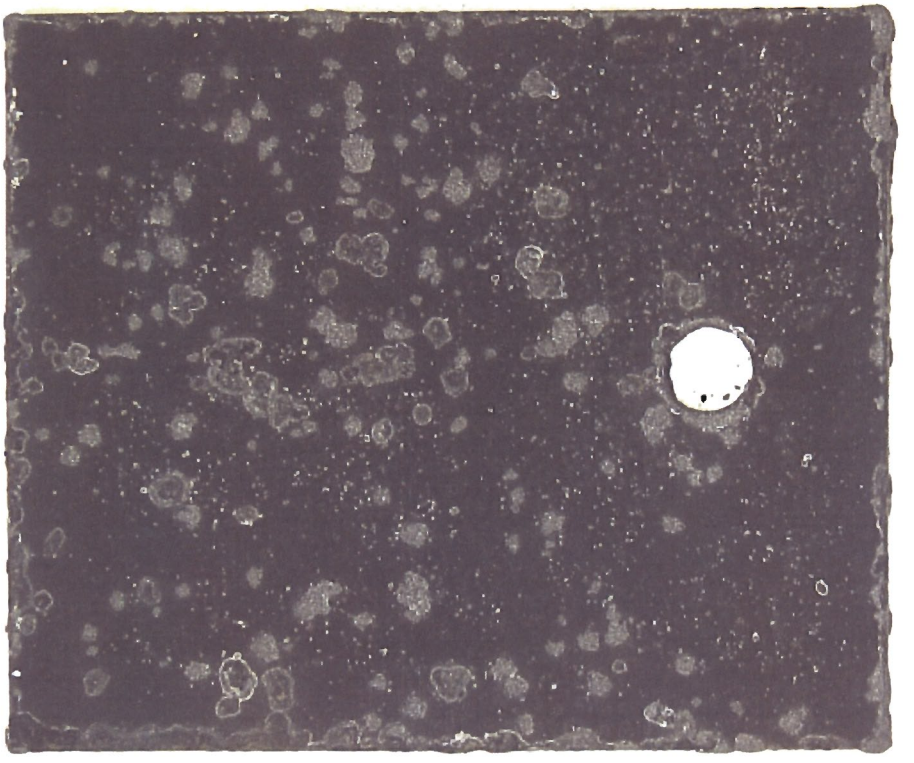
DISCLOSED TO AND UNDERSTOOD BY DATE

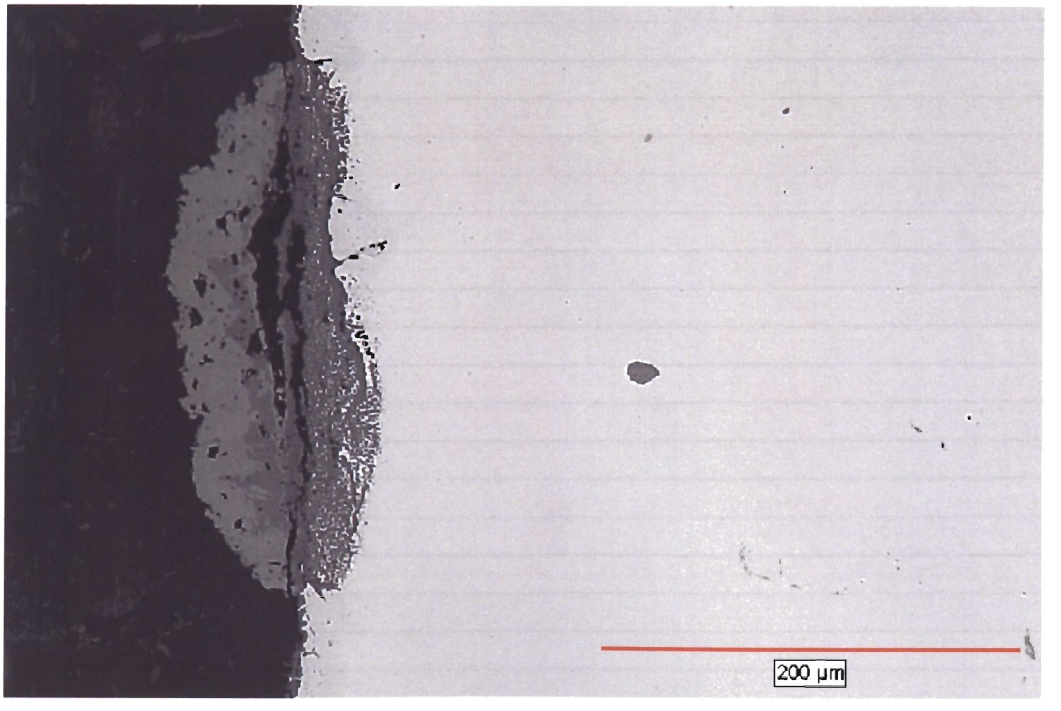
~~PROPRIETARY INFORMATION~~ 4/8/10

TITLE PROJECT

Continued From Page 113

TGA-004 images





Continued To Page 115

SIGNATURE Michael D. [illegible]

DATE 7/21/06

DISCLOSED TO AND UNDERSTOOD BY

DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 MP

TITLE **PROJECT**

Continued From Page 114 TGA-005

C-22 HT#: 2277-3-3266

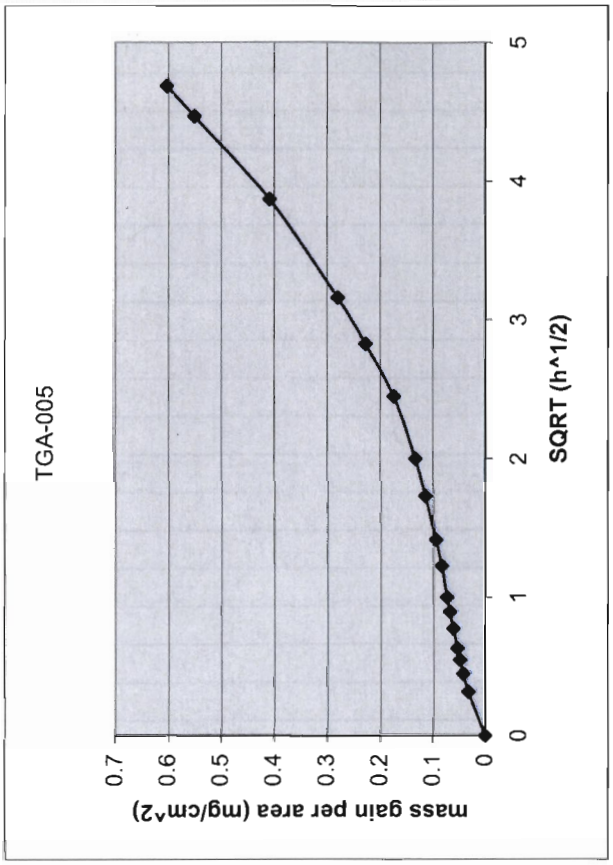
TGA: Thermolchn
ThermoMax 700
S/N#: CE032364

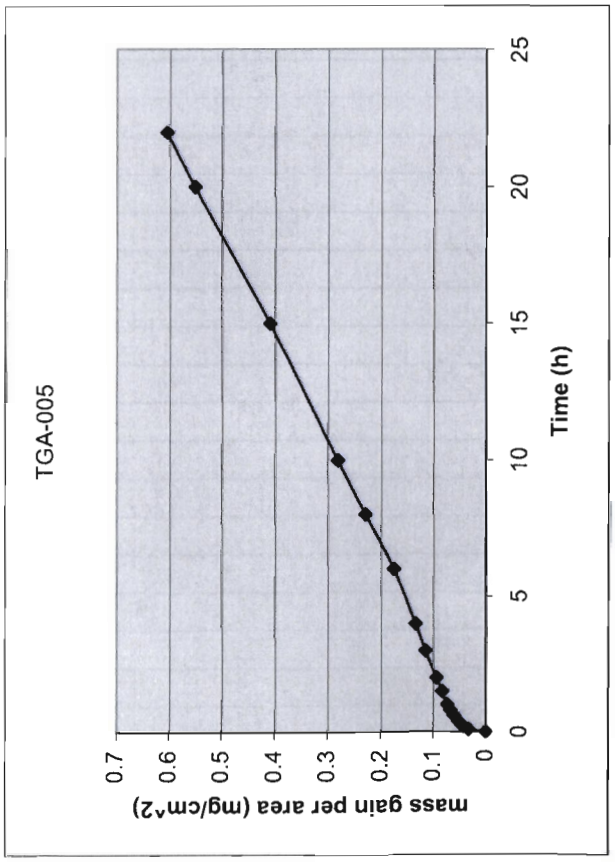
TGA-005

950°C - 1352.5 min - Air

Rate: 40°C / min
Method 1

Time (h)	SQRT (h^1/2)	mass gain per area (mg/cm^2)
0	0	0
0.1	0.316227766	0.032322573
0.2	0.447213595	0.041993912
0.3	0.547722558	0.047593145
0.4	0.632455532	0.052428846
0.6	0.774596669	0.060572977
0.8	0.894427191	0.066935741
1	1	0.072789484
1.5	1.224744871	0.082969699
2	1.414213562	0.093913654
3	1.732050808	0.114528803
4	2	0.133616888
6	2.449489743	0.174592883
8	2.828427125	0.228040104
10	3.16227766	0.279959014
15	3.872983346	0.408486855
20	4.472135955	0.550501261
22	4.69041576	0.603439045





Continued To Page 116

SIGNATURE Michael D. [illegible] DATE 7/21/06

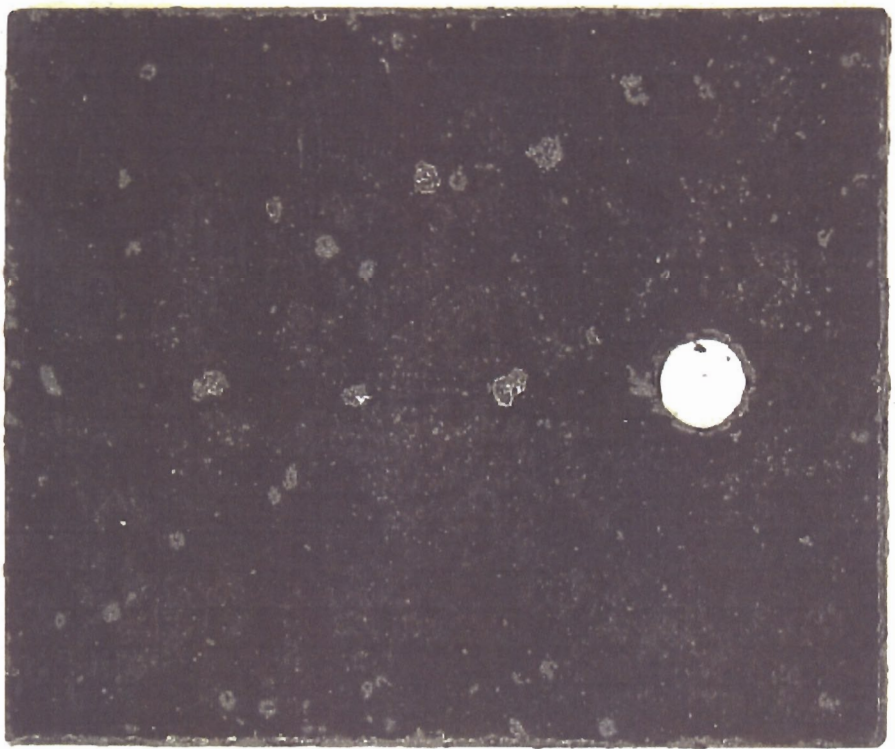
DISCLOSED TO AND UNDERSTOOD BY DATE

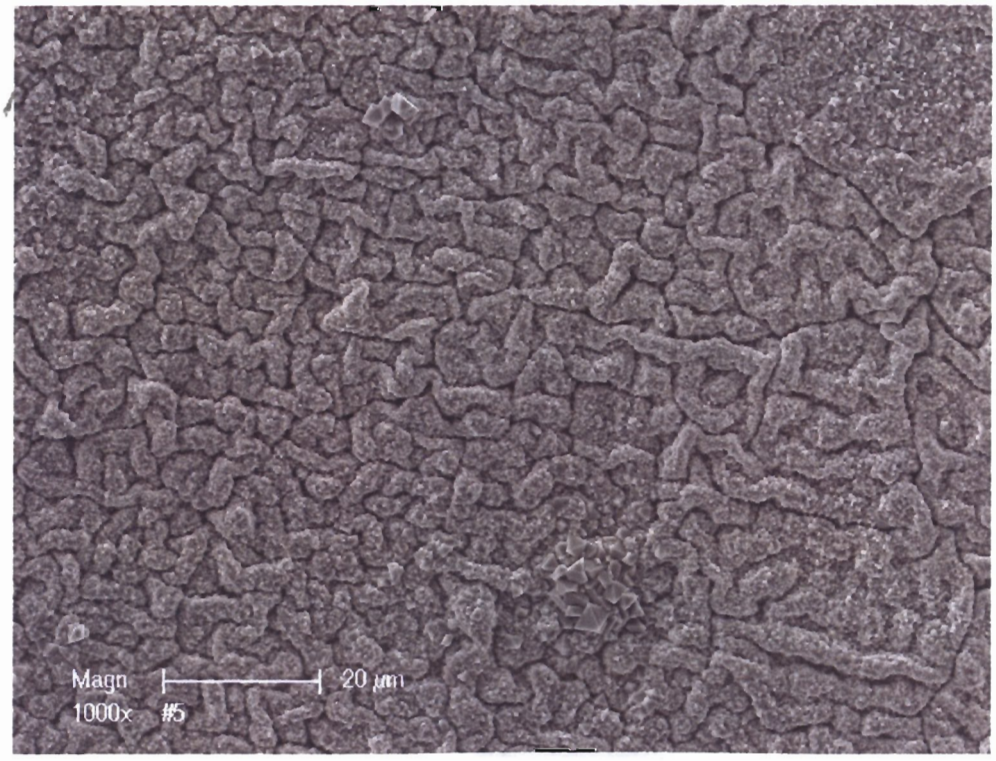
~~PROPRIETARY INFORMATION~~ 4/8/10 MD

TITLE

PROJECT

Continued From Page 115 TGA-008 images





Continued To Page 117

SIGNATURE Michael D. [illegible]

DATE 7/21/06

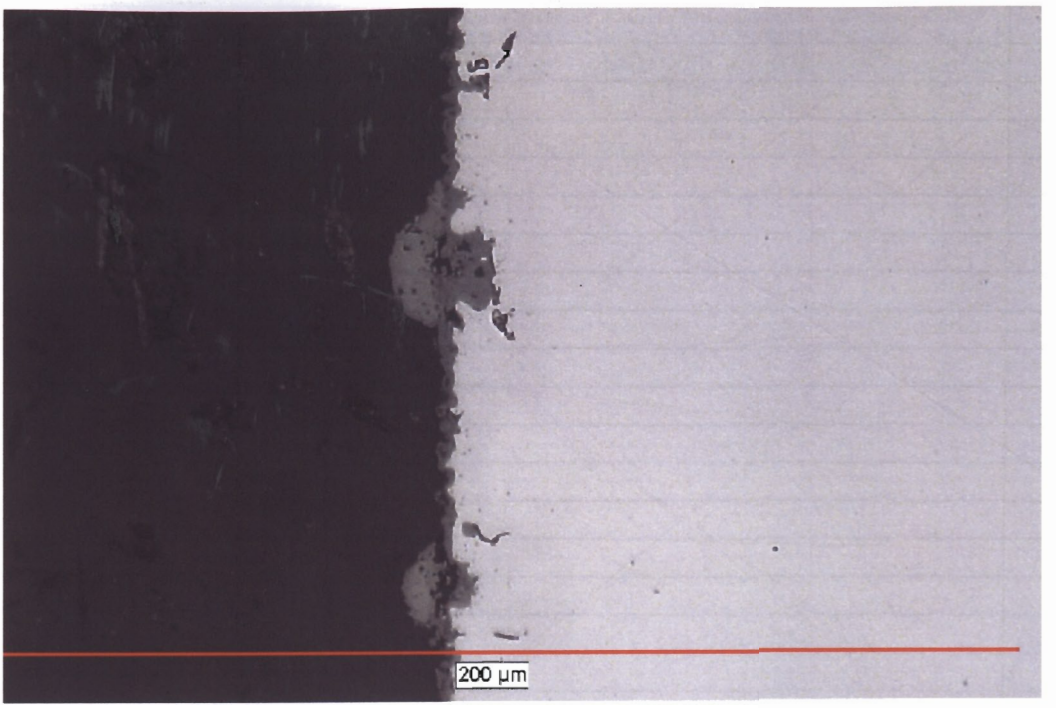
DISCLOSED TO AND UNDERSTOOD BY

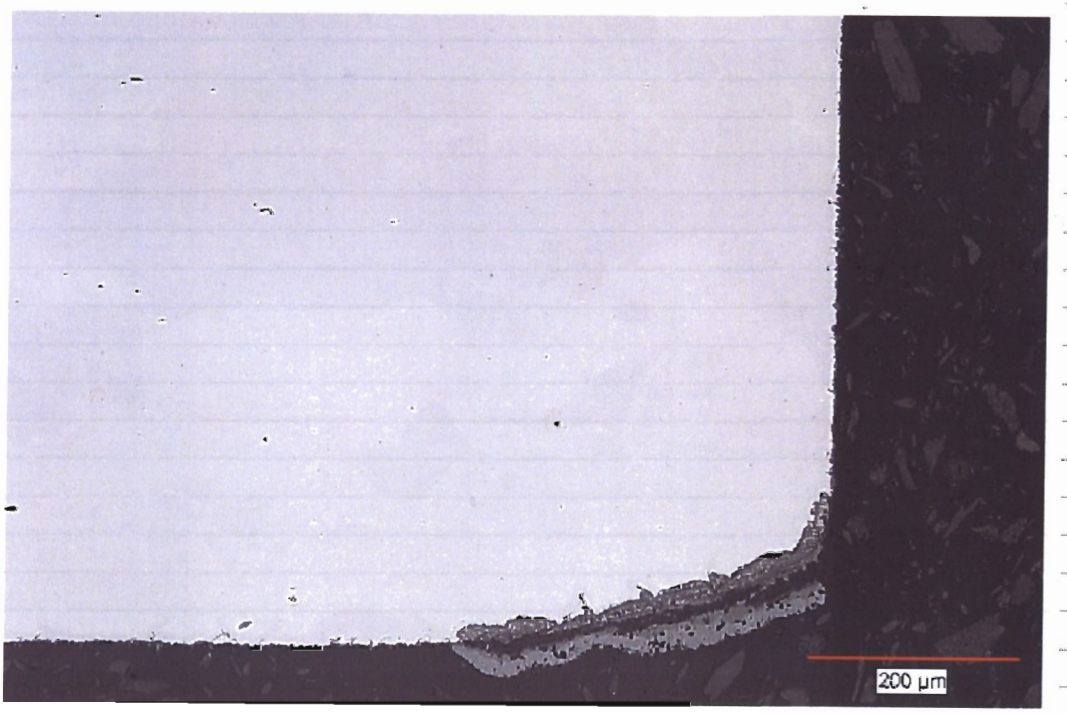
DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 [illegible]

