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Scientific Notebook # 157

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DARRELL DUNN
WALTER MACNOWSKI

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EBSER

Scientific notebook entry for Engineered Barrier System Experimental Research (EBSER).

EBSER TASKS:

1. Effect of Microorganisms on the Near Field Environment and the Corrosion of Waste Packages.
2. Effect of Waste Packages on the Near-Field Environment.
3. Long-Term Corrosion Tests for Prediction of Waste Package Performance.
4. Long-Term Stability and Embrittlement of Overpack Materials.
5. Stability of Multipurpose Canister Basket Materials.
6. Dissolution and Radionuclide Release From Spent Fuel and Vitrified Waste Form.
7. Reporting.

Tests Preformed by: Darrell S. Dunn, Peter Angell, Gustavo Cragnolino, and Narasi Sridhar.

EBSER Specific Objectives:

1. Develop and understanding of the processes affecting the near-field environment contacting the waste package in order to provide input to models and to confirm model predictions.
2. Address performance issues (corrosion, mechanical properties, radionuclide release rate) relevant to the current DOE ACD phase while retaining the flexibility to the methodologies developed to a variety of materials and design features
3. Conduct waste package experiments to scope and study the key parameters such as critical potentials, and fracture toughness affecting the long-term waste package performance.
4. Assess the adequacy of the DOE data and methodologies used to support lisenase application.
5. Provide information to support modeling activities related to waste package performance for Engineered Barrier Systems and Iterative Performance Assessment programs.

Detailed test objectives identified in initial entries or individual test entries.

TASK: All tests in this notebook form this page on were conducted as part of TASK 3, Long-Term Corrosion Tests for Prediction of Waste Package Performance, unless otherwise identified.

Equipment: Same as in IWPE-program. Specific equipment lists provided in test initial entries or in individual test entries.

Materials: Alloy 825 heat HH4371FG, Alloy 825 heat HH8882F, 316L heat P80746. Other materials and heats to be added and identified prior to testing.

 10/13/95

LONG TERM POTENTIOSTATIC TEST LT82SP24

SPECIMEN SAME AS IWPE 085 p 267

ALLOY 825 HN437IF6

START WT = 30.82028g

SOLUTION 1000 ppm Cl^- 85 ppm NaCO_3 20 ppm SO_4^{2-}
10 ppm NO_3^- 2 ppm F^- 2000 mL MAKE AS FOLLOWS

3.29966 g NaCl LOT 941616

0.24567 g NaHCO_3 LOT 89778940 mL SO_4 - 10/95 STOCK SOLUTION p 1420 mL NO_3 - 10/95 " p 144 mL F^- - 10/95 " p 14

+ DI WATER TO 2000 mL

START pH 8.27

T = 95°C H_2 THERMOMETER 0323008

POTENTIOSTAT ESC 440 #1 CHANNEL #1

DATA SAVED AS LT82SP24.DAT

REFERENCE FISHER 13-620-S1 SN 3106337

 E_{CORR} -77 mV +148 mV K6ITN64 617 SN 537418 E_{PE} +148 mV -77 mV 10/13/95 E_{APPLIED} 0 mV

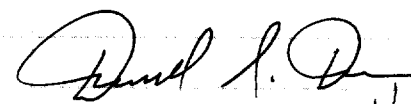
TEST STARTED 10/13/95

TEST STOPPED 11/26/95

END pH = 9.203

END WT. 30.82045g

NO SIGN OF LOCALIZED CORROSION


11/26/95

LONG TERM POTENTIOSTATIC TEST LT82SP7L

SPECIMEN SAME AS IWPE 085 p 268

ALLOY 825 HN437IF6

START WT 30.30907g

SOLUTION 1000 ppm Cl^- 85 ppm NaCO_3 20 ppm SO_4^{2-}
10 ppm NO_3^- 2 ppm F^- 2000 mL MAKE AS FOLLOWS

3.29697 g NaCl LOT 941616

0.24047 g NaHCO_3 LOT 89778940 mL SO_4 - 10/9520 mL NO_3 - 10/954 mL F^- - 10/95

+ DI WATER TO 2000 mL

START pH 8.260

T = 95°C H_2 THERMOMETER 0323007

POTENTIOSTAT ESC 440 #1 CHANNEL #2

DATA SAVED AS LT82SP7L.DAT

REFERENCE FISHER 13-620-S1 SN 9214074

 E_{CORR} -22 mV K6ITN64 617 SN 537418 E_{PE} +136 mV " E_{APPLIED} 200 mV

TEST STARTED 10/13/95

TEST STOPPED 11/26/95

END pH 9.230

END WT 30.30772

NO SIGN OF LOCALIZED CORROSION


11/26/95

LONG TERM POTENTIOSTATIC TEST LT82SP8L

SPECIMEN SAME AS IUPPE 085 p 269
 ALLOY 825 HH4371FG
 START WT 31.85443g

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
 10 PPM NO_3^- 2 PPM F^- 2000 mL MARK AS FOLLOWS
 3.29808g NaCl LOT 941616
 0.24312g NaHCO_3 LOT 897789
 40 mL SO_4^{2-} 10/95
 20 mL NO_3^- 10/95
 4 mL F^- 10/95
 + DI WATER TO 2000 mL
 T=95°C Hg THERMOMETER 183303
 START pH 8.126

1000 mL OF SOLUTION USED IN TEST

POTENTIOSTAT ESC 440 #1 CHANNEL #3

DATA SAVED AS LT82SP8L.DAT

REFERENCE FISHER 13-620-SI SN 2134032

E_{corr} -11 mV KEITHLEY 617 SN 537418

E_{PE} +135 mV

E_{APPLIED} 100 mV

TEST STARTED. 10/13/95

TEST STOPPED 11/26/95

END pH 9.200

END WT 31.85474g

NO SIGN OF LOCALIZED CORROSION

[Signature] 12/7/95

LONG TERM POTENTIOSTATIC TEST LTF2SP4L

SPECIMEN SAME AS IUPPE 085 P 270
 ALLOY 825 HH4371FG
 START WT 38.95319g

2 PTFE CREVICE BLOCKS ATTACHED TO SPECIMEN
 WITH C276 NUT AND BOLT TORQUED TO
 40 IN.OZ USING PROTO 6103

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
 10 PPM NO_3^- 2 PPM F^- 1000 mL OF
 SOLUTION LISTED ON P10
 T=95°C Hg THERMOMETER 183305
 START pH 8.126

POTENTIOSTAT ESC 440 #1 CHANNEL #4

DATA SAVED AS LTF2SP4L

REFERENCE FISHER 13-620-SI SN 8211163

E_{corr} -41 mV

KEITHLEY 617 SN 537418

E_{PE} +3 mV (GRAPHITE)

E_{APPLIED} 0 mV

TEST STARTED 10/13/95

REFERENCE ELECTRODE LOST CONTACT WITH LUGGING PROBE

LEADING TO ERRONEOUS CURRENT AND POTENTIAL READINGS
 AT TIMES IN THE RANGE OF TO 1813900 SECONDS

TEST STOPPED 11/26/95

END pH 8.933

END WT 38.95317g

NO SIGN OF LOCALIZED CORROSION

[Signature] 12/7/95

LONG TERM POTENTIOSTATIC TEST LTRSPSL

SPECIMEN SAME AS IWPE 085 P271
 ALLOY 825 HH4371FG
 START WT 39.08715g
 2 PTFE CREVICE BLOCKS ATTACHED TO SPECIMEN
 USING C276 NUT AND BOLT TORQUED TO
 40 IN. OZ USING PROTO 6103

SOLUTION 1000 PPM Cl^- 85 PPM NO_3^- 20 PPM SO_4^{2-}
 10 PPM NO_3^- 2 PPM F^- 2000 ML MADE AS FOLLOWS
 3.29808 g NaCl LOT 941616
 0.24312 g NaNO_3 LOT 897789
 40 mL SO_4^{2-} 10/95
 20 mL NO_3^- 10/95
 4 mL F^- 10/95

$T = 95^\circ\text{C}$ Hg THERMOMETER 183302
 START pH = 8.185 QD 10/13/95 8.185
 1000 mL OF SOLUTION USED IN TEST

POTENTIOSTAT ESC 440 #1 CHANNEL #5
 DATA SAVER AS LTRSPSL
 REFERENCE FISHER SEC 13-620-S1 SN 9214083

$E_{\text{corr}} -48 \text{ mV}$ KEITHLEY 617 SN S37418
 $E_{\text{PE}} +26 \text{ mV}$ (GRAPHIC)
 $E_{\text{APPLIED}} -100 \text{ mV}$
 TEST STARTED 10/13/95
 TEST STOPPED 11/26/95
 END pH 8.976
 END WT 39.08706g
 NO SIGN OF LOCALIZED CORROSION

Paul D 12/7/95

LONG TERM POTENTIOSTATIC TEST ~~LTSPSL~~ ^{OC825C16} QD 10/13/95

SPECIMEN SAME AS IWPE 085 P272
 ALLOY 825 HH4371FG
 START WT 39.28746g
 2 PTFE CREVICE BLOCKS ATTACHED TO SPECIMEN
 USING C276 NUT AND BOLT TORQUED TO
 40 IN. OZ USING PROTO 6103

SOLUTION 1000 PPM Cl^- 85 PPM NO_3^- 20 PPM SO_4^{2-}
 10 PPM NO_3^- 2 PPM F^- 1000 mL OF
 SOLUTION LISTED ON P12
 $T = 95^\circ\text{C}$ Hg THERMOMETER 183301
 START pH 8.185

POTENTIOSTAT ESC 440 #1 CHANNEL #6
 DATA SAVER AS OC825C16
 REFERENCE FISHER SEC 13-620-S1 SN 3106343

$E_{\text{corr}} -60 \text{ mV}$
 $E_{\text{PE}} +89 \text{ mV}$
 $E_{\text{APPLIED}} \text{ O.C.}$
 TEST STARTED 10/13/95
 TEST STOPPED 11/26/95
 END pH 9.215
 END WT 39.28756g
 NO SIGN OF LOCALIZED CORROSION.

Paul D 12/7/95

STOCK SOLUTIONS 10/95

NO₃ - 10/95 1000 ppm NO₃⁻ AS
 NaNO₃ 1.37128 g NaNO₃ LOT 897183
 + DI WATER TO 1000 mL EXP 11/1/95

SO₄ - 10/95 1000 ppm SO₄²⁻ AS Na₂SO₄
 1.47231 g Na₂SO₄ LOT 901213
 + DI WATER TO 1000 mL EXP 11/1/95

F⁻ - 10/95 1000 ppm F⁻ AS NaF
 2.21117 g NaF LOT 896405
 + DI WATER TO 1000 mL EXP 11/1/95

Paul D 10/12/95

GALVANIC CORROSION GC82SC5

OBJECTIVE DETERMINE INITIATION TIME OF LOCALIZED
 CORROSION UNDER OPEN CIRCUIT CONDITIONS

SPECIMEN ALLOY 825 HH4371FG 2 PTFE
 CREVICE BLOCKS BOLTED TO SURFACE WITH
 C 276 NUT AND BOLT TORQUE TO 40 in. oz
 USING PROTO 6103
 START WT = 27.99593 g

SOLUTION 1000 ppm Cl⁻, 1.0×10^{-5} M Cu⁺⁺ 7×10^{-4} M Cu⁺
 2000 mL OF SOLUTION
 3.21436 g NaCl LOT 941616
 0.12894 g CuCl LOT 951307
 0.00170 g CuCl₂ · 2H₂O LOT 897713
 T = 95°C N₂ THERMOMETER 0323004
 START pH 8.00 10/16/95 5.603
SETUP SPECIMEN AND ALLOY 825 CATHODES
 CONNECTED TO EG&G VERSASTAT SN 20104
 DATA ACQUIRED USING EG&G MODEL 352
 SOFTCORR CORROSION SOFTWARE IN GALVANIC
 CORROSION SETUP
CATHODES (2) ALLOY 825 HH4371FG 2000 grit FINISH
 TOTAL IMMERSED AREA ~ 180 cm²

E_{pt} +321 mV

E_{CATHODES} +307 mV & +275 mV

E_{CORN} +248 mV

END pH 5.663

INITIATION TIME 0.0135 MS AT 320 mV TO 300 mV

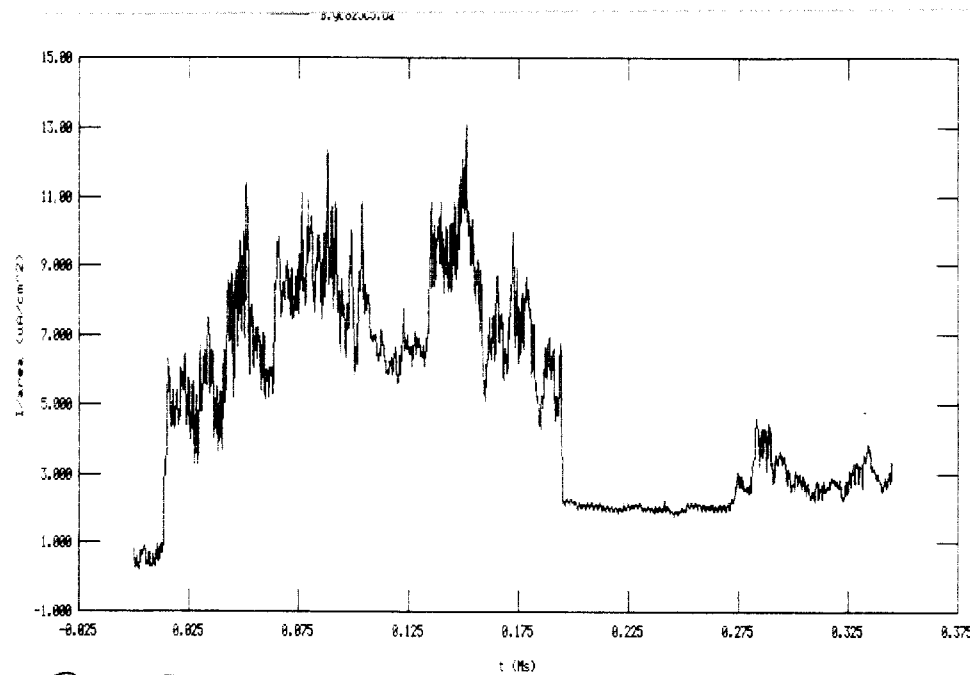
END WT 27.98418 g

CREVICE CORROSION ON 4 OF 24 SITES

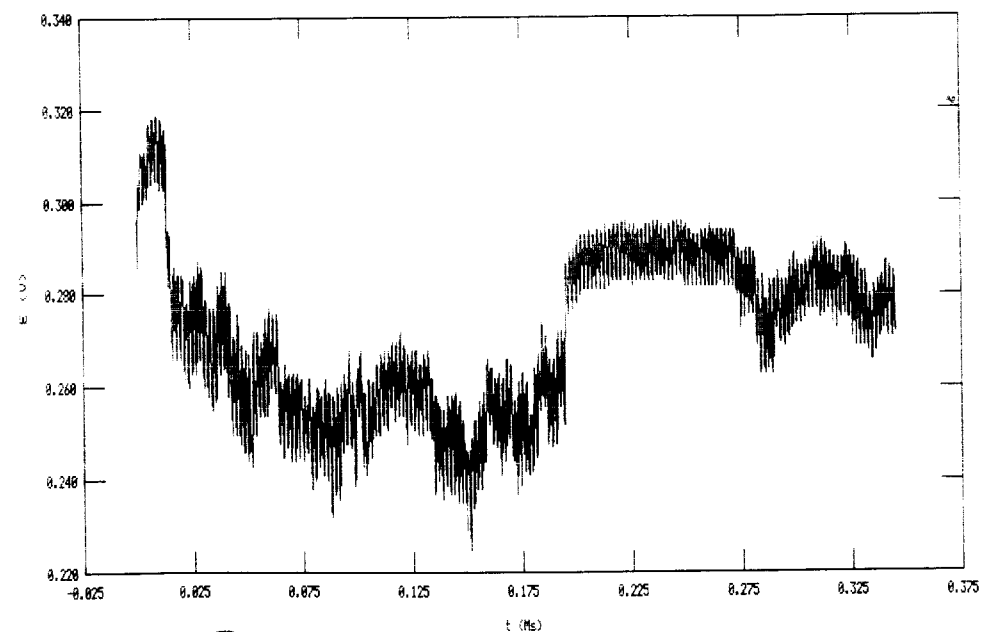
PENETRATION DEPTNS 225 μm, 120 μm, 60 μm, 60 μm

Paul D 10/24/95

GC82SC5



Paul D 10/16/95



Paul D 10/16/95

GALVANIC CORROSION

GC82SP1

OBJECTIVE SAMPLE AS P15

SPECIMEN MILL ANNEAL60 (AS RECEIVED) ALLOY 825
 HEAT HN4371FG 0.250" x 1.915" CYLINDRICAL
 SPECIMEN 1000 GRIT FINISH
 START WT 11.84055g

SOLUTION 1000 PPM Cl^- $2 \times 10^{-3} \text{ M Cu}^{++}$ $2 \times 10^{-3} \text{ M Cu}^+$
 2000 mL PREPARED AS FOLLOWS

2.04573 g NaCl LOT 941616
~~0.19807 g CuCl LOT 951307~~ DD 10/16/95
 0.39627 g CuCl LOT 951307
 0.68121 g $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$ LOT 897713
 40 mL OF 0.37 Molar HCl PREPARED
 BY 6.17 mL HCl LOT 956108 DILUTED TO
 200 mL WITH DI WATER
 TOTAL Cl^- CONCENTRATION = 0.056 M = 1000 PPM
 START pH 2.263

$T = 95^\circ\text{C}$ Hg THERMOMETER 0323004

SETUP SAMPLE AS P15

CATHODES ALLOY 825 HN4371FG 180 cm^2

E_{CATHODES} +426 mV +326 mV

E_{COMP} +400 mV

E_{PT} +475 mV

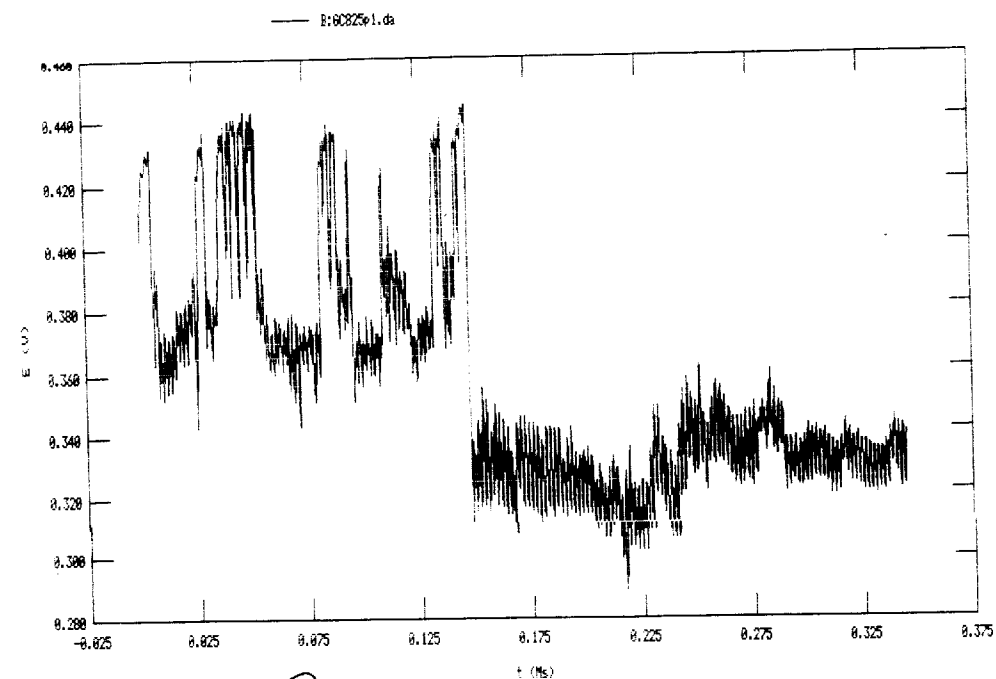
TEST STARTED 10/16/95

END WT 11.84051g

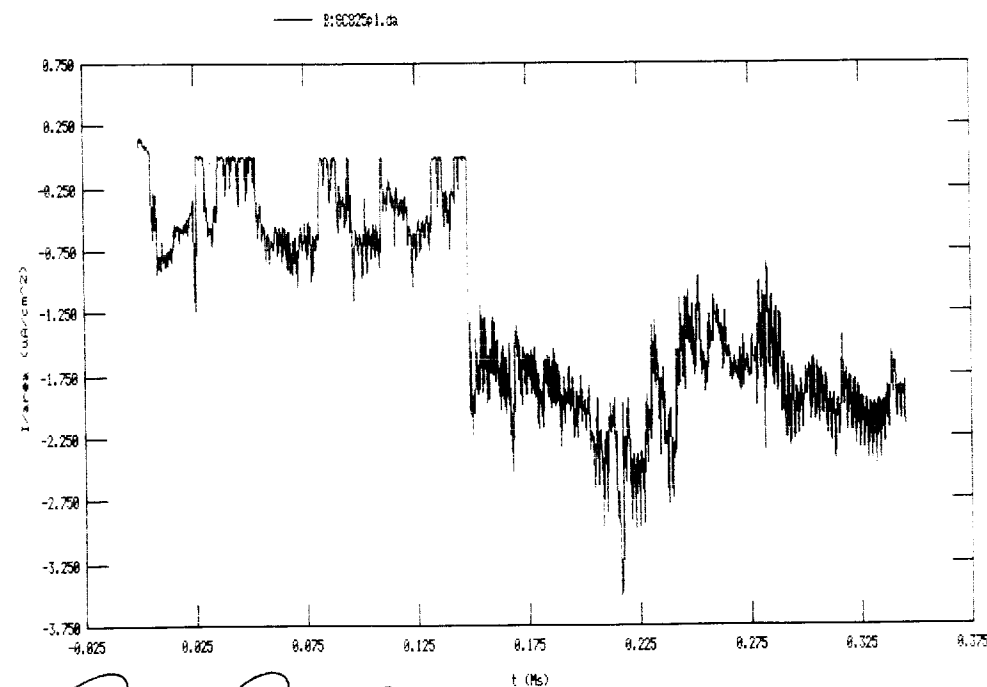
NO SIGN OF LOCALIZED CORROSION.

Paul D 10/23/95

GC 825 P1



Drew D 10/23/95



Drew D 10/23/95

PIT PROPAGATION 825PP13

OBJECTIVE MEASURE PIT PROPAGATION RATE

SPECIMEN ALLOY 825 HH 8882F COVERED IN NGT
SURFICK AREA = 0.041 cm^2 DEPTH = 2mmSTART WT MEASURED WITH METTLER UMT2
AT BOTTOM OF PAGESOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
10 PPM NO_3^- 2 PPM F^- 1000 mL MAKE AS FOLLOWS

1.64821 g NaCl LOT 941616

0.12268 g NaNO_3 LOT 89778920 mL SO_4 - 10/95 STOCK SOLUTION p 1410 mL NO_3 - 10/95 "2 mL F^- - 10/95 "

+ DI WATER TO 1000 mL (250 mL USED IN TEST)

START pH 8.211

T = 95°C Hg THERMOMETER 115814

POTENTIOSTAT ESC 440 #3 CHANNEL #5

REFERENCE FISHER SCE 13-620-51 SN 3106339

DATAFILES 825PP13.DAT & 825PP13B.DAT

 E_{CORR} - 38mV E_{PE} + 132mV E_{APPLIED} + 600 mV

TEST STARTED. 10/18/95 11:00am

TEST ABORTED 10/18/95 1:40 pm DUE
TO LACK OF POTENTIOSTATIC CONTROL.

START WT

1. 1341651

2. 1341659

3. 1341659

4. 1341655

5. 1341675

Drew D 10/18/95

POTENTIOSTATIC INITIATION TEST PS82551

OBJECTIVE DETERMINE INITIATION POTENTIAL FOR
INTERGRANULAR PITTING OF SENSITIZED ALLOYS

SPECIMEN ALLOT 825 HH4371FG SOLUTION ANNEALED
AT 1200°C FOR 10 min AND SENSITIZED AT
750°C FOR 100 hr AS NOTED IN IWP6103 p148
SPECIMEN POLISHED TO 2000 grit FINISH AND
THEN POLISHED ~~TD~~ 10/18/95 WITH COLLOIDAL
SILICA TO MIRROR LIKE FINISH. EXAMINATION
AT 100X SHOWS SOME SCRATCHES REMAINING IN
THE SURFACE. SURFACE AREA EXPOSED = 12.8 cm²

SOLUTION 1000 ppm Cl⁻ 85 ppm NO₃⁻ 20 ppm SO₄²⁻
10 ppm NO₃⁻ 2 ppm F⁻ SAME AS P 19
700 mL SOLUTION USED IN TEST.
START pH 8.211
T = 95°C H_g THERMOMETER 0323002

POTENTIOSTAT EG&G 273 SN 4/108

REFERENCE FISHER 13-620-S1 SN 3106339

E_{CORR} - 485 mV KEITHLEY 617 SN 579628

E_{PE} - 200 mV

E_{APPLIED} +285 mV TO +430 mV

TEST STARTED 10/18/95

TEST STOPPED 10/18/95 AT t = 17000 SECONDS

NO PITTING OR ATTACK. CREVICE (PTFE) ATTACHED

TO SPECIMEN TORQUED TO 14 IN. OZ CREVICE

AREA = 2.4 cm²

TEST RESTARTED 10/18/95 DATAFILE PS82551B.DAT

E_{CORR} +96 mV

E_{PE} - 156 mV

E_{APPLIED} +200 mV - 500 mV

TEST STOPPED 10/19/95 PITS AT GRAIN BOUNDARIES

NO CREVICE CORROSION

Paul D 10/19/95

Paul D 10/19/95

PIT PROPAGATION 825PP14

OBJECTIVE MEASURE PIT PROPAGATION RATE.

SPECIMEN ALLOT 825 ~~NN437HF6~~ ^{NN88826 DD 10/20/95} COVERED IN
 HGT SHRINK AREA = ~~20~~ DD 10/20/95 0.041 cm^2
 DEPTH = 0.19 cm

START WT MEASURED WITH METTLER UMT2

1. 1423054 μg
2. 1423065 μg
3. 1423071 μg
4. 1423066 μg
5. 1423068 μg

SOLUTION 1000 PPM Cl^- 85 PPM NO_3^- 20 PPM SO_4^{2-} 10 PPM NO_3^- 2 PPM F^- 1000 mL MADE AS FOLLOWS

1.64893 g NaCl LOT 941616

0.12188 g NaNO_3 LOT 89778920 mL SO_4 - 10/9510 mL NO_3 - 10/952 mL F^- - 10/95

+ DI WATER TO 1000 mL

START pH = 8.187

T = 95°C Hg THERMOMETER 115814

POTENTIOSTAT EG&G 273 SN 41108

REFERENCE FISHER SCE 13620-51 SN 3106339

DATAFILE 825PP14.DAT

 E_{corr} -191 mV E_{pt} +186 mV

TEST STARTED 10/20/95

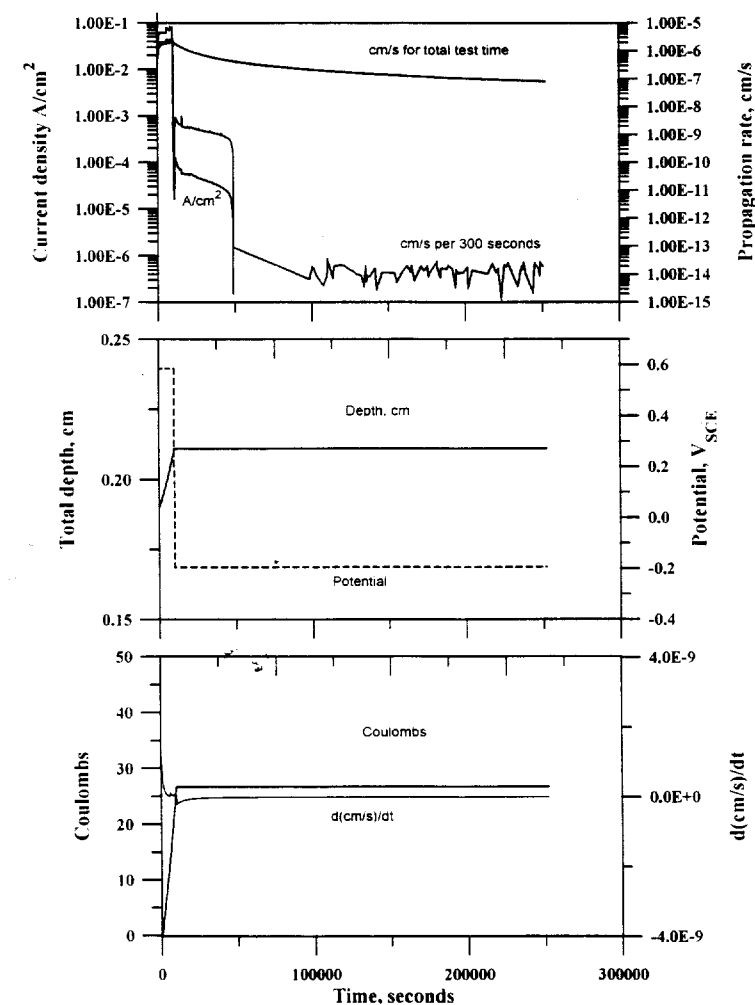
TEST STOPPED 10/23/95

MEASURED END DEPTH 0.20 cm

END pH = 9.233

 10/23/95

825PP14


 10/23/95

GALVANIC CORROSION GC316LC3

OBJECTIVE . DETERMINING INITIATION TIME AND
DEGREE OF CREVICE CORROSION

SPECIMEN 316L P80746 TOTAL AREA = 24 cm^2
IMMERSED AREA = 21 cm^2 TWO PTFE
CREVICE BLOCKS ATTACHED TO SPECIMEN TORQUES
TO 50 IN. OZ USING PROTO 6103. BLOCKS
HELD WITH C276 NUT & BOLT

SOLUTION 1 MOZAR Cl^- AS NaCl
116.88121 g NaCl LOT 941616
+ DI WATER TO 2000 mL
START $\text{pH} = 4.12$
SOLUTION AERATED WITH ZERO AIR
 $T = 95^\circ\text{C}$ Hg THERMOMETER 0323004

SETUP SAME AS P15

REFERENCE FISHER SCE 13-620-51 SN 3106340
COUNTER ELECTRODES 316L P80746 180 cm^2

$E_{\text{pt}} +150 \text{ mV}$
 $E_{\text{counter}} +133 \text{ mV}$ ~~$+126 \text{ mV}$~~ $10/20/95$ -133 & -126 mV
 $E_{\text{corr}} -189 \text{ mV}$

