CNWRA
CONTROLLED
COPY ~~489~~ unused #
~~705~~ 5/23/05 MD
715

PAVAN K. SHUKLA - P.K. Shukla PKS
Brian K. Derby - ~~B.K.D.~~ - BKD
WALTER J. MACHOWSKI Walter J. Machowski WJM

Date: April 28th, 2005

Project Title

Model Abstraction for Stress Corrosion Cracking

Starting Page 3

May 23rd 2005 P. K. Shukla

Initial Scientific Notebook Entry for Cyclic Potentiodynamic Polarization Tests on Alloy 22

Title: Cyclic Potentiodynamic Polarization Tests.

Tests Performed by: Pavan Shukla, Div. 20; Brian Derby, Div. 18, Walt Machowski, Div. 18.

Objectives: To determine the effect of environmental variations on the anodic dissolution of Alloy 22 and the possible susceptibility to stress corrosion cracking.

Proposed approach or procedure for achieving the objectives: Conduct cyclic potentiodynamic polarization per ASTM G61 and determine the possible susceptibility to stress corrosion cracking using the approach described by Parkins (Ref: Stress Corrosion Cracking and Hydrogen Embrittlement of Iron Base Alloy, NACE-5, 601-624,1977)

Equipment: Electrochemical test cell, EG&G 263A potentiostat, CorrWare version 2.8d data acquisition software, thermocouple/thermocouple meter, temperature controller, pH meter, balances, Keithley electrometer, Coolant system.

Potentiostat and CorrWare data acquisition performance verified using TOP-022 Thermocouple, thermocouple meter, pH meter, analytical balances, and electrometers calibrated by SwRI calibration laboratory.

Materials: Alloy 22 heat 2277-3-3266. Additional materials to be identified prior to testing

Specimen Specifications: Cylindrical specimens, CNWRA drawing number 20.01402.571.019

Measurement Parameters: Temperature, Potential and Current.

P. K. Shukla 07/21/05

Required Level of Accuracy: Temperature ±2°C, Potential ±1 mV, Current ±0.1 μA.

Uncertainty and Sources of Error: Current density calculated as current divided by sample area. Actual current density of corroding areas is not determined. Non-faraday charging current during polarization.

P. K. Shukla
06/01/05

May 16th, 2005

Array definitions in Mathematica

Transpose [{v_1, v_2}]

Combines two row or column vectors. Resulting matrix is a matrix with v_1 and v_2 as a column vectors.

P. K. Shukla

(May 23rd, 2005)

May 17th, 2005

5/24/05

Cyclic Potentiostatic Test

Objective: CPP test of Alloy 22 in 0.5 m NaCl + 0.74 m $NaHCO_3$

Specimen: C-22 Cylinder Plate D62X DOE - Base Alloy Ht# 059902LL2

Initial Weight: 12.95698 g	**Model:** Sartorius Genius	**SN:** 12809099
Final Weight: 12.95703 g	**Cal** 5/11/05	**Due:** 11/11/05

SOLUTION: 0.5 m NaCl + 0.74 m $NaHCO_3$
58.47 g NaCl Lot# 050089
124.37 g $NaHCO_3$ Lot# 044998
+ DI water to 2000 mls

Reagents measured with	**Model:** OHAUS	**SN:** 2883
	Cal: 1/14/05	**Due:** 7/14/05
Initial pH: 7.53	**Model:** orion	**SN:** 2390
Final pH: ~~7.8~~ PKS 05/24/05 9.55	**CAL:** 7/21/04	**DUE:** 7/21/05
	pH Probe: #13-620-296	**SN:** 4065196 P 16
TEST TEMPERATURE: 95°C	**Measured with Hg Thermometer SN:** C98-106	
	Cal: 4/27/05	**Due:** 4/27/06
Counter Electrode: Platinum Flag		
Reference Electrode: Fisher SCE	13-620-52	**SN:** 0066119
Gas: 99.999% Nitrogen		
Ecorr: -240 mv	**Model:** Keithley 617	**SN:** 537418
Ept: -170 mv	**Cal:** 12/2/04	**Due:** 6/2/05

Potentiostat: EG&G 263A **SN#** 66105

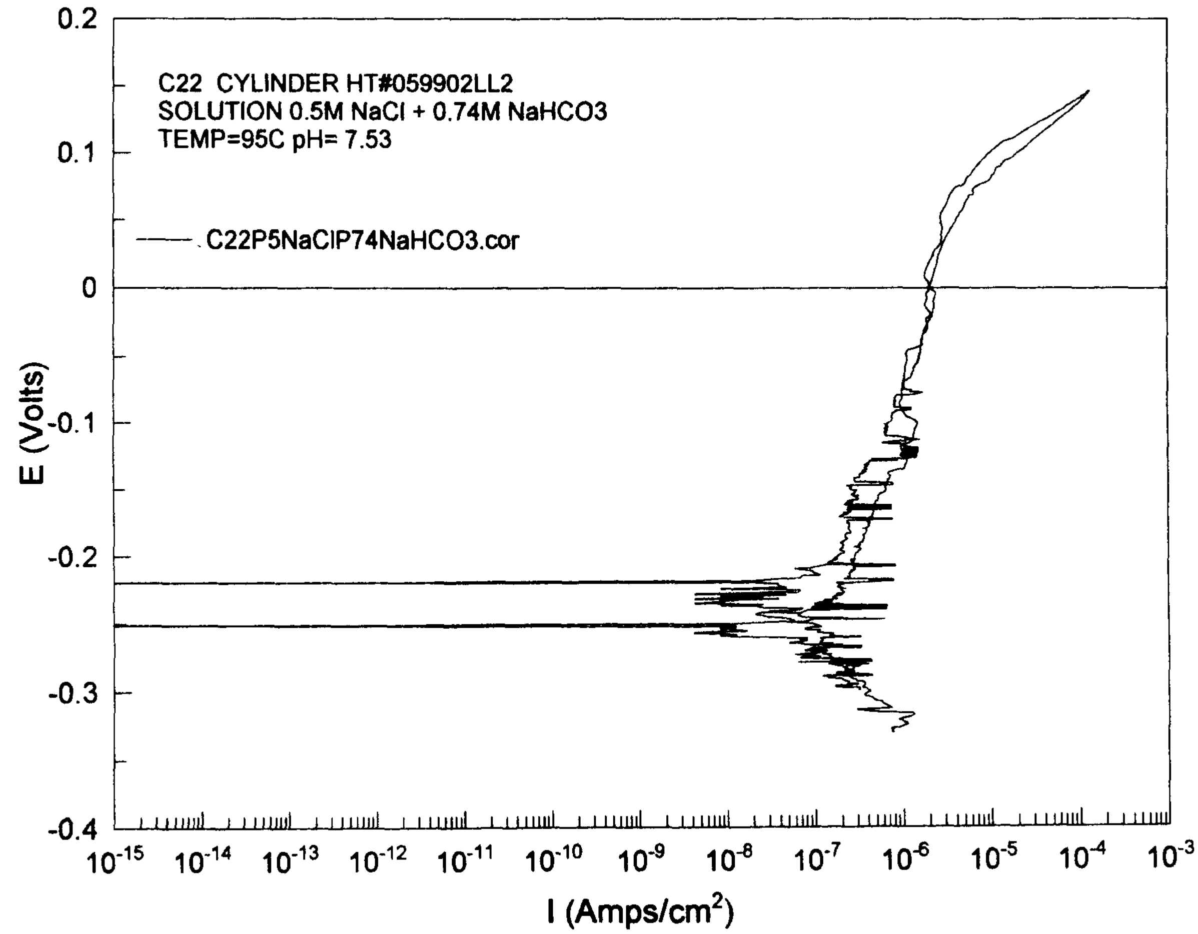
Specimen Examination: No visual sign of corrosion or pitting on surface of specimen. Very mild surface staining

Data File: C22 P5 NaCl P74 $NaHCO_3$

*Note will repolish specimen for further testing

P.K. Shukla 05/24/05

[signature] 5/24/05


C22 CYLINDER HT#059902LL2
SOLUTION 0.5M NaCl + 0.74M NaHCO3
TEMP=95C pH= 7.53
C22P5NaClP74NaHCO3.cor
E (Volts)
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
10-15
10-14
10-13
10-12
10-11
10-10
10-9
10-8
10-7
10-6
10-5
10-4
10-3
I (Amps/cm2)

05/24/05

5/24/05

Cyclic Potentiostatic Test

Objective:

Specimen: C22 Cylinder plate D62X DOE - Base Alloy
Ht # 059902LL2

Initial Weight: 12.49078 **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.49102 **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION: 0.5 M NaCl + 0.74 m $NaHCO_3$
58.49 gm of NaCl Lot # 050089
124.38 gm of $NaHCO_3$ Lot # 044998
+ DI water to 2000 ml

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 7.81 **Model:** orion **SN:** 2330
Final pH: 9.67 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-/06
Cal: 4/27/05 **Due:** 4/27/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen

Ecorr: -306 mV **Model:** Keithley 617 **SN:** 537418
Ept: -69 mV **Cal:** 12/2/04 **Due:** 6/2/05

Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination: No visual sign of corrosion or pitting on the surface of specimen. ~~With~~ ~~Very~~ Surface Stains

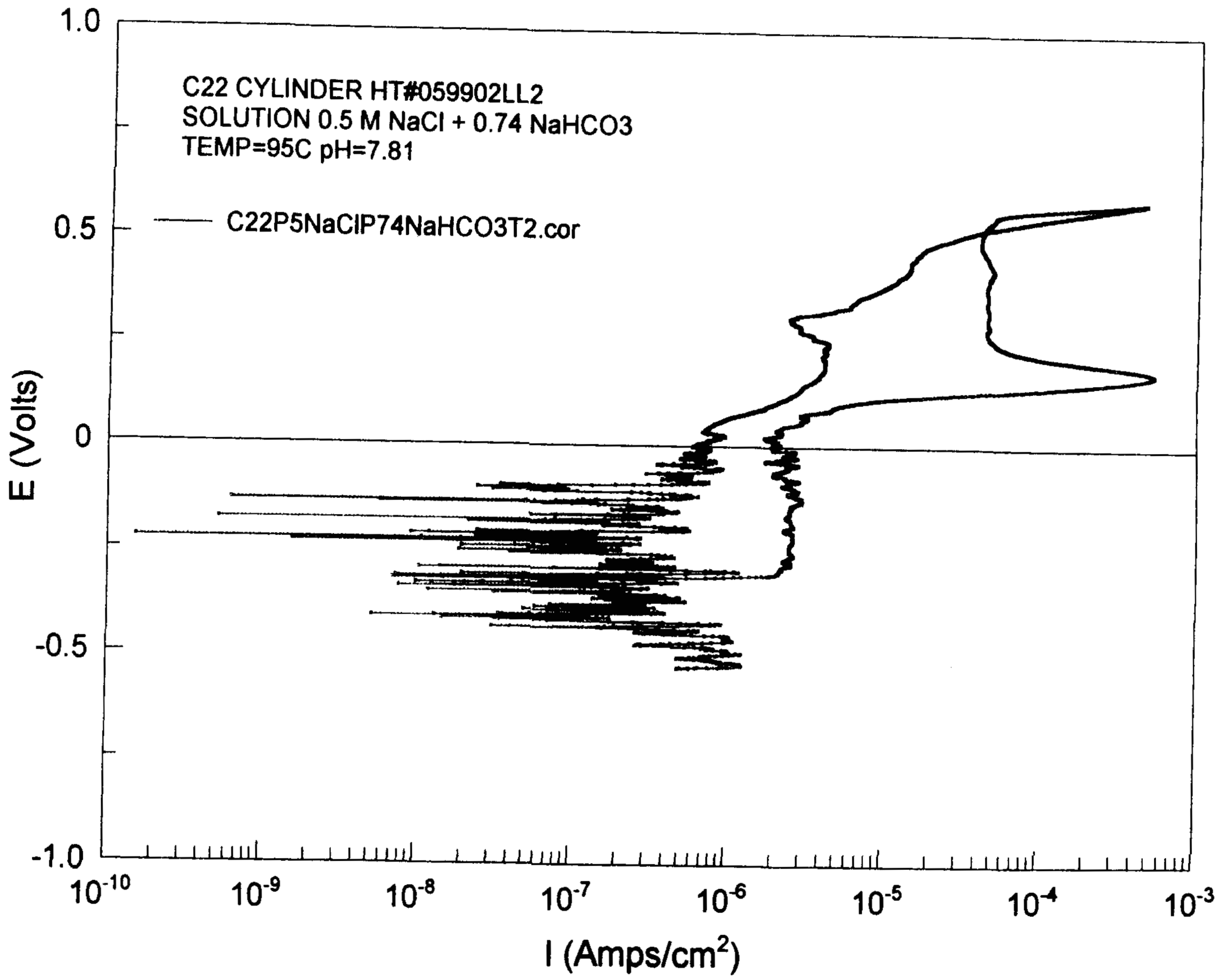
P.K. Shukla 5/25/05

P.K. Shukla 5/25/05

Data file: C22 P5 NaCl P74 $NaHCO_3$ T2

• Note will repolish specimen for further testing

P.K. Shukla
05/25/05



P. K. Shukla
05/25/05

T3 5/26/05
T4 5/26/05

Cyclic Potentiostatic Test

Objective:

Specimen: C22 Cylinder plate D62X D6F Bore Alloy
HT# 059902LL2

Initial Weight: 1.299670 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.926804 g **Cal** 05/11/05 **Due:** 11/11/05

SOLUTION: 0.5 m NaCl + 0.74 m $NaHCO_3$
58.46 gr g NaCl lot # 050089
124.37 ~~125.37~~ gr g $NaHCO_3$ lot # 044998
+ DI Water to 2000 ml
(I.K. Shukl 08/7/05)

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 7.78 **Model:** orion **SN:** 233°
Final pH: 9.23 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-06
Cal: 4/27/05 **Due:** 4/27/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 006619

Gas: 99.999% Nitrogen
Ecorr: -361 mV **Model:** Keithley 617 **SN:** 537418
Ept: -59 mV **Cal:** 12/2/04 **Due:** 6/2/05

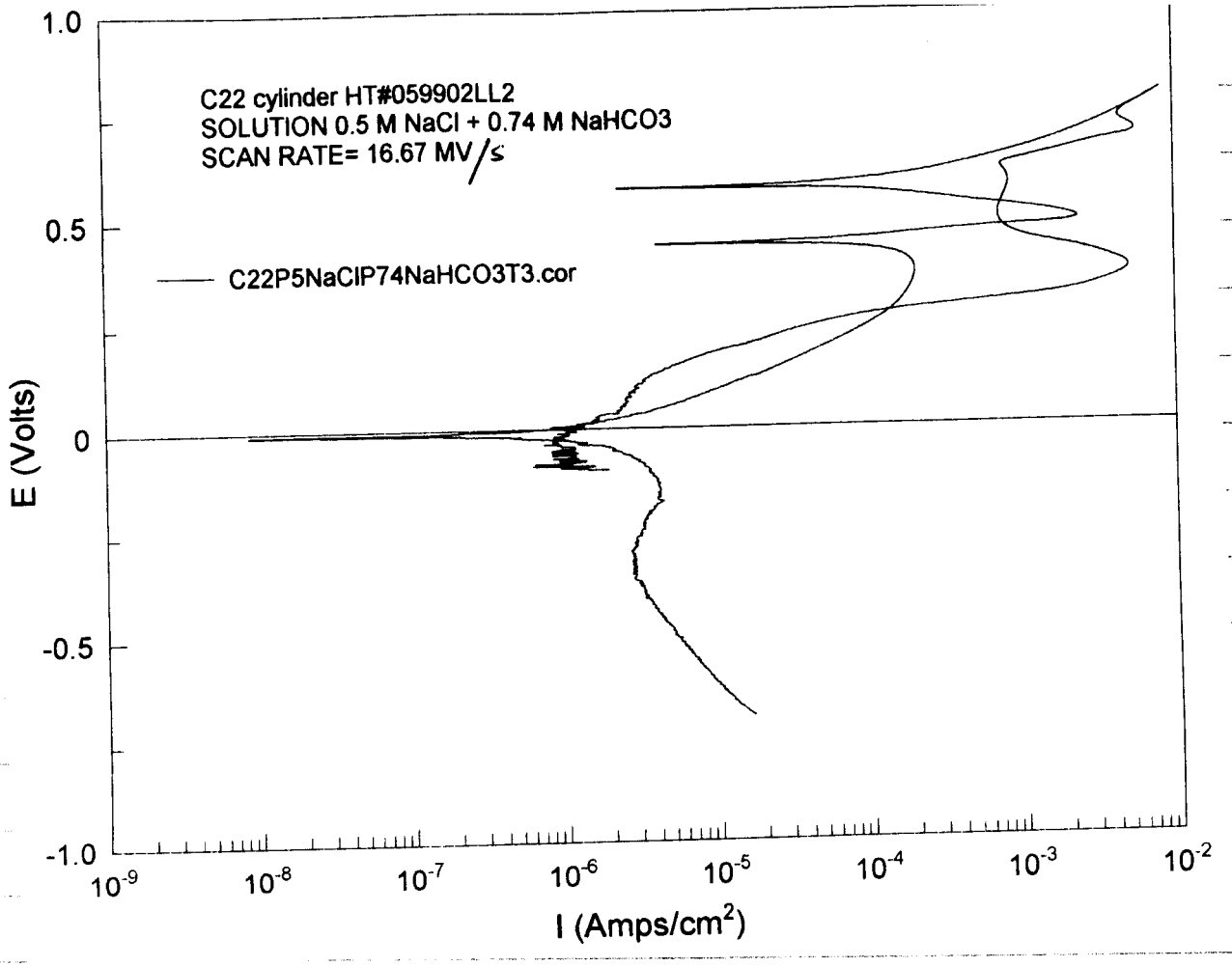
Potentiostat: EG&G 263A **SN#** 66105

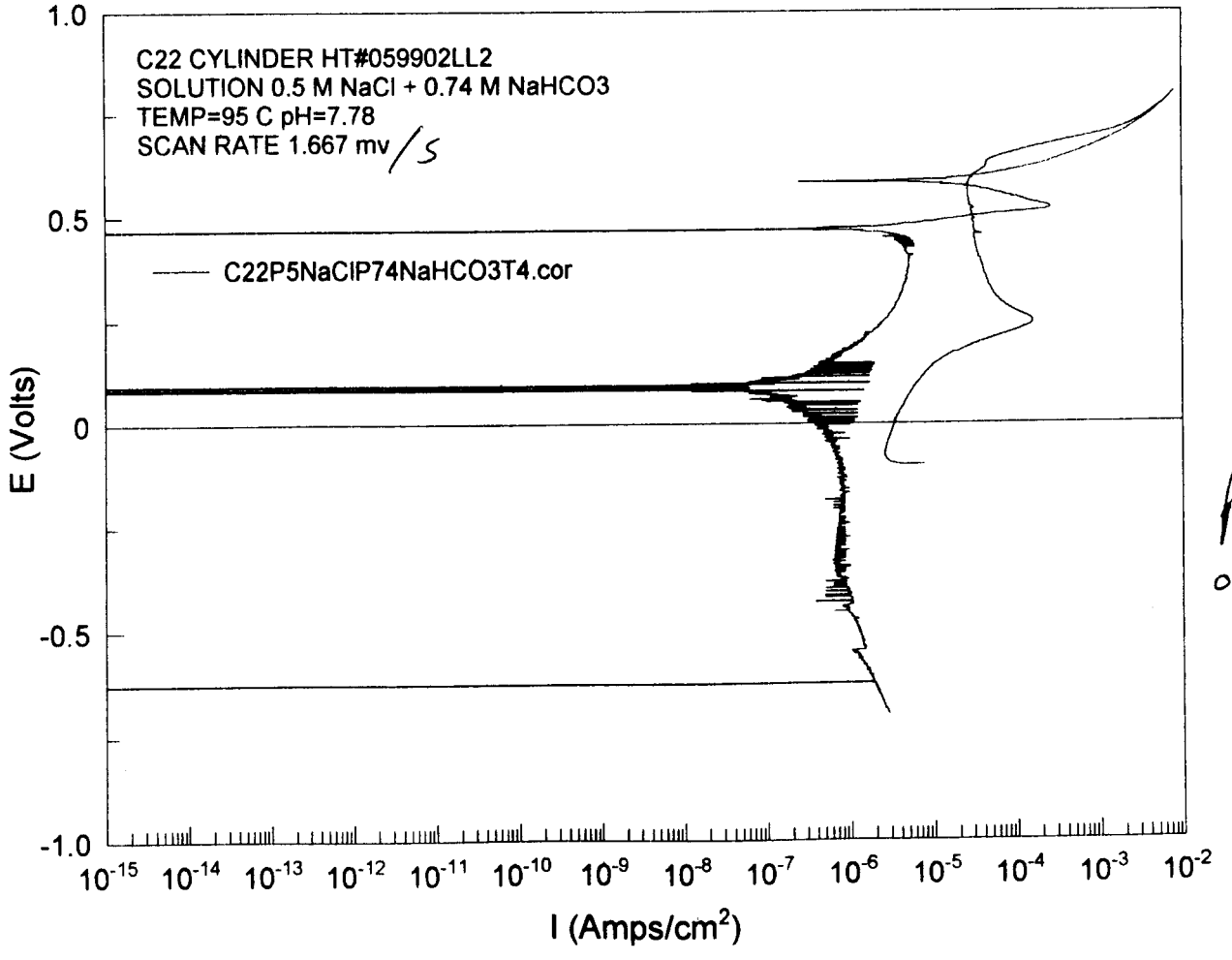
Specimen Examination: No usual signs of corrosion or pitting.

Data file: C22PS NaCl P74 NaHCO3 T3
C22PS NaCl P74 NaHCO3 T4

Note: Will refabish specimen for further testing.

I.K. Shukl
08/08/05





P.K. Shukla
01/06/05

P. K. Shukla T5 5/27/05
(8/9/05) T6 5/27/05

Cyclic Potentiostatic Test

Objective: Two Scan rate (166.70 mv/sec & 16.67 mv/sec) for C22 in Solution. (0.5 m NaCl + 0.74m $NaHCO_3$)

Specimen: C22 cylinder plate D62X DOE Base Alloy
HT # 059902LL2

Initial Weight: 12.42665 gm **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.42655 gm **Cal** 05/11/05 **Due:** 11/11/05

SOLUTION: 0.5 M NaCl + 0.74 $NaHCO_3$
58.45 gm of NaCl Lot # 050089
124.38 gm of $NaHCO_3$ Lot # 044998

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 7.81 **Model:** orion **SN:** 2330
Final pH: 9.02 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196P16

TEST TEMPERATURE: 95°c **Measured with Hg Thermometer SN:** C98/06
Cal: 4/27/05 **Due:** 4/27/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 006611 9

Gas: 99.999% Nitrogen
Ecorr: -463 mV **Model:** Keithley **SN:** 0579628
Ept: -210 mV **Cal:** Sep 15,04 **Due:** Sep 13,05

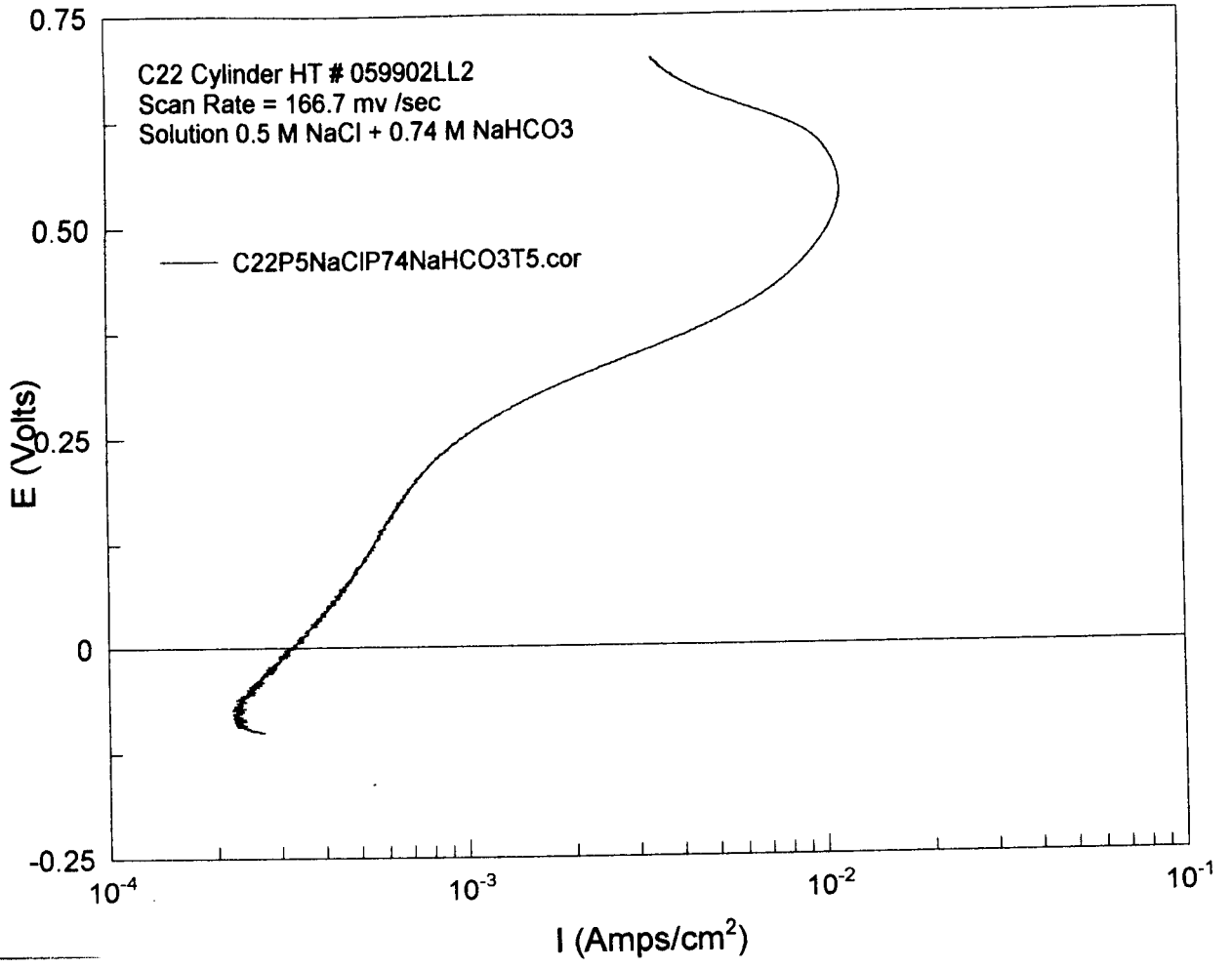
Potentiostat: EG&G 263A **SN#** 66105

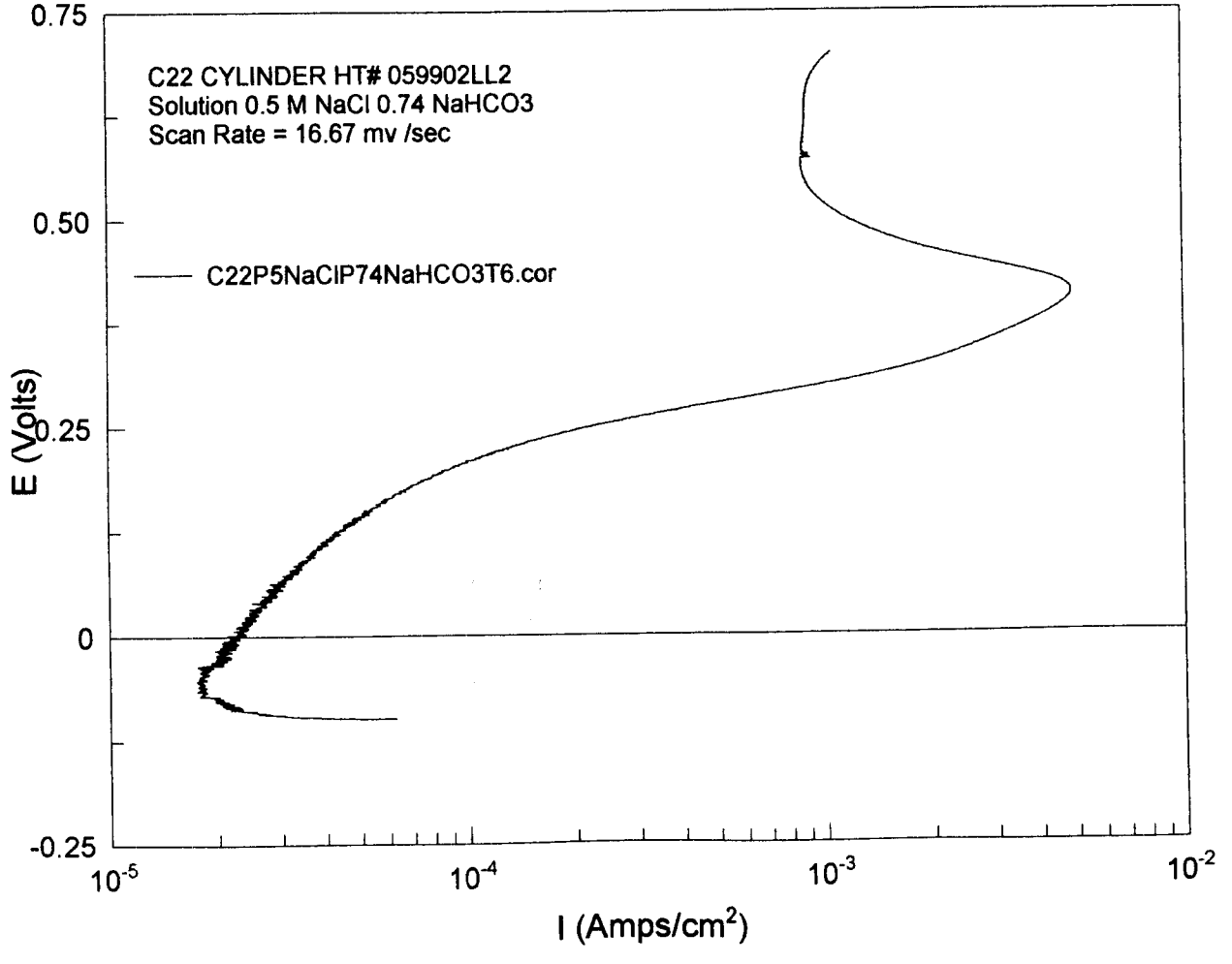
Specimen Examination: No initial Sign of pitting or Corrosion

Data files. C22P5NaCl P5NaHCO3 T5
C22 P5 NaCl P5 NaHCO3 T6

specimen re-polished
for re-use

P. K. Shukla
06/01/05





P.K Shukla
06/01/05

5/27/05

P. K. Shukla (8/8/05)

Cyclic Potentiostatic Test

Objective: Forward Potentodynamic ~~static~~ test at the scan rate of 1.667 mV/sec.