TITLE **PROJECT**

Continued From Page 116 TGA-005 2mages





Continued To Page 118

SIGNATURE Michael D. [illegible] DATE 7/21/06

DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 MD

TITLE **PROJECT**

Continued From Page 117 TGA-006

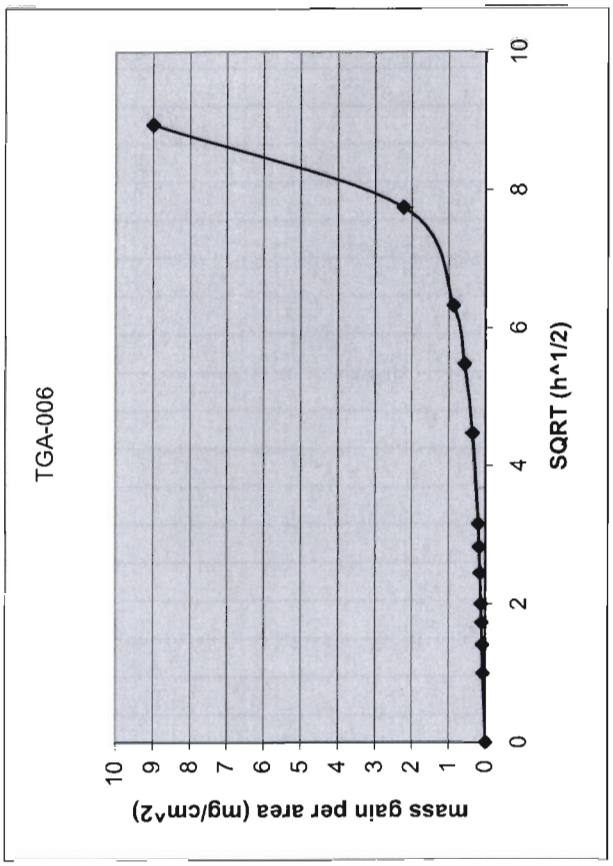
C-22 HT #: 2277-3-3266

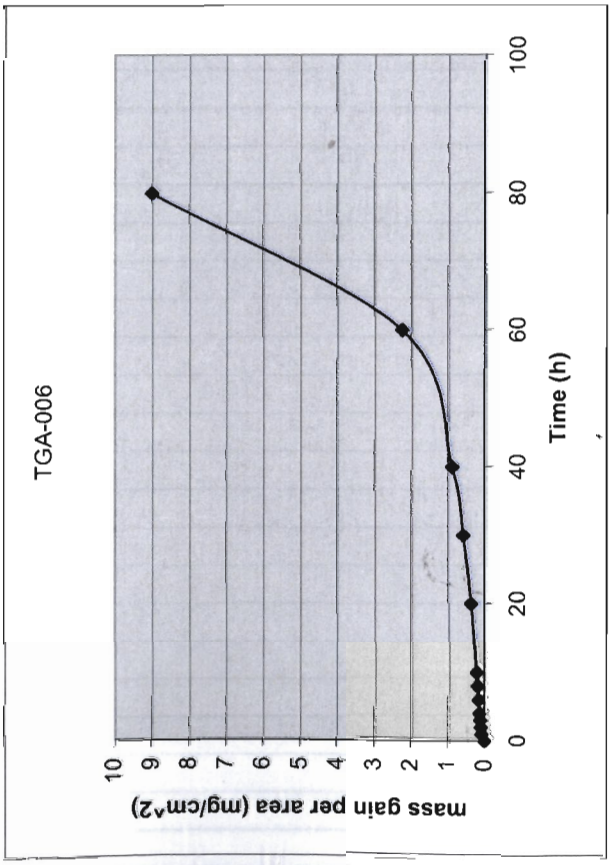
TGA: ThermoCahn
ThermoMax 700
Sn: CR032364

TGA -006

950°C - 4570 min - Air
40°C/min
Method 1

Time (h)	SQRT (h^1/2)	mass gain per area (mg/cm^2)
0	0	0
1	1	0.074609745
2	1.414213562	0.09607342
3	1.732050808	0.113959467
4	2	0.129290366
6	2.449489743	0.157140245
8	2.828427125	0.182437062
10	3.16227766	0.205688089
20	4.472135955	0.36461673
30	5.477225575	0.574648364
40	6.32455532	0.877686195
60	7.745966692	2.235478963
80	8.94427191	9.00146942





Continued To Page 119

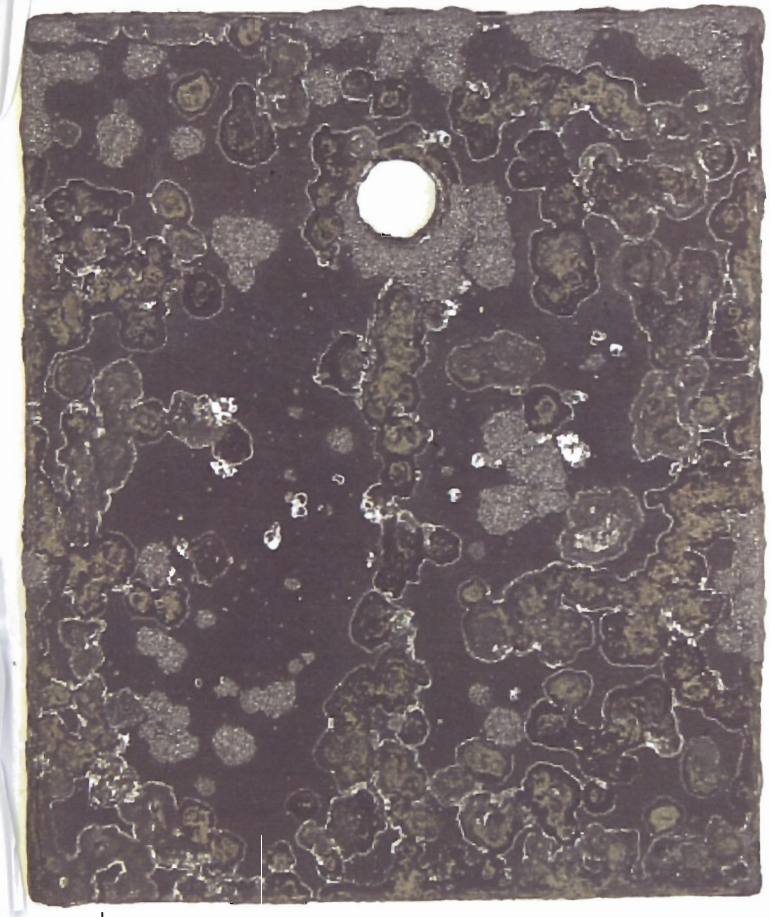
SIGNATURE Michael D. [illegible] DATE 7/21/06

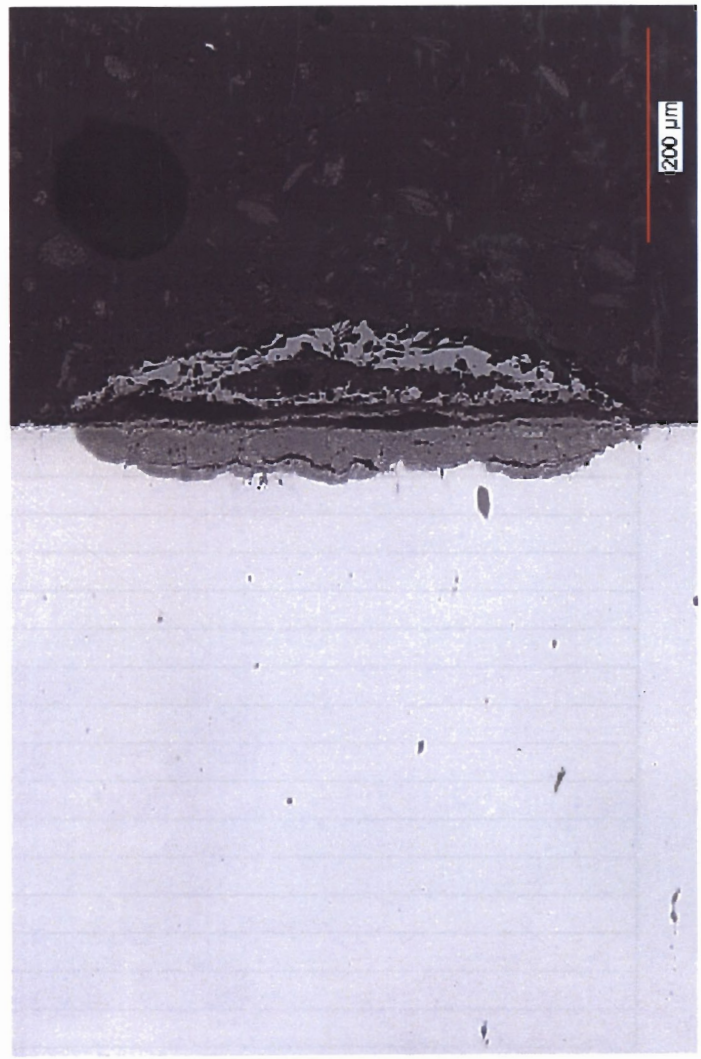
DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 MD

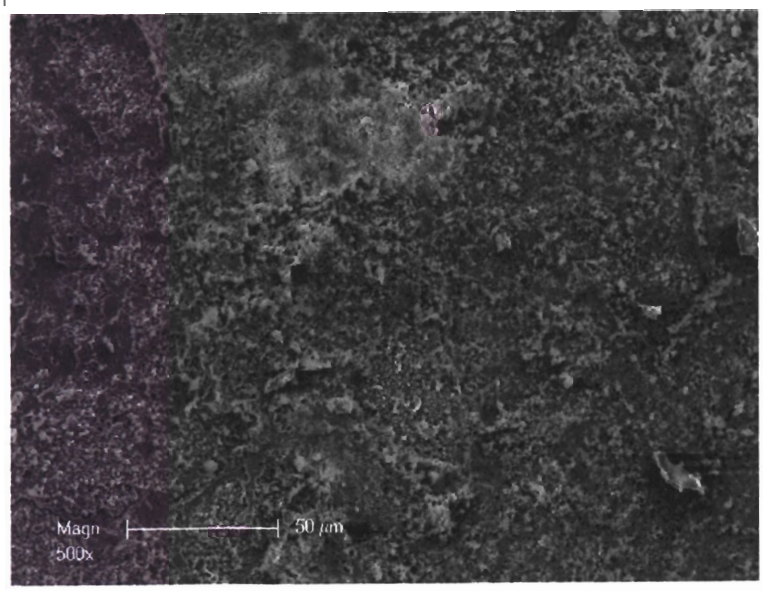
TITLE **PROJECT**

Continued From Page 118 TGA-006 Images





30



Continued To Page 120

SIGNATURE Michael D. [illegible] DATE 7/21/06

DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 MD

TITLE **PROJECT**

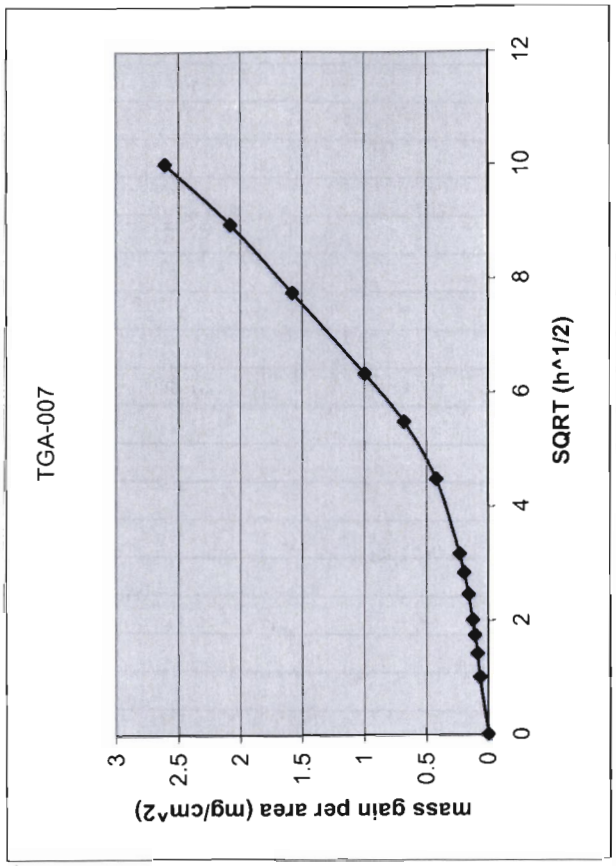
Continued From Page 119 TGA-007

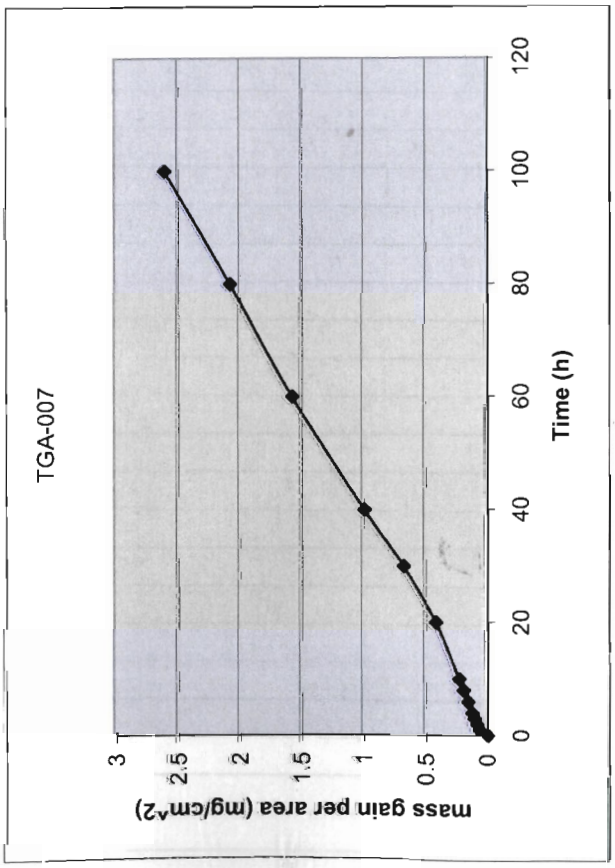
C-22 HT # 2277-3-3266

TGA: Thermolyne
ThermMax 700
Ser: CE 032364

950°C - 100hr - Argon
40°C/min
Method 1

Time (h)	SQRT (h^1/2)	mass gain per area (mg/cm^2)
0	0	0
1	1	0.067317813
2	1.414213562	0.088306623
3	1.732050808	0.108272206
4	2	0.125932443
6	2.449489743	0.159720063
8	2.828427125	0.197347138
10	3.16227766	0.23292483
20	4.472135955	0.42131324
30	5.477225575	0.682394072
40	6.32455532	0.99722727
60	7.745966692	1.580818118
80	8.94427191	2.086605636
100	10	2.613882389





