

Potentiodynamic
Cyclic Potentiostatic Test

810
4/25/07

Objective: O₂ Reduction Reaction on C-22

Specimen: C-22 HT# 2277-3-3266 Drawing # 20.01402.571.019
Polishes To A 600 Grit Finish cleaned with Acetone

Initial Weight: 12.24184g Model: Sartorius Genius SN: 12809099
Final Weight: 12.24163g Cal: 11/8/06 Due: 5/8/07

SOLUTION:
5 M NaCl
584.41g NaCl Lot# 065316
+ DI To 2000ml

Reagents measured with Model: OHAUS SN: 2883
Cal: 1/2/07 Due: 7/2/07

Initial pH: 5.78 Model: orion SN: 2330
Final pH: 4.61 Cal: 7/6/06 DUE: 7/6/07
pH Probe: #13-620-296 SN: 4065196

TEST TEMPERATURE: 95°C Measured with Hg Thermometer SN: H 98-187
Cal: 5/19/06 Due: 8/19/07

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE

SN: 616050

GAS: 99.999% O₂

Ecorr: +490 mV vs SCE Model: Keithley 614 SN: 467374
Ept: +478 mV vs SCE Cal: 1/25/07 Due: 1/25/08

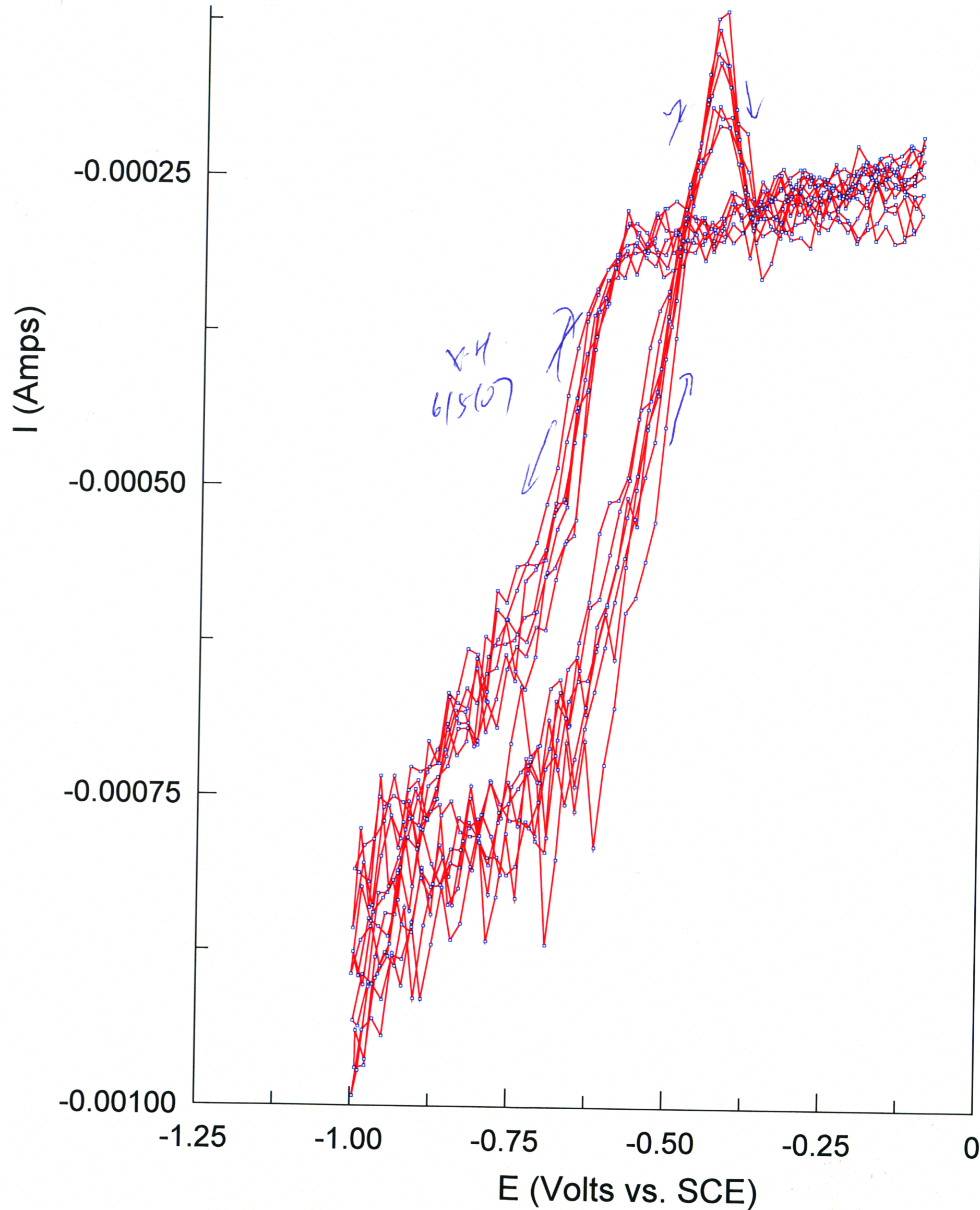
Potentiostat: Solartron 1287 SN# 00148500
cal: 11/7/06 due: 5/7/07

Specimen Examination:

No Visual Sign of Corrosion on pitting
on surface of Specimen.

* spike solution with 340 ml of CuCl₂ See p# 68

D. E. J. 9/25/07



Xinhua He 6/5/07

Objective: SEE PAGE #1

SPECIMENS: Crevice Specimen drawing # 20.06002.01.322.002 polished to 600 Grit finish then cleaned in acetone

C-22 Specimen
MT# 2277-3-3266

Ti7 Crevice Washers And Hardware
MT# CW2775

Ti7 Plate
MT# CW2725

Torque Screwdriver:

Tec Crest 75 In lbs
Cal: 7/25/06

SN: 654000691
Due: 7/20/07

Initial Weight: not taken 8/21/07

Model: Sartorius Genius

SN: 12809099

Final Weight: 23.78728g

Cal: 5/11/07

Due: 11/11/07

SOLUTION:

4 m CaCl₂ · 2H₂O
1176.20g CaCl₂ · 2H₂O lot# 061720
+ DI to 2000ml

Reagents measured with

Model: OHAUS
Cal: 1/2/07

SN: 2883
Due: 7/2/07

Initial pH: 4.69

Model: Orion EA 940

SN: 2330

Final pH: 4.35

Cal: 7/6/06

Due: 7/6/07

pH Probe: #13-620-296

SN: 4065196

TEST TEMPERATURE: 95°C

Thermometer: Fisher

SN: 498-162

Cal: 4/12/07

Due: 7/12/07

Reference Electrode: Fisher SCE

13-620-52

SN: 4028036

GAS: Zero Air

(CREVICE)