TEST STARTED 9:25 pm 10/20/95

TEST STOPPED 10/23/95

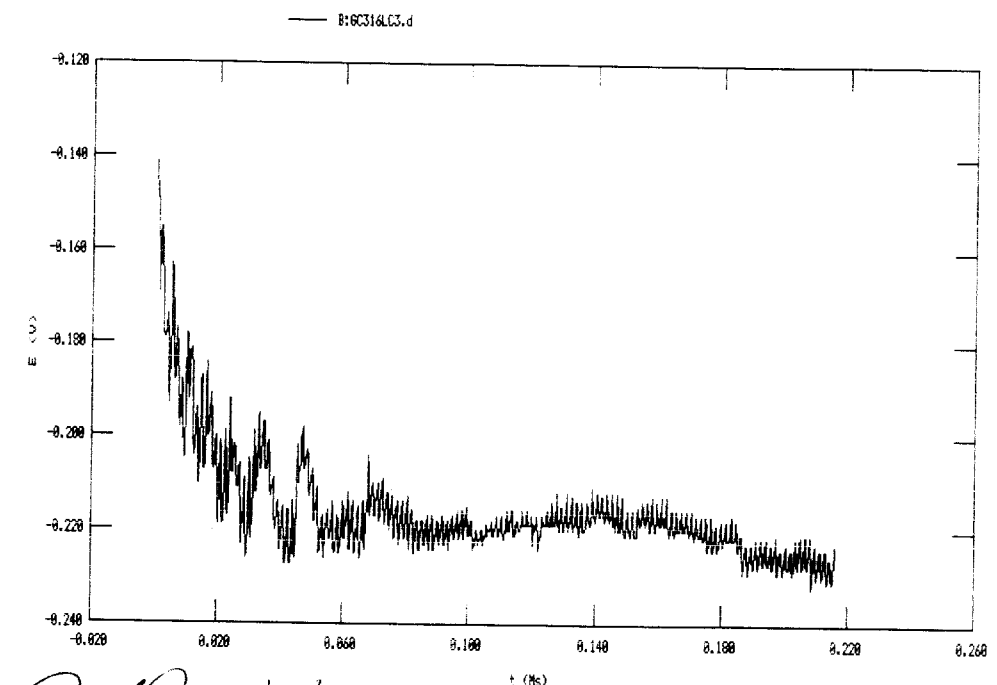
CREVICE CORROSION ON 2 OF 24 SITES

DEPTH OF ATTACK $230 \mu\text{m}$ & $250 \mu\text{m}$

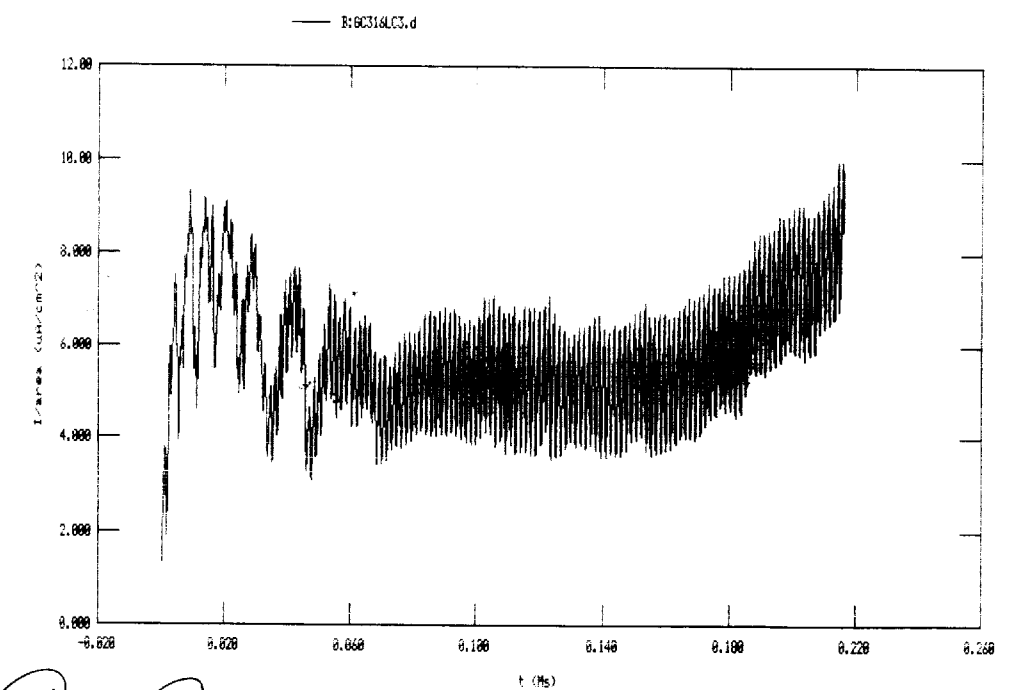
END pH 7.730

PLOTS P25

[Signature] 10/23/95



[Signature] 10/23/95



[Signature] 10/23/95

825PP15

OBJECTIVE MEASURE PIT PROPAGATION RATE

SPECIMEN ALLOY 825 HN 8882F COVERED
IN HEAT SINK AREA = 0.041 cm^2 DEPTH = 0.18 cm

START WT MEASURED WITH METTLER UMT2

1. 1428195
2. 1428190
3. 1428187
4. 1428198
5. 1428195

SOLUTION 1000 PPM Cl^- 85PPM HCO_3^- 20 PPM SO_4^{2-}
 10 PPM NO_3^- 2PPM F- 1000 mL MADE AS FOLLOWS
 1.64997 g NaCl LOT 941616
 0.12432 g NaHCO_3 LOT 897789
 20 mL SO_4 - 10/95
 10 mL NO_3 - 10/95
 2 mL F- 10/95
 + DI WATER TO 1000 mL
 START pH 8.177
 $T = 95^\circ\text{C}$ Hg THERMOMETER 115814

POTENTIOSTAT EG&G 273 MODEL SN 41108
 REFERENCE FISHER SCE 13-620-S1 SN 3106339
 DATAFILE 825PP15.DAT

$E_{\text{CORR}} -76 \text{ mV}$
 $E_{\text{PE}} +200 \text{ mV}$
 TEST STARTED 10/23/95
 TEST ABORTED 10/24/95 POTENTIAL NOT
 MAINTAINED AT -100 mV
 SPECIMEN RE USED AS 825PP16 P27

Paul D 10/24/95

825PP16

OBJECTIVE MEASURE PIT PROPAGATION RATE

SPECIMEN ALLOY 825 HN 8882F COVERED IN
HEAT SINK AREA = 0.041 cm^2 DEPTH = 2 mm

START WT

1. 1403737
2. 1403735
3. 1403727
4. 1403734
5. 1403732

SOLUTION 1000 PPM Cl^- 85PPM HCO_3^- 20 PPM SO_4^{2-} 10 PPM NO_3^-
 2PPM F- SAME SOLUTION AS ON P26
 START pH 8.177
 $T = 95^\circ\text{C}$ Hg THERMOMETER 115814

POTENTIOSTAT EG&G 273 SN 41108
 REFERENCE FISHER SCE 13-620-S1 SN 3106339
 DATAFILE 825PP16.DAT

$E_{\text{CORR}} -75 \text{ mV}$
 $E_{\text{PE}} +200 \text{ mV}$
 TEST STARTED 10/24/95
 TEST STOPPED 10/27/95
 PLOT P 32

Paul D 10/27/95

GC 316L C4

OBJECTING SAME AS P24SPECIMEN 316L P8074L TOTAL AREA = 24cm²IMMERSED AREA 21cm² 2 PTFE CRUICK

BLOCKS ATTACHED TO SPECIMEN TORQUE

TO 50 IN-OZ USING PROTO 6103. BLOCKS

HELD WITH C276 NUT & BOLT

START WT 34.52784g

SOLUTION 10000 ppm Cl⁻ AS NaCl

32.96066 g NaCl LOT 941616

+ DI WATER TO 2000 ml

START pH 5.977

T = 75 °C N₂ TRANSDUCER 0323004~~START pH 6.623~~ 10/23/95SETUP SAME AS P15REFERENCE FISHER SC6 13-620-51 SN 3106340COUNTER ELECTRODES 316L P80746 180cm²E_{PE} +120mVE_{CORR} -174mVE_{COUNTER} ~~+97mV~~ ~~+105mV~~ 10/23/95 -97mV, -105mV

TEST STARTED 10/23/95

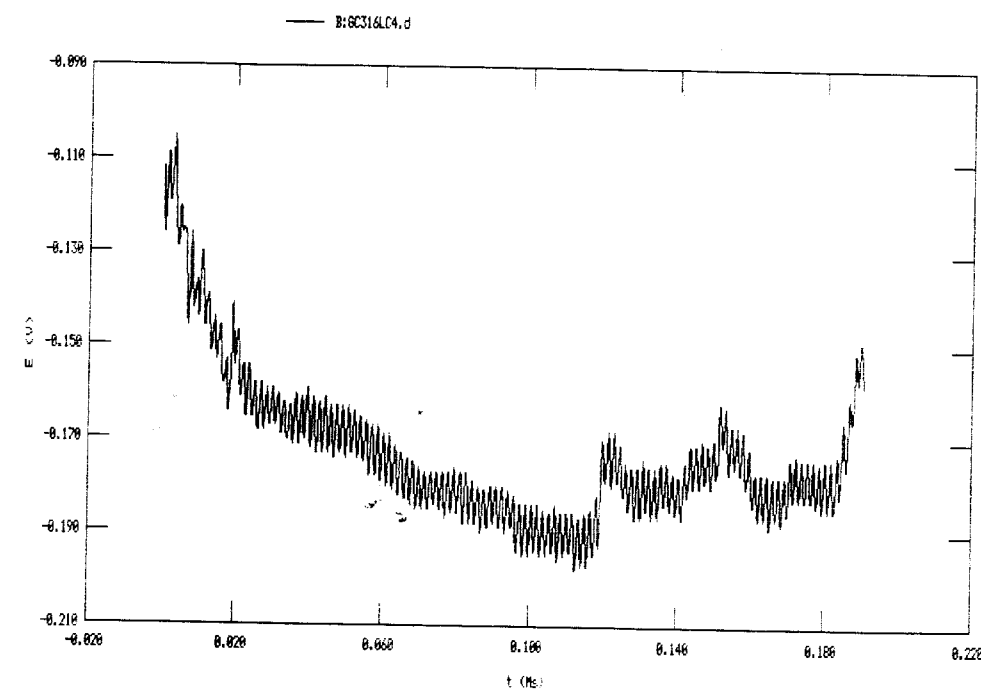
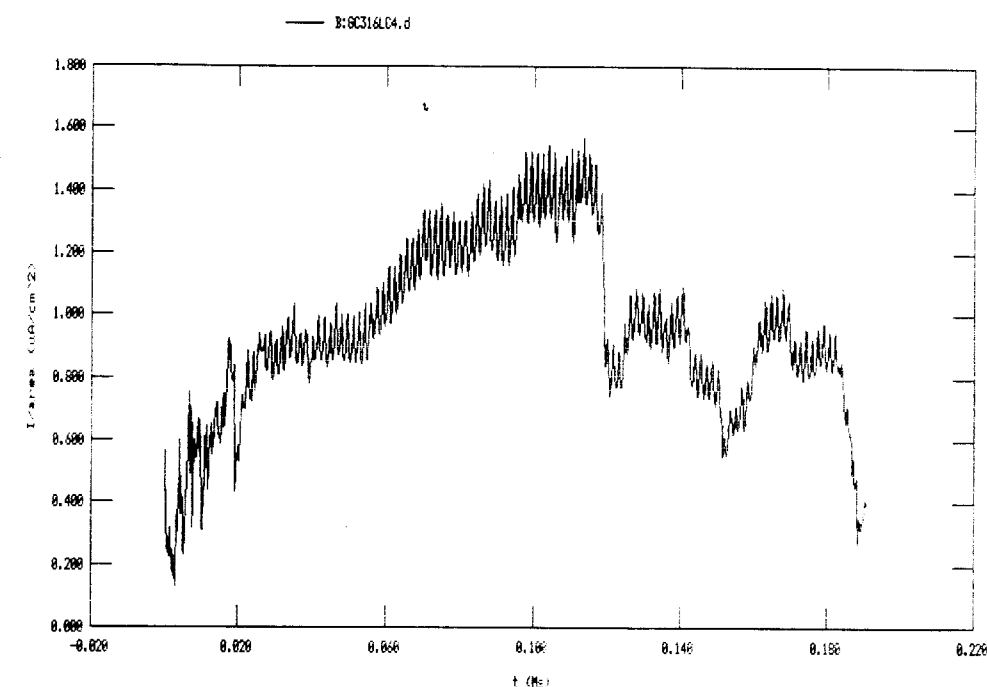
END pH 7.755

END WT 34.52671g

CRUICK CORROSION 1 OF 24 SITES

PENETRATION DEPTH 150 μm

Quik 10/26/95



Quik 10/26/95

GC 316L C5

OBJECTIVE SAME AS P24

SPECIMEN 316L P80746 TOTAL AREA = 24 cm²IMMERSION AREA = 21 cm² 2 PTFE CRACK

BLOCKS ATTACHED TO SPECIMEN USING

C276 NUT & BOLT TORQUED TO 50 in·oz

USING PROTO 6103

START WT: 34.44130g

SOLUTION 1 MOLAR Cl⁻ AS NaCl

116.88321 g NaCl LOT 941616 +

DI WATER TO 2000 mL

START pH 6.020

T = 95°C H₂ THERMOMETER 0323004

SETUP SAME AS P15

REFERENCE FISHER SEE 13-620-51 SN 3106340

COUNTER ELECTRODES 316L P80746 180 cm²E_{pt} +209 mVE_{corr} -170 mVE_{COUNTER} -119 mV -111 mV

TEST STARTED 10/26/95

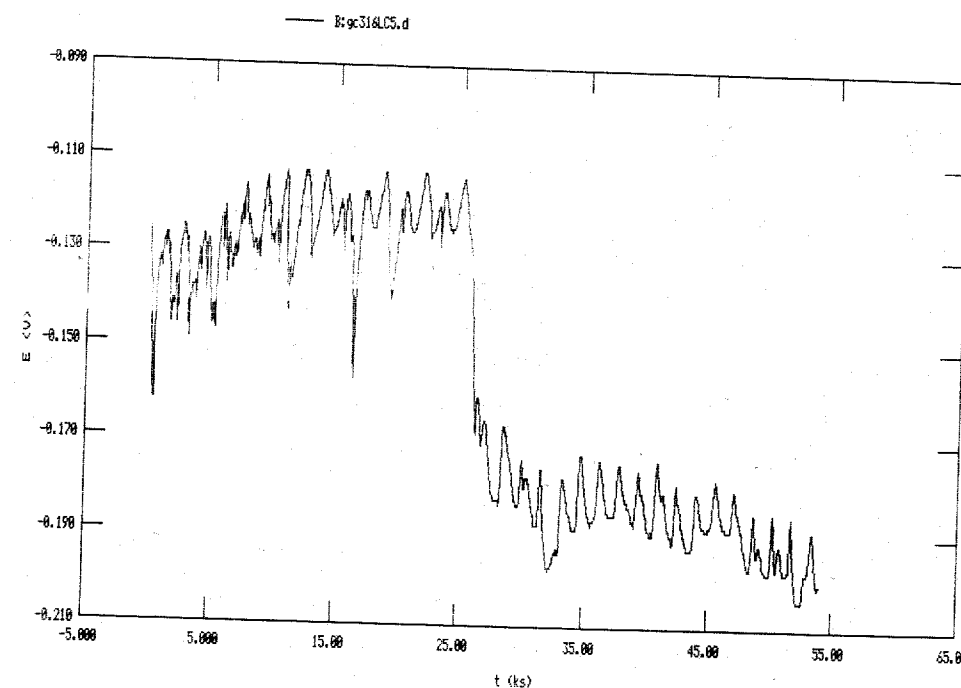
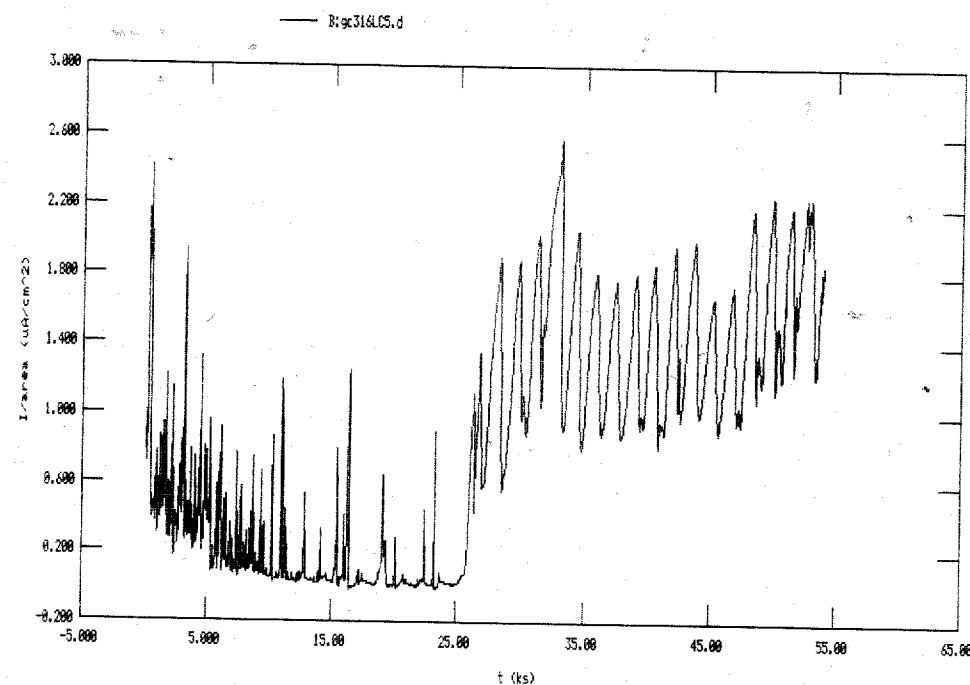
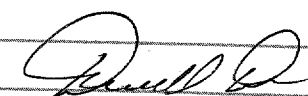
TEST STOPPED 10/27/95

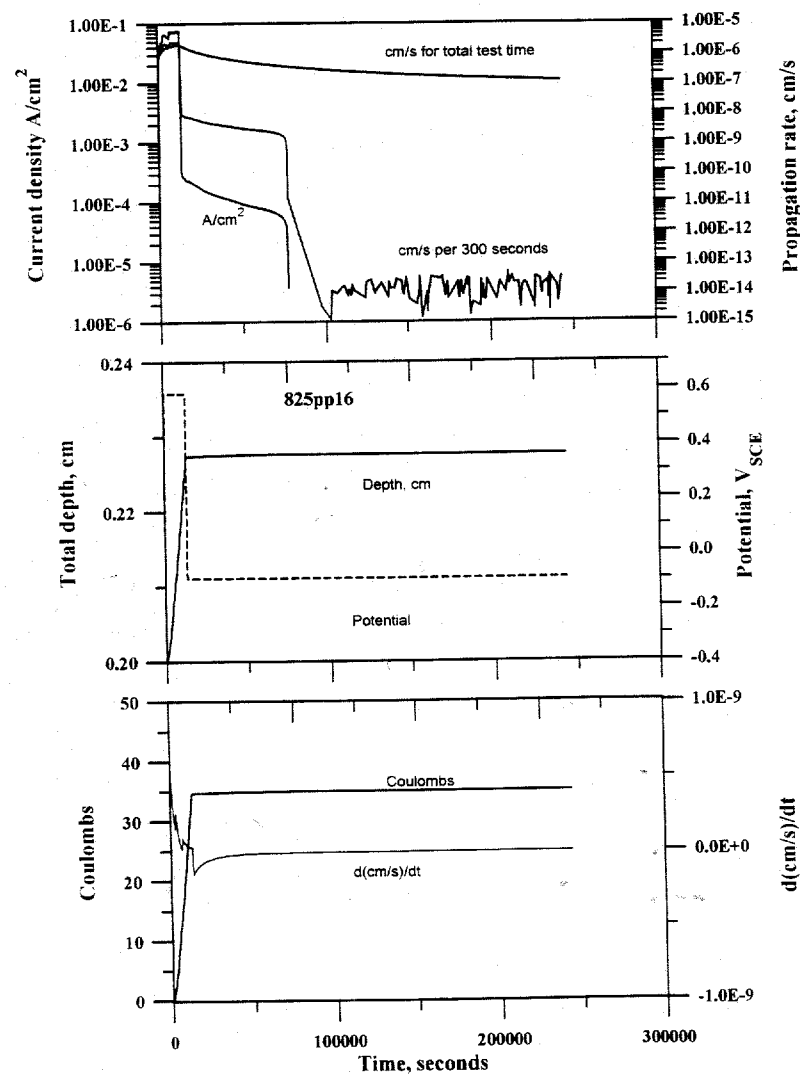
E_{pt} AT END OF TEST +140 mV

PENETRATION DEPTH MAXIMUM 120 μm

1 MAJOR SITE OF LOCALIZED CORROSION 3 OR 4

VERY SMALL SHALLOW SITES AS WELL.

 10/27/95

 10/27/95



Paul D 10/27/95

PIT PROPAGATION 825PP17

OBJECTIVE MEASURE PIT PROPAGATION RATE

SPECIMEN ALLOY 825 HN8882F COVERED IN
HEAT SHRINK AREA = 0.041 cm² DEPTH = 5mm

START WT MEASURED WITH METTLER UMT2

1. 1725652
2. 1725652
3. 1725658
4. 1725654
5. 1725660

SOLUTION 1000 PPM Cl⁻ 85 PPM HCO₃⁻ 20 PPM SO₄⁻
10 PPM NO₃⁻ 2 PPM F⁻ SMMG SOLUTION
AS ON P26

START PN 8.177 @ 10/27/95 8.177
T = 95 °C H₂ THERMOMETER 115814

POTENTIOSTAT E64G 273 MODEL SN 41108

REFERENCE FISHER SCE 13-620-51 SN 3106339

DATAFILE 825PP17.DAT

E_{corr} = -189 mV

E_{pt} = +194 mV

TEST STARTED.

END DEPTH MEASURED 5.2 mm

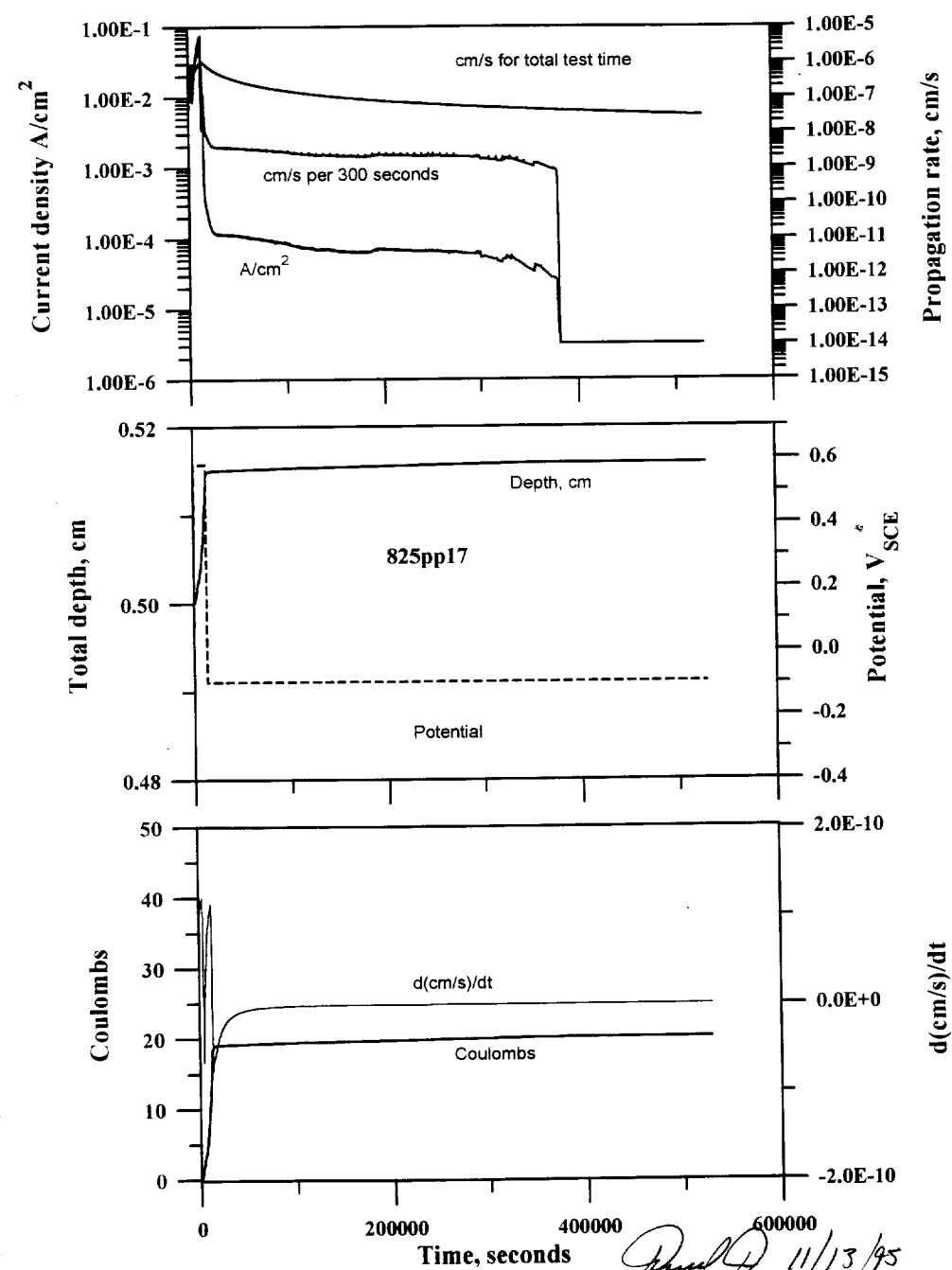
END PN 9.220

END WT MEASURED WITH METTLER UMT2

1. 1720497
2. 1720525
3. 1720522
4. 1720523
5. 1720512

Paul D 11/13/95

825PP17



GALVANIC CORROSION GC316LC6

OBJECTIVE SAME AS p24

SPECIMEN 316L P80746 TOTAL AREA = 24 cm²
 IMMERSED AREA = 21 cm² 2 PTFE CREVICE BLOCKS
 ATTACHED TO SPECIMEN USING C276 NUT
 AND BOLT TORQUED TO 4 DD 10/27/95
 50 in. oz. USING PRTO 6103
 START WT. NOT RECORDED

SOLUTION 1 Molar Cl⁻ AS NaCl
 116.88417 g NaCl LOT 941616
 + DI WATER TO 2000 mL

START pH 5.933
 T = 95 °C Hg THERMOMETER 0323004

SETUP SAME AS p15

REFERENCE SCE FISHER 13-620-51 SN 3106340

COUNTER ELECTRODES 316L P80746 180 cm²

E_{pc} +165 mV
 E_{corr} -165 mV
 E_{COUNTER} -126 mV -130 mV

TEST STARTED. 10/27/95

E_{pt} AT END +133 mV

3 SITES OF CREVICE CORROSION

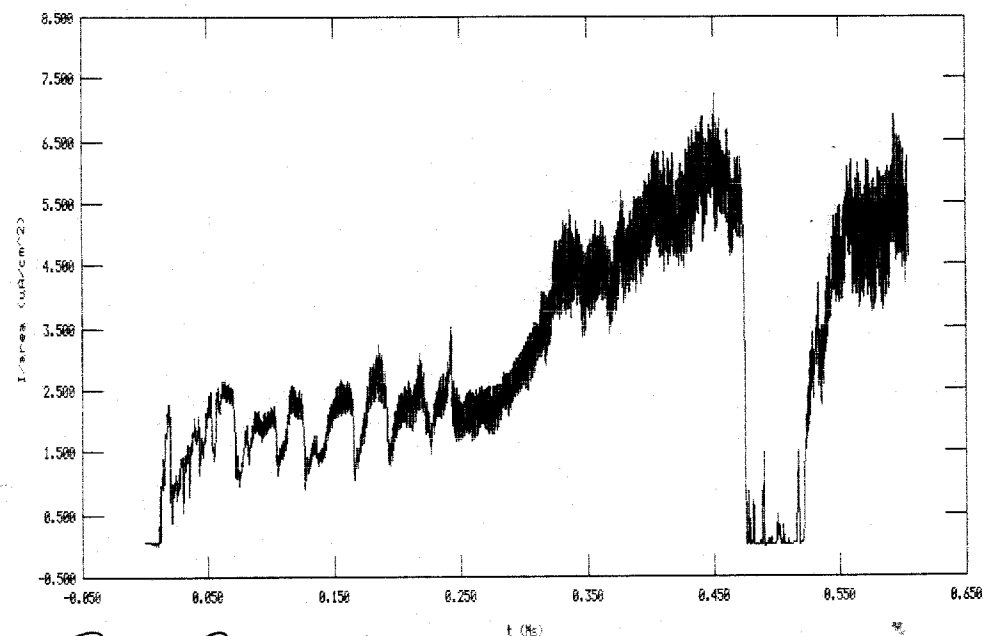
100, 120, 290 μm DEEP MINUT SMALL

PITS ON BOLDLY EXPOSED SURFACES.

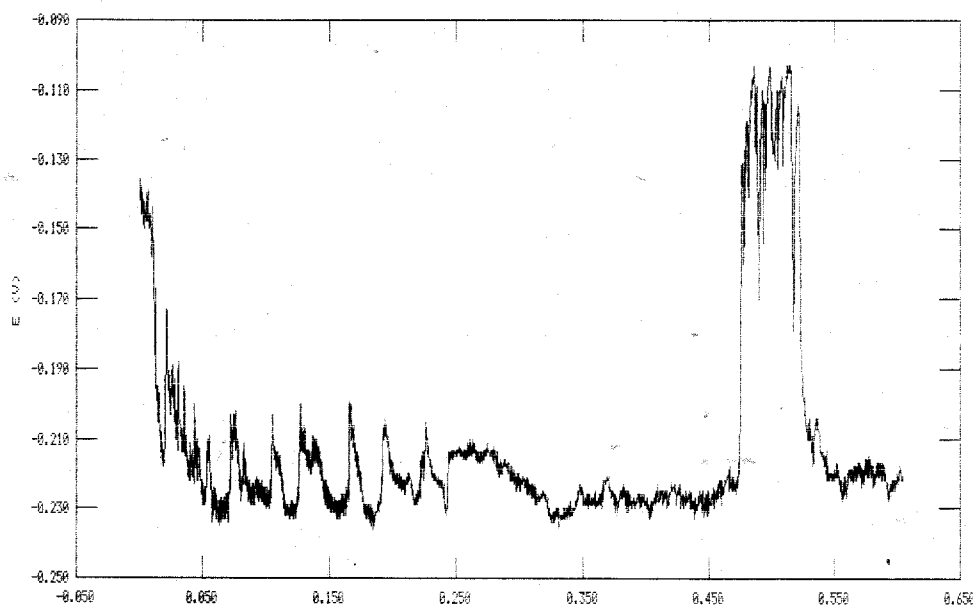
END pH 7.774

11/6/95

PD 11/6/95 GALVANIC CORROSION.



Paul D 11/6/95



Paul D 11/6/95

PIT PROPAGATION 825PP18

OBJECTIVE: MEASURE PIT PROPAGATION RATE.

SPECIMEN ALLOY: 825 HN 8882F COVERED IN
N6K SINK AREA = 0.041 cm² DEPTH = 5 mm

START WT MEASURED WITH METTLER UMT 2

1. 1482016 μ g
2. 1482029 μ g
3. 1482027 μ g
4. 1482023 μ g
5. 1482029 μ g

SOLUTION 1000 PPM Cl⁻ 85PPM HCO₃⁻ 20PPM SO₄⁻
10 PPM NO₃⁻ 2PPM F⁻ 1000 mL MAKE AS
FOLLOWS.