Continued To Page 121

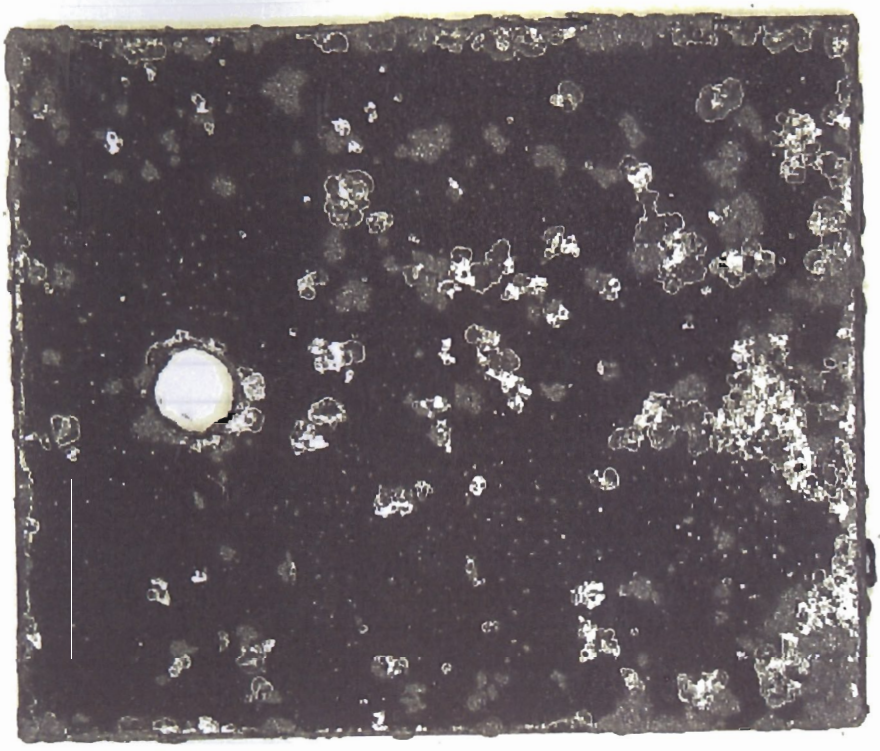
SIGNATURE [signature] DATE 7/21/06

DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10

TITLE PROJECT

Continued From Page 120 TGA -007 images



Continued To Page

SIGNATURE Michael D. [illegible] DATE 7/21/06

DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 MD

TITLE Cylinder Tests **PROJECT**

Continued From Page

OVEN= Rapid Temp Model #: 98002-24 SN#: 029786

OVEN SETPOINT= 1200°c
OVEN TEMPERATURE= 1206°c

Specimen: 1/4" diameter x 1" long C-22 cylinder, LW 4-1, alumina crucible

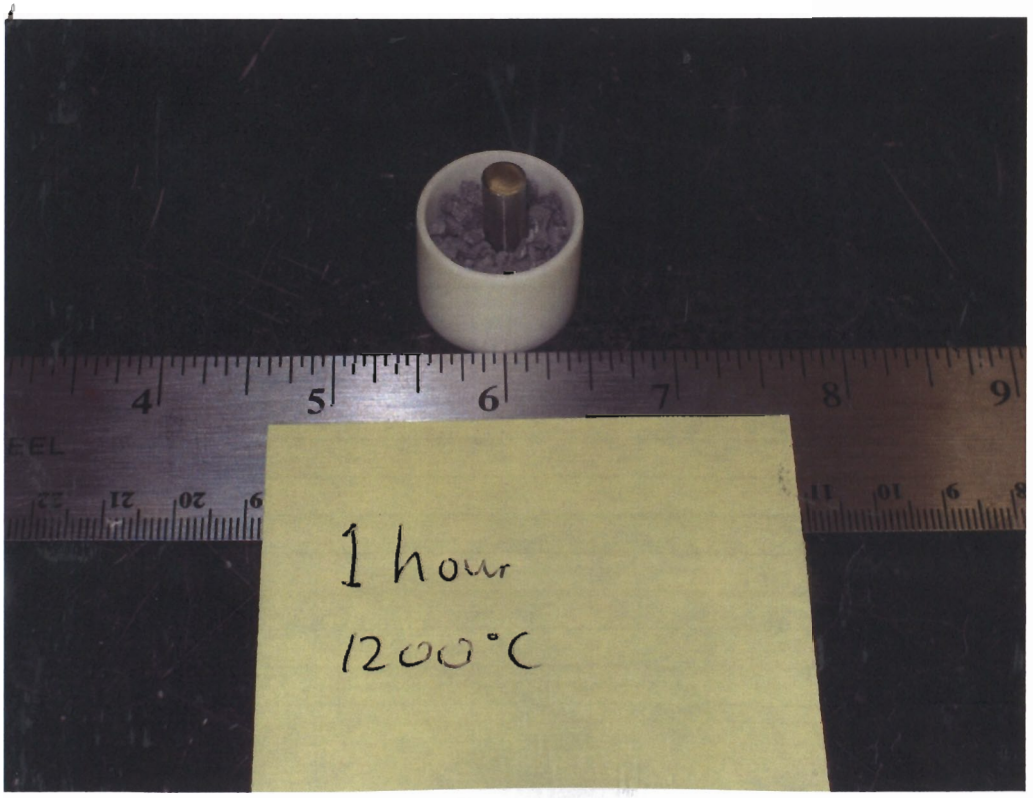
start weight: 24.245g
end weight: 24.238g

measurement scale: OHAUS Ans 002345 Sn: 2883

Measurement taken with OMEGA MICROPROCESSOR THEMOMETER MODEL# HH22
SN#=T-94140 CAL= DUE=
Thermocouple= SN#=328 CAL=1/16/06 DUE=7/14/06

AMOUNT OF TIME = 1 hour

DETAILS= Annealed @ 800°C in Lindberg for 45 min.
Trace amounts of oxide were lost during cooling.



Before

Continued To Page 123

SIGNATURE Michael D. [illegible] DATE 7/25/06

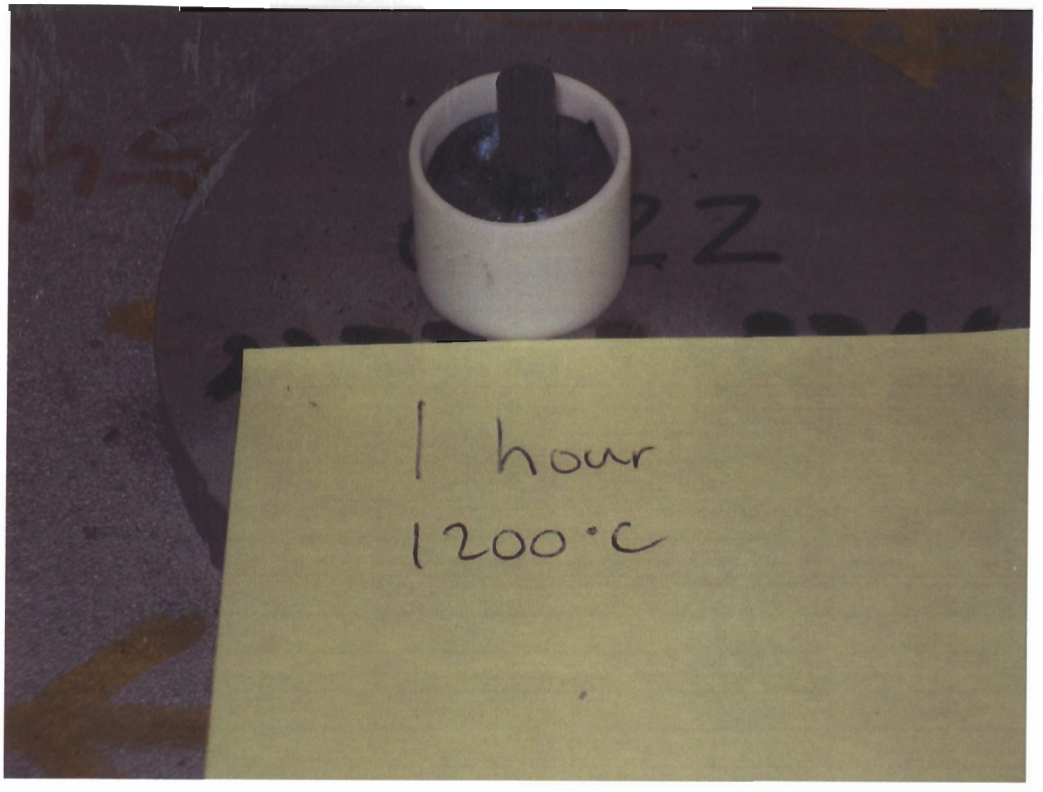
DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10

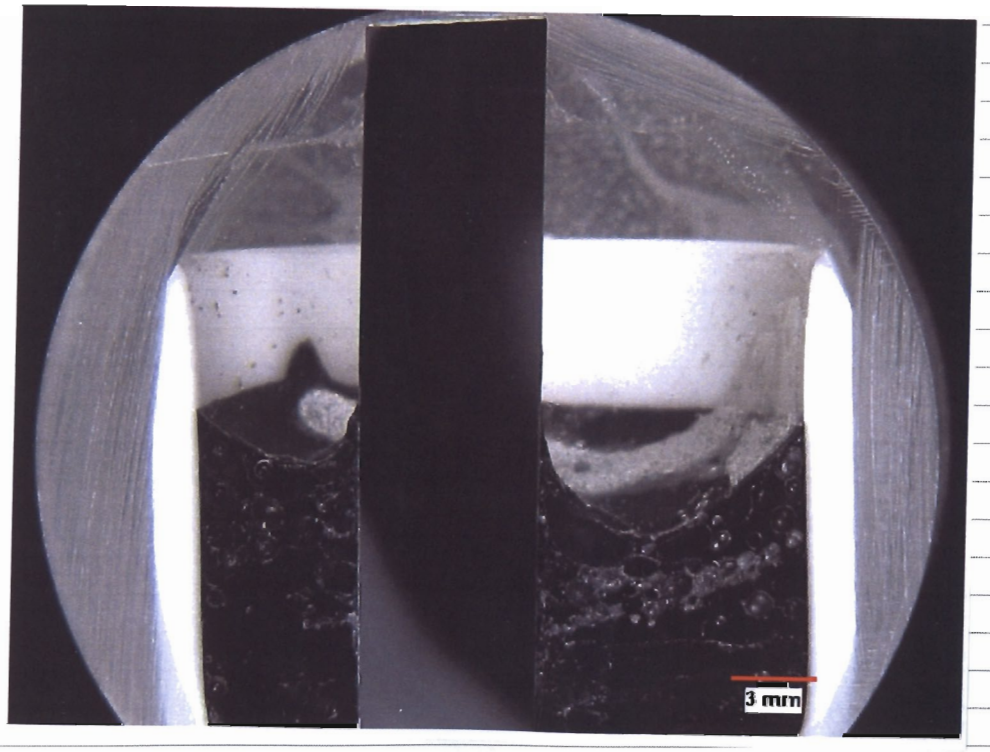
TITLE **PROJECT**

Continued From Page 122

1 hr test



After



low mag

Continued To Page 124

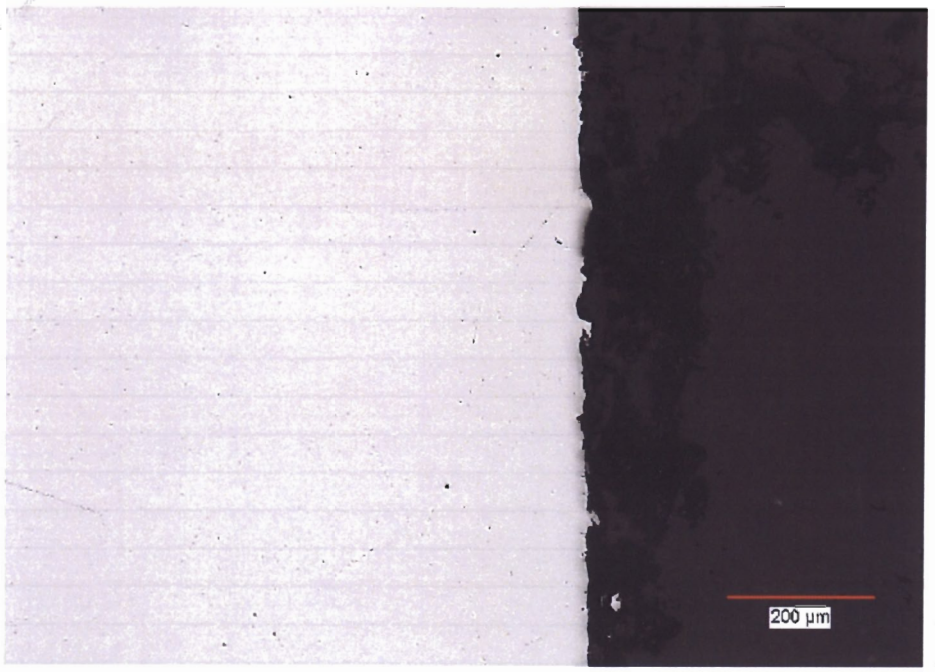
SIGNATURE Michael D. Asher DATE 7/25/06

DISCLOSED TO AND UNDERSTOOD BY DATE

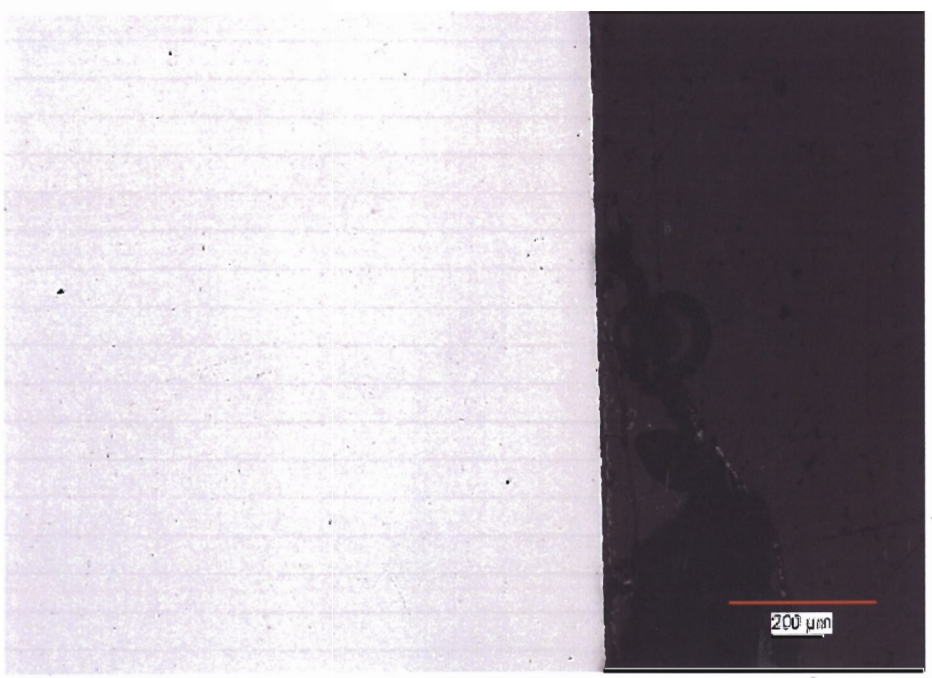
~~PROPRIETARY INFORMATION~~ 4/8/10 MD

TITLE PROJECT

Continued From Page 123 1 W test images



Metal loss



Triple point

Continued To Page 125

SIGNATURE Michael D. [illegible] DATE 7/25/06

DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10

TITLE **PROJECT**

Continued From Page 124 2.5 hr. Test

OVEN= Rapid Temp. model#: 98002-24 Sn#: 029786

OVEN SETPOINT= 1200°C
OVEN TEMPERATURE= 1213°C

Specimen: C-22 cylinder (1/4" diameter, 1" long), alumina crucible, magnaLW 4-1
4T # 2277-3-3266

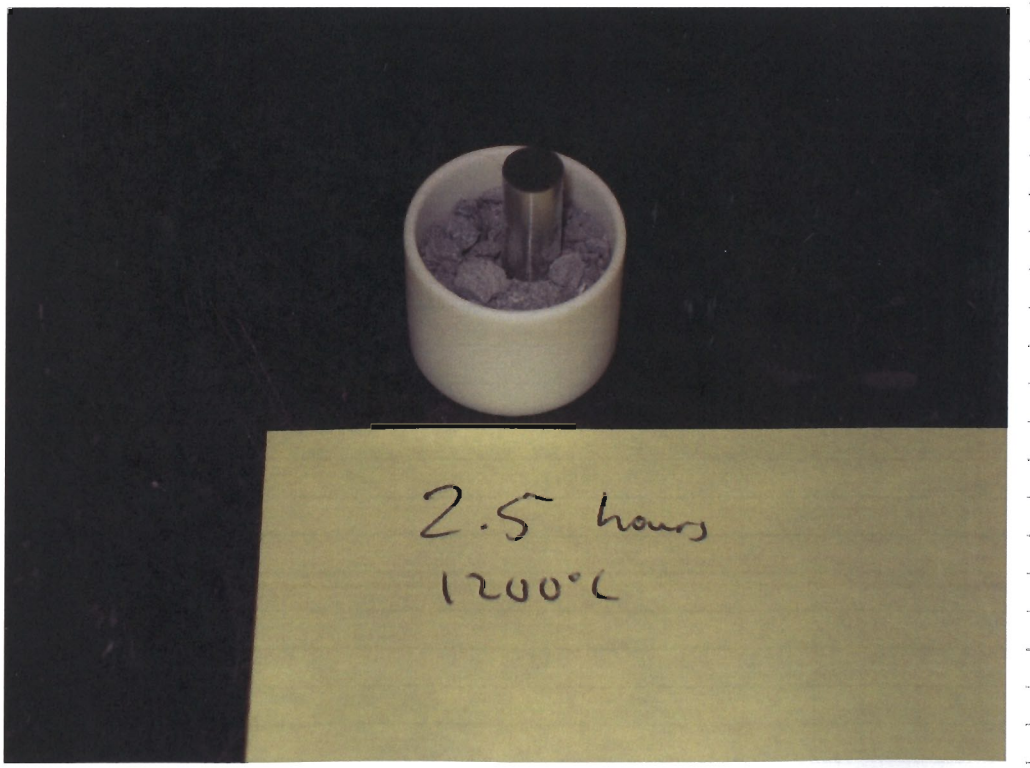
start weight: 22.668 g
end weight: 22.653 g

measurement scale: OHAUS
A.#: 002345
S.#: 2883

Measurement taken with **OMEGA MICROPROCESSOR THEMOMETER** **MODEL# HH22**
SN#=T-94140 **CAL=** **DUE=**
Thermocouple= **SN#=328** **CAL=1/16/06** **DUE=7/14/06**