Specimen: C22 cylinder plate D62X DOE Base Alloy HT # (05990 2LL2)

Initial Weight: 12.90072gm **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.90096gm **Cal** 05/11/05 **Due:** 11/11/05

SOLUTION: USCO Same Solution per testing on Pg #10
0.5m NaCl + 0.74m $NaHCO_3$

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: **Due:**

Initial pH: **Model:** orion **SN:**
Final pH: **CAL:** **DUE:**
pH Probe: #13-620-296 **SN:**

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98/06
Cal: 4/27/05 **Due:** 4/27/06

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

Gas: 99.999% Nitrogen
Ecorr: -694 mV **Model:** Keithley **SN:** 0579628
Ept: -344 mV **Cal:** Sep 15,04 **Due:** Sep 13,05

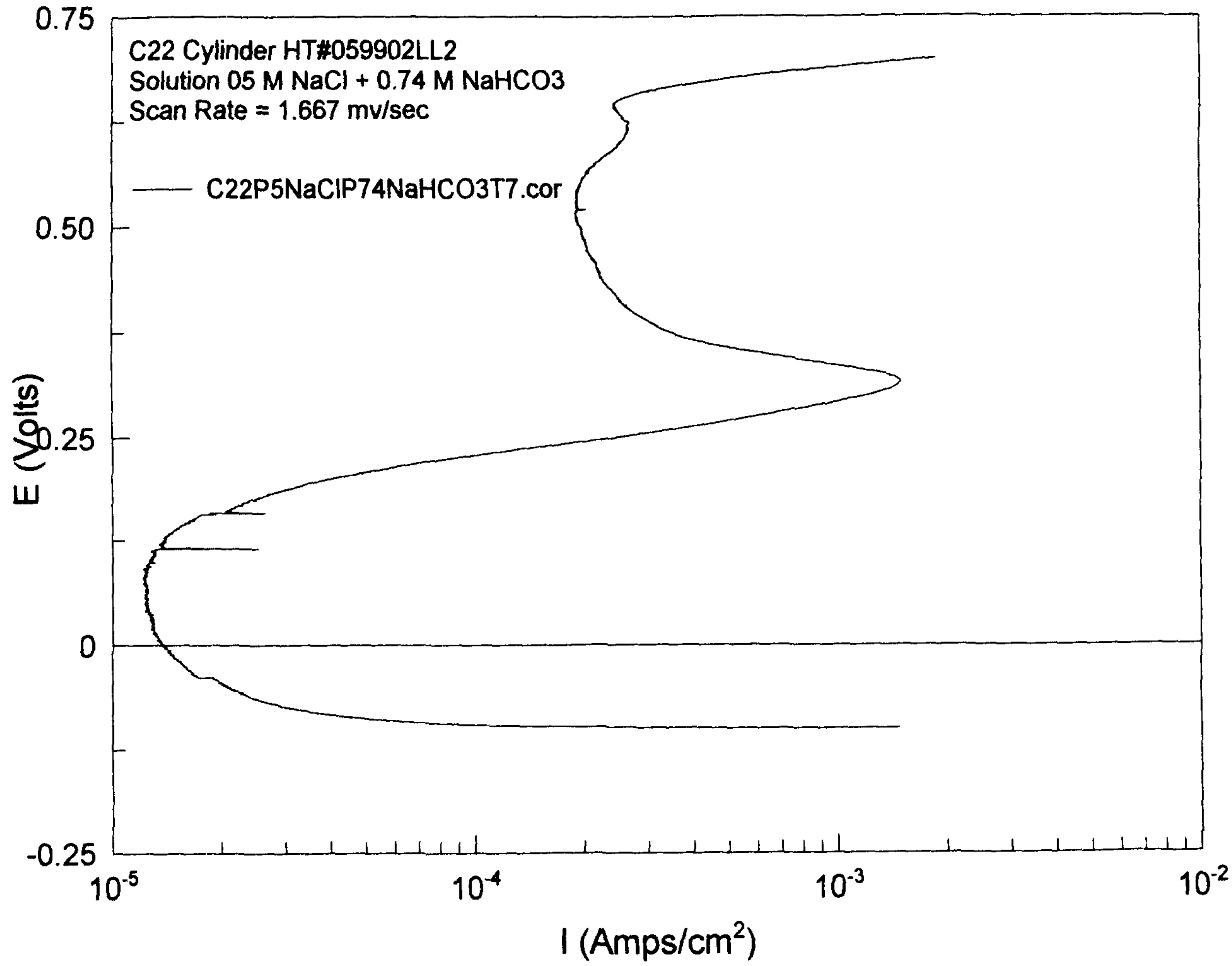
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:

Data File: C22PSNaClP74NaHCO3T7cor

specimen re-polished for re-use

P. K. Shu 06/01



P.K. Shukla
06/01/05

P.K. Stucki (8/8/05)

5/27/05

Cyclic Potentiostatic Test

Objective: forward ~~Potentiostatic~~ Potentiodynamic test at the 8cm rate of 0.1667 mV/sec

Specimen: C22 cylinder plate D62X DoE Base Alloy (HT#059902LL2)

Initial Weight: 12.4052 9 gr **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.40552 gm **Cal** **Due:**

SOLUTION: Used same solution per testing on page # 10

0.5 M NaCl + 0.74 M NaHCO3

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: **Due:**

Initial pH: **Model:** orion **SN:**
Final pH: **CAL:** **DUE:**
pH Probe: #13-620-296 **SN:**

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98/06
Cal: 4/27/05 **Due:** 4/27/06

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

Gas: 99.999% Nitrogen
Ecorr: -620 mV **Model:** Keithley **SN:** 0579628
Ept: -204 mV **Cal:** Sep 15,04 **Due:** Sep 13,05

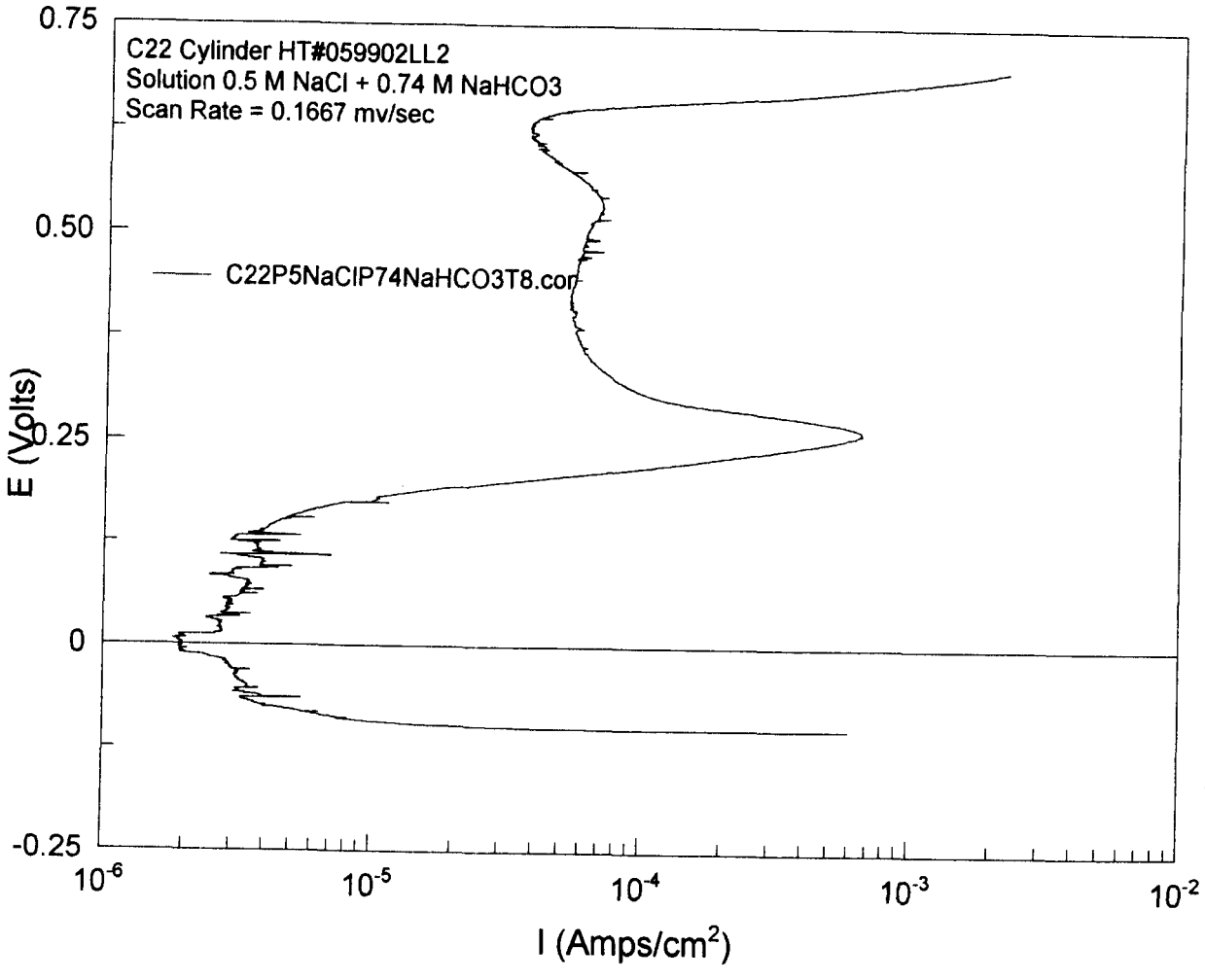
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination: No visual sign of pitting or Corrosion

Data file: C22P5NaClP74NaHCO3T8cm

specimen re-polished for re-use

P.K. Stucki 06/01/05



P.K. Shukla
04/01/05

6/2/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE Base Alloy HT # 05990211 2

Initial Weight: 12.87592 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.87567 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION: 0.5M NaCl + 0.74M Na_2CO_3 x 2L

NaCl 58.44 g LOT 050089
Na_2CO_3 156.865 g LOT 028087

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 11.27 **Model:** orion **SN:** 2330
Final pH: 11.12 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065796 P 16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 4/27/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen
Ecorr: -414 mV **Model:** Keithley 617 **SN:** 537418
Ept: -195 mV **Cal:** 5/27/05 **Due:** 11/25/05

Potentiostat: EG+G 263A **SN#** 66105

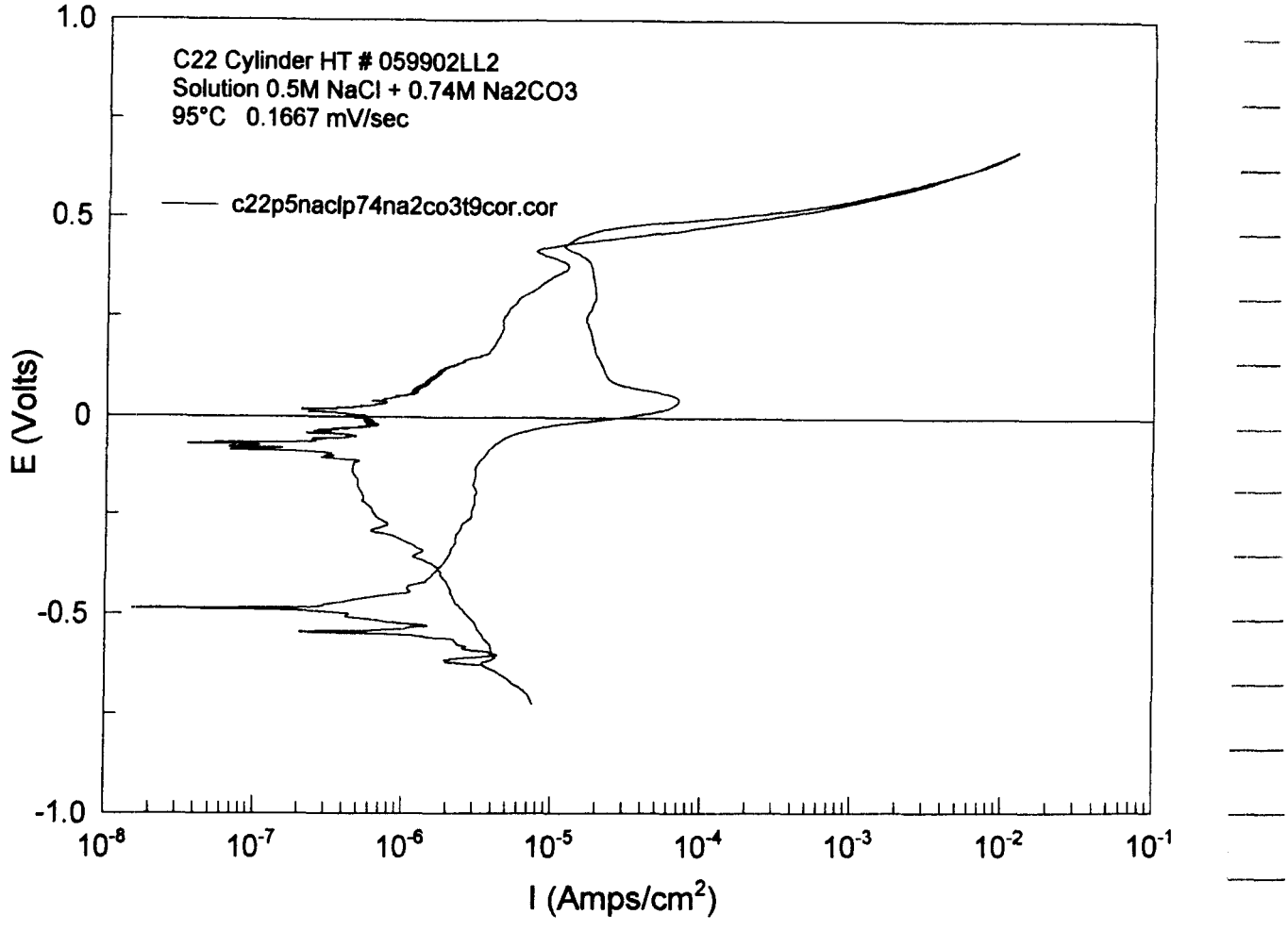
Specimen Examination:

unremarkable

data file: C22PSNaCl P74Na2CO3T 9 cor

specimen re-polished for re-use

Walter J. MacDowell 6/5/05



Walter J. Mackerle
6/3/05

6/3/05

Cyclic Potentiostatic Test

Objective: CPP test on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62x DOE Base Alloy HT# 05990211 2

Initial Weight: 12.39483 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.39461 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION: 0.5M NaCl pH adj to 10.00 w/NaOH
NaCl 58.46 g Lot # 045904
NaOH ~0.1N g Lot # 033972 drops added to adj pH

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 9.18 adj 10.05 **Model:** orion **SN:** 2330
Final pH: 9.53 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196 P1L

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 4/27/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen

Ecorr: −393 mV **Model:** Keithley 617 **SN:** 5-37418
Ept: −71 mV **Cal:** 5/27/05 **Due:** 11/25/05

Potentiostat: EG+G 263A **SN#** 66105

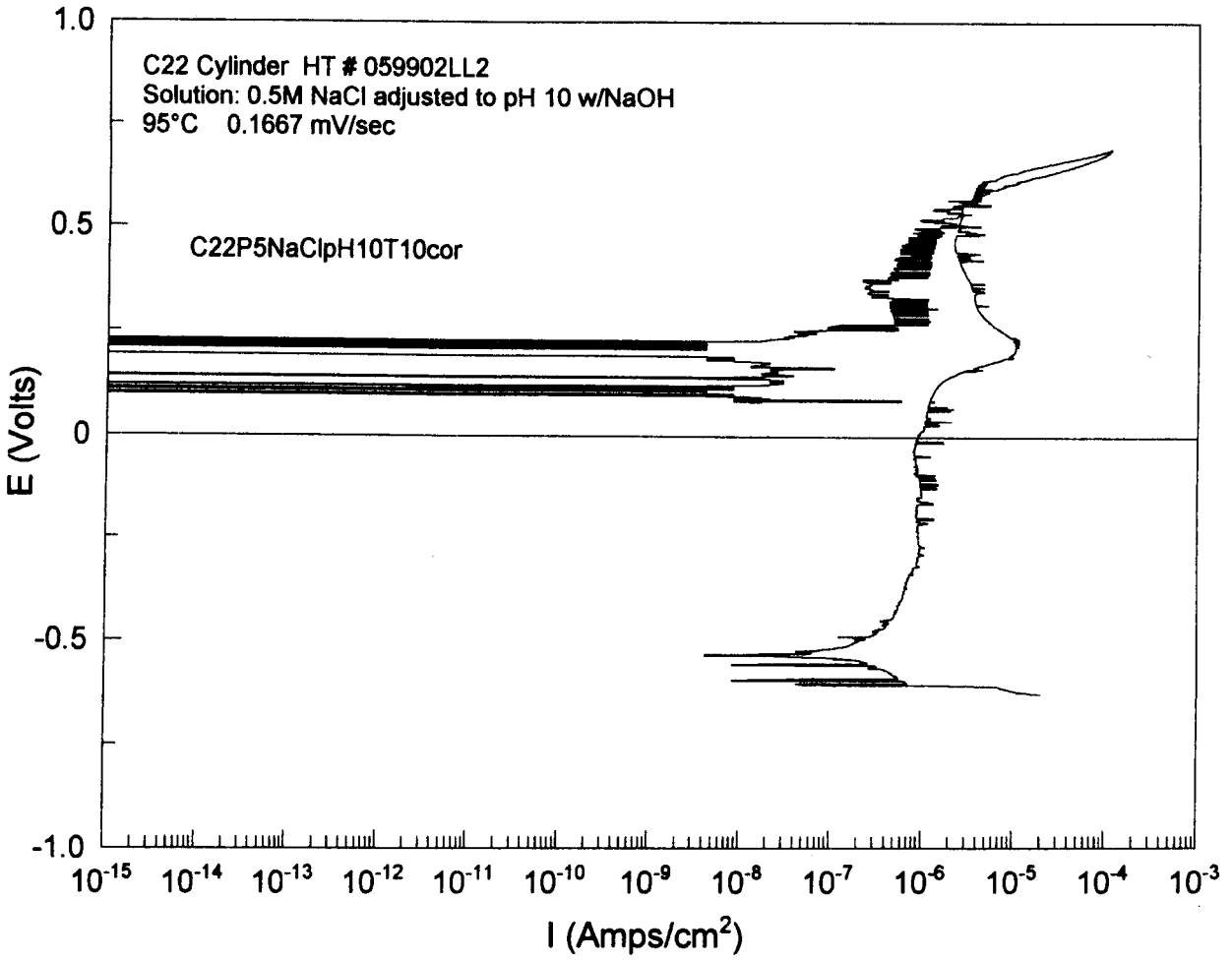
Specimen Examination:

unremarkable

C22 P5 NaCl pH10 T10 cor

specimen re-polished for re-use

H. Litz J. Markworth 6/6/05



Walter J. MacLaughlin
6/3/05

~~1~~ 20

6/6/05

Cyclic Potentiostatic Test

Objective: CPP at 0.01667 mV/sec

Specimen: C22 cylinder plate D62X DOE Base Alloy HT # 059902LL2

Initial Weight: 12.87375 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.90705 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

NaCl 58.42g Lot # 045 914 ∝ 2L
$NaHCO_3$ 124.32g Lot # 044998

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 7.69 **Model:** orion **SN:** 2330
Final pH: 9.32 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 406196 P1 L

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 4/27/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen

Ecorr: −455 mV **Model:** Keithley 617 **SN:** 597418
Ept: +74 mV **Cal:** 5/27/05 **Due:** 11/25/05

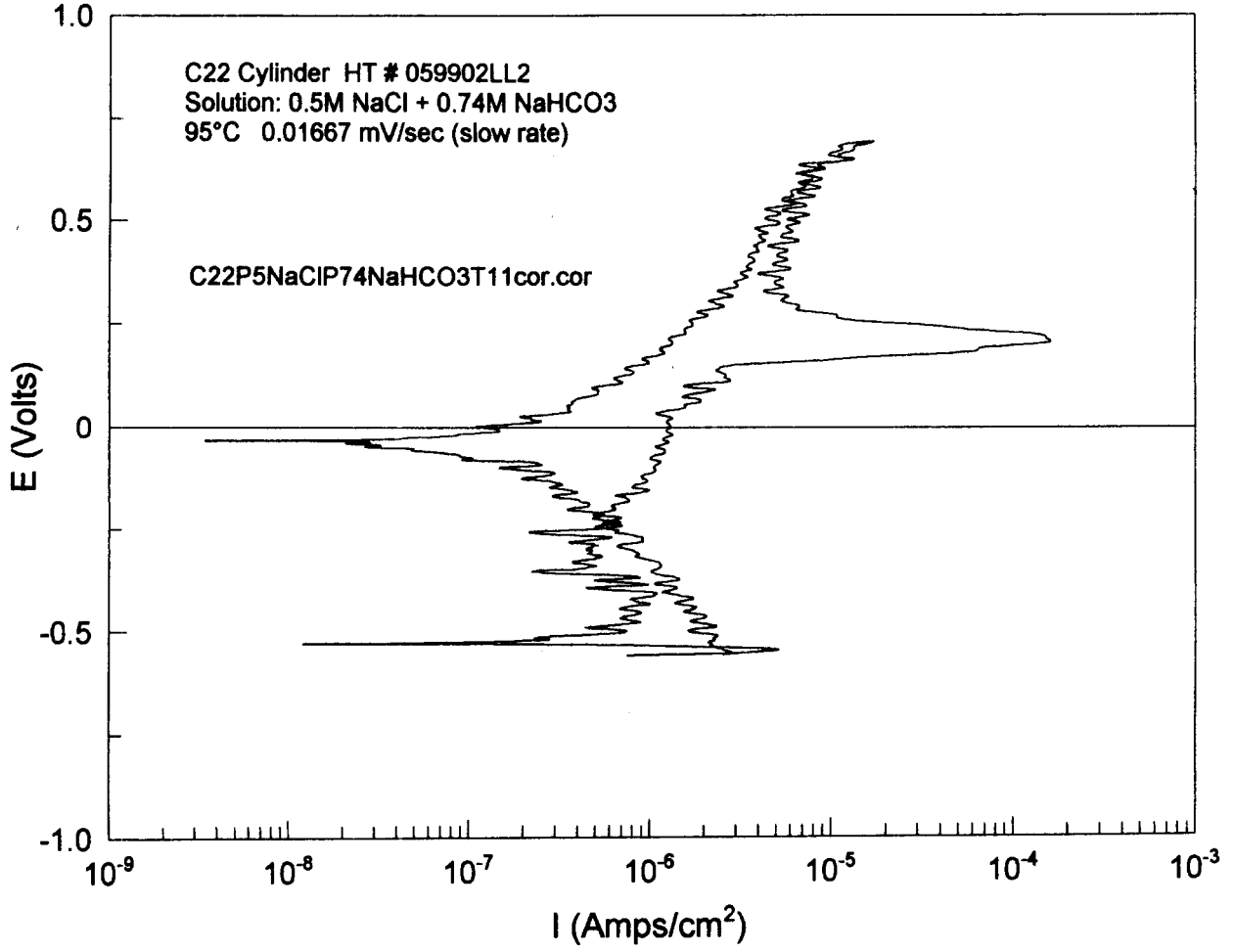
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:

slight bluish tint on specimen

data file: C22P5NaCl P74NaHCO3T11.cor
specimen re-polished
for re-use

Walter J. Mackerle



Walter J. Mackerle
6/6/05

6/6/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in chloride, carbonate + fluoride

Specimen: C22 cylinder plate D62x DOE Base Alloy HT # 05990222-2

Initial Weight: 12.37793 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.37770 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

0.5M NaCl	NaCl	58.44 g	Lot # 045904	} x 2 L
0.37M Na_2CO_3	Na_2CO_3	78.45 g	Lot # 028087	
0.35M $NaHCO_3$	$NaHCO_3$	62.19 g	Lot # 028924	

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 9.42
Final pH: 9.47
Model: orion 04 agm **SN:** 2330
CAL: 7/21/05 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196 P1L

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C96-106
Cal: 4/27/05 **Due:** 4/27/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen

Ecorr: -332 mV **Model:** Keithley 617 **SN:** 5370418
Ept: +98 mV **Cal:** 5/27/05 **Due:** 11/25/05

Potentiostat: EG&G 263A **SN#** 66105

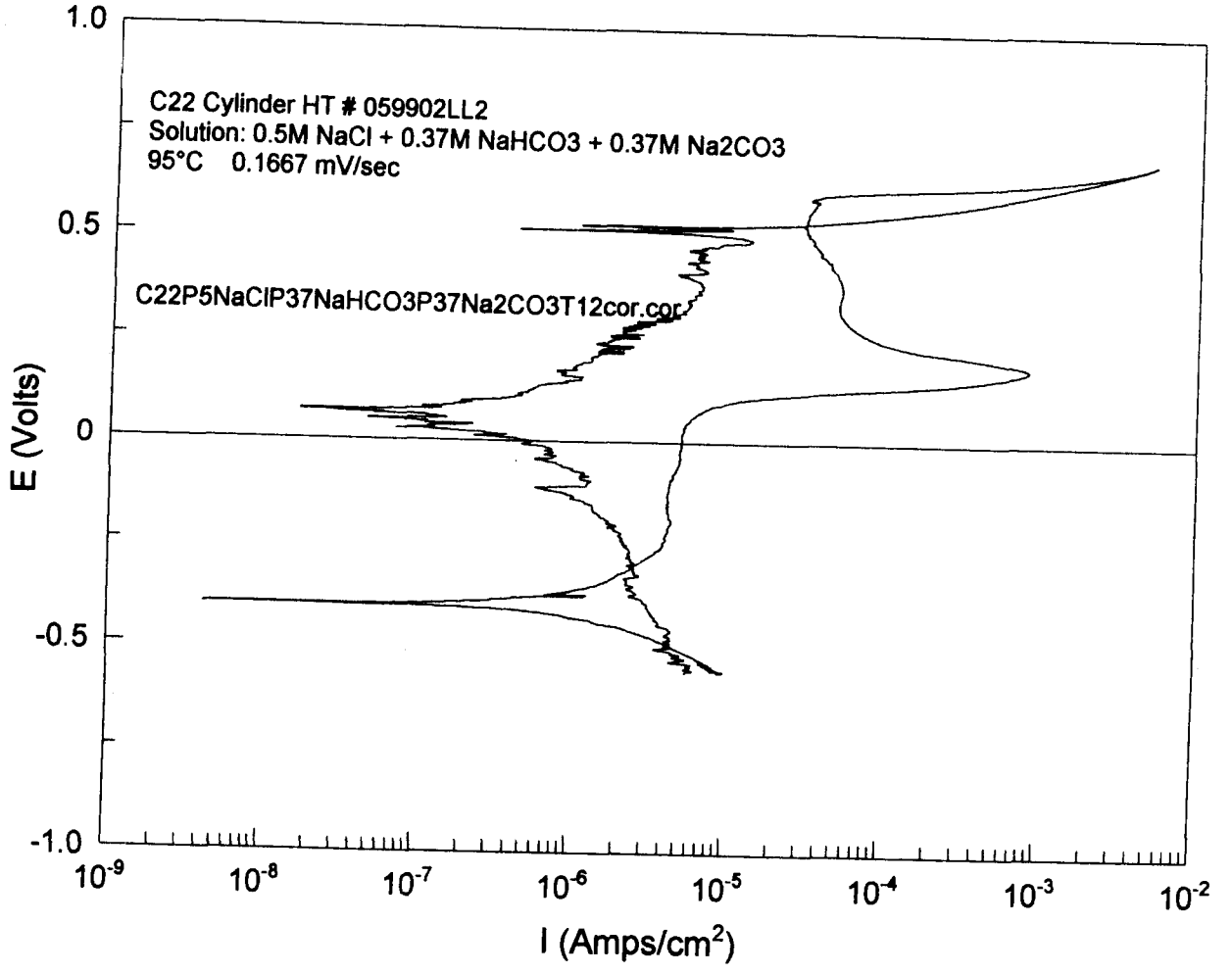
Specimen Examination:

slightly dull - unremarkable

data file: C22P5NaClP37NaHCO3P37Na2CO3T12.cor

specimen re-polished for re-use

Walter J. Mackowiak
6/7/05



Walter J. MacIntyre
6/7/05

6/7/05

Cyclic Potentiostatic Test

Objective: CP of alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE base alloy HT# 05990211 2

Initial Weight: 12.85719 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.85752 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

(0.5M) NaCl 58.43g Lot# 045904 x2L
(0.555M) $NaHCO_3$ 93.24 g " 028924
(0.185M) Na_2CO_3 39.24 g " 028087

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 8.97 **Model:** orion **SN:** 2330
Final pH: 9.13 **CAL:** 7/21/04 **DUE:** 7/21/06
pH Probe: #13-620-296 **SN:** 406196 PIL

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 4/27/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 066119

Gas: 99.999% Nitrogen
Ecorr: -548 mV **Model:** Keithley 617 **SN:** 5-37418
Ept: +100 mV **Cal:** 5/27/05 **Due:** 11/25/05

Potentiostat: EG+G 263A **SN#** 66105

Specimen Examination:

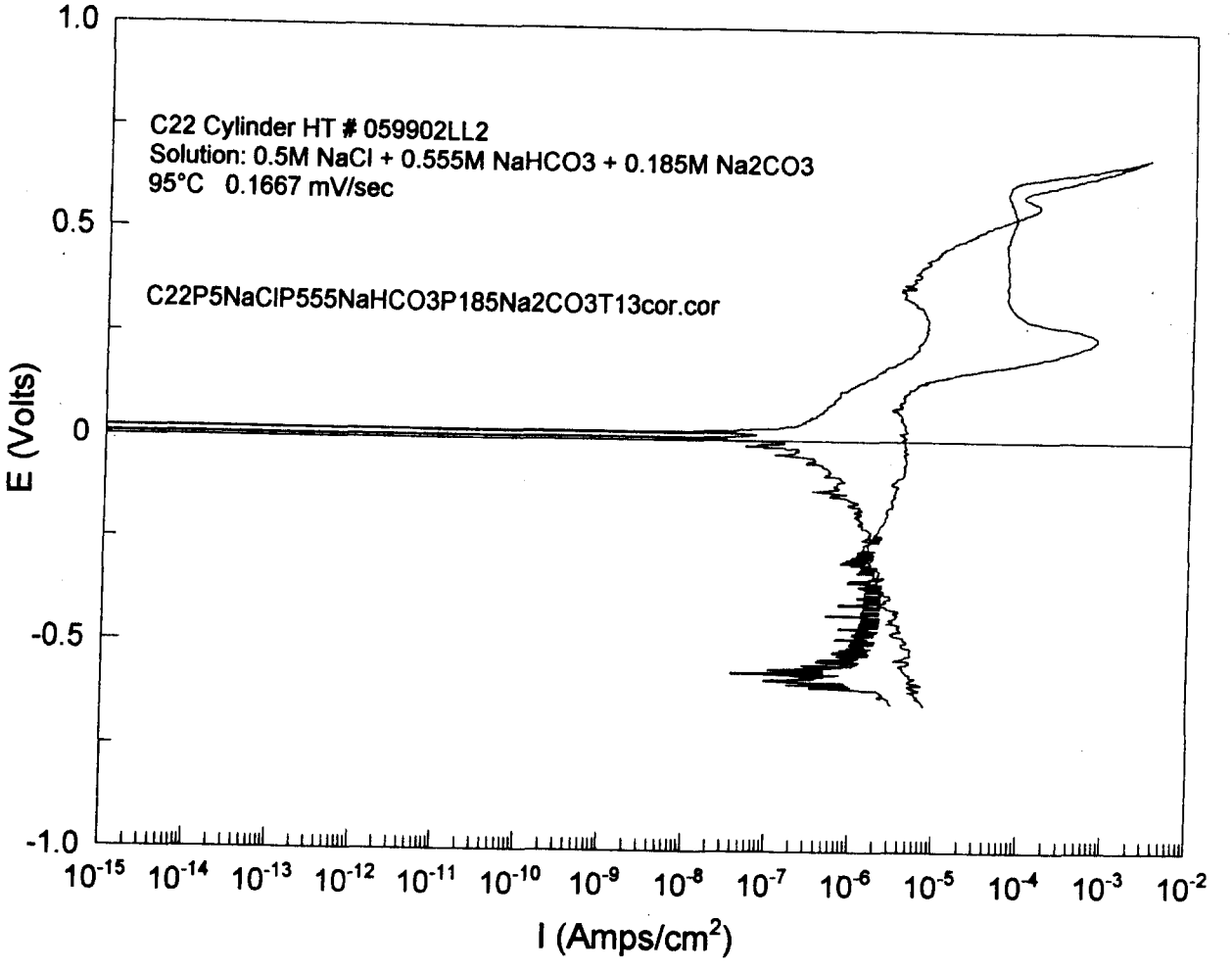
very slight powdery film

data file: C22P5NaCl P55NaHCO3P185Na2CO3

specimen re-polished for re-use

T13 ca

Walter J. MacKenzie
6/7/05



Walter J. Mackerras
6/8/05

6/7/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62 x DOE base alloy HT # 05-9902LL 2

Initial Weight: 12.36510 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.36318 g **Cal** 5/11/05 **Due:** 11/4/05

SOLUTION:

2.0M NaCl 233.25g Lot # 045904 x 2L
0.38M $NaNO_3$ 64.61g Lot 020809

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 5.09 **Model:** orion **SN:** 2330
Final pH: 7.91 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 4/27/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen
Ecorr: -318 mV **Model:** Keithley 617 **SN:** 537418
Ept: +142 mV **Cal:** 5/27/05 **Due:** 11/25/05

Potentiostat: EG&G 263A **SN#** 66105

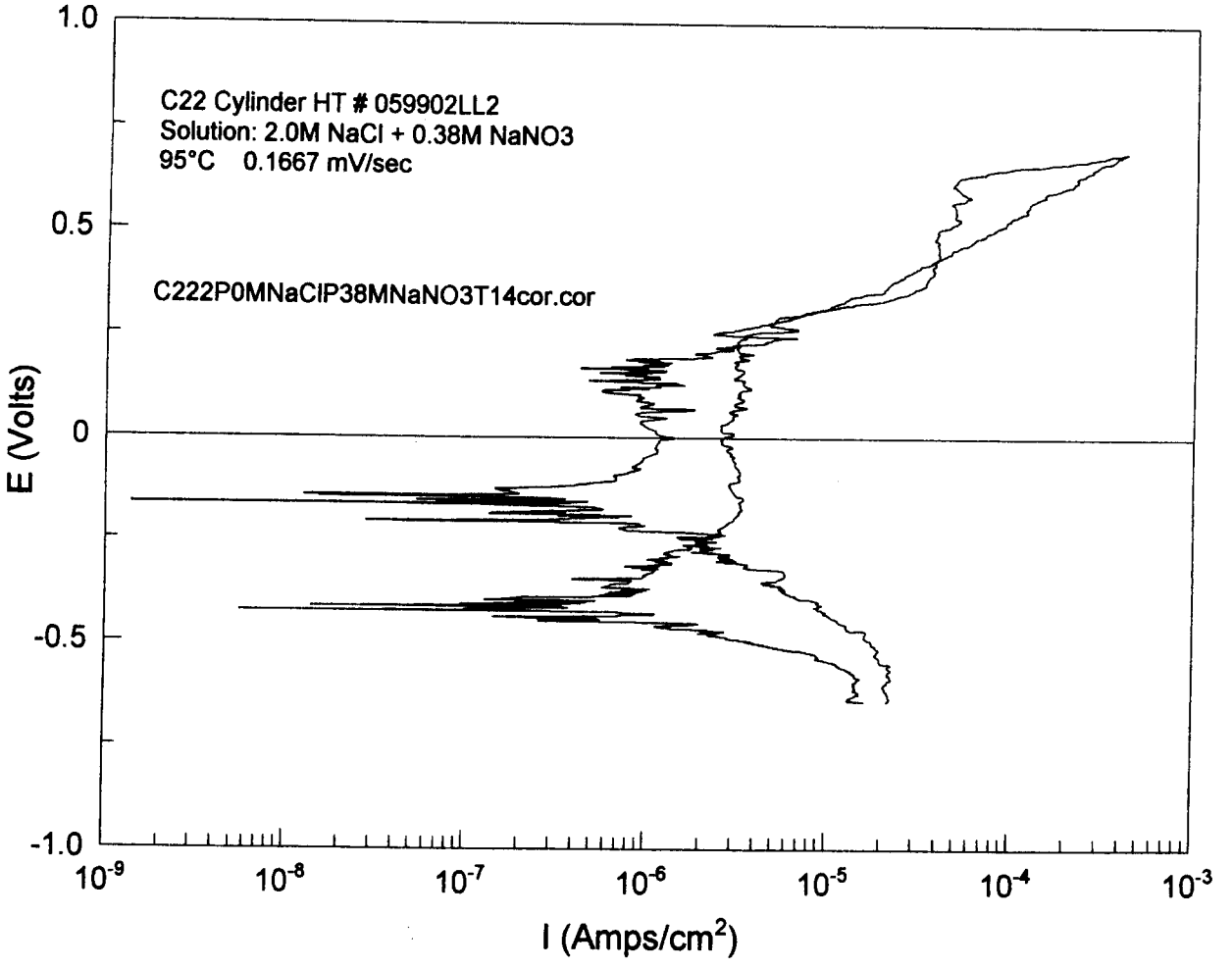
Specimen Examination:

very slight stain & slight film

data file: C222POMNaCl38MNaNO3T14cor

specimen re-polished
for re-use

Walter J. Markham
6/6/05



Walter J. Mackowski
6/8/05

6/8/05

Cyclic Potentiostatic Test

Objective: CPP test on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE base alloy HT# 05990222 2

Initial Weight: 12.83986 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.83997 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

NaCl 350.72 g Lot # 045904 ~ 2L
$NaHCO_3$ 50.44 g Lot 028924

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 7.43 **Model:** orion **SN:** 2330
Final pH: 8.66 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196 P 16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 4/27/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen
Ecorr: -235 mV **Model:** Keithley 617 **SN:** 537418
Ept: +25 mV **Cal:** 6/27/05 **Due:** 11/26/05

Potentiostat: EG&G 263A **SN#** 66105

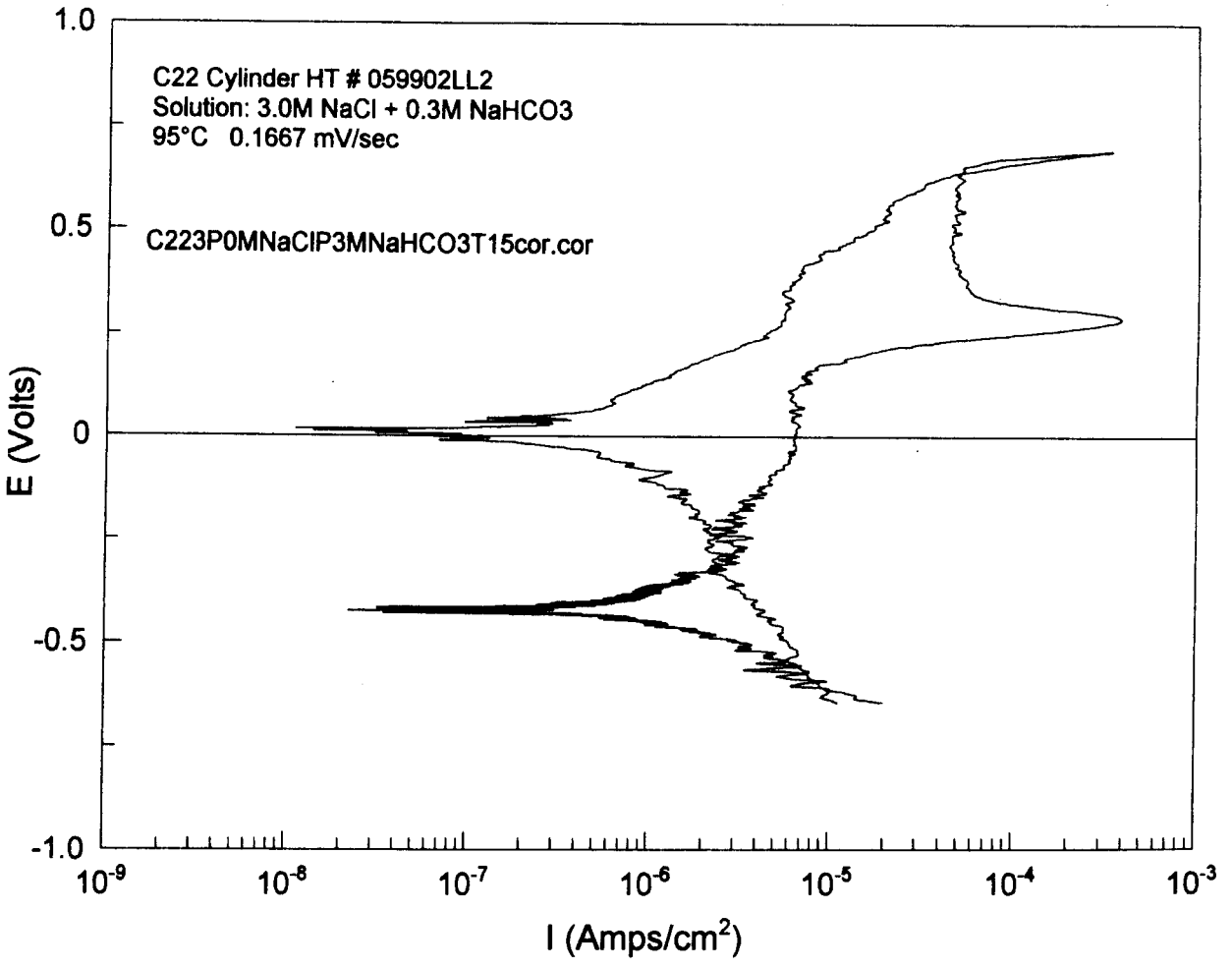
Specimen Examination:

unremarkable

specimen re-polished for re-use

data file: C22 3POMNaCl P3M NaHCO3T 15 cor

Walter D Mackowski
6/10/05



Walter J. Machovina
6/10/05

6/8/05

Cyclic Potentiostatic Test

Objective: CPP test on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62x DOE base alloy HT # 05990222 2