1.65017 g NaCl LOT 941616
0.12111 g NaHCO₃ LOT 897789
20 mL SO₄ - 11/95
10 mL NO₃ - 11/95
2 mL F - 11/95

+ DI WATER TO 1000 mL START pH 8.440

T = 95°C Hg THERMOMETER 115814

POTENTIOSTAT EG&G 273 MODEL 2 PD 11/6/95 41108

REFERENCE FISHER SCE 13-620-S1 SN 3106339

DATATELL 825PP18

END pH 9.263

E_{CORR} -25 mV

E_{PL} +110 mV

TEST STARTED 11/6/95

END WT

1. 1473149
2. 1473156
3. 1473160
4. 1473160
5. 1473170

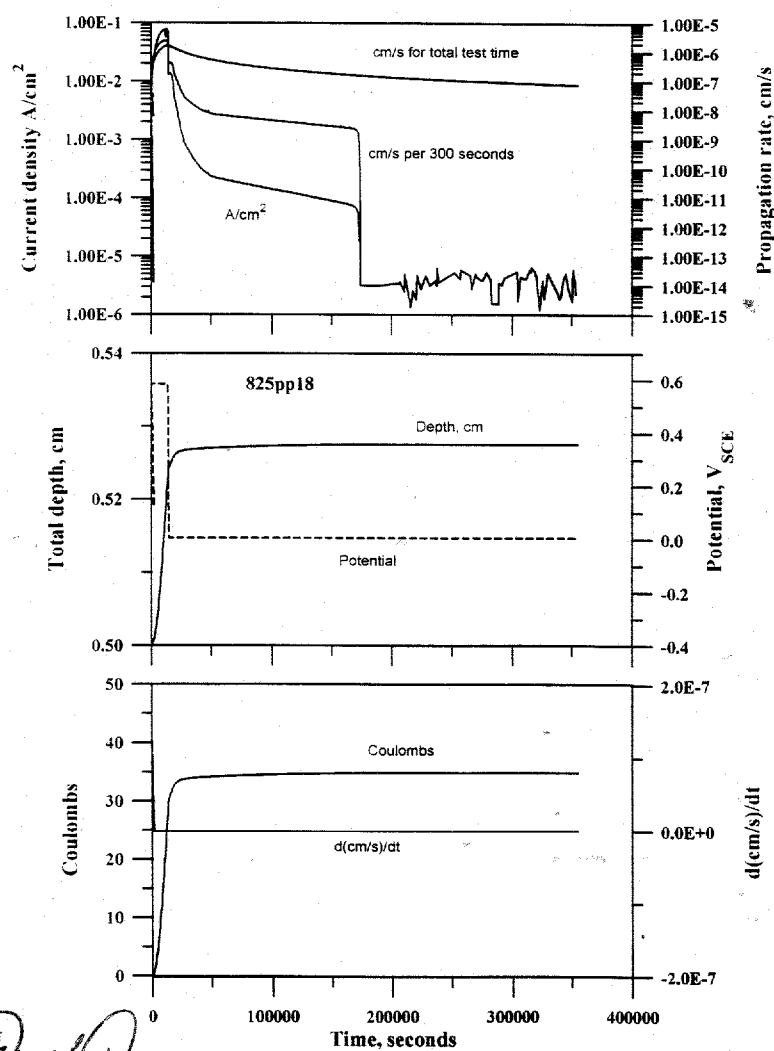
END DEPTH MEASURED 5.2 mm.

Paul D 11/13/95

825 PP18

CALCULATED WT LOSS 9.2×10^{-3} g

CALCULATED DEPTH = 0.528 cm

MEASURED WT LOSS = 8.9×10^{-3} gMINOR CREVICE CORROSION BETWEEN SPECIMEN
AND TUBING.

David D.

David D. 11/13/95

STOCK SOLUTIONS 11/95

SO₄-11/95 1000 PPM SO₄ = AS Na₂SO₄1.47096 g Na₂SO₄ LOT 901213 + DI

WATER TO 1000 mL EXP 12/1/95

NO₃-11/95 1000 PPM NO₃ = AS NaNO₃1.37201 g NaNO₃ 897183 + DI

WATER TO 1000 mL EXP 12/1/95

F-11/95 1000 PPM F⁻ AS NaF

2.4106 g NaF LOT 8964DS + DI

WATER TO 1000 mL EXP 12/1/95

David D. 12/4/95

STOCK SOLUTIONS 12/95

1000 ppm SO_4^{2-} AS Na_2SO_4
 1.47177 g Na_2SO_4 LOT 901213
 + DI WATER TO 1000 mL EXP 1/4/96

1000 ppm NO_3^- AS NaNO_3
 1.37097 g NaNO_3 LOT 897183
 + DI WATER TO 1000 mL EXP 1/4/96

1000 ppm F^- AS NaF
 2.21234 g NaF LOT 896405
 + DI WATER TO 1000 mL EXP 1/4/96

[Signature] 12/4/95

LONG TERM POTENTIOSTATIC TEST LT82SP2V

SPECIMEN ALLOT 825 HN437IFG SAME AS P8

STARTWT 30.82045

SOLUTION 1000 ppm Cl⁻ 85 ppm NO_3^- 20 ppm SO_4^{2-}
 10 ppm NO_3^- 2 ppm F^- 2000 mL MADE AS FOLLOWS

3.30009 g NaCl LOT 941616

0.23821 g NaHCO_3 LOT 897789

40 mL SO_4^{2-} - 12/95 P40

20 mL NO_3^- - 12/95 P40

4 mL F^- - 12/95 P40

+ DI WATER TO 2000 mL

START PN = 81481

T = 95°C Hg THERMOMETER 0323007

POTENTIOSTAT ESC 440 #1 CHANNEL #1

DATA SAVER AS LT82SP2V

REFERENCE FISHER 13-620-51 SN 2134032

ECORR -65 mV K6ITN61 617 SN 579628

E_{PE} +152 mV

E_{APPLIED} 0 mV

TEST STARTED 12/15/95

TEST STOPPED 1/29/96 8:00 AM

END PN 9.244

END WT = 30.82062 g

NO SIGN OF LOCALIZED CORROSION

[Signature] 1/30/96

LONG TERM POTENTIOSTATIC TEST LT825P7M

SPECIMEN ALLOY 825 HH437IFG SAME AS p 9

START WT 30.30772g

SOLUTION 1000 ppm Cl^- 85ppm HCO_3^- ~~20 ppm NO_3^-~~ ^{12/15/95}20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-

2000 mL MADE AS FOLLOWS

3.30606 g NaCl LOT 9416160.23602 g NaHCO_3 LOT 89778940 mL SO_4 - 12/9520 mL NO_3 - 12/954 mL F^- - 12/95

+ DI WATER TO 2000 mL

START pH 8.439

T = 95°C Hg THERMOMETER 0323008

POTENTIOSTAT ESC 440 #1 CHANNEL #2

DATA SAVED AS LT825P7M.DAT ^{12/15/95}

REFERENCE FISHER 13-620-S1 SN 0323008 3106343

E_{corr} - 85 mV KETNLEY 617 SN 579628E_{pe} +192 mVE_{applied} 200 mV

TEST STARTED 12/15/95

TEST STOPPED 1/29/96

END pH 9.239

END WT 30.30769g

NO SIGN OF LOCALIZED CORROSION

1/30/96

LONG TERM POTENTIOSTATIC TEST LT825P8M

SPECIMEN ALLOY 825 HH437IFG SAME AS p 10

START WT 31.85474g

SOLUTION 1000 ppm Cl^- 85ppm HCO_3^- 20 ppm SO_4^{2-}
10 ppm NO_3^- 2 ppm F^- 2000 mL MADE AS FOLLOWS3.29973 g NaCl LOT 9416160.23725 g NaHCO_3 LOT 89778940 mL SO_4 - 12/9520 mL NO_3 - 12/954 mL F^- - 12/95

+ DI WATER TO 2000 mL

T = 95°C Hg THERMOMETER 183302

START pH 8.403

1000 mL OF SOLUTION USED IN TEST

POTENTIOSTAT ESC 440 #1 CHANNEL #3

DATA SAVED AS LT825P8M.DAT

REFERENCE FISHER 13-620-S1 SN 8211163

E_{corr} +41 mV KETNLEY 617 SN 579628E_{pe} +174 mVE_{applied} 100 mV

TEST STARTED 12/15/95

TEST STOPPED 1/29/96

END pH 9.078

END WT 31.85352g

NO SIGN OF LOCALIZED CORROSION

1/30/96

LONG TERM POTENTIOSTATIC TEST LT82SP4M

SPECIMEN SAME AS p 11 ALLOY 825 NN4371F6

START WT 38.95317

2 PTFE CREVICE WASHERS ATTACHED TO SPECIMEN
WITH C276 NUT & BOLT TORQUED TO 40 IN.OZ
USING PROTO 6103

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
10 PPM NO_3^- 2 PPM F^- 1000 mL OF SOLUTION
LISTED ON p 43

T=95°C N_2 THERMOMETER 183301

START pH 8.403

POTENTIOSTAT ESC 440 #1 CHANNEL #4

DATA SAVED AS LT82SP4M @ 12/15/95

REFERENCE FISHER 13-620-SI SN 821163 9214083

E_{CORR} +3mV KEITHLEY 617 SN 579628E_{PT} -65mVE_{APPLIED} 0mV

TEST STARTED 12/15/95

TEST STOPPED 1/29/96

END pH 8.829

END WT 38.95294g

NO SIGN OF LOCALIZED CORROSION

1
J. D. 1/30/96

LONG TERM POTENTIOSTATIC TEST LT82SP5M

SPECIMEN SAME AS p12 ALLOY 825 NN4371F6

START WT 39.08706

2 PTFE CREVICE WASHERS ATTACHED TO SPECIMEN
WITH C276 NUT & BOLT TORQUED TO 40 IN.OZ
USING PROTO 6103

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
10 PPM NO_3^- 2 PPM F^- 2000 mL OF SOLUTION
MADE AS FOLLOWS.

3.29937g NaCl LOT 941616

0.24016g NaHCO_3 LOT 89778940 mL SO_4 - 12/95 pH 4.020 mL NO_3 - 12/95 pH 4.04 mL F^- - 12/95 pH 4.0T=95°C N_2 THERMOMETER 183305

START pH 8.411

1000 mL OF SOLUTION USED IN THIS TEST.

POTENTIOSTAT ESC 440 #1 CHANNEL #5

DATA SAVED AS LT82SP5M

REFERENCE FISHER SCE 13-620-SI SN 3106337

E_{CORR} -50 mV

KEITHLEY 617 SN 579628.

E_{PT} +47 mV (GRAPHITE)E_{APPLIED} -100 mV

TEST STARTED. 12/15/95

TEST STOPPED 1/29/96

END pH 8.839

END WT 39.08687g

NO SIGN OF LOCALIZED CORROSION

J. D. 1/30/96

LONG TERM TEST OC82SC1 H

SPECIMEN SAME AS p13 ALLOY 625 HN437IF6

START WT. 39.28756 g

2 PTFE CRUICK WARNERS ATTACHED TO SPECIMEN
USING C26 DD 12/15/95 C276 NUT & BOLT TORQUED TO
40 IN-OZ USING PROTO 6103SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-} 10 PPM NO_3^- 2 PPM F^- 1000 mL OF

SOLUTION ON p46 Q1A 12/15/95 p45

T = 95 °C Hg THERMOMETER 183303

START pH 8.411

POTENTIOSTAT ESC 440 #1 CHANNEL # 6

DATA SAVED AS OC82SC1 H

REFERENCE FISHER 13-620-SI SN 9214074

E_{CORN} - 117 mVE_{PE} + 108 mVE_{APPLIED} 0.0

TEST STARTED 12/15/95

TEST STOPPED 1/29/96

END DN 9.013

END WT. 39.28732 g

NO SIGN OF LOCALIZED CORROSION

D. D. 1/30/96

STOCK SOLUTIONS 1/96

1000 PPM SO_4^{2-} AS Na_2SO_4 SO_4 - 1/961.47229 g Na_2SO_4 LOT 901213

+ DI WATER TO 1000 mL PREP 1/11/96 EXP 2/11/96

1000 PPM NO_3^- AS NaNO_3 NO_3 - 1/961.37633 g NaNO_3 LOT 897183

+ DI WATER TO 1000 mL PREP 1/11/96 EXP 2/11/96

1000 PPM F^- AS NaF F - 1/962.21063 g NaF LOT 896405

+ DI WATER TO 1000 mL PREP 1/11/96 EXP 2/11/96

100 PPM Cl^- AS NaCl 100 Cl - 1/960.16521 g NaCl LOT 951450 + DI WATER TO

1000 mL PREP 1/8/96 EXP 2/8/96

1000 Cl^- AS NaCl 1000 Cl - 1/961.64822 g NaCl LOT 951450 + DI WATER TO

1000 mL PREPARED 1/8/96 EXP 2/8/96

1 MOLAR Cl^- AS NaCl 1M Cl - 1/9658.44136 g NaCl LOT 951450 + DI WATER TO

1000 mL PREPARED 1/8/96 EXP 2/8/96

2 MOLAR Cl^- AS NaCl 2M Cl - 1/96116.88 g NaCl LOT 951450 + DI WATER TO

1000 mL PREPARED 1/8/96 EXP 2/8/96

D. D. 1/11/96

LONG TERM TESTS LT825P2W

SPECIMEN ALLOY 825 HN437IFG SAME AS p41

START WT 30.82062 g

SOLUTION 1000 PPM Cl^- 85PPM HCO_3^- 20PPM SO_4^{2-}
10 PPM NO_3^- 2PPM F^- 2000 mL MADE AS FOLLOWS

3.30385 g NaCl LOT 951450

0.24304 g NaHCO_3 LOT 89778940 mL SO_4^{2-} 1/96 STOCK SOLUTION p 4720 mL NO_3^- 1/96 "4 mL F^- 1/96 "

+ DI WATER TO 2000 mL

START pH = 8.292

T = 95°C H_2 THERMOMETER 0323007

POTENTIOSTAT ESC 440 #1 CHANNEL #1

DATA SAVED AS LT825P2W.DAT

REFERENCE FISHER 13-620-SI SN ~~63~~ 9214074

COUNTER ELECTRODE Pt FLAG

 E_{CORR} -13 mV KEITHLEY 614 SN 467374 E_{Pt} + 266 mV " E_{APPLIED} 0 mV

TEST STARTED 2/1/96 5:00 pm

TEST STOPPED 3/12/96 4:00 ~~20~~ 3/12/96 5:00 pm

RUNTIME 3456000 SECONDS

END pH 9.296

END WT 30.82286 g

NO SIGN OF LOCALIZED CORROSION

Daniel D 3/14/96

LONG TERM TESTS LT825P7N

SPECIMEN ALLOY 825 HN437IFG SAME AS p42

START WT 30.30769 g

SOLUTION 1000 PPM Cl^- 85PPM HCO_3^- 20PPM SO_4^{2-}
10 PPM NO_3^- 2PPM F^- 2000 mL MADE AS FOLLOWS

3.30065 g NaCl LOT 951450

0.24274 g NaHCO_3 LOT 89778940 mL SO_4^{2-} 1/96 STOCK SOLUTION p4720 mL NO_3^- 1/964 mL F^- 1/96

+ DI WATER TO 2000 mL

START pH = 8.407

T = 95°C H_2 THERMOMETER 0323008POTENTIOSTAT ~~ESC 440~~ 2/1/96 ESC 440 #1 CHANNEL #2

DATA SAVED AS LT825P7N.DAT

REFERENCE FISHER 13-620-SI SN 9214083

COUNTER ELECTRODE Pt FLAG

 E_{CORR} +106 mV KEITHLEY 614 SN 467374 E_{Pt} +193 mV E_{APPLIED} 200 mV

TEST STARTED 5:00 pm 2/1/96

TEST STOPPED 5:00 pm 3/12/96

END pH 9.105

END WT 30.31002 g

NO SIGN OF LOCALIZED CORROSION

Daniel D 3/14/96

LONG TERM TEST LT825P8N

SPECIMEN ALLOY 825 HH4371FG SAME AS P 43

START WT - 31.85352g

SOLUTION 1000 PPM Cl^- 85PPM NO_3^- 20PPM SO_4^{2-} 10 PPM NO_3^- 2PPM F- 2000ML MADE AS FOLLOWS

3.29813 g NaCl LOT 951450

0.24039 g NaHCO_3 LOT 89778940 mL SO_4 - 1/96 STOCK SOLUTION p4720 mL NO_3 - 1/96 "

4 mL F- 1/96 "

+ DI WATER TO 2000 mL

T = 95°C Hg THERMOMETER 183305

START pH 8.243

1000 mL SOLUTION USED IN THIS TEST

POTENTIOSTAT ESC 440 #1 CHANNEL #3

DATA SAVER AS LT825P8N.DAT

REFERENCE FISHER 13-620-SI SN 3106343

COUNTER ELECTRODE Pt FLAG

 E_{CORR} -72 mV E_{PE} +187 mV E_{APPLIED} 100 mV

TEST STARTED. 2/1/96 5:00 pm

TEST STOPPED 3/12/96 5:00 pm

END pH 9.072

END WT 31.85457g

NO SIGN OF LOCALIZED CORROSION

Daniel D 3/14/96

LONG TERM TEST LT825P4N

SPECIMEN ALLOY 825 HH4371FG SAME AS P44

START WT 38.95294g

2 PTFE CREVICE WASHERS ATTACHED TO SPECIMEN

WITH C276 NUT AND BOLT TORQUED TO 40 IN.OZ

USING PROTO 6103

SOLUTION 1000 PPM Cl^- 85PPM NO_3^- 20PPM SO_4^{2-} 10 PPM NO_3^- 2PPM F- 1000 mL OF SOLUTION

LISTED ON p50

T = 95°C Hg THERMOMETER 183302

START pH 8.243

POTENTIOSTAT ESC 440 #1 CHANNEL #4

DATA SAVER AS LT825P4N.DAT

REFERENCE FISHER 13-620-SI SN 8211163

COUNTER ELECTRODE GRAPHITE ROD

 E_{CORR} -88 mV KETNER 614 SN 467374 E_{GRAPHITE} +28 mV E_{APPLIED} 0 mV

TEST STARTED. 2/1/96 5:00 pm

ON 2/13/96 $t = 100,930$ SECONDS OBSERVED SOLUTION

IN LUGGIN PROBE LOW AND NOT IN CONTACT WITH

REFERENCE ELECTRODE. CURRENT READING 10^{-4} A/cm^2

REFILLED LUGGIN PROBE AND CURRENT DENSITY

DECREASED TO 10^{-6} A/cm^2

TEST STOPPED 3/12/96 5:00 pm

END pH 8.881

END WT 38.95313g

NO SIGN OF LOCALIZED CORROSION

Daniel D 3/14/96

LONG TERM TEST LT825PSN

SPECIMEN SAME AS P 45 ALLOY 825 HH4371FG

START WT 39.08687g

2 PTFE CRUICE WASNERS ATTACHED TO SPECIMEN
WITH C 276 NUT & BOLT TORQUED TO 40 IN. OZ
USING PROTO 6103SOLUTION 1000 PPM Cl^- 85 PPM NO_3^- 20 PPM SO_4^{2-}
10 PPM NO_3^- 2 PPM F^- 2000 mL OF SOLUTION AS FOLLOWS

3.29934 g NaCl LOT 951450

0.24300 g NaNCO_3 LOT 89778940 mL SO_4 - 1/96 STOCK SOLUTION p4720 mL NO_3 - 1/964 mL F^- - 1/96

+ DI WATER TO 2000 mL 1000 mL USED IN TEST

T = 95°C Hg THERMOMETER 183303

START pH = 8.227

POTENTIOSTAT ESC 440 #1 CHANNEL #5

DATA SAVER AS LT825PSN.DAT

REFERENCE FISHER SC6 13-620-S1 SN 2134032

COUNTER ELECTRODE GRAPHITE ROD

E_{CORR} - 79 mV KEITHLEY 614 SN 467374E_{GRAPHITE} + 69 mVE_{APPLIED} -100 mV

TEST STARTED 2/1/96 5:00 PM

TEST STOPPED 3/12/96 5:00 PM

END pH 8.973

END WT 39.08685g

NO SIGN OF LOCALIZED CORROSION

J. D. 3/14/96

LONG TERM TEST OC825C1I

SPECIMEN ALLOY 825 HH4371FG SAME AS P 46

START WT 39.28732g

2 PTFE CRUICE WASNERS ATTACHED TO SPECIMEN
WITH C 276 NUT & BOLT TORQUED TO 40 IN. OZ
USING PROTO 6103SOLUTION 1000 PPM Cl^- 85 PPM NO_3^- 20 PPM SO_4^{2-}
10 PPM NO_3^- 2 PPM F^- 1000 mL OF SOLUTION

ON P 52

T = 95°C Hg THERMOMETER 183301

START pH = 8.227

POTENTIOSTAT ESC 440 #1 CHANNEL #6

DATA SAVER AS OC825C1I.DAT

REFERENCE FISHER 13-620-S1 SN 3106337

COUNTER ELECTRODE PE FLAG.

E_{CORR} -106 mV KEITHLEY 614 SN 467374E_{PE} +105 mVE_{APPLIED} 0. C.

TEST STARTED 2/1/96 5:00 PM

TEST STOPPED 3/12/96 5:00 PM

END pH 8.947

END WT 39.28732g

NO SIGN OF LOCALIZED CORROSION.

J. D. 3/14/96

STOCK SOLUTIONS 2/96

1000 ppm SO_4^{2-} AS Na_2SO_4 SO_4 -2/96
 1.47130 g Na_2SO_4 LOT 901213
 + DI WATER TO 1000 mL EXP 3/11/96

NO_3 -2/96 1000 ppm NO_3^- AS NaNO_3
 1.37411 g NaNO_3 LOT 897183
 + DI WATER TO 1000 mL EXP 3/11/96

F-2/96 1000 ppm F^- AS NaF
 2.21187 g NaF LOT 896405
 + DI WATER TO 1000 mL EXP 3/11/96

David D 2/12/96

STOCK SOLUTIONS 3/96

SO_4 -3/96 1000 ppm SO_4 AS Na_2SO_4
 1.47118 g Na_2SO_4 LOT 901213
 + DI WATER TO 1000 mL EXP 4/6/96

NO_3 -3/96 1000 ppm NO_3^- AS NaNO_3
 1.37362 g NaNO_3 LOT 897183
 + DI WATER TO 1000 mL EXP 4/6/96

F-3/96 1000 ppm F^- AS NaF
 2.21325 g NaF LOT 896405
 + DI WATER TO 1000 mL EXP 4/6/96

David D 3/6/96

LONG TERM TEST LT82SP2X

SPECIMEN SAME AS P48 ALLOY 825 HH4371FC

START WT = 30.82286g

SOLUTION 1000 ppm Cl^- 85 ppm HCO_3^- 20 ppm SO_4^{2-}
10 ppm NO_3^- 2 ppm F^- 2000 mL MAKE AS FOLLOWS

3.29712 g NaCl LOT 951450

0.24643 g NaHCO_3 LOT 89778940 mL SO_4 - 3/96 STOCK SOLUTION PSS20 mL NO_3 - 3/96 "4 mL F^- - 3/96 "

+ DI WATER TO 2000 mL

START pH = 8.307

T = 95°C Hg THERMOMETER 0323008

POTENTIOSTAT ESC 440 #1 CHANNEL #1

DATA SAVED AS LT82SP2X.DAT 03/14/96 LT82SP2X.DAT

REFERENCE FISHER SCE 13-620-SI SN

COUNTER ELECTRODE Pt FLAG

E_{corr} +4 mV K6ITN67 617 SN 537418E_{pt} +150 mV "E_{applied} 0 mV "

TEST STARTED 3/15/96 5:30 PM

TEST STOPPED 4/22/96 7:30 AM

RUNTIME 3243600 s OR 901 h

PIN AT END 9.020

END WT 30.82259 g

NO SIGN OF LOCALIZED CORROSION

Daniel D 4/23/96

LONG TERM POTENTIOSTATIC TEST LT82SP70

SPECIMEN ALLOY 825 HH4371FC SAME AS P49

START WT = 30.31002g

SOLUTION 1000 ppm Cl^- 85 ppm HCO_3^- 20 ppm SO_4^{2-}
10 ppm NO_3^- 2 ppm F^- 2000 mL MAKE AS FOLLOWS

3.29816 g NaCl LOT 951450

0.23919 g NaHCO_3 LOT 89778940 mL SO_4 - 3/96 STOCK SOLUTION PSS20 mL NO_3 - 3/96 "4 mL F^- - 3/96 "

+ DI WATER TO 2000 mL

START pH =

T = 95°C Hg THERMOMETER 0323007

POTENTIOSTAT ESC 440 #1 CHANNEL #2

DATA SAVED AS LT82SP70.DAT

REFERENCE FISHER SCE 13-620-SI SN

COUNTER ELECTRODE Pt FLAG

E_{corr} +60 mV K6ITN67 617 SN 537418E_{pt} +147 mV "E_{applied} +200 mV "

TEST STARTED 3/15/96 5:30 PM

TEST STOPPED 4/22/96 7:30 AM

RUNTIME 3243600 s OR 901 h

PIN AT END 9.028

END WT 30.30954g

NO SIGN OF LOCALIZED CORROSION

Daniel D 4/23/96

LONG TERM TESTS LTR2SP80

SPECIMEN ALLOT 825 NH4371FG SAME AS P50

START WT 31.85457g

SOLUTION 1000 ppm Cl^- 85 ppm NO_3^- 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^- 2000 mL MAKE AS FOLLOWS3.29801g NaCl LOT 9514500.25008g NaHCO_3 LOT 89778940 mL SO_4 - 3/96 STOCK SOLUTION p 5520 mL NO_3 - 3/96 "4 mL F^- - 3/96 "

+ DI WATER TO 2000 mL

T = 95°C Hg THERMOMETER 183303

START pH = 8.227

1000 mL SOLUTION USED IN THIS TEST

POTENTIOSTAT ESC 440 #1 CHANNEL #3

DATA SAVED AS LTR2SP80.DAT

REFERENCE FISHER ~~31~~ 3/14/96 13-620-S1 SN

COUNTER ELECTRODE Pt FLAG.

E_{corr} -42 mVE_{pe} +171 mVE_{APPLIED} 100 mVTEST STARTED. 3/15/96 - 5:43 ~~3/15/96~~ 5:30 PM

TEST STOPPED 4/22/96 7:30 AM

RUNTIME 3243600 s OR 901 hr

END pH 9.033

END WT 31.85344g

NO SIGN OF LOCALIZED CORROSION

Daniel D 4/23/96

LONG TERM TEST LTR2SP40

SPECIMEN ALLOT 825 NH4371FG SAME AS P51

START WT 38.95313g

2 PTFE CRUICK WASHERS ATTACHED TO SPECIMEN

WITH C 276 NUT AND BOLT TORQUED TO

40 IN-OZ USING PROTO 6103

SOLUTION 1000 ppm Cl^- 85 ppm NO_3^- 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^- 1000 mL OF SOLUTION

LISTED ON p 58

T = 95°C Hg THERMOMETER 183301

START pH 8.227

POTENTIOSTAT ESC 440 #1 CHANNEL #4

DATA SAVED AS LTR2SP40.DAT

REFERENCE FISHER 13-620-S1 SN

COUNTER ELECTRODE GRAPHITE ROD

E_{corr} -76 mV

R6ITN64 617 SN S37418

E_{pe} ~~+75 mV~~ E_{GRAPHITE} -2 mVE_{APPLIED} 0 mV

TEST STARTED. 3/15/96 5:30 PM

TEST STOPPED 4/22/96 7:30 AM

RUNTIME 3243600 s OR 901 hr

END pH 8.877

END WT 38.95268g

NO SIGN OF LOCALIZED CORROSION

Daniel D 4/23/96

LONG TERM TEST LT82SP50

SPECIMEN ALLOY 825 HH437IFG SAME AS P52

START WT = 39.08685g

2 PTFE CRUICE WASNERS ATTACHED TO SPECIMEN
WITH C276 NUT & BOLT TORQUED TO 40 IN.OZ
USING PROTO 6103SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
10 PPM NO_3^- 2 PPM F^- 2000 ML OF SOLUTION AS FOLLOWS

3.29733g NaCl LOT 951450

0.25204g NaHCO_3 LOT 89778940 mL SO_4^{2-} 3/96 STOCK SOLUTION P5520 mL NO_3^- 3/96 "4 mL F^- 3/96 "

+ DB WATER TO 2000 ML

T = 95°C Hg THERMOMETER 183302

START pH 8.272

1000 ML SOLUTION USED IN THIS TEST

POTENTIOSTAT ESC 440 #1 CHANNEL #5

DATA SAVED AS LT82SP50.DAT

REFERENCE FISHER SC6 13-620-S1 SN

COUNTER ELECTRODE GRAPHITE ROD

E_{CORR} -66mV K6ITHLEY 617 SN 537418E_{PE} $\frac{915mV}{2}$ E_{GRAPHITE} +12mV "E_{APPLIED} -100mV "

TEST STARTED 3/15/96 5:30 PM

TEST STOPPED 4/22/96 7:30 AM

RUNTIME 3243600 s OR 901 h

END pH 8.882

END WT 39.08665g

NO SIGN OF LOCALIZED CORROSION

D. J. D. 4/23/96

LONG TERM TEST OC825C1J.

SPECIMEN ALLOY 825 HH437IFG SAME AS 53

START WT 39.28732g

2 PTFE CRUICE WASNERS ATTACHED TO SPECIMEN
WITH C276 NUT & BOLT TORQUED TO 40 IN.OZ
USING PROTO 6103SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
10 PPM NO_3^- 2 PPM F^- 1000 ML OF

SOLUTION LISTED ON P60

T = 95°C Hg THERMOMETER 183305

START pH 8.272

POTENTIOSTAT ESC 440 #1 CHANNEL #5

DATA SAVED AS OC825C1J.DAT

REFERENCE FISHER SC6 13-620-S1 SN

COUNTER ELECTRODE Pt FLAG

E_{CORR} -115mV

K6ITHLEY 617 SN 537418

E_{PE} +20mV "E_{APPLIED} 0.1C "

TEST STARTED 3/15/96 5:30 PM

TEST STOPPED 4/22/96 7:30 AM

RUNTIME 3243600 s OR 901 h

END pH 9.006

END WT 39.28691g

SMALL AREA UNDER ONE CRUICE TOOTH OF
LIGHT CORROSION ON MILL FINISHED SIDE
NO SIGNIFICANT LOCALIZED ATTACK OR
PENETRATION

D. J. D. 4/23/96

NRC

As a result of budget changes decided by the Nuclear Regulatory Commission for the remaining of FY 96, the Engineered Barrier System Experimental Research (EBSER) Project has been closed. Starting from January 20, 1996, the experimental research activities have been reoriented according to the prioritization of technical needs described in the Key Technical Issue of Container Life and Source Term.

The task that replaces EBSER, titled Container Life and Source Applied Technical Investigations, includes the continuation of long-term experimental studies on corrosion and stress corrosion cracking of candidate waste package materials and the effect of microbial activity on the long-term performance of these materials. The scientific notebooks for activities under EBSER will continue to be used for similar activities that are contained in the new task.

[Signature]
4/23/96

STOCK SOLUTIONS 4/96

SO₄ 4/96 1000 PPM SO₄⁼ AS Na₂SO₄
1.47231 g Na₂SO₄ LOT 901213
+ DI WATER TO 1000 mL EXP 5/11/96

NO₃ 4/96 1000 PPM NO₃⁼ AS NaNO₃
1.37166 g NaNO₃ LOT 897183
+ DI WATER TO 1000 mL EXP 5/11/96

F- 4/96 1000 PPM F⁻ AS NaF
2.21207 g NaF LOT 896405
+ DI WATER TO 1000 mL EXP 5/11/96

[Signature]
4/23/96

CT82SP2Y

SPECIMEN ALLOY 825 NN4371FG SAME AS p56

START WT = 30.8225g

SOLUTION 1000 PPM Cl^- 85PPM HCO_3^- 20PPM SO_4^{2-}
10PPM NO_3^- 2PPM F^- 2000 mL MAKE AS FOLLOWS

3.30169 g NaCl LOT 951450

0.24283 g NaHCO_3 LOT 89778940 mL SO_4 - 4/96 STOCK SOLUTION p 6320 mL NO_3 - 4/96 "4 mL F^- - 4/96 "

+ DI WATER TO 2000 mL

T = 95.2 $^{\circ}\text{C}$ N₂ THERMOMETER 0323004

START pH 8.207

POTENTIOSTAT ESC 440#1 CHANNEL #1

DATA SAVED AS CT82SP2Y.DAT

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHER SCE 13-620-S1 SN 3106343

 E_{corr} -74 mV KEITHLEY 614 SN 555368 E_{Pt} +128 mV " E_{APPLIED} 0 mV

TEST STARTED 5/3/96 10:50 AM

TEST STOPPED 6/10/96 4:50 PM

END pH 9.077

END WT 30.82065g

Daniel D 6/10/96

CT82SP7P

SPECIMEN ALLOY 825 NN4371FG SAME AS p57

START WT = 30.30954g

SOLUTION 1000 PPM Cl^- 85PPM HCO_3^- 20 PPM SO_4^{2-}
10 PPM NO_3^- 2PPM F^- 2000 mL MAKE AS FOLLOWS

3.29637 g NaCl LOT 951450

0.24137 g NaHCO_3 LOT 89778940 mL SO_4 - 4/96 STOCK SOLUTION p 6320 mL NO_3 - 4/96 "4 mL F^- - 4/96 "

+ DI WATER TO 2000 mL

START pH 8.223

T = 95 $^{\circ}\text{C}$ N₂ THERMOMETER 0323008

POTENTIOSTAT ESC 440#1 CHANNEL #2

DATA SAVED AS CT82SP7P.DAT

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHER SCE 13-620-S1 SN 3106337

 E_{corr} -72 mV KEITHLEY 614 SN 555368 E_{Pt} +147 mV " E_{APPLIED} 200 mV

TEST STARTED 5/3/96 10:50 AM

TEST STOPPED 6/10/96 4:50 PM

END pH 9.041

END WT 30.30764g

MANY SMALL PITS ON POLISHED SURFACE
SOME UP TO 15 μm DEEP SOME PITS
APPEAR TO BE FROM REMOVED INCLUSIONS.