AMOUNT OF TIME = 2.5 hours

DETAILS= Annealed in Lindberg for 45 min @ 800°C



Before

Continued To Page 126

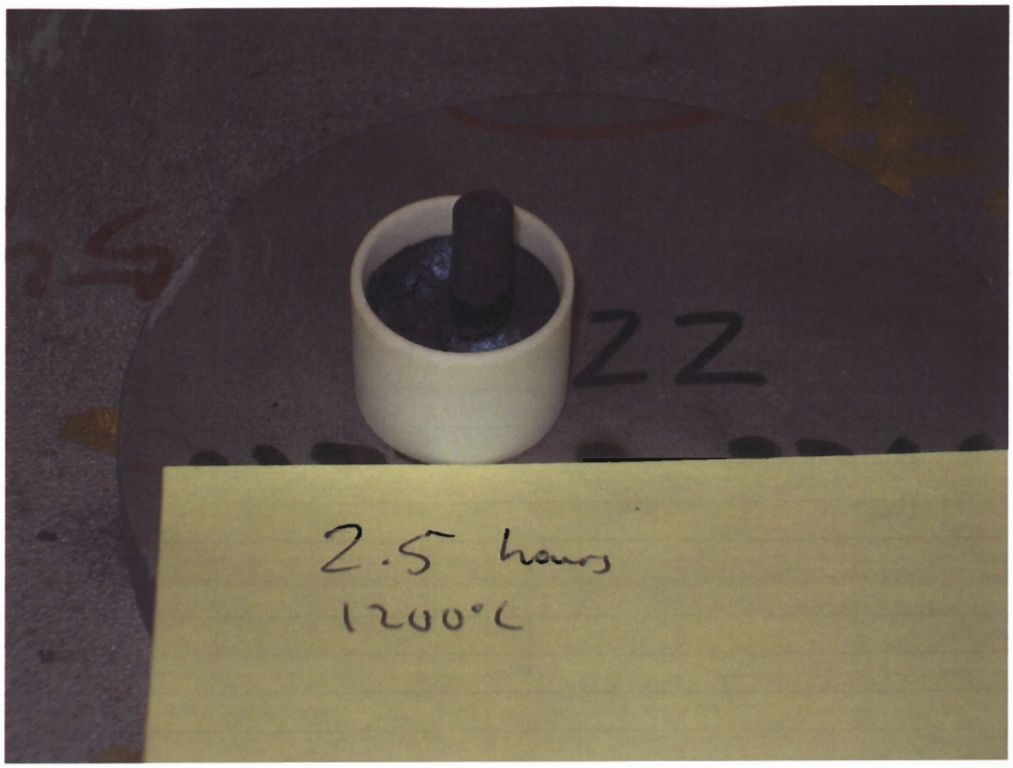
SIGNATURE Michael D. [illegible] DATE 7/25/06

DISCLOSED TO AND UNDERSTOOD BY DATE

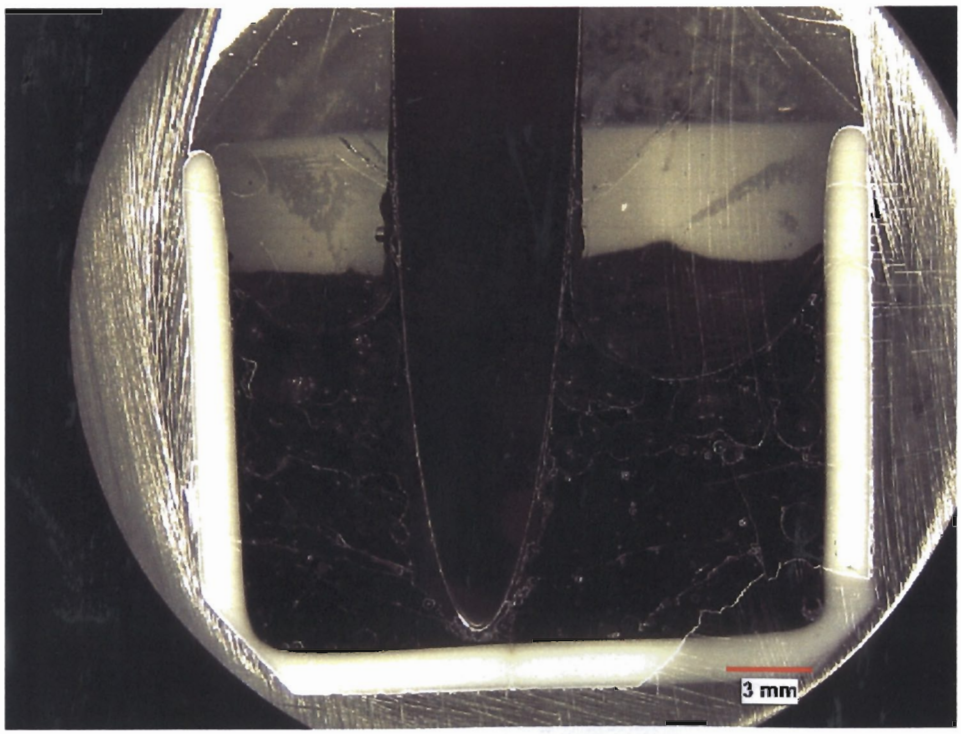
~~PROPRIETARY INFORMATION~~ 4/8/10 MD

TITLE PROJECT

Continued From Page 125 2.5 W images



After



Low Mag
mounted

Continued To Page 127

SIGNATURE Michael D. [illegible] DATE 7/25/06

DISCLOSED TO AND UNDERSTOOD BY DATE

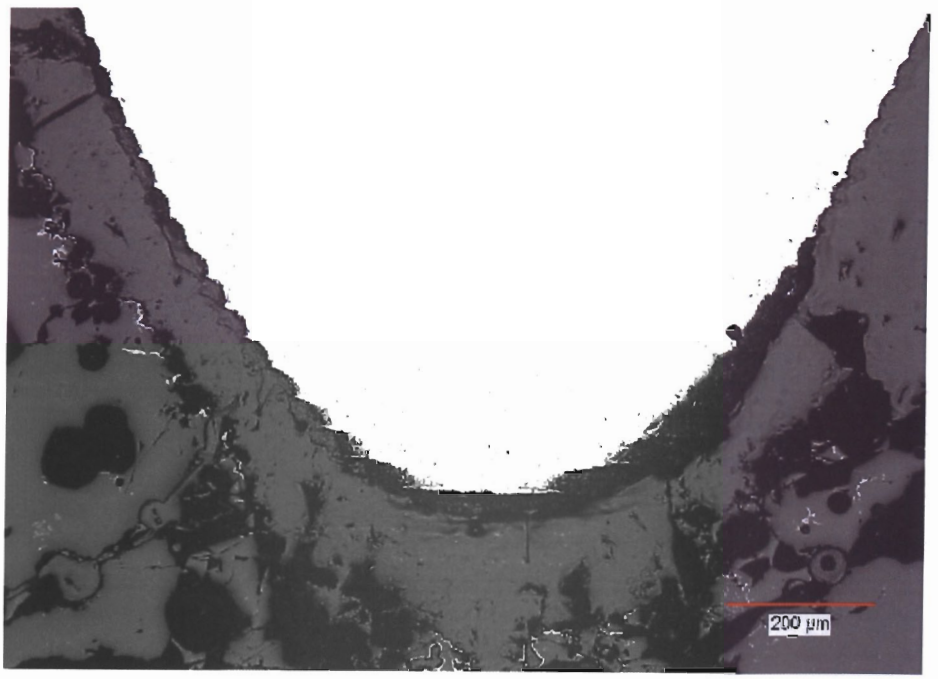
~~PROPRIETARY INFORMATION~~ 4/8/10

TITLE **PROJECT**

Continued From Page 126

2.5 hr image

Triple point



Base
(cut at angle)

Continued To Page 128

SIGNATURE Richard D. Aston DATE 7/25/06

DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 MP

TITLE **PROJECT**

Continued From Page 127 4 hr test

OVEN= RapidTemp
model #: 98002-24
Sn #: 029786

OVEN SETPOINT= 1200°C
OVEN TEMPERATURE= 1206°C

HT# 2277-3-3266

Specimen: 1/4" diameter C-22 cylinder, LW4-1, alumina crucible
1" length

start weight: 23.624g
end weight: 24.036g

measurement scale: O HAUS
An: 002345
Sn: 2883

Measurement taken with **OMEGA MICROPROCESSOR THEMOMETER** **MODEL# HH22**
SN#=T-94140 **CAL=** **DUE=**
Thermocouple= **SN#=328** **CAL=1/16/06** **DUE=7/14/06**

AMOUNT OF TIME = 4 hr.

DETAILS= Annealed at 800°C in Lindberg for 45 min.

Oxide formed around alloy. Fell off.
Wt. of oxide: ~~1.757~~ g MOS 8/17/06 1.752g
Wt. of crucible + LW4-1 + C22: 22.284g

Continued To Page 129

SIGNATURE Michael D. [illegible] DATE 7/25/06

DISCLOSED TO AND UNDERSTOOD BY DATE

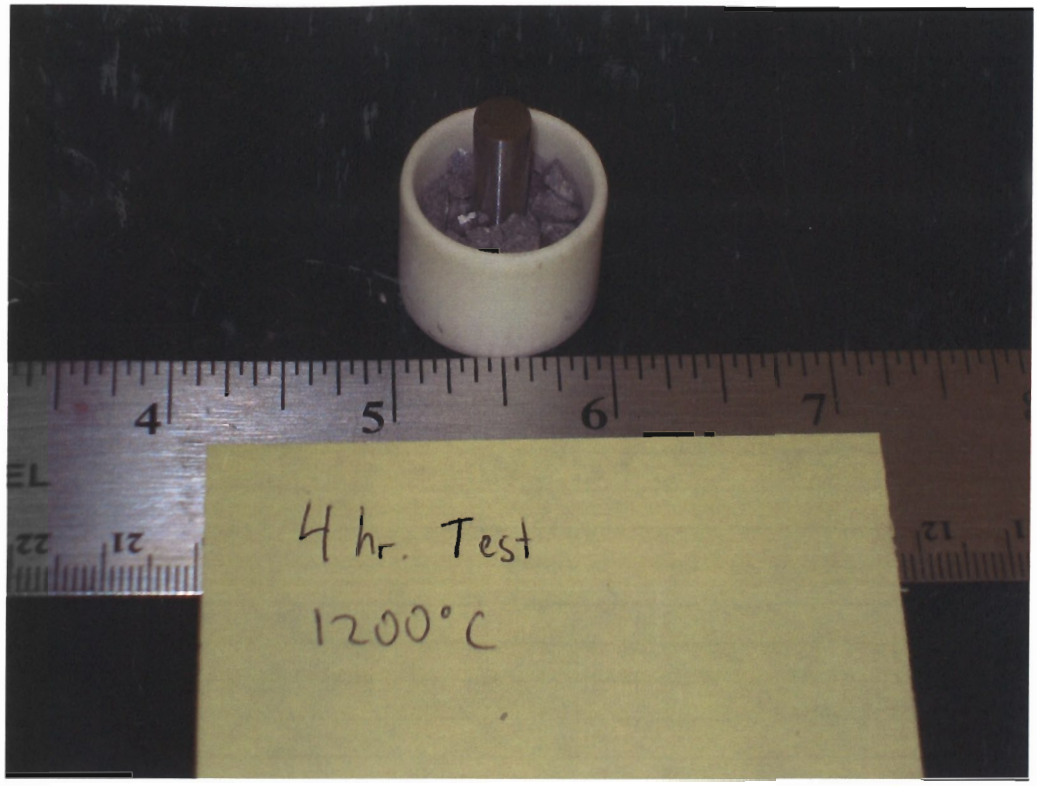
~~PROPRIETARY INFORMATION~~ 4/8/10

TITLE

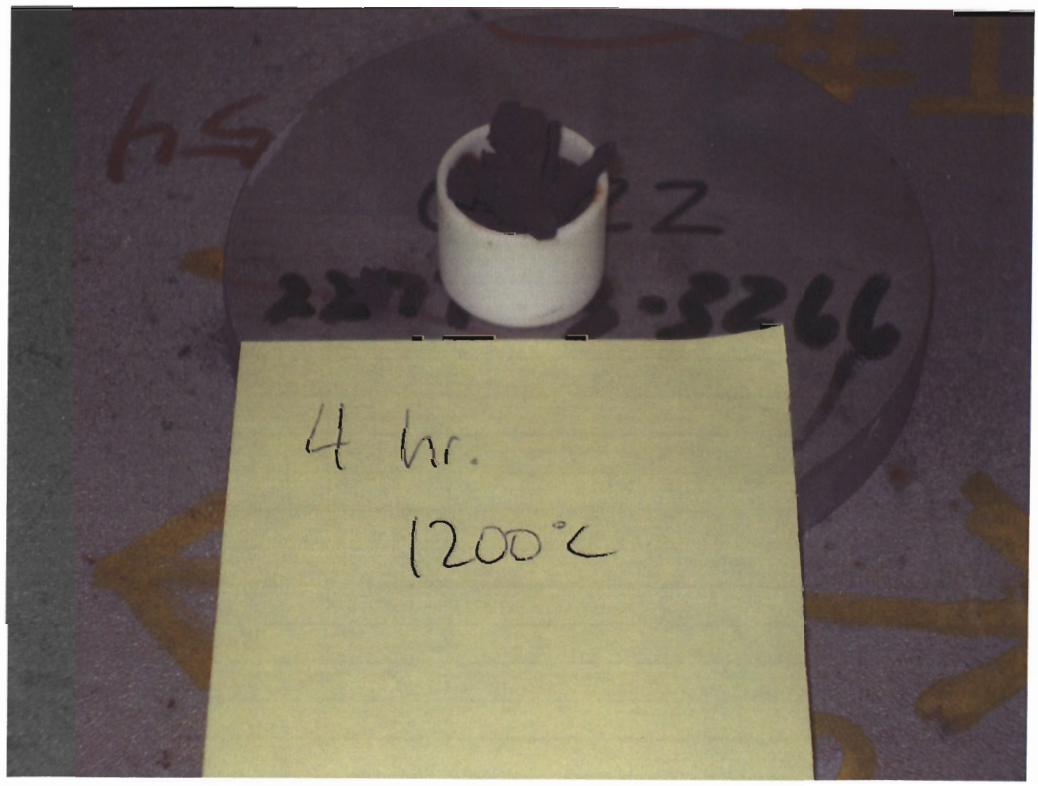
PROJECT

Continued From Page 128

4 hr Smelter



Before



After

Continued To Page 130

SIGNATURE Michael D. [illegible]

DATE 7/25/04

DISCLOSED TO AND UNDERSTOOD BY

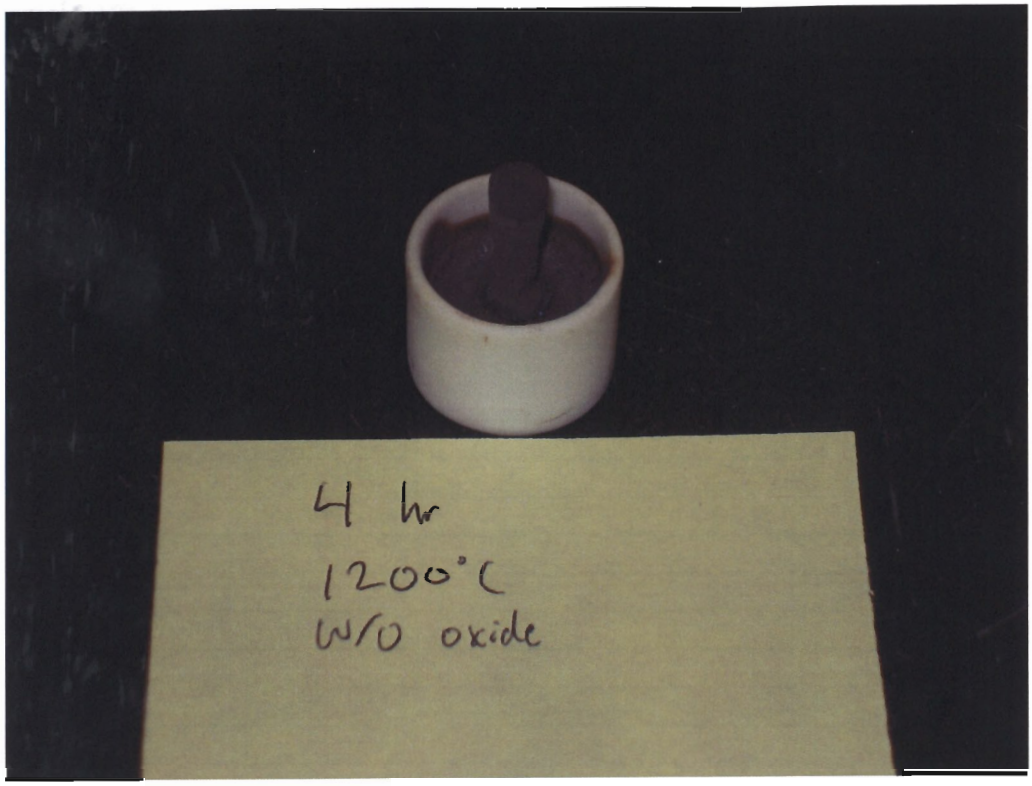
DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 MD