Initial Weight: 12.34960 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.35375 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

NaCl 350.70 g Lot # 045904 x 2L
Na_2CO_3 63.53 g Lot 028087

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 10.62 **Model:** orion **SN:** 2330
Final pH: 10.51 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196 p 16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 4/27/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 006611 9

Gas: 99.999% Nitrogen
Ecorr: -411 mV **Model:** Keithley 617 **SN:** 537418
Ept: +24 mV **Cal:** 5/27/05 **Due:** 11/25/05

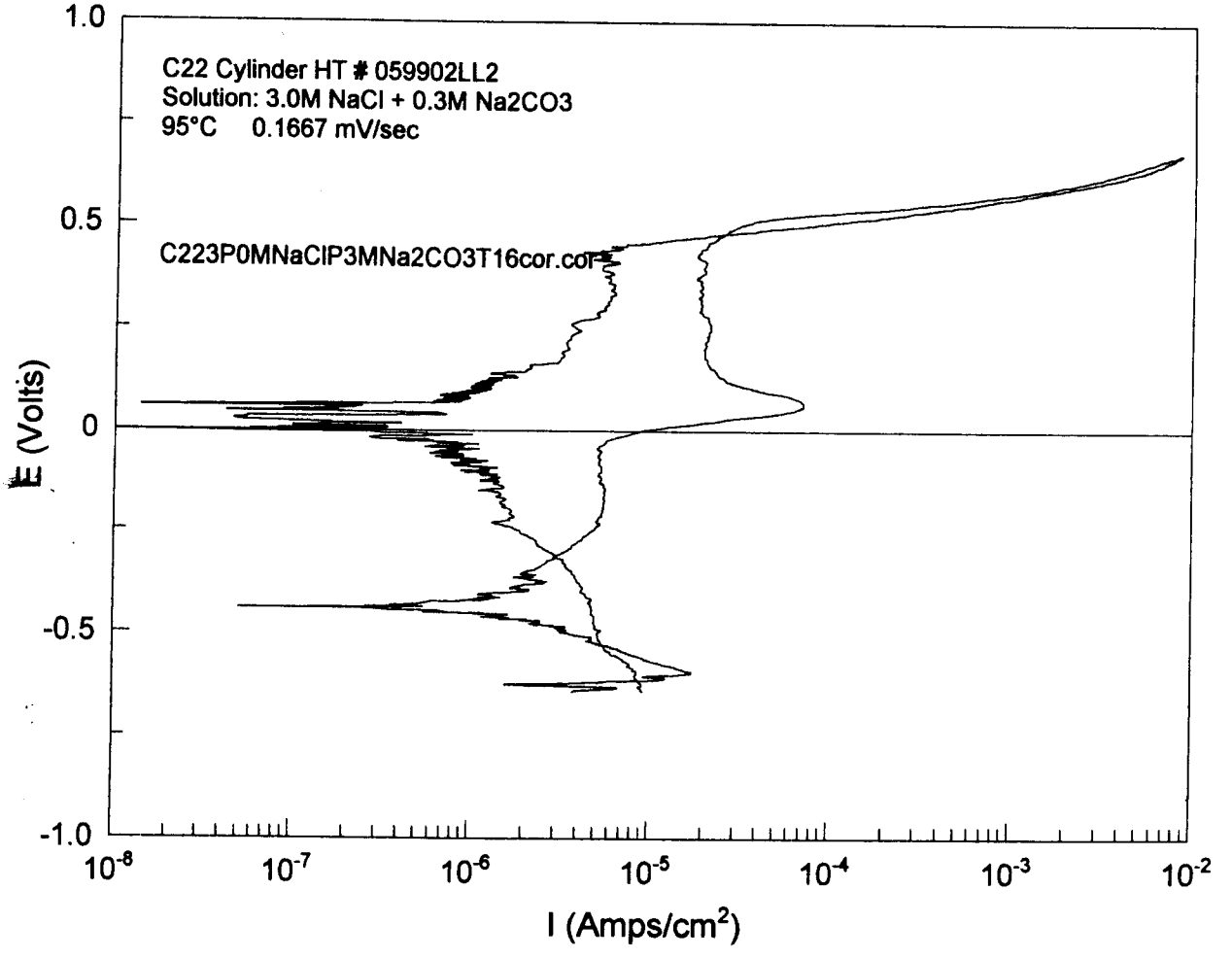
Potentiostat: EG+G 263A **SN#** 66105

Specimen Examination:

unremarkable specimen re-polished for re-use

data file: C223POMNaCl P3MNa2CO3T16 cv

Walter J. Mackowiak
6/13/05



Walter J. Machowski
6/13/05

6/9/05

Cyclic Potentiostatic Test

Objective: CPP test on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62x D05 base alloy HT# 059902LL2

Initial Weight: 12.83919 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.83969 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

NaCl 116.79 g Lot #045904 x 2L
$NaHCO_3$ 8.412 g Lot 028924

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 7.84 **Model:** orion **SN:** 2330
Final pH: 8.92 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 406196 P 16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/05

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen
Ecorr: −305 mV **Model:** Keithley 617 **SN:** 533418
Ept: +105 mV **Cal:** 5/27/05 **Due:** 11/25/05

Potentiostat: EG&G 263A **SN#** 66105

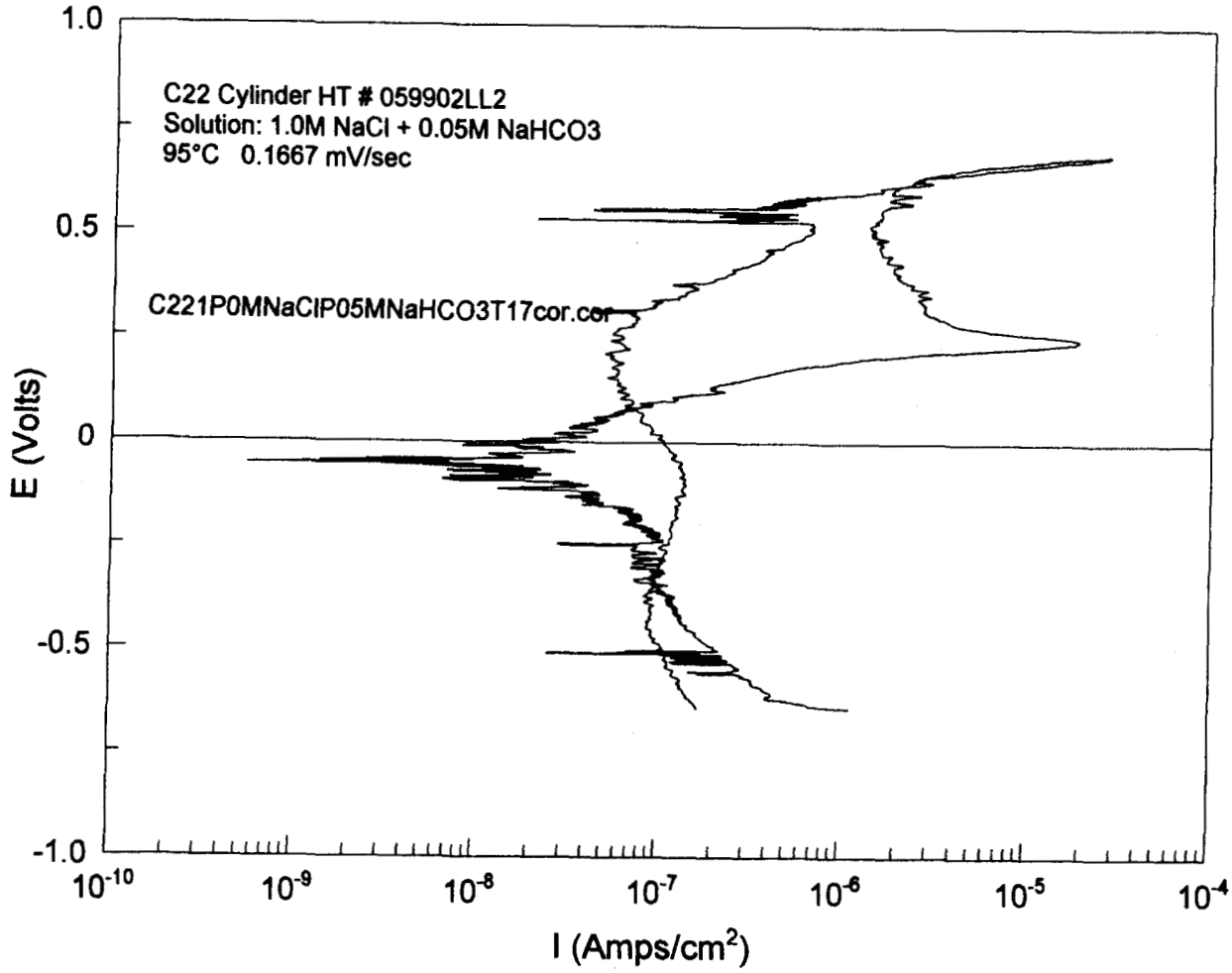
Specimen Examination:

specimen re-polished for re-use

very slight stain

data file: C221POMNaClPOSNaHCO3T17.cor

Walter D. Mackenzie
6/14/05



Walter J. Machowski
6/14/05

6/9/05

Cyclic Potentiostatic Test

Objective: CPP Test on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62x DOE base alloy HT # 05990222 2

Initial Weight: 12.34334 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.34370 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

NaCl 116.85 g LOT # 045904 x 2 L
$NaHCO_3$ 50.39 g LOT 028924

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 7.61 **Model:** orion **SN:** 2330
Final pH: 9.04 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 406596 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/05

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen
Ecorr: -342 mV **Model:** Keithley 617 **SN:** 537418
Ept: +176 mV **Cal:** 5/27/05 **Due:** 11/25/05

Potentiostat: EG+G 263A **SN#** 66105

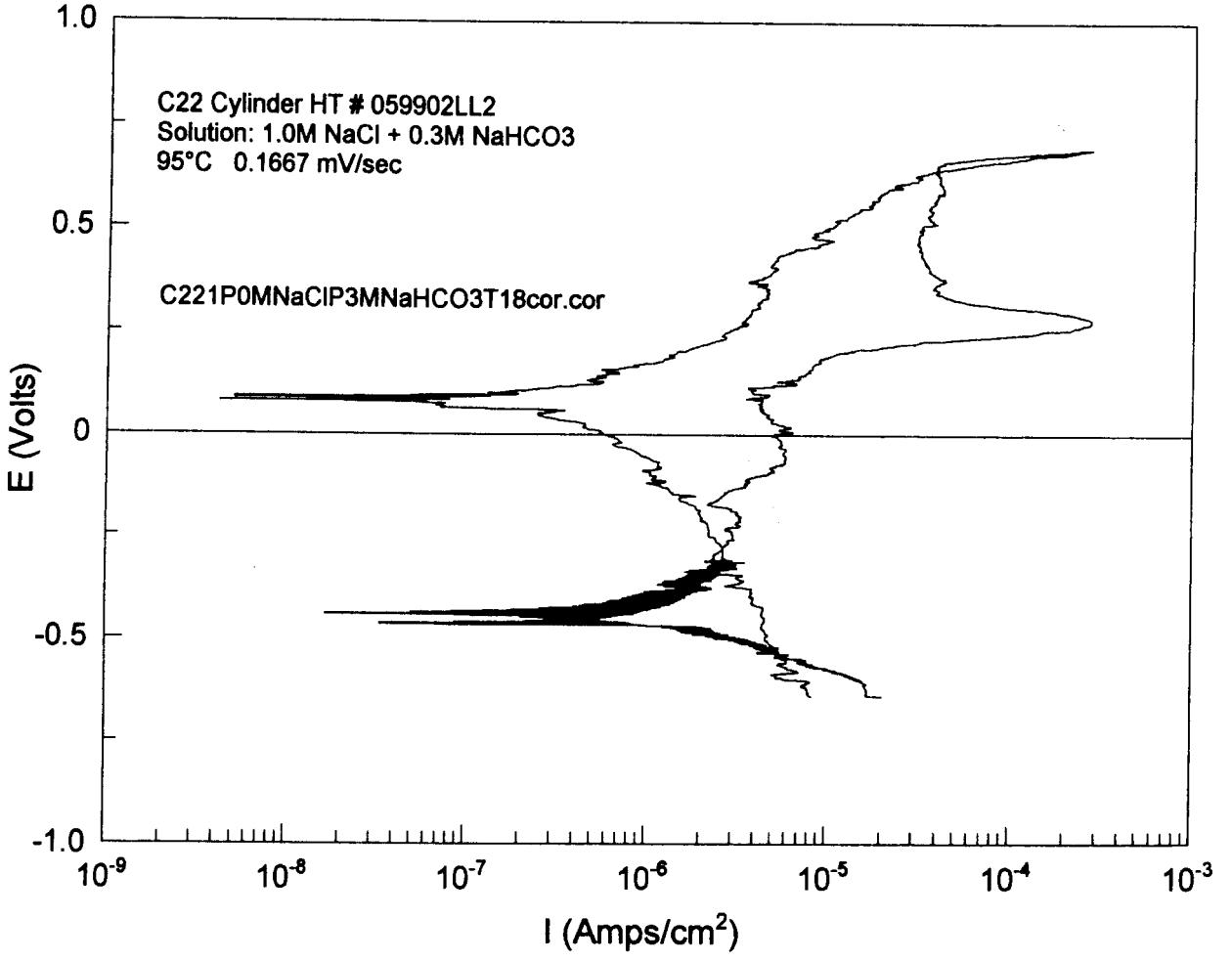
Specimen Examination:

specimen re-polished for re-use

slightly dull finish

data file: C221POMNaCl P3MNaHCO3T18 cor

Walter J. Markowski
6/14/05



Walter J. Mackowski
6/14/05

6/10/05

Cyclic Potentiostatic Test

Objective: CPP test on alloy 22 in various Chemistries

Specimen: C22 cylinder plate D62X DOE base alloy HT # 05990222 2

Initial Weight: 12.83190 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.83165 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

NaCl 116.94 g Lot # 045904 x 2L
$NaHCO_3$ 110.83 g Lot 028924

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 7.61 **Model:** orion **SN:** 2330
Final pH: 9.29 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/05

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen
Ecorr: -415 mV **Model:** Keithley 617 **SN:** 537418
Ept: -298 mV **Cal:** 5/27/05 **Due:** 11/25/05

Potentiostat: EG&G 263A **SN#** 66105

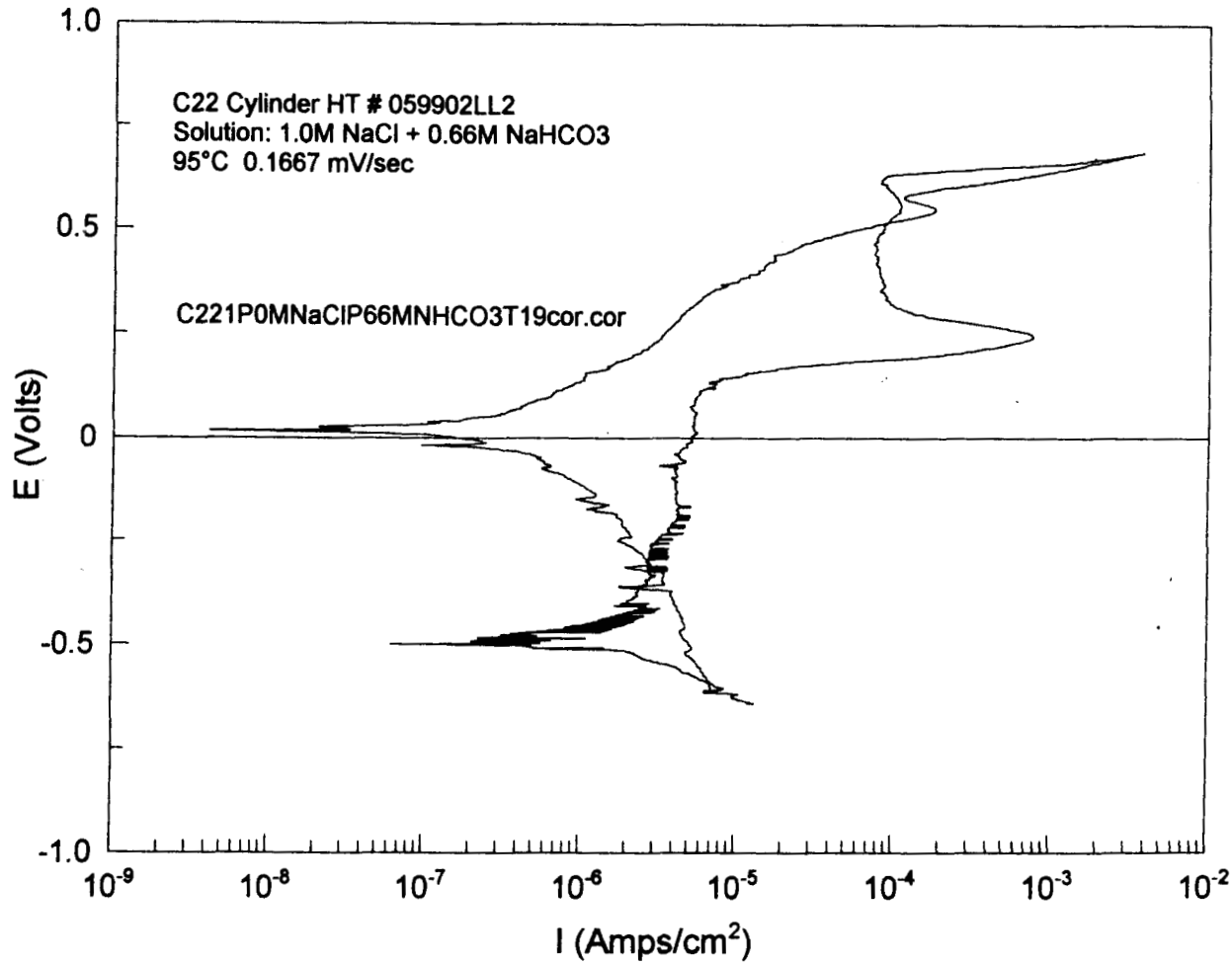
Specimen Examination:

slightly dull

specimen re-polished for re-use

data file: C22POMNaCl p6 6mNaHCO3T19.cor

Walter J. MacKenzie
6/15/05



Walter J. Mochowski
6/15/05

6/14/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE base alloy HT# 059902LL2

Initial Weight: 12.33609 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.33661 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

NaCl 116.83 g Lot # 045904 x 2 L
Na_2CO_3 69.99 g Lot 028087

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 11.23 **Model:** orion **SN:** 2330
Final pH: 10.98 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/05

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen
Ecorr: -285 mV **Model:** Keithley 617 **SN:** 537418
Ept: -336 mV **Cal:** 5/27/05 **Due:** 11/25/05

Potentiostat: EG+G 263A **SN#** 66105

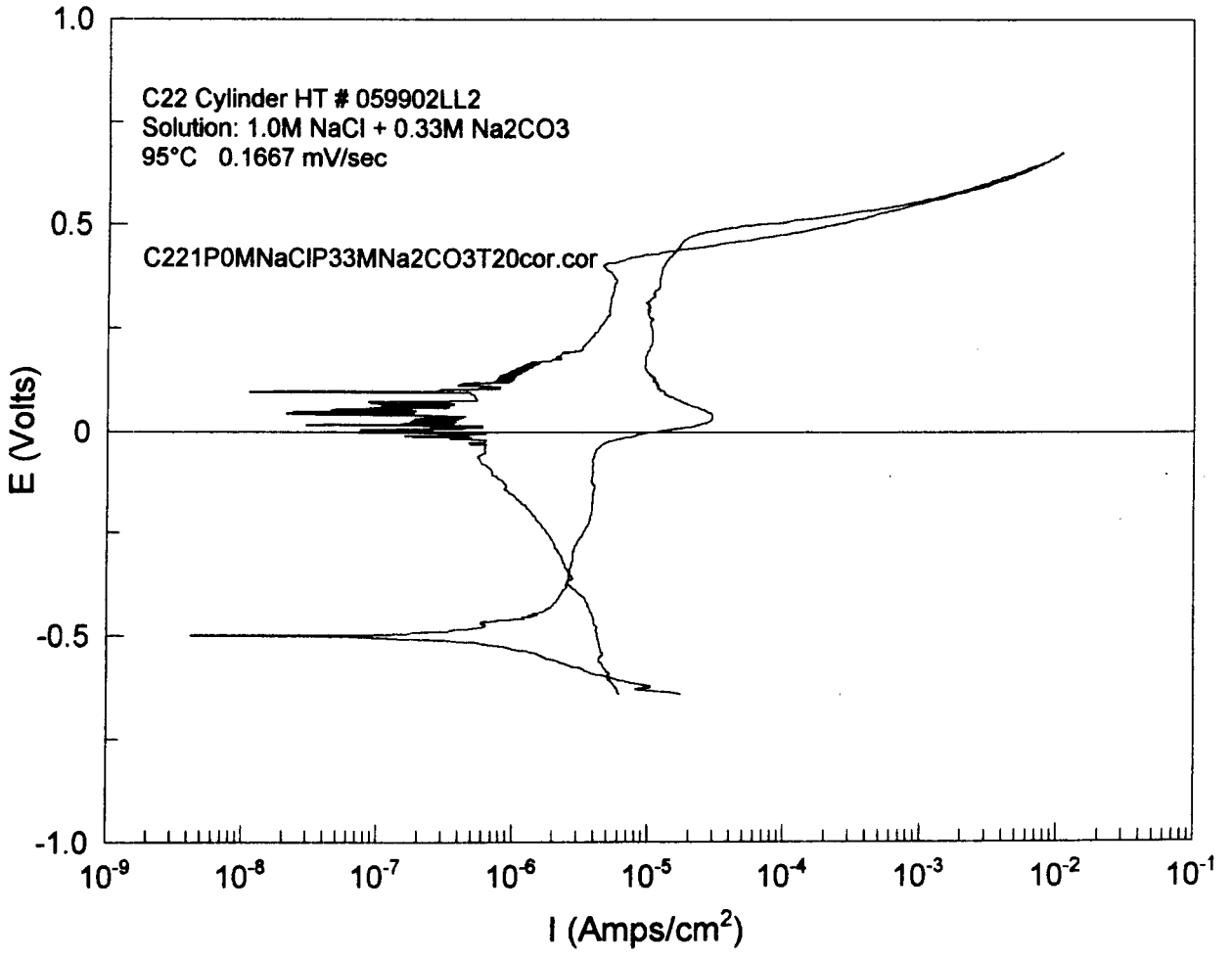
Specimen Examination:

specimen repolished for re-use

unremarkable

data file: C221P0MNaClP33Na2CO3T20 cor

Walter J. Machowski
6/15/05



Walter J. Machoosh
6/15/05

6/14/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in BSW

Specimen: C22 cylinder plate D62X — D05 base alloy HT# 05990222 2

Initial Weight: 12.82632 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.83023 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION: x2L

$NaNO_3$	486.09 g	Lot 020809	NaF	7.162 g	006679
KCl	345.49 g	005573	Na_2CO_3	378.61	028087
NaCl	314.408 g	045904	Na_2SO_4	50.01	035461

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 11.30 **Model:** orion **SN:** 2330
Final pH: 10.92 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/05

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 006611 9

Gas: 99.999% Nitrogen

Ecorr: −744 mV **Model:** Keithley 617 **SN:** 537418
Ept: −456 mV **Cal:** 5/27/05 **Due:** 11/25/05

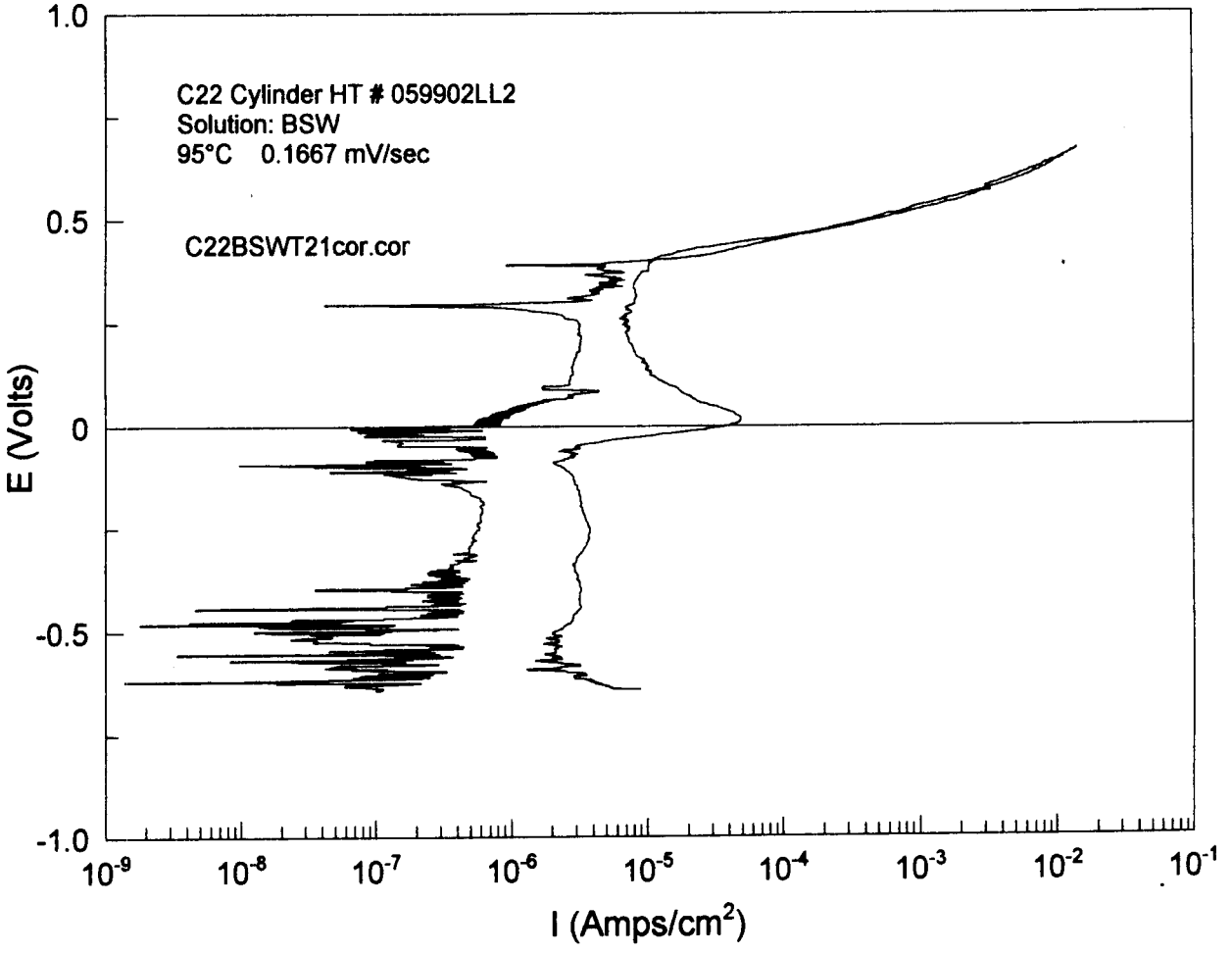
Potentiostat: EG+G 263A **SN#** 66105

Specimen Examination: slight film — unremarkable otherwise

data file: C22BSW T21cor

specimen re-polished for re-use

Walter J. Mackowiak
6/16/05



Walter J. Machnacki
6/16/05

6/15/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in BSW minus $SO_4^=$ and NO_3^-

Specimen: C22 cylinder plate D62X DOE base alloy HT# 05990LL 2

Initial Weight: 12.33087 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.33159 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

KCl	345.82 g	Lot # 044597	x 2 L
NaCl	314.98 g	" 045904	
NaF	7.29 g	" 991559	{028087
Na_2CO_3	38.71 g		{99043

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 11.30 **Model:** orion **SN:** 2330
Final pH: 10.92 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196 P 16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/05

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen
Ecorr: −178 mV **Model:** Keithley 617 **SN:** 537418
Ept: −359 mV **Cal:** 5/27/05 **Due:** 11/25/05

Potentiostat: EG&G 263A **SN#** 66105

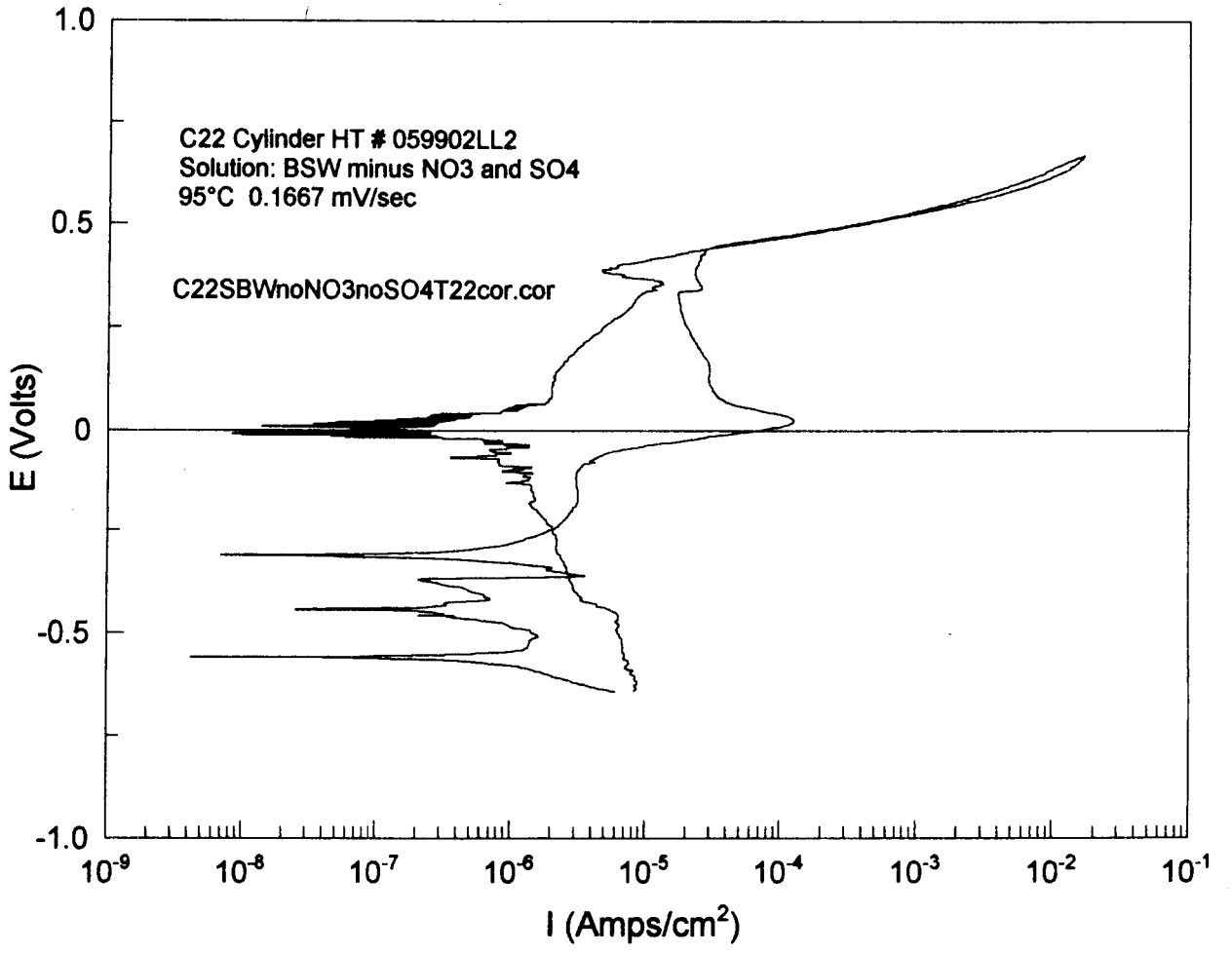
Specimen Examination:

slight film - unremarkable otherwise

data file: C22 SBW NO NO3 NO SO4 T22 cor

specimen re-polished for re-use

Walter J. Machuca
6/16/05



Walter D. Mackenzie
6/16/05

6/17/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE base alloy HT # 05990222 2

Initial Weight: 12.32529 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.32488 g **Cal** 5/4/05 **Due:** 11/11/05

SOLUTION:

0.5 M NaCl 58.67 g LOT# 045904 x 2 L
0.493 M Na_2CO_3 104.52 g " 990437
0.247 M $NaHCO_3$ 41.55 g " 028934

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 9.72 **Model:** orion **SN:** 2330
Final pH: 9.85 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196 P1 6

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/05

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen
Ecorr: -498 mV **Model:** Keithley 617 **SN:** 537418
Ept: -2 mV **Cal:** 5/24/05 **Due:** 11/25/05

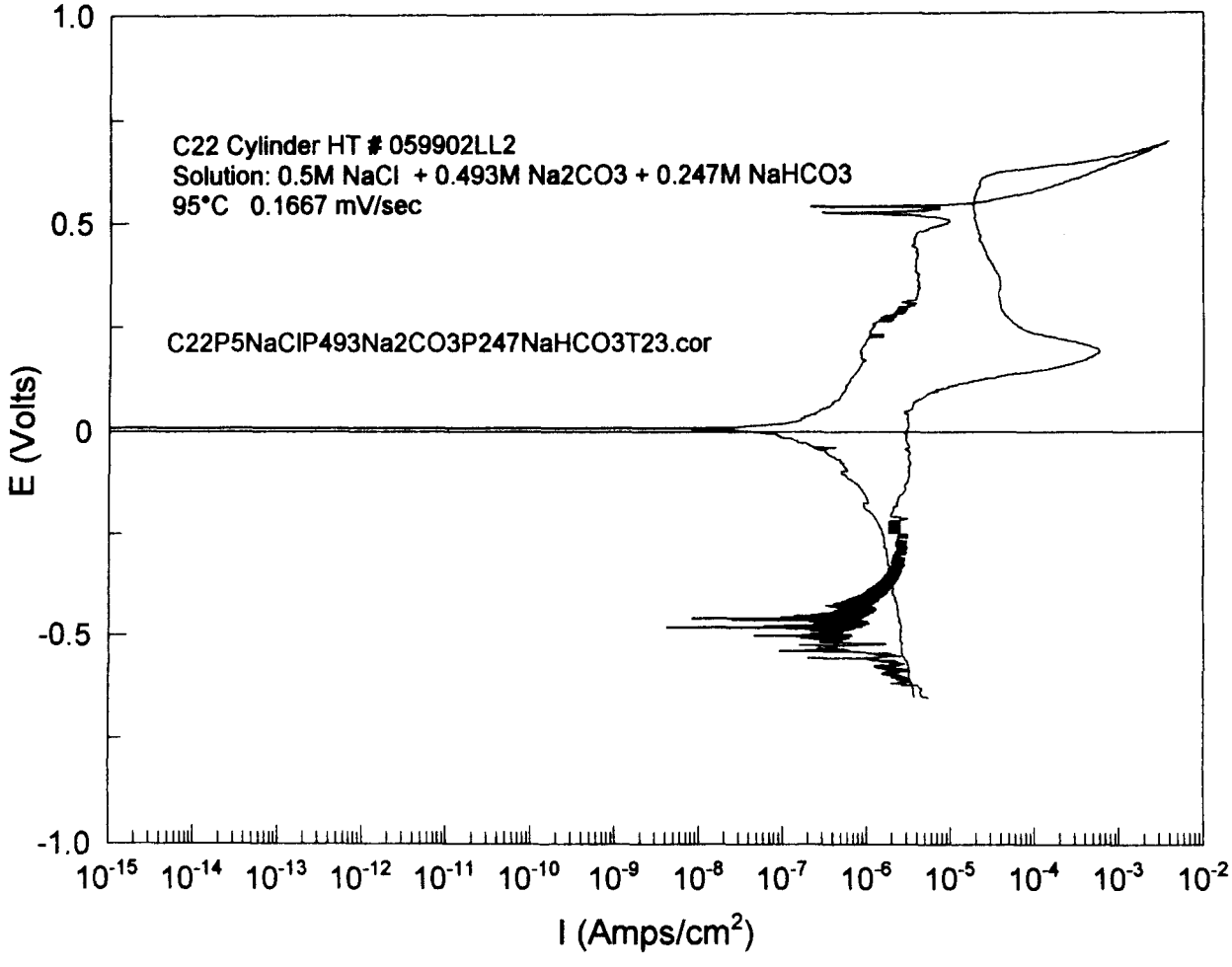
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:

slight film; otherwise OK
specimen reprobed for further tests

data file: C22P5NaClP493Na2CO3P247NaHCO3T23.ca

Walter J. MacKenzie
6/21/05



Walter J. Mazurkiewicz

6/21/05

6/20/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder, plate D62x DOE base alloy
HT # 05990222