Daniel D 6/10/96

LT82SP8P

SPECIMEN ALLOY 825 HN437IFG SAME AS p 58

START WT = 31.85344g

SOLUTION 1000 ppm Cl^- 85 ppm NaCO_3^- 20 ppm SO_4^{2-}
10 ppm NO_3^- 2 ppm F^- 2000 mL MADE AS FOLLOWS

3.29709g NaCl LOT 951450

0.24452g NaHCO_3 LOT 89778940 mL SO_4 - 4/9620 mL NO_3 - 4/964 mL F^- - 4/96

+ DI WATER TO 2000 mL / 1000 mL USED IN TEST

T = 95°C Hg THERMOMETER 183305

START pH 8.261

POTENTIOSTAT ESC 440 #1 CHANNEL #3

DATA SAVED AS LT82SP8P.DAT

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHER 13-620-S1 SN 9214074

 E_{CORR} -98 mV KEITNEY 614 SN 555368 E_{PE} +109 mV E_{APPLIED} 100 mV

TEST STARTED 5/3/96 10:50 AM

TEST STOPPED 6/10/96 4:50 PM

END pH 9.080

END WT 31.85357g

PIT ON MILL FINISHED SURFACE THAT

IS $\approx 35 \mu\text{m}$ DEEP

Daniel D 6/10/96

LT82SP4P

SPECIMEN ALLOY 825 HN437IFG SAME AS p 59

START WT = 38.95268

2 PTFE CRUICK WASNERS ATTACHED TO SPECIMEN
USING C276 NUT & BOLT TORQUED TO 40 IN-OZ
USING PROTO 6103SOLUTION 1000 ppm Cl^- 85 ppm NaCO_3^- 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^- 2000 mL 4/26/96

1000 mL OF SOLUTION LISTED ON P66

START pH 8.261

T = 95°C Hg THERMOMETER 183302

POTENTIOSTAT ESC 440 #1 CHANNEL #4

DATA SAVED AS LT82SP4P.DAT

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHER 13-620-S1 SN 9214083

 E_{CORR} -46 mV KEITNEY 614 SN 555368 E_{PE} +43 mV (GRAPHITE) E_{APPLIED} 0 mV

TEST STARTED 5/3/96 10:50 AM

TEST STOPPED 6/10/96 4:50 PM

END pH 8.825

END WT = 38.95241g

NO SIGN OF LOCALIZED CORROSION

Daniel D 6/10/96

LT82SPSP

SPECIMEN) ALLOY 825 NH437IFG SAME AS p60

START WT 39.08665g

2 PTFE CRUICK BLOCKS ATTACHED TO SPECIMEN
WITH A C276 NUT & BOLT TORQUED TO
40 IN.OZ USING PROTO 6103SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-} 10 PPM NO_3^- 2 PPM F^- 2000 mL MADE AS FOLLOWS

3.2974 g NaCl LOT 951450

0.24317 g NaHCO_3 LOT 89778940 mL SO_4 - 4/96 STOCK SOLUTION p 6320 mL NO_3 - 4/964 mL F^- - 4/96

+ DIST WATER TO 2000 mL / 1000 mL USED IN TEST

T = 95°C Hg THERMOMETER 183301

START pH 8.229

POTENTIOSTAT ESC 440 #1 CHANNEL #5

DATA SAVER AS LT82SPSP.DAT

REFERENCE FISHER 13-620-SI SN 2134032

 E_{corr} - 52 mV KEITNEY 614 SN 553368 E_{pc} + 58 mV (GRAPHITE) E_{APPLIED} - 100 mV

TEST STARTED 5/3/96 10:50 AM

TEST STOPPED 6/10/96 4:50 PM

END pH 8.812

END WT 39.08637g

NO SIGN OF LOCALIZED CORROSION

D. J. 6/10/96

OC82SC1K

SPECIMEN) ALLOY 825 NH437IFG SAME AS ^{DD 4/26/96} P53 p61

START WT 39.28691g

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-} 10 PPM NO_3^- 2 PPM F^- 1000 mL SOLUTION

LISTED ON P68

START pH 8.229

T = 95°C Hg THERMOMETER2 PTFE CRUICK BLOCKS ATTACHED TO SPECIMEN
USING C276 NUT & BOLT TORQUED TO 40 IN.OZ
USING PROTO 6103

POTENTIOSTAT ESC 440 #1 CHANNEL #6

DATA SAVER AS LT82SPSP.DAT

REFERENCE FISHER 13-620-SI SN 8211163

 E_{corr} - 159 mV KEITNEY 614 SN 553368 E_{pc} + 84 mV E_{APPLIED} O.C.

TEST STARTED 10:50 AM 5/3/96

TEST STOPPED 6/10/96 4:50 PM

END pH 9.064

END WT 39.28616g

LIGHT CORROSION ON MILL FINISHED SURFACE
UNDER CRUICK WASHER

D. J. 6/10/96

INITIAL ENTRY FOR CYCLIC POLARIZATION TESTS OF A 516 GRADE 60

Initial Scientific notebook entry for A 516 grade 60 carbon steel cyclic polarization tests.

Title: CPP of A516 grade 60

Tests Performed by: Darrell S. Dunn

Objectives: Determine the effect of solution temperature, chloride concentration, and pH on the initiation and repassivation of localized corrosion of A516 grade 60.

Equipment: EG&G Versastat Serial Number 20104. EG&G model 352 corrosion software. Compaq 386/20 computer. Keithley Electrometer model 614 SN 555368 or equivalent. ASTM G-5 polarization cell, Teflon/glass reaction vessels or vessel meeting the requirements of TOP-008

Materials: A516 grade 60

Specimen specifications: 0.250" diameter x 1.915" long (+/- 0.005") specimens polished to a 600 grit finish. Specimens to be weighed before and after exposure.

Measurement Parameters: As described in TOP-008

Required level of accuracy: Potentials ± 5 mV

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

Darrell D 6/4/96

Darrell D 6/4/96

CPP TEST A 516 CP 01

OBJECTIVE MEASURE E_p & E_{RP}

SPECIMEN A 516 GRADE 60

0.250" DIA x 1.915" LONG 600 GRIT

FINISH EXPOSED AREA = 8.0 cm²

START WT = 10.85333 g

END WT = 10.81645 g

SOLUTION 0.0003 M NaCl LOT 951450 (0.0167 M NaCl)

0.0107 M NaHCO₃ (0.9 g NaHCO₃) LOT 923337A

0.00085 M Na₂HPO₄ DD 6/4/96 Na₂CO₃ LOT 960685

(0.09 g Na₂CO₃), 0.0007 M SO₄²⁻ (0.1 g Na₂SO₄ LOT 901213)

+ DI WATER TO 1000 mL DEMINER W/ 99.999% N₂

T = 95°C H₂ THERMOMETER 183304

START pH 9.00

END pH 10.71

POTENTIOSTAT EG&G VERSASTAT SN 20104

WITH MODEL 352C SOFTWARE

REFERENCE FISHER SCE 13-62U-S1 SN 4280310

COUNTER ELECTRODE Pt FLAG

DATA SAVED AS A516CP01.DAT

E_{CORR} - 586 mV

E_p - 415 mV

TEST STARTED 6/4/96

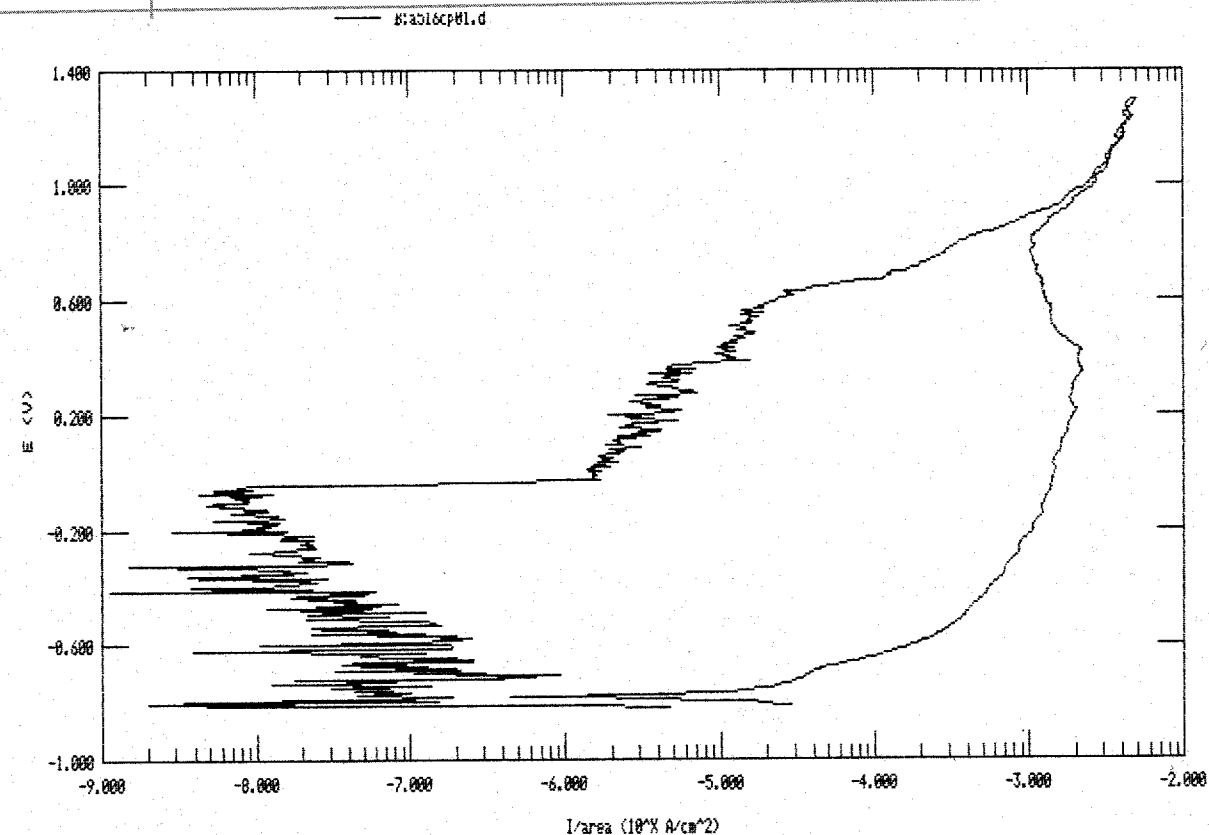
E_p 607 mV

E_{RP} - 778 mV

LARGE AREAS OF SHALLOW ATTACK AND SOME PITS

GRAPH AND RUN PARAMETERS P 72

Darrell D 6/5/96



Handwritten signature 6/5/96

Model 352/252 Corrosion Analysis Software, v. 2.01
 Filename: B:\A516cp01.dat
 Pstat: VStat[] Ver 2
 CP CYCLIC POLARIZATION
 Date Run: 03-03-96

File Status: NORMAL
 Time Run: 15:36:26

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm ²
				Final Pot.	FP	-0.2000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93 s
No. of Points	NP	846				

Line Sync.	LS	yes	GI Time Const.	TC	Off
Rise Time	RT	high stability	IR Mode	IR	none
Working Elec.	WE	Solid	Filter	FL	Off
Sample Area	AR	8.000	Ref. Elec.	RE	SCE 0.2415 V
Density	DE	7.900	Equiv. Wt.	EW	0.0000 g
			Open Circuit	OC	-0.6180 V

Comment: A516 grade 60 0.0003 M Cl- pH 9.00 95 C

Handwritten signature 6/5/96

CPP TEST A516CP02

OBJECTIVE MEASURE E_p & E_{RP}

SPECIMEN A 516 GRADE 60

0.250" DIA ϕ DD 6/5/96 x 1.915" LONG
 600 GRIT FINISH EXPOSED AREA = 8.0 cm²
 START WT 10.85508
 END WT 10.82873

SOLUTION 0.03 M Cl⁻ AS NaCl LOT 951450
 0.0007 M SO₄²⁻ AS Na₂SO₄ LOT 901213
 0.001 M CO₃²⁻ AS Na₂CO₃ LOT 960685
 0.0105 M CO₃²⁻ AS NaHCO₃ LOT 923937A
 + DI WATER TO 1000 mL PERMEGA w/99.99% N₂
 T = 95°C N₂ THERMOMETER 183304

START pH 9.03

END pH 10.01

POTENTIostat EG & G VERASTAT SN 20104

WITH MODEL 34 DD 6/5/96 352C SOFTWARE

REFERENCE FISHER SCE 13-620-SI SN ϕ DD 6/5/96
 4280310

COUNTER ELECTRONIC PE FLAG

DATA SAVER AS A516CP02.DAT

E_{CORR} -676 mV

E_p -313 mV

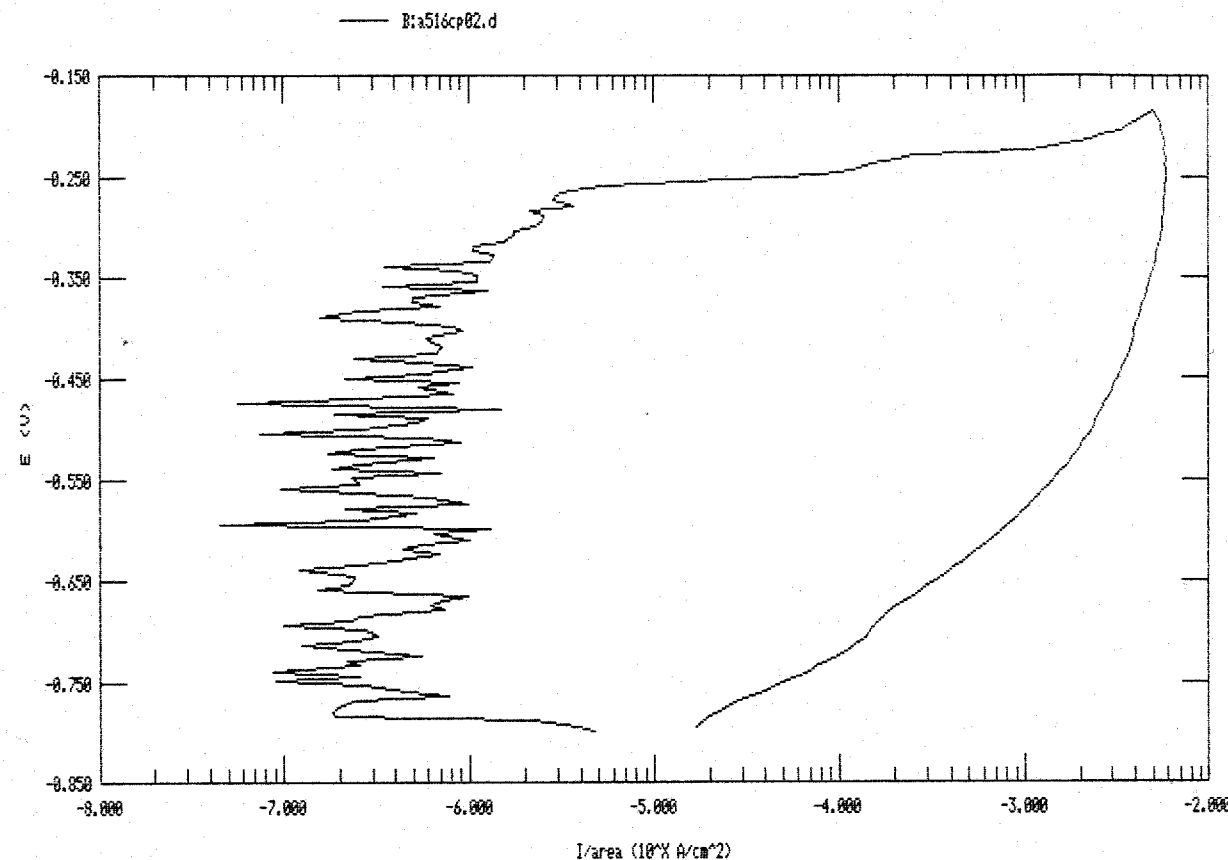
TEST STARTED 6/5/96

E_p -259 mV

E_{RP} $\leftarrow$ -759 mV DD 6/5/96 $<$ -794 mV

LARGE AREAS OF CORROSION SOME SHALLOW
 PITS

Handwritten signature 6/6/96



David D 6/6/96

Model 352/252 Corrosion Analysis Software, v. 2.01
 Filename: B:\516cp02.dat
 Pstat: VStat[] Ver 2
 CP CYCLIC POLARIZATION
 Date Run: 03-04-96

File Status: NORMAL
 Time Run: 11:39:37

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	VI	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm ²
				Final Pot.	FP	-0.2000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto	
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93	s
No. of Points	HP	246					

Line Sync.	LS	yes		GI Time Const.	TC	Off	
Rise Time	RT	high stability		IR Mode	IR	none	
Working Elec.	WE	Solid		Filter	FL	Off	
Sample Area	AR	8.000	cm ²	Ref. Elec.	RE	SCE 0.2415	V
Density	DE	7.900	g/ml	Equiv. Wt.	EW	0.0000	g
				Open Circuit	OC	-0.5990	V

Comment: A516 grade 60 0.03 M Cl⁻ pH 9.00 95 C

David D 6/6/96

A 516 CP03

OBJECTIVE MEASURE E_p & E_{RP}

SPECIMEN A 516 GRADE 60

0.250" DIA x 1.915" LONG

600 GRIT FEMIN EXPOSED AREA = 8.0 cm²

START WT 10.86315 g

END WT 10.74990 g

SOLUTION 0.0007 M SO_4^{2-} AS Na_2SO_4 LOT 901213

0.0005 M CO_3^{2-} AS Na_2CO_3 LOT 960685

0.0105 M CO_3^{2-} AS $NaHCO_3$ LOT 923337A

+ DI WATER TO 1000 mL

T = 95°C H_2 THERMOMETER 183304

START pH 9.003

END pH 9.997

SOLUTION DE AERATED w/ 99.999% N_2

POTENTIOSTAT EG&G VERSASTAT SN 20104

w/ MODEL 352C SOFTWARE

REFERENCE FISHER SCE 13-620-51 SN 4280310

COUNTER ELECTRODE Pt FLAG

DATA SAVED AS A516CP03.PMT

E_{corr} -525mV K_{GITM6Y} 614 SN 555368

E_{pe} -183mV

TEST STARTED 6/11/96

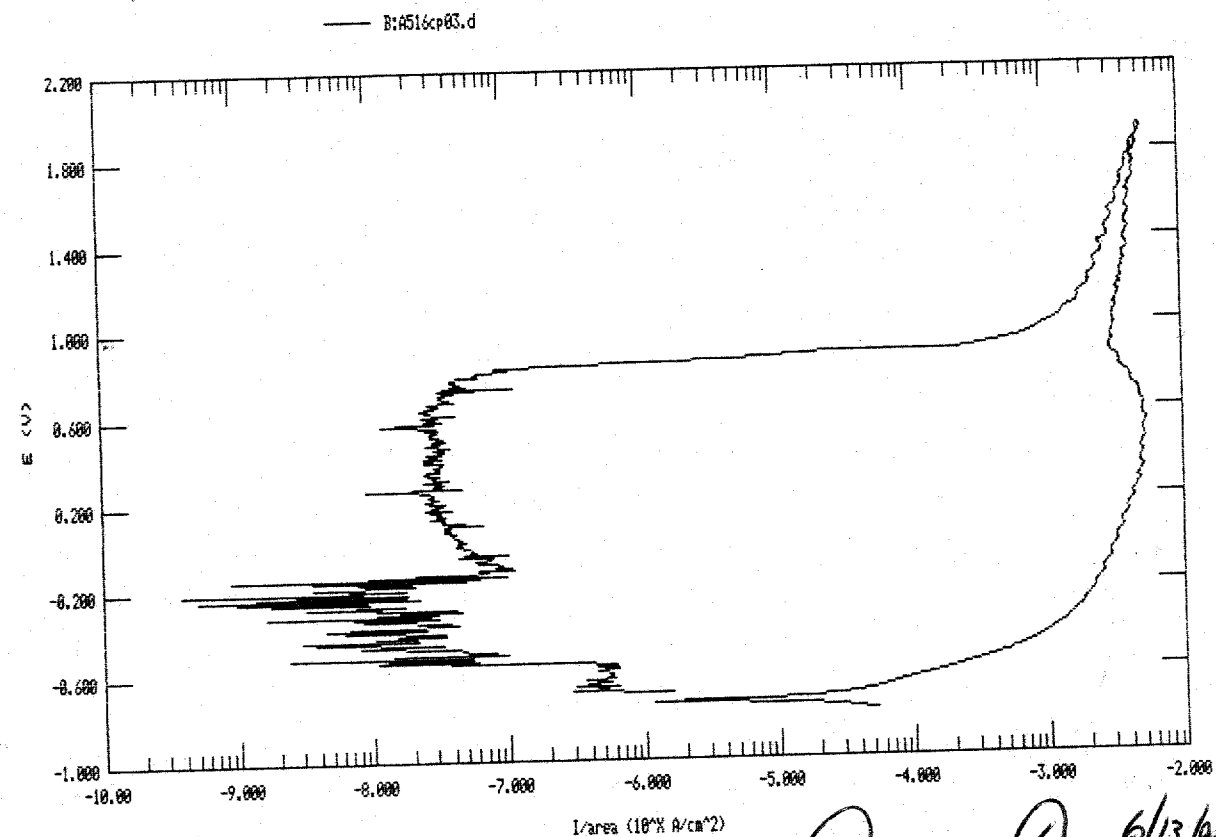
E_p 814mV

E_{RP} -736mV

SPECIMEN NAS MANT PITS

RUN PARAMETERS AND PLOT P76

David D 6/13/96



Don 6/13/96

Model 352/252 Corrosion Analysis Software, v. 2.01

Filename: B:A516cp03.dat

Pstat: VStat[] Ver 2

CP CYCLIC POLARIZATION

Date Run: 03-05-96

File Status: NORMAL

Time Run: 14:32:34

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm ²
				Final Pot.	FP	-0.3000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93 s
No. of Points	NP	1056				

Line Sync.	LS	yes		GI Time Const.	TC	Off
Rise Time	RT	high stability		IR Mode	IR	none
Working Elec.	WE	Solid		Filter	FL	Off
Sample Area	AR	8.000	cm ²	Ref. Elec.	RE	SCE 0.2415 V
Density	DE	7.900	g/ml	Equiv. Wt.	EW	0.0000 g
				Open Circuit	OC	-0.4000 V

Comment: A516 grade 60 no Cl- pH 9.00 95 C

Don 6/13/96

STOCK SOLUTIONS 6/95

SO₄ - 6/95 1000 PPM SO₄²⁻ AS Na₂SO₄
 1.47039 g Na₂SO₄ LOT 901213
 + DI WATER TO 1000 mL

NO₃ - 6/95 1000 PPM NO₃⁻ AS NaNO₃
 1.37021 g NaNO₃ LOT 897183
 + DI WATER TO 1000 mL

F - 6/95 1000 PPM F⁻ AS NaF
 2.21033 g NaF LOT 896405
 + DI WATER TO 1000 mL

Don 6/13/96

LT82SP28

SPECIMEN ALLOY 825 H4371FG SAME AS P64

START WT = 30.82065g

END WT 30.82097g

SOLUTION 1000 ppm Cl⁻ 85 ppm HCO₃⁻ 20 ppm SO₄²⁻
10 ppm NO₃⁻ 2 ppm F⁻ 2000 mL MAKE AS FOLLOWS

3.29683 g NaCl LOT 951450

0.24127 g NaHCO₃ LOT 923337A40 mL SO₄²⁻ 6/96 STOCK SOLUTION P7720 mL SOD 6/19/96 NO₃⁻ 6/96 STOCK SOLUTION P774 mL F⁻ 6/96 STOCK SOLUTION P77

+ DI WATER TO 2000 mL

T = 95°C N₂ THERMOMETER 0323004

START pH 8.080

POTENTIOSTAT ESC 440 #1 CHANNEL #1

DATA SAVER AS

COUNTER ELECTRODE Pt FLAG.

REFERENCE FISHER SC6 13-620-51 SN 3106343

E_{CORR} -36mVE_P +130 mVE_{APPLIED} 0mV

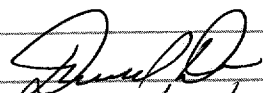
TEST STARTED 6/20/96 10:50 AM

TEST STOPPED 8/16/96 12:50 PM

RUNTIME 1371 hr

END pH 9.196

NO SIGN OF LOCALIZED CORROSION


8/23/96

LT82SP7Q

SPECIMEN ALLOY 825 H4371FG SAME AS P65

START WT 30.30764g

END WT 30.30797g

SOLUTION 1000 ppm Cl⁻ 85 ppm HCO₃⁻ 20 ppm SO₄²⁻
10 ppm NO₃⁻ 2 ppm F⁻ 2000 mL MAKE AS FOLLOWS

3.29664 g NaCl LOT 951450

0.24130 g NaHCO₃ LOT 923337A40 mL SO₄²⁻ 6/96 STOCK SOLUTION P7720 mL NO₃⁻ 6/96 "4 mL F⁻ 6/96 "

+ DI WATER TO 2000 mL

T = 95°C N₂ THERMOMETER 0323008

START pH 8.124

POTENTIOSTAT ESC 440 #1 CHANNEL #2

DATA SAVER AS

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHER SC6 13-620-51 SN 2134032

E_{CORR} -10E_P +156 mVE_{APPLIED} +200 mV

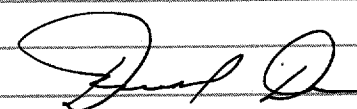
TEST STARTED 6/20/96 10:50 AM

TEST STOPPED 8/16/96 12:50 PM

RUNTIME 1371 hr

END pH 9.203

NO SIGN OF LOCALIZED CORROSION


8/23/96

LT82SP8Q

SPECIMEN ALLOY 825 HX4371FG SAME AS ~~P66~~ P66

START WT = 31.85357g

SOLUTION 1000 PPM Cl^- 85PPM NaCO_3 20PPM SO_4^{2-}
10PPM NO_3^- 2PPM F- 2000mL MADE AS FOLLOWS

3.29722 g NaCl LOT 951450

0.24118 g NaHCO_3 LOT 923337A40mL SO_4^{2-} 6/96 STOCK SOLUTION p 7720mL NO_3^- 6/96 "

4mL F- 6/96 "

+ DI WATER TO 2000mL / 1000mL USED IN TEST

T = 95°C Hg THERMOMETER 183303

START pH 8.118

POTENTIOSTAT ESC 440 #1 CHANNEL #3

DATA SAVED AS LT82SP8Q.DAT

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHER SCE 13-620-S1 SN 9214083

E_{corr} - 80 mVE_{pt} + 153 mV

APPLIED 100 mV

TEST STARTED 6/20/96 10:50 AM

TEST STOPPED 8/16/96 12:50 PM

RUNTIME 1371 h

END pH 9.196

END WT: 31.85358g

NO SIGN OF LOCALIZED CORROSION

J. D. 8/23/96

LT82SP4Q

SPECIMEN ALLOY 825 HX4371FG SAME AS P67

2PTFG CRUSHER WASHERS ATTACHED TO SPECIMEN
WITH C276 NUT & BOLT TORQUED TO 40 IN. OZ
USING PRISO 6103

START WT. 38.95241g

END WT. 38.95248g

SOLUTION 1000 PPM Cl^- 85PPM NaCO_3 20PPM SO_4^{2-}
10PPM NO_3^- 2PPM F- 1000mL OF SOLUTION

LISTED ON P 80

T = 95°C Hg THERMOMETER 183301

START pH 8.118

POTENTIOSTAT ESC 440 #1 CHANNEL #4

DATA SAVED AS LT82SP4Q.DAT

COUNTER ELECTRODE GRAPHITE ROD

REFERENCE FISHER SCE 13-620-S1 SN 8211163

E_{corr} -46 mVE_{pt} (GRAPHITE) +12

APPLIED 0 mV

TEST STARTED 6/20/96 10:50 AM

TEST STOPPED 8/16/96 12:50 PM

RUNTIME 1371 h

END pH 9.008

NO SIGN OF LOCALIZED CORROSION DURING THIS
TEST.

J. D. 8/23/96

LT825PSQ

SPECIMEN ALLOY 825 HH4371FG SAME AS P 68
 2 PTFE CRUICK WASHERS ATTACHED TO SPECIMEN
 WITH C276 NUT & BOLT TORQUED TO 40 IN-OZ
 USING PROTO 6103

START WT 39.08637 g

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
 10 PPM NO_3^- 2 PPM F^- 2000 mL MAKE AS FOLLOWS

3.29668 g NaCl LOT 951450

0.24008 g NaHCO_3 LOT 923337A

40 mL SO_4^{2-} 6/96 STOCK SOLUTION P 77

20 mL NO_3^- 6/96 STOCK SOLUTION P 77

4 mL F^- 6/96 STOCK SOLUTION P 77

+ DI WATER TO 2000 mL / 1000 mL OF

SOLUTION USED IN THIS TEST

$T = 95^\circ\text{C}$ N_2 THERMOMETER 183302

START pH 8.206

POTENTIOSTAT ESC 440 #1 CHANNEL #5

COUNTER ELECTRODE GRAPHITE ROD

REFERENCE FISHER SCG 13-620-S1 SN 9214074

E_{corr} -71 mV

E_{pt} (GRAPHITE) +24 mV

E_{APPLIED} -100 mV

TEST STARTED 6/20/96 10:50 AM

TEST STOPPED 8/14/96 12:50 PM

RUNTIME 1371 hr

END pH 9.055

END WT 39.08630 g

NO SIGN OF LOCALIZED CORROSION DURING THIS

TEST

[Signature] 8/23/96.

OC82SC1L

SPECIMEN ALLOY 825 HH4371FG SAME AS P 69

2 PTFE CRUICK WASHERS ATTACHED TO SPECIMEN
 WITH C276 NUT & BOLT TORQUED TO 40 IN-OZ

USING PROTO 6103

START WT: 39.28616 g

END WT: 39.28574 g

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}

10 PPM NO_3^- 2 PPM F^- 1000 mL OF SOLUTION

LISTED ON P 82

$T = 95^\circ\text{C}$ N_2 THERMOMETER 183305

START pH 8.206

POTENTIOSTAT ESC 440 #1 CHANNEL #6

REFERENCE FISHER SCG 13-620-S1 SN 3106337

COUNTER ELECTRODE Pt FLAG

E_{corr} -161 mV

E_{pt} +75 mV

E_{APPLIED} 0. C.

TEST STARTED 6/20/96 10:50 AM

TEST STOPPED 8/14/96 12:50 PM

RUNTIME 1371 hr

END pH 9.181

SOME MINOR CRUICK CORROSION ON
 MILL FINISHED SURFACE.