Ecorr: mV vs SCE

(PLATE) not taken 8/21/07

Model: Keithley 614

SN#: 0704934

Ecorr: not taken 8/21/07 mV vs SCE

Cal: 6/6/06

Due: 6/6/07

Test time: 6.12 x 10⁶ seconds = 70.8 days

Potentiostat: Solartron 1480

sn# 00240551

cal: 11/7/06 Due: 5/7/07

TEST ID: MA22CaCl2E

DATA FILES:

C22CaCl205162, 0516E, ... through C22CaCl0720I, C22CaCl0720E

Specimen Examination: No crevice corrosion 1/24 feet of Ti7 ^{x.H} 8/21/07

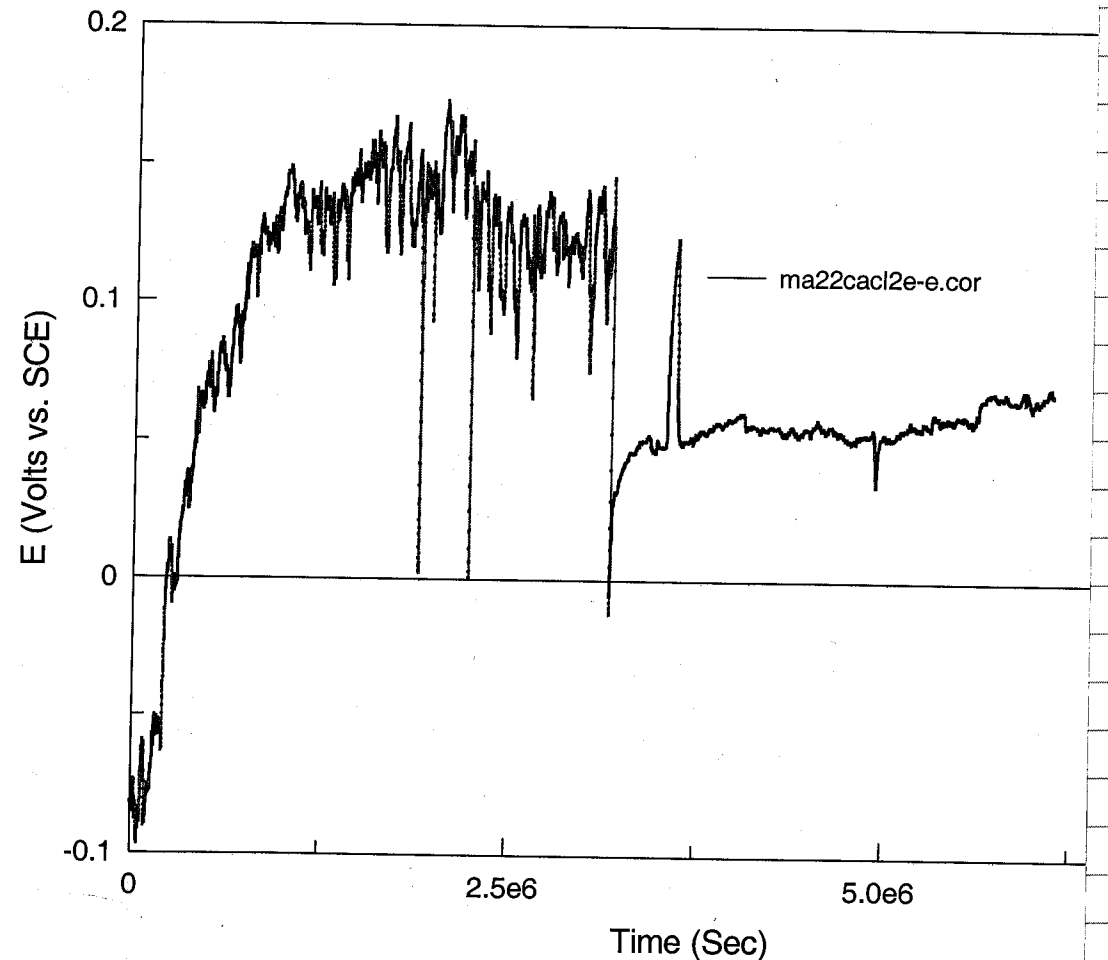
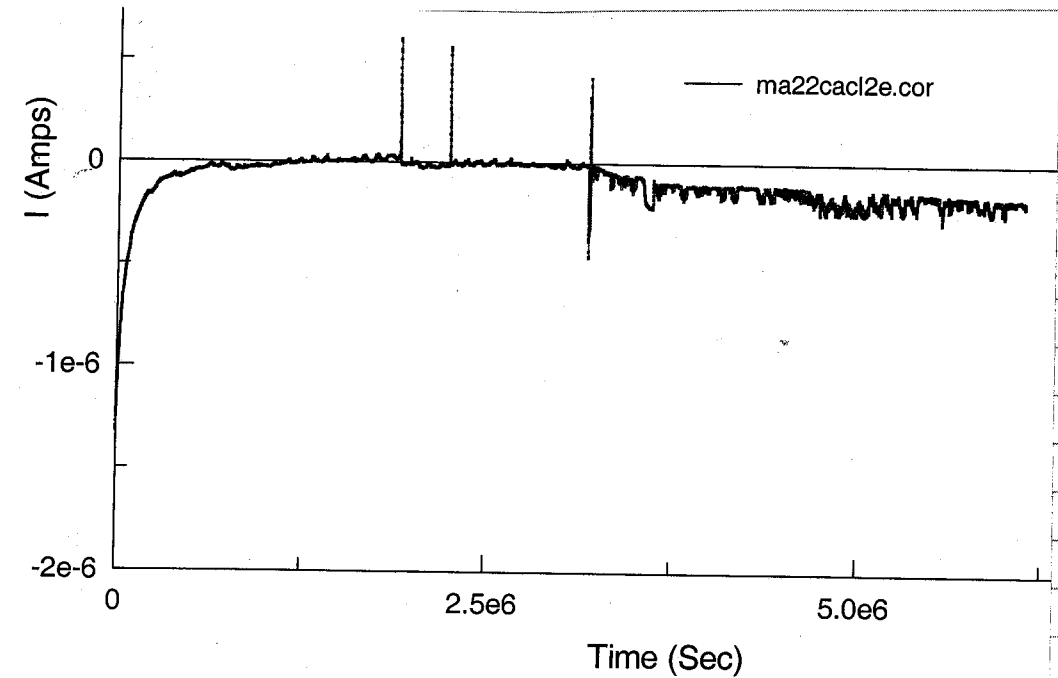
Crevice washers - Surface of C-22 specimen has minor surface scratches from crevice washers - No staining on specimen very

mlb - No corrosion on Ti7 hardware - Dull tint staining on all Ti7 material

Standards 5/15/07

Enos 7/25/07

5/15/07



The crevice specimen was polished for other use.

