

POTENTIAL SCAN AND HOLD

Objective: See page 1.

Alloy / Heat No.: C-22 HT# 2277-3-3266 w/ C-22 HT# 2277-3-3266 Crevice Washers And Hardware

Specimen Preparation: Specimen machined to dimensions specified in CNWRA Drawing #20.06002.01.322.002. Specimen surfaces polished to 600 Grit finish using SiC paper. Specimen cleaned in acetone then crevice forming washers attached to specimen using hardware. Torque to 50 in-oz. or 75 in lbs.

Torque Screwdriver: Proto 6104 Model# & Torque: 50 In-oz SN: 139072 Cal: 9/20/06 Due: 3/20/07

Initial Weight: 24.06190g Model: Sartorius Genius SN: 12809099 Cal: 11/8/06 Due: 5/8/07

Solution: 4.0 M NaCl 467.53 NaCl Lot# 054171 + D2 to 2000ml

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

Initial pH: 7.47 Model: Orion EA 940 SN: 2330 Cal: 7/6/06 Due: 7/6/07 Final pH: 6.72 pH Probe: #13-620-296 SN: 4065196

Test ID: BA22BA2201f

Test Temperature: 95°C Measured with Hg Thermometer SN: 498-120 Cal: 4/7/06 Due: 4/6/07

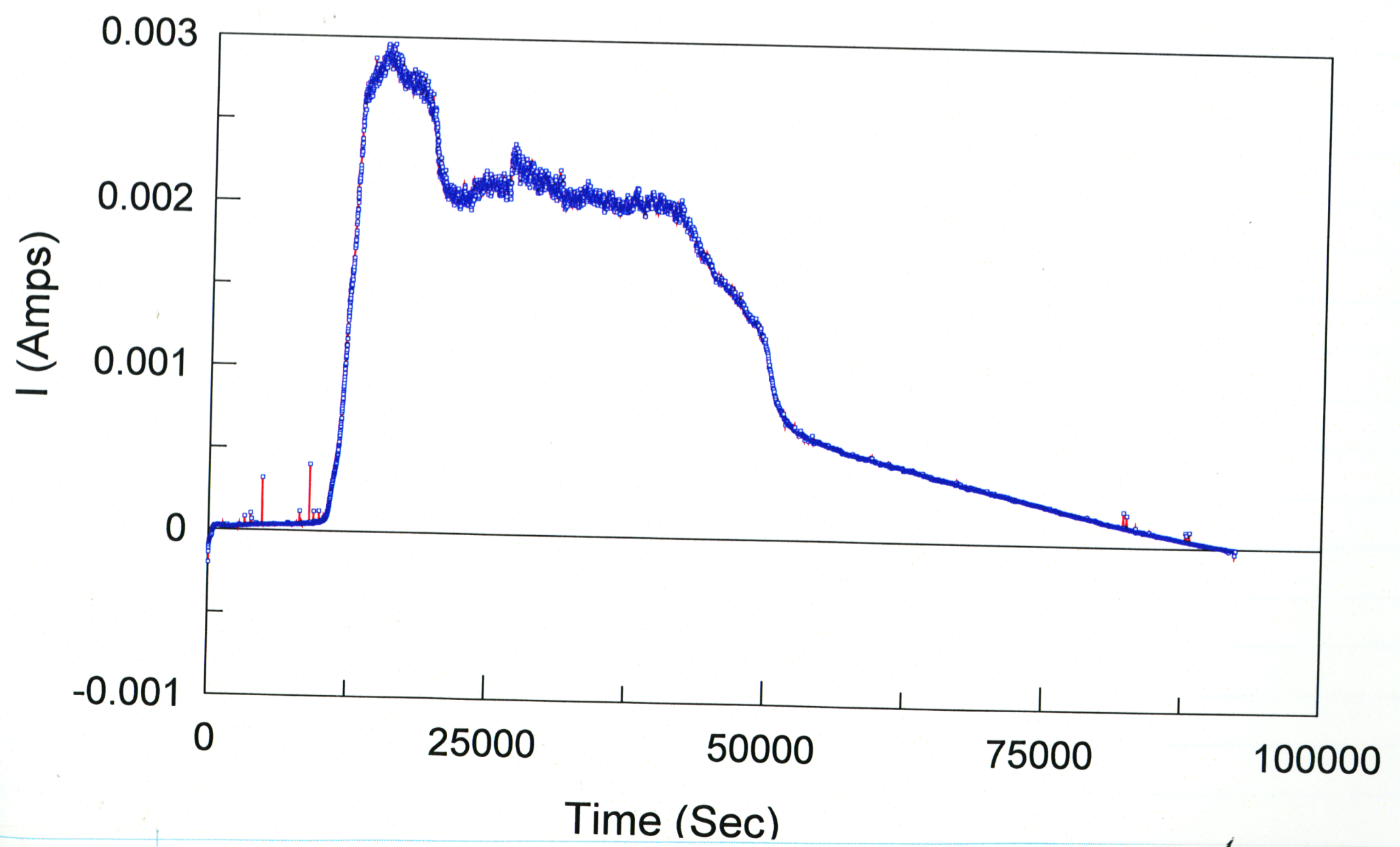
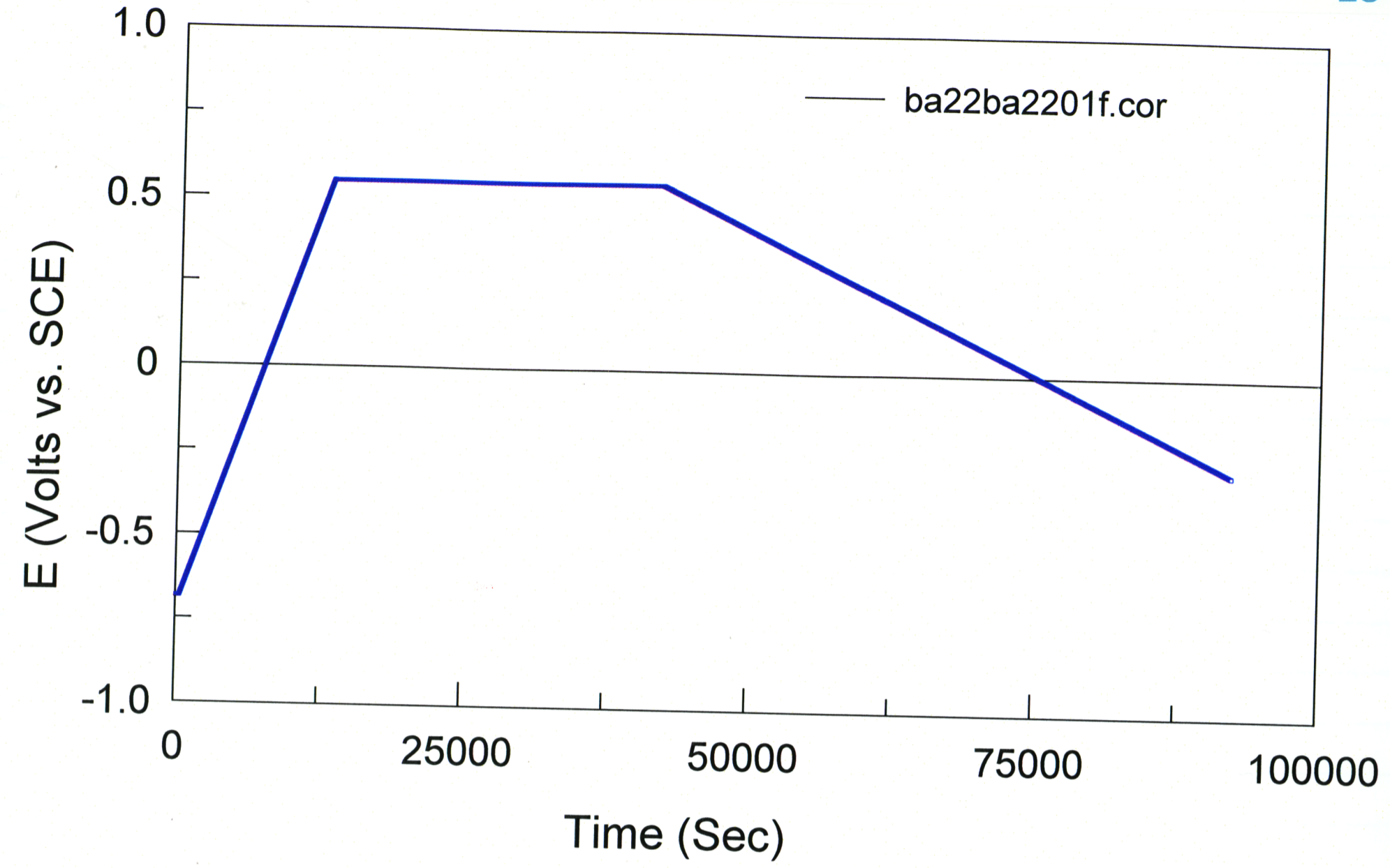
Counter Electrode: Platinum Flag Reference Electrode: Fisher 13-620-52 SN: 4028036

Gas: 99.999% N2 Ecorr: -544 mV SCE Model: Keithley 614 SN: 467374 Ept: +) mV SCE Cal: 1/25/07 Due: 1/25/08 Potentiostat: Solartron 1287 SN: 00153550

DATA FILE: C22C226SP-600grit C22C226SH-600grit Cal: 11/7/06 Due: 5/7/07 C22C226SU-600grit C22C226SD-600grit Number of Crevice Corrosion Sites: 0/24 (24 max.)