[Signature] 9/4/96

AS16CP04

OBJECTIVE MEASURE E_p & E_{RP}

SPECIMEN AS16 GRADE 60

0.250" DIA x 1.915" LONG

600 ORIT FINISH CAPS60 AREA 8.0cm²

START WT 10.83049g

END WT 10.78251g

SOLUTION 1 M Cl⁻ AS NaCl LOT 9514500.0087 M SO₄²⁻ AS Na₂SO₄ LOT 9012130.004 M CO₃²⁻ AS Na₂CO₃ LOT 9606850.008 M CO₃²⁻ AS NaHCO₃ LOT 923337A+ DI WATER TO 1000 mL DEGASSING W/99.999% N₂T = 95°C N₂ THERMOMETER

START pH 9.03

END pH 9.77

POTENTIOSTAT EG&G VERSASTAT SN 20104

w/ MODEL 352C SOFTWARE

REFERENCE FISHER SCE 13-620-S1 SN 4280310

COUNTER ELECTRODE Pt FLAG

 E_{CORR} -718 mV E_{RP} -428 mV

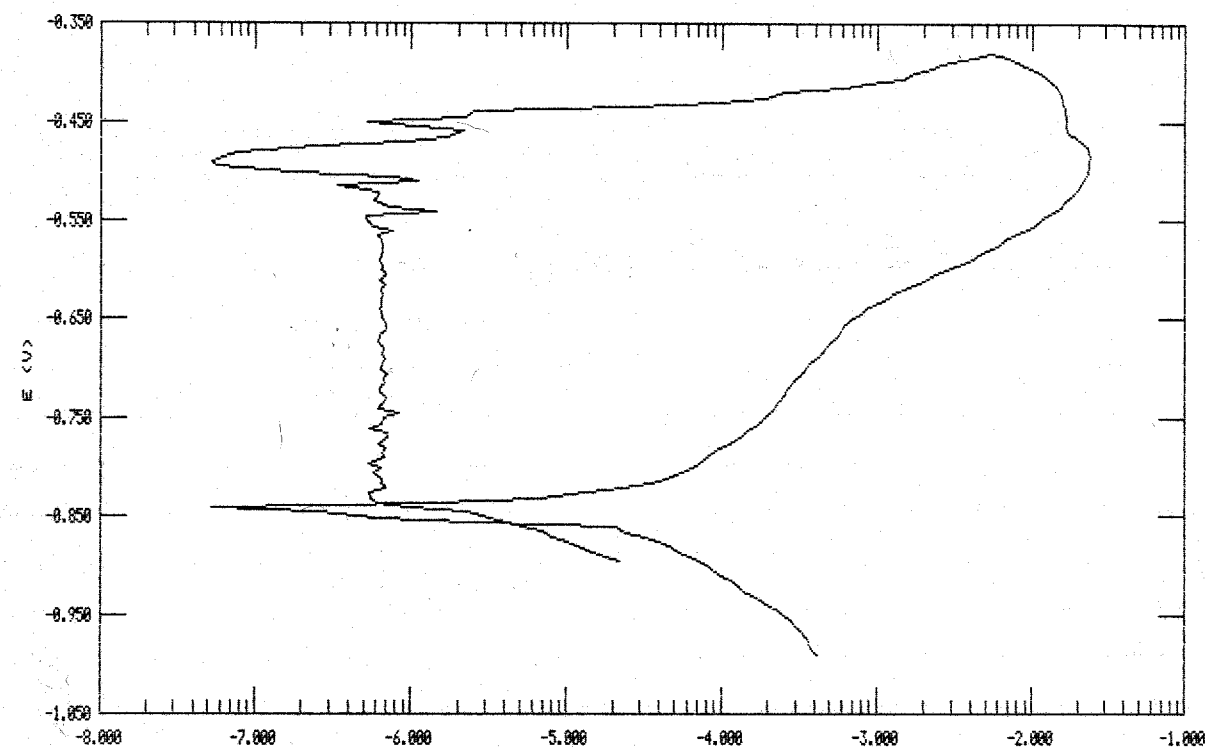
TEST STARTED 6/21/96

 E_p -451 mV E_{RP} -841 mV

SPECIMEN HAS LARGE AREAS OF CORROSION

WITH VERY SHALLOW PITS

Daniel D 6/21/96



Daniel D 6/21/96

Model 352/252 Corrosion Analysis Software, v. 2.01

Filename: B:\AS16cp04.dat

Pstat: VStat[] Ver 2

CP CYCLIC POLARIZATION

Date Run: 03-09-96

File Status: NORMAL

Time Run: 00:53:30

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm ²
				Final Pot.	FP	-0.3000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93
No. of Points	NP	226				s

Line Sync.	LS	yes	GI Time Const.	TC	Off
Rise Time	RT	high stability	IR Mode	IR	none
Working Elec.	WE	Solid	Filter	FL	Off
Sample Area	AR	8.000	Ref. Elec.	RE	SCE 0.2415 V
Density	DE	7.900	Equiv. Wt.	EW	0.0000 g
			Open Circuit	OC	-0.6960 V

Comment: AS16 grade 60 1 M Cl⁻ pH 9.00 95 C

Daniel D 6/21/96

A516CPOS

OBJECTIVE MEASURE E_p & E_{RP}

SPECIMEN A516 GRADE 60

0.250" DIA x 1.915" LONG

600 GRI FINISH EXPOSED AREA 8.0 cm²

START WT 10.89240g

END WT 10.86736g

SOLUTION 5 M Cl⁻ AS NaCl LOT 9514500.0007 M SO₄²⁻ AS Na₂SO₄ LOT 9012130.007 M CO₃²⁻ AS Na₂CO₃ LOT 9606850.004 M CO₃²⁻ AS NaHCO₃ LOT 923337A

+ DI WATER TO 1000 mL

DEAERATED w/ 99.999% N₂

T = 95°C Hg THERMOMETER 183304

START pH 9.007

END pH 9.107

POTENTIOSTAT EG&G VERSASTAT SN 20104

w/ MODEL 352C SOFTWARE

REFERENCE FISHER SCE 13-620-S1 SN 4280310

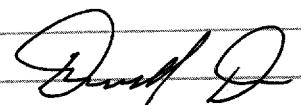
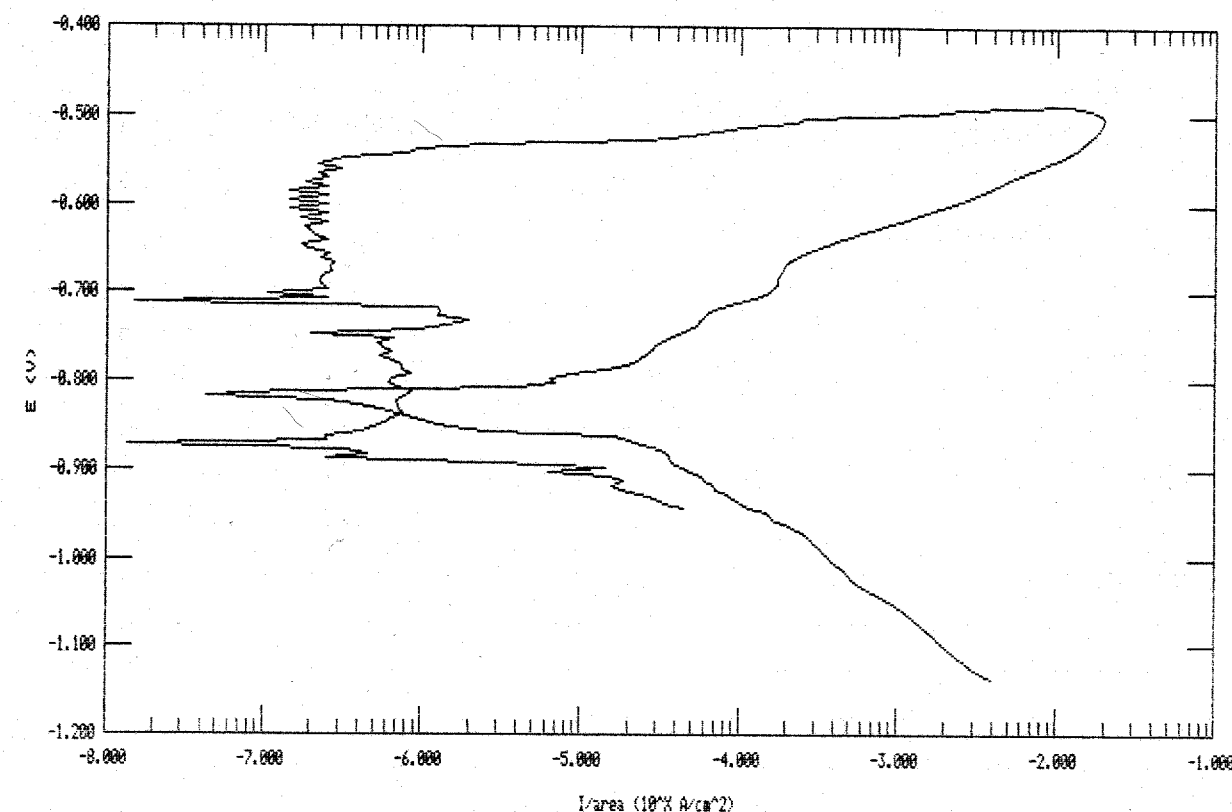
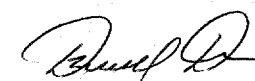
COUNTER ELECTRODE Pt FLAG

 E_{COR} - 737 mV KEITHLEY 614 SN 555388 E_{RP} - 116 mV

TEST STARTED 6/24/96

 E_p - 547 mV E_{RP} - 812 mV

LARGE AREAS OF CORROSION AND SHALLOW PITS

 6/25/96

 6/25/96

Model 352/252 Corrosion Analysis Software, v. 2.01

Filename: B1a516cp05.dat

Pstat: VStat() Ver 2

CP CYCLIC POLARIZATION

Date Run: 03-10-96

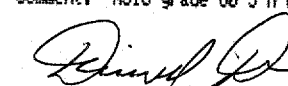
File Status: NORMAL

Time Run: 14:59:42

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm²
				Final Pot.	FP	-0.4000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto	
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93	s
No. of Points	NP	222					

Line Sync.	LS	yes		GI Time Const.	TC	Off	
Rise Time	RT	high stability		IR Mode	IR	none	
Working Elec.	WE	Solid		Filter	FL	Off	
Sample Area	AR	8.000	cm²	Ref. Elec.	RE	SCE 0.2415	V
Density	DE	7.900	g/ml	Equiv. Wt.	EW	0.0000	g
				Open Circuit	OC	-0.7420	V

Comment: A516 grade 60 5 M Cl⁻ pH 9.00 95 C
 6/25/96

A 516 CPDL

OBJECTIVE MEASURE E_p & E_{RP}

SPECIMEN A 516 GRADE 60

0.250" DIA x 1.915" LONG

600 GRIT FINISH EXPOSED AREA $\approx 8.0 \text{ cm}^2$

START WT 10.76562 g

END WT 10.73910 g

SOLUTION 0.03 M Cl^- AS NaCl LOT 9514500.0007 M SO_4^{2-} AS Na_2SO_4 LOT 9012130.001 M CO_3^{2-} AS Na_2CO_3 LOT 9606850.0105 M CO_3^{2-} AS NaHCO_3 LOT 923337A

+ DI WATER TO 1000 mL

DEAERATED W/ 99.999 % N_2 $T = 65^\circ\text{C}$ H_2 THERMOMETER 183304

START pH 9.080

END pH 9.606

POTENTIOSTAT EG&G LARSSTAT SN 20104

W/ MODEL 352C SOFTWARE.

REFERENCE FISHER SCE 13-620-51 SN 4280310

COUNTER ELECTRODE Pt FLAG

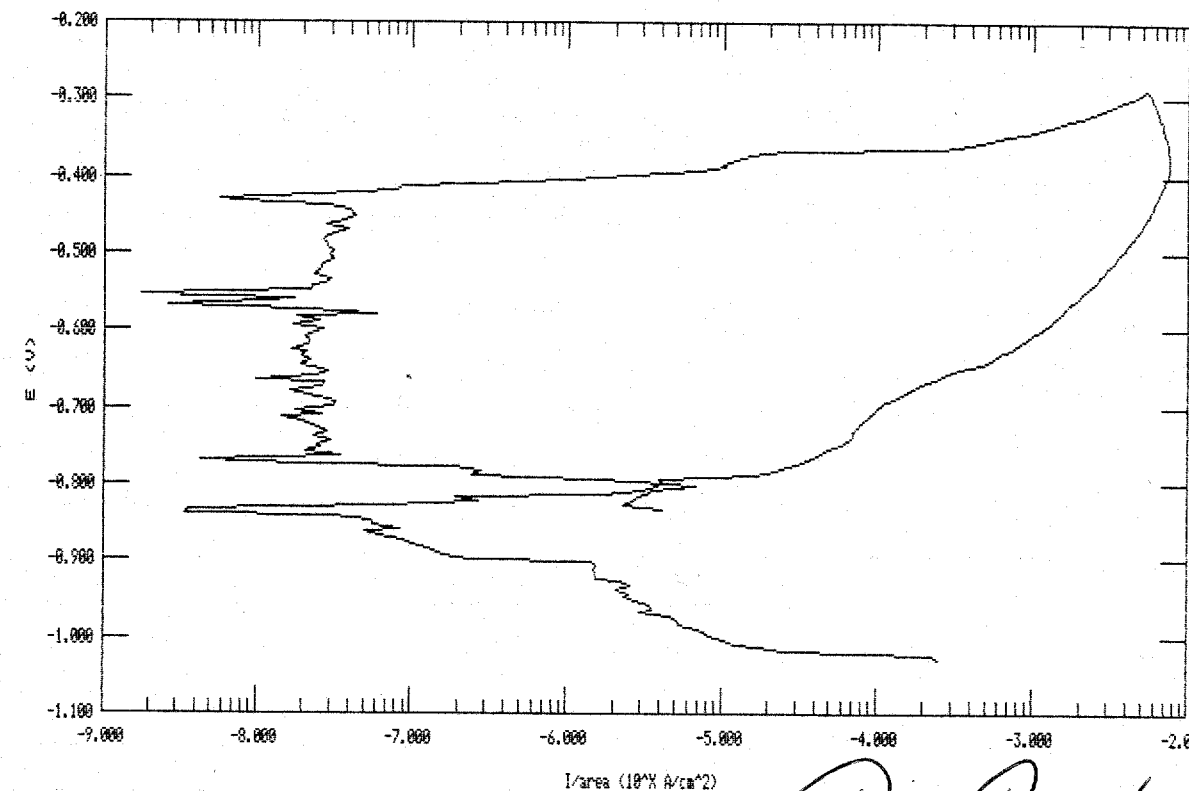
 $E_{\text{CEN}} -637 \text{ mV}$ RESTING 614 SN 555368 $E_{\text{PE}} +53 \text{ mV}$

TEST STARTED 6/26/96

 $E_p -423 \text{ mV}$ $E_{\text{RP}} -808 \text{ mV}$

LARGE AREAS OF CORROSION & SHALLOW PITS

6/26/96



6/26/96

Model 352/252 Corrosion Analysis Software, v. 2.01

Filename: B:\516cp06.dat

Pstat: VStatII Ver 2

CP CYCLIC POLARIZATION

Date Run: 03-12-96

File Status: NORMAL

Time Run: 10:23:37

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm ²
				Final Pot.	FP	-0.4000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93 s
No. of Points	NP	258				

Line Sync.	LS	yes	GI Time Const.	TC	Off
Rise Time	RT	high stability	IR Mode	IR	none
Working Elec.	WE	Solid	Filter	FL	Off
Sample Area	AR	8.000 cm ²	Ref. Elec.	RE	SCE 0.2415 V
Density	DE	7.900 g/ml	Equiv. Wt.	EW	0.0000 g
			Open Circuit	OC	-0.6330 V

Comment: A516 grade 60 0.03 M Cl- pH 9.00 65 C

6/26/96

A516 CP07

OBJECTIVE MEASURE E_p & E_{pp}

SPECIMEN A516 GRADE 60

0.250" x 1.915" 600 GRIT FINISH

EXPOSURE AREA = 8.0 cm²

START WT 10.43450g

END WT 10.40067g

SOLUTION 0.0003 M Cl⁻ AS NaCl LOT 9514500.0007 M SO₄²⁻ AS Na₂SO₄ EXT 992130.0105 M CO₃²⁻ AS NaHCO₃ LOT 923337A0.0005 M CO₃²⁻ AS Na₂CO₃ LOT 960685

+ DE WATER TO 1000 mL

DEAERATED w 99.999 % N₂T = 65°C N₂ THERMOSTATED 183304

START pH 9.003

END pH 9.767

POTENTIOSTAT EG&G LARSTAT SN 20104

w MODEL 352C SOFTWARE

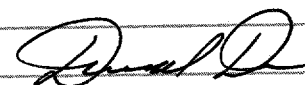
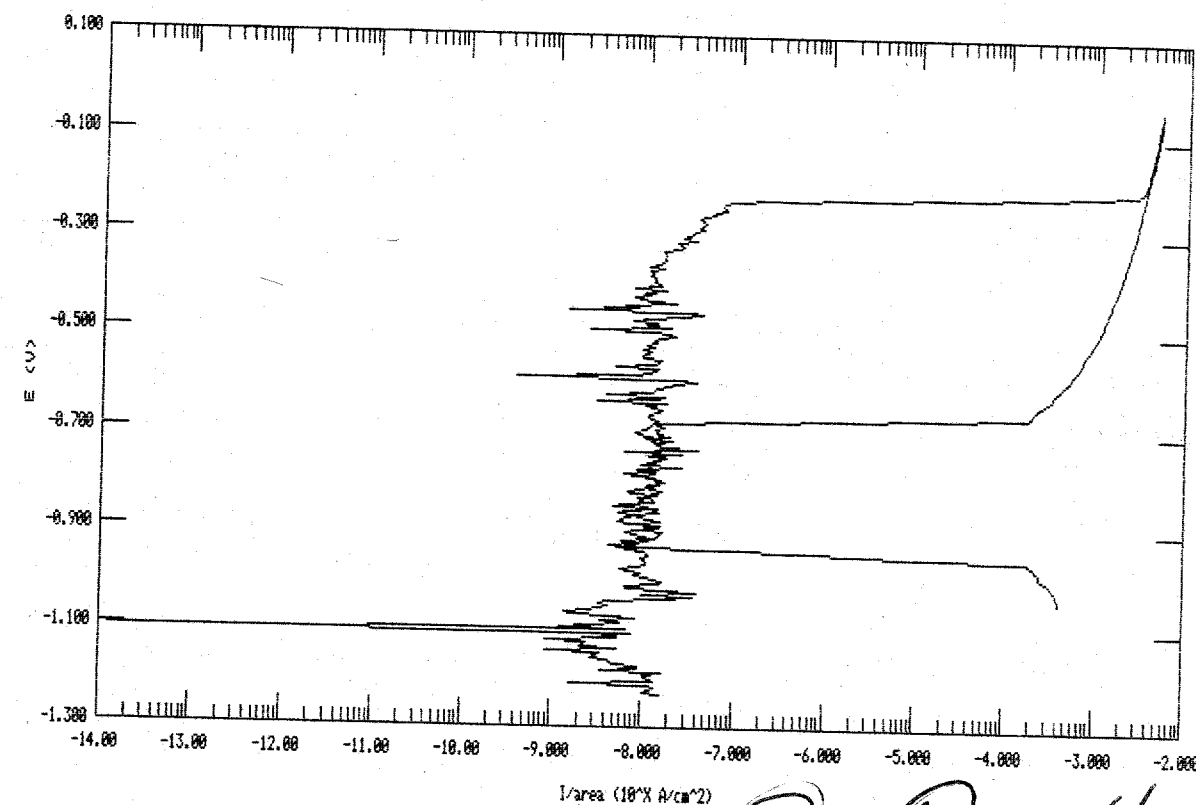
REFERENCE FISHER SC6 13-620-51 SN 4280310

COUNT ELECTRODE Pb FLAG

E_{corr} -852 KEITHLEY 614 SN 555368E_p -136 mV

TEST STARTED 6/27/96

LARGE AREAS OF ATTACK AND SHALLOW PITTING.

E_p = -235 mVE_{pp} = -685 mV
 6/28/96

 6/27/96

Model 352/252 Corrosion Analysis Software, v. 2.01

Filename: Bta516cp07.dat

Pstat: VStatII Ver 2

CP CYCLIC POLARIZATION

Date Run: 03-13-96

File Status: NORMAL

Time Run: 12:09:09

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm ²
				Final Pot.	FP	-0.4000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto	
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93	s
No. of Points	NP	440					

Line Sync.	LS	yes		GI Time Const.	TC	Off	
Rise Time	RT	high stability		IR Mode	IR	none	
Working Elec.	WE	Solid		Filter	FL	Off	
Sample Area	AR	8.000	cm ²	Ref. Elec.	RE	SCE 0.2415	V
Density	DE	7.900	g/ml	Equiv. Wt.	EW	0.0000	g
				Open Circuit	OC	-0.8400	V

Comment: A516 grade 60 0.0003 M Cl⁻ pH 9.00 65 C
 6/27/96

A 516 CP08

OBJECTIVE MEASUREMENT E_p & E_{RP}

SPECIMEN A 516 GRADE 60
 1.915" x 0.250" 600 GRIT FINISH
 EXPOSED AREA = 8.0 cm²
 START WT 10.65679 g
 END WT 10.63964 g

SOLUTION 1 M Cl⁻ AS NaCl LOT 951450
 0.0007 M SO₄²⁻ AS Na₂SO₄ LOT 901213
 0.004 M CO₃²⁻ AS Na₂CO₃ LOT 960685
 0.008 M CO₃²⁻ AS NaHCO₃ LOT 923337A
 + DI WATER TO 1000 mL
 DE AERATED w 99.999% N₂
 T = 65°C H₂ THERMOMETER 183304
 START pH 9.052
 END pH 9.347

POTENTIOSTAT GCG & G KUSA STAT SN 20104
 w/ MODEL 352C SOFTWARE

REFERENCE FISHER SC6 13-620-SI SN 4280310

COUNTER ELECTRODE pt FLOG

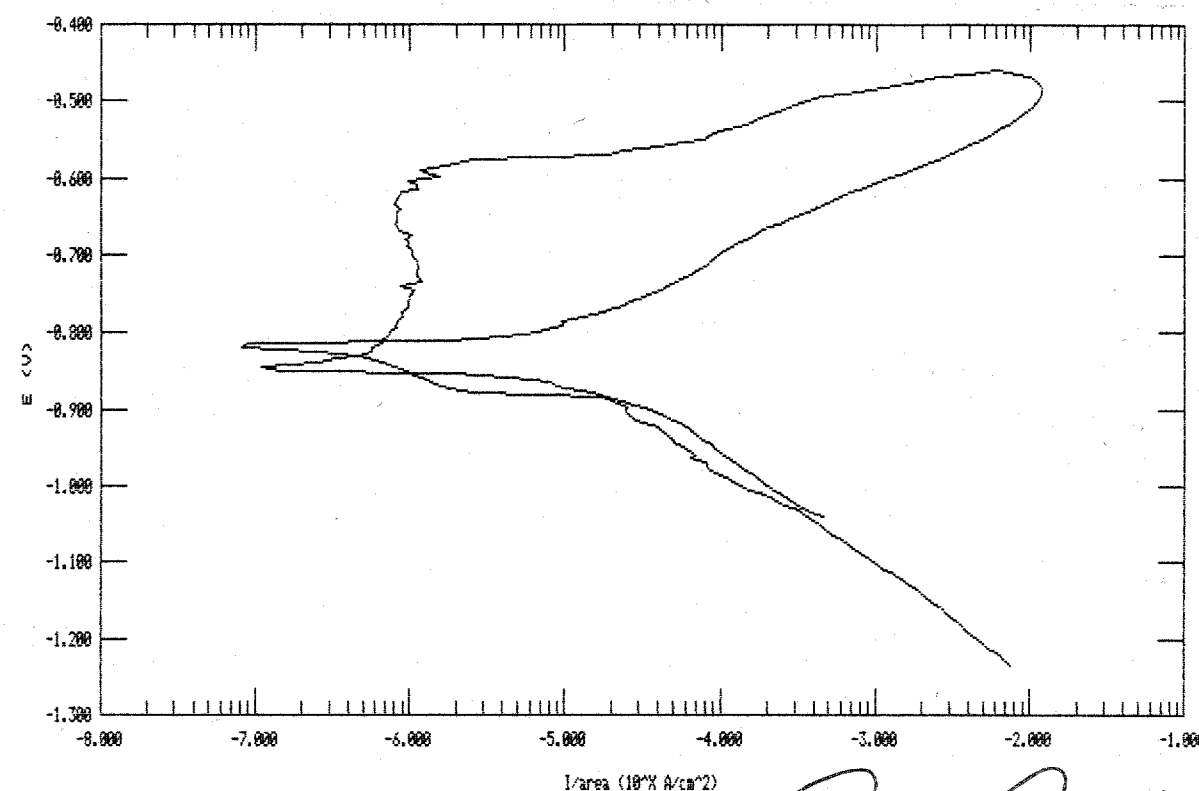
E_{CORR} -834 mV KEITNEL 614 SN 555368
 E_{PE} +34 mV

TEST STARTED 6/28/96

E_p -574 mV
 E_{RP} -814 mV

LARGE AREAS OF ATTACK AND SHALLOW PITTING

[Signature] 6/28/96



[Signature] 6/28/96

Model 352/252 Corrosion Analysis Software, v. 2.01

Filename: B:\a516cp08.dat

Pstat: VStat[] Ver 2

CP CYCLIC POLARIZATION

Date Run: 03-14-96

File Status: NORMAL

Time Run: 10:15:36

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm²
				Final Pot.	FP	-0.4000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93 s
No. of Points	NP	272				

Line Sync.	LS	yes	GI Time Const.	TC	Off
Rise Time	RT	high stability	IR Mode	IR	none
Working Elec.	WE	Solid	Filter	FL	Off
Sample Area	AR	8.000	Ref. Elec.	RE	SCE 0.2415 V
Density	DE	7.900	Equiv. Wt.	EW	0.0000 g
			Open Circuit	OC	-0.8390 V

Comment: A516 grade 60 1 M Cl⁻ pH 9.00 65 C

[Signature] 6/28/96

AS16 CP09

OBJECTIVE MEASUREMENT E_p & E_{pp}

SPECIMEN AS16 GRADE 60

1.915" x 0.250" 600 GRIT FINISH

EXPOSED AREA = 8.0 cm²

START WT 10.44679 g

END WT 10.41408 g

SOLUTION 5.0 M Cl⁻ AS NaCl LOT 9514500.0007 M SO₄²⁻ AS Na₂SO₄ LOT 9012130.007 M Na₂CO₃ LOT 9606850.004 M NaHCO₃ LOT 923337A

+ DI WATER TO 1000 mL

T = 65°C

START pH 9.00

END pH 9.121

POTENTIOSTAT EG&G VASASTAT SN 20104
w/ MODEL 352C SOFTWARE

REFERENCE FISHER SGS 13-620-S1 SN 4280310

COUNTER ELECTRODE Pt FLEM

 E_{CORR} -812 E_p +211

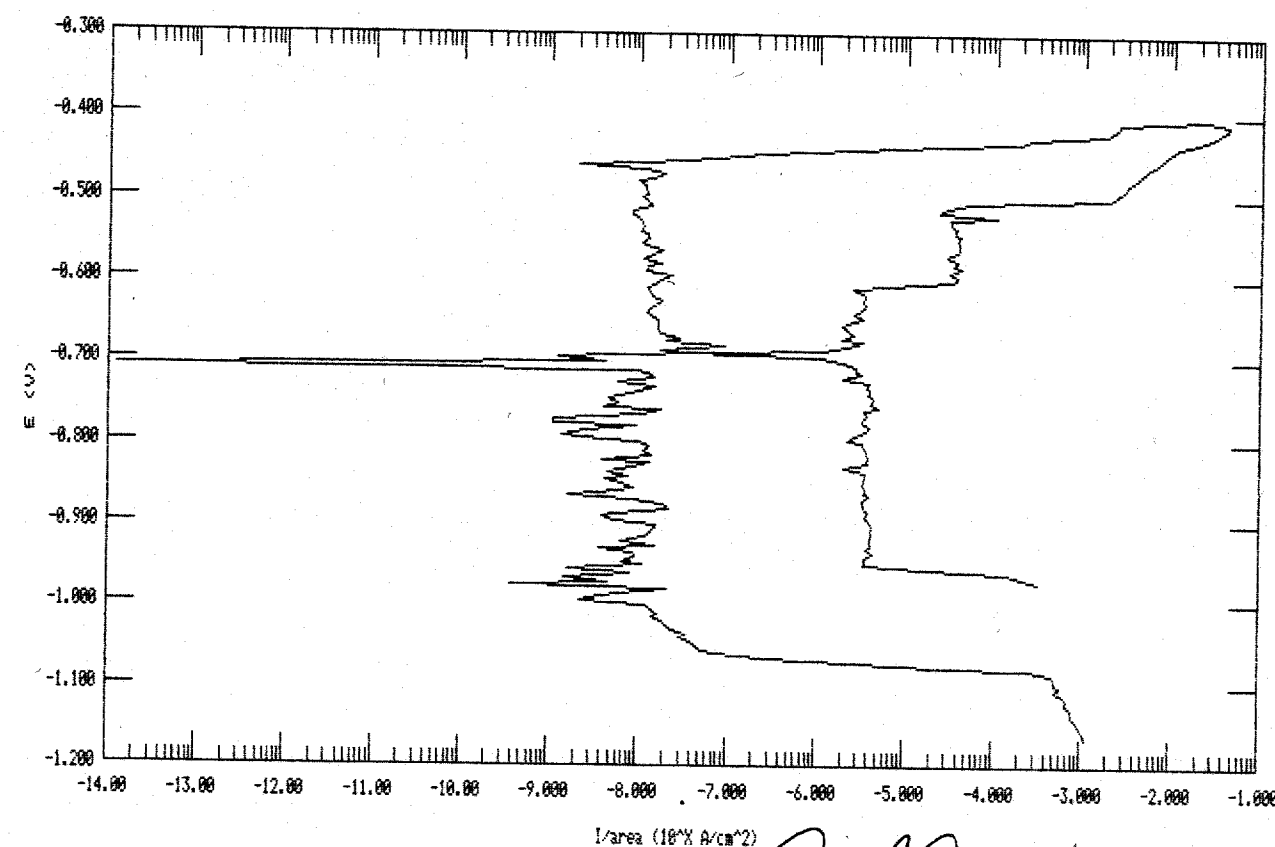
TEST STARTED 8/19/96

 E_p -462 E_{pp} -670

END pH 9.121

SOME SHALLOW PITS MAINLY GENERAL
DISSOLUTION.