Initial Weight: 12.32106 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.32125 g **Cal** 5/4/05 **Due:** 11/4/05

SOLUTION:

1.0M NaCl 116.90 g Lot # 045904
1.5M $NaHCO_3$ 84.55 g " 041522

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 7.75 **Model:** orion **SN:** 2330
Final pH: 9.14 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/05

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen

Ecorr: −343 mV **Model:** Keithley 617 **SN:** 537418
Ept: −105 mV **Cal:** 5/27/05 **Due:** 11/25/05

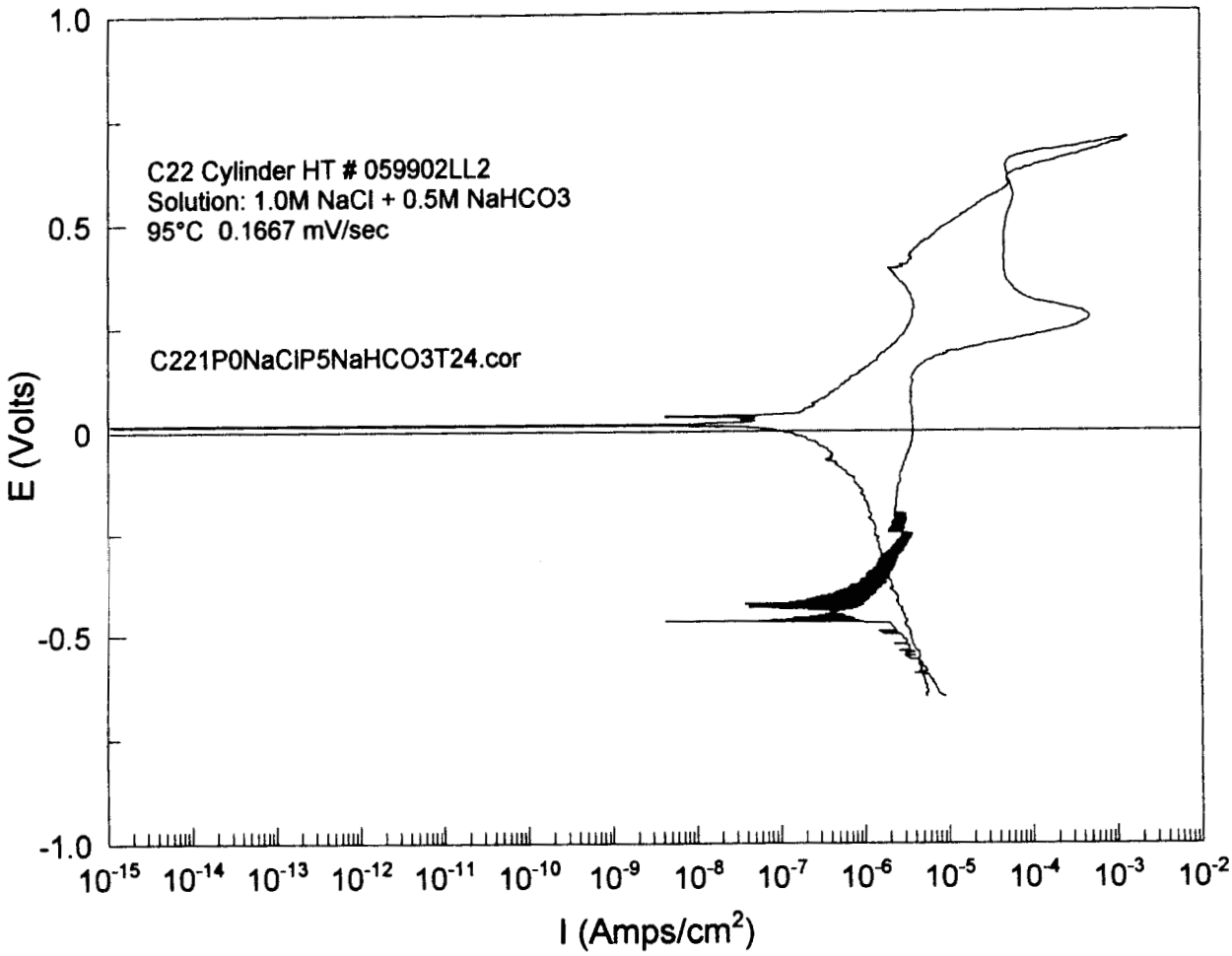
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:

slight film; unremarkable
reproached for further tests

Data file: C221PONaClP5NaHCO3T24.COR

Walter J. Mackerle
6/21/05



Walter J. Machowski 6/21/05

6/20/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE base alloy HT# 059902LL2

Initial Weight: 12.82039 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.82049 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

1.0M NaCl 58.46 g Lot # 045904
0.444M $NaHCO_3$ 74.65 g " 041522
0.296M Na_2CO_3 62.74 g " 990437

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 9.40 **Model:** orion **SN:** 2330
Final pH: 9.69 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/05

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen
Ecorr: -475 mV **Model:** Keithley 617 **SN:** ~~0066119~~ 537418 WJM 6/22/05
Ept: +55 mV **Cal:** 5/27/05 **Due:** 11/25/05

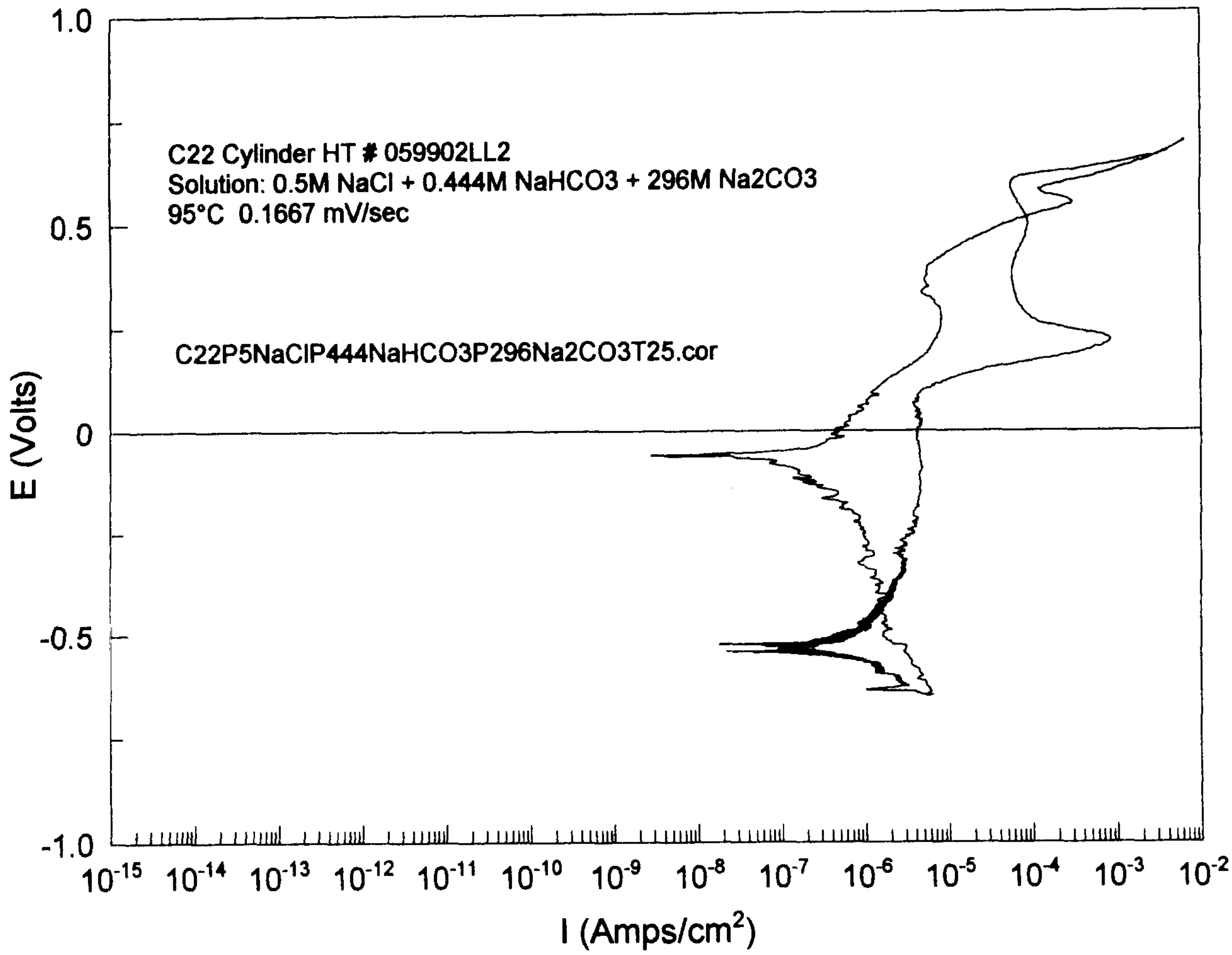
Potentiostat: EG+G 263A **SN#** 66105

Specimen Examination:

some filming; otherwise unremarkable
specimen repolished for more testing

data file: C22P5NaClP444NaHCO3P296Na2CO3T95.cor

Walter J. Mackowski
6/22/05



Walter J. Machowski
6/22/05

6/21/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62x DOE base alloy HT# 05990211 2

Initial Weight: 12.31501 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.31660 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

0.5M NaCl	58.55g	Lot # 045904	x 2L
0.246M Na_2CO_3	52.42 g	" 990437	
0.494 M $NaHCO_3$	80.25 g	" 041522	

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 9.58 **Model:** orion **SN:** 2330
Final pH: 9.69 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 406796 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/05

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 006611 9

Gas: 99.999% Nitrogen

Ecorr: -499 mV **Model:** Keithley 617 **SN:** 5370418
Ept: -44 mV **Cal:** 5/27/05 **Due:** 11/25/05

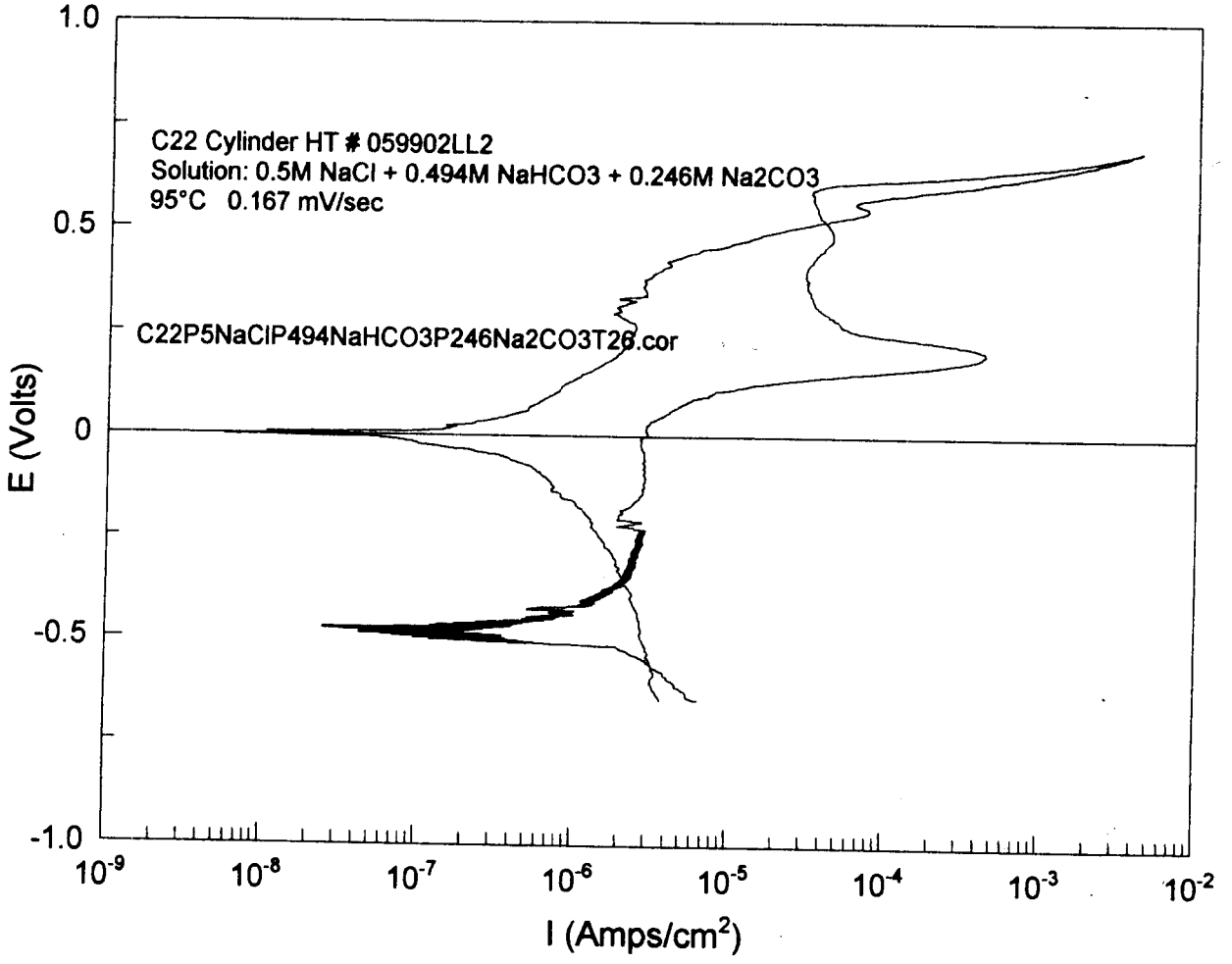
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:

some film; no visible corrosion
re-polished for further Pt testing

data file: C22NaClP494NaHCO3P246Na2CO3T26.
cor

Walter J. Mackowski
6/22/05



Walter J. Mochowski
6/22/05

6/21/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE base alloy HT# 05990LL 2

Initial Weight: 12.81565 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.81784 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

0.5 NaCl 58.50 g Lot # 045504 x 2L
0.212 Na_2CO_3 44.89 g " 990437
0.538 $NaHCO_3$ 88.75 g " 041522

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 9.63
Final pH: 9.87
Model: orion **SN:** 2330
CAL: 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/05

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen
Ecorr: -426 mV **Model:** Keithley 617 **SN:** 537418
Ept: -77 mV **Cal:** 5/27/05 **Due:** 11/25/05

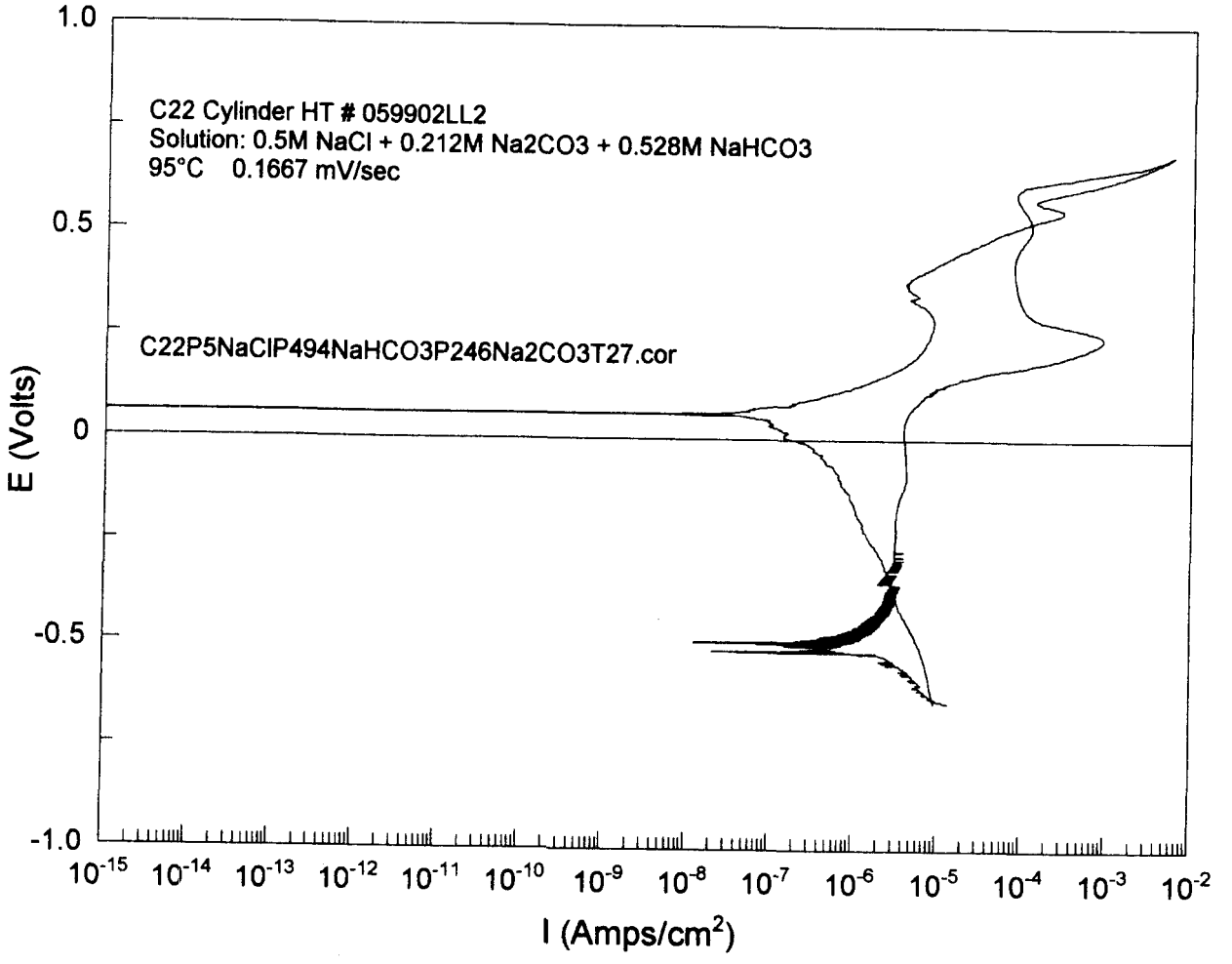
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:

some film – otherwise unremarkable
specimen re-polished for further use

data file: C22P5NaClP494NaHCO3P246Na2CO3T27.COR

Walter J Mackrodt
6/22/05



Walter J. Mackowski
6/22/05

6/23/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE base alloy HT # 05990222 2

Initial Weight: 12.81083 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.81113 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

3.0M NaCl 350.84 g Lot # 045904 x 2L
0.15M $NaHCO_3$ 25.48 g " 041522

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 7.41 **Model:** orion **SN:** 2330
Final pH: 9.04 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 406596 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/05

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen

Ecorr: −307 mV **Model:** Keithley 617 **SN:** 537418
Ept: −103 mV **Cal:** 5/27/05 **Due:** 10/25/05

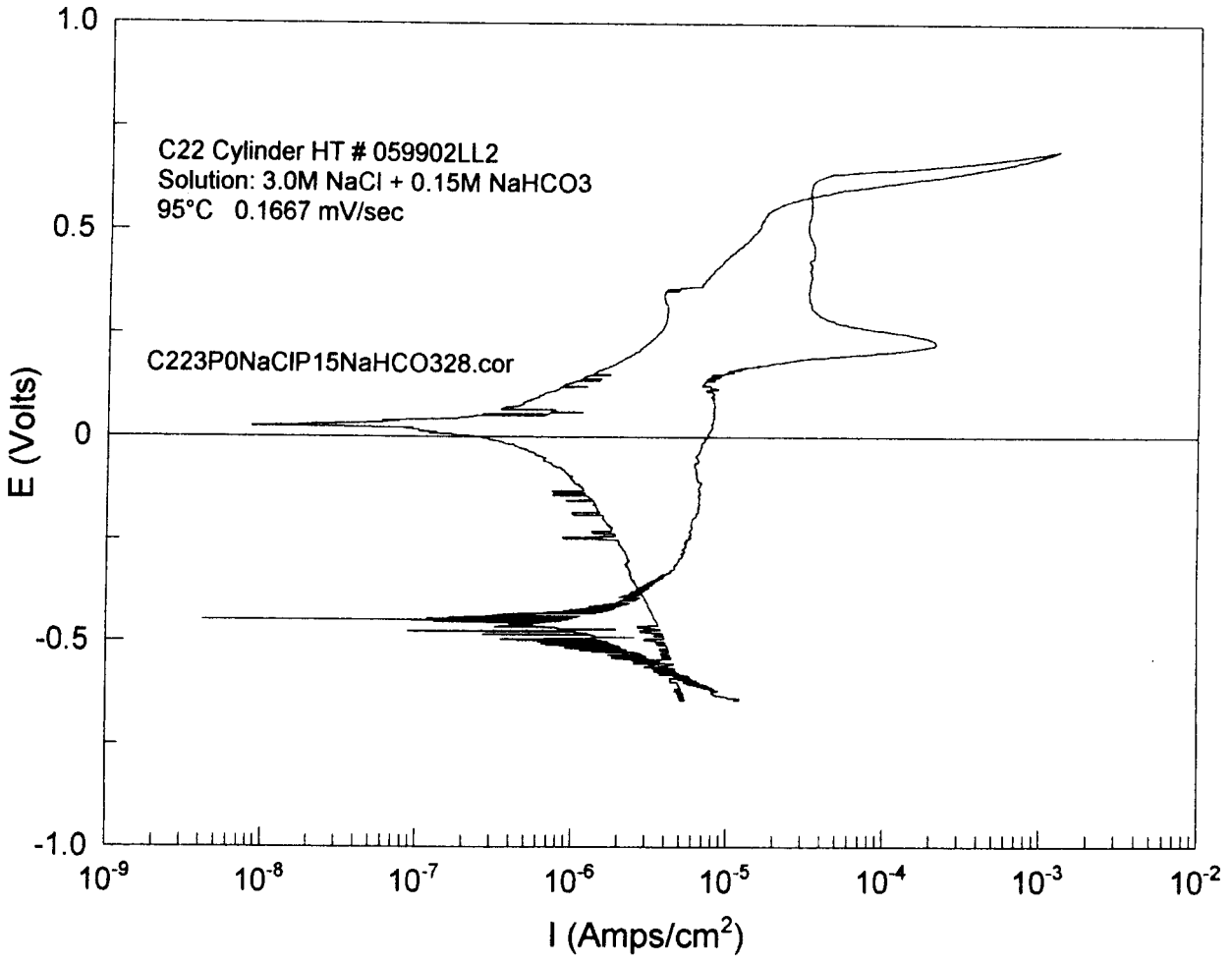
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:

slight film - no pits, etc; unremarkable
specimen re-polished for further use
WBM 6/27/05

data file: C223PDNaClP15 ~~NaCl~~ $NaHCO_3$28.cor

Walter J. Mackowiak
6/27/05



Walter J. Markowski 6/27/05

6/27/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE bare alloy HT #05990222 2

Initial Weight: 12.80633 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.80685 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION: x 2L

1.0M NaCl 116.90g Lot # 045904
0.494M $NaHCO_3$ 52.91 g " 041522
0.246M Na_2CO_3 52.41 g " 990432
} adjust to pH 9.60 w/ ~11 g NaOH #033972

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 9.12 adj → 9.57 **Model:** orion **SN:** 2330
Final pH: 9.63 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065194 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/05

Counter Electrode: Platinum Flag
Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen
Ecorr: -326 mV **Model:** Keithley 617 **SN:** 537418
Ept: -167 mV **Cal:** 5/27/05 **Due:** 10/25/05

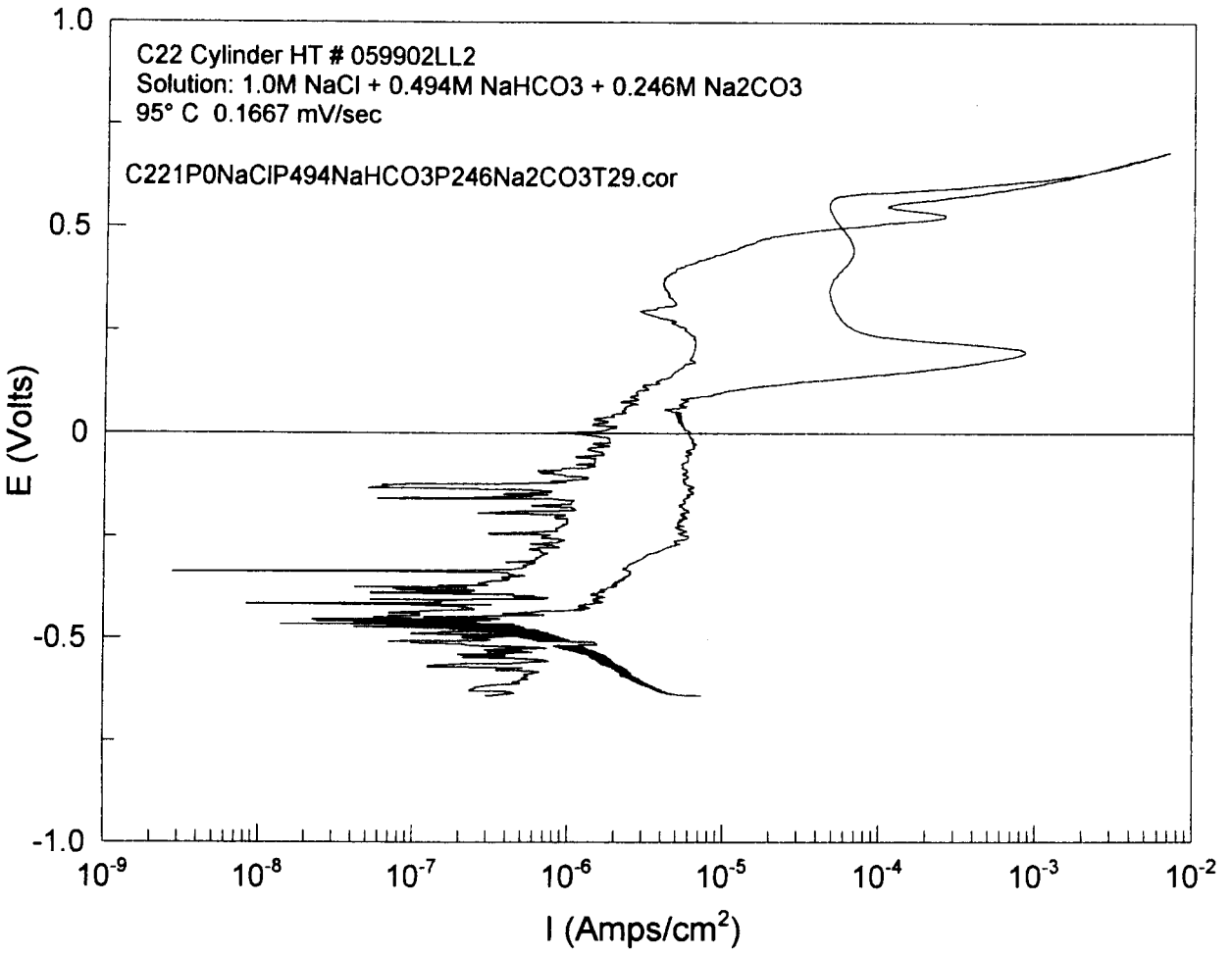
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:

slight film unremarkable
repolished for further use

data file: C22PONaCl P494 NaHCO3 P246 Na2CO3T29.Cor

Walter J. Mahowski
6/28/05



Walter J. Machemehl
6/28/05

6/28/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X 20" base alloy HT # 05990211L2

Initial Weight: 12.80242 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.80240 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION: x2 L

2.0M NaCl	233.71 g	Lot # 045904	
0.494M $NaHCO_3$	63.20 g	" 041522	adj pH w
0.246M Na_2CO_3	52.26 g	" 990437	18.85 NaOH #033972

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 8.91 adj → 9.57 **Model:** orion **SN:** 2330
Final pH: 9.60 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196 P 16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 006611 9

Gas: 99.999% Nitrogen
Ecorr: −449 mV **Model:** Keithley 617 **SN:** 5-37418
Ept: +90 mV **Cal:** 5/24/05 **Due:** 10/25/05

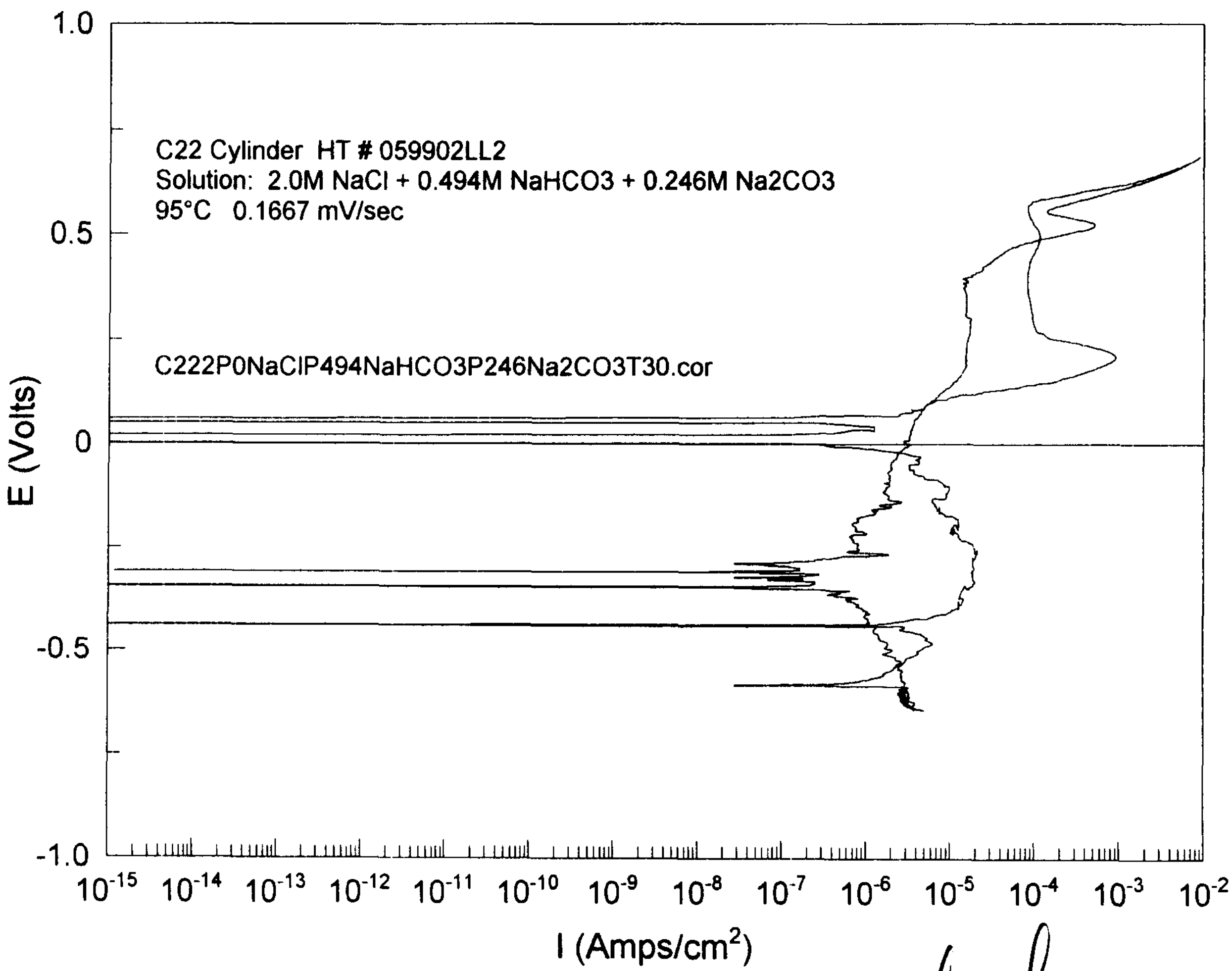
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:

slight film - unremarkable
repolished for further use

data file: C222PONaClP494NaHCO3P246Na2CO3T30.cor

Walter J. Machuca
6/29/05



Walter J. Machowski
6/29/05

6/29/05

Cyclic Potentiostatic Test

Objective: CPP a alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE base alloy HT # 05-9902 LL 2

Initial Weight: 12.31183 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.31242 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION: x 2 L

0.2M NaCl 23.32 g Lot # 045904 adj. pH w/ 6.0 g NaOH
0.494M $NaHCO_3$ 83.15 g " 041522 # 033972
0.246M Na_2CO_3 52.20 g " 990437

Reagents measured with pH 6/29/05 **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 9.30 adj → ~~9.56~~ 9.56 **Model:** orion **SN:** 2330
Final pH: 9.63 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0046119

Gas: 99.999% Nitrogen
Ecorr: −393 mV **Model:** Keithley 617 **SN:** 537418
Ept: −223 mV **Cal:** 5/27/05 **Due:** 10/26/05

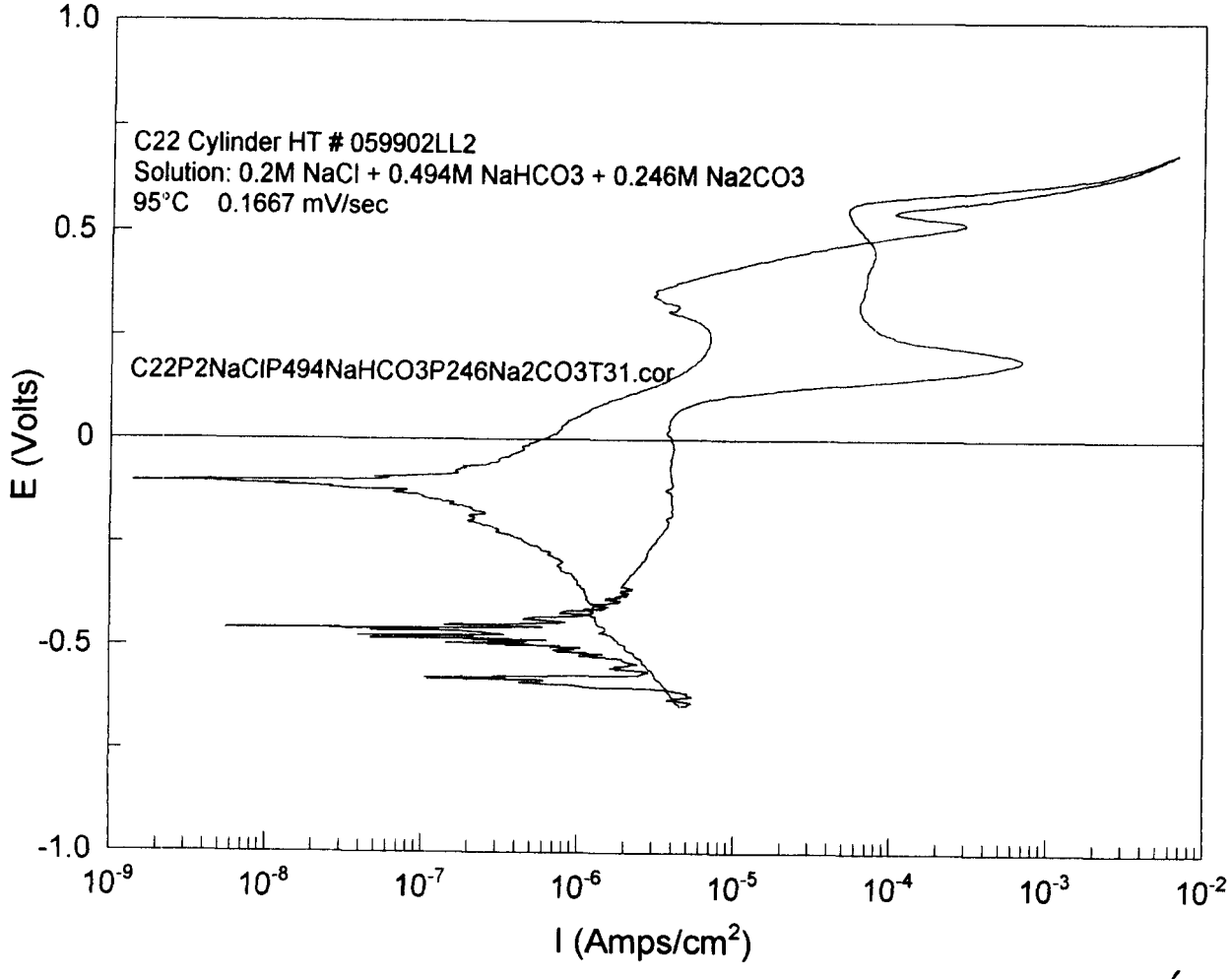
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:

slight film - unremarkable
repolished for further use

data file: C22P2NaClP494NaHCO3P246Na2CO3T31.cor

Walter J. Mackerras
6/29/05



Walter J. Machowski
6/29/05

7/7/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE base alloy HT # 059902LL2