Xuhua He 8/21/07

Objective: SEE PAGE #1

SPECIMENS: Crevice Specimen drawing # 20.06002.01.322.002 polished to 600 Grit finish then cleaned in acetone

C22 specimen HT# 2277-3-3266
C22 hardware + Crevice washers HT# 2277-3-3266
C22 Plate HT# 2277-3-3266
washers: c22 Bolt & nut: Ti7

Torque Screwdriver: Truecraft 75 in-lb
Cal: 8/1/07
SN: 694000691
Due: 8/1/08

Initial Weight: 23.7945g Model: Sartorius Genius SN: 12809099
Final Weight: 23.7897g Cal: 5/11/07 Due: 11/11/07

SOLUTION: 4 M MgCl₂·6H₂O w/ 0.04 M Mg(NO₃)₂·6H₂O
20.532g Mg(NO₃)₂·6H₂O lot #: 037549
1026.53g MgCl₂·6H₂O lot #: 066759
+ DI to 2000 mL

Reagents measured with Model: OHAUS SN: 2883
Cal: 7/5/07 Due: 1/5/08

Initial pH: 2.86 Model: Orion EA 940 SN: 2330
Final pH: not taken Cal: 7/6/07 Due: 7/6/08
pH Probe: #13-620-296 SN: 5003085

TEST TEMPERATURE: 95°C Thermometer: Fisher SN: 296-833
Cal: 3/1/07 Due: 9/1/07

Reference Electrode: Fisher SCE # 13-620-52 SN: 9252165

GAS: Zero Air

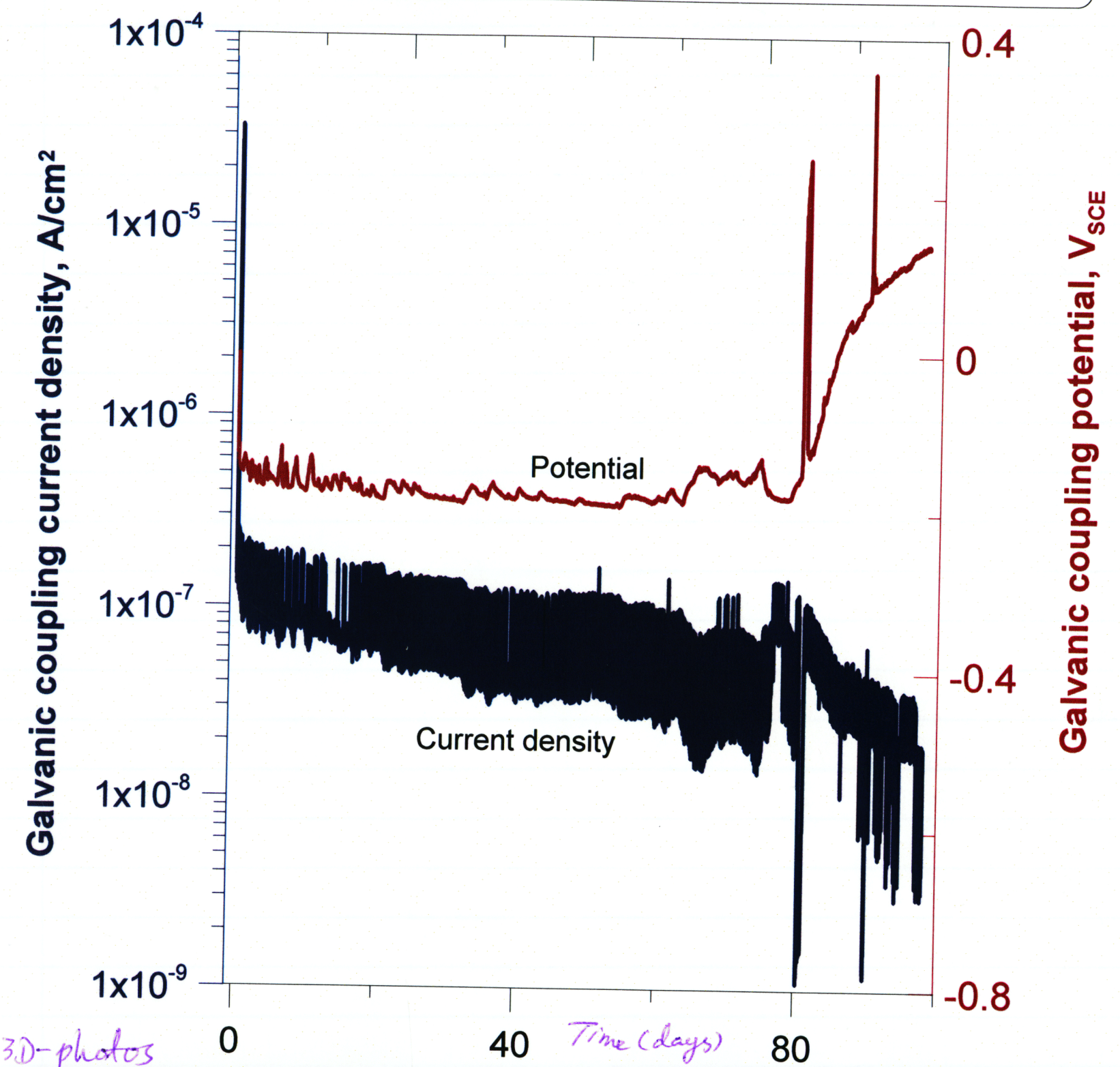
(CREVICE)
Ecorr: -161 mV vs SCE
(PLATE)
Ecorr: 88 mV vs SCE
Model: Keithley 614 SN#: 0704934
Cal: 7/6/07 Due: 6/6/08
BB 8/2/07 7/6/08