C-22 Specimen 1/24 feet of crevice washer No crevice corrosion C-22 crevice washers and hardware No corrosion M.I. to Gold tint surface staining on All C-22 material

Signature: S. D. 2/7/07



Signature: K. H. 3/2/07

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# 2277-3-3266

Ti 7 Crevice washers And Hardware
MT# CN2775

Ti 7 Plate
MT# CN2775

Torque Screwdriver:

True Craft 75 In lbs
Cal: 2/25/06

SN: 694000691
Due: 7/25/07

Initial Weight: 23.81174 g
Final Weight: 23.81176 g

Model: Sartorius Genius
Cal: 11/8/06

SN: 12809099
Due: 5/8/07

SOLUTION:

4 m CaCl₂ · 2H₂O
1176.23g CaCl₂ · 2H₂O lot# 061720
+ DI To 2000mls

Reagents measured with

Model: OHAUS
Cal: 1/2/07

SN: 2883
Due: 7/2/07

Initial pH: 2.81
Final pH: 3.59

Model: Orion EA 940
Cal: 7/6/06
pH Probe: #13-620-296

SN: 2330
Due: 7/6/07
SN: 4065196

TEST TEMPERATURE: 95°C

Thermometer: Fisher
Cal: 6/1/06

SN: 4418
Due: 6/1/07

Reference Electrode: Fisher SCE

13-620-52

SN: ~~4028036~~ 4028036
3/1/06

GAS: Zero Air

(CREVICE)

Ecorr: -151 mV vs SCE

(PLATE)

Ecorr: -348 mV vs SCE

Model: Keithley 614
Cal: 6/6/06

SN#: 0704934
Due: 6/6/07

Potentiostat: Solartron 1480

sn# 00240551

cal: 11/7/06 Due: 5/1/07

TEST ID: MA22CaCl2d

DATA FILES: C22CaCl20302I_UnlCh5, C22CaCl20302E_UnlCh6, 0309I, 0309E, 0316I, 0316E, 0323I, 0323E, 0330I, 0330E, 0402I, 0402E, 0406I, 0406E, 0413I, 0413E, 0420I, 0420E, 0427I, 0427E, 0504I, 0504E, 0511I, 0511E

Specimen Examination: No Corrosion 1/24 feet of Crevice washer

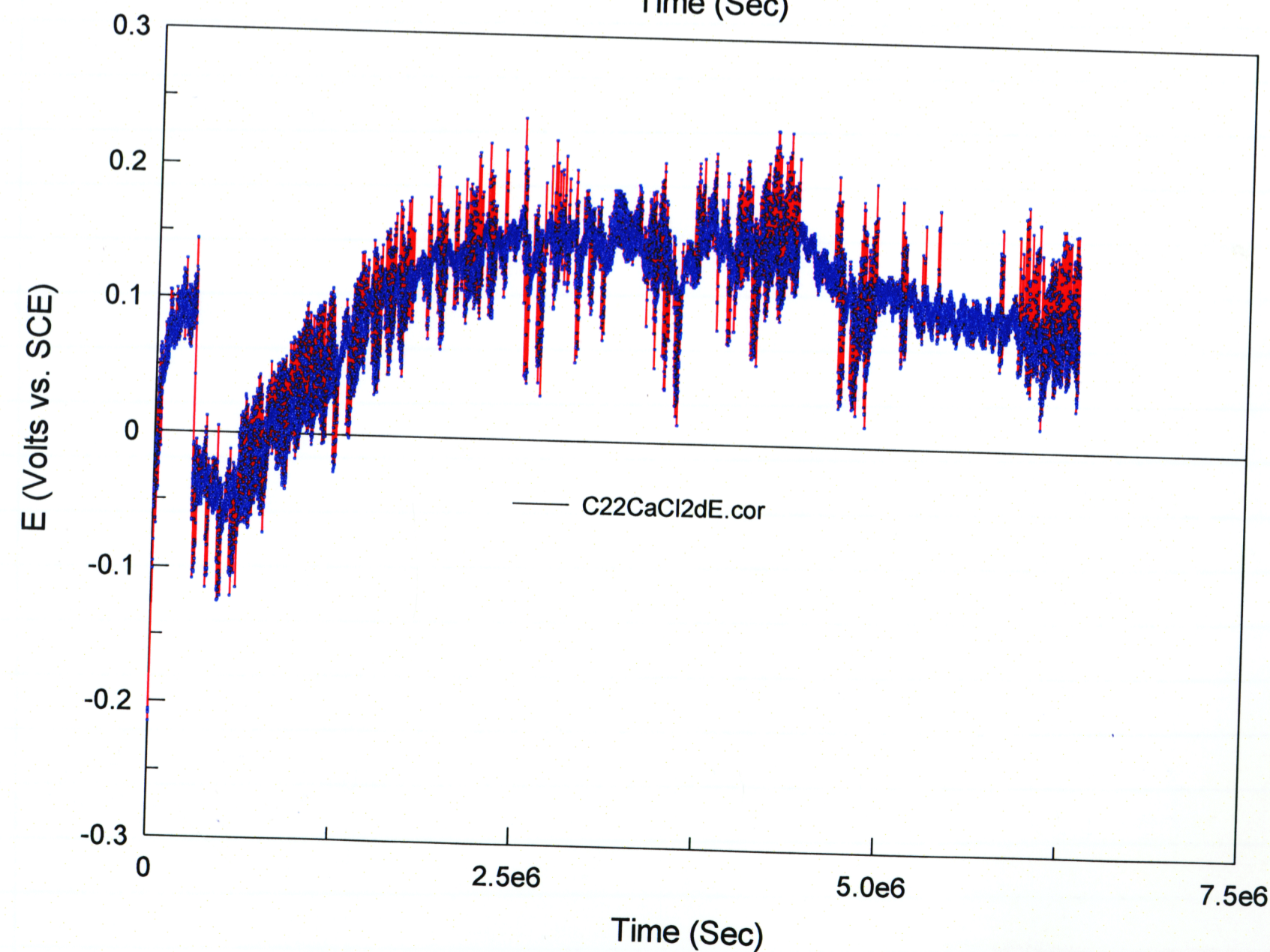
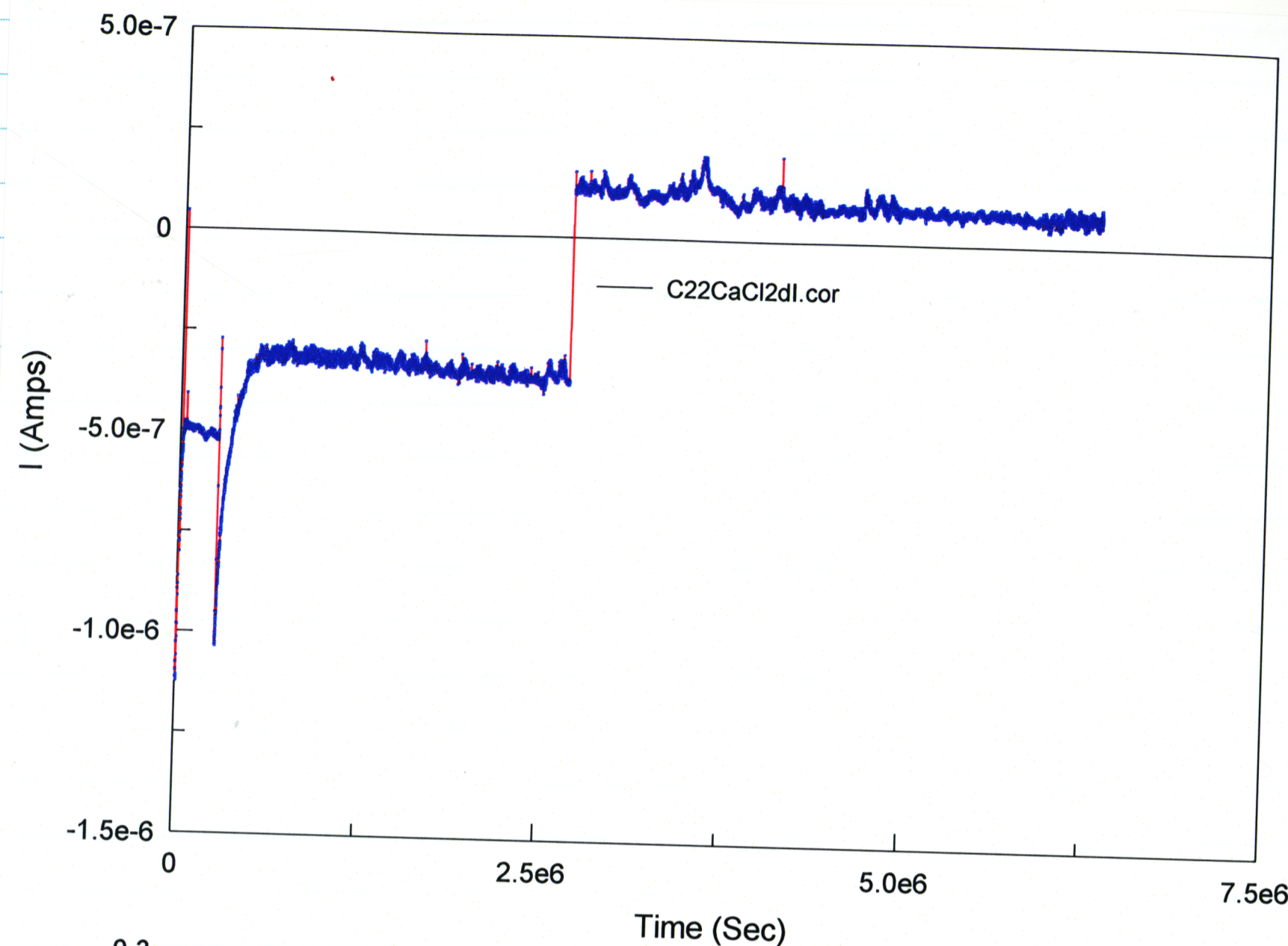
Ti 7 Crevice washers And Hardware No Corrosion - Ti 7 Plate