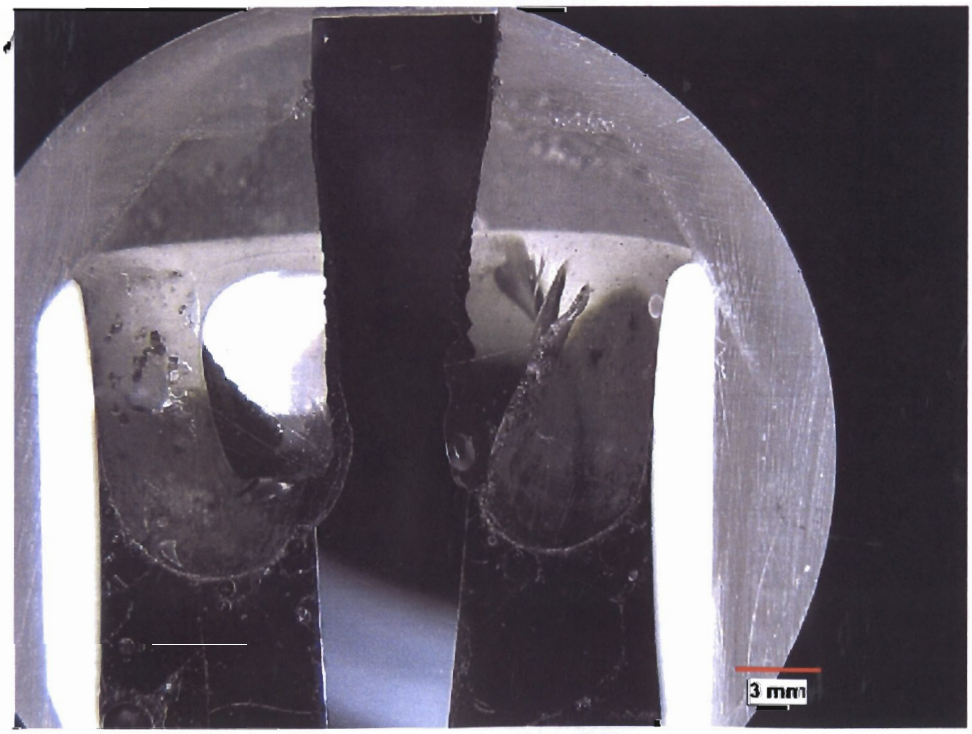
TITLE **PROJECT**

Continued From Page 129

4 hr images



After w/o oxide



low mag mounted

Continued To Page 131

SIGNATURE Michael D. [illegible] DATE 7/25/06

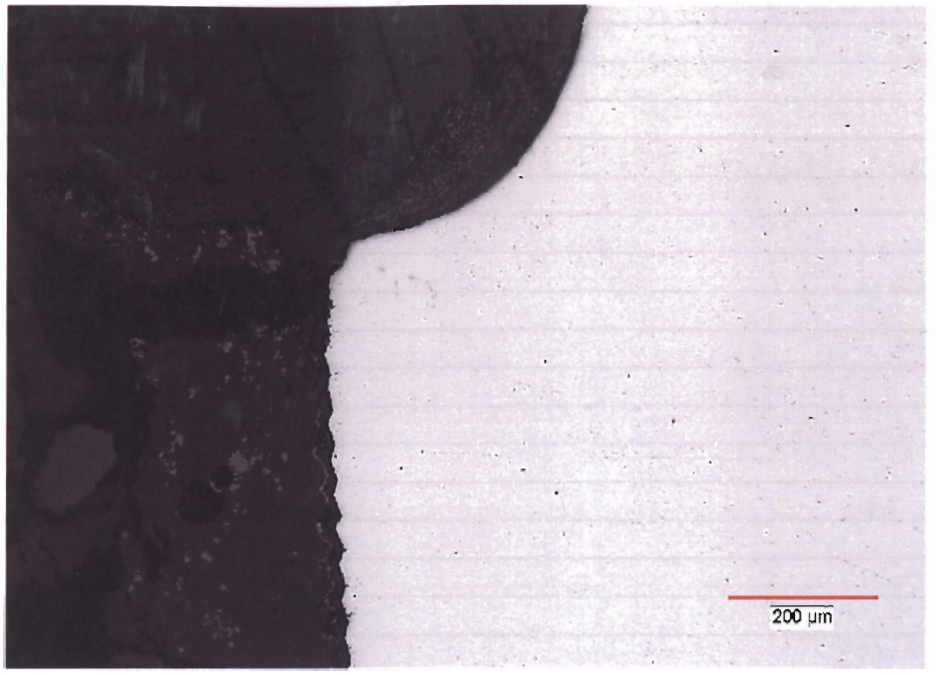
DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 mo

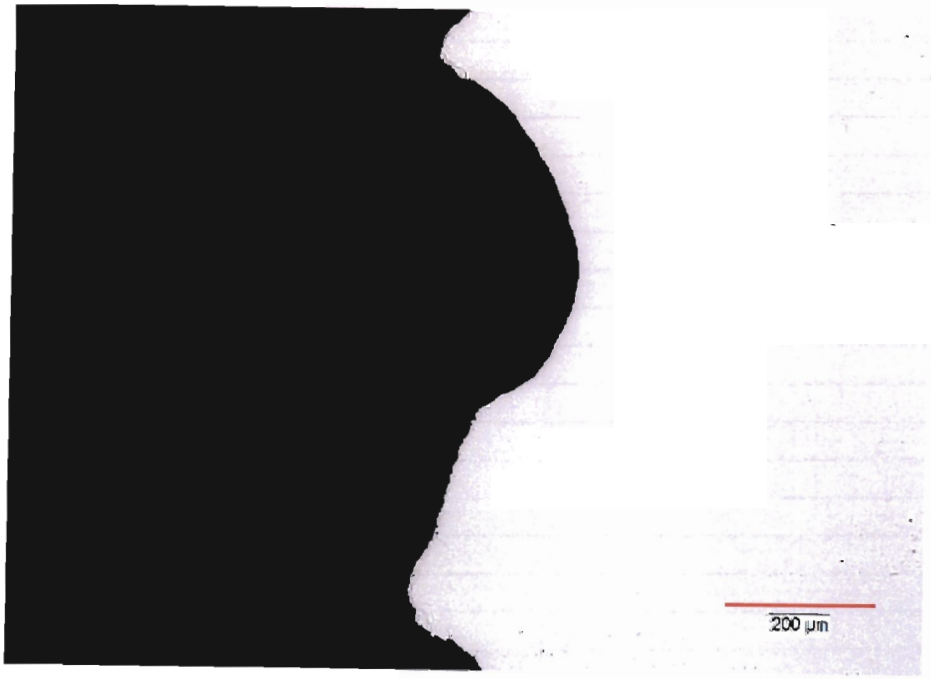
TITLE PROJECT

Continued From Page 130

4 hr images



triple point



metal loss

Continued To Page 132

SIGNATURE Michael D. [illegible] DATE 7/25/06

DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 MP

TITLE **PROJECT**

Continued From Page 131 8 hour test

OVEN= Rapid Temp model #: ~~98002~~ MDS 7-25-06 98002-24 SN# 029786

OVEN SETPOINT= 1200°C
OVEN TEMPERATURE= 1206°C

Specimen: 1/4" diameter x 1" long C-22 cylinder, LW 4-1, alumina crucible HT # 2277-3-3266

start weight: 24.196 g
end weight: 24.866 g

measurement scale: OHAUS Sn: 2883 An: 002345

Measurement taken with **OMEGA MICROPROCESSOR THEMOMETER** **MODEL# HH22**
SN#=T-94140 **CAL=** **DUE=**
Thermocouple= **SN#=328** **CAL=1/16/06** **DUE=7/14/06**

AMOUNT OF TIME = 8 hour

DETAILS= Annealed in Lindberg at 800°C for 45 min.

Oxide formed around cylinder and fell off during cooling. Minimal wt. loss due to loss of oxide.

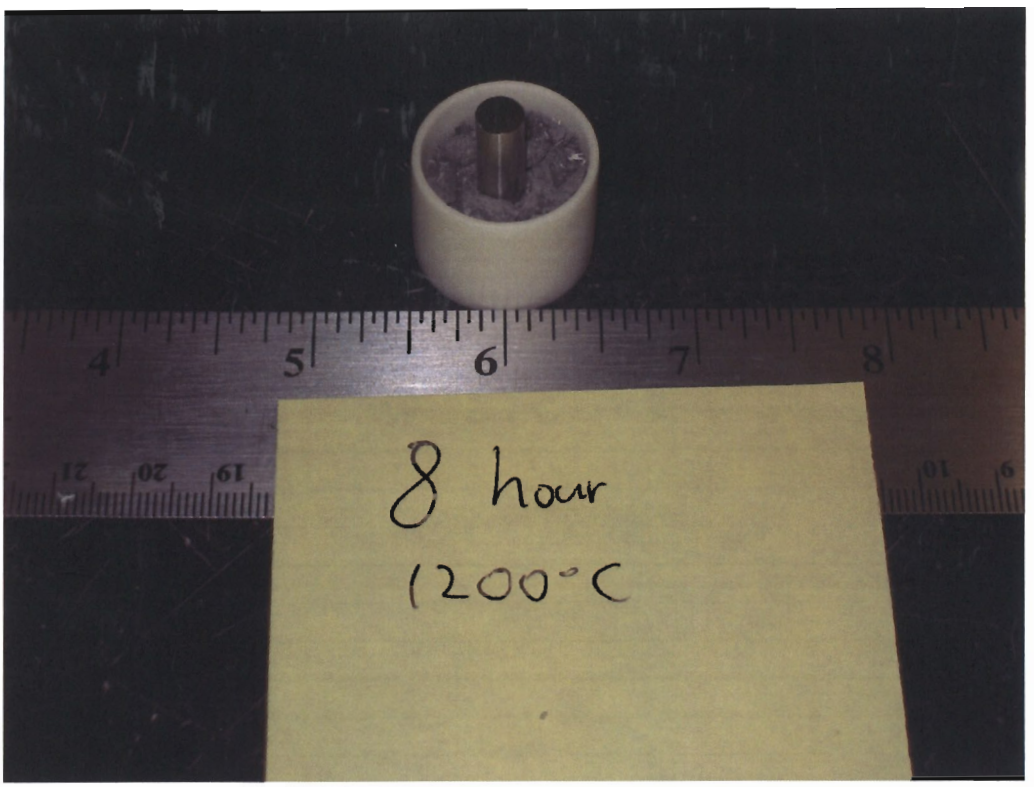
Wt. of oxide: 2.995 g
Wt. of crucible + alloy + magna: 21.871 g

Continued To Page 133

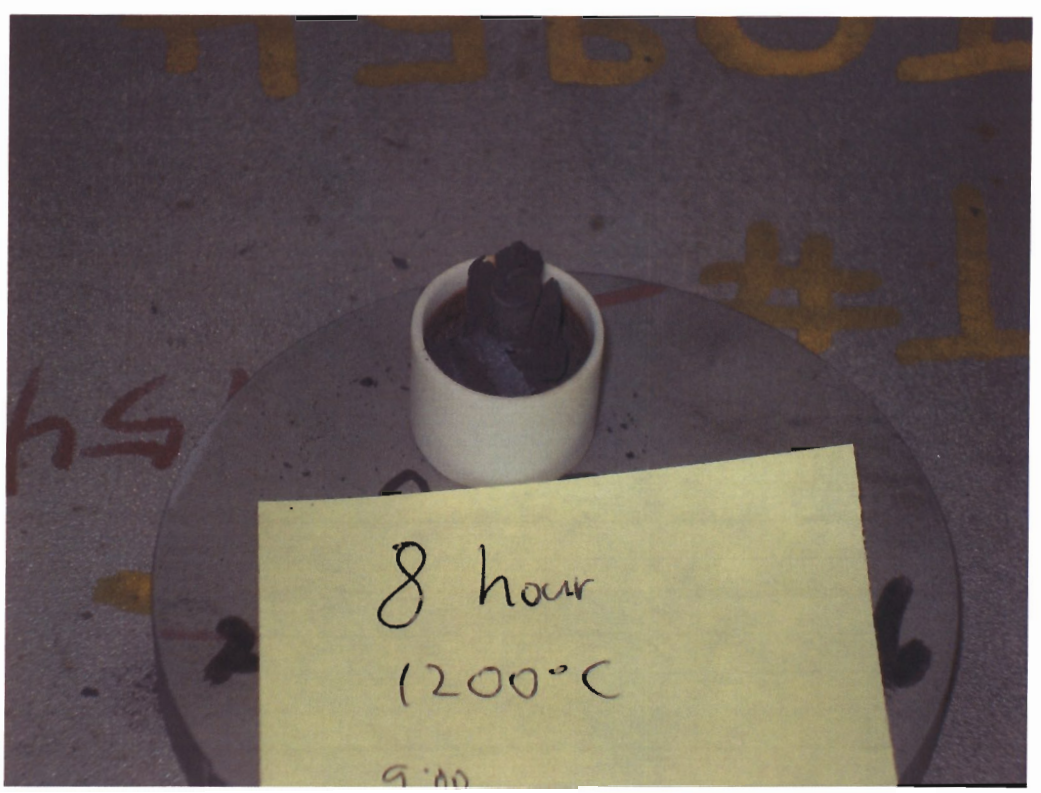
SIGNATURE Michael D. [illegible] DATE 7/25/06
DISCLOSED TO AND UNDERSTOOD BY DATE
~~PROPRIETARY INFORMATION~~ 4/8/10

TITLE PROJECT

Continued From Page 132 8 hour immersion



before



After

Continued To Page 134

SIGNATURE Michael D. [illegible] DATE 7/25/06

DISCLOSED TO AND UNDERSTOOD BY DATE

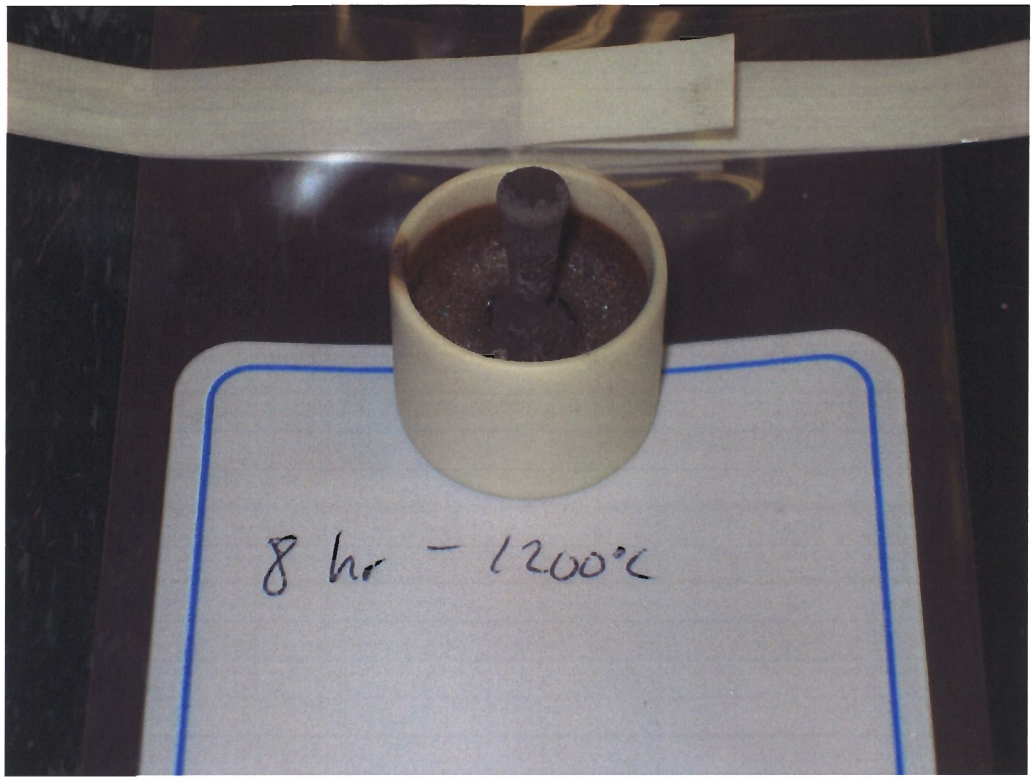
~~PROPRIETARY INFORMATION~~ 4/8/10 MD

TITLE

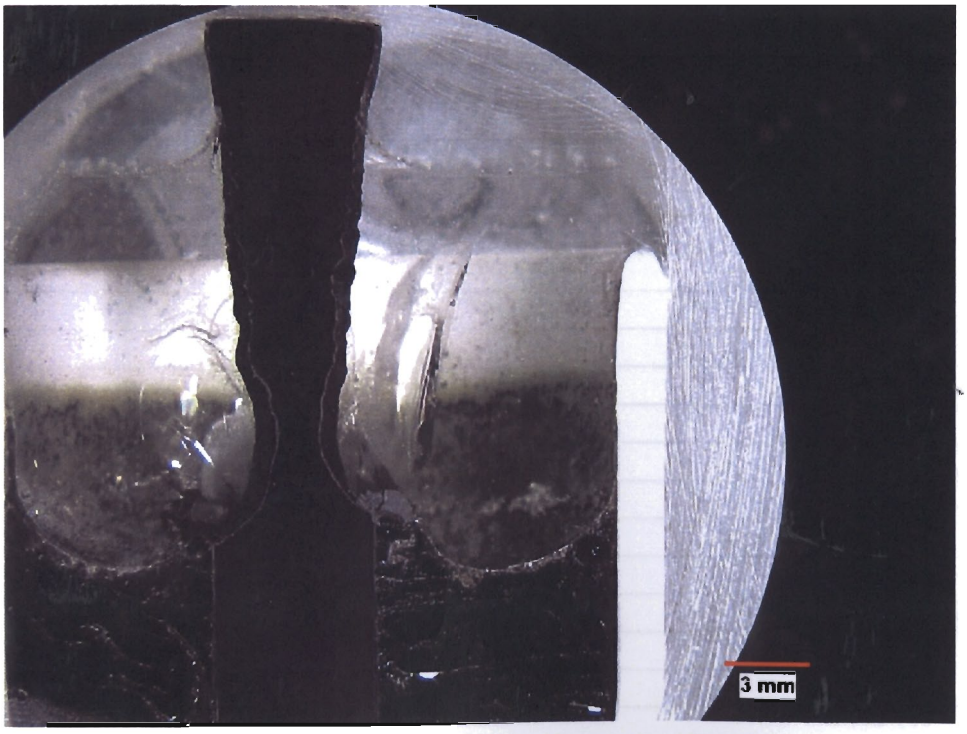
PROJECT

Continued From Page 133

8 hr images



After w/o oxide



low mag mounted

Continued To Page 135

SIGNATURE Michael D. [illegible]