Potentiostat: Solartron 1480 sn# cal: 4/2/07 Due: 10/2/07

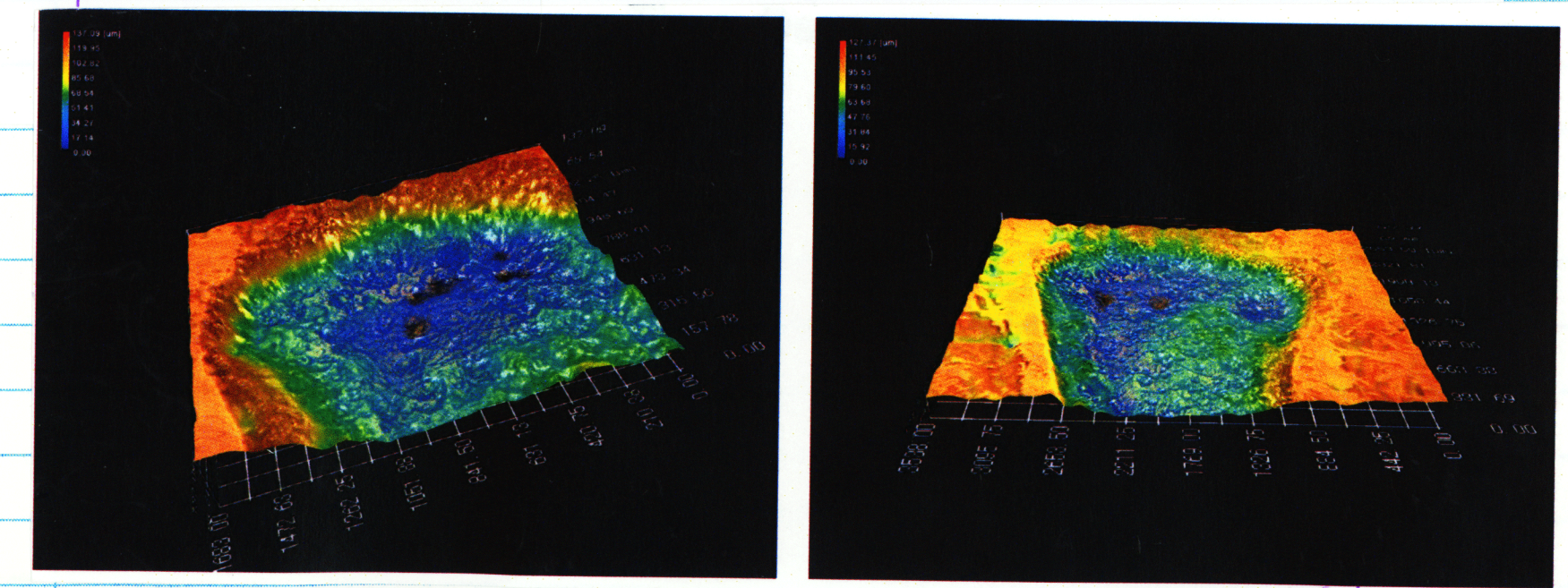
TEST ID: MA22MA22MA22e Test date: 8/3/07 - 11/9/07
DATA FILES: C22C220803IA_Unlch3 Test time: 8.47x10⁶ seconds = 98 days
C22C220803EA_Unlch4 to C22C221109E_Unlch4, C22C221109I_Unlch3
Specimen Examination: 1/24 corrosion sites

d_max = 240 μm Olympus microscope
Cal: 7/16/07 Due: 1/16/08 Blair Brethmann
8/3/07

Test ID: MA22MA22MA22e
4 M MgCl₂ + 0.04 M Mg(NO₃)₂, 95°C, Alloy 22/Alloy 22 (75 in-lbs)
Coupled to Alloy 22 Plate



3D-photos



Xi-hua He 1/10/08

Objective: SEE PAGE #1

SPECIMENS: Crevice Specimen drawing # 20.06002.01.322.002 polished to 600 Grit finish then cleaned in acetone

C22 specimen HT#: 2277-3-3206 Ti7 Hardware + Crevice Washers HT#: CN2775 Ti7 Plate HT#: CN2775

Torque Screwdriver: True craft 75 in-lb bolt & nut C22 SN: 694000691 Cal: 8/11/07 Due: 8/11/08

Initial Weight: 23.51038g Model: Sartorius Genius SN: 12809099 Cal: 5/11/07 Due: 11/11/07

Final Weight: 23.7898g Model: Sartorius Genius SN: 12809099 Cal: 5/11/07 Due: 11/11/07

SOLUTION: 4 M MgCl2 · 6H2O w/ 0.04 M Mg(NO3)2 · 6H2O 20.561g Mg(NO3)2 · 6H2O lot# 037544 1626.56g MgCl2 · 6H2O lot#: 066759 + DI to 2000mL

Reagents measured with Model: OHAUS SN: 2883 Cal: 7/5/07 Due: 1/5/08

Initial pH: 2.80 Model: Orion EA 940 SN: 2330 Cal: 7/6/07 Due: 7/6/08

Final pH: 5.13 pH Probe: #13-620-296 SN: 5003095

TEST TEMPERATURE: 95°C Thermometer: Fisher SN: H98-162 Cal: 4/13/07 Due: 4/13/08

Reference Electrode: Fisher SCE # 13-620-52 SN: 4028036

GAS: Zero Air

(CREVICE) Ecorr: -99 mV vs SCE

(PLATE) Ecorr: -92 mV vs SCE Model: Keithley 614 SN#: 0704934 Cal: 7/6/07 Due: 7/6/08