8/20/96



8/20/96

Model 352/252 Corrosion Analysis Software, v. 2.01

Filename: B:a516cp09.dat

Pstat: VStat11 Ver 2

CP CYCLIC POLARIZATION

Date Run: 03-21-96

File Status: NORMAL

Time Run: 16:46:48

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm ²
				Final Pot.	FP	-0.4000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93 s
No. of Points	NP	268				

Line Sync.	LS	yes	GI Time Const.	TC	Off
Rise Time	RT	high stability	IR Mode	IR	none
Working Elec.	WE	Solid	Filter	FL	Off
Sample Area	AR	8.000	Ref. Elec.	RE	SCE 0.2415 V
Density	DE	7.900	Equiv. Wt.	EW	27.92 g
			Open Circuit	OC	-0.7720 V

Comment: a516g60 5 molar Cl pH 9 65 C 8/19/96

8/20/96

A516 CP10

OBJECTIVE MEASURE E_p & E_{RP}

SPECIMEN A516 GRADE 60
 1.915" x 0.250" 600 GRIT FINISH
 EXPOSED AREA 8.0 cm²
 START WT 10.21101 g
 END WT 10.07462 g

SOLUTION 0.0003 M Cl⁻ AS NaCl
 0.0007 M SO₄²⁻ AS Na₂SO₄
 0.0110 M NaHCO₃
 0.00025 M Na₂CO₃
 START pH 9.196
 END pH 9.410
 1000 mL TEST SOLUTION
 T = 22°C

POTENTIOSTAT EG&G VERASTAT SN 20104
 W/ MODEL 3526 SOFTWARE

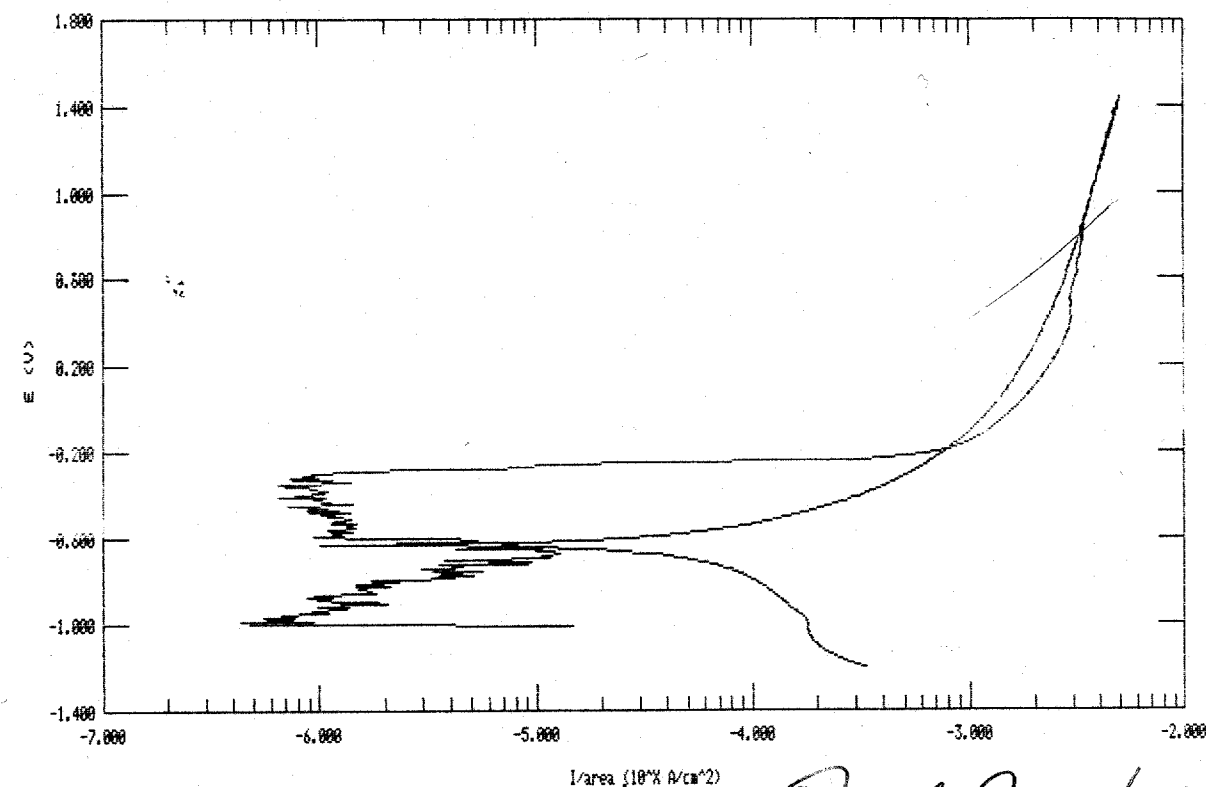
REFERENCE FISHER SC6 13-620-S1 SN
 COUNTER ELECTRODE Pt FINE
 SALT BRIDGE SOLUTION 1000 PPM Cl⁻ AS NaCl

E_{CORR} -775 mV
 E_{PT} +354
 TEST STARTED 8/28/96

E_p -298
 E_{RP} -633 mV

MANY SMALL PITS

[Signature] 8/30/96



[Signature] 8/30/96

Model 352/252 Corrosion Analysis Software, v. 2.01

Filename: B:\516cp18.dat

Pstat: VStat[] Ver 2

CP CYCLIC POLARIZATION

Date Run: 03-23-96

File Status: NORMAL

Time Run: 13:31:40

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm ²
				Final Pot.	FP	-0.4000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93 s
No. of Points	NP	1016				

Line Sync.	LS	yes	GI Time Const.	TC	Off
Rise Time	RT	high stability	IR Mode	IR	none
Working Elec.	WE	Solid	Filter	FL	Off
Sample Area	AR	8.000 cm ²	Ref. Elec.	RE	SCE 0.2415 V
Density	DE	7.900 g/ml	Equiv. Wt.	EW	0.0000 g
			Open Circuit	OC	-0.0030 V

Comment: A516 grade 60 0.0003 M Cl⁻ pH 9.00 22 C

8/30/96

[Signature] 8/30/96

~~A 516 CP11~~ ~~9/4/96~~ A 516 CP11

OBJECTIVE MEASURE E_p & E_{RP}

SPECIMEN A 516 GRADE 60
1.915 x 0.250" 600 GRIT FINISH
EXPOSED AREA 8.0 cm²
START WT 10.18989g
END WT 10.15644g

SOLUTION 0.03 M Cl⁻ AS NaCl LOT 951450
0.0007 M SO₄²⁻ AS Na₂SO₄ LOT 901213
0.0005 M CO₃²⁻ AS Na₂CO₃ LOT 960685
~~0.01 M CO₃²⁻ AS Na₂CO₃ LOT 960685~~
0.0115 M CO₃²⁻ AS NaHCO₃ LOT 923337A
START pH 9.152
END pH 9.639
1000 mL OF TEST SOLUTION
T = 22°C

POTENTIOSTAT EG&G VERSASTAT SN 20104
w/ MODEL 352c SOFTWARE

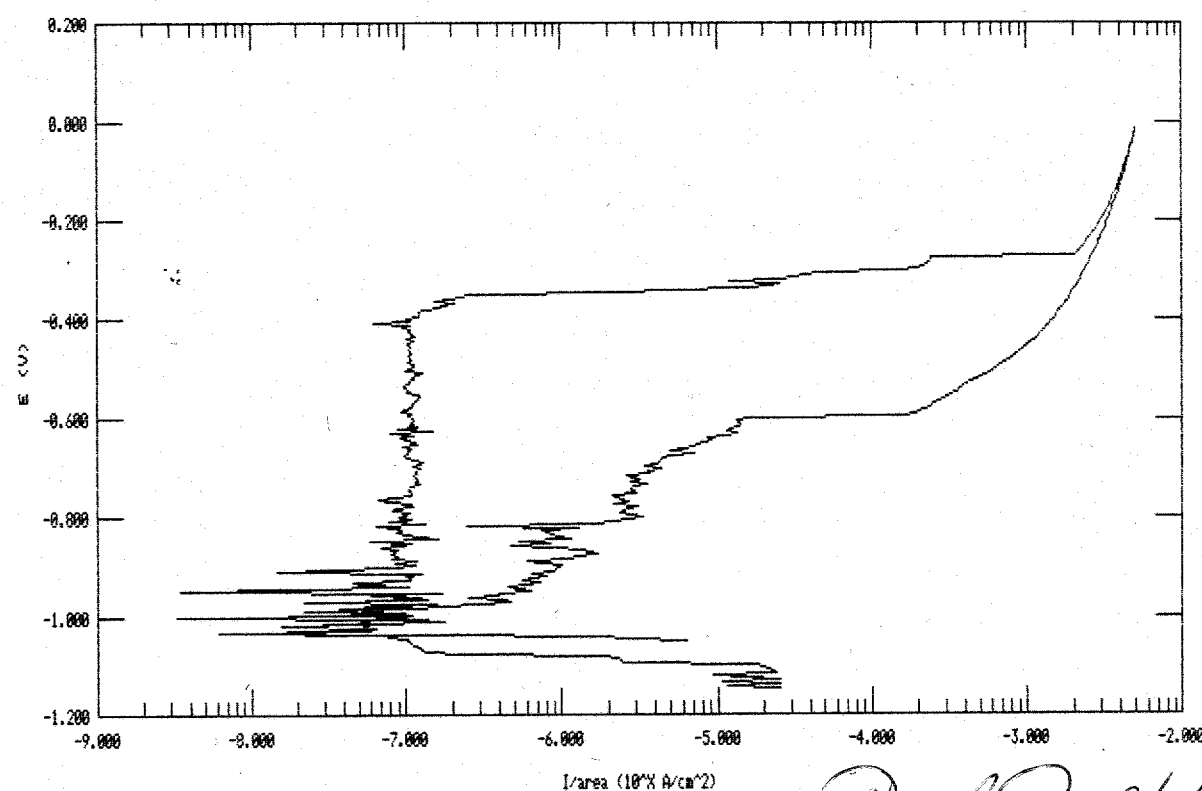
REFERENCE FISHER SCE 13-620-S1 SN 4280310
COUNTER ELECTRODE Pt FLAG
SALT BRIDGE SOLUTION 1000 PPM Cl⁻ AS NaCl

E_{corr} - 815 mV KEITHLEY 617 SN 537418
 E_{pt} + 360 mV
TEST STARTED 9/4/96

E_p - 367 mV
 E_{RP} - 817 mV

SPECIMEN HAS LARGE AREA OF SMALL PITS

David D 9/5/96



David D 9/5/96

Model 352/252 Corrosion Analysis Software, v. 2.01

Filename: Bta516cp11.dat

Pstat: VStat[] Ver 2

CP CYCLIC POLARIZATION

Date Run: 03-27-96

File Status: NORMAL

Time Run: 15:37:34

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm²
				Final Pot.	FP	-0.3000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93
No. of Points	NP	434				

Line Sync.	LS	yes	GI Time Const.	TC	Off
Rise Time	RT	high stability	IR Mode	IR	none
Working Elec.	WE	Solid	Filter	FL	Off
Sample Area	AR	8.000	Ref. Elec.	RE	SCE 0.2415 V
Density	DE	7.900	Equiv. Mt.	EM	0.0000 g
			Open Circuit	OC	-0.8520 V

Comment: A516 grade 60 0.03 M Cl⁻ pH 9.00 25 C

David D 9/5/96

A516CP12

OBJECTIVE MEASURE E_p & E_{pp}

SPECIMEN A516 GRADE 60
 1.915" x 0.250" 600 GRIT FINISH
 AREA = 8.0 cm²
 START WT 10.28207
 END WT 10.24390

SOLUTION 1 M Cl⁻ AS NaCl LOT 951436
 0.0007 M SO₄²⁻ AS Na₂SO₄ LOT 901213
 0.0025 M CO₃²⁻ AS Na₂CO₃ LOT 960685
 0.0075 M CO₃²⁻ AS NaHCO₃ LOT 923337A
 1000 mL OF TEST SOLUTION
 START pH 9.000
 END pH 9.363
 T = 22°C

POTENTIOSTAT GGC VERSASTAT SN 20104
 w/ MODEL 352c SOFTWARE

REFERENCE FISHER SCE 13-620-S1 SN 4280316

COUNTER ELECTRODE Pt FLAG

SALT BRIDGE SOLUTION 1 M Cl⁻

E_{corr} - 802

E_p + 342

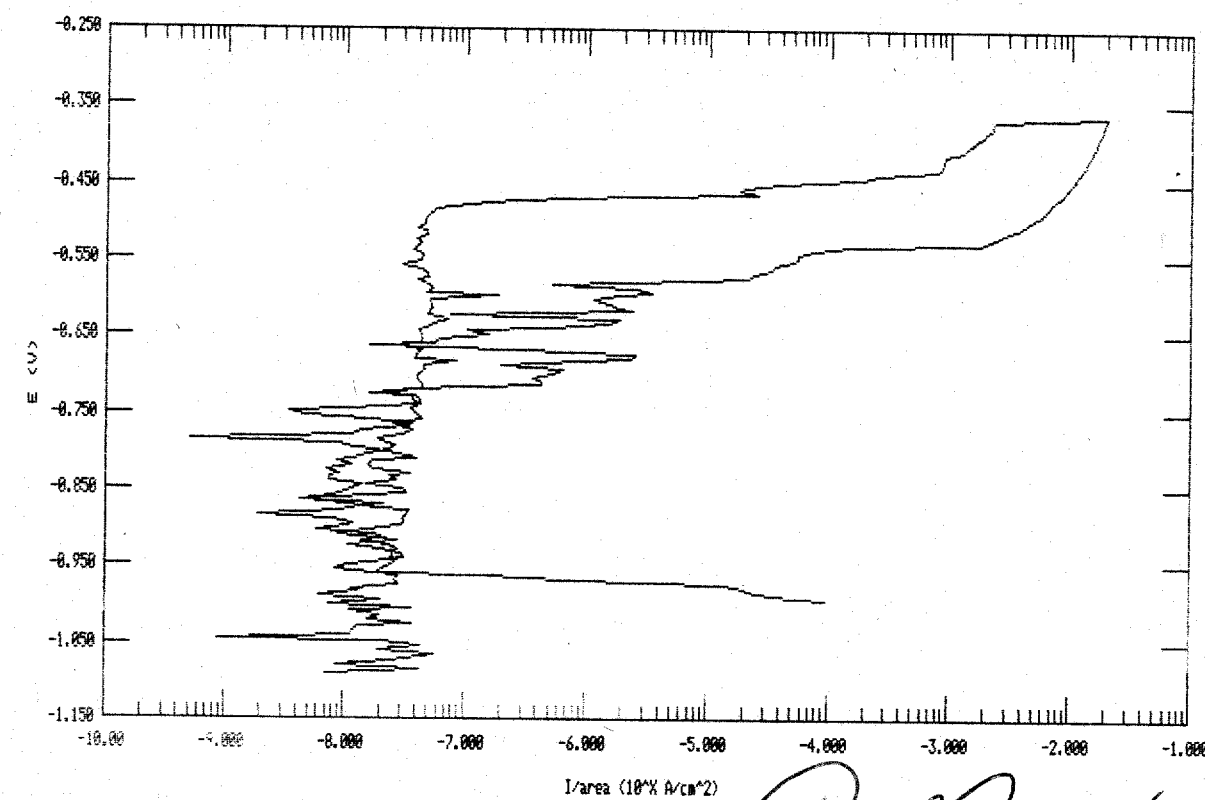
TEST STARTED. 9/5/96

E_p - 484 mV

E_{pp} - 719 mV

SOME SMALL PITS AND UNIFORM CORROSION

[Signature] 9/6/96



[Signature] 9/6/96

Model 352/252 Corrosion Analysis Software, v. 2.01

Filename: B:\a516cp12.dat

Pstat: VStat[1] Ver 2

CP CYCLIC POLARIZATION

Date Run: 03-28-96

File Status: NORMAL

Time Run: 14:45:53

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	28	s	I Threshold	IT	5.000E-3	A/cm ²
				Final Pot.	FP	-0.3000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto	
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93	s
No. of Points	NP	272					

Line Sync.	LS	yes		GI Time Const.	TC	Off	
Rise Time	RT	high stability		IR Mode	IR	none	
Working Elec.	WE	Solid		Filter	FL	Off	
Sample Area	AR	8.000	cm ²	Ref. Elec.	RE	SCE 0.2415	V
Density	DE	7.900	g/ml	Equiv. Wt.	EW	0.0000	g
				Open Circuit	OC	-0.7940	V

Comment: A516 grade 60 1 M Cl⁻ pH 9.00 25 C

[Signature] 9/6/96

L825P2AA

SPECIMEN ALLOY 825 HH4371FG SAME AS p78

START WT 30.82097g

END WT 30.82077g

SOLUTION 1000 PPM Cl^- 85PPM HCO_3^- 20PPM SO_4^{2-}
 10PPM NO_3^- 2PPM F^- 2000 mL MAKE
 AS FOLLOWS

3.30067g NaCl LOT 951450

0.23790g NaHCO_3 LOT 923337A40 mL SO_4^{2-} 8/96 STOCK SOLUTION p10820 mL NO_3^- 8/96 "4 mL F^- 8/96 "

+ DI WATER TO 2000 mL

T=95°C Hg THERMOMETER 0323004

START pH 8.109

POTENTIOSTAT ESC 440 #1 CHANNEL #1

DATA SAVED AS L825P2AA.DAT 9/8/96

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHER SC6 13-620-51 SN 8211163

E_{CORR} -110mV KEITNEY 614 SN 555368E_{PT} +130mV "E_{APPLIED} 0mV "

TEST STARTED 9/9/96

TEST STOPPED 11/4/96

RUNTIME 1344 HOURS OR 56 DAYS

END pH 9.140

EN

NO SIGN OF LOCALIZED CORROSION DURING THIS
 TEST SEGMENT

Dennis D 11/5/96

L825P7R

SPECIMEN ALLOT 825 HH4371FG SAME AS p79

START WT 30.30797

END WT 30.30788g

SOLUTION 1000 PPM Cl^- 85PPM HCO_3^- 20PPM SO_4^{2-}
 10 PPM NO_3^- 2PPM F^- 2000 mL MAKE
 AS FOLLOWS

3.29969g NaCl LOT 951450

0.24231g NaHCO_3 LOT 923337A40 mL SO_4^{2-} 8/96 STOCK SOLUTION p10820 mL NO_3^- 8/96 "4 mL F^- 8/96 "

+ DI WATER TO 2000 mL

T=95°C Hg THERMOMETER 0323008

START pH 8.452

POTENTIOSTAT ESC 440 #1 CHANNEL #2

DATA SAVED AS L825P7R.DAT

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHER SC6 13-620-51 SN 9214083

E_{CORR} -99mV KEITNEY 614 SN 555368E_{PT} +141mV "E_{APPLIED} 200 "

TEST STARTED 9/9/96

TEST STOPPED 11/4/96

RUNTIME 1344 HOURS OR 56 DAYS

END pH 9.084

NO SIGN OF LOCALIZED CORROSION DURING
 THIS TEST SEGMENT

Dennis D 11/5/96

LT82SP8R

SPECIMEN ALLOY 82S HN4371FG SAME AS p80
 START WT ~~31.85358~~ 20 9/1/96 31.85358g
 END WT 31.85340g
 SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
 10 PPM NO_3^- 2 PPM F⁻ 2000 mL MARK
 AS FOLLOWS

3.29973g NaCl LOT 951450
 0.24764g NaHCO_3 LOT 923337A
 40 mL SO_4 - 8/96 STOCK SOLUTION P108
 20 mL NO_3 - 8/96 "
 4 mL F⁻ - 8/96 "

+ DI WATER TO 2000 mL

1000 mL USED IN THIS TEST

T = 95°C H_2 THERMOMETER 183304

START pH 8.207

POTENTIOSTAT ESC 440 CHANNEL #3
 DATA SAVER AS LT82SP8R.DAT

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHER SCE 13-620-S1 SN 9214074

E_{CORR} -106 mV E_{REF} 614 SN 555368

E_{PE} +133 mV "

E_{APPLIED} 100 mV "

TEST STARTED 9/9/96

TEST STOPPED 11/4/96

RUNTIME 1344 HOURS OR 56 DAYS

END pH 9.130

NO SIGN OF LOCALIZED CORROSION DURING
 THIS TEST SEGMENT

Paul D 11/5/96

LT82SP4R

SPECIMEN ALLOY 82S HN4371FG SAME AS p81

START WT 38.95248g

END WT 38.95235g

2 PTFE CRUICK BLOCKS ATTACHED TO SPECIMEN
 USING C276 NUT AND BOLT TORQUED TO
 40 IN.OZ WITH PROTO 6103

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
 10 PPM NO_3^- 2 PPM F⁻

1000 mL OF SOLUTION ON p 104

T = 95°C H_2 THERMOMETER 183305

START pH 8.207

POTENTIOSTAT ESC 440 CHANNEL #4

DATA SAVER AS LT82SP4R.DAT

COUNTER ELECTRODE GRAPHITE ROD

REFERENCE FISHER SCE 13-620-S1 SN 3106337

E_{CORR} -60 mV E_{REF} 614 SN 555369

E_{PE} +18 mV "

E_{APPLIED} 0 mV "

TEST STARTED 9/9/96

TEST STOPPED 11/4/96

RUNTIME 56 DAYS OR 1344 HOURS

END pH 8.944

NO SIGN OF LOCALIZED ATTACK DURING THIS
 TEST SEGMENT

Paul D 11/5/96

LT82SP5R

SPECIMEN ALLOY 825 NH4371FC SAME AS P82

START WT 39.08630g

END WT 39.08609g

2 PTFE CREVICE WASHERS ATTACHED TO SPECIMEN
USING C276 NUT & BOLT TORQUED TO

40 IN.OZ USING PROTO 6103

SOLUTION 1000 PPM Cl^- 85PPM HCO_3^- 20PPM SO_4^{2-}
10PPM NO_3^- 2PPM F^- 2000ML MADE AS FOLLOWS

3.29861g NaCl LOT 951450

0.24244g NaHCO_3 LOT 923337A40 mL SO_4^{2-} 8/96 STOCK SOLUTION P10820 mL NO_3^- 8/96 "4 mL F^- 8/96 "

+ DI WATER TO 2000 mL

1000 mL SOLUTION USED IN THIS TEST

T=95°C Hg THERMOMETER 183302

START pH 7.970

POTENTIOSTAT ESC 440 #1 CHANNEL #5

DATA SAVED AS LT82SP5R.DAT

COUNTER ELECTRODE GRAPHITE ROD

REFERENCE FISHER SCG 13-620-S1 SN 310C343

Ecorr -80mV KETTLER 614 SN 555368

Ept +9mV "

Eapplied -100mV "

TEST STARTED 9/9/96

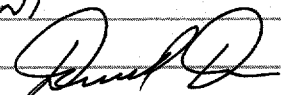
TEST STOPPED 11/4/96

RUNTIME 56 DAYS OR 1344 HOURS

END pH 8.984

NO SIGN OF LOCALIZED ATTACK DURING THIS

TEST SEGMENT

 11/5/96

OC82SC1M

SPECIMEN ALLOY 825 NH4371FC SAME AS P83

START WT 39.28574

END WT 39.28566

2 PTFE CREVICE WASHERS ATTACHED TO SPECIMEN
USING C276 NUT & BOLT TORQUED TO

40 IN.OZ USING PROTO 6103

SOLUTION 1000 PPM Cl^- 85PPM HCO_3^- 20PPM SO_4^{2-}
10 PPM NO_3^- 2PPM F^-

1000 mL SOLUTION ON P 106

T=95°C Hg THERMOMETER 183303

START pH 7.970

POTENTIOSTAT ESC 440 #1 CHANNEL #6

DATA SAVED AS OC82SC1M.DAT

COUNTER ELECTRODE Pt FLNG

REFERENCE FISHER SCG 13-620-S1 SN 2134032

Ecorr -169mV KETTLER 614 SN 555368

Ept +108mV "

Eapplied O.C. "

TEST STARTED 9/9/96

TEST STOPPED 11/4/96

RUNTIME 1344 HOURS OR 56 DAYS

END pH 9.063

CORROSION UNDER 1 PTFE CREVICE WASHER TOOTH. CORROSION
DEPTH WAS MAXIMUM OF 45 MICRONS. 11/5/96

STOCK SOLUTIONS 8/96

NO_3^- - 8/96 1000 ppm NO_3^- AS NaNO_3
 1.37210 g NaNO_3 LOT 897183 +
 DI WATER TO 1000 mL Exp 9/15/96

SO_4^- - 8/96 1000 ppm SO_4^- AS Na_2SO_4
 1.47027 g Na_2SO_4 LOT 901213 +
 DI WATER TO 1000 mL Exp 9/15/96

F⁻ - 8/96 1000 ppm F⁻ AS NaF
 2.21503 g NaF LOT 896405 +
 DI WATER TO 1000 mL Exp 9/15/96

Shel D
 8/15/96

A 516 CP13

OBJECTIVE MEASURE E_p & E_{Rp}

SPECIMEN A 516 GRADE 60
 1.915" x 0.250" 600 GRIT FINISH
 AREA 8.0 cm²
 START WT 10.57237 g
 END WT 10.51157 g

SOLUTION 5 M Cl^- AS NaCl LOT 951450
 0.0007 M SO_4^{2-} AS Na_2SO_4 LOT 901213
 0.007 M Na_2CO_3 LOT 960685
 0.0045 M NaHCO_3 LOT 923337A
 1000 mL OK TEST SOLUTION
 START pH 8.995
 END pH 9.189
 T = 22 °C

POTENTIOSTAT EG&G URSASTAT 8N 20104
 W MODEL 352C SOFTWARE

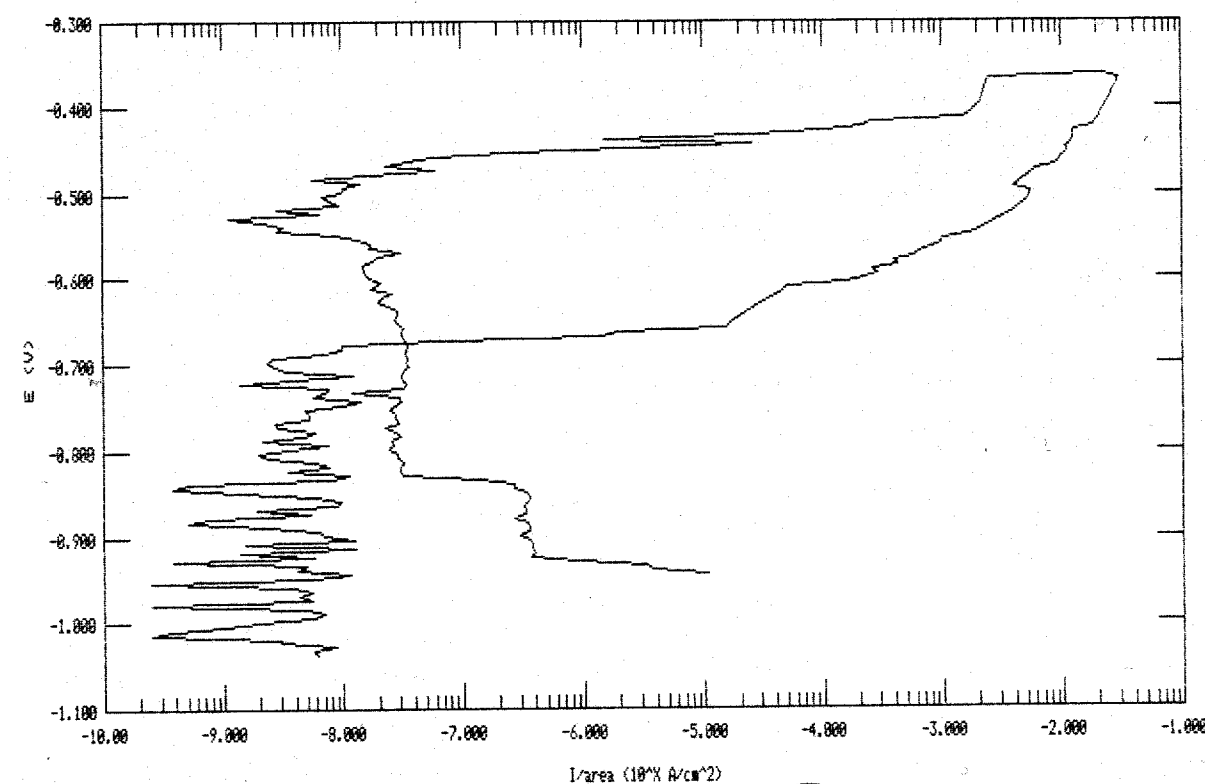
REFERENCE FISHER SCE 13-620-S1 SN 4280310
 COUNTER ELECTRODE Pt FLAG
 SALT BRIDGE SOLUTION 5 M Cl^-

E_{corr} -704 mV
 E_{pk} +423 mV
 TEST STARTED 9/9/96

E_p -468 mV
 E_{Rp} -678 mV

MAINLY UNIFORM CORROSION SOME SMALL
 PITS

Shel D 9/13/96



9/13/96

Model 352/252 Corrosion Analysis Software, v. 2.01

Filename: Bta516cp13.dat

Pstat: VStatII Ver 2

CP CYCLIC POLARIZATION

Date Run: 03-30-96

File Status: NORMAL

Time Run: 15:34:24

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm²
				Final Pot.	FP	-0.3000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93 s
No. of Points	NP	252				

Line Sync.	LS	yes		GI Time Const.	TC	Off
Rise Time	RT	high stability		IR Mode	IR	none
Working Elec.	WE	Solid		Filter	FL	Off
Sample Area	AR	8.000	cm²	Ref. Elec.	RE	SCE 0.2415 V
Density	DE	7.900	g/ml	Equiv. Wt.	EW	0.0000 g
				Open Circuit	OC	-0.7430 V

Comment: A516 grade 60 5 M Cl- pH 9.00 25 C

9/13/96

A516CP14

OBJECTIVE measure E_p & E_{CP}

SPECIMEN A516 GRADE 60
1.915" x 0.250" 600 GRIT FINISH
AREA 8.0 cm²
START WT 10.57036
END WT 10.56964g

SOLUTION 0.0003 M Cl^- AS $NaCl$ LOT 951450
0.0007 M SO_4^{2-} AS Na_2SO_4 LOT 901213
0.012 M Na_2CO_3 LOT 960685
4 mL 0.1 M $NaOH$ LOT 883164
+ DI WATER TO 1000 mL
START pH 11.00
END pH 11.03
T = 95°C N_2 TRANSMITTER C96 742

POTENTIOSTAT EG&G VERSASTAT SN 20104
w/ MODEL 352C SOFTWARE

SOLUTION DEAERATED w/ 99.999% N_2
REFERENCE FISHER SCE 13-620-SI SN 4280310
COUNTER ELECTRODE Pt FLAG

SALT BRIDGE SOLUTION 1000 PPM Cl^- AS $NaCl$

E_{corr} -897 mV KEITHLEY 617 SN 537419

E_{PE} -414 mV

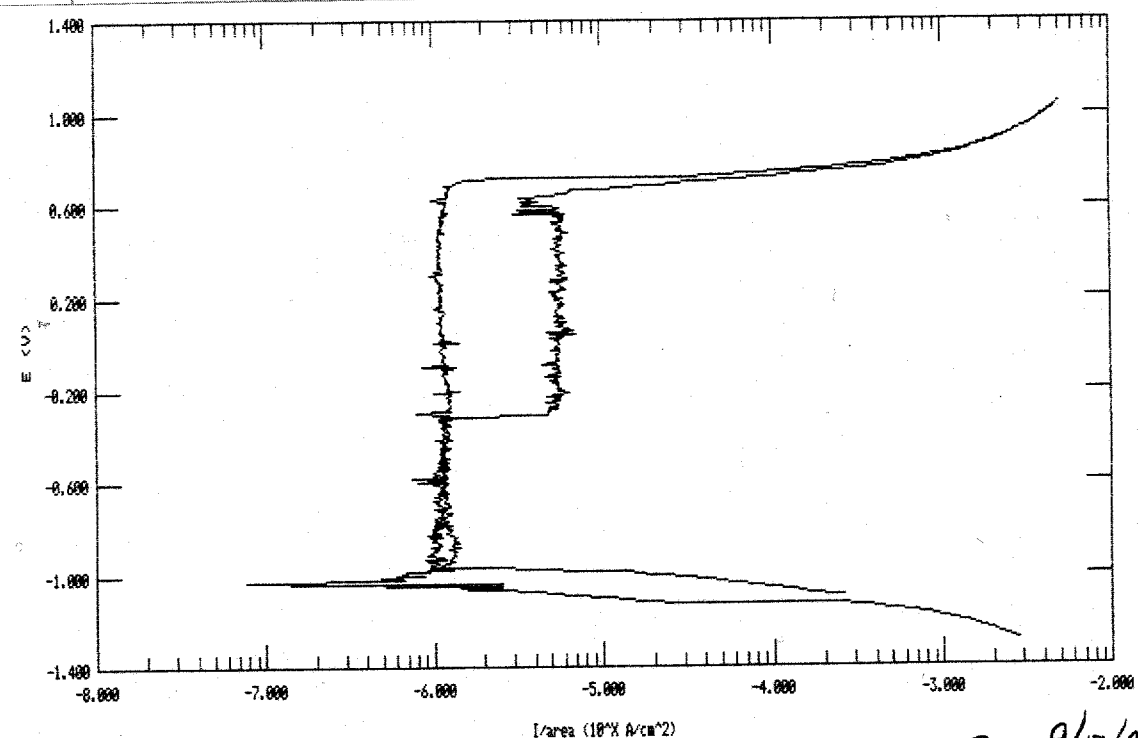
TEST STARTED 9/17/96

E_p 701 mV

E_{CP} -314 mV

SPECIMEN DISCOLORED A FEW SMALL PITS
VISIBLE.