DATE 7/25/06

DISCLOSED TO AND UNDERSTOOD BY

DATE

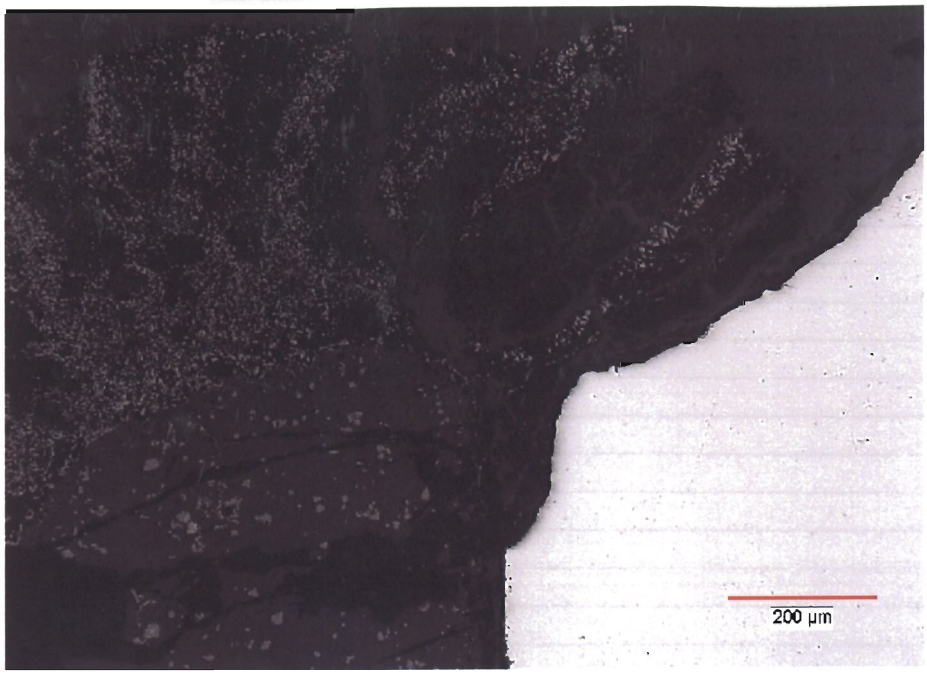
~~PROPRIETARY INFORMATION~~ 4/8/16

TITLE

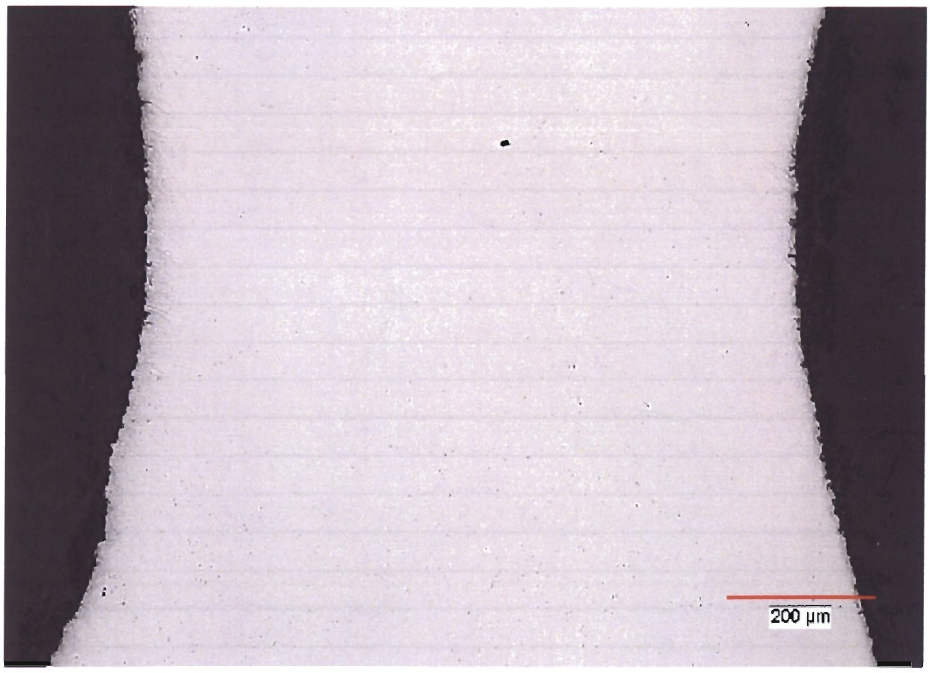
PROJECT

Continued From Page 134

8 W images



Triple Point



metal loss

MDS 7/25/06

Continued To Page ~~136~~

SIGNATURE Michael D. Ash

DATE 7/25/06

DISCLOSED TO AND UNDERSTOOD BY

DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 MAP

TITLE PROJECT

Continued From Page Coating Tests

Yucca Mountain Rock Testing

STEP 1

OVEN= Rapid Temp. model # : 98002-24 Sn # : 029786

OVEN SETPOINT= 900°C
OVEN TEMPERATURE= 917 °C

Specimen: 7 C-22 coupons, Pt. wire, alumina crucible HT # 2277-3-32d, Aldrich Chem. Co. 36,745-9 07703JS

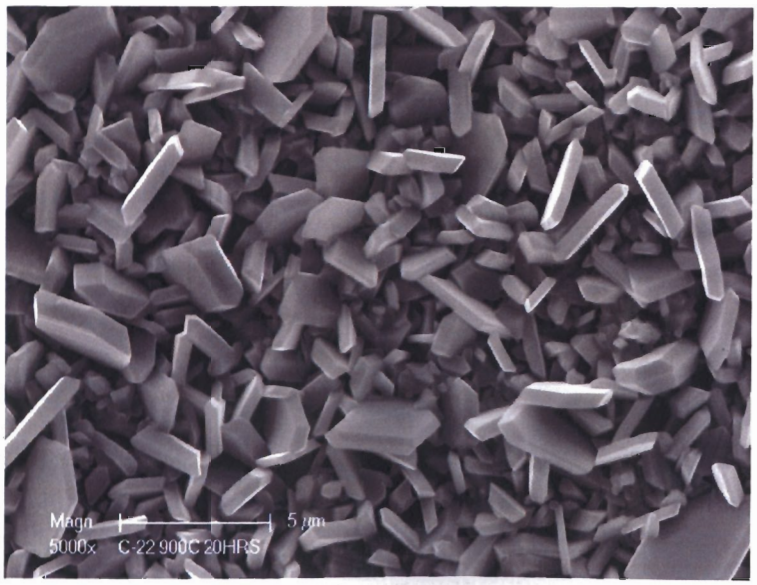
start weight:
end weight: } See table on page 144

measurement scale: weight: Sartorius An: 008780 Sn: 12809099 length: Calipers Starrett No. 734M An: 010094 Sn: 02437171

Measurement taken with OMEGA MICROPROCESSOR THEMOMETER MODEL# HH22
SN#=T-94140 CAL= DUE=
Thermocouple= SN#=328 CAL=1/16/06 DUE=7/14/06

AMOUNT OF TIME = 20 hrs.

DETAILS= Thin oxide layer was formed on alloy.
Samples 3, 4, 6, 7 were then coated w/ LW3-3



SEM of surface of sample 1 after 900°C for 20hr.

Continued To Page 137

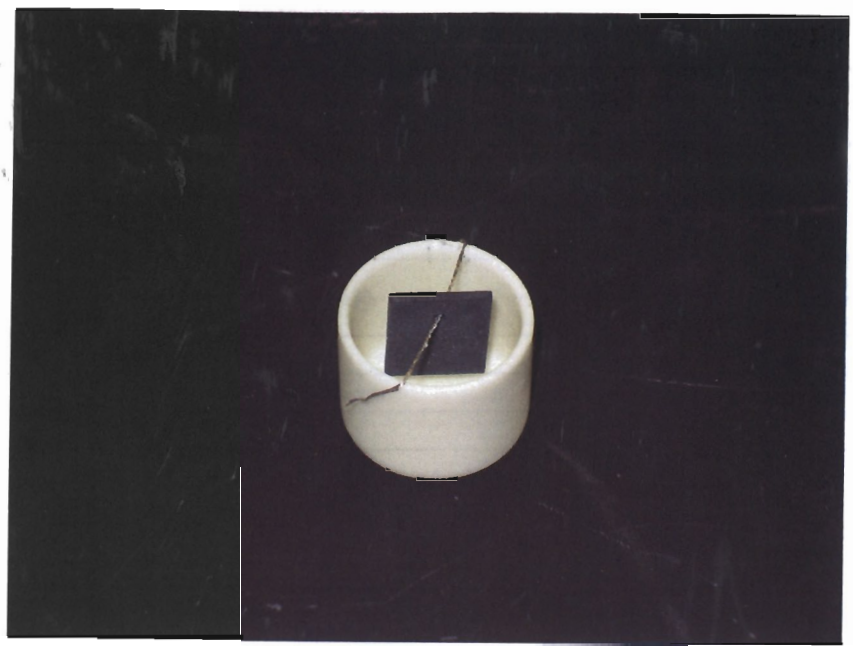
SIGNATURE Michael D. [illegible] DATE 8/8/06

DISCLOSED TO AND UNDERSTOOD BY DATE

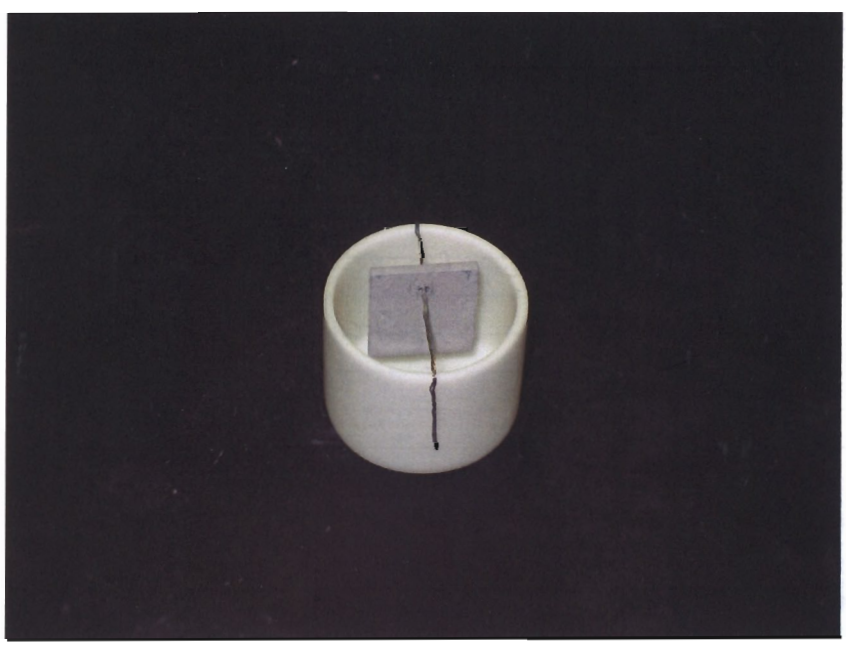
~~PROPRIETARY INFORMATION~~ 4/8/10 MP

TITLE PROJECT

Continued From Page 136



Coupon after 20 hr @ 900C



after 20 hr @ 900C
and coated
with LW3-3 powder

Continued To Page 138

SIGNATURE Michael D. Ar DATE 8/8/06

DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY~~ INFORMATION
4/8/10 MA

TITLE

PROJECT

Continued From Page 137

Yucca Mountain Rock Testing

OVEN= Rapid Temp model#: 98002-24 Sn#: 028786

OVEN SETPOINT= 1050 °C
OVEN TEMPERATURE= 1062°C

Specimen: Samples #2, 3, 4 (3 + 4 coated w/ LW3-3)

start weight: sample #2: 2.28748g (not coated), #3: 2.40218g (coated), #4: 2.42001g (coated)
end weight: Sample 2: 2.28987g, sample 3: 2.40641g, Sample 4: 2.41940g or 2.42426g with piece of LW3-3 that fell off

measurement scale: Sartorius An: 008780 Sn: 12809098

Measurement taken with OMEGA MICROPROCESSOR THEMOMETER MODEL# HH22
SN#=T-94140 CAL= DUE=
Thermocouple= SN#=328 CAL=1/16/06 DUE=7/14/06

AMOUNT OF TIME = 24 hr.

DETAILS= Large piece of LW3-3 coating fell off sample 4 when placing in furnace.

Annealed in Lindberg at 800°C for 45 min.

Coated specimens have a red/brown tint to them.

Continued To Page 139

SIGNATURE Michael D. [illegible]

DATE 8/8/06

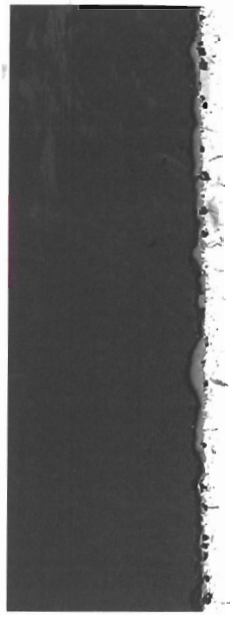
DISCLOSED TO AND UNDERSTOOD BY

DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 [illegible]

TITLE PROJECT

Continued From Page 138



Sample 2
not coated

Sample 3
Coated with LW 3-3

Continued To Page 140

SIGNATURE Michael D. [illegible] DATE 8/8/06

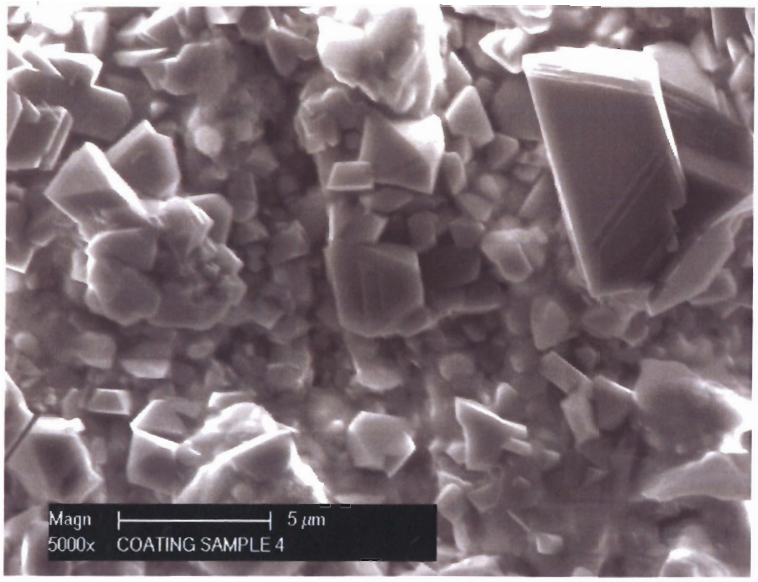
DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~
4/8/10 [illegible]

TITLE

PROJECT

Continued From Page 139



Sample 4 mx 8/8/06
~~uncoated~~ Coated
SEM of surface
after 24 hr @ 1050°C

Continued To Page 141

SIGNATURE Michael D. [illegible]

DATE 8/8/06

DISCLOSED TO AND UNDERSTOOD BY

DATE

~~PROPRIETARY INFORMATION~~
4/8/10 mb

TITLE PROJECT

Continued From Page 140

Yucca Mountain Rock Testing

OVEN= Rapid Temp
model #: 98002-24
Sn#: 029786

OVEN SETPOINT= 1150°C
OVEN TEMPERATURE= 1153°C

Specimen: samples 5, 6, 7 (5 not coated, 6 + 7 coated w/ LW3-3)

start weight: sample 5: 2.36653 g sample 6: 2.39731 g sample 7: 2.37045 g
end weight:

measurement scale: Sartorius
An: 008780
Sn: 12809099

Measurement taken with OMEGA MICROPROCESSOR THEMOMETER MODEL# HH22
SN#=T-94140 CAL= DUE=
Thermocouple= SN#=328 CAL=1/16/06 DUE=7/14/06

AMOUNT OF TIME = 24 hr.

DETAILS= Annealed in Lindberg for 45 min @ 800°C
Coated specimens: much coating would flake off.

Continued To Page 142

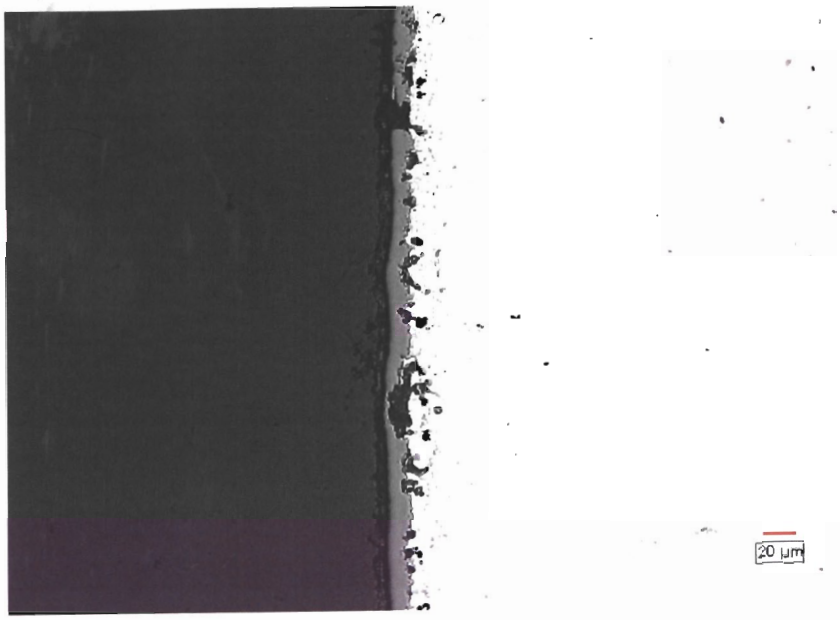
SIGNATURE Michael D. [illegible] DATE 8/8/06

DISCLOSED TO AND UNDERSTOOD BY DATE

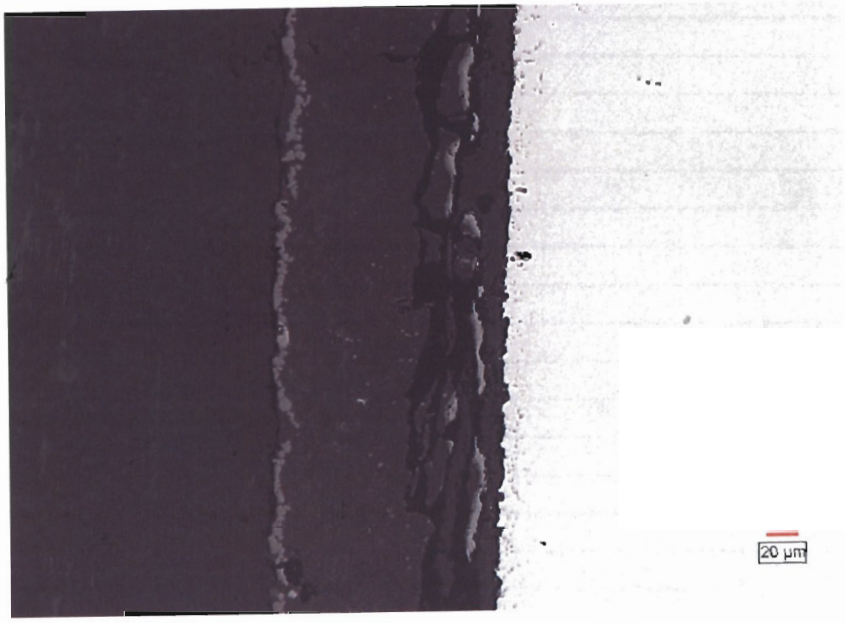
~~PROPRIETARY INFORMATION~~ 4/8/10 [illegible]