Potentiostat: Solartron 1480 sn# 00238265 cal: 4/12/07 Due: 10/2/07

TEST ID: MA22Ti7Ti7C xH 8/22/07 Test Date: 8/3/07 - 11/19/07

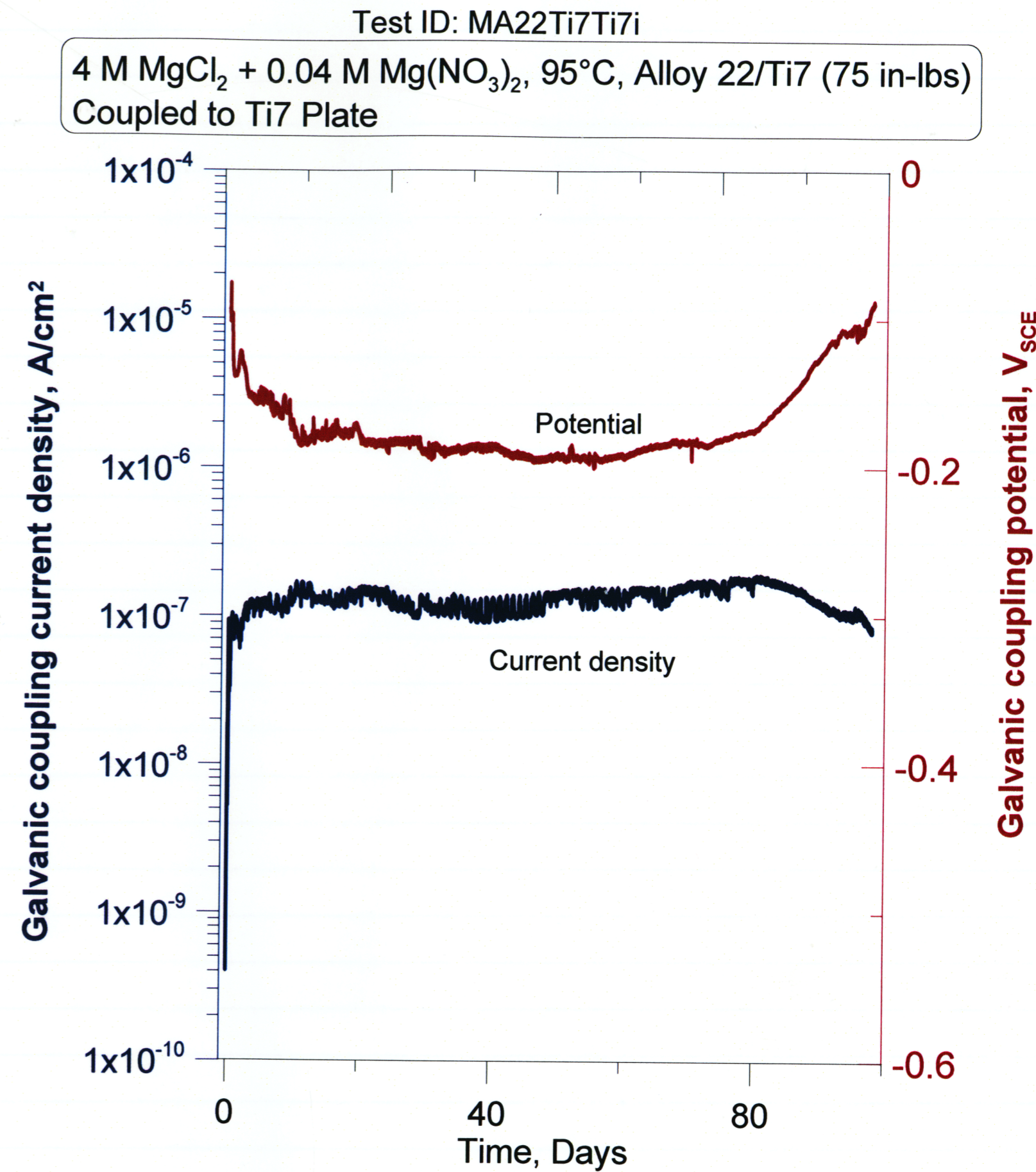
DATA FILES: C22Ti70803 Ia - Unlch1, C22Ti70803Ea Test time: 8.47 x 10^6 seconds = 98 days

Specimen Examination: to C22Ti71109I - Unlch1, - Unlch2 ... C22Ti71109E - Unlch2

no corrosion

corrosion occurred on Alloy 22 bolt and nut

Blair Brettmann 8/3/07



Xichua He 11/12/07

KH 3/14/08

Galvanic Corrosion Test

Objective: SEE PAGE #1

SPECIMENS: Crevice Specimen drawing # 20.06002.01.322.002 polished to 600 Grit finish then cleaned in acetone

C-22 Specimen
HT # 2277-3-3266

C-22 crevice washers,
nut & Bolt
HT # 2277-3-3266
True Craft 75 In-lbs
Cal: 8/1/07

C-22 Plate
HT # 2277-3-3266

Torque Screwdriver:

Initial Weight: 23.80341g
Final Weight: 23.80358g

Model: Sartorius Genius
Cal: 11/13/07

SN: 694000691
Due: 5/1/08
SN: 12809099
Due: 5/13/08

SOLUTION: 4 m $MgCl_2 \cdot 6H_2O$ + 0.04 m $Mg(NO_3)_2 \cdot 6H_2O$
1626.44g $MgCl_2 \cdot 6H_2O$ lot # 074866
20.519g $Mg(NO_3)_2 \cdot 6H_2O$ lot # 037544