No Corrosion - Very mild staining of All Material

* will Repolish Specimen C-22 And Ti 7 Material for further Testing

started 3/1/07 Enoco 5/14/07

[Signature] 3/1/07



Test time: 6.33x10⁶ seconds = 73 days

[Signature] 6/5/07

Cyclic Potentiostatic Test

Objective:

dynamic
c.d. 3/8/07

Specimen: C-22 Cylinder HT# 2277-3-3206 Drawing # 26.01402.571.019
Polished to A 600 Grit Finish - Cleaned with Acetone

Initial Weight: 12.48614g Model: Sartorius Genius SN: 12809099
Final Weight: 12.48609g Cal 11/8/06 Due: 5/8/07

SOLUTION:
5 M NaCl
584.40g NaCl Lot # 054171
+ DI to 2000 ml

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

Initial pH: 6.27 Model: orion SN: 2330
Final pH: 7.41 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 98-170
Cal: 4/6/06 Due: 4/6/07

Counter Electrode: Platinum Flag
Reference Electrode: Fisher SCE SN: 6166050

GAS: 99.999% O₂
Ecorr: -215 mV vs SCE Model: Keithley 614 SN: 467374
Ept: +222 mV vs SCE Cal: 1/25/07 Due: 1/25/08

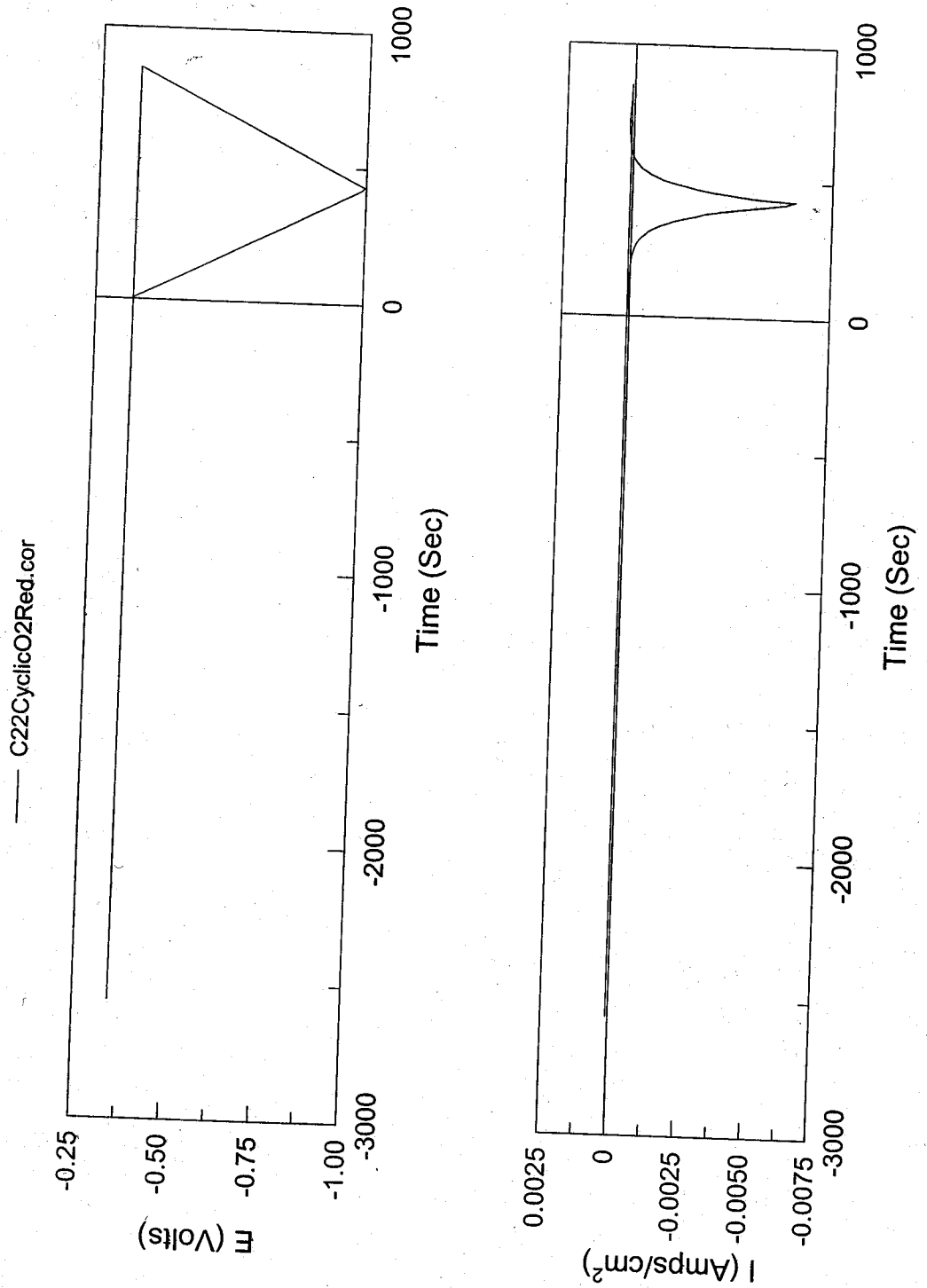
Potentiostat: Solartron 1287 SN# 00148500
Specimen Examination: Cal: 11/7/06 Due: 5/7/07

No sign of corrosion Very little staining on surface

* Ran 5 cycles only stores last cycle will refer
Test same conditions

* Note: Repolished specimen for further testing

[Signature] 3/8/07



* Data for last cycle only will refer test.