TITLE PROJECT

Continued From Page 141



Sample 5
not coated



Sample 6
coated with
LW333 powder

Continued To Page 143

SIGNATURE Michael D. [illegible] DATE 8/8/06

DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 MD

TITLE

PROJECT

Continued From Page 142

MDS 8/8/06

Sample 7 ~~uncoated~~
SEM of surface
Coated
Image after 24 hr @ 1150C

Continued To Page 144

SIGNATURE Michael D. Dill

DATE 8/8/06

DISCLOSED TO AND UNDERSTOOD BY

DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 MD

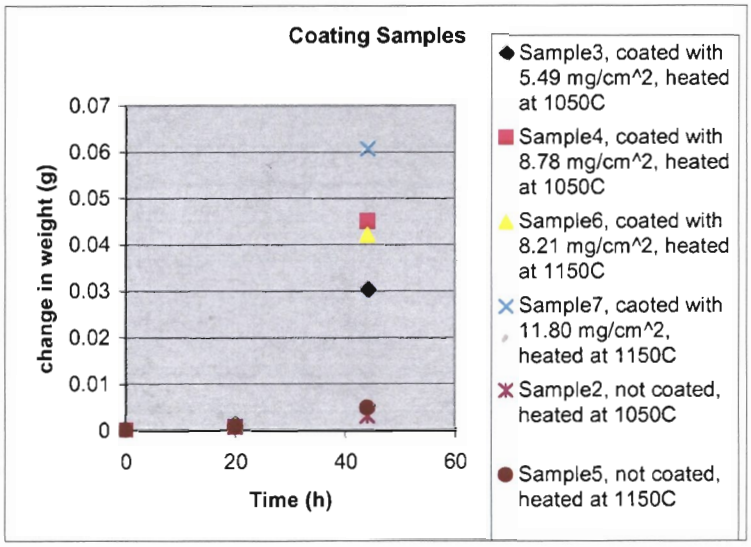
TITLE **PROJECT**

Continued From Page 143

Coating tests summary

Sample #	1	2	3	4	5	6	7
Height (mm)	14.5	14.468	14.488	14.522	14.486	14.514	14.549
Width (mm)	12.641	12.797	12.701	12.754	12.63	12.655	12.747
Thickness (mm)	1.523	1.472	1.544	1.546	1.534	1.528	1.484
Initial Wt (g)	2.34595	2.2866	2.37748	2.38142	2.36586	2.34972	2.31746
Wt after 20h at 900C (g)	2.34659	2.28727	2.37881	2.38218	2.3666	2.35088	2.31839
Difference in wt after 20h at 900C (g)	0.00064	0.00067	0.00133	0.00076	0.00074	0.00116	0.00093
Wt after coating with LW 3-3 (g)	NA	NA	2.40367	2.42219	NA	2.3879	2.3718
Difference in wt after coating	NA	NA	0.02486	0.04001	NA	0.03702	0.05341
Area (cm^2)	4.500003	4.512765	4.5273405	4.555158	4.498535	4.511201	4.526471
Weight Change per area (mg/cm^2)	NA	NA	5.4910825	8.783449	NA	8.206241	11.79948
Wt before 24 hour test (g)	NA	2.28748	2.40213	2.42001	2.36653	2.38731	2.37045
Wt after 24 hour test (g)	NA	2.28987	2.40641	2.42426	2.37057	2.39127	2.37707
Difference in wt after 24h test	NA	0.00239	0.00428	0.00425	0.00404	0.00396	0.00662

Weight taken with Sartorius, An: 008780, Sn: 12809099
Length take with calipers, Starrett No. 734M, An: 010084, Sn: 02437171



Continued To Page

SIGNATURE Michael D. [illegible] DATE 8/8/06

DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 m

TITLE

PROJECT

Continued From Page CaO vs. Basalt Tests

Yucca Mountain Rock Testing

OVEN= Rapid Temp model #: 98002-24 Sn #: 028786

OVEN SETPOINT= 1205°C
OVEN TEMPERATURE= 1204°C

C-22 Lot #: 2277-3-3266

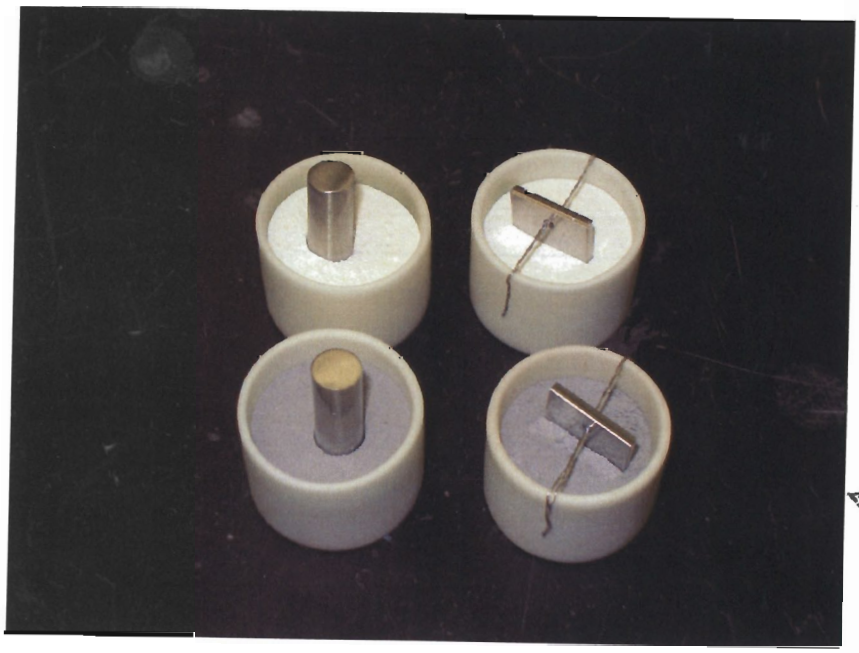
Specimen: 2 1/8" diameter C-22 rods x 1" long, 2 C-22 coupons, 4 alumina crucible
CaO, Magma LW 3-3, Pt. wire Aldrich Chem. Co. 35,735-9 07703HS

start weight: CaO: Fisher Chemicals UN 1910 Lot No. 061963
end weight:
measurement scale:

Measurement taken with OMEGA MICROPROCESSOR THEMOMETER MODEL# HH22
SN#=T-94140 CAL= DUE=
Thermocouple= SN#=328 CAL=1/16/06 DUE=7/14/06

AMOUNT OF TIME = 24hr.

DETAILS= Annealed in Lindberg @ 800°C for 45 min
Much oxide peeled off.
Coupons appear to be completely oxidized.



← CaO

Samples before test

← LW 3-3

Continued To Page 146

SIGNATURE Michael D. [illegible]
DATE 8/8/06

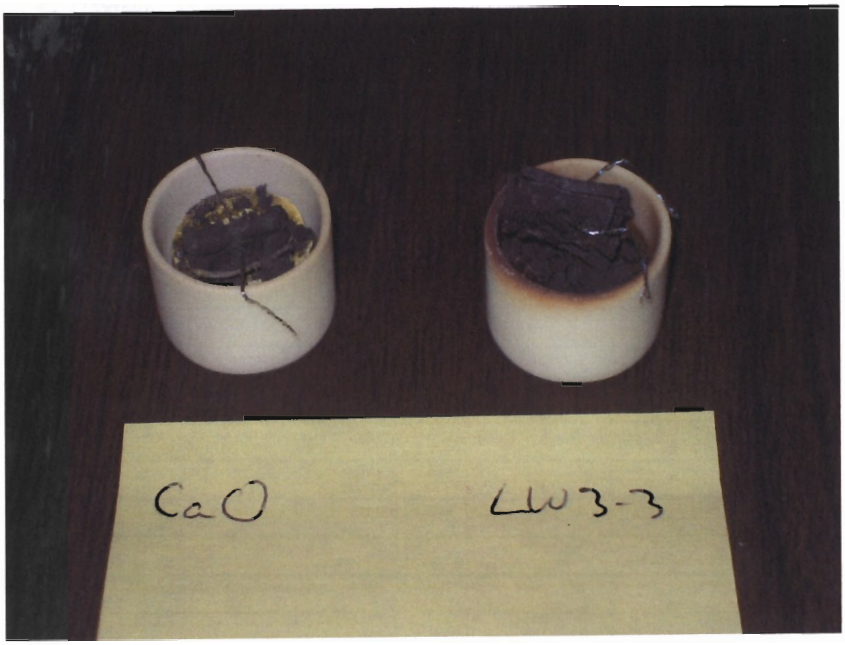
DISCLOSED TO AND UNDERSTOOD BY
DATE

~~PROPRIETARY INFORMATION~~
4/8/10 MD

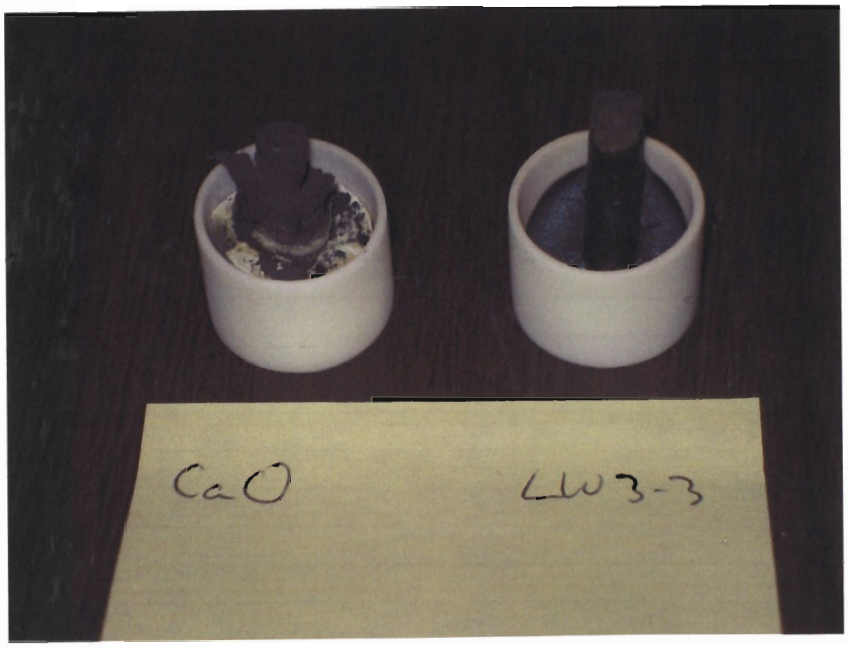
TITLE

PROJECT

Continued From Page 145



Samples After Test



Continued To Page 147

SIGNATURE Michael D. [illegible]

DATE 8/8/06

DISCLOSED TO AND UNDERSTOOD BY

DATE

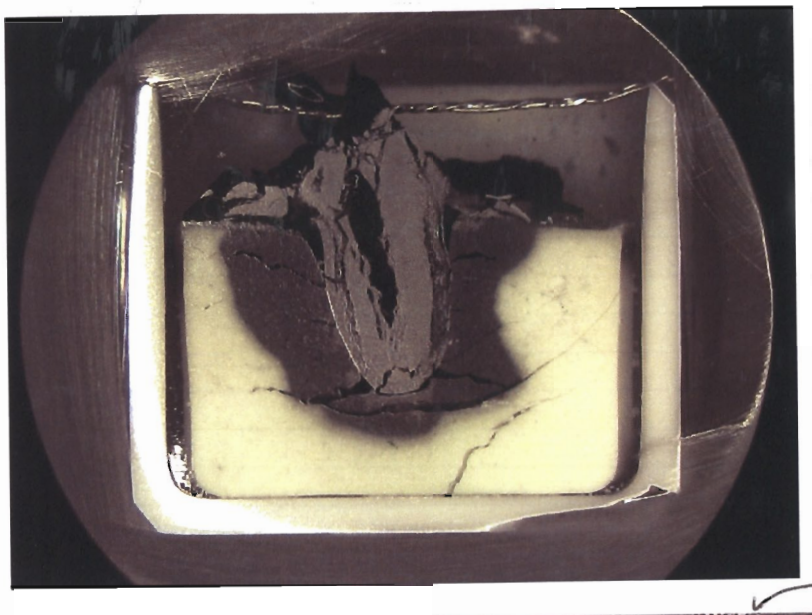
~~PROPRIETARY INFORMATION~~ 9/8/10 MD

TITLE

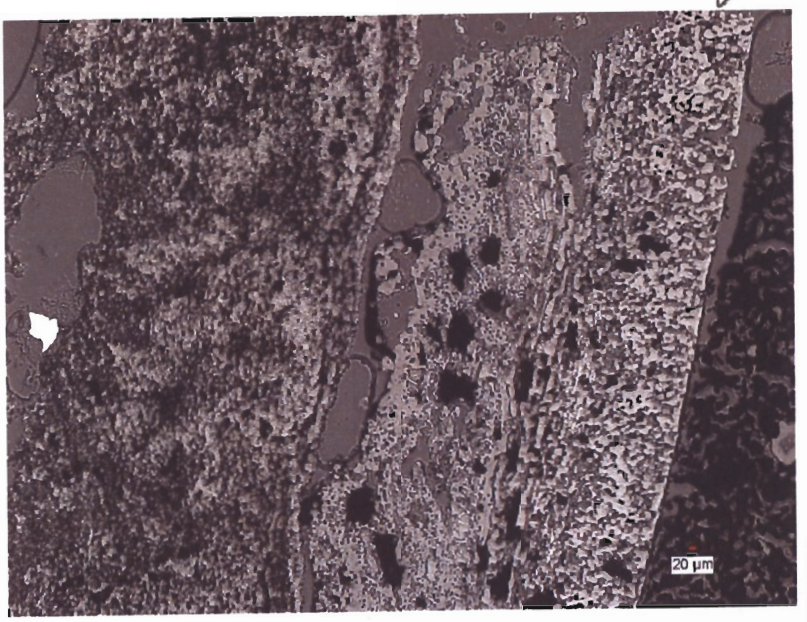
PROJECT

Continued From Page 146

CaO + coupon sample

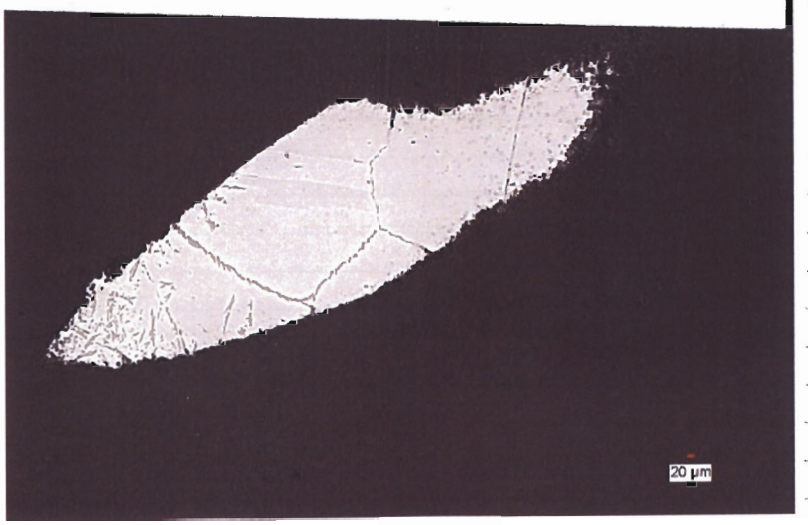


CaO + coupon cross section



Oxide

CaO + oxide



Small piece of alloy still intact.