Reagents measured with

Model: OHAUS
Cal: 7/5/07

SN: 2883
Due: 1/5/08

Initial pH: 3.17
Final pH: 5.59

Model: Orion EA 940
Cal: 7/6/07
pH Probe: #13-620-296

SN: 2330
Due: 7/6/08
SN: 5003095

TEST TEMPERATURE: 95°C

Thermometer: Fisher
Cal: 4/13/07

SN: 1498-162
Due: 4/13/08

Reference Electrode: Fisher SCE # 13-620-52

13-620-52

SN: 4028076

GAS: Zero Air

(CREVICE)
Ecorr: -200 mV vs SCE
(PLATE)
Ecorr: +100 mV vs SCE

Model: Keithley 614
Cal: 7/6/07

SN#: 0704934
Due: 7/6/08

Potentiostat: Solartron 1480

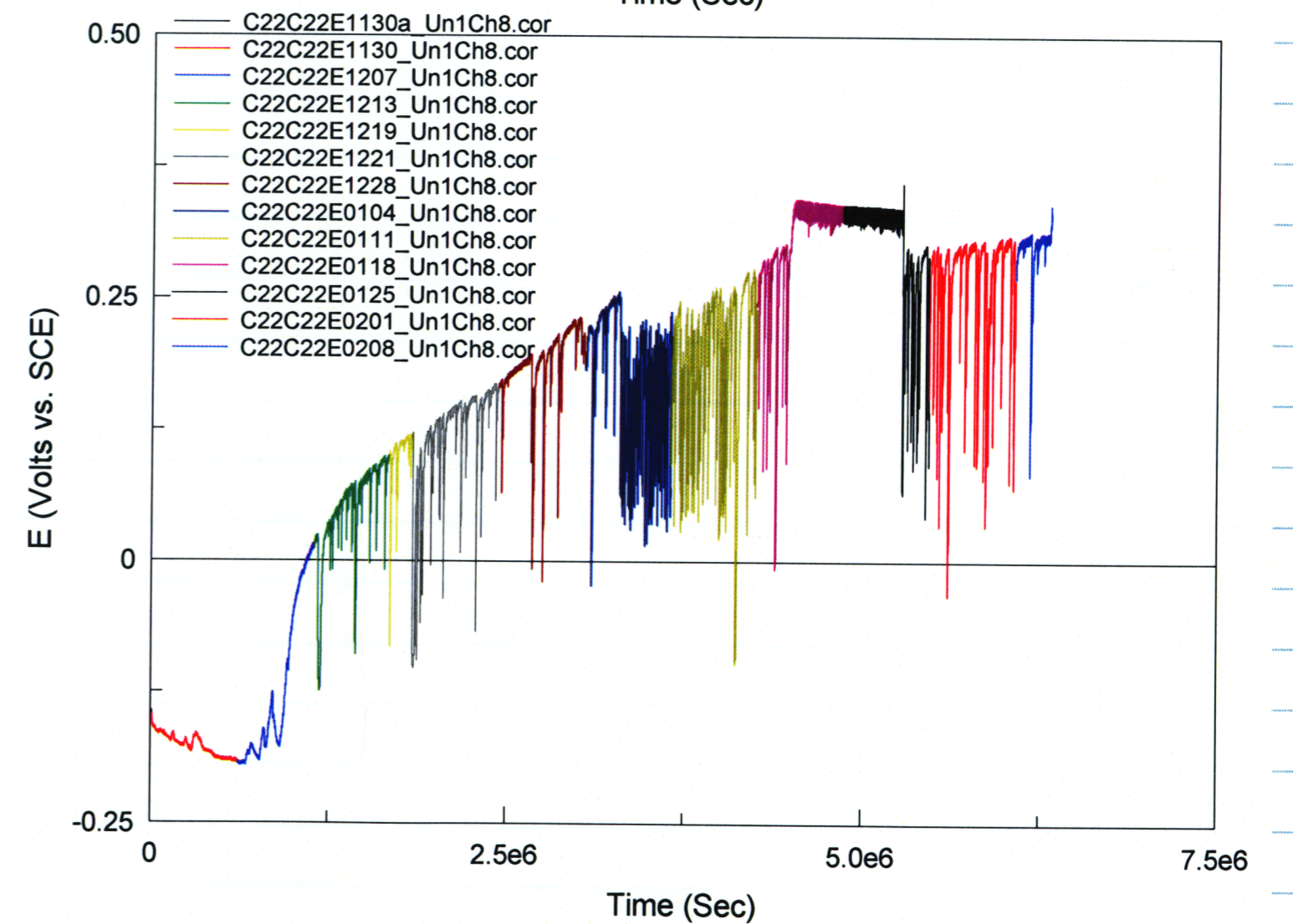
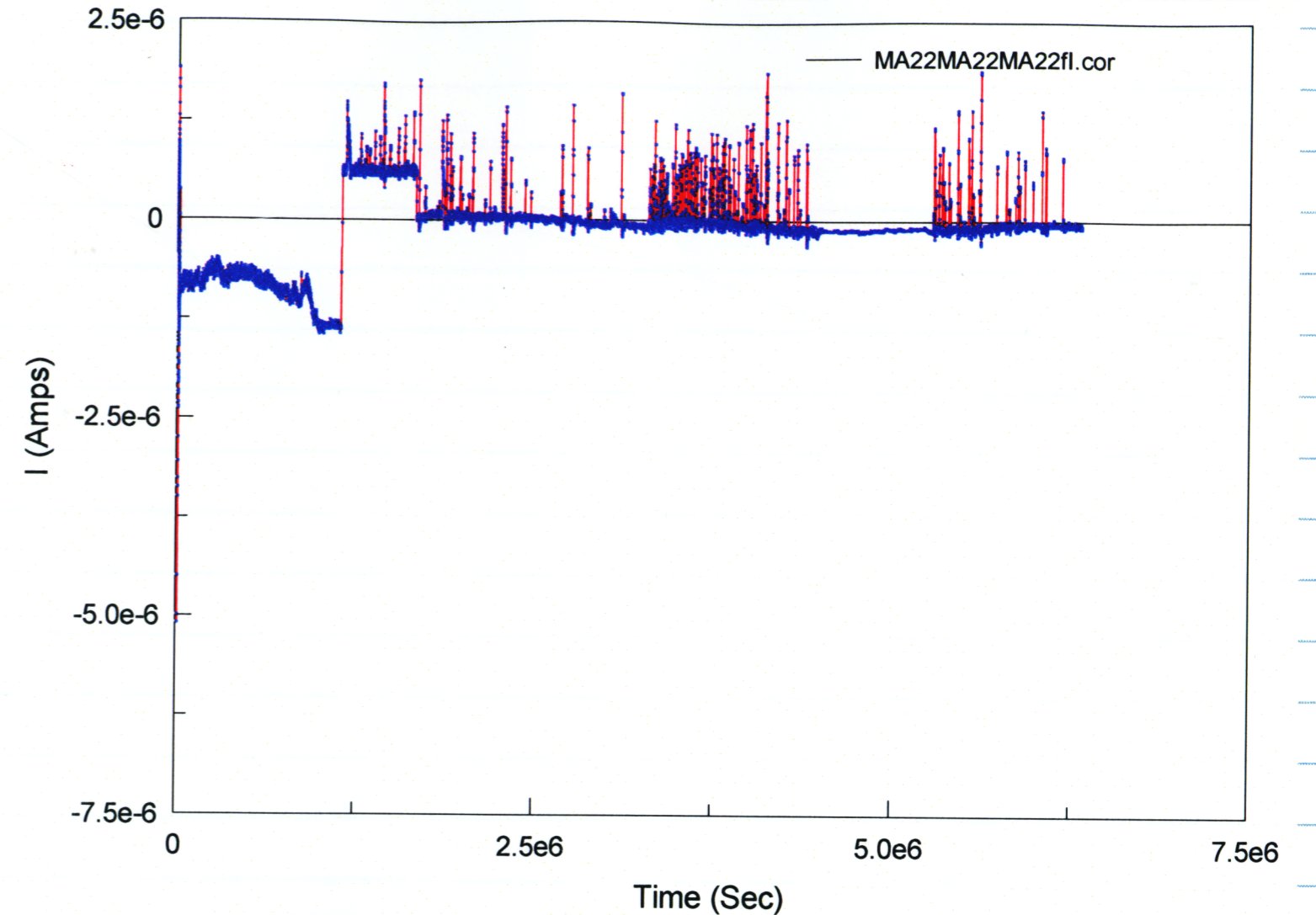
sn# 00238265 cal: 11/14/07 Due: 5/12/08