[Signature] 3/8/07

Cyclic Potentiostatic Test

Objective:

dynamic
3/8/07

Specimen: Ti 7 HT# 34115 Drawing# 20.01402.571.019
Polished To A600 Get Finish then Cleaned with Acetone

* Used Ti 7 HT# 34115 Rod for Specimen

Initial Weight: 6.56895g Model: Sartorius Genius SN: 12809099
Final Weight: not taken Cal 11/8/06 Due: 5/8/07

SOLUTION:

3/18/07
5 M NaCl
584.42g NaCl Lot# 054171
+ DI To 2000mls

Reagents measured with

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

Initial pH: 6.12
Final pH: Not Taken

Model: orion SN: 2330
CAL: 7/6/06 DUE: 7/6/07
pH Probe: #13-620-296 SN: 4065796

TEST TEMPERATURE: 95°C

Measured with Hg Thermometer SN: H 98-170
Cal: 4/6/06 Due: 4/6/07

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE

SN: 6166050

GAS: 99.999% O₂

Ecorr: -375mV vs SCE
Ept: +246 mV vs SCE

Model: Keithley 614 SN: 467374
Cal: 1/25/07 Due: 1/25/08

Potentiostat: Solartron 1287

SN# 06148500
Cal: 11/7/06 Due: 5/7/07

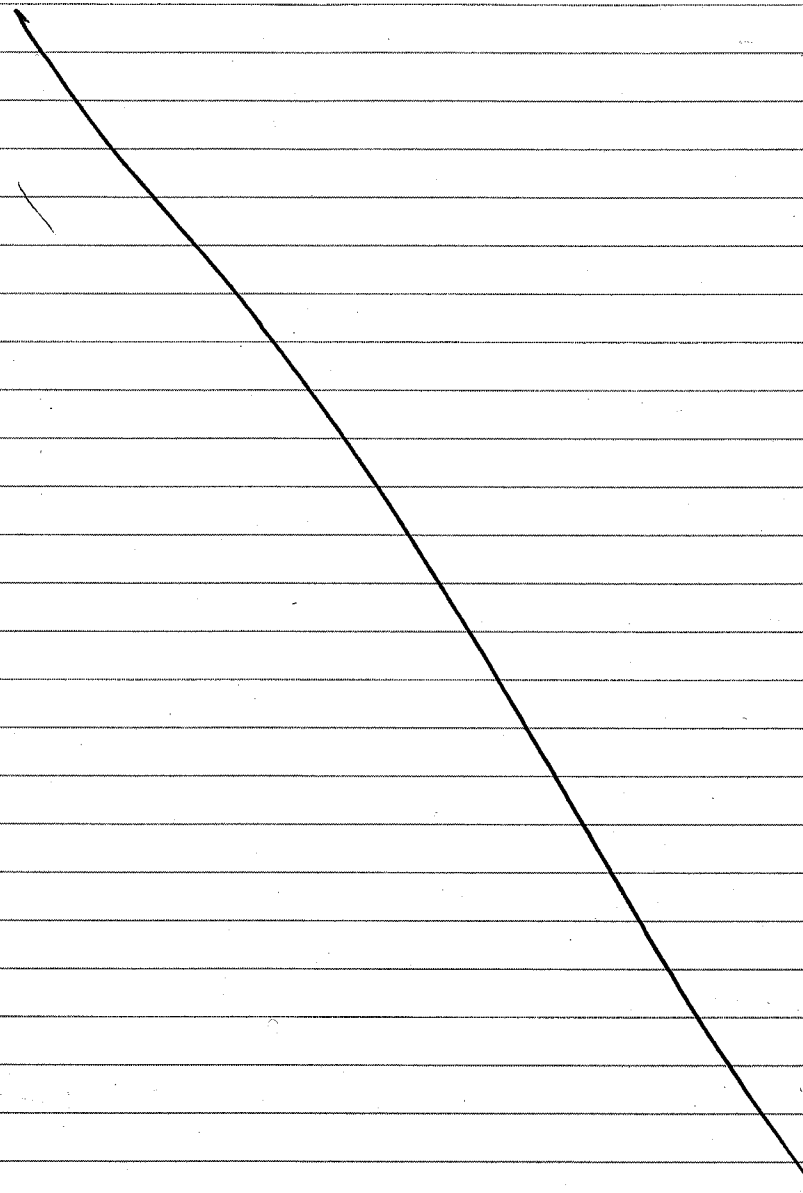
Specimen Examination:

Lost Heat Control will Repolish And Restart
Test And Make New Solution

* Note will Repolish Specimen for further Test/2

[Signature] 3/8/07

Lost Control of Heater - Repolish Specimen - Make New
Solution And Restart Test



[Signature] 3/14/07

^{dynamic}
Cyclic Potentiostatic Test

Objective:

O₂ reduction reaction on Alloy 22 ^{X-rt 3/26/07}

Specimen: C-22 MT# 2277-3-3266 Drawing # 20.01402.571.019
Polished To A 600 Grit Finish - Cleaned with Acetone

specimen area immersed in solution: 8.62 cm²

Initial Weight: 12.4575g Model: Sartorius Genius SN: 12809099
Final Weight: 12.4577g Cal: 11/8/06 Due: 5/8/07

SOLUTION:

5 m NaCl
584.4g NaCl lot# 054171
+ O₂ to 2000 ml/s

Test ID: C22CyclicO2Red

Reagents measured with

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

Initial pH: 8.23

Model: orion SN: 2330
CAL: 7/6/06 DUE: 7/6/07
pH Probe: #13-620-296 SN: 4065196

Final pH: 8.45

TEST TEMPERATURE: 95°C

Measured with Hg Thermometer SN: 498-170
Cal: 4/6/06 Due: 4/6/07

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE

SN: 6166050

GAS: 99.999% O₂

Ecorr: -268 mV vs SCE

Model: Keithley 614 SN: 467374
Cal: 1/25/07 Due: 1/25/08

Ept: +230 mV vs SCE

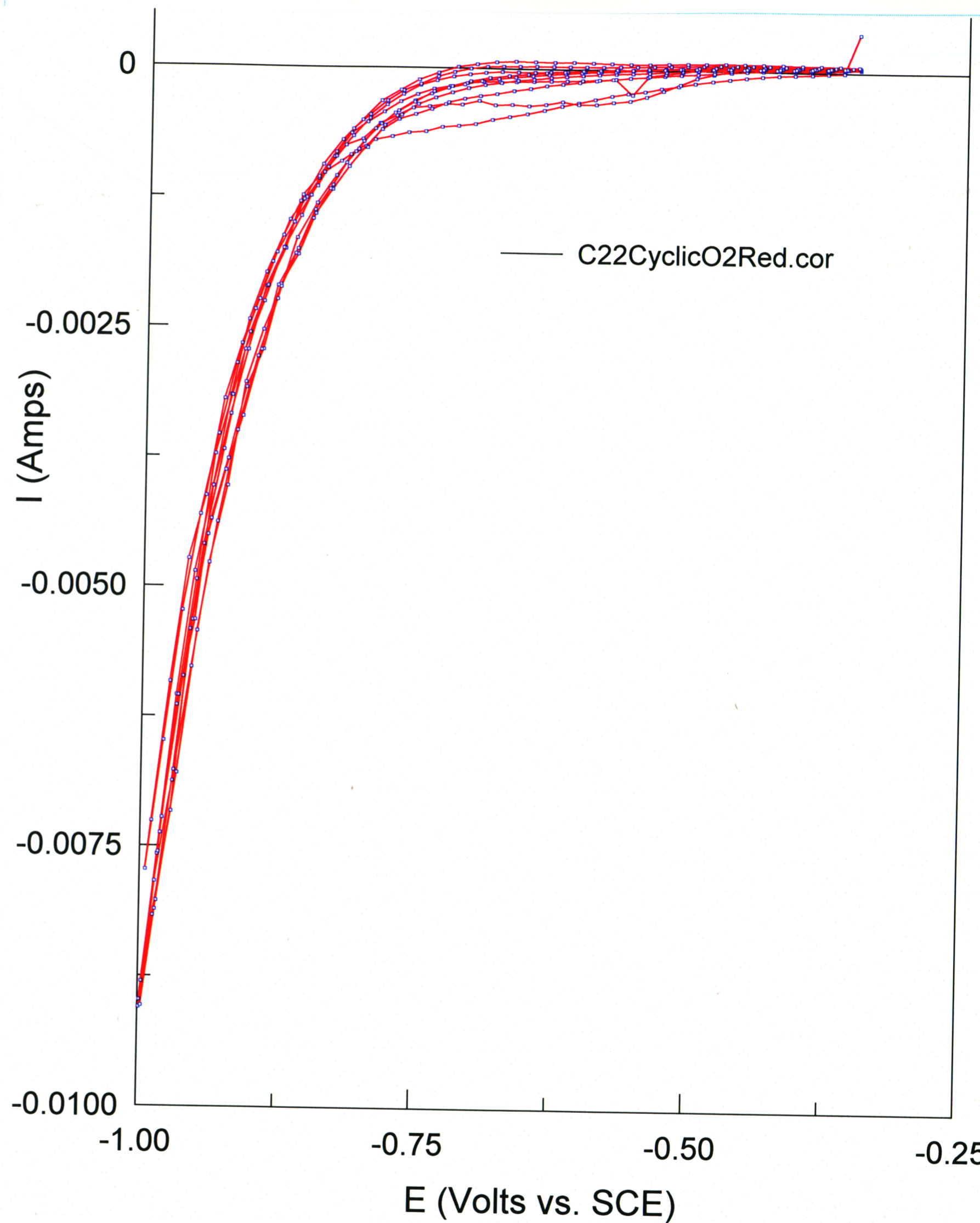
Potentiostat: Solartron 1287

SN# 00148500
Cal: 11/7/06 Due 5/7/07

Specimen Examination:

No Corrosion or Pitting on Specimen
Very mild Tint staining on surface

[Signature] 3/21/07



Xi Hua He
3/26/07

^{dynamic}
Cyclic Potentiostat Test

Objective: *O₂ reduction reaction on Titanium Grade 7*

Specimen: Ti 7 HT# 34115 Drawing # 20.01402.571.019
Polished To A 600 Grit Finish then cleaned with Acetone
* Usco Ti 7 loop for Specimen HT# CN2775

Initial Weight: 6.56453g Model: Sartorius Genius SN: 12809099
Final Weight: 6.56536g Cal 11/8/06 Due: 5/8/07

SOLUTION: 5 M NaCl
g NaCl Lot# 054171
+ DI To 2000 mls

Specimen area immersed in solution: 8.62 cm²

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

Initial pH: 7.87 Model: orion SN: 2330
Final pH: 7.46 CAL: 7/6/06 DUE: 7/6/07
pH Probe: #13-620-296 SN: 4065196

TEST TEMPERATURE: 95°C Measured with Hg Thermometer SN: C96-816
Cal: 11/28/06 Due: 5/28/07

Counter Electrode: Platinum Flag
Reference Electrode: Fisher SCE SN: 6166050

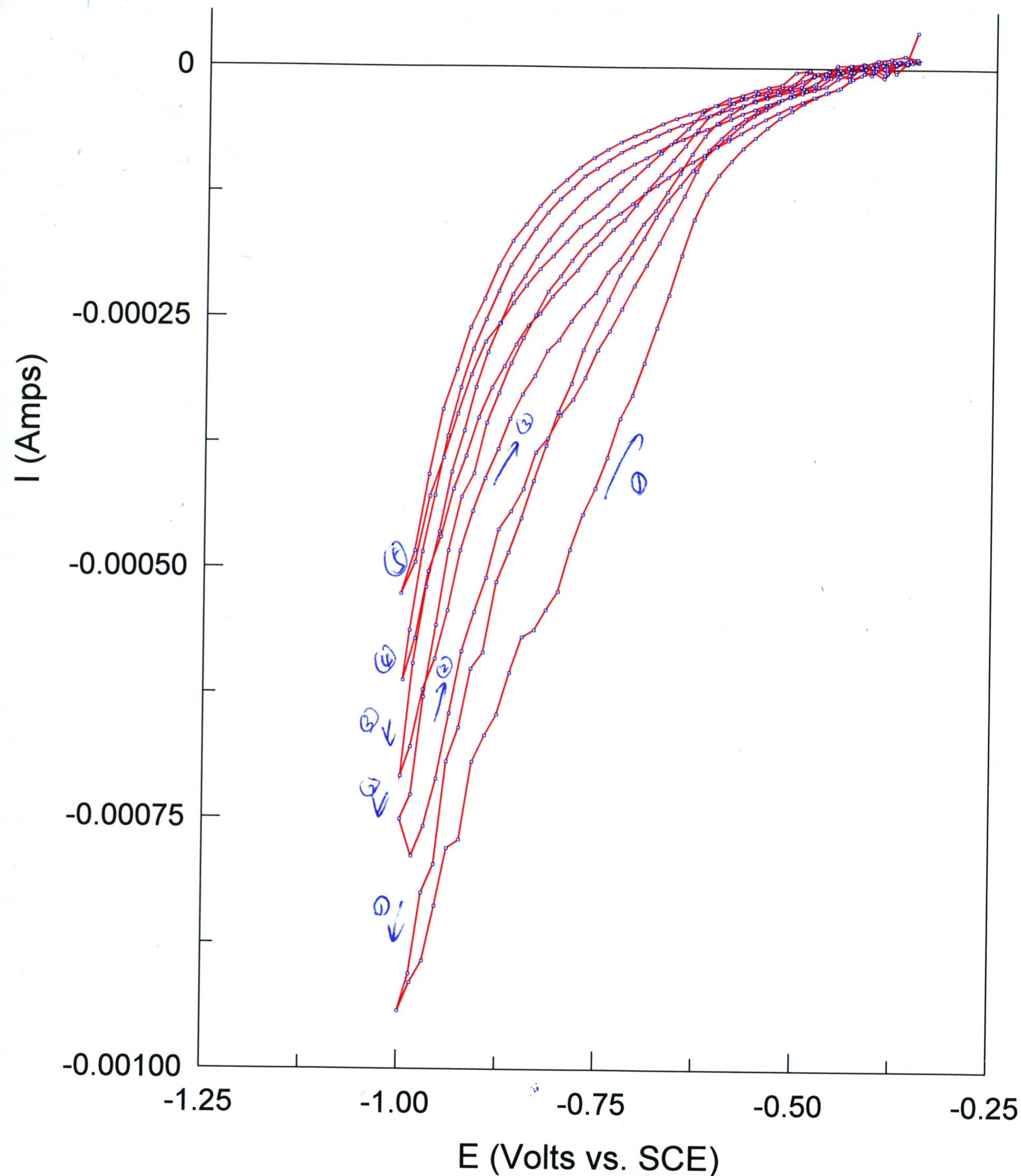
GAS: 99.999% O₂
Ecorr: -344 mV vs SCE Model: Keithley 614 SN: 467374
Ept: +246 mV vs SCE Cal: 1/25/07 Due: 1/25/08

Potentiostat: Solartron 1287 SN# 00148500
Cal: 11/7/06 Due: 5/7/07

Specimen Examination:
No corrosion or pitting on Specimen
Very Very mild surface staining

Test ID: Ti7CyclicO2Red

B. R. J. 3/21/07



Xilinx He 3/26/07

Potentiodynamic
Cyclic Potentiostatic Test ⁸⁴⁰ 3/26/07

Objective: O₂ Reduction Reaction of Pt

Specimen: Pt Foil 25mm x 17mm x 0.025mm thick Lot # D17M13

Cleaned with Acetone

Surface area: 8.62 cm²

Initial Weight: No wt.

Model: Sartorius Genius

SN: 12809099

Final Weight:

Cal: 11/8/06

Due: 5/8/07

SOLUTION:

5 m NaCl

584.47 NaCl Lot # 054171

+ DI To 2000mls

Test ID: PtCyclicO2Red

Reagents measured with

Model: OHAUS

SN: 2883

Cal: 1/2/07

Due: 7/2/07

Initial pH: 7.63

Model: orion

SN: 2330

Final pH: 6.73

CAL: 7/6/06

DUE: 7/6/07

pH Probe: #13-620-296

SN: 4065196

TEST TEMPERATURE: 95°C

Measured with Hg Thermometer SN: M98-170

Cal: 4/6/06

Due: 4/6/07

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE

SN: 6166050

GAS: 99.995% O₂

Ecorr: +244 mV vs SCE

Model: Keithley 614

SN: 467374

Ept: +381 mV vs SCE

Cal: 1/25/07

Due: 1/25/08

Potentiostat: Solartron 287

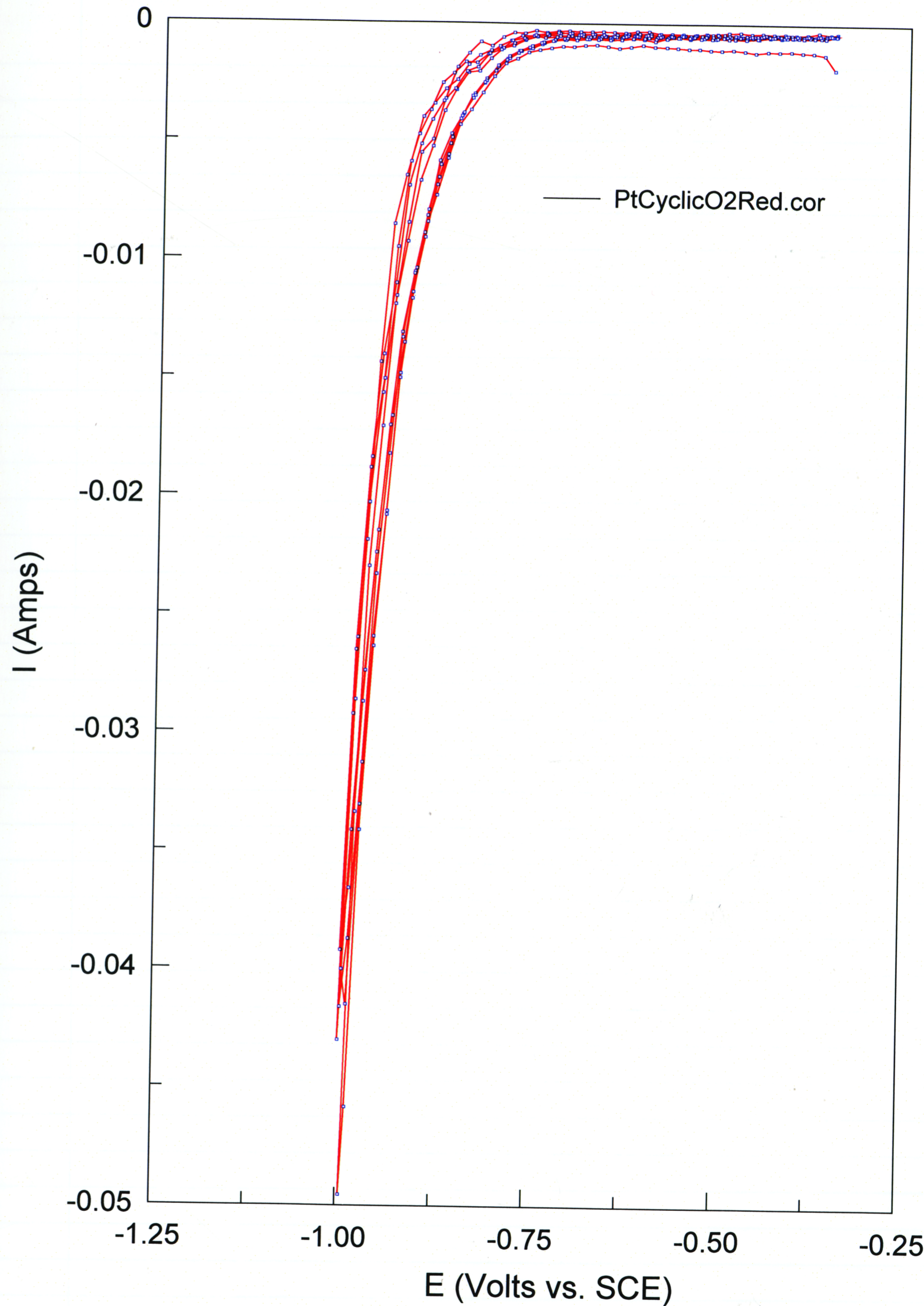
SN# 00148500

Cal: 11/7/06 06/27/07 5/7/07

Specimen Examination:

No staining on Pt Foil
OR Surface Etching

B. P. 3/26/07



Xi Hua 3/30/07

OCP Tests

Objective: to measure open circuit potentials

Specimen: C22 specimen Heat# 2277-3-3266 CNWRA Drawing 20.06002.01.322.002 polished to a 600 grit finish cleaned with Acetone

Crevice washers: Ti7 HT# CN2775 Crevice Washers And Hardware (Lg)

Torque Screwdriver: Teve Craft 75 In-lbs SN: 694000691 Cal: 7/25/06 Due: 7/25/07

Initial Weight: 23.42263g Model: Sartorius Genius SN: 12809099 Final Weight: 23.42366g Cal: 11/8/06 Due: 5/8/07

SOLUTION: SCW - simulates Concentrated water + DI To 2L
KCl 12.962g Lot# 043820 Na₂SO₄ 41.27g Lot# 035461
NaCl 10.871g Lot# 054171 NaHCO₃ 192.72g Lot# 054010
NaNO₃ 17.562g Lot# 050093 NaF 6.190g Lot# 006679
Reagents measured with Model: OHAUS SN: 2883 Cal: 1/2/07 Due: 7/2/07

Initial pH: 7.84 Model: Orion SN: 2330 Final pH: 10.24 x.M 6/4/07 CAL: 7/6/06 DUE: 7/6/07 Adjusted pH to 10.26 w/10mM NaOH Lot# 033972 pH Probe: #13-620-296 SN: 4065196

TEST TEMPERATURE: 95°C Measured with Hg Thermometer SN: 498-162 Cal: 4/7/06 Due: 4/6/07
Thermometer was re-calibrated Cal: 5/2/07 Due: 5/2/08 SN: 4028031

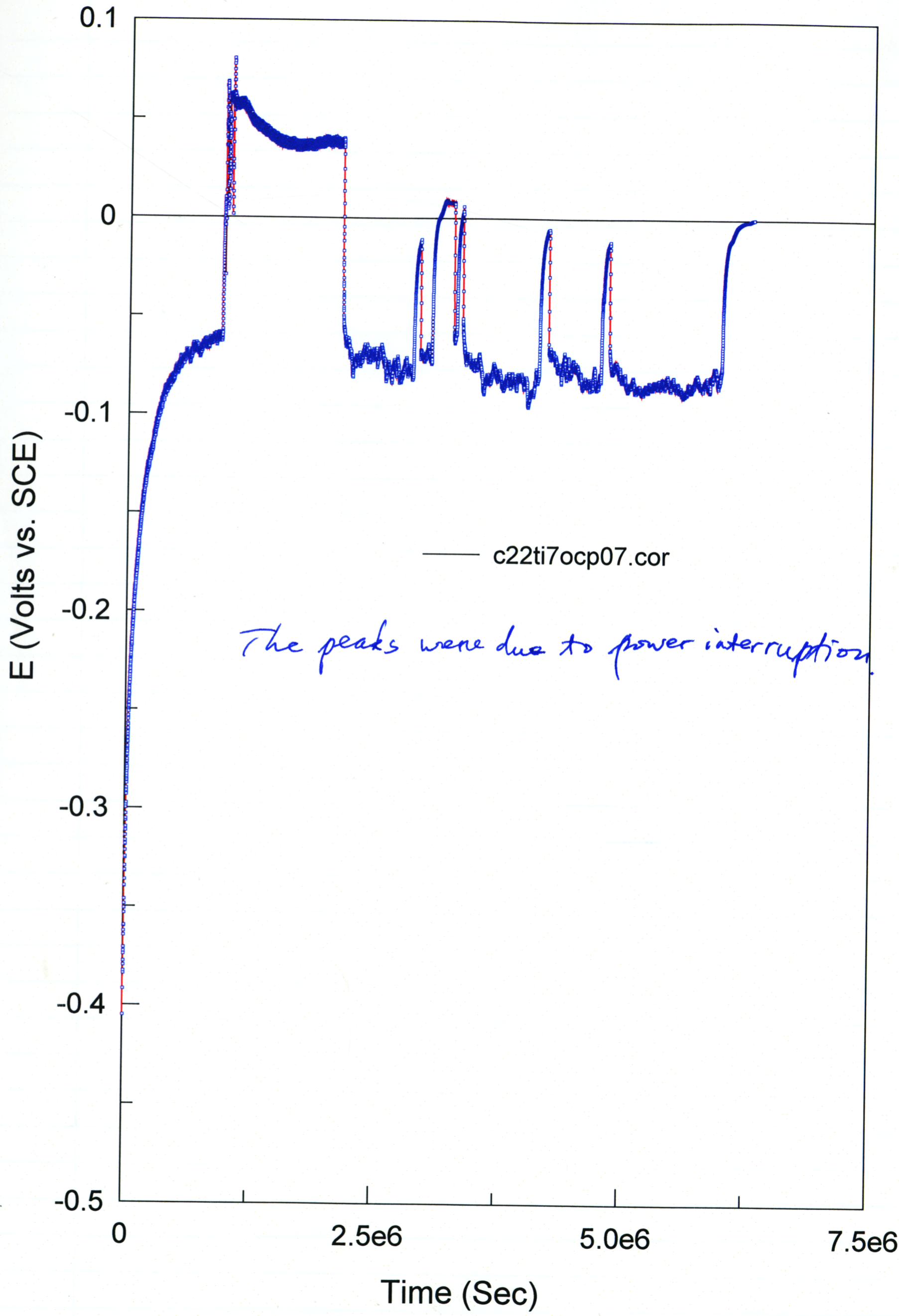
Counter Electrode: Platinum Flag Reference Electrode: Fisher SCE Gas: Zero Air Ecorr: -0.168 mV vs SCE Model: Keithley 614 SN: 0704934 Ept: +0.149 mV vs SCE Cal: 7/6/06 Due: 7/6/07

Potentiostat: Solartron 1450 SN# 00238265 Test ID: C22Ti7ocp07 Cal: 9/11/06 Due: 3/10/07

Specimen Examination: re-cal: 4/2/07 Due: 10/2/07

No Corrosion 1/4 feet of Ti7 crevice washer
Dull tint staining on C-22 specimen - All
Ti7 Hardware Has dull tint staining No
Corrosion