Initial Weight: 12.79494 g **Model:** Sartorius Genius **SN:** 12809099

Final Weight: 12.79451 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

0.1M NaCl 10.73g LOT # 045904 x2L

0.246m Na_2CO_3 52.21 g " 990437

0.494m $NaHCO_3$ 83.11 g " 041522

Reagents measured with **Model:** OHAUS **SN:** 2883

Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 9.35 **Model:** orion **SN:** 2330

Final pH: 9.56 **CAL:** 7/21/04 **DUE:** 7/21/05

pH Probe: #13-620-296 **SN:** 4065196 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106

Cal: 4/27/05 **Due:** 11/25/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen

Ecorr: -398mV **Model:** Keithley 617 **SN:** 53718

Ept: -160mV **Cal:** 5/27/05 **Due:** 10/25/05

Potentiostat: EG+G 263A **SN#** 66105

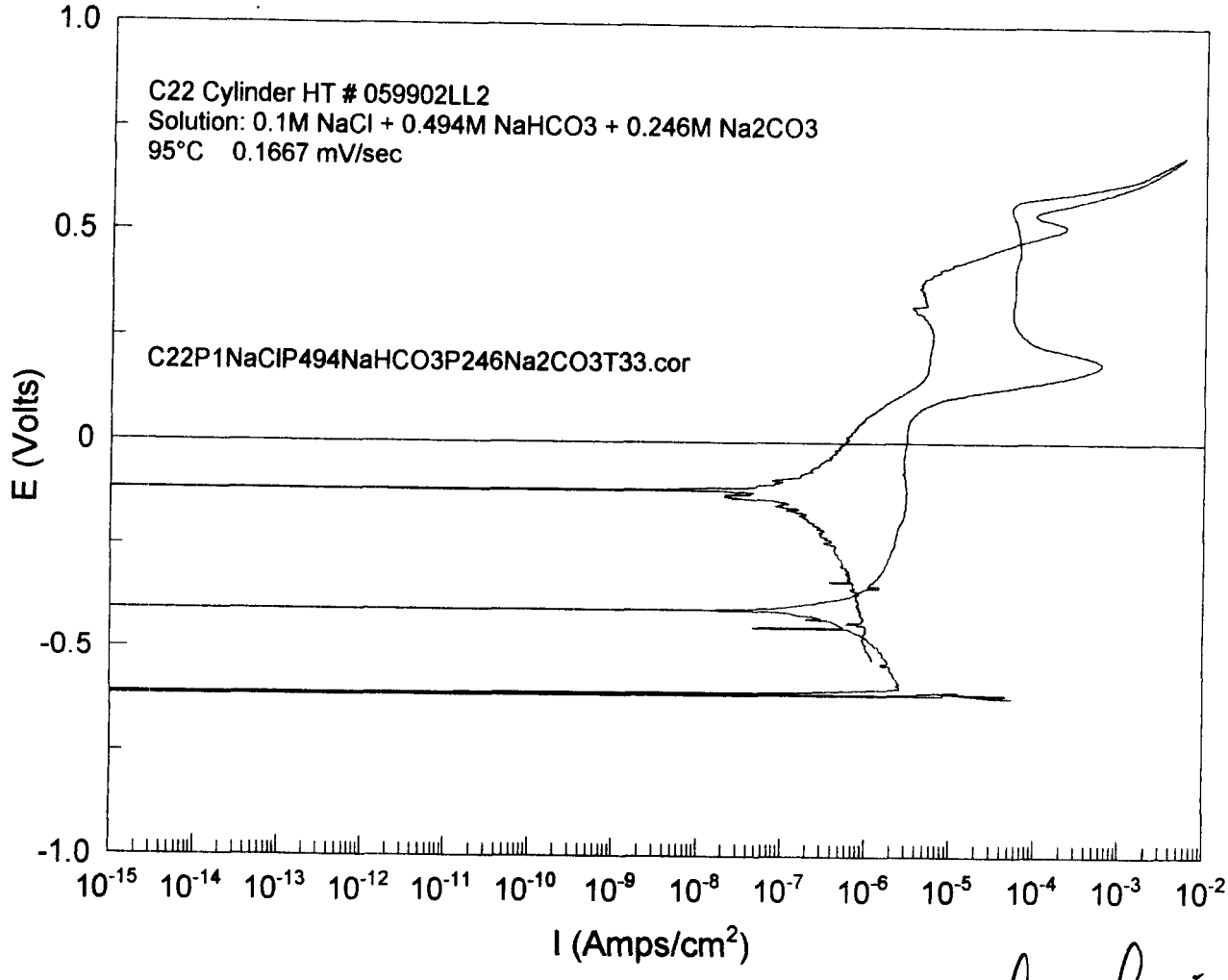
Specimen Examination:

slight film - otherwise unremarkable

repolished for further use

data file: C22P1NaClP494NaHCO3P246Na2CO3T33.cor

Walter J. Nachowski
7/11/05



Walter J. Machowski 7/11/05

7/6/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE base alloy HT # 05990211 2

Initial Weight: 12.30553 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.30587 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

0.5M NaCl	58.47 g	Lot # C45904	x 2 L
0.246M Na_2CO_3	52.21 g	990437	
0.494M $NaHCO_3$	83.11 g	041522	

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 1/14/05 **Due:** 7/14/05

Initial pH: 9.24 **Model:** orion **SN:** 2330
Final pH: 9.51 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 406596 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 006611 9

Gas: 99.999% Nitrogen
Ecorr: -525 mV **Model:** Keithley 617 **SN:** 537418
Ept: -30 mV **Cal:** 5/27/05 **Due:** 11/25/05

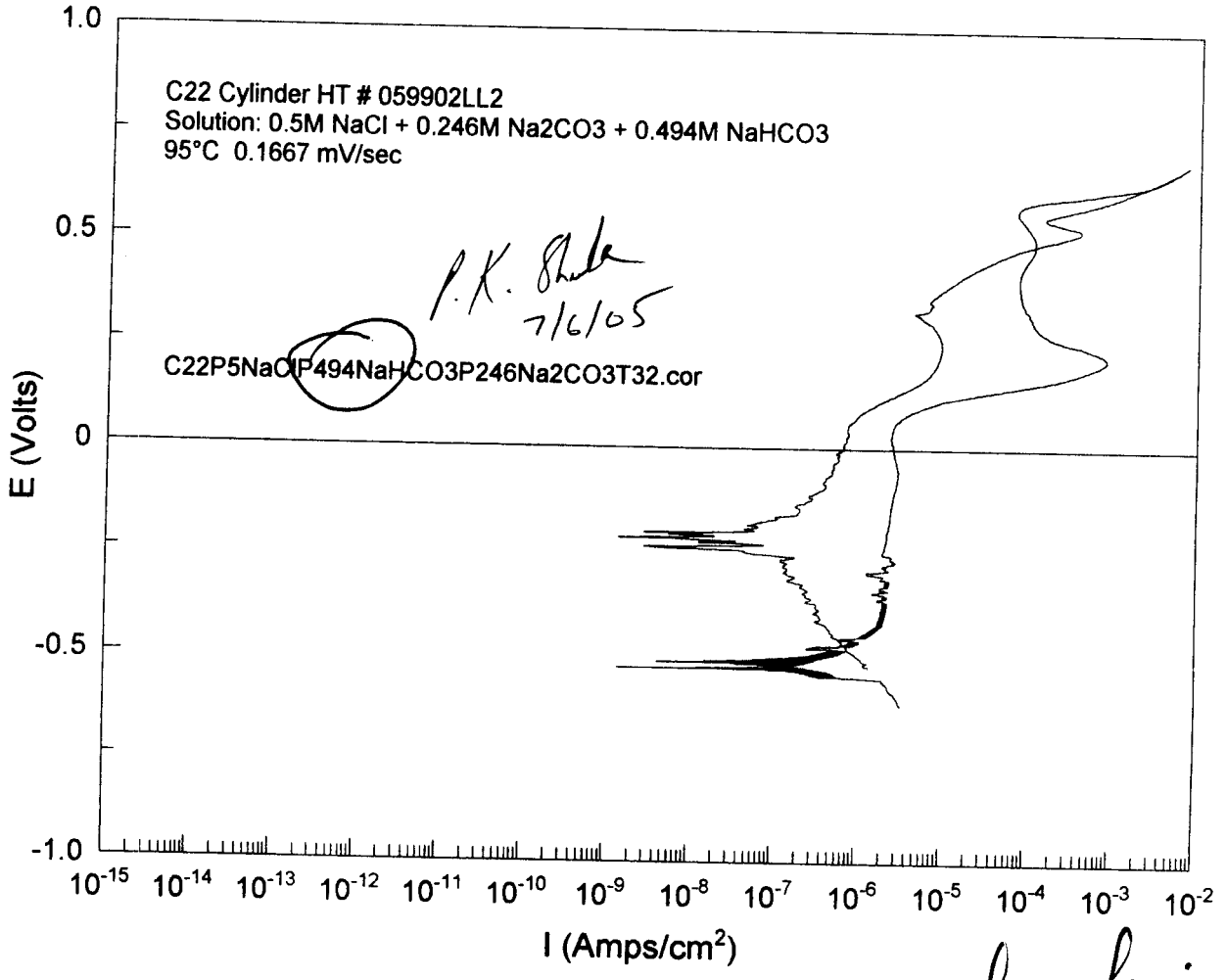
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:

slight film - otherwise unremarkable specimen repolished for further testing

data file: C22P5NaClPH94NaHCO3P246Na2CO3T32.cor

Walter J. Machuca
7/7/05



Walter J. Mackerras 7/7/05

7/13/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE base alloy
HT # 05990211 2

Initial Weight: 12.29737 g Model: Sartorius Genius SN: 12809099
Final Weight: 12.29741 g Cal 5/11/05 Due: 11/11/05

SOLUTION:

0.2M NaCl	23.98 g	Lot# 045904	X 2L
0.296M Na_2CO_3	62.75 g	" 990437	
0.494M $NaHCO_3$	83.00 g	" 041522	

Reagents measured with Model: OHAUS SN: 2883
Cal: 1/14/05 Due: 7/14/05

Initial pH: 9.37 (no adj) Model: orion SN: 2330
Final pH: 9.67 CAL: 7/21/04 DUE: 7/21/05
pH Probe: #13-620-296 SN: 406596 P16

TEST TEMPERATURE: 95°C Measured with Hg Thermometer SN: C98-106
Cal: 4/27/05 Due: 11/25/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 SN: 006611 9

Gas: 99.999% Nitrogen

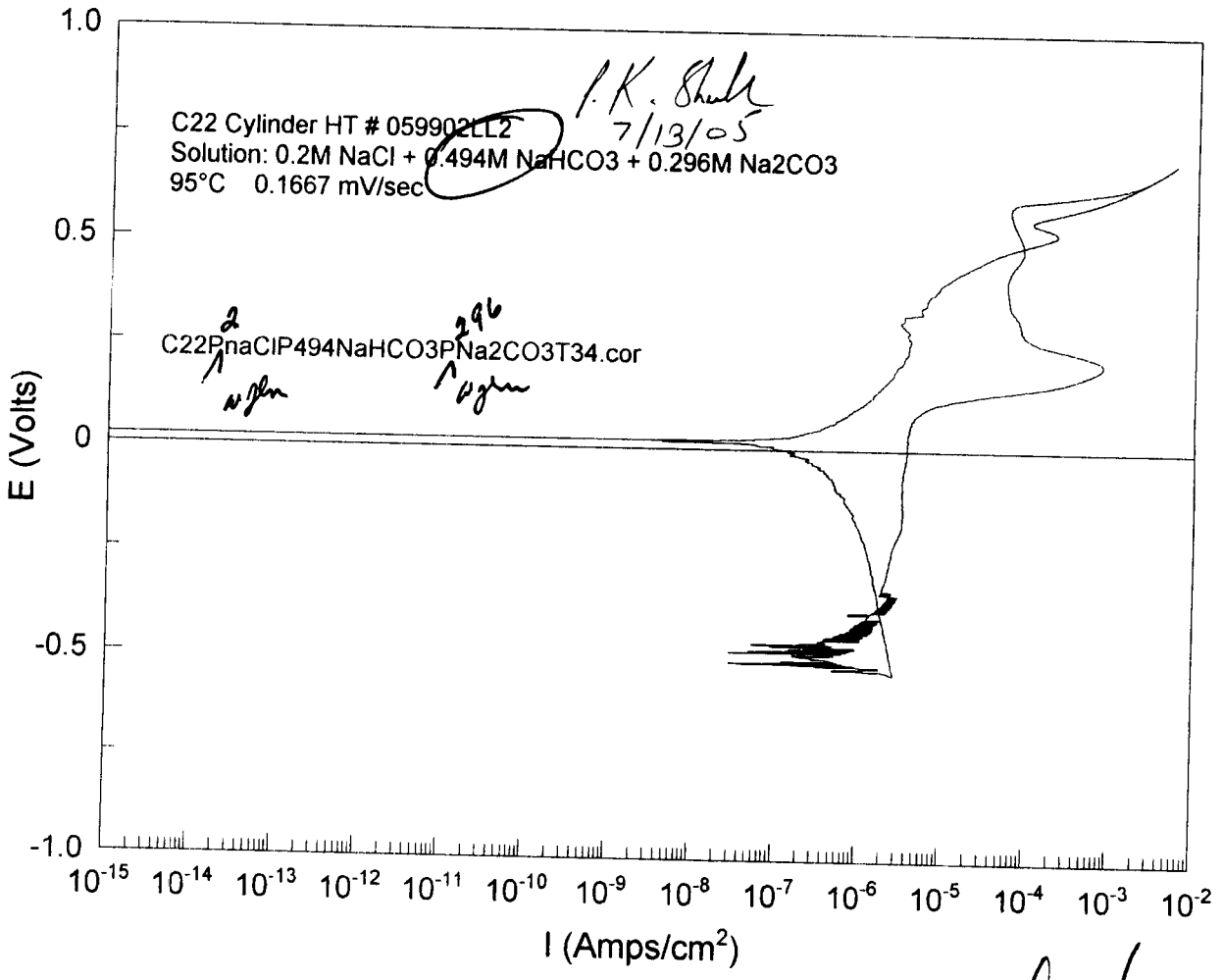
Ecorr: -432 mV Model: Keithley 617 SN: 537418
Ept: -95 mV Cal: 5/27/05 Due: 10/25/05

Potentiostat: EG+G 263A SN# 66105

Specimen Examination:
Slight film - unremarkable
specimen repolished for further use

data file: C22P2NaCl P494NaHCO3P2.96Na2CO3T34.cor

Walter J. Mackowiak
7/13/05



P.K. Shukla 7/13/05

note: test matrix called for 0.444M
i.e. Param requested 0.444M
and I misread the instructions

Walter J. Mackowski 7/13/05

7/14/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE base alloy
HT # 05990LL2

Initial Weight: 12.29516 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.29539 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

1.0M NaCl	116.89 g	Lot # 045904	x 2L
0.296M Na_2CO_3	62.69 g	990437	
0.494M $NaHCO_3$	82.96 g	041522	

Reagents measured with **Model:** OHAUS **SN:** 2883 1/12/06
Cal: ~~7/14/05~~ **Due:** ~~7/14/05~~ ~~7/14/06~~ WJM 7/15/05

Initial pH: 9.21 adj → 9.35 **Model:** orion 7/12/05 WJM 7/15/05 **SN:** 2330
Final pH: 9.49 **CAL:** 7/21/04 **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 4065196 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

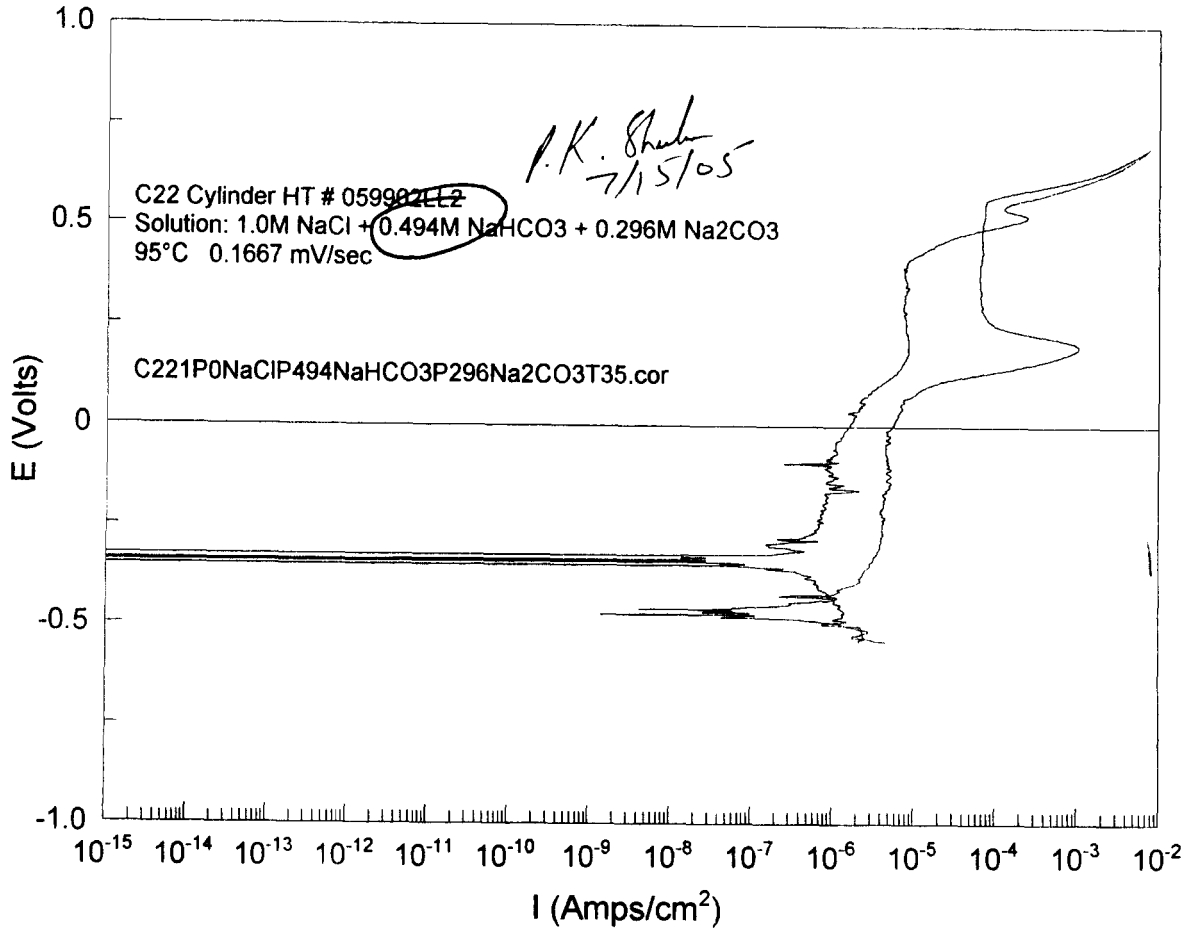
Gas: 99.999% Nitrogen
Ecorr: -350 mV **Model:** Keithley 617 **SN:** 537418
Ept: -70 mV **Cal:** 5/27/05 **Due:** 10/25/05

Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:
slight film - otherwise unremarkable
repolished for further use

data file: C22IPONaClP494NaHCO3P296Na2CO3T35.cor

Walter J. Mackanic
7/15/05



P.K. Shukla 7/15/05

Walter J. MacIntosh 7/15/05

note: O should have been 0.444M
i.e. Pavan requested 0.444M
+ I misread the instruction

7/15/05

Cyclic Potentiostatic Test

Objective: CPP in SAW at pH of ~2.0

Specimen: C22 cylinder plate D62X DOE base alloy
HT # 05990222 2

Initial Weight: 12.28928 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.28832 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

NaCl 69.22 g #045904 $MgSO_4 \cdot 7H_2O$ 20.30 g #034812
$NaNO_3$ 54.60 g 020809 $Ca(NO_3)_2 \cdot 4H_2O$ 11.60 886082
Na_2SO_4 101.87 g 035461 KCl 12.95 005513
adj. pH 4.53 → 1.98 w/ H_2SO_4

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: ~~7/14/05~~ 7/12/05 wdm (7/13/05) **Due:** ~~7/14/05~~ 1/12/06 ~~7/12/06~~

Initial pH: 1.98 **Model:** orion **SN:** 2330 wdm (7/13/05)
Final pH: 2.00 **CAL:** 7/21/05 04 wdm **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 406196 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 006611 9

Gas: 99.999% Nitrogen
Ecorr: -215 mV **Model:** Keithley 617 **SN:** 537418
Ept: + 384 mV **Cal:** 5/27/05 **Due:** 10/25/05

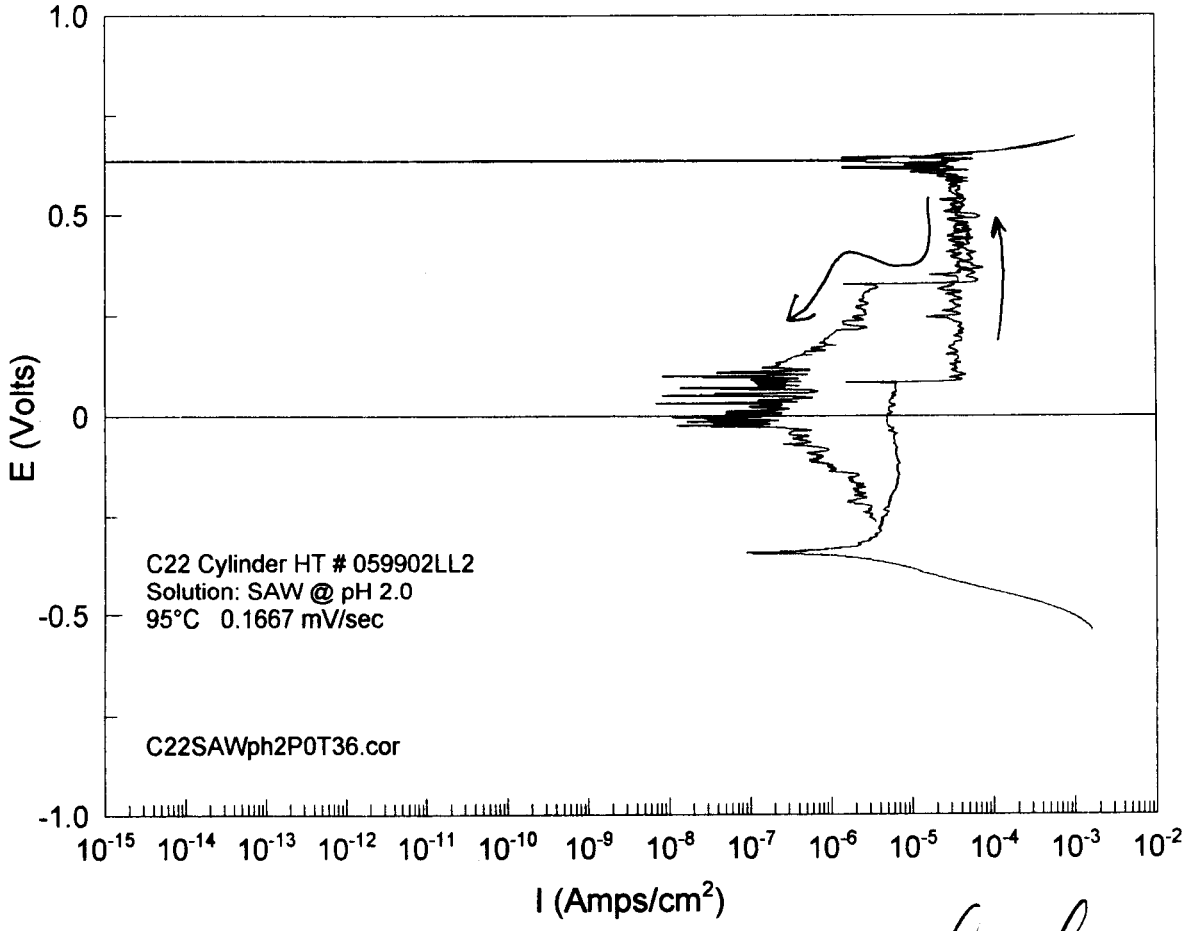
Potentiostat: EG+G 263A **SN#** 66105

Specimen Examination:

unremarkable
replished for reuse

data file: C22SAWpH2POT36.cor

Walter J. Mackanic
7/18/05



Walter J. Mackerle 7/18/05

7/18/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62x DOE Base alloy HT # 05990LL2

Initial Weight: 12.28583 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.28530 g **Cal** 5/11/05 **Due:** 11/11/05

SOLUTION:

1.0M NaCl 116.91 g Lot # 045904 x 2L
0.296M Na_2CO_3 62.77 g 990437
0.444 $NaHCO_3$ 74.60 g 041522 pH 9.35

Reagents measured with

Model: OHAUS **SN:** 2883
Cal: ~~1/11/05~~ 7/12/05 wjm **Due:** ~~7/11/05~~ 1/12/06 wjm (7/18/05)

Model: orion **SN:** 2330
CAL: 7/21/04 (7/18/05) **DUE:** 7/21/05
pH Probe: #13-620-296 **SN:** 406196 P14

Initial pH: 9.35
Final pH: 9.36

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/06

Counter Electrode: Platinum Flag
Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen
Ecorr: -274 mV **Model:** Keithley 617 **SN:** 533418
Ept: -237 mV **Cal:** 5/27/05 **Due:** 10/25/05

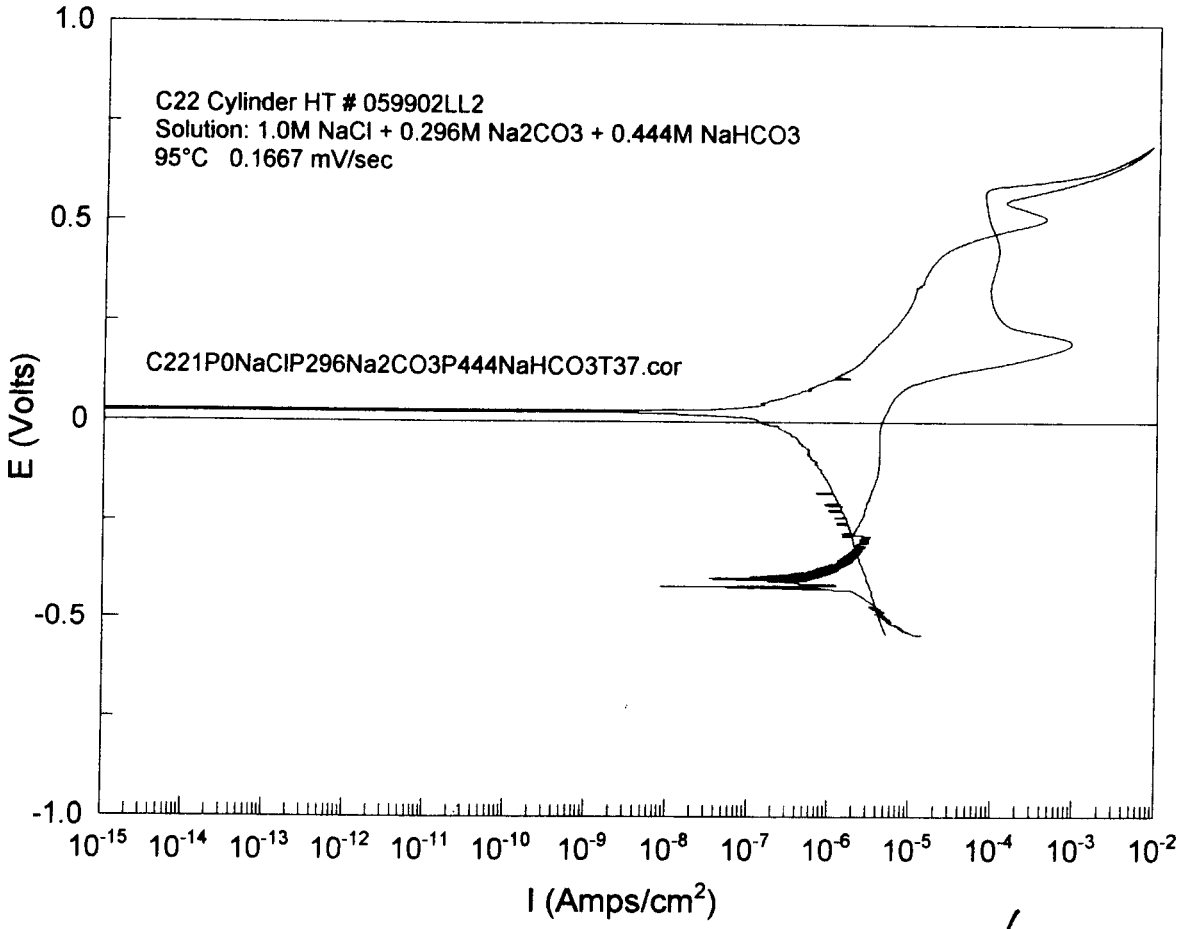
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:

unremarkable slight film
specimen re-polished for further use

data file: C22PONaCl P296 Na2CO3 P444 NaHCO3 T37.ca

Walter J. Mackerle
7/18/05



Walter J. Machowski 2/18/05

7/19/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE base alloy HT # 05990222

Initial Weight: 12.78837 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.79096 g **Cal** 5/4/05 **Due:** 11/11/05

SOLUTION: x 2 L

2.0M NaCl 233.73 g Lot # 045904 adj pH w/NaOH
0.444M $NaHCO_3$ 74.60 g " 041522 Lot # 033972
0.296M Na_2CO_3 62.77 g " 990437

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 7/12/05 **Due:** 1/12/06

Initial pH: 8.68 adj → 9.43 **Model:** orion **SN:** 2330
Final pH: 9.35 **CAL:** 7/25/05 **DUE:** 7/25/06
pH Probe: #13-620-296 **SN:** 4065196 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/06

Counter Electrode: Platinum Flag
Reference Electrode: Fisher SCE 13-620-52 **SN:** 006611 9

Gas: 99.999% Nitrogen
Ecorr: -342 mV **Model:** Keithley 617 **SN:** 537418
Ept: -98 mV **Cal:** 5/27/05 **Due:** 10/25/05

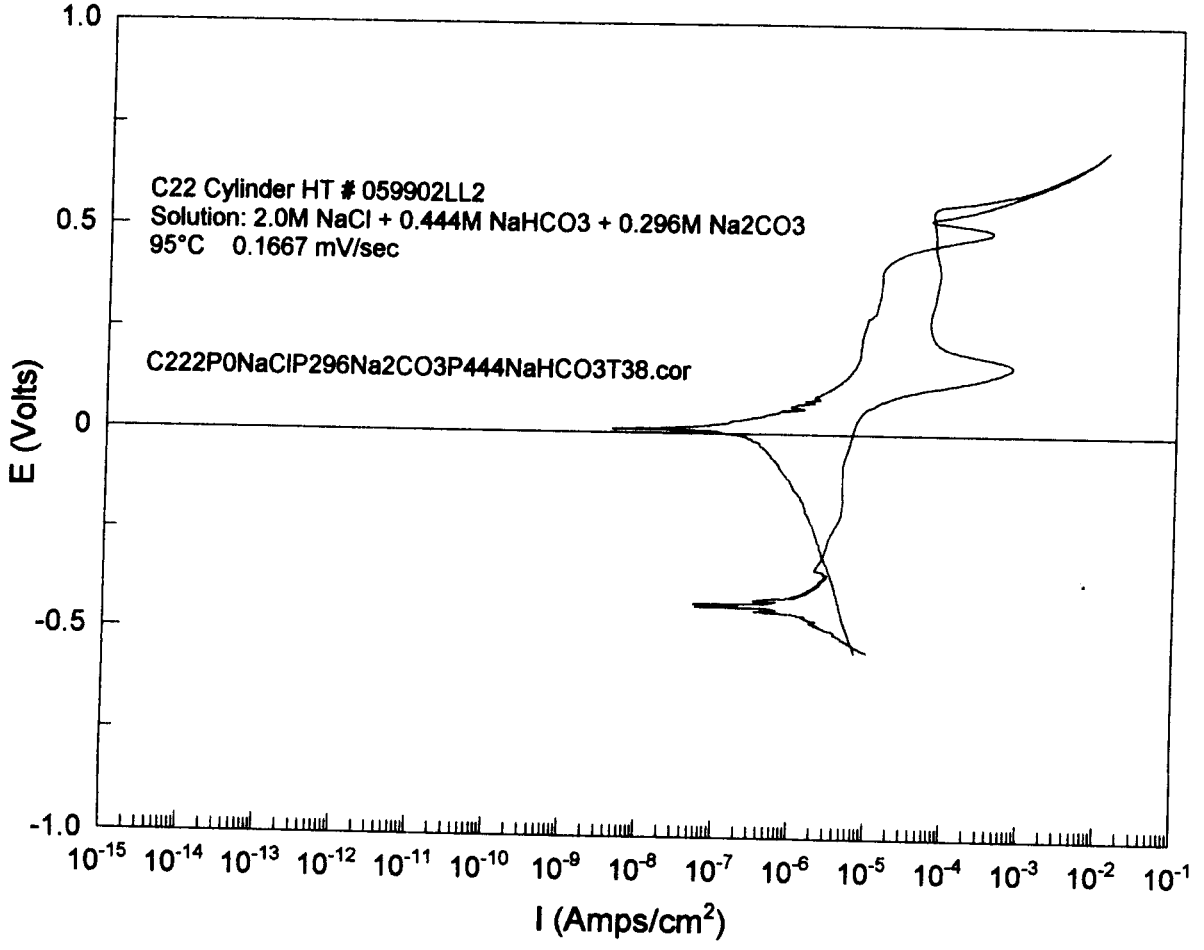
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:

slight film - otherwise unremarkable
specimen re-polished for further use

data file: C2228ONaCl P296Na2CO3 P444NaHCO3 T38.cor

Walter J. Machowski
7/20/05



Walter J. Mackowiak
7/20/05

7/21/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE base alloy HT # 05990224 2

Initial Weight: 12.78351 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.78253 g **Cal** 5/4/05 **Due:** 11/11/05

SOLUTION: x 2L

0.2M NaCl	23.75 g	Lot # 045904	
0.444M $NaHCO_3$	74.56 g	Lot # 041522	pH adj to 9.39
0.296M Na_2CO_3	62.73 g	Lot # 990437	w/NaOH Lot # 033972

9.05 before adj

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 7/12/05 **Due:** 1/12/06

Initial pH: 9.39 **Model:** orion **SN:** 2330
Final pH: 9.42 **CAL:** 7/25/05 **DUE:** 7/25/06
pH Probe: #13-620-296 **SN:** 406596P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-104
Cal: 4/27/05 **Due:** 11/25/06