TEST ID: MA22MA22MA22f

DATA FILES: C22C22E1130a_Un1Ch7, C22C22E1130a_Un1Ch8,
1207, 1213, 1219, 1221, 1228, 1228, 0104, 0111, 0118, 0125, 0208, 0208

Specimen Examination: No Corrosion 9/24 feet of C-22 crevice washers
C-22 Plate. No corrosion or pitting on surface - All surface
of specimen. Hardware & Plate have a slight gold tint
staining

Signature
11/29/07



Xihua He 2/20/08

Galvanic Corrosion Test

Objective: SEE PAGE #1

SPECIMENS: Crevice Specimen drawing # 20.06002.01.322.002 polished to 600 Grit finish then cleaned in acetone

C-22 Specimen
MT # 2277-3-3206

Ti-7 Crevice Washers
Nut & Bolt
HT # CN2775
True Craft 75 In-lbs
Cal: 8/1/07

Ti-7 Plate
HT # CN2715
SN: 69000691
Due: 8/1/07
SN: 12809099
Due: 5/13/08

Torque Screwdriver:

Initial Weight: 23.59419
Final Weight: 23.59422

Model: Sartorius Genius
Cal: 11/13/07

SOLUTION:

4M MgCl₂ · 6H₂O + 0.04M Mg(NO₃)₂ · 6H₂O
1626.4g MgCl₂ · 6H₂O Lot # 074866
20.520g Mg(NO₃)₂ · 6H₂O Lot # 037544
+ DI To 2000 mL

Reagents measured with

Model: OHAUS
Cal: 2/5/07

SN: 2883
Due: 1/5/08

Initial pH: 3.64
Final pH: 5.87

Model: Orion EA 940
Cal: 7/6/07
pH Probe: #13-620-296

SN: 2330
Due: 7/6/08
SN: 5403095

TEST TEMPERATURE: 95°C

Thermometer: C96 Fisher
Cal: 8/2/07

SN: C96-637
Due: 2/2/08

Reference Electrode: Fisher SCE

13-620-52

SN: 9252105

GAS: Zero Air

(CREVICE)

Ecorr: -200 mV vs SCE

(PLATE)