9/18/96



9/18/96

Model 352/252 Corrosion Analysis Software, v. 2.01

Filename: B1a516cp14.dat

Pstat: VStat[] Ver 2

CP CYCLIC POLARIZATION

Date Run: 04-01-96

File Status: NORMAL

Time Run: 13:06:45

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm²
				Final Pot.	FP	-0.4000	V oc
Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto	
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93	s
No. of Points	NP	894					
Line Sync.	LS	yes		GI Time Const.	TC	Off	
Rise Time	RT	high stability		IR Mode	IR	none	
Working Elec.	WE	Solid		Filter	FL	Off	
Sample Area	AR	8.000	cm²	Ref. Elec.	RE	SCE 0.2415	V
Density	DE	7.900	g/ml	Equiv. Wt.	EW	27.92	g
				Open Circuit	OC	-0.8940	V

Comment: A516 grade 60 0.0083 M Cl- pH 11.00 95 C

9/18/96

A516CP15

OBJECTIVE MEASURE E_p & E_{RP}

SPECIMEN A516 GRADE 60
1.915" x 0.250" 600 GRIT FINISH
AREA = 8.0 cm²
START WT 10.59002 g
END WT 10.53542 g

SOLUTION 0.03 M Cl⁻ AS NaCl LOT 951430
0.0007 M SO₄²⁻ AS Na₂SO₄ LOT 901213
0.012 M Na₂CO₃ LOT 960685
7 mL 0.1M NaOH LOT 883164
PH 11.01
END PH 10.71
1000 mL TEST SOLUTION
T = 95°C N₂ THERMOMETER C96 742
DEAERATED w/ 99.999% N₂

POTENTIOSTAT EG&G VSGASTAT SN 20104
w/ MODEL 352C SOFTWARE

REFERENCE FISHER 13-620-S1 SN 428031D
COUNTER ELECTRODE Pt FLAG

SALT BRIDGE SOLUTION 1000 ppm Cl⁻ AS NaCl

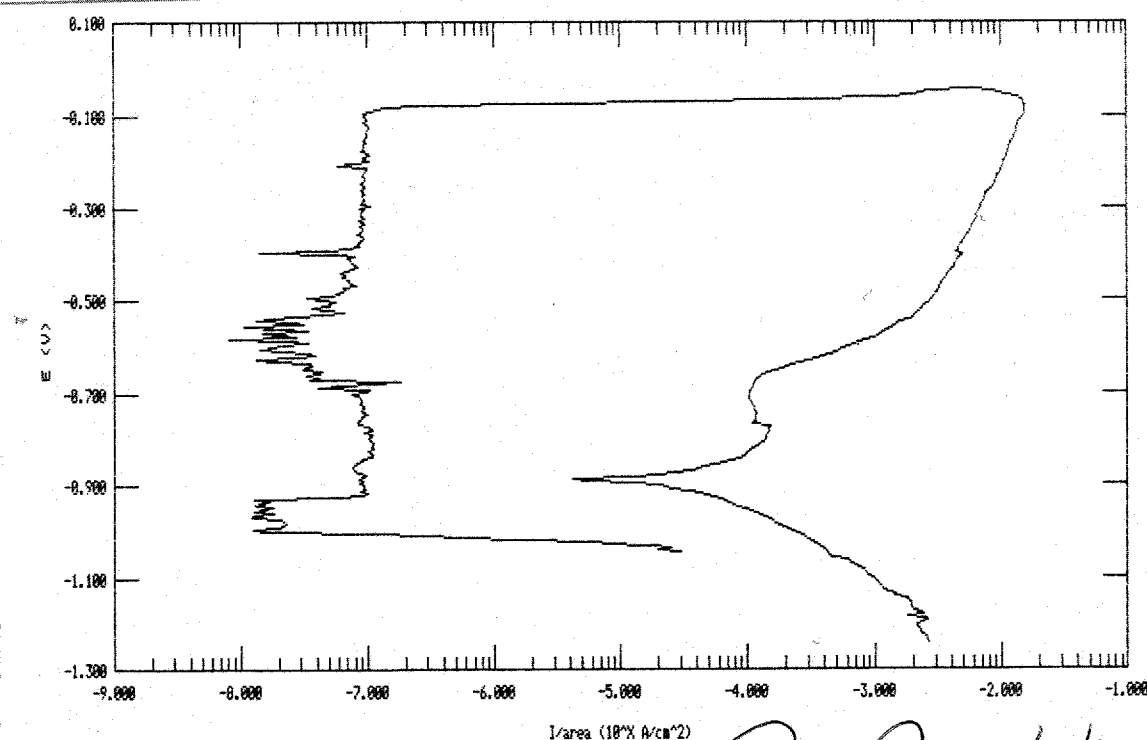
E_{corr} -803 mV REITAL61 617 SN 537418
 E_{RP} -112 mV "

TEST STARTED 9/18/96

E_p -96 mV
 E_{RP} -886 mV

MANY SMALL PITS AND AREAS OF UNIFORM
ATTACK.

9/19/96



I/area (10% A/cm²)

D.D. 9/19/96

Model 352/252 Corrosion Analysis Software, v. 2.01
 Filename: B1a516cp15.dat
 Pstat: VStat[] Ver 2
 CP CYCLIC POLARIZATION
 Date Run: 04-02-96

File Status: NORMAL
 Time Run: 13:35:13

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	VI	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm²
				Final Pot.	FP	-0.4000	V oc

Scan Rate	SR	0.1678	mV/s	Curr. Range	CR	Auto
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93 s
No. of Points	NP	440				

Line Sync.	LS	yes		GI Time Const.	TC	Off
Rise Time	RT	high stability		IR Mode	IR	none
Working Elec.	WE	Solid		Filter	FL	Off
Sample Area	AR	8.000	cm²	Ref. Elec.	RE	SCE 0.2415 V
Density	DE	7.900	g/ml	Equiv. Wt.	EW	27.92 g
				Open Circuit	OC	-0.8460 V

Comment: A516 grade 60 0.03 M Cl- pH 11.00 95 C

D.D. 9/19/96

A 516 CP16

OBJECTIVE MEASURE EP & Epp

SPECIMEN A 516 GRADE 60
 1.915" x 0.250"
 AREA = 8.0 cm²
 START WT 10.60413 g
 END WT 10.43811 g

SOLUTION 1.0 M Cl⁻ AS NaCl LOT 951456
 0.0007 M SO₄²⁻ AS Na₂SO₄ LOT 901213
 0.012 M Na₂CO₃ LOT 960685
 2.75 mL 1.0 M NaOH LOT 883164
 START pH 11.00
 END pH 10.32
 1000 mL TEST SOLUTION
 T = 95°C N₂ THERMOSTAT
 DE AERATED w/ 99.999% N₂

REFERENCE FISHER SCE 13-620-S1 SN 4280310
 COUNTER ELECTRODE Pt FLAG

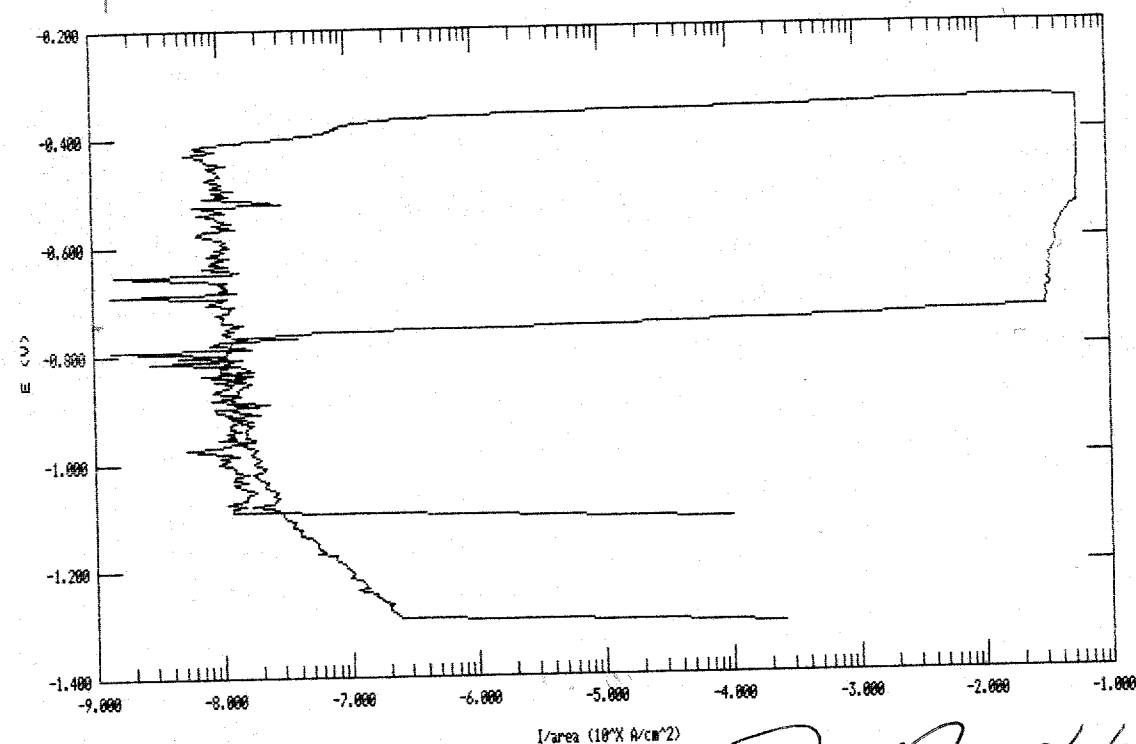
SALT BRIDGE SOLUTION, SAME AS TEST SOLUTION

Ecorr = -863 mV KEITHLEY 617 SN S37418

Epc = -121 mV
TEST STARTED. 9/19/96Ep = -414 mV
Epp = -769 mV

LARGE AREAS OF UNIFORM ATTACK AND SHALLOW
 PITTING A FEW SMALL AREAS ONLY DISCOLORED

D.D. 9/20/96

I/area (10⁻⁴ A/cm²)

[Signature] 9/19/96

Model 352/252 Corrosion Analysis Software, v. 2.01

Filename: Bta516cp16.dat

Pstat: VStat[] Ver 2

CP CYCLIC POLARIZATION

Date Run: 04-03-96

File Status: NORMAL

Time Run: 11:54:36

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm ²
				Final Pot.	FP	-0.4000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto	
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93	s
No. of Points	NP	348					
Line Sync.	LS	yes		GI Time Const.	TC	Off	
Rise Time	RT	high stability		IR Mode	IR	none	
Working Elec.	WE	Solid		Filter	FL	Off	
Sample Area	AR	8.000	cm ²	Ref. Elec.	RE	SCE 0.2415	V
Density	DE	7.900	g/ml	Equiv. Wt.	EW	27.92	g
				Open Circuit	OC	-0.9090	V

Comment: A516 grade 60 1.0 M Cl⁻ pH 11.00 95 C

[Signature] 9/19/96

A 516 CP17

OBJECTIVE MEASURE E_p & E_{pp}

SPECIMEN A 516 GRADE 60
1.915" x 0.250" 600 GRIT FINISH
AREA 8.0 cm²
START WT 10.72051 g
END WT 10.68768 g

SOLUTION 5.0 M Cl⁻ AS NaCl LOT 951450
0.0007 M SO₄²⁻ AS Na₂SO₄ LOT 901213
0.012 M Na₂CO₃ LOT 960685
4.5 mL 1.0 M NaOH LOT 883164
START PN 11.00
END PN ~~10.32~~ *[Signature]* 9/20/96 10.48
T = 95°C H₂ THERMOMETER C96-742
DE AERATION W 99.999 % N₂

POTENTIOSTAT EG&G VERSA STAT SN 20104
w/ MODEL 352C SOFTWARE

REFERENCE FISHER SCE 13-C20-S1 SN 4280310
COUNTER ELECTRODE Pt FLAG

SALT BRIDGE SOLUTION SAME AS TEST SOLUTION

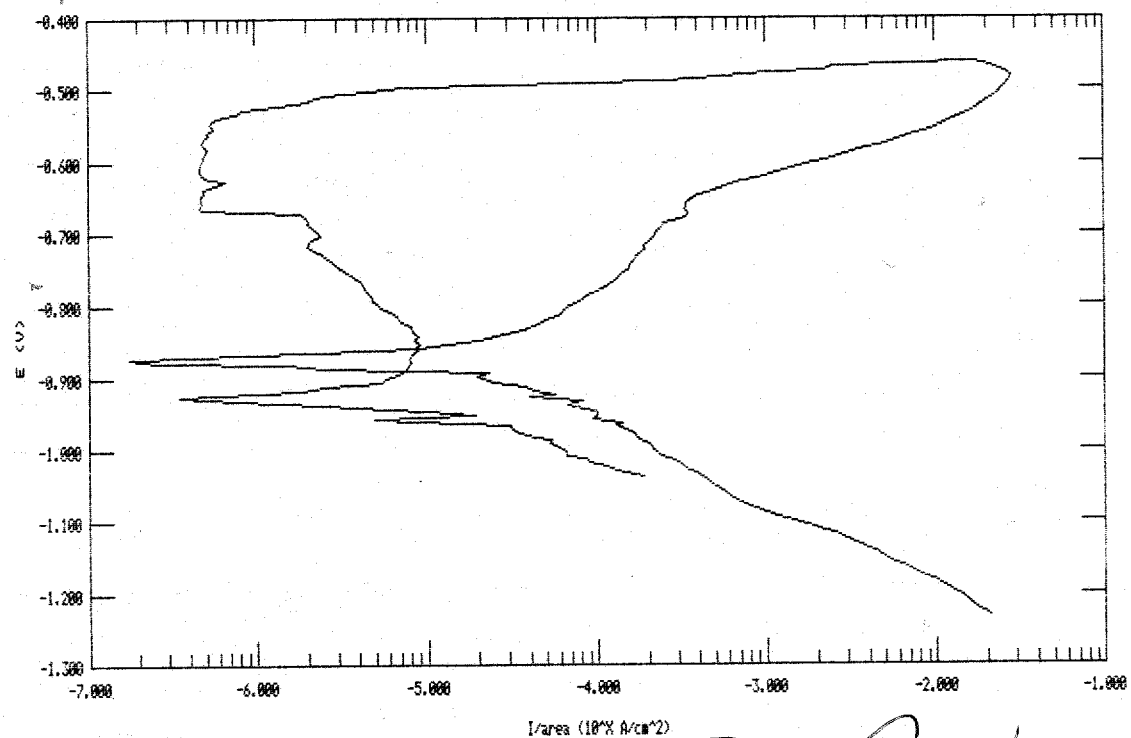
 E_{corr} -831 mV E_{pe} +264 mV

TEST STARTED. 9/20/96

 E_p -527 mV E_{pp} -872 mV

LARGE AREAS OF UNIFORM ATTACK & SNALLOW
PITTING

[Signature] 9/20/96



DD 9/20/96

Model 352/252 Corrosion Analysis Software, v. 2.01
 Filename: B1a516cp17.dat
 Pstat: VStat[] Ver 2
 CP CYCLIC POLARIZATION
 Date Run: 04-04-96

File Status: NORMAL
 Time Run: 09:21:43

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm²
				Final Pot.	FP	-0.4000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93 s
No. of Points	NP	270				

Line Sync.	LS	yes		GI Time Const.	TC	Off
Rise Time	RT	high stability		IR Mode	IR	none
Working Elec.	WE	Solid		Filter	FL	Off
Sample Area	AR	8.000	cm²	Ref. Elec.	RE	SCE 0.2415 V
Density	DE	7.900	g/ml	Equiv. Wt.	EW	27.92 g
				Open Circuit	OC	-0.8370 V

Comment: A516 grade 60 5.0 M Cl- pH 11.00 95 C

DD 9/20/96

A 516 CP18

OBJECTIVE DETERMINE E_p & E_{rp}

SPECIMEN A 516 GRADE 60 600 GRIT FINISH
 1.915" x 0.250"
 AREA 8.0 cm²
 START WT 10.56807 g
 END WT 10.52310 g

SOLUTION 0.0003 M Cl⁻ AS NaCl LOT 951450
 0.0007 M SO₄²⁻ AS Na₂SO₄
 0.012 M Na₂CO₃ LOT 960685
 3 mL 0.1 M NaOH LOT 883164
 PH 11.01
 END PH 10.60
 T = 95°C THERMOMETER 925-3474
 D6 AGATES w 99.999% N₂
 T = 65°C

POTENTIOSTAT EG&G VERSASTAT SN 20104
 w/ MODEL 352C SOFTWARE

REFERENCE SCE FISHER 13-620-S1 SN 9280310
 COUNTER ELECTRODE Pt FLAG

SALT BRIDGE SOLUTION ~~SAME AS TEST SOLUTION~~
 1000 ppm Cl⁻ AS NaCl

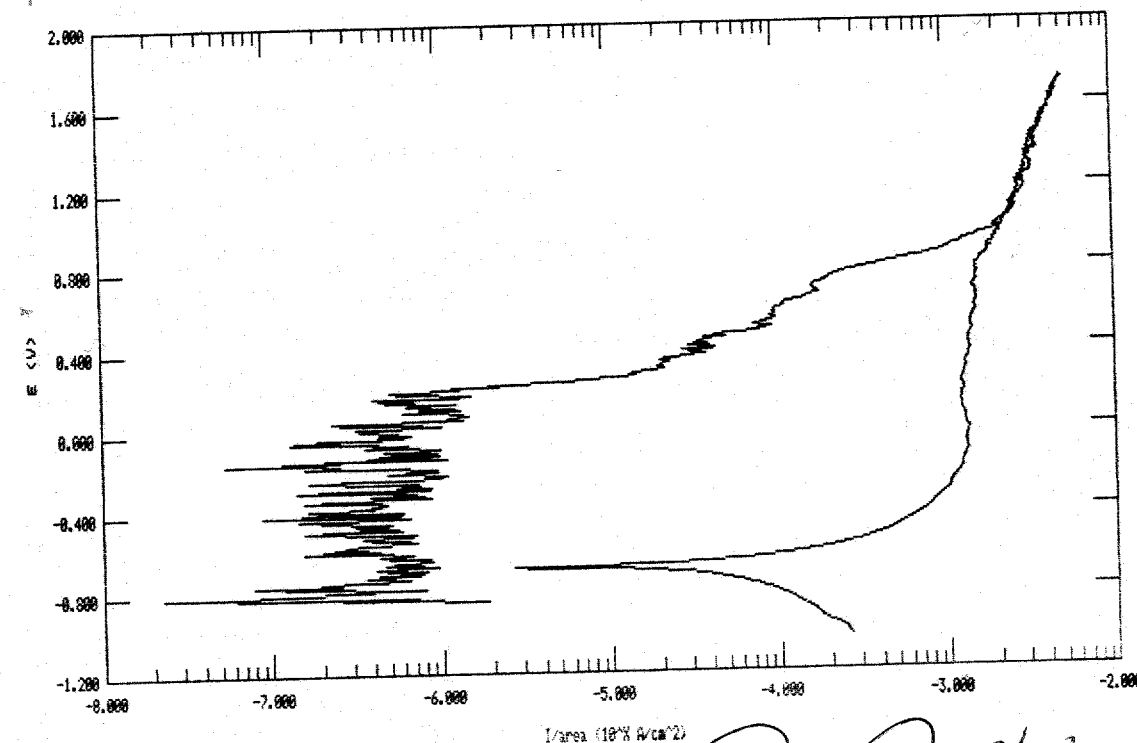
E_{corr} -622 mV
 E_{pb} +248 mV

TEST STARTED. 9/24/96

E_p = +217 mV
 E_{rp} = -678 mV

LARGE AREAS OF BROAD SHALLOW PITS

DD 9/25/96



Model 352/252 Corrosion Analysis Software, v. 2.01
 Filename: B1a516cp18.dat
 Pstat: VStat Ver 2
 CP CYCLIC POLARIZATION
 Date Run: 04-07-96

File Status: NORMAL
 Time Run: 12:59:50

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm²
				Final Pot.	FP	-0.4000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93
No. of Points	NP	1056				

Line Sync.	LS	yes		GI Time Const.	TC	Off
Rise Time	RT	high stability		IR Mode	IR	none
Working Elec.	WE	Solid		Filter	FL	Off
Sample Area	AR	8.000	cm²	Ref. Elec.	RE	SCE 0.2415 V
Density	DE	7.900	g/ml	Equiv. Wt.	EW	27.92 g
				Open Circuit	OC	-0.6330 V

Comment: A516 grade 60 0.0083 M Cl- pH 11.00 65 C

D. D. 9/25/96

A 516 CP 19

OBJECTIVE DETERMINE E_p & E_{RP}

SPECIMEN A 516 GRADE 60
 1.915" x 0.250" 600 GRIT FINISH
 AREA 8.0 cm²
 START WT 10.63104 g
 END WT 10.57961 g

SOLUTION 0.03 M Cl⁻ AS NaCl LOT 951450
 0.0007 M SO₄²⁻ AS Na₂SO₄ LOT 901213
 0.012 M Na₂CO₃ LOT 960685
 7 mL 0.1 M NaOH LOT 883164
 pH 11.00
 END pH 10.76
 T = 65°C Hg THERMOMETER 925-3474
 DE AERATED w 99.999% N₂

POTENTIOSTAT EG&G VERSASTAT SN 20104
 w/ MODE & 352C SOFTWARE

REFERENCE FISHER SCG 13-620-S1 SN 4280310
 COUNTER ELECTRODE Pt FLAG.

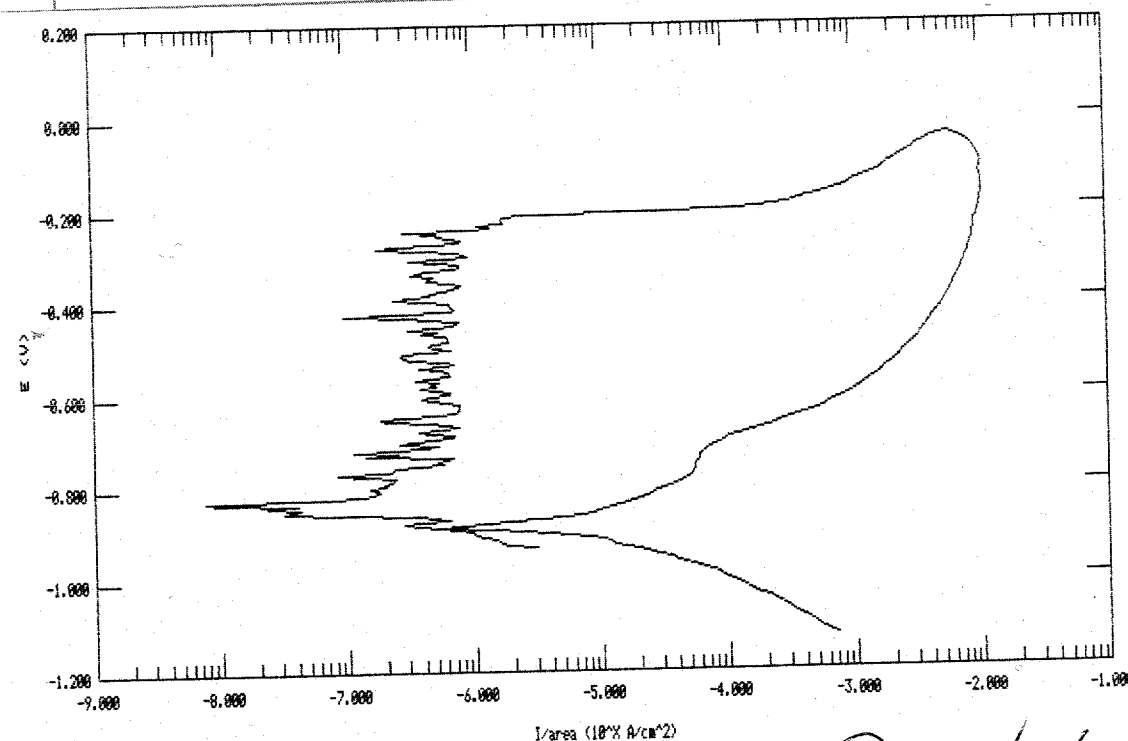
SALT BRIDGE SOLUTION SAME AS TEST SOLUTION

E_{CORR} -730 mV
 E_{pe} -93 mV
 TEST STARTED 9/25/96

E_p -230 mV
 E_{RP} -885 mV

SOME SMALL PITS LARGE AREA OF UNIFORM ATTACK

D. D. 9/25/96

I/area (10⁻⁴ A/cm²)

David D. 9/28/96

Model 352/252 Corrosion Analysis Software, v. 2.01
 Filename: Bta516cp19.dat
 Pstat: VStat Ver 2
 CP CYCLIC POLARIZATION
 Date Run: 04-08-96

File Status: NORMAL
 Time Run: 11:12:32

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm ²
				Final Pot.	FP	-0.4000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto	
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93	s
No. of Points	NP	396					

Line Sync.	LS	yes		GI Time Const.	TC	Off	
Rise Time	RT	high stability		IR Mode	IR	none	
Working Elec.	WE	Solid		Filter	FL	Off	
Sample Area	AR	8.000	cm ²	Ref. Elec.	RE	SCE 0.2415	V
Density	DE	7.900	g/ml	Equiv. Wt.	EW	27.92	g
				Open Circuit	OC	-0.7300	V

Comment: A516 grade 60 0.03 M Cl⁻ pH 11.00 65 C

David D. 9/28/96

A 516 CP20

OBJECTIVE DETERMINE E_p & E_{RP}

SPECIMEN A 516 GRADE 60
 1.915" x D. 250" 600 GRIT FINISH
 AREA = 8.0 cm²
 START WT 10.69166 g
 END WT 10.67480

SOLUTION 1.0 M Cl⁻ AS NaCl LOT 951450
 0.0007 M SO₄²⁻ AS Na₂SO₄ LOT 901213
 0.012 M Na₂CO₃ LOT 960685
 3.0 mL 1.0 M NaOH LOT 883164
 START pH 11.00
 END pH 10.80
~~T = 70~~ 9/26/96 T = 65°C N₂ THERMOMETER 9253474
 DE AERATED W/ 99.999% N₂

POTENTIOSTAT ~~ESE 44~~ 9/26/96 EG&G URSAS STAT
 SN 20104 W MORSE 352C SOFTWARE

REFERENCE FISHER SCE 13-620-SI SN 4280310
 COUNTER ELECTRODE Pt FLAG

SALT BRIDGE SOLUTION: SAME AS TEST SOLUTION

E_{corr} - 784 mV

E_{pe} - 18 mV

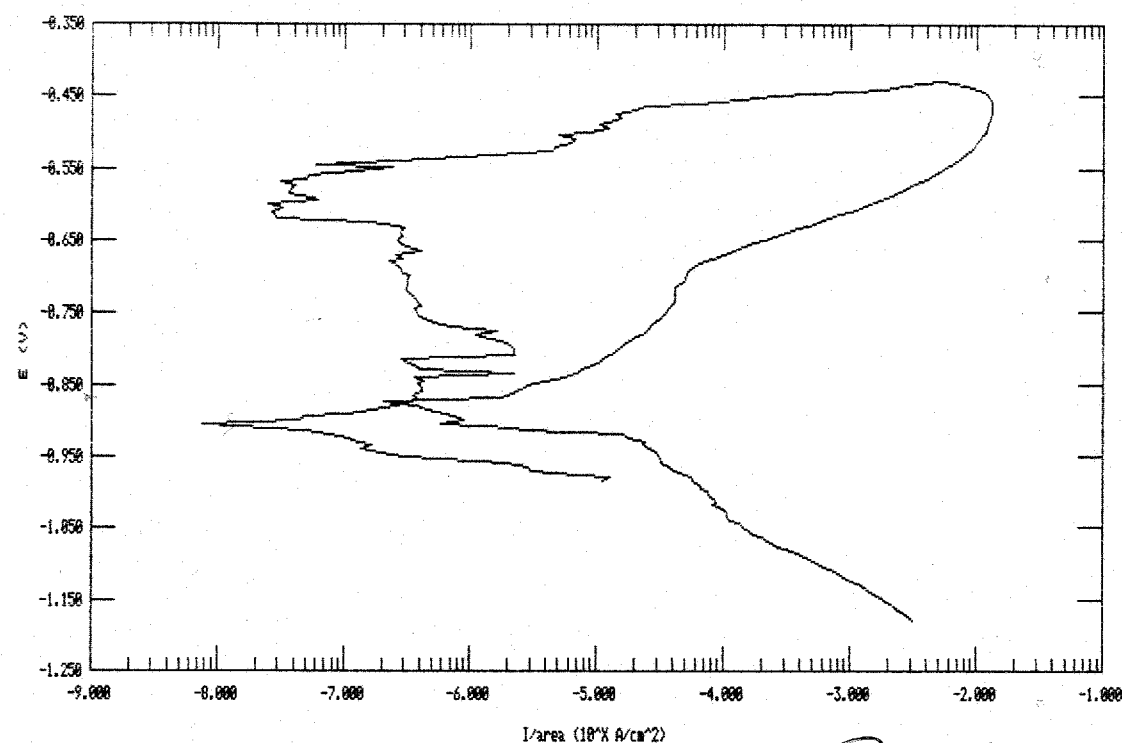
TEST STARTED. 9/26/96

E_p - 544 mV

E_{RP} - 874 mV

LARGE AREAS OF UNIFORM CORROSION SOME AREAS
 WITH NO ATTACK.

David D. 9/27/96



9/27/96

Model 352/252 Corrosion Analysis Software, v. 2.01

Filename: B:\a516cp20.dat

Pstat: VStat11 Ver 2

CP CYCLIC POLARIZATION

Date Run: 04-09-96

File Status: NORMAL

Time Run: 12:57:25

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm ²
				Final Pot.	FP	-0.4000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93 s
No. of Points	NP	262				

Line Sync.	LS	yes	GI Time Const.	TC	Off
Rise Time	RT	high stability	IR Mode	IR	none
Working Elec.	WE	Solid	Filter	FL	Off
Sample Area	AR	8.000	Ref. Elec.	RE	SCE 0.2415 V
Density	DE	7.900	Equiv. Mt.	EW	27.92 g
			Open Circuit	OC	-0.7040 V

Comment: A516 grade 60 1.0 M Cl- pH 3.00 65 C

11.00
9/27/96

9/27/96

A 516 CP 21

OBJECTIVE MEASUREMENTS E_p & E_{Rp}

SPECIMEN A 516 GRADE 60
1.915" x 0.250" 600 GRIT FINISH
AREA = 8.0 cm²
START WT 10.43566g
END WT 10.42360g

SOLUTION 5.0 M Cl⁻ AS NaCl LOT 951450
0.0007 M SO₄²⁻ AS Na₂SO₄ LOT 901213
0.012 M Na₂CO₃ 960685
3.7 mL 1.0 M NaOH LOT 883164
START pH 11.00
END pH 10.58
T = 65°C Hg THERMOMETER 9253474
D6 MERCURY W 99.999% N₂

POTENTIOSTAT EG&G VERSASTAT SN 20104
w/ MODEL 352c SOFTWARE.

REFERENCE ELECTRODE FISHER SCE 13-620-SI SN 4280310
COUNTER ELECTRODE Pt FLAG.