[Signature] 2/23/07



[Signature] 6/11/07

OCP Tests

Objective: to measure open circuit potentials

Specimen: C22 specimen Heat# 2277-3-3266 CNWRA Drawing 20.06002.01.322.002 polished to a 600 grit finish cleaned with Acetone

Crevice washers: C-22 HT# 2277-3-3266 Crevice Washers And Hardware (Large)

Torque Screwdriver: True Craft 75 In-lbs
Cal: 7/25/06 SN: 69400069
Due: 7/25/07

Initial Weight: 23.42263g Model: Sartorius Genius
Final Weight: ~~23.42360g~~ 23.53332g Cal: 11/8/06 SN: 12809099
X.H 6/11/07 Due: 5/8/01

SOLUTION: SCW - Simulated Concentrated H₂O
KCl 12.964g Lot# 043220 Na₂SO₄ 41.90g Lot# 03546 + DI To 2L
NaCl 10.870 Lot# 05417 NaHCO₃ 192.70g Lot# 054010
NaNO₃ 17.512 Lot# 050053 NaF 6.191g Lot# 006679

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

Initial pH: 7.82 Model: Orion SN: 2330
Final pH: ~~10.04~~ X.H 6/11/07 CAL: 7/6/06 DUE: 7/6/07
Adjusted pH to 10.21 pH Probe: #13-620-296 SN: 4065196
w/10 mL NaOH Lot# 037972 End pH 10.53

TEST TEMPERATURE: 95°C Measured with Hg Thermometer SN: E98-191
Cal: 11/28/07 Due: 5/28/07

Counter Electrode: Platinum Flag
Reference Electrode: Fisher SCE 13-620-52 SN: 9252105

Gas: Zero Air
Ecorr: -233 mV vs SCE Model: Keithley 614 SN: 0704936
Ept: +0.051 mV vs SCE Cal: 5/17/06 Due: 5/17/07

Potentiostat: Solartron 1480 SN# 00238265 ?
Test ID: C22C220408 Cal: 9/11/06 Due: 3/10/06

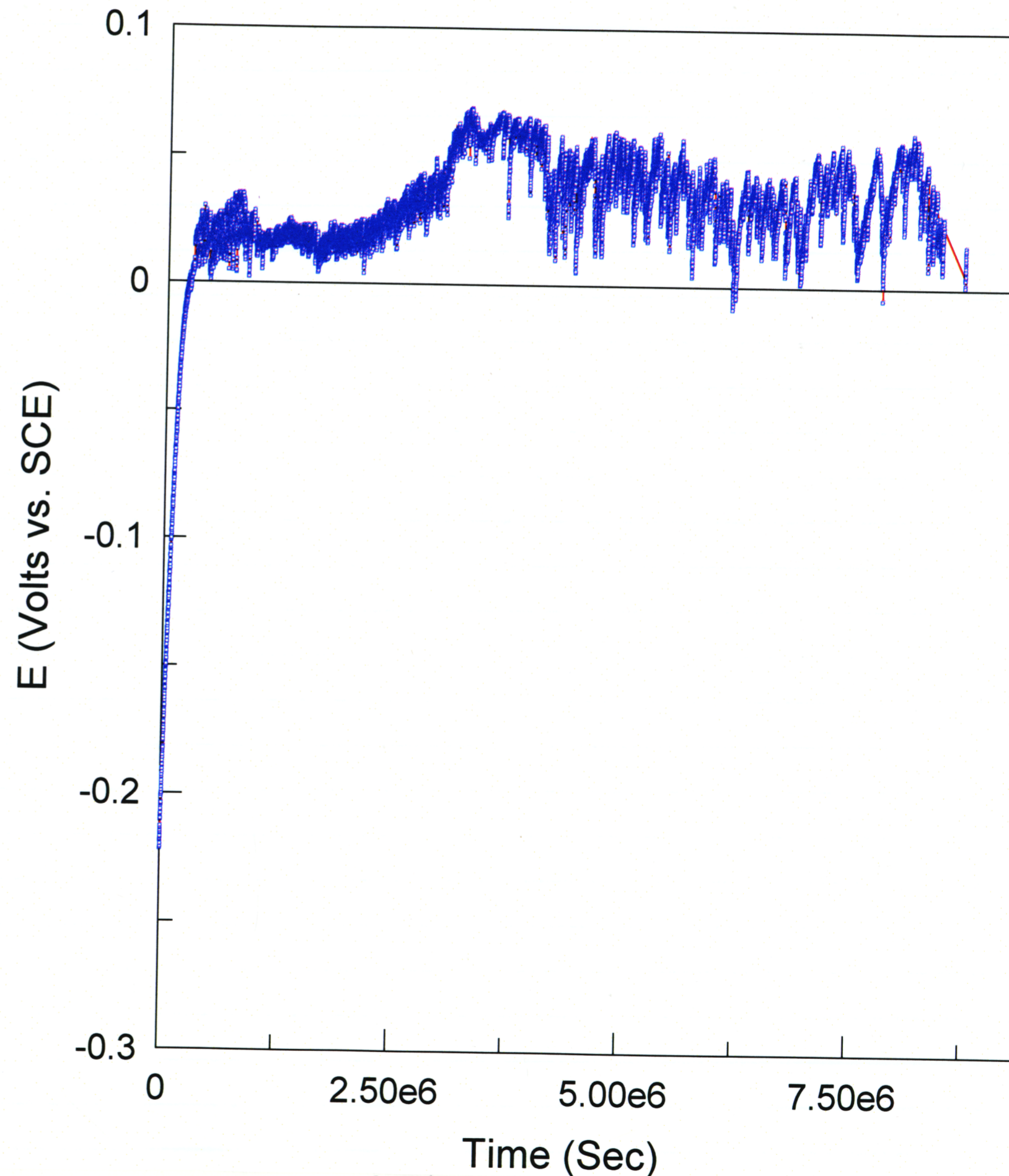
Specimen Examination: re-calibrated X.H 3/28/07
Cal: 4/2/07, Due: 10/2/07

~~No corrosion~~
~~No corrosion~~ 1/4 inch of J.
X.H 6/11/07
No corrosion on C-22 specimen on C-22 hardware. Dull tint staining on All C-22 material - Specimen Has some minor scuffs on surface from Torque

B.D.J.
3/28/07

Total test time: 8.715×10^6 seconds = 101 days
3/27/07 - 7/2/07

Data files: C22C22SCW0323-UnlCh8, 0330, 0403, 0406, 0413, 0409, 0420, 0427, 0504, 0511, 0518, 0525, 0601, 0608, 0615, 0622, 0702



Time (Sec)
X.H 7/2/07
X.H 6/11/07
~~6/6/07~~ X.H 6/11/07

Potentiodynamic
Cyclic Potentiostatic Test

342 4/3/07

Objective: O₂ Reduction Reaction on Ti-7

Specimen: Ti-7 HT# 34115 Drawing # 20-01402.571.019
Polished To A 600 Grit Finish the cleaned with Acetone

* Uses Ti-7 Specimen Run HT# CW2775

Initial Weight: 6.55184g Model: Sartorius Genius SN: 12809099
Final Weight: 6.55061g Cal: 11/8/06 Due: 5/8/07

SOLUTION: 5 M NaCl
584.42g NaCl Lot# 065316
7.0L To 2000ml

Test ID: Ti7bCyclicO2Red

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

Initial pH: 7.73 Model: orion SN: 2330
Final pH: 6.65 CAL: 7/6/06 Due: 7/6/07
pH Probe: #13-620-296 SN: 4065796

TEST TEMPERATURE: 95°C Measured with Hg Thermometer SN: 198-187
Cal: 8/19/06 Due: 8/19/07