Ecorr: -10 mV vs SCE

Model: Keithley 614
Cal: 7/6/07

SN#: 6704934
Due: 7/6/08

Potentiostat: Solartron 1480

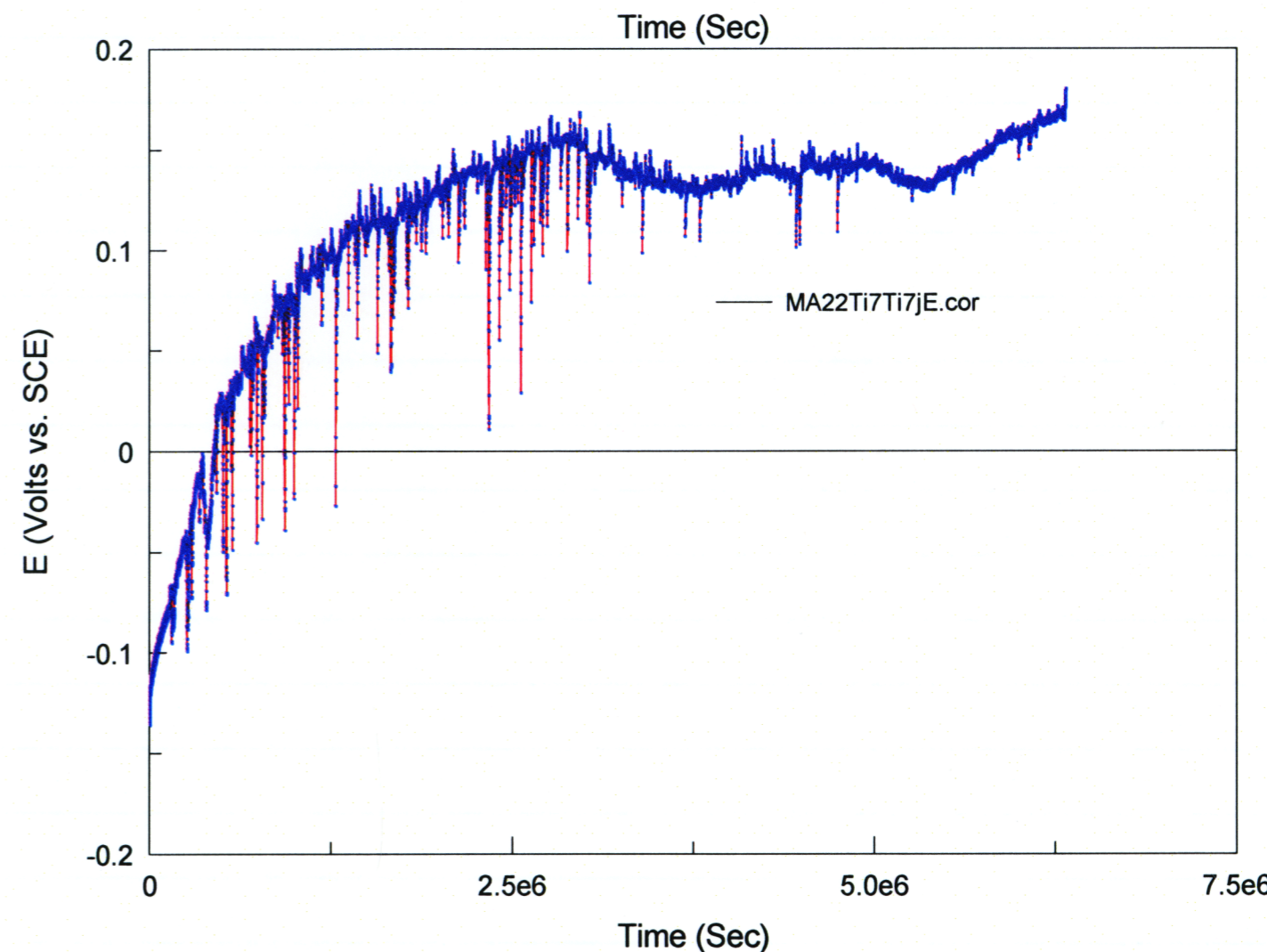
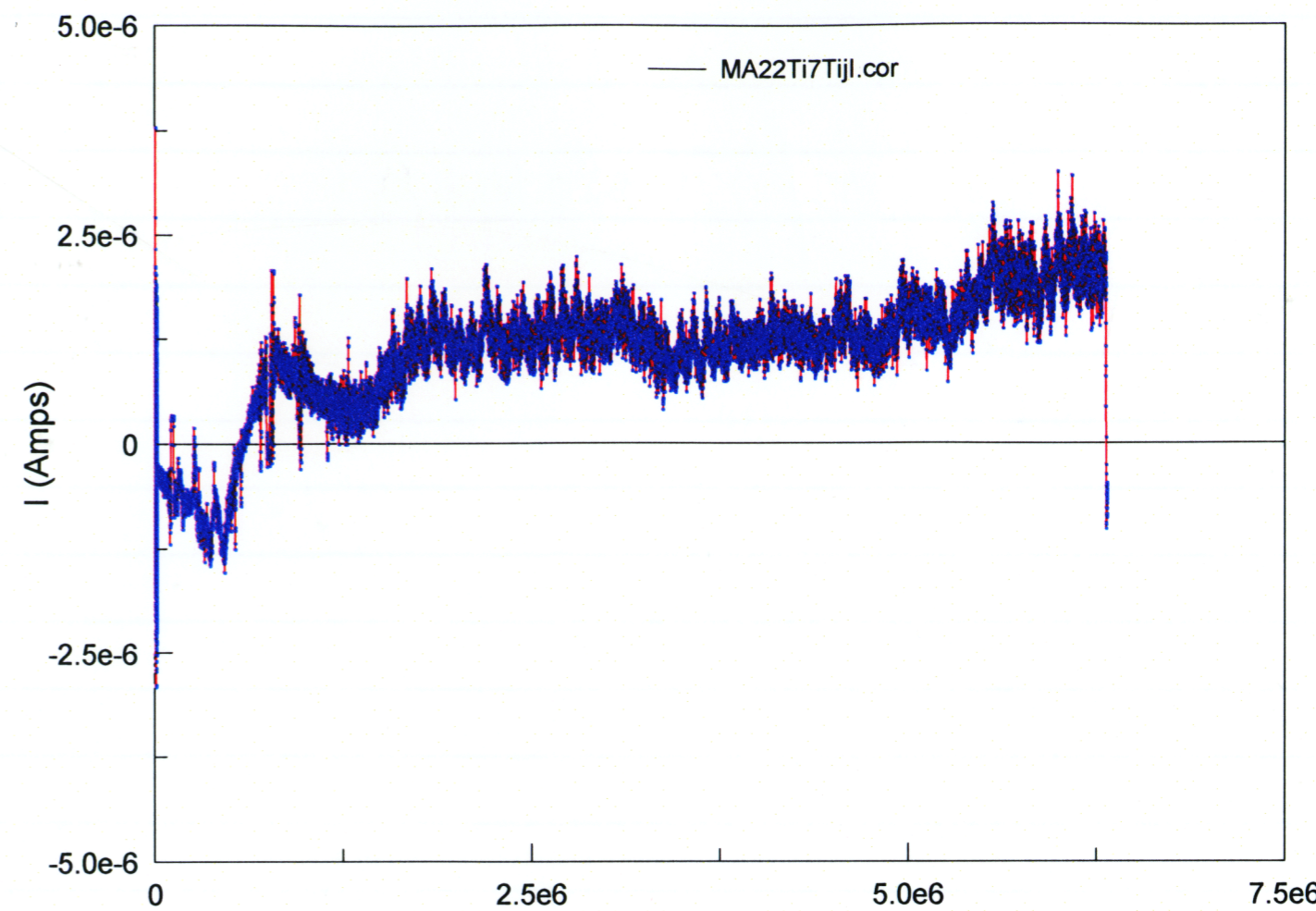
sn# 06238265 cal: 11/12/07 Due: 5/12/08

TEST ID: MA22Ti7Ti7J
DATA FILES:

C22Ti7Ti730A - UNICH5, C22Ti7E1130A - UNICH6, 1130, 1207, 1213, 1221, 1219, 1221b, 1228, 0104, 0111, 0118, 0125, 0201, 0208

Specimen Examination: No Corrosion 1/24 feet of Ti-7 Crevice Washers
Ti-7 Plate No corrosion or pitting. C-22 Specimen mild color
that staining - Ti-7 Hardware And Plate HAVE A Dull
staining on All Surfaces

[Signature]
11/29/07



Xhua He 2/20/08

End of Notebook

Xi Hua He 3/25/58

Notebook #: 815

Operating System: Windows 98 # up

Version: _____

Notebook #: 815
Date Disk Generated: 3/25/2008
Operating System of software: Windows
Software Application(s) Used: CorrView
File types: .cview and .exe
Remarks: Data were generated using la

Application Used: CorrView

Date Generated: 3/25/08

File Types: exe & .cview
xls, graf, cor

ADDITIONAL INFORMATION FOR SCIENTIFIC NOTEBOOK NO. 815

Document Date:	08/01/2006
Availability:	Southwest Research Institute® Center for Nuclear Waste Regulatory Analyses 6220 Culebra Road San Antonio, Texas 78228
Contact:	Southwest Research Institute® Center for Nuclear Waste Regulatory Analyses 6220 Culebra Road San Antonio, TX 78228-5166 Attn.: Director of Administration 210.522.5054
Data Sensitivity:	<input checked="" type="checkbox"/> "Non-Sensitive" <input type="checkbox"/> Sensitive <input type="checkbox"/> "Non-Sensitive - Copyright" <input type="checkbox"/> Sensitive - Copyright
Date Generated:	10/01/2006
Operating System: (including version number)	Windows 98 and up
Application Used: (including version number)	CorrView
Media Type: (CDs, 3 1/2, 5 1/4 disks, etc.)	1 CD
File Types: (.exe, .bat, .zip, etc.)	(exe. and .cview
Remarks: (computer runs, etc.)	Data were generated using lab corrosion software CorrWare