Counter Electrode: Platinum Flag
Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen
Ecorr: -400mV **Model:** Keithley 617 **SN:** 537418
Ept: -35mV **Cal:** 5/27/05 **Due:** 10/25/05

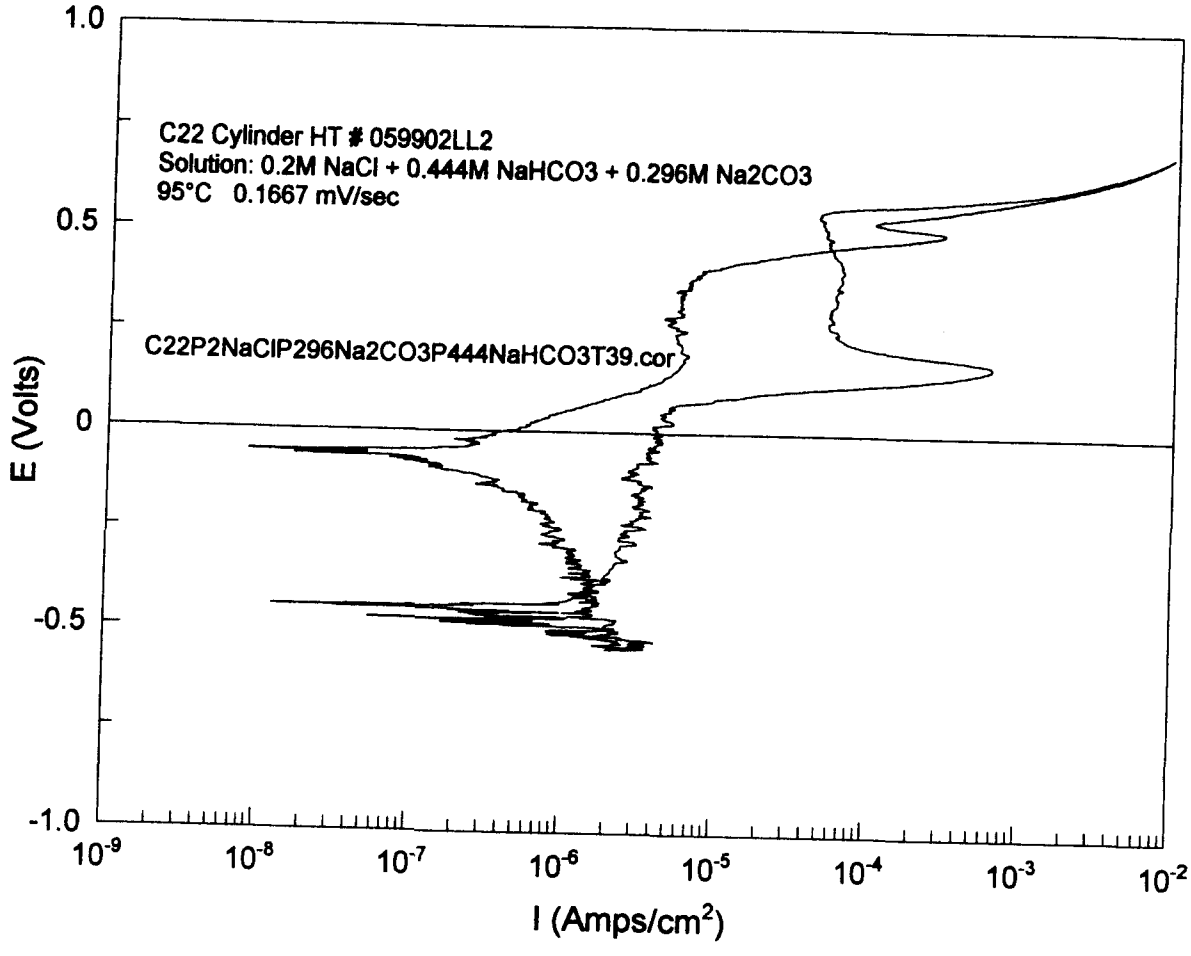
Potentiostat: EG+G 263A **SN#** 66105

Specimen Examination:

slight film - otherwise unremarkable
specimen repolished for further use

data file: C22P2NaClP296Na2CO3P444NaHCO3T39.cor

Walter J. Machowski
7/29/05



Walter J. Machrowski
7/29/05

7/22/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE base alloy HT# 05990211L2

Initial Weight: 12.78321 g **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.78253 g **Cal** 5/4/05 **Due:** 11/11/05

SOLUTION: x 2L

NaCl	69.74 g	Lot# 045904	$MgSO_4 \cdot 7H_2O$ 20.31 g Lot# 034816
$NaNO_3$	54.62 g	Lot# 020809	$Ca(NO_3)_2 \cdot 4H_2O$ 11.83 g Lot# 886062
Na_2SO_4	101.84 g	Lot# 035451	KCl 2.59 g Lot# 044597

adj pH to ~2 w/ H_2SO_4

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 7/12/05 **Due:** 1/12/06

Initial pH: 4.70 adj → 2.12 **Model:** orion **SN:** 2330
Final pH: 2.72 **CAL:** 7/25/05 **DUE:** 7/25/06
pH Probe: #13-620-296 **SN:** 4065196 P16

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen

Ecorr: −202 mV **Model:** Keithley 617 **SN:** 537418
Ept: +368 mV **Cal:** 5/27/05 **Due:** 10/25/05

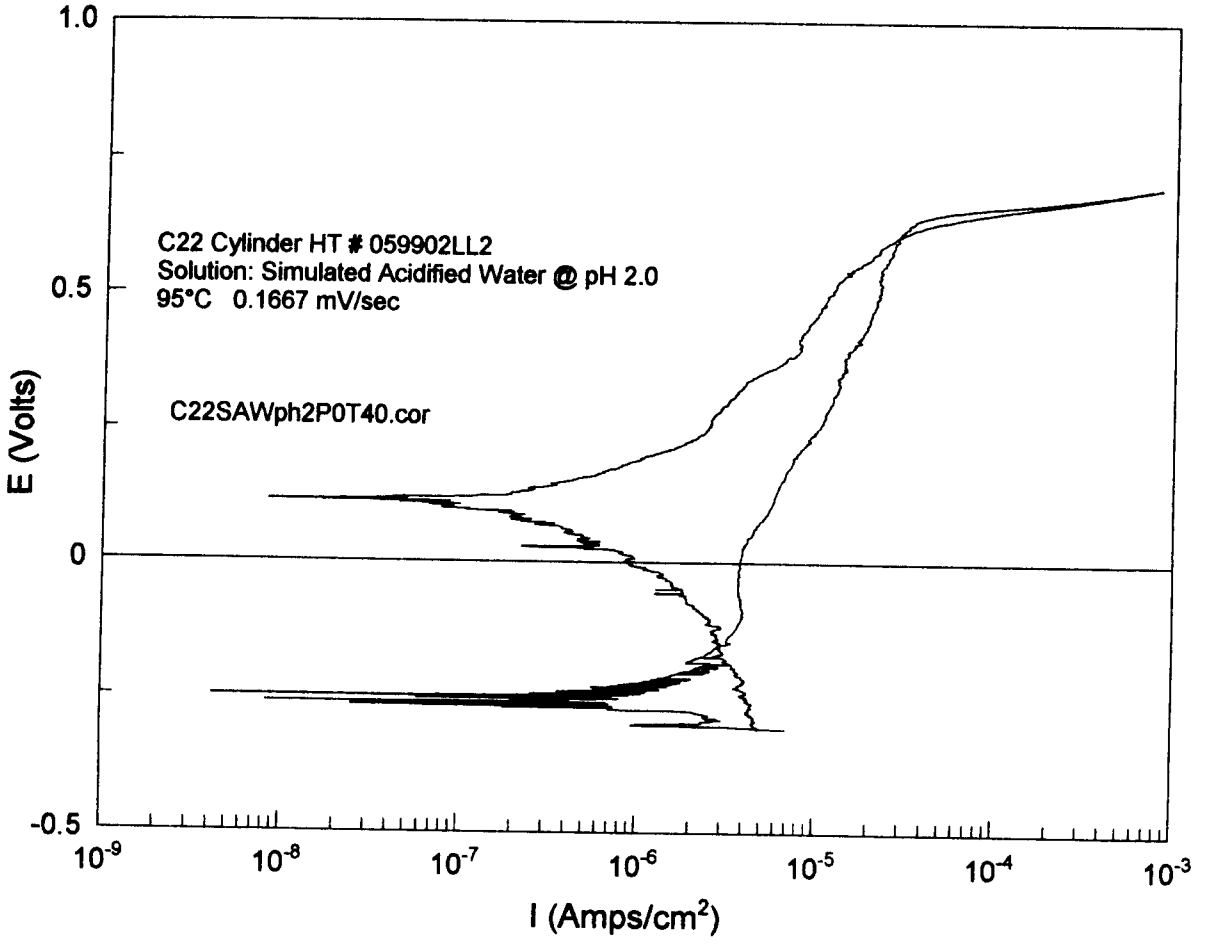
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:

slight film - otherwise unremarkable
specimen repolished for further use

data file: C22SAWph2POT40.cor

Walter J. MacKowski
7/29/05



Walter J. Machowski
7/29/05

9/13/05

Cyclic Potentiostatic Test

Objective: CPP on Alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DCE base alloy HT # 05990222 2

Initial Weight: 12.45398 **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.46451 **Cal** 5/4/05 **Due:** 11/11/05

SOLUTION: x 2L

0.5M NaCl 58.61g Lot# 051570
0.444M $NaHCO_3$ 74.52g Lot# 050282
0.296M Na_2CO_3 62.73g Lot# 044284

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 7/12/05 **Due:** 1/12/06

Initial pH: 9.41 **Model:** orion **SN:** 2330
Final pH: 9.10 **CAL:** 7/25/05 **DUE:** 7/25/06
pH Probe: #13-620-296 **SN:** 406596

TEST TEMPERATURE: 45°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 006611 9

Gas: 99.999% Nitrogen
Ecorr: −330 mV **Model:** Keithley 614 **SN:** 704936
Ept: +149 mV **Cal:** 5/27/05 **Due:** 5/26/06

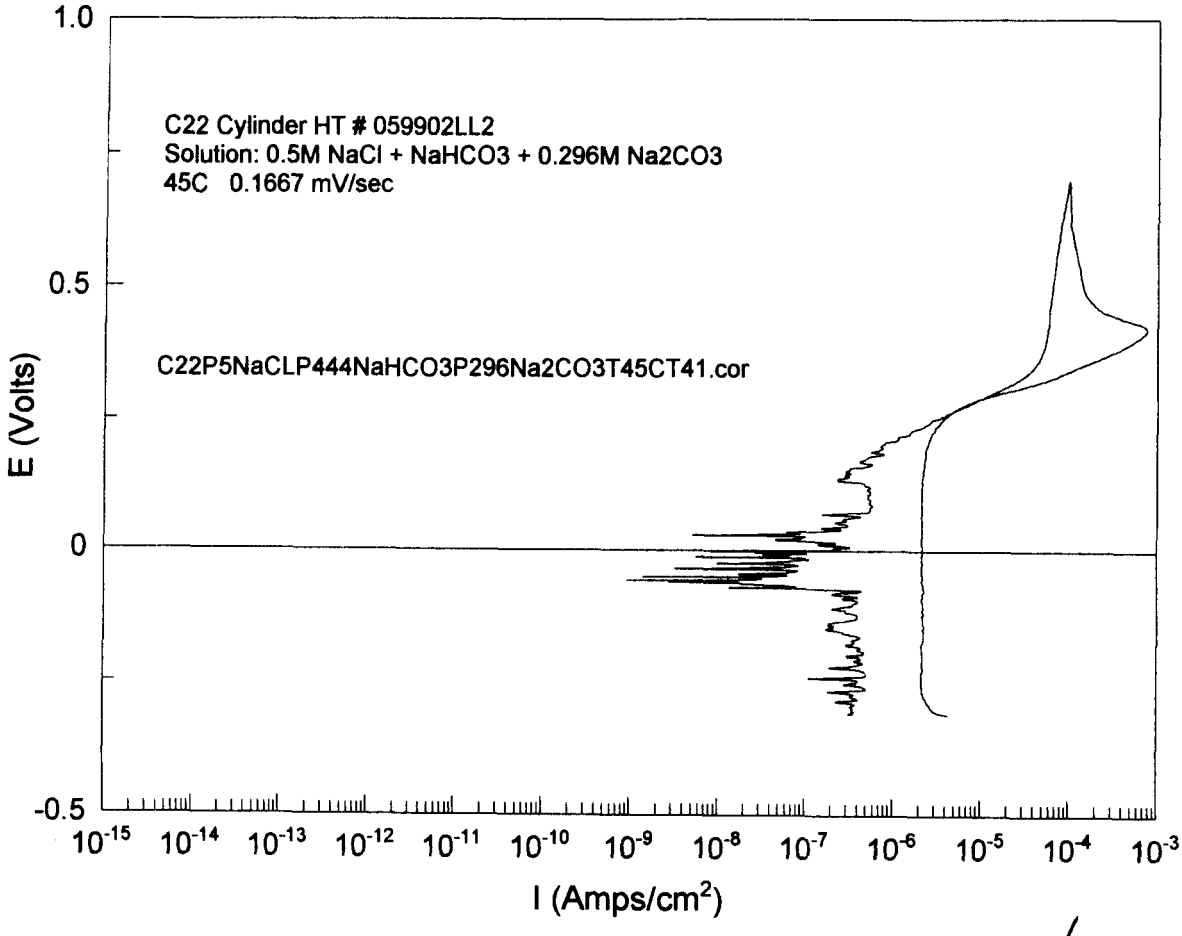
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:

slight film - otherwise unremarkable
specimen repolished for further use

data file; C22P5NaClP444NaHCO3P296Na2CO3T45CT41
.cor

Walter J. Mackowski
9/15/05



Walter J. Machnaski
9/15/05

9/14/05

Cyclic Potentiostatic Test

Objective: CPP on Alloy 22 in various chemistries

Specimen: C22 cylinder plate D62x DOE base alloy
HT # 0599022LL 2

Initial Weight: 12.39879 **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.40093 **Cal** 5/14/05 **Due:** 11/11/05

SOLUTION: x 2L

0.5M NaCl 58.65g Lot # 051510
0.444M $NaHCO_3$ 74.57g Lot # 050282
0.296M Na_2CO_3 62.78g Lot # 044284

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 7/12/05 **Due:** 1/12/06

Initial pH: 9.49 **Model:** orion **SN:** 2330
Final pH: 9.40 **CAL:** 7/25/05 **DUE:** 7/25/06
pH Probe: #13-620-296 **SN:** 406196

TEST TEMPERATURE: 45°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 006611 9

Gas: 99.999% Nitrogen

Ecorr: -215 mV **Model:** Keithley 614 **SN:** 704936
Ept: +179 mV **Cal:** 5/27/05 **Due:** 5/26/06

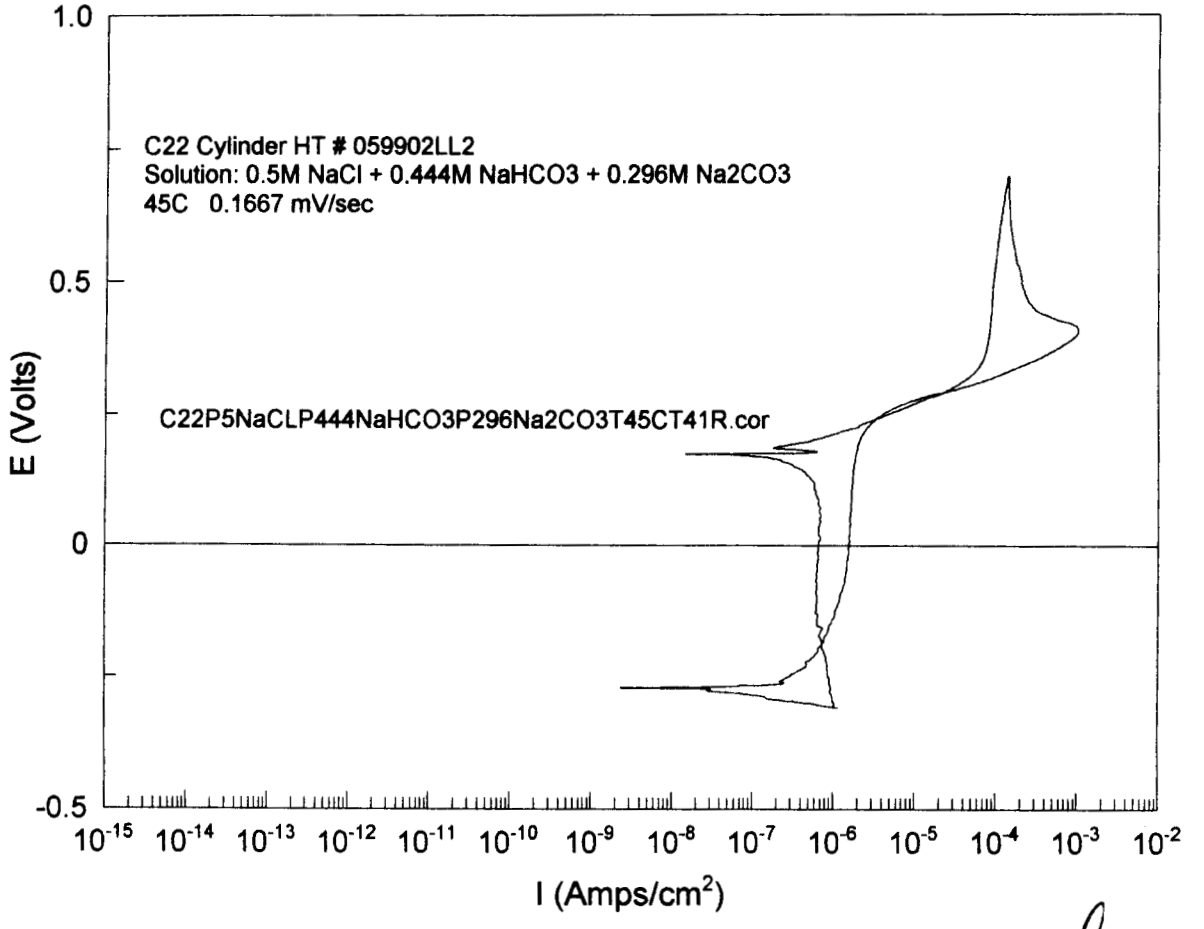
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:

slight filming - otherwise unremarkable
specimen repolished for further use

data file: C22P5NaClP444NaHCO3P296Na2CO3T45CT41R
4 cor

Walter J. Mackowiak
9/15/05



Walter J. Machowski
9/15/05

9/15/05

Cyclic Potentiostatic Test

Objective: CPP on Alloy 22 in various chemistries

Specimen: C22 cylinder plate D62X DOE base alloy HT # 05990222 2

Initial Weight: 12.38172 Model: Sartorius Genius SN: 12809099
Final Weight: 12.39861 Cal 5/14/05 Due: 11/4/05

SOLUTION: x2L

0.5M NaCl 58.66g Lot # 051510
0.444M $NaHCO_3$ 74.53g Lot # 050282
0.296M Na_2CO_3 62.78g Lot # 044284

Reagents measured with Model: OHAUS SN: 2883
Cal: 7/13/05 Due: 1/12/06

Initial pH: 9.34 Model: orion SN: 2330
Final pH: 9.42 CAL: 7/25/05 DUE: 7/25/06
pH Probe: #13-620-296 SN: 406596

TEST TEMPERATURE: 75°C Measured with Hg Thermometer SN: C98-106
Cal: 4/27/05 Due: 11/25/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 SN: 006611 9

Gas: 99.999% Nitrogen
Ecorr: -352 mV Model: Keithley 614 SN: 704936
Ept: + 3 mV Cal: 5/27/05 Due: 5/26/06

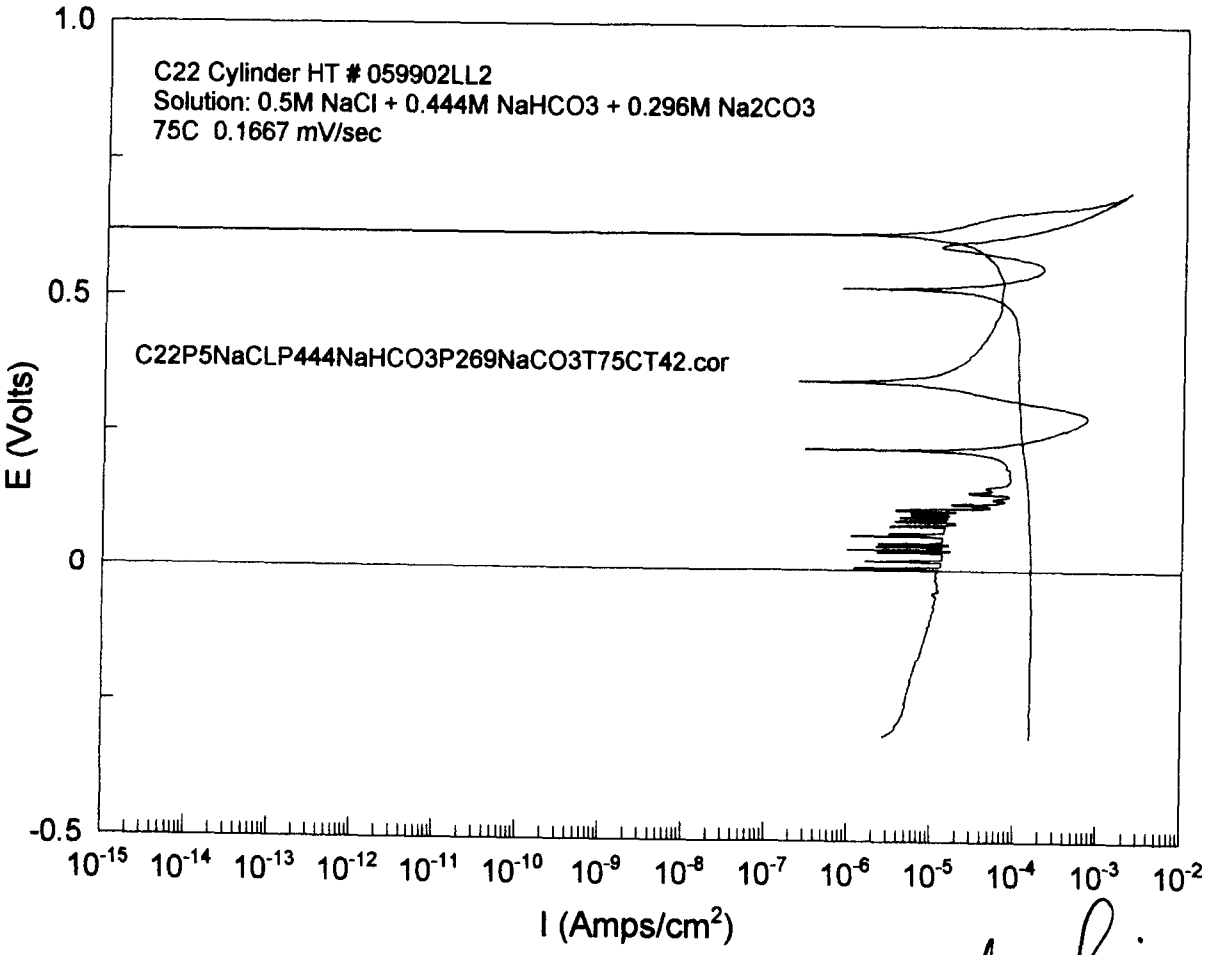
Potentiostat: EG&G 263A SN# 66105

Specimen Examination:

some slight filming - otherwise unremarkable
specimen repolished for further use

file; C22P5NaClP444NaHCO3P269Na2CO3T45CT42.cor

Walter J. MacKovach
9/16/05



Walter J. Machowski
9/16/05

Initial Scientific Notebook Entry for Slow Strain Rate Tests on Alloy 22

Title: Slow Strain Rate Tests.

Tests Performed by: Pavan Shukla, Div. 20; Walt Machowski, Div. 18.

Objectives: To determine the effect of chloride, carbonate bicarbonate and nitrate ions on stress corrosion cracking susceptibility of Alloy 22.

Proposed approach or procedure for achieving the objectives: Conduct slow strain rate tests on Alloy 22 sample in various test solutions containing chloride, carbonate, bicarbonate, and nitrate ions at different applied anodic potentials.

Equipment: Electrochemical test cell made of glass and teflon, ESC 440-2 multichannel potentiostat, Labview data acquisition software, temperature controller, pH meter, balances, FLUKE 87 II electrometer, Coolant system, LVDT.

Potentiostat and Labview data acquisition performance verified using TOP-022 Thermocouple, thermocouple meter, pH meter, analytical balances, and electrometers calibrated by SwRI calibration laboratory.

Materials: mill-annealed Alloy 22.

Specimen Specifications: slow strain rate specimens, CNWRA drawing number 20-03704-042-001

Measurement Parameters: Temperature, Potential and Current, Load in lbs.

Required Level of Accuracy: Temperature ±2°C, Potential 1 mV, Current ±0.1 μA.

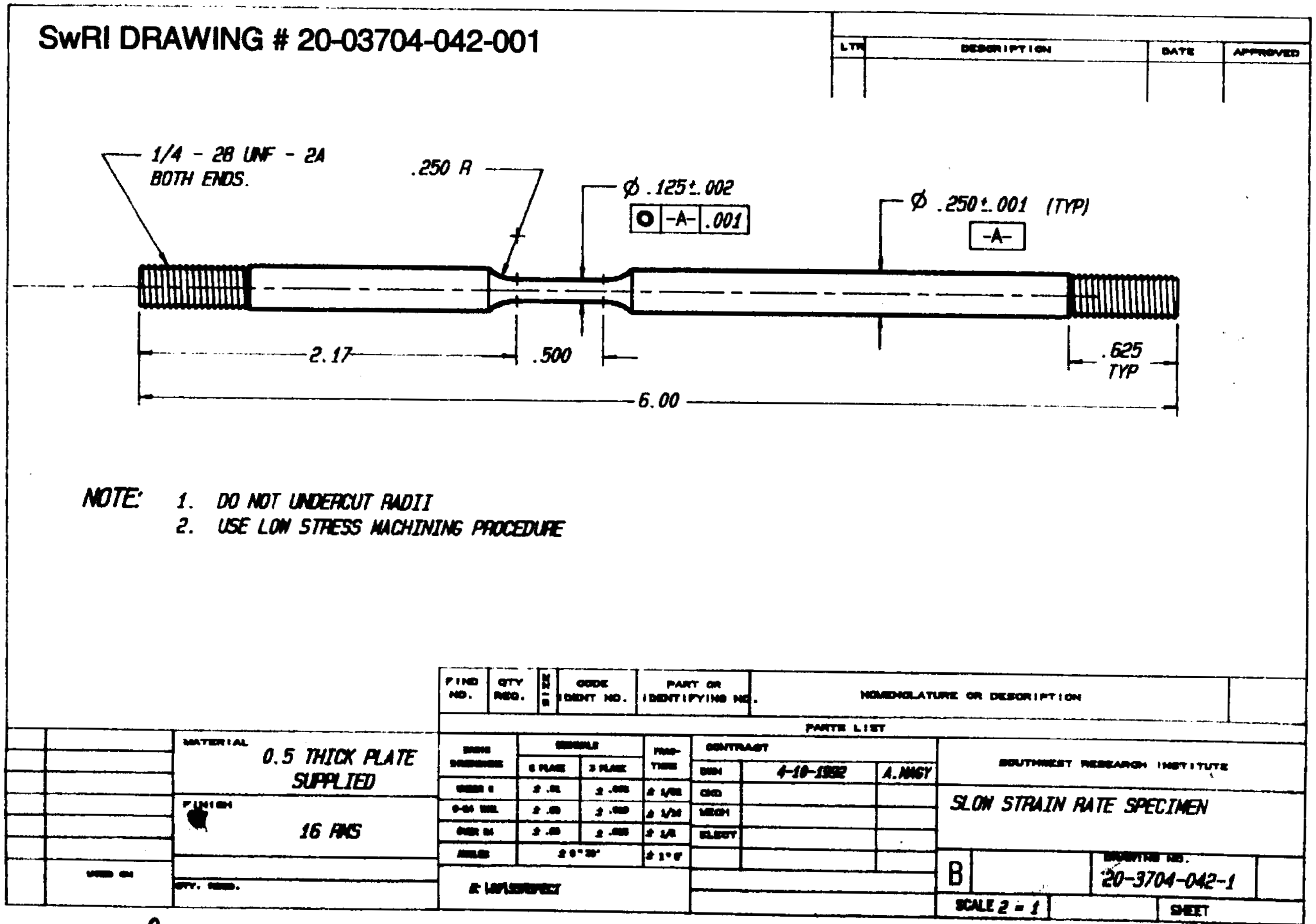
Uncertainty and Sources of Error: Current density calculated as current divided by sample area. Actual current density of corroding areas is not determined.

I K. Shukla
10/12/05

Ken Chiang
SwRI-CNWRA
Phone: (210) 522-2308
Fax: (210) 522-5184
e-mail: Kchiang@swri.org

3/8 SQ x 6 1/4

SwRI DRAWING # 20-03704-042-001



K.J. Chiang 1-13-04
Initiator: K. Chiang Date

[signature] for V. Jain
Reviewer: V. Jain Date 1/13/04

[signature] for 1/13/04
QA Approval: R. Brient Date

Procedure 105-WI-821
Project #
TOTAL PCS. INSPECTED 2
TOTAL PCS. ACCEPTED 2
TOTAL PCS. REJECTED 0
"NR #" IF REJECTS
INSPECTOR
LOCATION CC 30 MS
J.C. # 81904
EQUIPMENT Mic 008976 Due 1-13-06
Comp 002158 Due 1-18-06
Thd Gage 002176 Due 11-19-07
DATE SEP -6 2005
P.O.# 528572n
(C-22 Alloy // to Rolling Direction)
[signature] 10/12/05

SLOW STRAIN RATE TEST

Objective: see page 86

03304-042-001 wjm 9/30/05

Specimen: MA Alloy 22 SwRI Drawing # 20-~~06002-01-321-001~~

Solution: ∝ 1/2 L

0.5M NaCl 14.62 g Lot # 051510

0.74M Na_2CO_3 39.21 g Lot # {044284 / 990437}

pH_i = 11.40 pH_f = 11.13

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 7/12/05 **Due:** 1/12/06

Counter Electrode: Pt flag **Reference Electrode:** ** Ag/AgCl w/3M KCl in house

Gas: N_2 (99.999%) *Ecorr: −306 mV

*Eapplied: +200 mV **Potentiostat:** ESC440-2 **SN:** 9209138

Specimen Visual:

metallic silver unremarkable

loops life ductile fracture

** fluke III S/N 73980493 SCE 13-650-52
cal 2/9/05 – 2/9/06 ** VS SCE # 500301P13
A −35 mV

$\epsilon^0 = 3.2 \times 10^{-6}\ s^{-1}$

* fluke 179 S/N 010857 cal 5/11/05 – 5/11/06

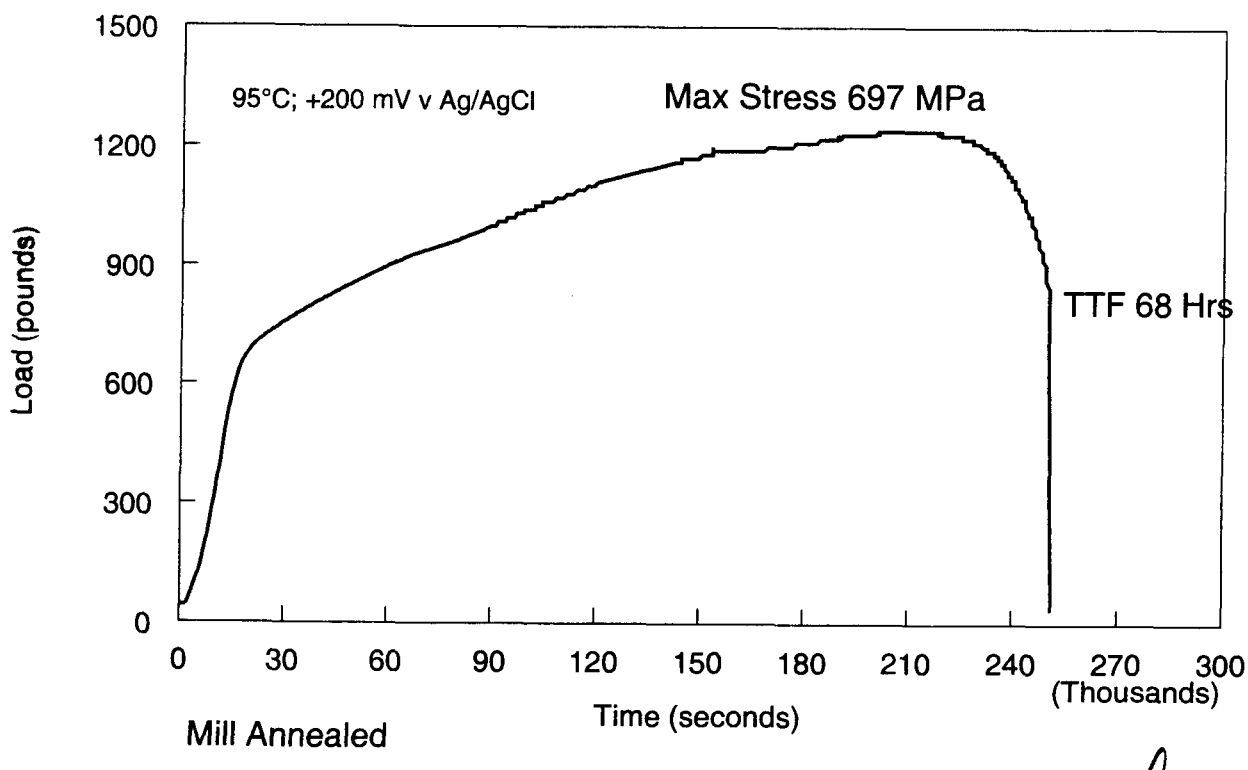
pH meter ORION EA940 S/N 2330 pH electrode 13-620-29
cal 7/25/05 – 7/25/06 S/N 1406196 P

T/C S/N 0003 cal 6/14/05 – 11/18/05

Walter J. Machowski
9/19/05

Slow Strain Rate Test

0.5M NaCl; 0.74M Na2CO3



Walter J. MacNaughton
9/19/05

SLOW STRAIN RATE TEST

Objective: see page 86

03704-042-001 wjm 9/30/05

Specimen: MA Alloy 22 SwRI Drawing # 20-~~06002-01-321-001~~

Solution: ~ 1/2 L

0.5M NaCl 14.63 g Lot # 051510
0.37M Na_2CO_3 19.61 g Lot # 044284
0.37M $NaHCO_3$ 15.54 g Lot # 050282

Reagents measured with Model: OHAUS SN: 2883
Cal: 7/12/05 Due: 1/12/06

Counter Electrode: Pt flag **Reference Electrode:** Ag/AgCl ~4M KCl
Cal Check v SCE : Δ 34 mV S/N 500303P13

Fluke 87 DVM: SN: 73960493 Cal: 2/9/05 Due: 2/9/06

Initial pH: 9.42 **pH Meter:** ORION 940 SN: 2330 Cal: 7/25/05 Due: 7/25/06
Final pH: 9.50 **pH electrode:** 13-620-240 SN: 14065196P

Gas: N_2 (99.999%) **Ecorr:** −241 mV

Eapplied: +200 mV **Potentiostat:** EGC 440-2 SN: 9209138

DVM: SN: FLUKE 179 010657 Cal: 5/11/05 Due: 5/11/06

T/C or Thermometer: SN 0003
Cal: 5/19/05 Due: 11/18/05

Specimen Visual: grayish - some secondary cracking fracture looks more ductile than brittle