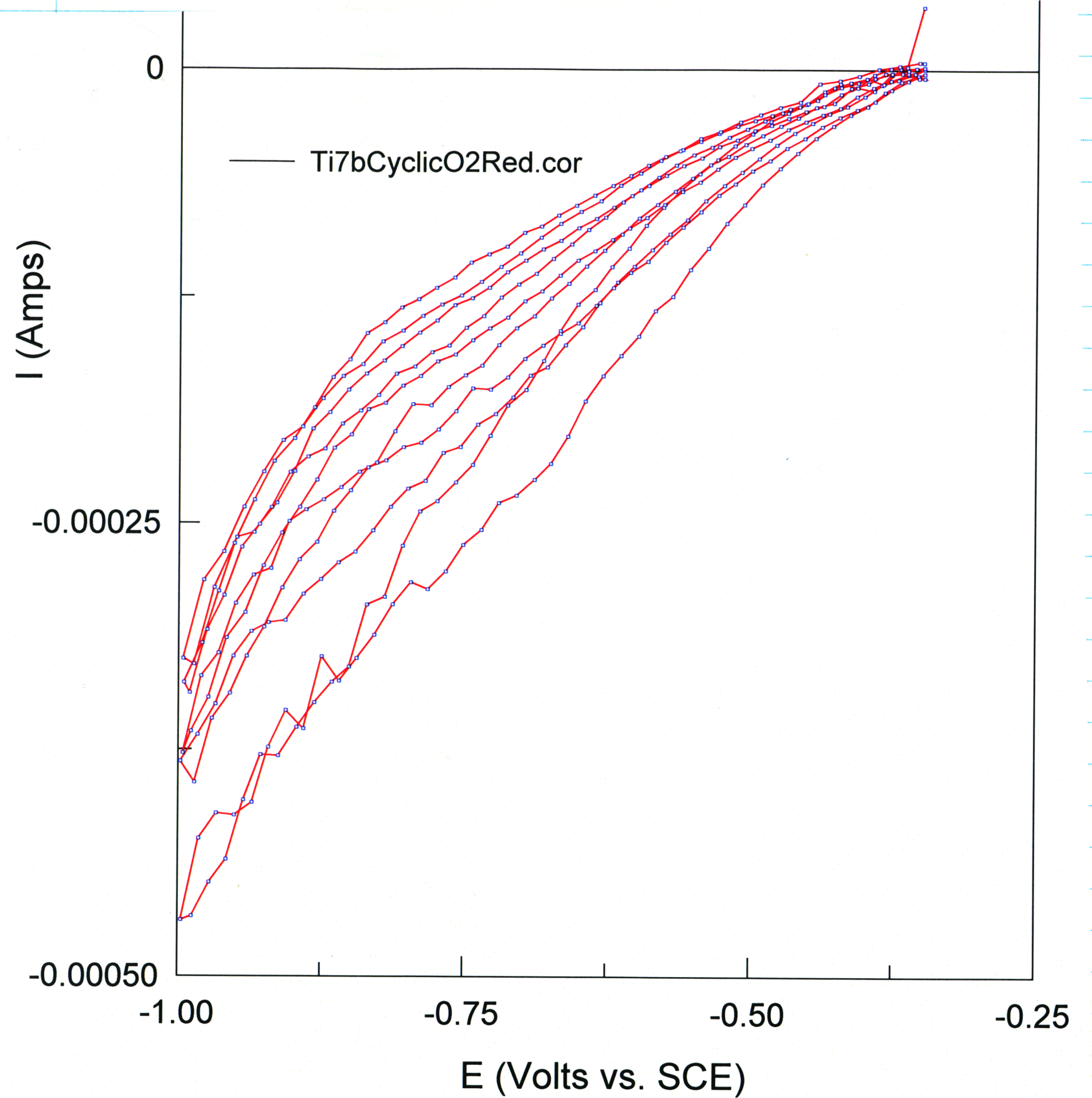
Counter Electrode: Platinum Flag
Reference Electrode: Fisher SCE SN: 6166050

GAS: 99.999% O₂
Ecorr: -322mV_{SCE} Model: Keithley 614 SN: 467374
Ept: +404mV_{SCE} Cal: 1/25/07 Due: 1/25/08

Potentiostat: Solartron 1287 SN# 00148500
Specimen Examination: Cal: 11/7/06 Due: 5/7/07

No Corrosion on Ti-7 Specimen m/o Surface Dull
+int staining

B-F 4/3/07



Richard He
4/8/07

Potentiodynamic
Cyclic Potentiostatic Test

840
4/25/07

Objective: O_2 Reduction Reaction on Ti7

Specimen: Ti7 HT# 34115 Drawing # 20.01402.571.015
Polished To A 600 Grit Finish the cleaned with Acetone
* Used Ti7 Specimen Rod HT# CN2715

Initial Weight: 6.59928g Model: Sartorius Genius SN: 12809099
Final Weight: 6.60170g Cal 11/8/06 Due: 5/8/07

SOLUTION: 5 M NaCl
584.45g NaCl lot # 065316
+ DI TO 2000ml

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

Initial pH: 5.89 Model: orion SN: 2330
Final pH: 4.29 CAL: 7/6/06 DUE: 7/6/07
pH Probe: #13-620-296 SN: 4065196

TEST TEMPERATURE: 95°C Measured with Hg Thermometer SN: H98-187
Cal: 8/19/06 Due: 8/19/07

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE

GAS: 99.999% O_2

Ecorr: +0.266 mV vs SCE Model: Keithley 614 SN: 467374
Ept: +496 mV vs SCE Cal: 1/25/07 Due: 1/25/08

Potentiostat: Solatron 1287 SN# 00148500
Cal: 11/7/06 Due: 5/7/07

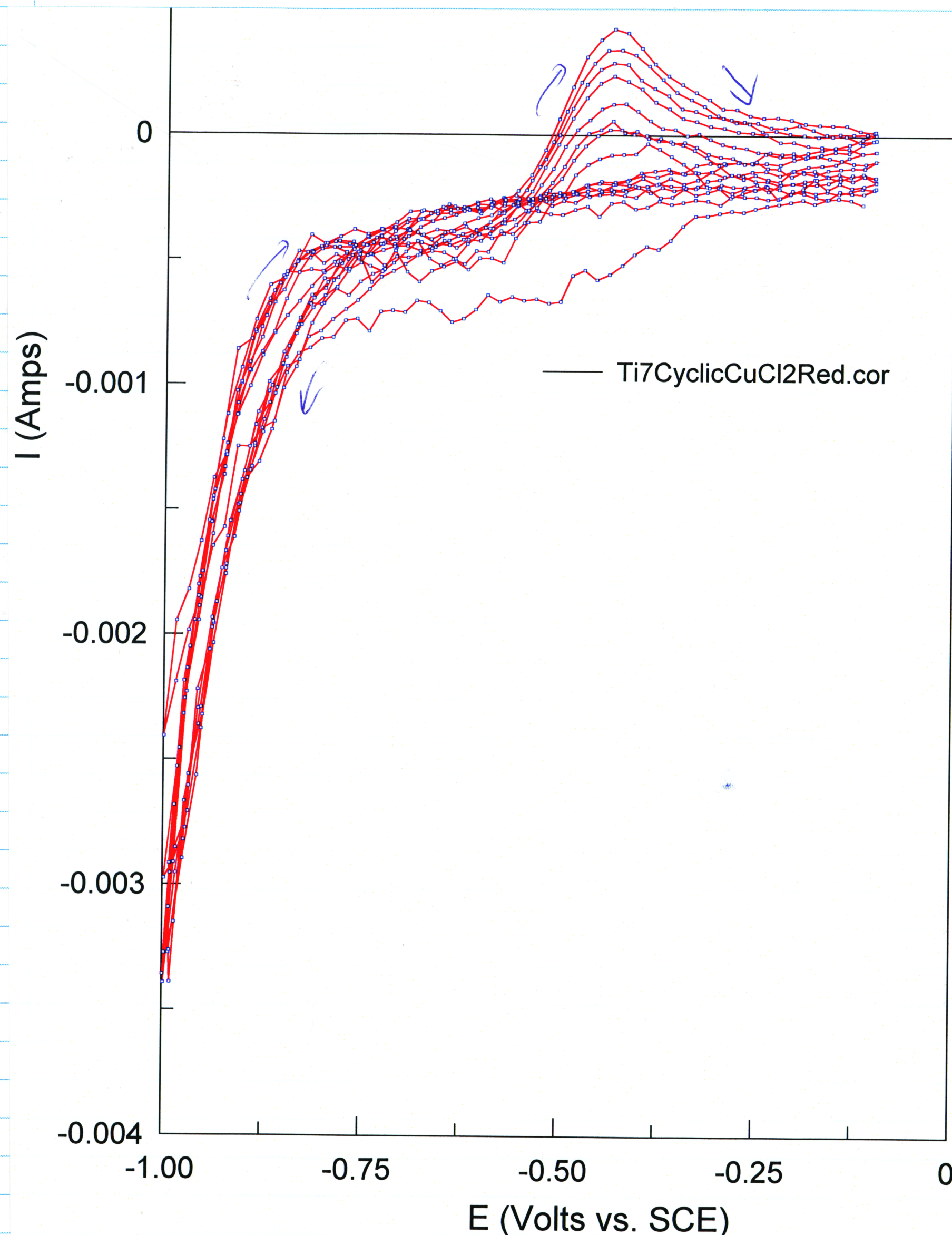
Specimen Examination:

No Visual Sign of Corrosion or Pitting on
All Surfaces of specimen - Dull Tint
Surface Staining - Also Darker Staining
At Solution Vapor Interface

* Spik solution with 340 ml of $CuCl_2$

$CuCl_2$ solution

B. D. J. 4/25/07



Xihua He
6/5/07