Continued To Page 148

SIGNATURE Michael D. [illegible]

DATE 8/8/06

DISCLOSED TO AND UNDERSTOOD BY

DATE

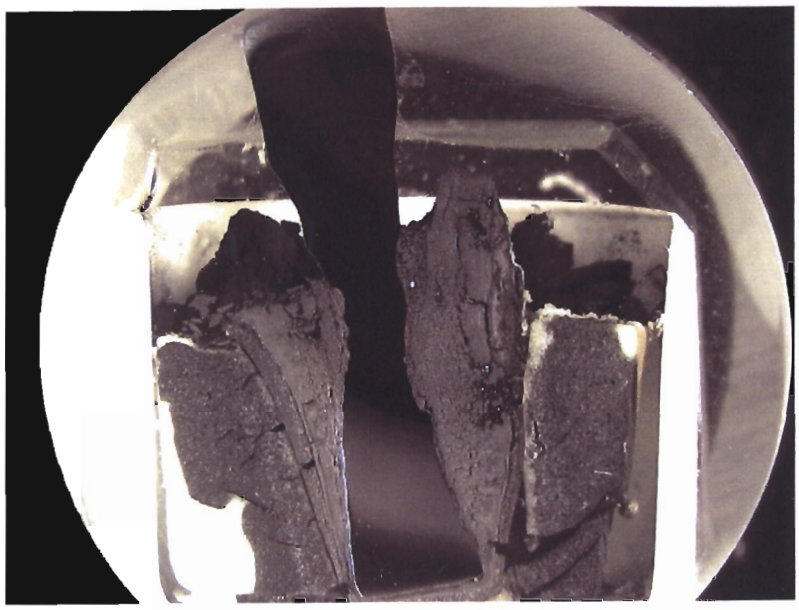
~~PROPRIETARY INFORMATION~~ 4/8/10 MD

TITLE

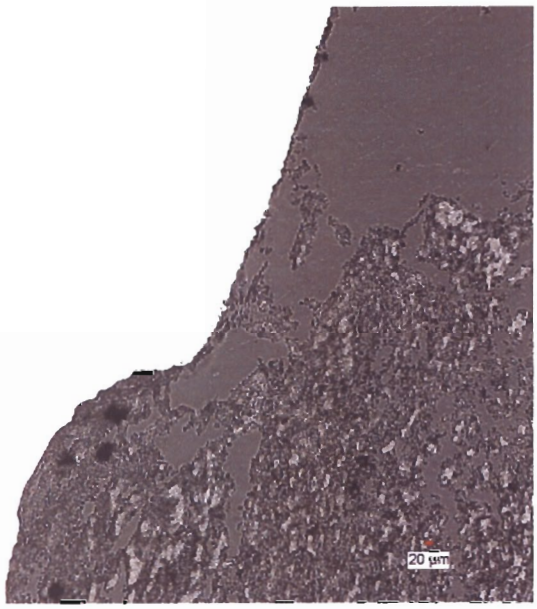
PROJECT

Continued From Page 147

CaO + cylinder



CaO + cylinder cross section



Triple point

Continued To Page 149

SIGNATURE Michael D. [illegible]

DATE 8/8/00

DISCLOSED TO AND UNDERSTOOD BY

DATE

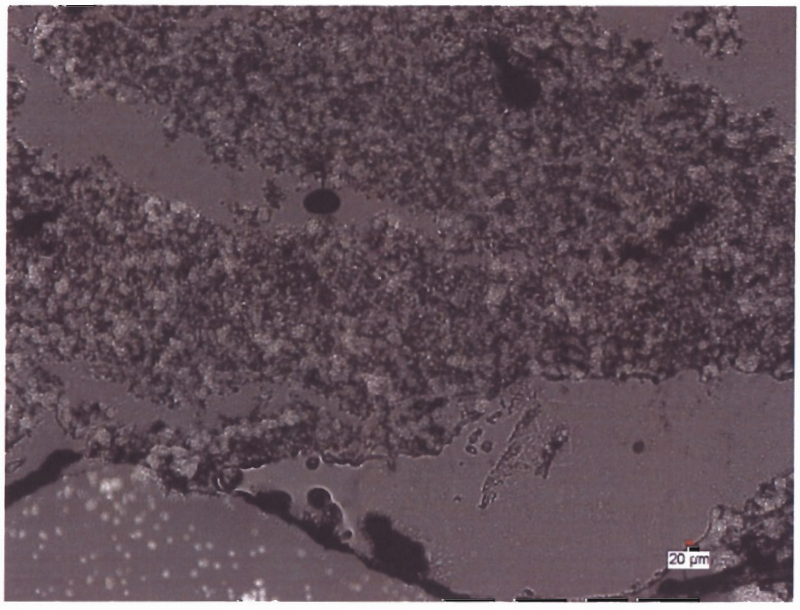
~~PROPRIETARY INFORMATION~~ 4/9/10 MD

TITLE

PROJECT

Continued From Page 148

LW 3-3 + coupon



magma

Oxide

Continued To Page 150

SIGNATURE Michael D. [illegible]

DATE 8/8/06

DISCLOSED TO AND UNDERSTOOD BY

DATE

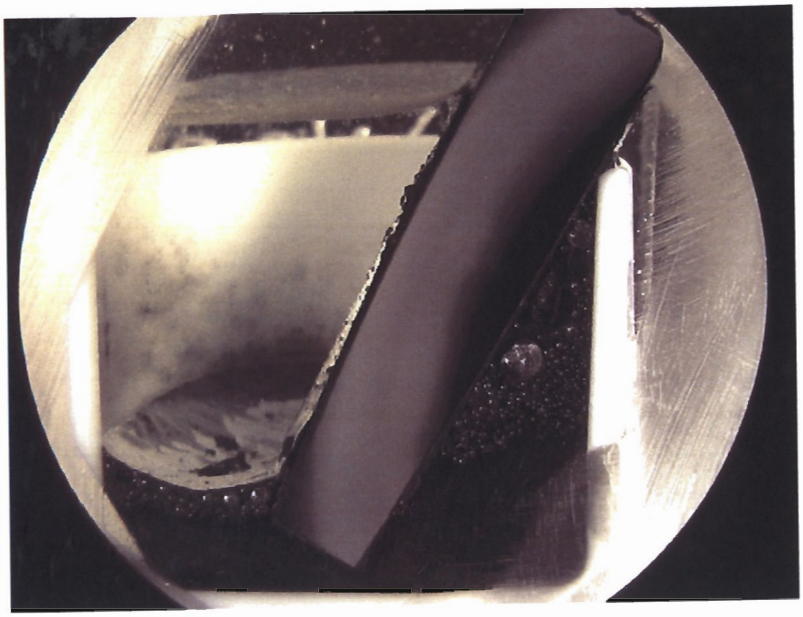
~~PROPRIETARY INFORMATION~~ 4/8/10 MP

TITLE

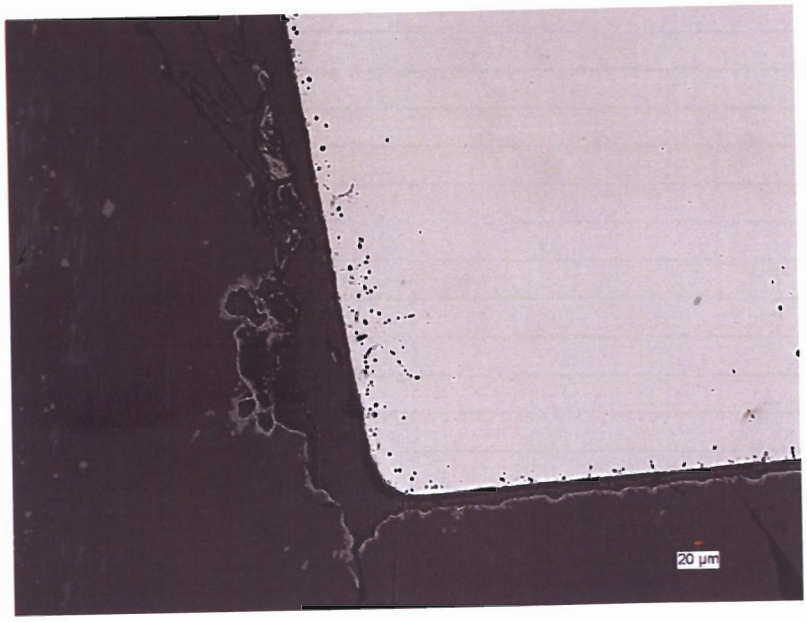
PROJECT

Continued From Page 149

LW3-3 and cylinder



LW3-3 and cylinder cross section



base with alloy and magma

Continued To Page 154

SIGNATURE Michael D. [illegible]

DATE 8/8/06

DISCLOSED TO AND UNDERSTOOD BY

DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 MD

TITLE PROJECT

Continued From Page Quenched magma test

Yucca Mountain Rock Testing

MDS 8/4/06

OVEN= Rapid Temp. model# 98002-24 SN#: 029796

OVEN SETPOINT= ~~1200°C~~ 1205°C
OVEN TEMPERATURE= 1204°C

Specimen: LW 3-3 + Alumina crucible

start weight:
end weight:

measurement scale:

Measurement taken with OMEGA MICROPROCESSOR THEMOMETER MODEL# HH22
SN#=T-94140 CAL= DUE=
Thermocouple= SN#=328 CAL=1/16/06 DUE=7/14/06

AMOUNT OF TIME = 1 hour

DETAILS= Thin layer (~1/8") of LW 3-3 powder was spread on crucible. Heated to 1200°C for 1 hour, then quenched in water.

LW 3-3 powder before melt

Continued To Page 152

SIGNATURE [signature] DATE 8/8/06

DISCLOSED TO AND UNDERSTOOD BY DATE

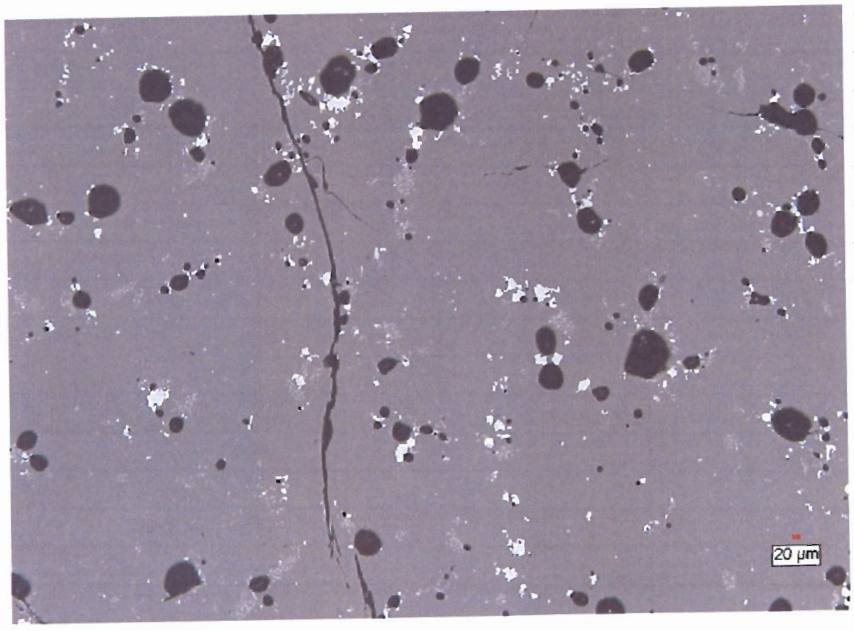
~~PROPRIETARY INFORMATION~~ 4/8/10 MD

TITLE

PROJECT

Continued From Page 151

After quenching



Quenched LW 3-3

Continued To Page 153

SIGNATURE Michael D. [illegible]

DATE 8/8/06

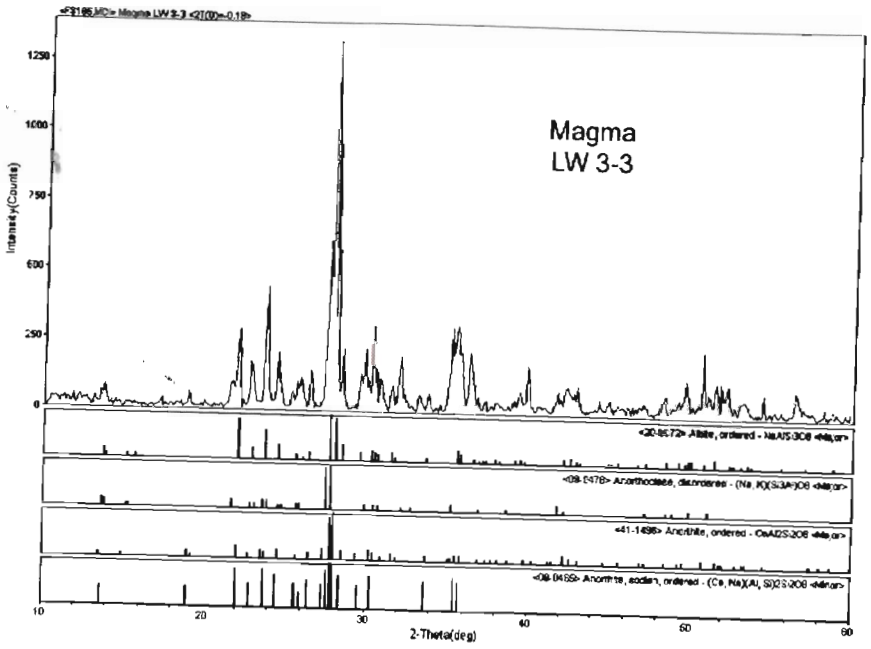
DISCLOSED TO AND UNDERSTOOD BY

DATE

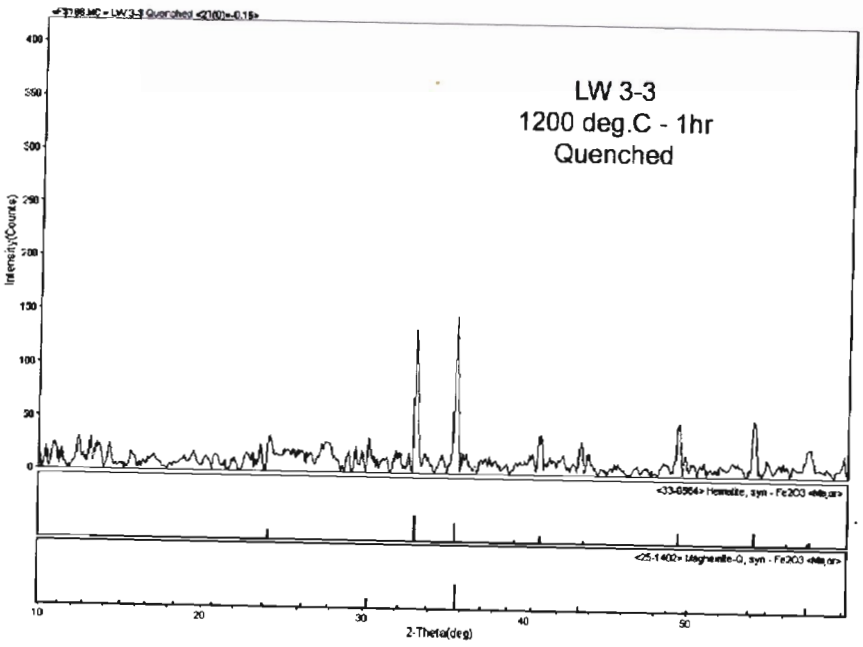
~~PROPRIETARY INFORMATION~~ 4/8/10

TITLE **PROJECT**

Continued From Page 152



XRD of powdered LW 3-3



XRD of quenched LW 3-3

Continued To Page

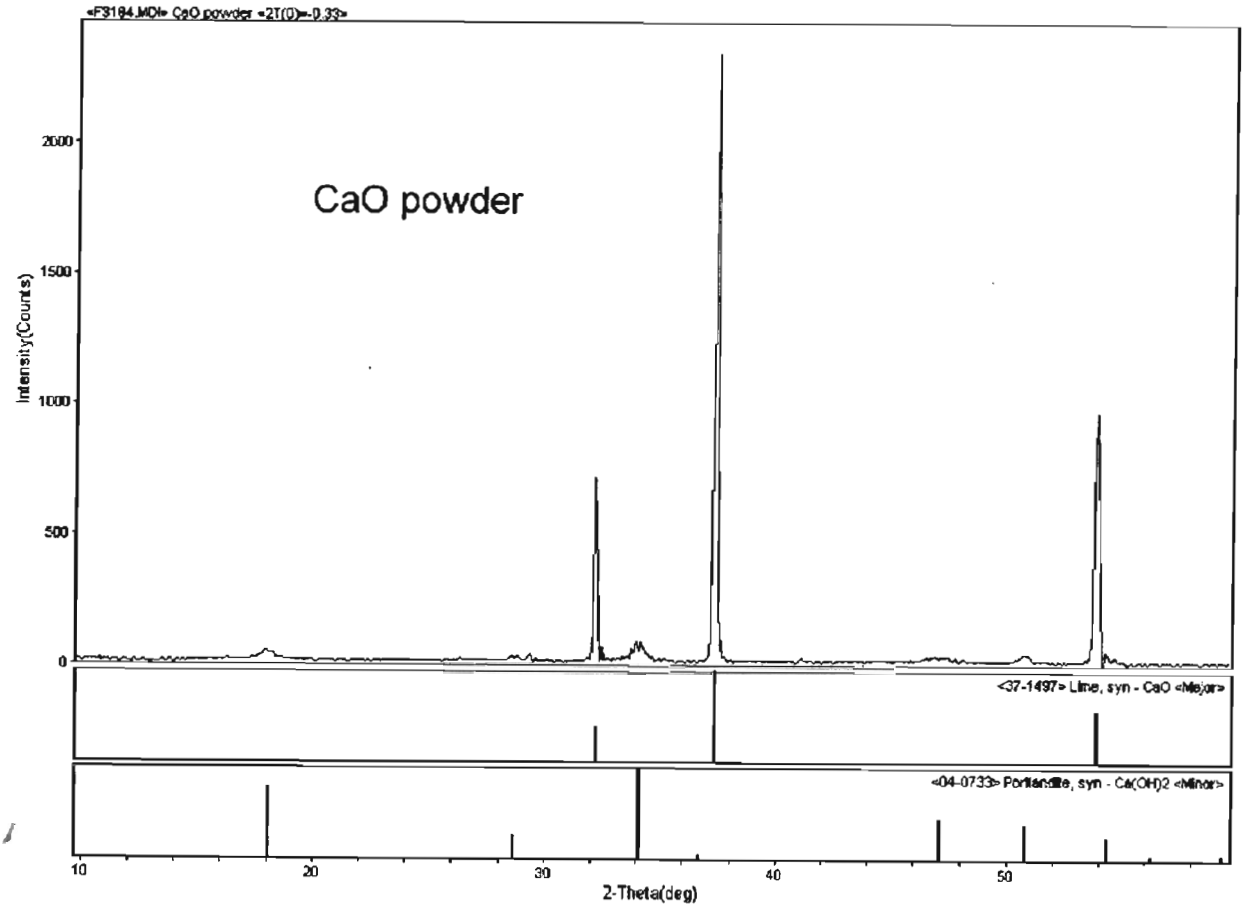
SIGNATURE Michael D. [illegible] DATE 8/8/06

DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10

TITLE **PROJECT**

Continued From Page 150



XRD of CaO powder used.

Continued To Page

SIGNATURE Michael D. [illegible] DATE 8/8/06

DISCLOSED TO AND UNDERSTOOD BY DATE

~~PROPRIETARY INFORMATION~~ 4/8/10 [illegible]

TITLE

PROJECT

Continued From Page

Continued to CNWRA Controlled Notebook No. 840

7 January 2007 M.B.

Continued To Page

SIGNATURE K. J. Chiang

DATE 2/26/10

DISCLOSED TO AND UNDERSTOOD BY

DATE

~~PROPRIETARY INFORMATION~~ 4/8/10