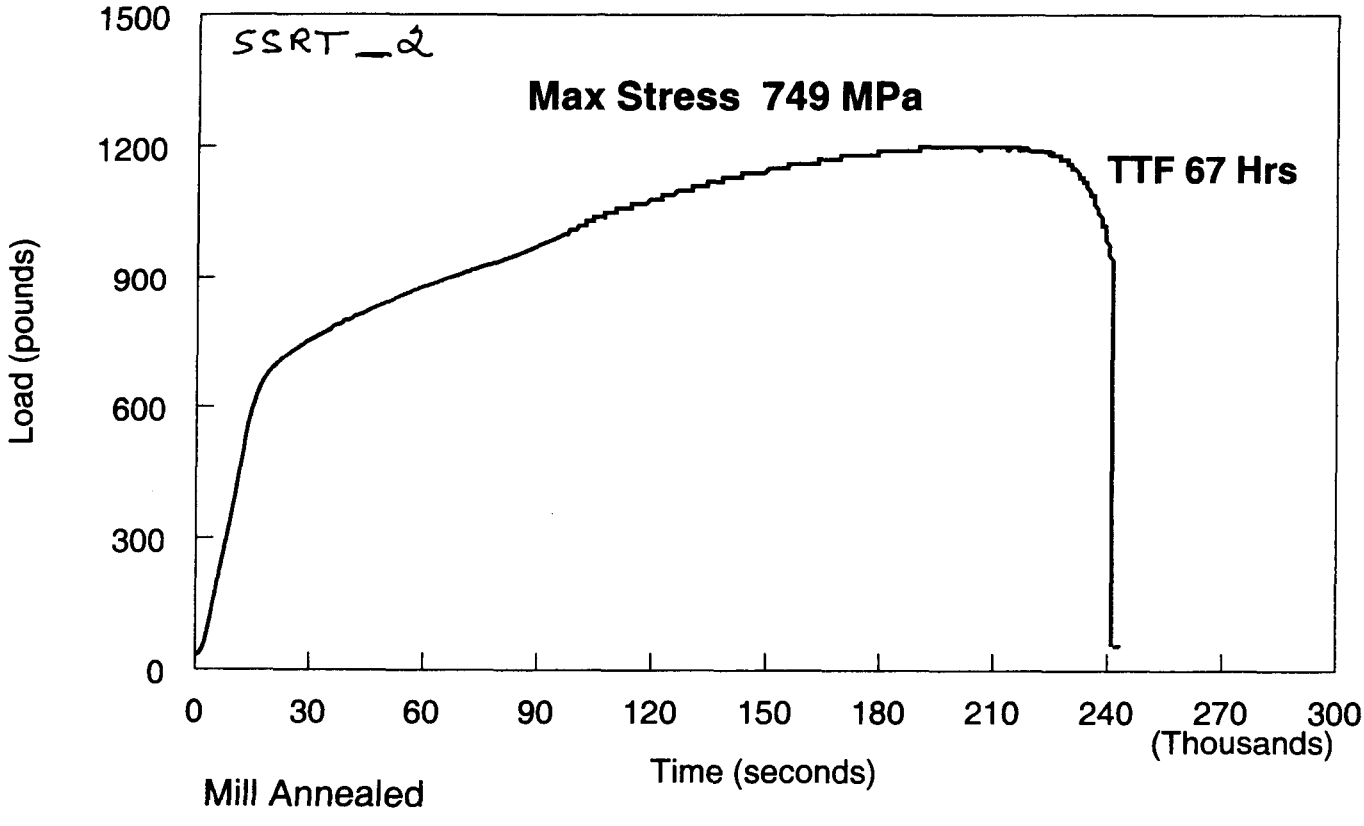
$\epsilon^o = 3.2 \times 10^{-6}\ s^{-1}$

Walter J. Mackowiak 9/30/05

Slow Strain Rate Test

0.5M NaCl; 0.37M Na2CO3; 0.37M NaHCO3

+200 mV 95°C



Walter J. Machowski 9/30/05

SLOW STRAIN RATE TEST

Objective: see page 86

Specimen: MA Alloy 22 SwRI Drawing # 20-03704-042-001

Solution: X / L (BSW)

$NaNO_3$	243.16 g	Lot 052080	Na_2CO_3	25.00 g	Lot 035451
KCl	172.50 g	Lot 044597	Na_2SO_4	189.40 g	Lot 044284
NaCl	157.31 g	Lot 051510			
NaF	3.56 g	Lot 006679			

Reagents measured with Model: ORION 5 SN: 2883
Cal: 7/12/05 Due: 1/12/06

Counter Electrode: Pt flag **Reference Electrode:** Ag/AgCl 4/3M KCl
Cal Check v SCE : Δ 33mV
DVM: SN: Cal: 2/4/05 Due: 2/9/06
73980493

Initial pH: 11.17 **pH Meter:** ORION SN: 2330 Cal: 7/29/05 Due: 7/25/06
Final pH: 11.02 **pH electrode:** 13-620-296 SN: 1406519GP

Gas: N_2 (99.99%) **Ecorr:** -347 mV

Eapplied: +100 mV **Potentiostat:** ESC 440-2 SN: 9209138

DVM: SN: 73980493 (FLUKE 87III) Cal: 2/9/05 Due: 2/9/06

T/C or Thermometer: SN 0003
Cal: 5/19/05 Due: 11/18/05

Specimen Visual: slightly dull - looks like ductile fracture

$\dot{\varepsilon}^o =$
$3.2 \times 10^{-6} s^{-1}$

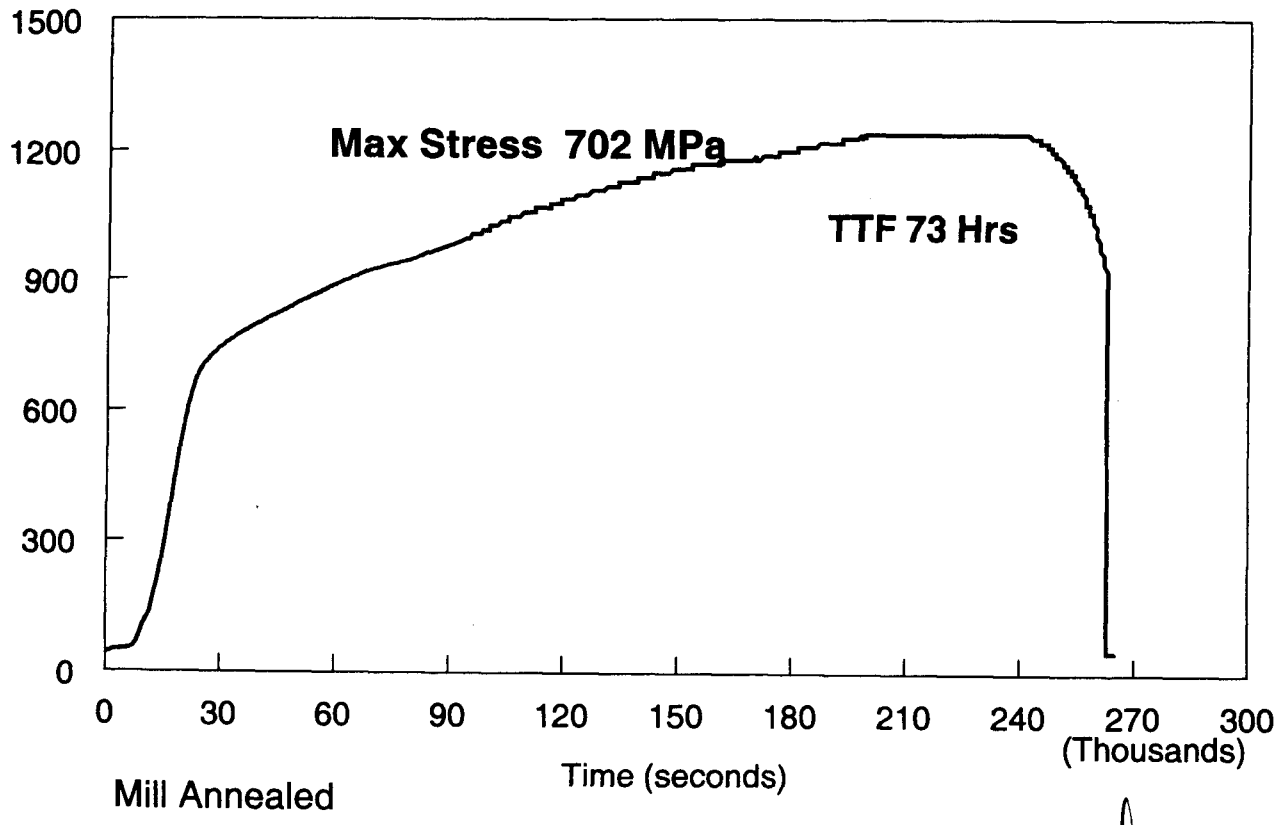
Walter J. Machowski
10/11/05

Slow Strain Rate Test

BSW

+100 mV 95°C

SSRT#3



Mill Annealed

Walter J. MacIvor
10/11/05

SLOW STRAIN RATE TEST

Objective: see page 86

Specimen: MA Alloy 22 SwRI Drawing # 20-03704-042-001

Solution: (BSW)

balance of solution on p. 92

Reagents measured with Model: OHAUS SN: 2883
Cal: 7/12/05 Due: 1/12/06

Counter Electrode: Pt flag **Reference Electrode:** Ag/AgCl w/3M KCl
Cal Check v SCE : Δ 33 mV
DVM: SN: 73980493 Cal: 2/9/05 Due: 2/9/06

Initial pH: 11.17 **pH Meter:** ORION SN: 2330 Cal: 7/25/05 Due: 7/25/06
Final pH: 10.96 **pH electrode:** 13-620-296 SN: 1406196 P

Gas: N_2 (99.999%) **Ecorr:** −302 mV

Eapplied: +300 mV **Potentiostat:** ESC 440-2 SN: 9209138

DVM: SN: FLUKE 73980493 Cal: 2/9/05 Due: 2/9/06

T/C or Thermometer: SN 0003
Cal: 5/19/05 Due: 11/18/05

Specimen Visual: dull; much secondary cracking
failure looks brittle

$\epsilon^{\circ} = 3.2 \times 10^{-6}\ s^{-1}$

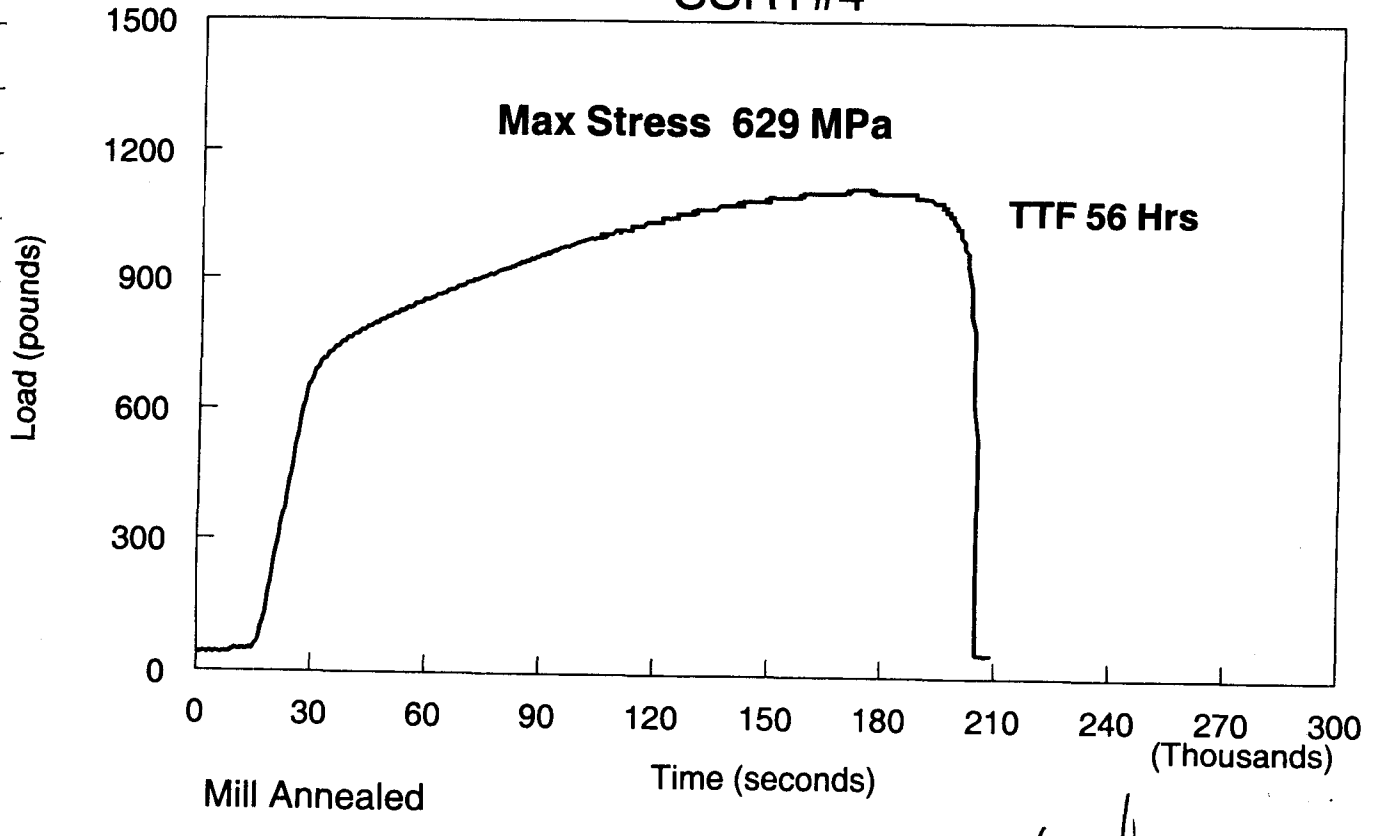
Walter J. Mackowiak 10/11/05

Slow Strain Rate Test

BSW

95°C +300mV

SSRT#4



Walter J. Mackwoski
10/11/05

11/1/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D602X DOE base alloy HT # 05990222 2

Initial Weight: 12.37423 Model: Sartorius Genius SN: 12809099
Final Weight: 12.39618 Cal 5/14/05 Due: 11/14/05

SOLUTION: 2 L

0.5M NaCl	58.49 g	Lot # 051510
0.37 M $NaHCO_3$	62.25 g	Lot # 050382
0.37 M Na_2CO_3	78.40 g	Lot # 0442841
0.2 M $NaNO_3$	34.92 g	Lot # 020809

Reagents measured with Model: OHAUS SN: 2883
Cal: 7/12/05 Due: 1/12/06

Initial pH: 9.48 Model: orion SN: 2330
Final pH: 9.25 CAL: 7/25/05 DUE: 7/25/06
pH Probe: #13-620-296 SN: 14065196 P

TEST TEMPERATURE: 95°C Measured with Hg Thermometer SN: CG6-106
Cal: 4/27/05 Due: 4/25/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 SN: 0066119

Gas: 99.999% Nitrogen
Ecorr: -525 mV
Ept: -60 mV
Model: ~~Keithley~~ FLUKE (K. Sholl (11/9/05))
Cal: 2/9/05
SN: 7398049 3
Due: 2/9/06

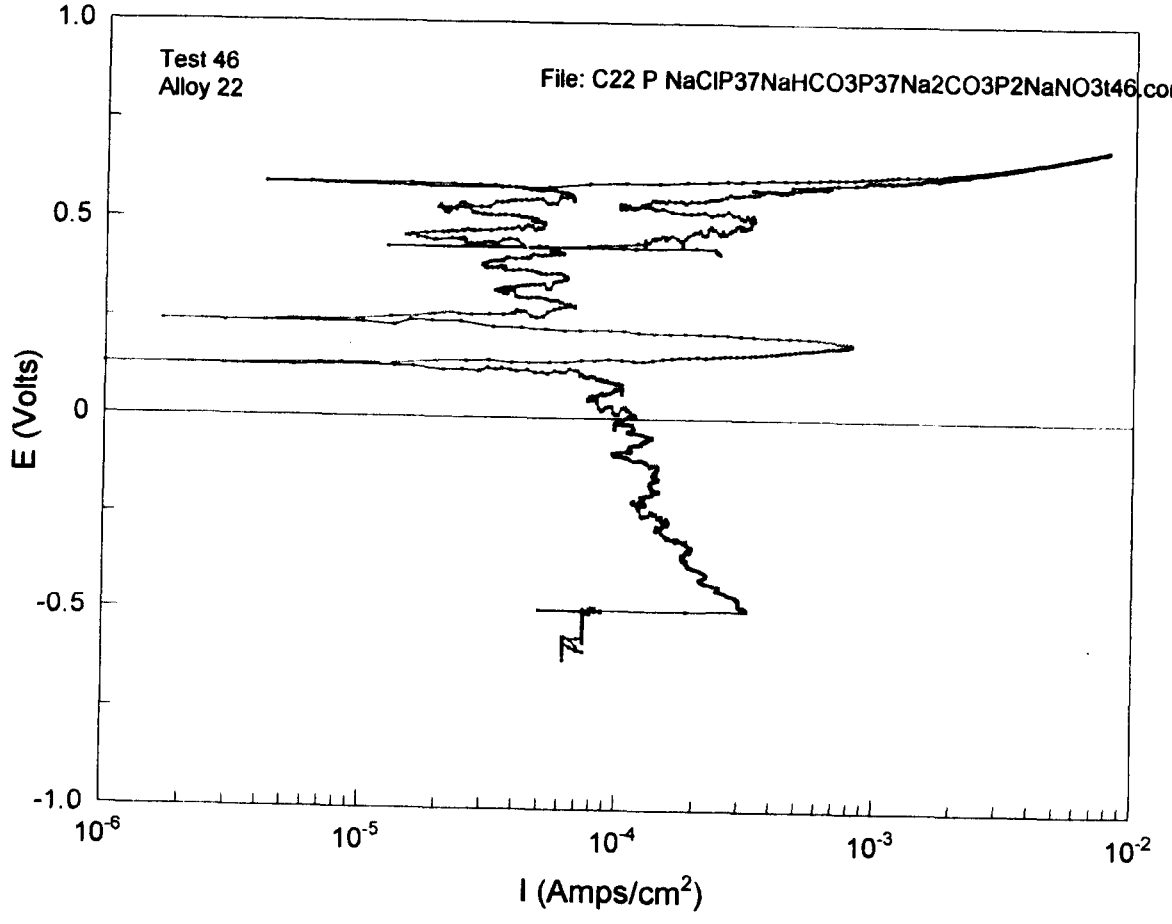
Potentiostat: EG&G 263A SN# 66105

Specimen Examination:

slight film; otherwise unremarkable
specimen repolished for further use

file: C22P5NaClP37NaHCO3P37Na2CO3P2NaNO3t46.cor

Walter J. Mackowski
11/8/05



Walter J. Machowski 11/8/05

11/3/05

Cyclic Potentiostatic Test

Objective: CPP on alloy 22 in various chemistries

Specimen: C22 cylinder plate D662X DOE base alloy HT #05990211 2

Initial Weight: 12.36383 **Model:** Sartorius Genius **SN:** 12809099
Final Weight: 12.36356 **Cal** 5/14/05 **Due:** 11/11/05

SOLUTION: ~2 L

0.5M	NaCl	58.50 g	Lot # 051510
0.37M	$NaHCO_3$	62.22 g	Lot # 050382
0.37M	Na_2CO_3	78.38 g	Lot # 049284
0.2M	$NaNO_3$	34.87 g	Lot # 020809

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 7/12/05 **Due:** 1/12/06

Initial pH: 9.49 **Model:** orion **SN:** 2330
Final pH: 9.10 **CAL:** 7/25/05 **DUE:** 7/25/06
pH Probe: #13-620-296 **SN:** 14065196P

TEST TEMPERATURE: 95°C **Measured with Hg Thermometer SN:** C98-106
Cal: 4/27/05 **Due:** 11/25/06

Counter Electrode: Platinum Flag

Reference Electrode: Fisher SCE 13-620-52 **SN:** 0066119

Gas: 99.999% Nitrogen
Ecorr: -485 mV **Model:** ~~Keithley~~ FLUKE P.K. Shah (11/8/05) **SN:** 73980493
Ept: -170 mV **Cal:** 2/9/05 **Due:** 2/9/06

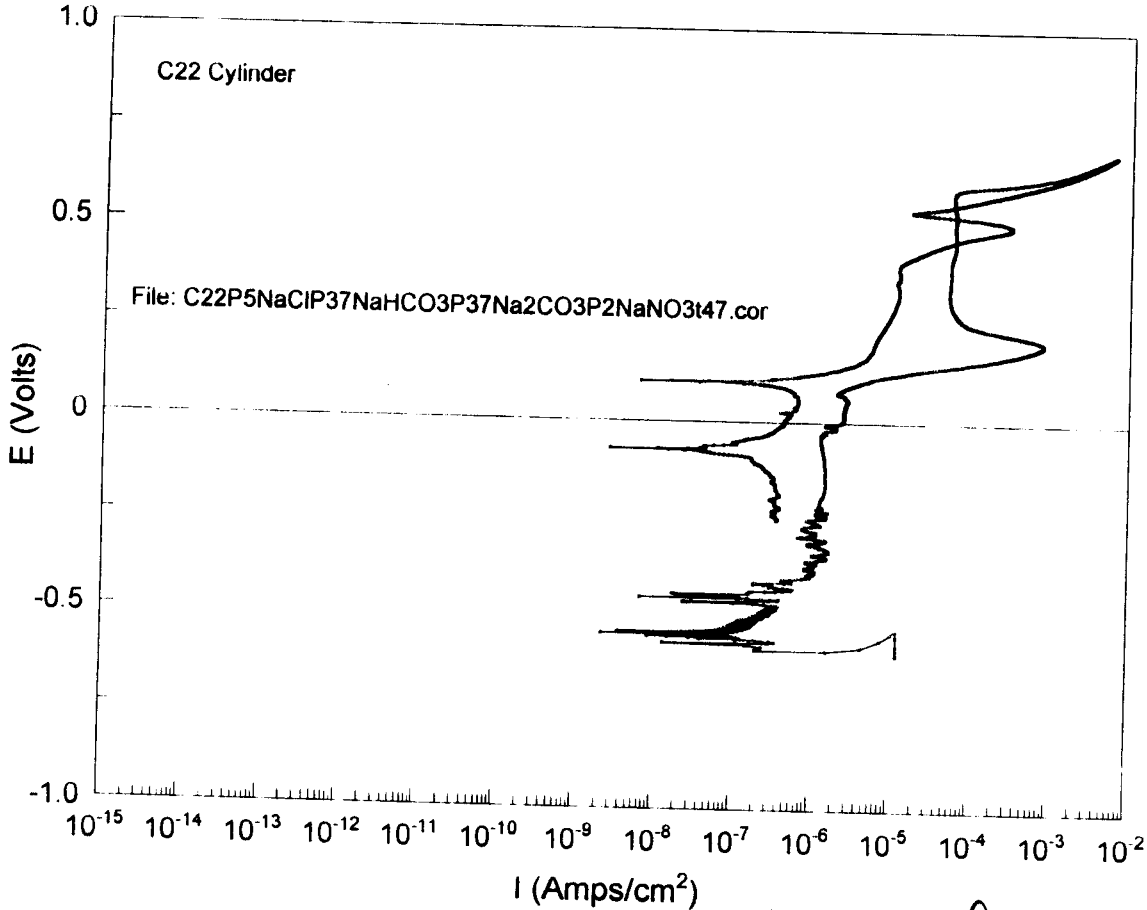
Potentiostat: EG&G 263A **SN#** 66105

Specimen Examination:

slight film; otherwise unremarkable
repolished for further use

file: C22P5NaClP37NaHCO3P37Na2CO3P2NaNO3t47.cor

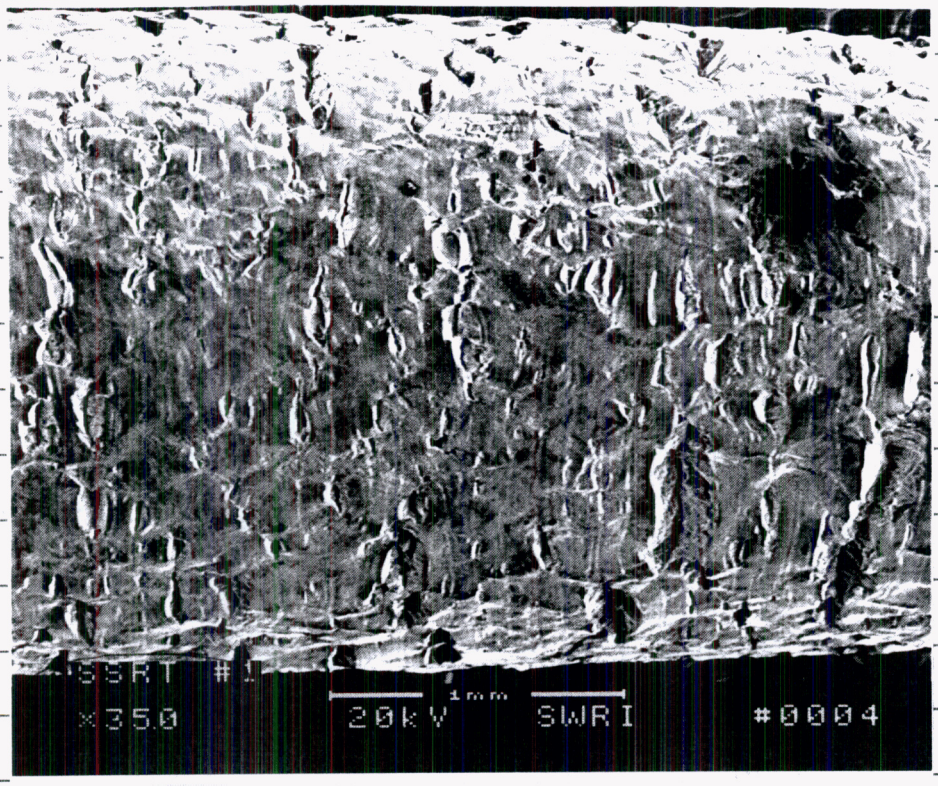
Walter J. Mackowiak
11/8/05

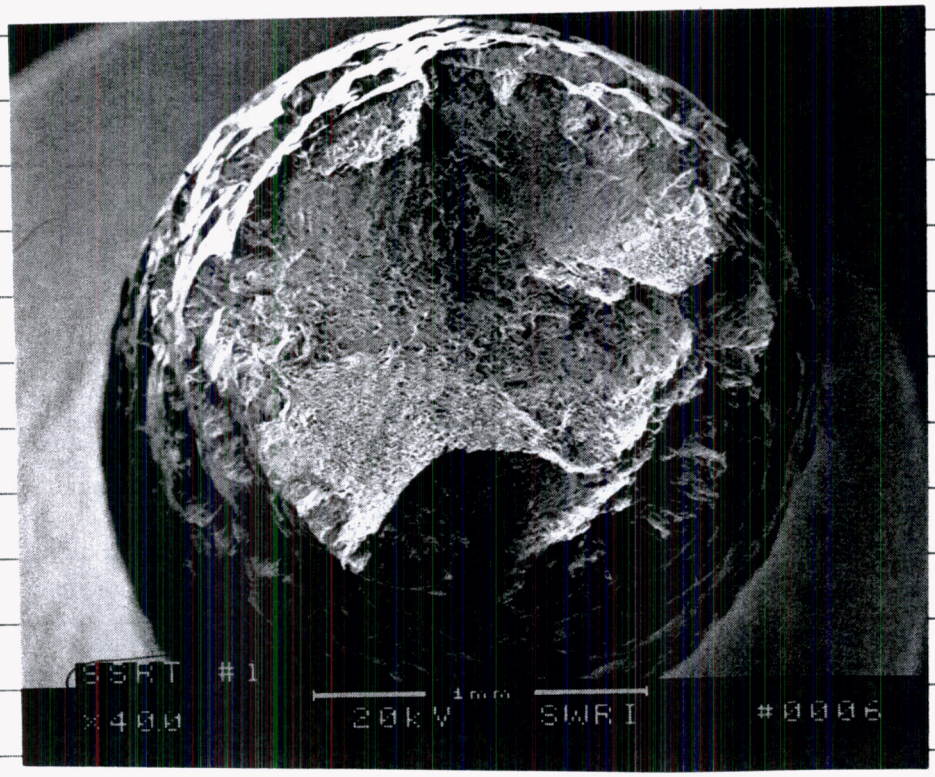


Walter J. Machowski
11/8/05

Side view and top view of the Sample (Alloy 22) after slow strain rate test. Data sheet and test results are on page 88 and 89.

P.K. Shukla
11/10/05

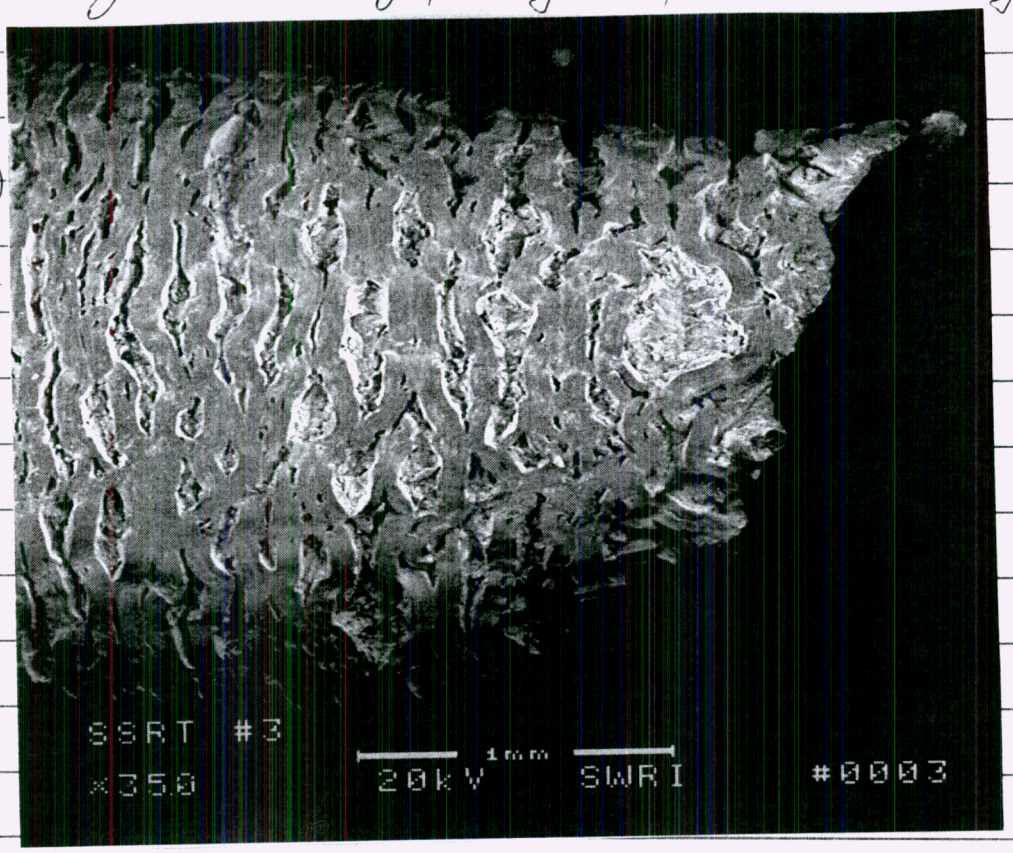


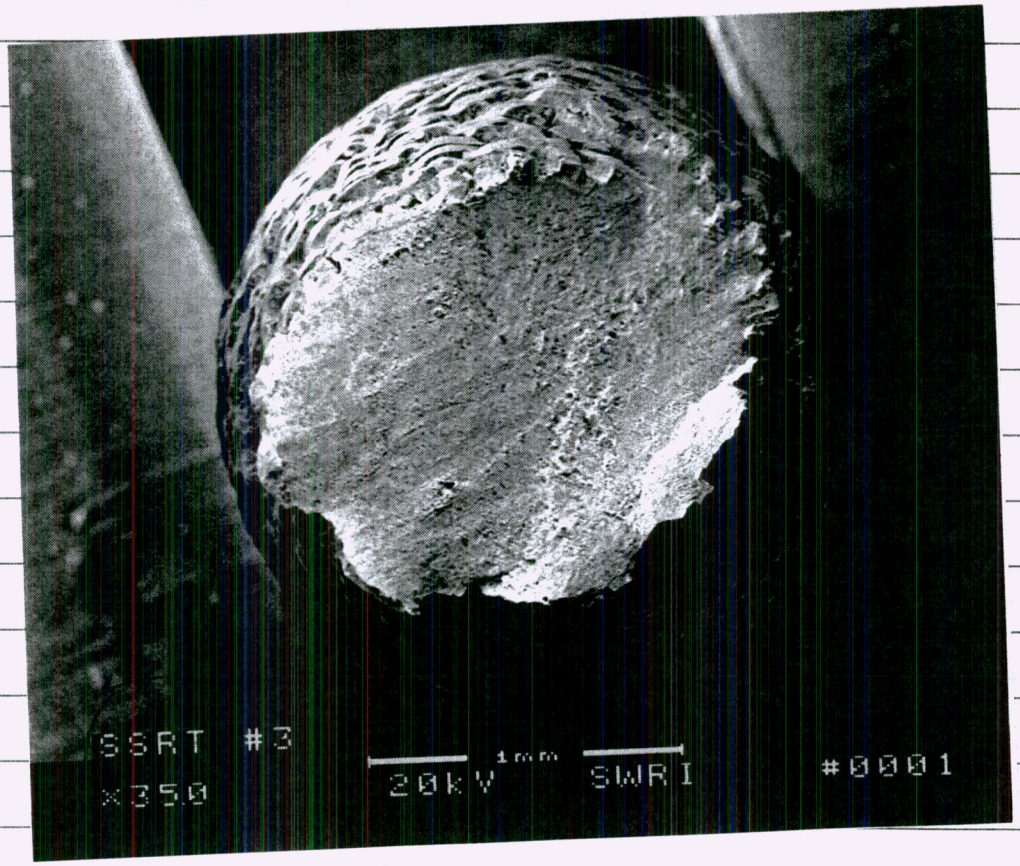


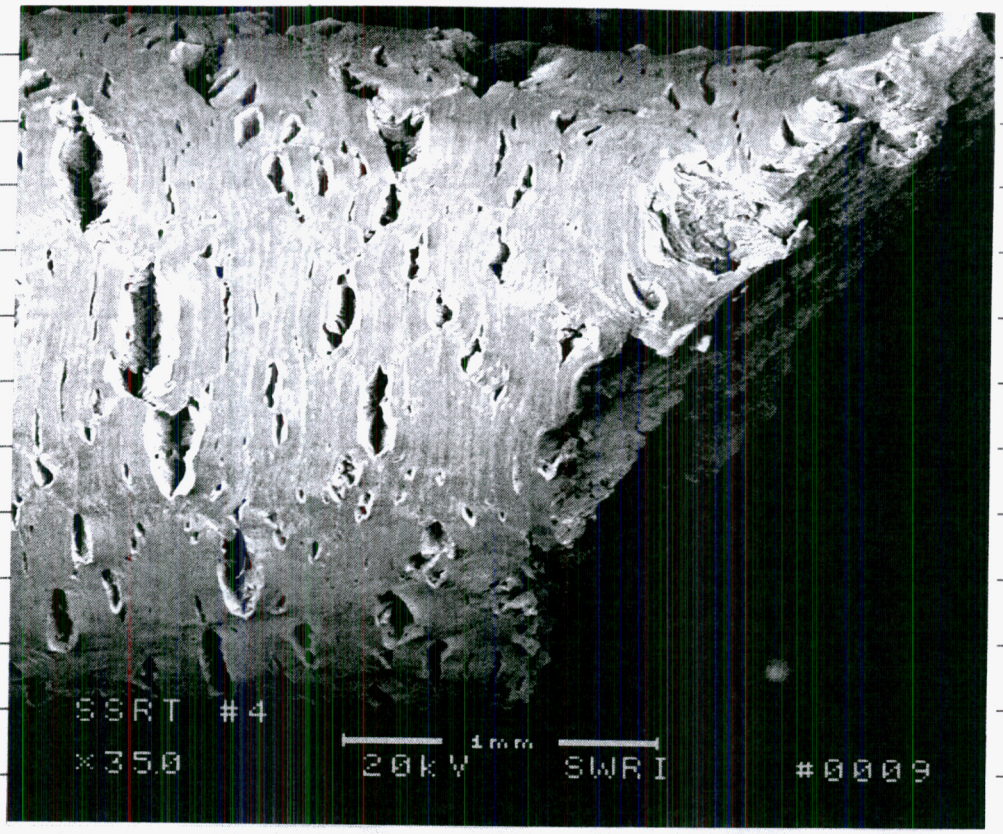
Side and top view of mill-annealed Alloy-22 sample after SSRT. Experimental data sheet and test results are on page 90 and 91.

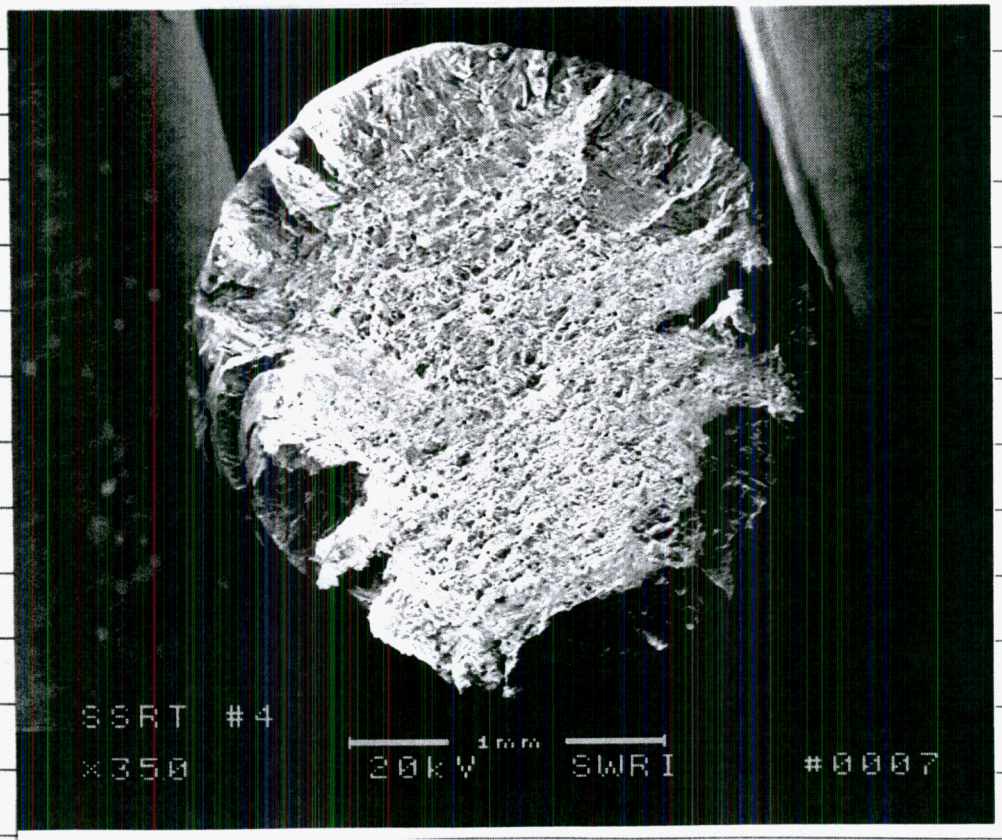
P. K. Shukla
11/10/05

102 SEM (Scanning electron micrograph) of top and side view of m-tl Alloy 22 sample after SSRT #3 (92,93) P. K. Shukla 11/10/05









SEM of m-A Alloy 22 sample after SSRT #4 on page 94 and 95.

I. K. Gruhl
11/10/05

last page copied for #4

Initial Scientific Notebook Entry for Passive Film Chemistry Tests on Alloy 22

Title: Passive Film Chemistry Tests at Constant Potentials.

Tests Performed by: Pavan Shukla, Div. 20; Brian Derby, Div. 18.

Objectives: To grow a passive film on Alloy 22 surface in basic saturated water at 95 °C, and to analyze the oxide layer for chromium oxide in the passive film.

Proposed approach or procedure for achieving the objectives: Subject Alloy 22 sample at constant potential in basic saturated water solution for seven days.

Equipment: Electrochemical test cell, EG&G potentiostat, thermocouple/thermocouple meter, temperature controller, pH meter, balances, Keithley electrometer, Coolant system.

Materials: Alloy 22. Material heats to be added prior to testing

Specimen Specifications: CNWRA drawing number 20.06002.01.322.015

Measurement Parameters: Temperature, Potential and Current as a function of time of specimen during test.

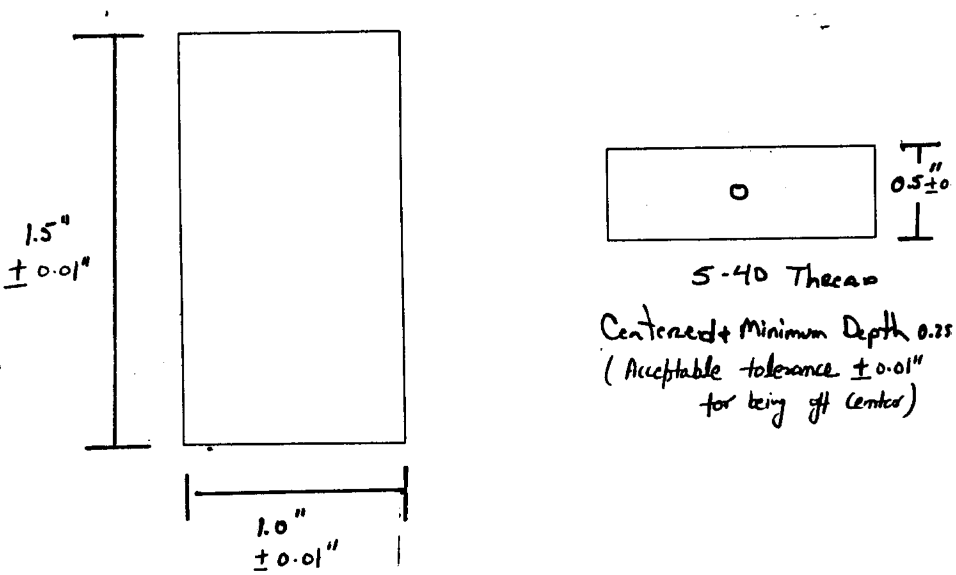
Required Level of Accuracy: Temperature ±2°C, Potential ±1 mV, Current ±0.1 μA.

Uncertainty and Sources of Error: Current density calculated as current divided by sample area. Actual current density of corroding areas is not determined. Non-faraday charging current during polarization.

P. K. Shukla
12/12/05

CNWRA Pavan Shukla Ext.6534 E mail: pshukla@swri.org	CNWRA Drawing# 20.06002.01.322.015	Material: C-22 Heat#: 2277-3-3266

Block Specimen



Procedure
Project #
TOTAL PCS. INSPECTED 3
TOTAL PCS. ACCEPTED 3
TOTAL PCS. REJECTED 0
"NR #" IF REJECTS
INSPECTOR
LOCATION IC 3/MS
J.C. # 82240
EQUIPMENT
QL 00508 Due 9-6-06
Tool Corp. 00217 Due 4-19-07
DATE NOV 21 2005

P.K. Shukla 11/11/2005
Initiator: P. Shukla Date

Mark R. Ehnstrom 11/11/05
for QA Approval: B Brient Date

[signature] 11/11/05
Reviewer: V. Jain Date

[signature] 12/12/05

PASSIVE FILM CHEMISRTY

Objective: See pg #104

SPECIMEN: C-22 Block HT# 2277-3-3266 See pg #105

Initial Weight: 105.36127g **Model:** Sartorious Genius **Sn:**12809099
End Weight: ~~105.37295g~~ 105.36295g Cal: 11/14/05 Due: 5/12/06

SOLUTION: Basic Saturated Water.

$NaNO_3$	486.59g	Lot# 020809	NaF	7.139g	Lot# 006675
KCl	346.10g	Lot# 043820	Na_2CO_3	378.73	Lot# 044284
NaCl	314.52g	Lot# 051510	Na_2SO_4	50.00	Lot# 035461

+ DI To 2000ml's

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 7/12/05 Due: 1/12/06

TEST TEMPERATURE: 95°C **Thermometer:** H 98-182
Cal: 5/6/05 Due: 5/5/06

Initial pH: 11.637 **Model:** Orion EA 940 **SN:** 2330

Final pH: 10.871 Cal: 7/25/05 Due: 7/25/06

pH Probe: #13-620-296 **SN:** 4065196

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

GAS: 99.995% N_2
ECORR: -582mv **Model:** Keithley **SN#:** 0579628
EPT: -310mv Cal: 9/14/05 Due: 9/14/06

Potentiostat: EG&G Versastat **SN#:** 2204
cal: 10/5/05 Due: 4/5/06

TEST ID: PFCBSW1

TEST DETAILS: Specimen shows no sign of corrosion or pitting
golo tint staining on All surfaces of Specimen

50mv Test.

Initial Test will Continue Testing See pg #109

DE 12/12/05

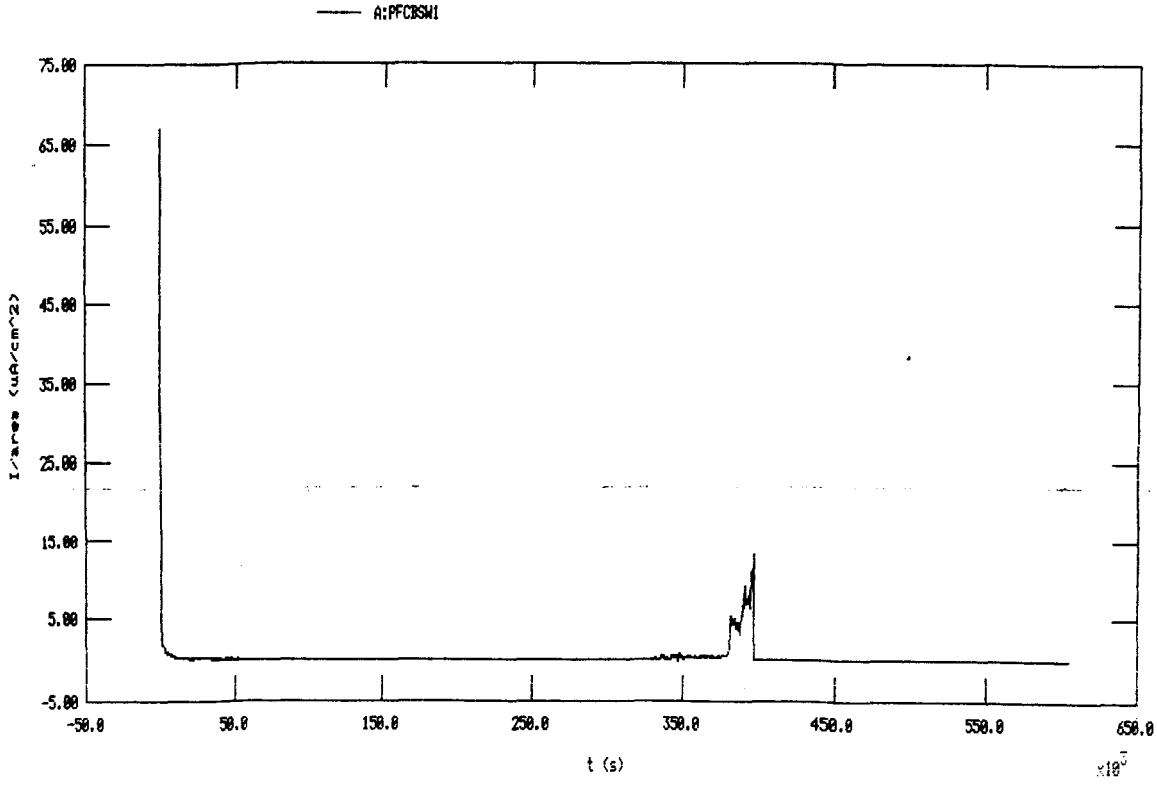
Model 352/252 Corrosion Analysis Software, v. 2.30
Filename: A:PFCBSW1
Pstat: VStat[] Ver 2
PS POTENTIOSTATIC
Date Run: 12-12-05

File Status: NORMAL
Time Run: 15:05:13

Cond. Time	CT	pass	s	Initial Pot.	IP	50.00E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	604.0E3	s
Initial Delay	ID	5	s	Stop On	SO	Pass	
Time/Pt.	TP	201.3	s	Curr. Range	CR	Auto	
No. of Points	NP	3000					
Line Sync.	LS	yes		IR Mode	IR	none	
Rise Time	RT	high stability		Filter	FL	I 5.3Hz	
Working Elec.	WE	Solid		Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	76.24	cm^2	Equiv. Wt.	EW	26.84	g
Density	DE	8.698	g/ml	AUX A/D	AX	no	
Open Circuit	OC	-583.0E-3	V				

Comment: Alloy 22 passive film chemistry BCW 95C test1

Model 352/252 Corrosion Analysis Software, v. 2.30 Filename: A:PFCBSW1 Pstat: VStat[] Ver 2 PS POTENTIOSTATIC
File Status: NORMAL Date Run: 12-12-05 Time Run: 15:05:13
OF PASS vs. R CT PASS IP 0.050 vs. R ID 5 s TP 2.013E+02 T1 6.040E+05
CR AUTO NP 3000 SO Pass IR NONE FL I 5.3Hz RT HIGH STABILITY
REF 2.24150 SCE WRK SOLID AR 7.624E+01 LS YES EW 2.684E+01 DEN 8.698E+00 AU NO
OC -0.583
Comment: Alloy 22 passive film chemistry BCW 95C test1

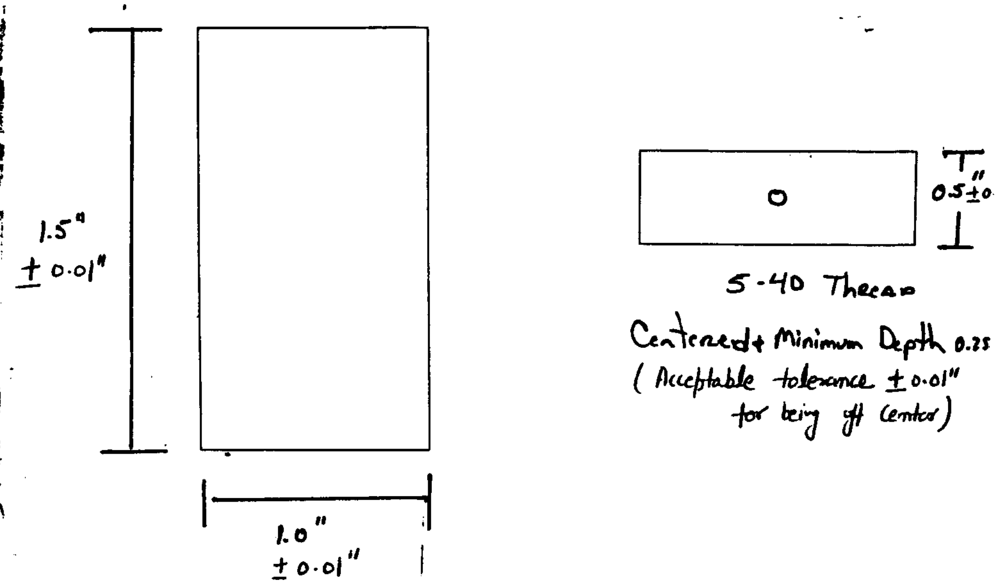


12/20/05

CNWRA Pavan Shukla Ext.6534 E mail: pshukla@swri.org	CNWRA Drawing# 20.06002.01.322.015	Material: C-22 Heat#: 2277-3-3266

Procedure
Project #
TOTAL PCS. INSPECTED 3
TOTAL PCS. ACCEPTED 3
TOTAL PCS. REJECTED 0
"NR #" IF REJECTS
INSPECTOR
LOCATION IC 3/ MS
J.C. # 82240
EQUIPMENT
QI 00508 Due 6-6-06
Tbd Caf 00276 Due 11-19-07
DATE NOV 21 2005

Block Specimen



P.K. Shukla 11/11/2005
Initiator: P. Shukla Date

Mark R. Ehnstrom 11/11/05
for QA Approval: B Brient Date

11/11/05
Reviewer: V. Jain Date

Additional Copy from pg #105 11/24/05

Test Matrix: will Continue Testing with The following Matrix After Initial 50 mV Test.

PASSIVE FILM CHEMISTRY TESTS

Specimen: C-22 heat# 2277-3-3266
CNWRA Drawing # 20.06002.01.322.015

Solution: Basic Saturated Water

Temp: 95C

Gas: ~~Puged~~ Purged 11/21/05 with 99.999% N2

Duration / Time: 7Days

Test # &	Test Potentials	
1.)	50mV vs. SCE	See pg# 106 - 107
2.)	100mV vs. SCE	See pg# 110 - 111
3.)	200mV vs. SCE	See pg# 112 - 113
4.)	400mV vs. SCE	
5.)		
6.)		

11/21/05

PASSIVE FILM CHEMISRTY

Objective: See pg # 104

SPECIMEN: C-22 Block HT # 2277-3-3266 See pg # 105

Initial Weight: 105.28605 g **Model:** Sartorious Genius **Sn:**12809099
End Weight: 105.28758 g Cal: 11/14/05 Due: 5/12/06

SOLUTION: Basic Saturated Water

$NaNO_3$	486.36 g lot # 020809	NaF	7.140 g lot # 006679
KCl	346.05 g lot # 043820	Na_2CO_3	378.66 g lot # 044284
NaCl	314.57 g lot # 052761	Na_2SO_4	49.99 g lot # 035461

+ DI To 2000 mL

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 7/12/05 Due: 1/12/06

TEST TEMPERATURE: 95°C **Thermometer:** H98-182
Cal: 5/6/05 Due: 5/5/06

Initial pH: 11.561 **Model:** Orion EA940 **SN:** 2330
Final pH: 10.466 Cal: 7/25/05 Due: 7/25/06
pH Probe: #13-620-296 **SN:** 4065196
Reference: Fisher # 13-620-52 SN # 4028036
Counter Electrode: PT Flag

GAS: 99.999% N_2
ECORR: -441 mV **Model:** Keithley **SN#:** 0579628
EPT: -173 mV Cal: 9/14/05 Due: 9/14/06

Potentiostat: EG&G Veesastat **SN#:** 20104
cal: 10/5/05 Due: 4/5/06

TEST ID: PFC BSW 2

TEST DETAILS: No sign of Corrosion or pitting. Slight tint staining on All Surfaces of Specimen

100 mv. Test

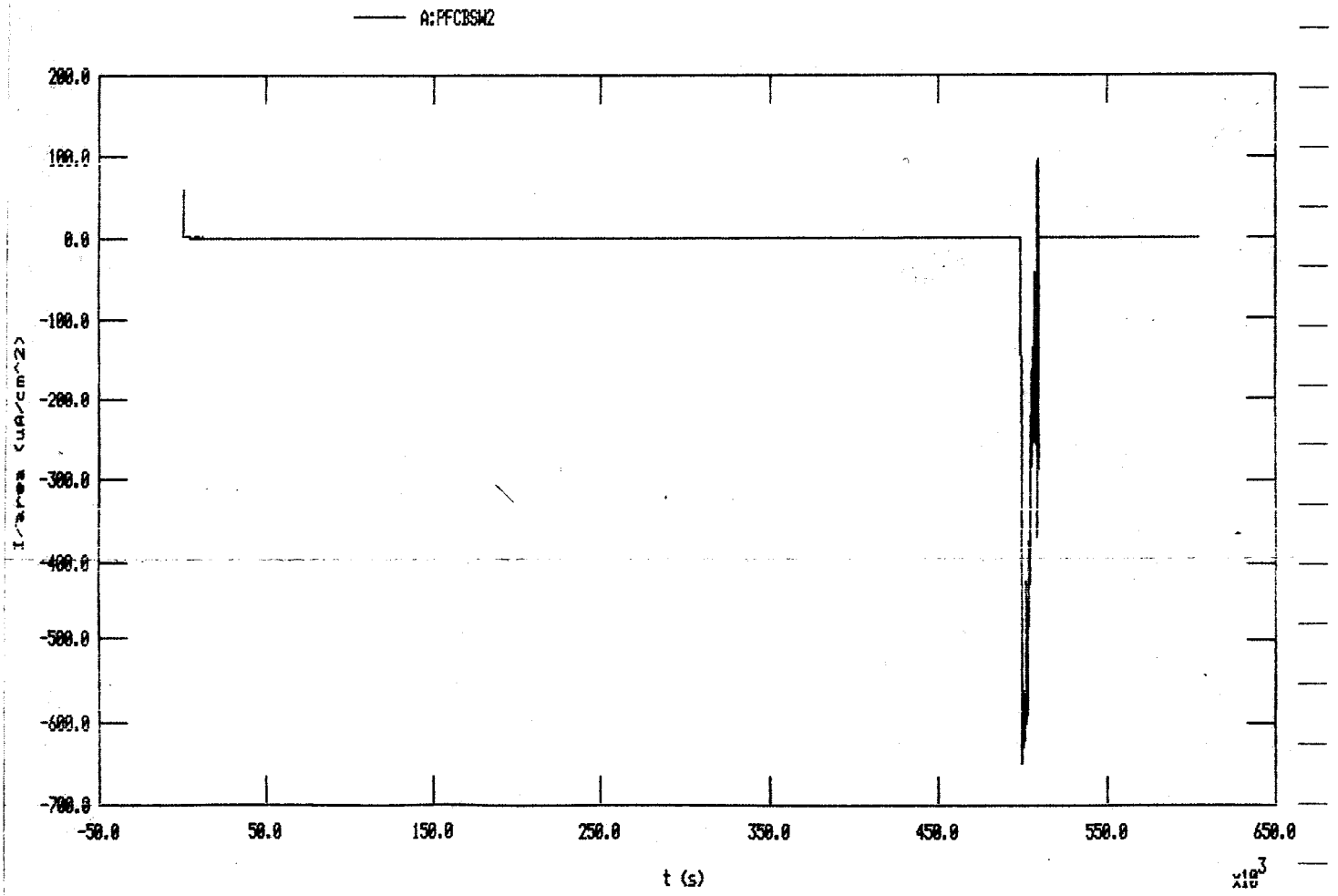
1/3/06

Model 352/252 Corrosion Analysis Software, v. 2.30
Filename: A:PFCBSW2
Pstat: VStat[] Ver 2
PS POTENTIOSTATIC File Status: NORMAL
Date Run: 12-15-05 Time Run: 11:01:17

Cond. Time	CT	pass	s	Initial Pot.	IP	100.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	604.0E3	s
Initial Delay	ID	5	s	Stop On	SO	Pass	
Time/Pt.	TP	201.3	s	Curr. Range	CR	Auto	
No. of Points	NP	3000					
Line Sync.	LS	yes		IR Mode	IR	none	
Rise Time	RT	high stability		Filter	FL	I 5.3Hz	
Working Elec.	WE	Solid		Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	76.24	cm^2	Equiv. Wt.	EW	26.04	g
Density	DE	8.690	g/ml	AUX A/D	AU	no	
Open Circuit	OC	-439.0E-3	V				

Comment: Alloy 22 passive film chemistry BCW 95C test1

Model 352/252 Corrosion Analysis Software, v. 2.30 Filename: A:PFCBSW2 Pstat: VStat[] Ver 2 PS POTENTIOSTATIC
File Status: NORMAL Date Run: 12-15-05 Time Run: 11:01:17
CP PASS vs. R CT PASS IP 0.100 vs. R ID 5 S TP 2.013E+02 T1 6.040E+05
CR AUTO NP 3000 SO Pass IR NONE FL I 5.3Hz RT HIGH STABILITY
REF 0.24150 SCE WRK SOLID AR 7.624E+01 LS YES EW 2.604E+01 DEN 8.690E+00 AU NO
OC -0.439
Comment: Alloy 22 passive film chemistry BCW 95C test1



1/10/05

PASSIVE FILM CHEMISRTY

Objective: See pg # 104

SPECIMEN: C-22 Black HT # 2277-3-3266 See pg # 105

Initial Weight: 105.44635g **Model:** Sartorious Genius **Sn:12809099**
End Weight: 105.45359g Cal: 11/14/05 Due: 5/12/06

SOLUTION: Basic Saturated water

$NaNO_3$	486.21g	Lot # 020809	NaF	7.139g	Lot # 006679
KCl	346.12g	Lot # 043820	Na_2CO_3	378.67g	Lot # 044284
NaCl	314.52g	Lot # 051510	Na_2SO_4	50.00g	Lot # 035461

+ DI To 2000mls

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 7/12/05 **Due:** 1/12/06

TEST TEMPERATURE: 95°C **Thermometer:** H98-182
Cal: 5/6/05 **Due:** 5/5/06

Initial pH: 11.396 **Model:** Orion EA940 **SN:** 2330
Final pH: 10.503 **Cal:** 7/25/05 **Due:** 7/25/06
pH Probe: #13-620-296 **SN:** 4065196
Reference: Fisher 13-620-52 SN # 4028036

GAS: 99.999% N_2
ECORR: -195 mV **Model:** Keithley **SN#:** 0579628
EPT: -86 mV **Cal:** 9/14/05 **Due:** 9/14/06

Potentiostat: EG+G Versastat **SN#:** 20104
cal: 10/5/05 **Due:** 4/5/06

TEST ID: PFCBSW3

TEST DETAILS: No Sign of Corrosion or Pitting · Slight Tint Surface Staining

200 mV Test

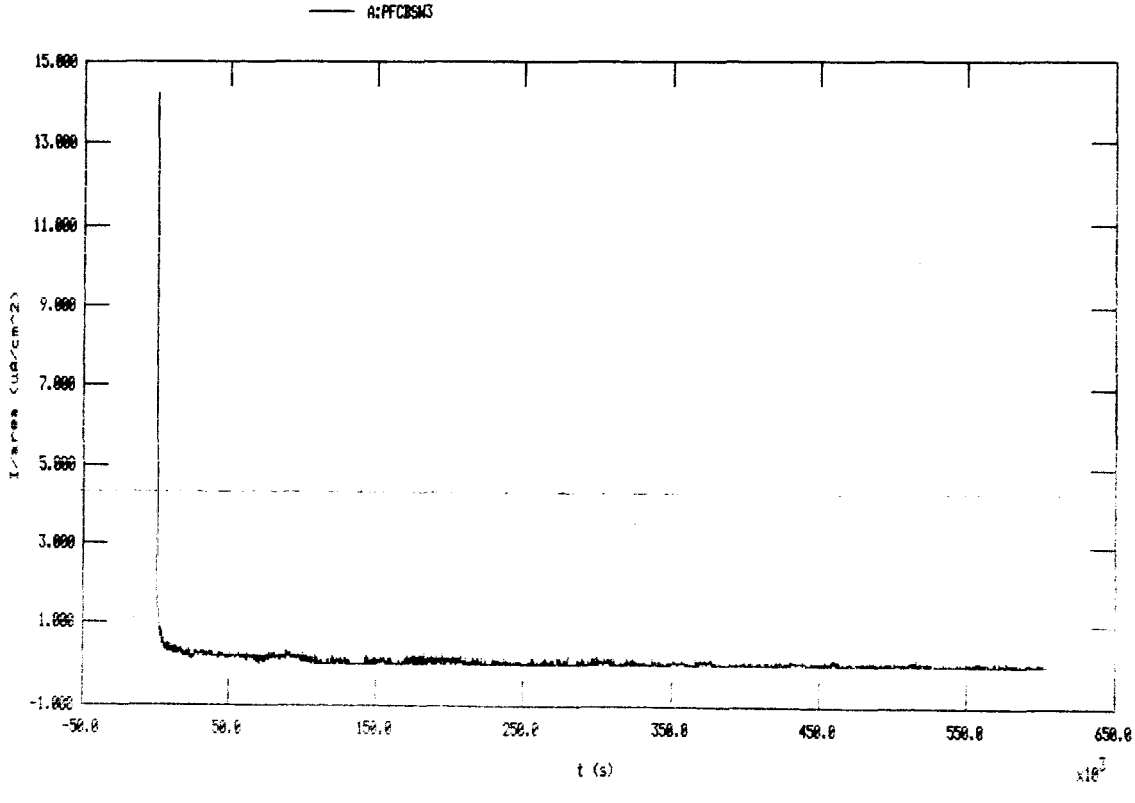
1/9/06

Model 352/252 Corrosion Analysis Software, v. 2.30
Filename: A:PFCBSW3
Pstat: VStat[] Ver 2
PS POTENTIOSTATIC — File Status: NORMAL
Date Run: 12-17-05 — Time Run: 09:46:12

Cond. Time	CT	pass	s	Initial Pot.	IP	200.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	604.0E3	s
Initial Delay	ID	5	s	Stop On	SO	Pass	
Time/Pt.	TP	201.3	s	Curr. Range	CR	Auto	
No. of Points	NP	3000					
Line Sync.	LS	yes		IR Mode	IR	none	
Rise Time	RT	high stability		Filter	FL	I 5.3Hz	
Working Elec.	WE	Solid		Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	76.24	cm^2	Equiv. Wt.	EW	26.04	g
Density	DE	8.690	g/ml	AUX A/D	AU	no	
Open Circuit	OC	-192.0E-3	V				

Comment: Alloy 22 passive film chemistry BCW 95C test3

Model 352/252 Corrosion Analysis Software, v. 2.30 Filename: A:PFCBSW3 Pstat: VStat[] Ver 2 PS POTENTIOSTATIC
File Status: NORMAL Date Run: 12-17-05 Time Run: 09:46:12
CP PASS vs. R CT PASS IP 0.200 vs. R ID 5 S TP 2.013E+02 T1 6.040E+05
CR AUTO NP 3000 SO Pass IR NONE FL I 5.3Hz RT HIGH STABILITY
REF 0.24150 SCE WRK SOLID AR 7.624E+01 LS YES EW 2.604E+01 DEN 8.690E+00 AU NO
OC -0.192
Comment: Alloy 22 passive film chemistry BCW 95C test3



1/17/06

PASSIVE FILM CHEMISRTY

Objective: See pg #104

SPECIMEN: C-22 Block HT# 2277-3-3266 See pg #105

Initial Weight: 105.53418g **Model:** Sartorious Genius **Sn:12809099**
End Weight: 105.53928g Cal: 11/14/05 Due: 5/12/06

SOLUTION: Basic Saturated Water

$NaNO_3$	486.67g	Lot# 020809	NaF	7.139g	Lot# 006679
KCl	346.14g	Lot# 043820	Na_2CO_3	378.77g	Lot# 044284
NaCl	314.42g	Lot# 051510	Na_2SO_4	50.03g	Lot# 035461

+ DI To 2000mL

Reagents measured with **Model:** OHAUS **SN:** 2883
Cal: 7/12/05 **Due:** 1/12/06

TEST TEMPERATURE: 95°C **Thermometer:** H98-182
Cal: 5/6/05 **Due:** 5/5/06

Initial pH: 11.497 **Model:** orion EA940 **SN:** 2330
Final pH: 10.475 **Cal:** 7/25/05 **Due:** 7/25/06
pH Probe: #13-620-296 **SN:** 4065196
Reference: Fisher 13-620-52 SN# 4028036

GAS: 99.999 % N_2
ECORR: -200mV **Model:** Kejthley **SN#:** 0579628
EPT: -70mv **Cal:** 9/4/05 **Due:** 9/14/06

Potentiostat: E G & G VersaStat **SN#:** 20104
cal: 10/5/05 **Due:** 4/5/00

TEST ID: PFCBSW4

TEST DETAILS: No Corrosion or Pitting on Specimen - Gold Blue tint Staining on All surfaces of Specimen

400 mV Test

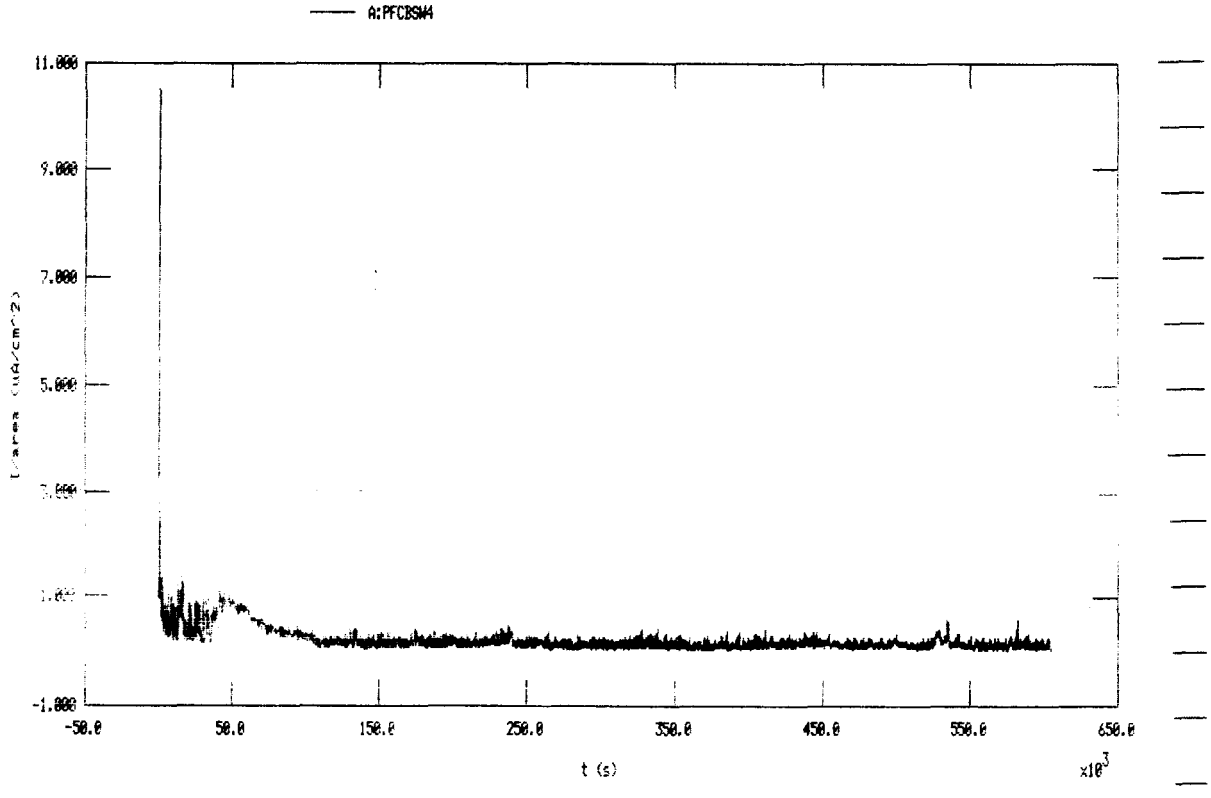
1/6/06

Model 352/252 Corrosion Analysis Software, v. 2.30
Filename: A:PFCBSW4
Pstat: VStat[] Ver 2
PS POTENTIOSTATIC File Status: NORMAL
Date Run: 12-19-05 Time Run: 07:47:46

Cond. Time	CT	pass	s	Initial Pot.	IP	400.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	604.0E3	s
Initial Delay	ID	5	s	Stop On	SO	Pass	
Time/Pt.	TP	201.3	s	Curr. Range	CR	Auto	
No. of Points	NP	3000					
Line Sync.	LS	yes		IR Mode	IR	none	
Rise Time	RT	high stability		Filter	FL	I 5.3Hz	
Working Elec.	WE	Solid		Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	76.24	cm^2	Equiv. Wt.	EW	26.84	g
Density	DE	8.690	g/ml	AUX A/D	AU	no	
Open Circuit	OC	-199.0E-3	V				

Comment: Alloy 22 passive film chemistry BCW 95C test3

Model 352/252 Corrosion Analysis Software, v. 2.30 Filename: A:PFCBSW4 Pstat: VStat[] Ver 2 PS POTENTIOSTATIC
File Status: NORMAL Date Run: 12-19-05 Time Run: 07:47:46
CP PASS vs. R CT PASS IP 0.400 vs. R ID 5 S TP 2.013E+02 T1 6.040E+05
CR AUTO NP 3000 SO Pass IR NONE FL I 5.3Hz RT HIGH STABILITY
REF 0.2415@ SCE WRK SOLID AR 7.624E+01 LS YES EW 2.684E+01 DEN 8.690E+00 AU NO
OC -0.199
Comment: Alloy 22 passive film chemistry BCW 95C test3



1/26/06