SALT BRIDGE SOLUTION: SAME AS TEST SOLUTION

E_{corr} -720 mV

E_{pe} +29 mV

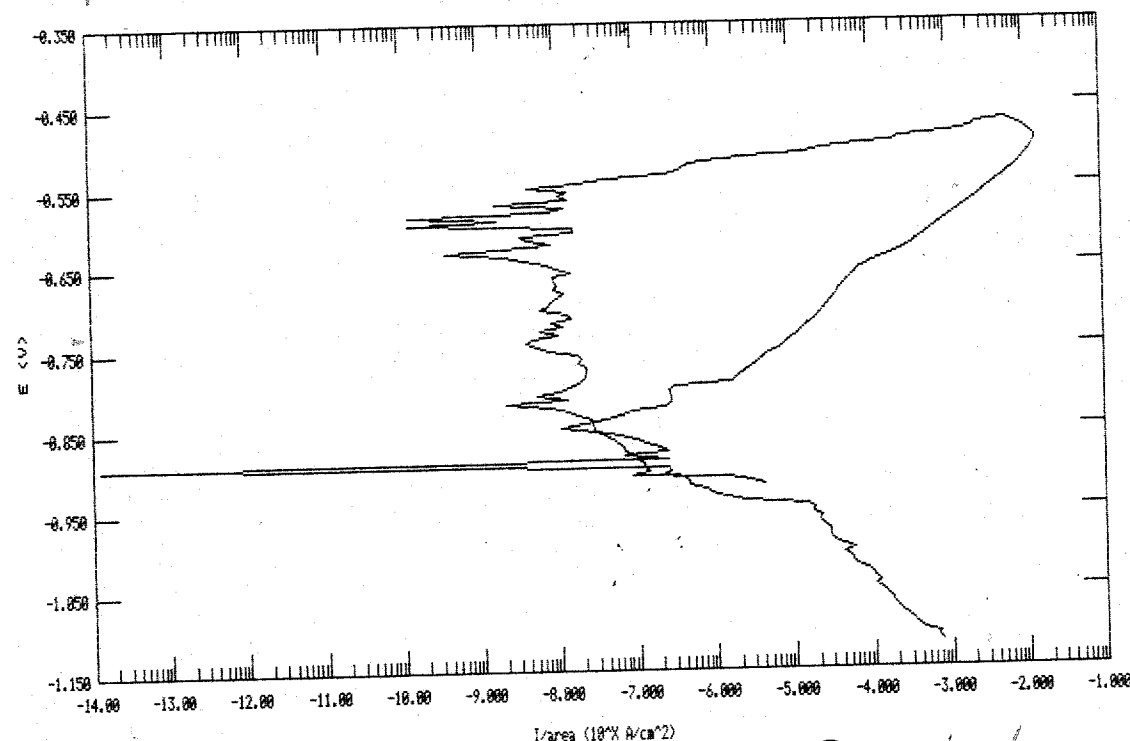
TEST STARTED. 9/27/96

E_p -552 mV

E_{Rp} -847 mV

LARGE AREAS OF UNIFORM ATTACK SOME AREAS
WITH NO ATTACK

9/27/96



Quel D 9/27/96

Model 352/252 Corrosion Analysis Software, v. 2.01
 Filename: B:\516cp21.dat
 Pstat: VStat1 Ver 2
 CP CYCLIC POLARIZATION
 Date Run: 04-10-96

File Status: NORMAL
 Time Run: 12:43:39

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm ²
				Final Pot.	FP	-0.4000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto	
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93	s
No. of Points	NP	220					
Line Sync.	LS	yes		GI Time Const.	TC	Off	
Rise Time	RT	high stability		IR Mode	IR	none	
Working Elec.	WE	Solid		Filter	FL	Off	
Sample Area	AR	8.000	cm ²	Ref. Elec.	RE	SCE 0.2415	V
Density	DE	7.900	g/ml	Equiv. Wt.	EW	27.92	g
				Open Circuit	OC	-0.7220	V

Comment: A516 grade 60 5.0 M Cl⁻ pH 11.00 65 C

Quel D 9/27/96

A 516 CP 22

OBJECTIVE MEASURE E_p & E_{RP}

SPECIMEN A516 GRADE 60
 1.915" x 0.250" 600 GRIT FINISH
 AREA = 8.0 cm²
 START WT 10.48003
 END WT 10.34495

SOLUTION 0.0003 M Cl⁻ AS NaCl LOT 951450
 0.0007 M SO₄²⁻ AS Na₂SO₄ LOT 901213
 0.012 M Na₂CO₃ LOT 960685
 START pH 11.10
 END pH 11.20
 T = 25°C THERMOMETER 9253474
 DEGASATION W 99.999 % N₂

POTENTIOSTAT EG&G VERSASTAT SN 20104
 W/MORSE 352C SOFTWARE.

REFERENCE ELECTRODE FISHER SCE 13-620-S1 SN 4280310
 COUNTER ELECTRODE Pt FLAG

SALT BRIDGE SOLUTION 0.03 M Cl⁻ AS NaCl pH 11.00

E_{COR} - 667 mV

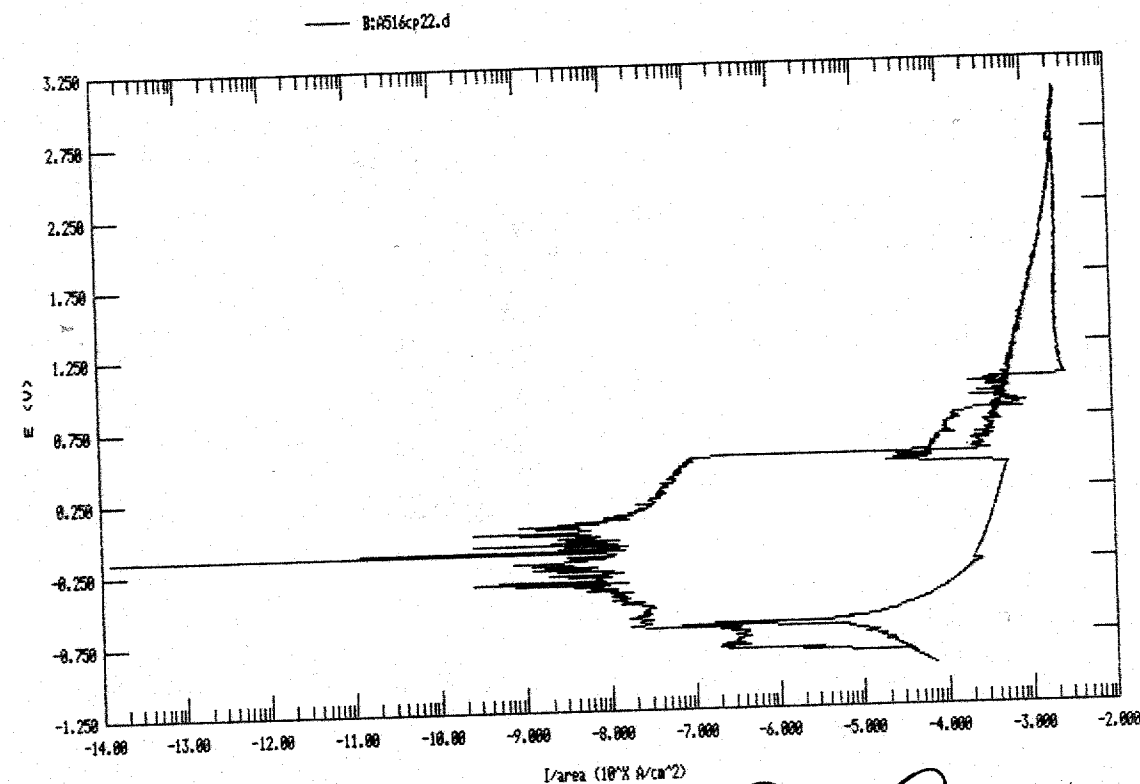
E_{AP} + 591 mV

TEST STARTED 10/22/97

E_p + 497 mV

E_{RP} - 663 mV

Quel D 10/22/96



Paul D 10/23/96

Model 352/252 Corrosion Analysis Software, v. 2.01
 Filename: B:\S16cp22.d
 Pstat: VStatID Ver 2
 CP CYCLIC POLARIZATION
 Date Run: 10/23/96

File Status: NORMAL
 File Name: B:\S16cp22.d

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	VI	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm ²
				Final Pot.	FP	-0.3000	V oc
Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto	
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93	s
No. of Points	NP	1581		GI Time Const.	TC	Off	
Line Sync.	LS	yes		IR Mode	IR	none	
Rise Time	RT	high stability		Filter	FL	Off	
Working Elec.	WE	Solid		Ref. Elec.	RE	SCE 0.2415	V
Sample Area	AR	8.000	cm ²	Equiv. Wt.	EW	0.0000	g
Density	DE	7.900	g/ml	Open Circuit	OC	-0.6600	V

Comment: A516 grade 60 0.0003 M Cl⁻ pH 11.00 25 C

Paul D 10/23/96

A S16 CP23

OBJECTIVE MEASURE E_p & E_{pp}

SPECIMEN A S16 GRADE 60
 1.915" x 0.250" 600 GRIT FINISH
 START WT 10.60803
 END WT 10.54174

SOLUTION 0.03 M Cl⁻ AS NaCl LOT 951450
 0.0007 M SO₄²⁻ AS Na₂SO₄ WT 901213
 0.012 M Na₂CO₃ LOT 960685
 4.0 mL 0.1 M NaOH LOT 883164
 1000 mL OF TEST SOLUTION
 START pH 11.00
 END pH 10.85
 T = 25 °C N₂ THERMOMETER 9253474
 DEGASSED w/ 99.999% N₂

POTENTIOSTAT EG&G VERSASTAT SW 20104
 w/ MODEL 392C SOFTWARE

REFERENCE ELECTRODE FISHER SCE 13-620-S1 IN 4280310
 COUNTER ELECTRODE Pt FLAG

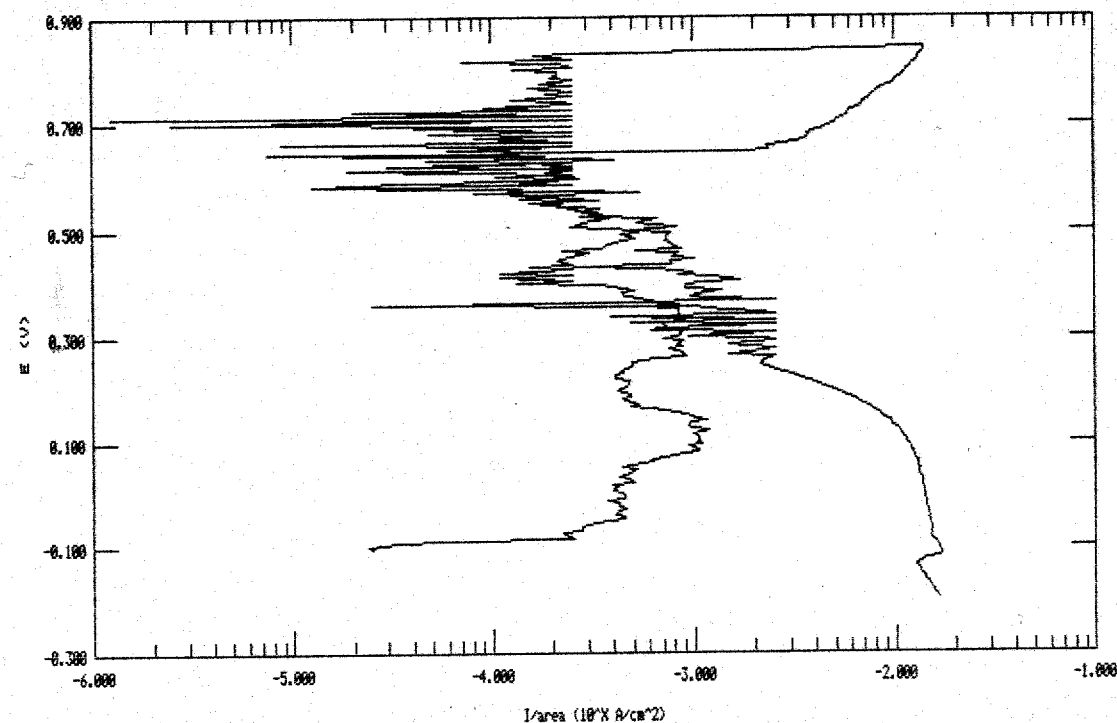
SALT BRIDGE SOLUTION: SAME AS TEST SOLUTION

E_{corr} -605 mV
 E_p +279 mV
 TEST STARTED.

E_p 832 mV
 E_{pp} 632 mV

ALL VALUES INCLUDING CORROSION POTENTIAL MEASURED
 BY POTENTIOSTAT ARE TOO HIGH UNKNOWN SOURCE
 FOR ERROR TEST TO BE RE RUN WITH NEW
 SPECIMEN

Paul D 10/24/96



David Q 10/24/96

Model 352/252 Corrosion Analysis Software, v. 2.01
 Filename: Bra516cp23.dat
 Pstat: VStat11 Ver 2
 CP CYCLIC POLARIZATION
 Date Run: 10-15-96

File Status: NORMAL
 Time Run: 15:44:36

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm²
				Final Pot.	FP	-0.3000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto	
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93	s
No. of Points	NP	398					

Line Sync.	LS	yes		GI Time Const.	TC	Off	
Rise Time	RT	high stability		IR Mode	IR	none	
Working Elec.	WE	Solid		Filter	FL	Off	
Sample Area	AR	8.000	cm²	Ref. Elec.	RE	SCE 0.2415	V
Density	DE	7.900	g/ml	Equiv. Wt.	EW	27.92	g
				Open Circuit	OC	97.00E-3	V

Comment: AS16 grade 60 0.03 M Cl- pH 11.00 25 C

David Q 10/24/96

AS16 CP24

OBJECTIVE MEASURE E_p & E_{pp}

SPECIMEN AS16 GRADE 60
 1.915" x 0.250" 600 GRIT FINISH
 START WT 10.55448g
 END WT 10.53562g

SOLUTION 1.0 M Cl⁻ AS NaCl LOT 951450
 0.0007 M SO₄²⁻ AS Na₂SO₄ LOT 901213
 0.012 M Na₂CO₃ LOT 960685
 3.0 mL NaOH 1.0 M LOT 883164
 PH 11.00 AT START
 1000 mL OF TEST SOLUTION
 DEGENERATED W/ 99.999% N₂
 T= 25°C Hg THERMOMETER 9253474
 END PH 11.11

POTENTIOSTAT EG&G VERSASTAT SN 20104
 w/ MODEL 352C SOFTWARE

REFERENCE ELECTRODE FISHER SCE 13-620-S1 SN 4280310
 COUNTER ELECTRODE Pt FLAG

SALT BRIDGE SOLUTION SAME AS TEST SOLUTION

E_{corr} -691 mV

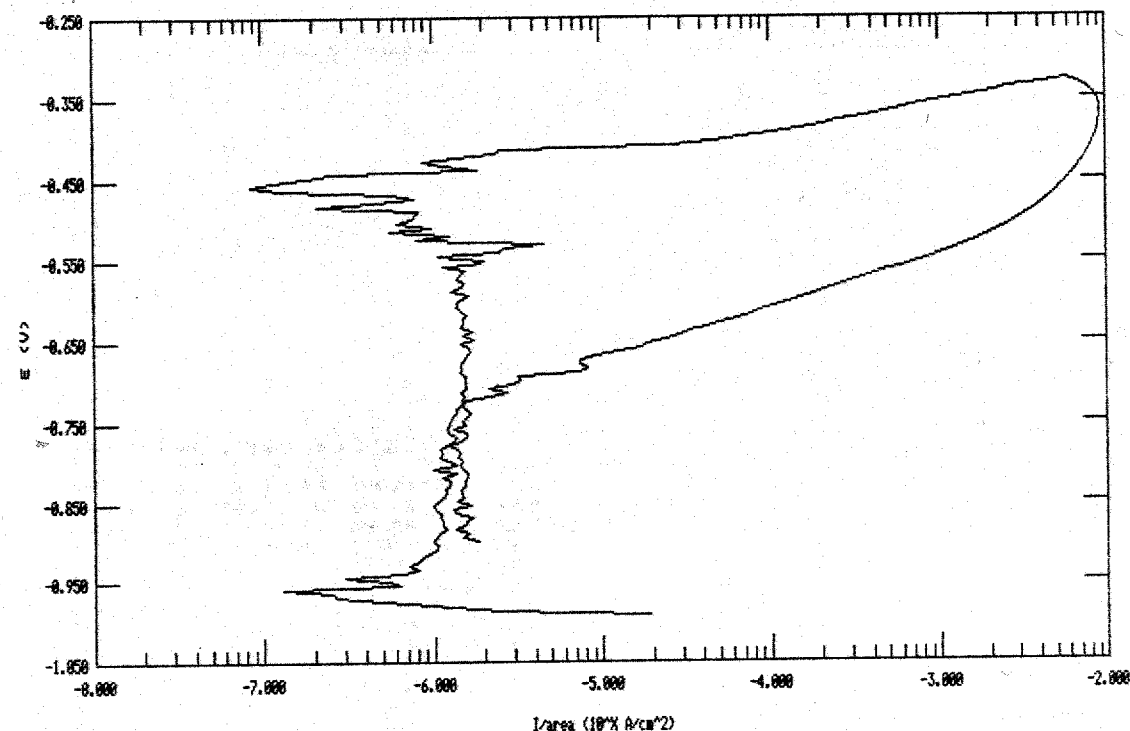
E_{pt} +462 mV

TEST STARTED 10/24/96

E_p -413 mV

E_{pp} -723 mV

David Q
 10/25/96



[Signature] 10/25/96

Model 352/252 Corrosion Analysis Software, v. 2.01

Filename: B:a516cp24.dat

Pstat: VStatC Ver 2

CP CYCLIC POLARIZATION

Date Run: 10-16-96

File Status: NORMAL

Time Run: 15:15:25

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm²
				Final Pot.	FP	-0.3000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93 s
No. of Points	NP	248				

Line Sync.	LS	yes		GI Time Const.	TC	Off
Rise Time	RT	high stability		IR Mode	IR	none
Working Elec.	WE	Solid		Filter	FL	Off
Sample Area	AR	8.000	cm²	Ref. Elec.	RE	SCE 0.2415 V
Density	DE	7.900	g/ml	Equiv. Wt.	EW	0.0000 g
				Open Circuit	OC	-0.6900 V

Comment: A516 grade 60 1.0 M Cl- pH 11.00 25 C

[Signature] 10/25/96

A 516 CP25

OBJECTIVE MEASURE E_p & E_{Rp}

SPECIMEN A516 GRADE 60
1.915" x 0.250" 600 GRIT FINISH
START WT 10.68032g
END WT 10.65725g

SOLUTION 5.0 M Cl⁻ AS NaCl LOT 951450
0.0007 M SO₄²⁻ AS Na₂SO₄ LOT 901213
0.012 M Na₂CO₃ LOT 960685
4.0 mL 1.0 M NaOH LOT 883164
pH = 11.00 AT START
1000 mL TEST SOLUTION
T = 25 °C N₂ THERMOMETER 925 3474
END pH 11.05

POTENTIOSTAT EG&G VERSASTAT SN 2010P
w/ MODEL 352C SOFTWARE

REFERENCE ELECTRODE FISHER SCE 13-620-S1 SN 4280310
COUNTER ELECTRODE PE FLAG
SALT BRIDGE SOLUTION SAME AS TEST SOLUTION

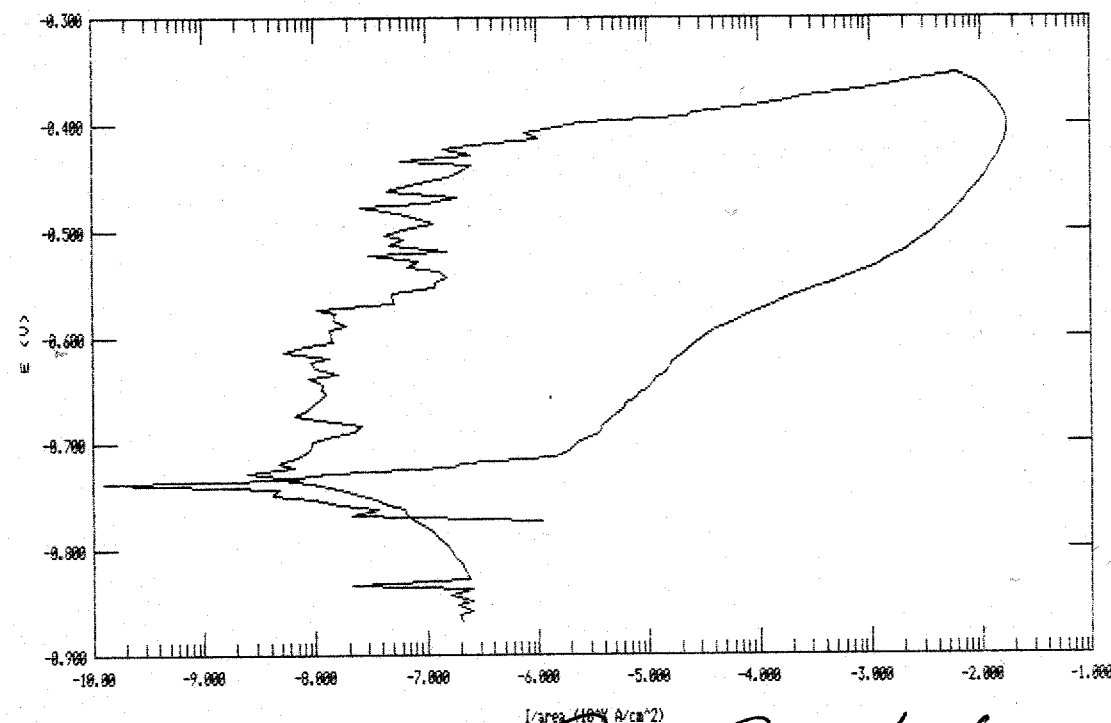
E_{corr} -572mV
 E_{pe} +26mV
TEST STARTED 10/25/96

E_p -408mV
 E_{Rp} -733mV

~~TEST STARTED~~ DID 10/25/96

SOME PITS SOME AREAS OF GENERAL ATTACK
SOME AREAS UNATTACKED MOSTLY GENERAL CORROSION

[Signature] 10/26/96

I/area (10⁻⁴ A/cm²)

10/26/96

Model 352/252 Corrosion Analysis Software, v. 2.01

Filename: B1a516cp25.dat

Pstat: UStat[] Ver 2

CP CYCLIC POLARIZATION

Date Run: 10-17-96

File Status: NORMAL

Time Run: 13:55:11

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	VI	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm²
				Final Pot.	FP	-0.3000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93 s
No. of Points	NP	188				

Line Sync.	LS	yes	GI Time Const.	TC	Off
Rise Time	RT	high stability	IR Mode	IR	none
Working Elec.	WE	Solid	Filter	FL	Off
Sample Area	AR	8.000 cm²	Ref. Elec.	RE	SCE 0.2415 V
Density	DE	7.900 g/ml	Equiv. Wt.	EW	0.0000 g
			Open Circuit	OC	-0.5730 V

Comment: A516 grade 60 5.0 M Cl- pH 11.00 25 C

10/26/96

A 516 CP26

OBJECTIVE M6ASURG Ep & ERP

SPECIMEN A 516 GRADE 60
 1.915" x 0.250" 600 GRIT FINISH
 START WT 10.68823g
 END WT 10.64679g

SOLUTION 0.03 M Cl⁻ AS NaCl LOT 951450
 0.0007 M SO₄²⁻ AS Na₂SO₄ LOT 901213
 0.012 M Na₂CO₃ LOT 960685
 4mL 0.1M NaOH LOT 883164
 START pH = 11.00
 1000 mL TEST SOLUTION
 END pH 10.75
 T = 25°C N₂ THERMOSTAT 9253474

POTENTIOSTAT EG&G VERSASTAT SN 2010P
 w/ MODEL 352C SOFTWARE

REFERENCE ELECTRODE FISHER SCE 13-620-S1 SN 4280310
 COUNTER ELECTRODE Pt FLAG

SALT BRIDGE SOLUTION - SAME AS TEST SOLUTION

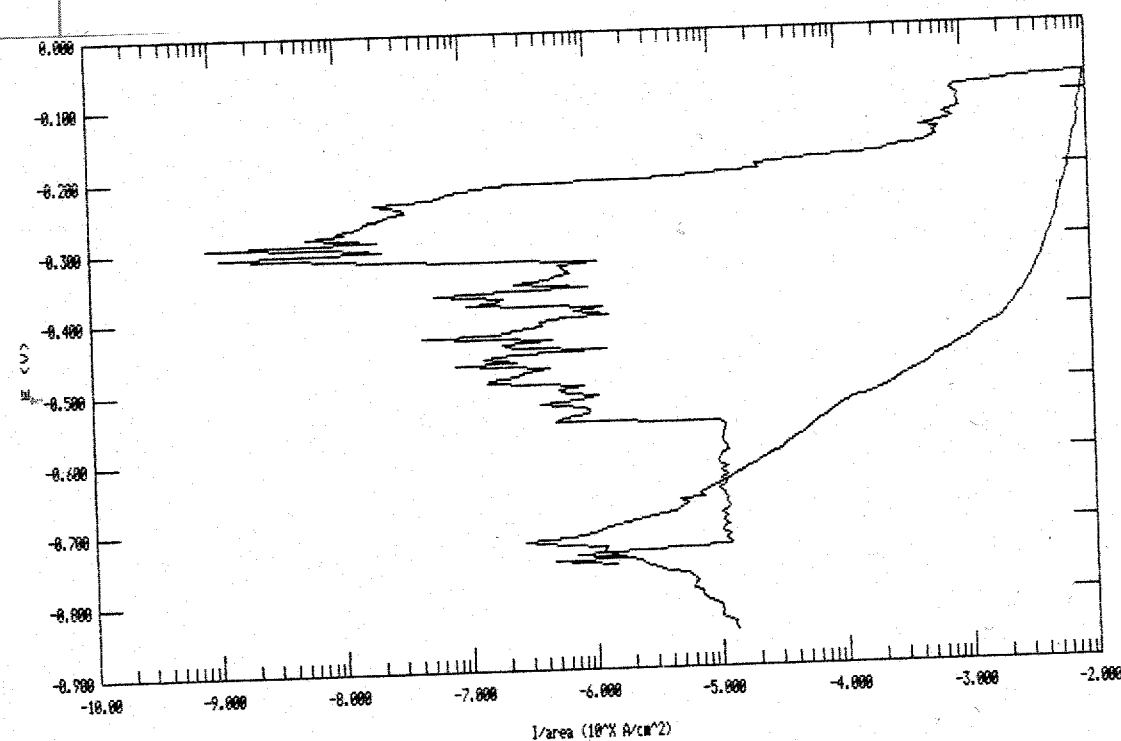
E_{corr} -551 mVE_{pe} -52 mV

TEST STARTED 10/28/96

E_p -238 mVE_{ap} -723 mV

A LARGE NUMBER OF SHALLOW PITS

10/29/96



David D 10/29/96

Model 352/252 Corrosion Analysis Software, v. 2.01

Filename: B:a516cp26.dat

Pstat: VStat Ver 2

CP CYCLIC POLARIZATION

Date Run: 10-18-96

File Status: NORMAL

Time Run: 15:45:55

Cond. Time	CT	pass	s	Initial Pot.	IP	-0.2000	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	50.00E-3	V oc
Initial Delay	ID	20	s	I Threshold	IT	5.000E-3	A/cm²
				Final Pot.	FP	-0.3000	V oc

Scan Rate	SR	0.1670	mV/s	Curr. Range	CR	Auto	
Scan Incr.	SI	5.000	mV	Step Time	ST	29.93	s
No. of Points	NP	292					

Line Sync.	LS	yes		GI Time Const.	TC	Off	
Rise Time	RT	high stability		IR Mode	IR	none	
Working Elec.	WE	Solid		Filter	FL	Off	
Sample Area	AR	8.000	cm²	Ref. Elec.	RE	SCE 0.2415	V
Density	DE	7.900	g/ml	Equiv. Wt.	EW	0.0000	g
				Open Circuit	OC	-0.5530	V

Comment: A516 grade 60 0.03 M Cl- pH 11.00 25 C

David D 10/29/96

STOCK SOLUTIONS 11/96

NO₃ - 11/96 1000 ppm NO₃ AS NaNO₃
 1.37260 g NaNO₃ LOT 961772A +
 DI WATER TO 1000 mL EXP 12/4/96

SO₄ - 11/96 1000 ppm SO₄ AS Na₂SO₄
 1.47019 g Na₂SO₄ LOT 901213 +
 DI WATER TO 1000 mL EXP 12/4/96

F- 11/96 1000 ppm F- AS NaF
 2.21148 g NaF LOT 896405 +
 DI WATER TO 1000 mL EXP 12/4/96

David D
 12/15/96

L825P2AB

SPECIMEN ALLOY 825 HN437IFG SAME AS P102

START WT 30.82077g

END WT 30.82112g

SOLUTION 1000 ppm Cl^- 85PPM HCO_3^- 20PPM SO_4^{2-}
 10 ppm NO_3^- 2PPM F^- 2000mL MAKE AS FOLLOWS

3.29699g NaCl LOT 951450

0.24725g NaHCO_3 LOT 923337A40 mL SO_4^{2-} 11/96 STOCK SOLUTION P13720 mL NO_3^- 11/96 "4 mL F^- 11/96 "

+ DI WATER TO 2000 mL

+ ~~QD~~ 11/6/96 $T = 95^\circ\text{C}$ Hg THERMOMETER 0323004

START pH 8.296

POTENTIOSTAT ESC 440 #1 CHANNEL #1

DATA SAVED AS L825P2AB.DAT

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHER SCE 13-620-S1 SN 2134032

E_{CORR} +5mV KESTNLEY 617 # 537418E_{PE} +151mVE_{APPLIED} 0mV

TEST STARTED 11/7/96 8:35AM

TEST STOPPED 12/21/96 10:35AM

RUNTIME 3808,800 SECONDS OR 44.08 DAYS

END pH 9.258

NO SIGN OF LOCALIZED CORROSION

~~QD~~ 12/30/96

LT825P7S.DAT

SPECIMEN ALLOY 825 HN437IFG SAME AS P103

START WT 30.30788g

END WT 30.30867g

SOLUTION 1000 ppm Cl^- 85PPM HCO_3^- 20PPM SO_4^{2-}
 10 ppm NO_3^- 2PPM F^- 2000 mL MAKE AS FOLLOWS

3.29684g NaCl LOT 951450

0.24776g NaHCO_3 LOT 923337A40 mL SO_4^{2-} 11/96 STOCK SOLUTION P13720 mL NO_3^- 11/96 "4 mL F^- 11/96 "

+ DI WATER TO 2000 mL

 $T = 95^\circ\text{C}$ Hg THERMOMETER 0323008

START pH 8.353

POTENTIOSTAT ESC 440 #1 CHANNEL #2

DATA SAVED AS LT825P7S.DAT

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHER SCE 13-620-S1 SN 3106343

E_{CORR} +51 mV KESTNLEY 617 SN 537418E_{PE} +153 mVE_{APPLIED} +200 mVTEST STARTED 11/7/96 ~~8/10/96~~ 11/7/96 8:35AM

TEST STOPPED 12/21/96 10:35AM

RUNTIME 3,808,800 SECONDS OR 44.08 DAYS

END pH 9.124

NO SIGN OF LOCALIZED CORROSION

~~QD~~ 12/30/96

CT82SP8S, DAT

SPECIMEN ALLOY 825 HN4371FG SAME AS P104

START WT 31.85340 g

END WT 31.85346 g

SOLUTION 1000 PPM Cl^- 85 PPM NO_3^- 20 PPM SO_4^{2-}
 10 PPM NO_3^- 2 PPM F^- 2000 mL MADE AS FOLLOWS

3.29622 g NaCl LOT 951450

0.24354 g NaHCO_3 LOT 923337A40 mL SO_4^{2-} 11/96 STOCK SOLUTION P13720 mL NO_3^- 11/964 mL F^- 11/96

+ DI WATER TO 2000 mL

T = 95°C Hg THERMOMETER 183302

START pH 8.242

1000 mL SOLUTION USED IN THIS TEST

POTENTIOSTAT ESC 440 #1 CHANNEL #3

DATA SAVED AS CT82SP8S.DAT

COUNTER ELECTRODE Pt FLAT

REFERENCE ELECTRODE FISHER SCE 13-620-S1 SN 9214074

E CORR -45 mV KETTLER 619 SN 537418

E PR +152 mV

E APPLIED +100 mV

TEST STARTED 11/7/96 8:35 AM

TEST STOPPED 12/21/96 10:35 AM

RUNTIME 3808800 SECONDS OR 44.08 DAYS

END PN 9.130

NO SIGN OF LOCALIZED CORROSION

Duff 12/30/96

CT82SP4S

SPECIMEN ALLOY 825 HN4371FG SAME AS P105

START WT 38.95235 g

~~END WT 38.95235~~ 11/6/96 DuffEND WT ~~38.95353~~ 12/30/96 38.95227 g

2 PTFE CRUICK WASHERS ATTACHED TO SPECIMEN
 USING C276 NUT AND BOLT TORQUED TO 40 IN. OZ
 USING PROTO 6103

SOLUTION 1000 PPM Cl^- 85 PPM NO_3^- 20 PPM SO_4^{2-} 10 PPM NO_3^- 2 PPM F^-

1000 mL OF SOLUTION LISTED ON P 140

T = 95°C Hg THERMOMETER 183304

START pH 8.242

POTENTIOSTAT ESC 440 #1 CHANNEL #4

DATA SAVED AS CT82SP4S.DAT

COUNTER ELECTRODE GRAPHITE ROD

REFERENCE ELECTRODE FISHER SCE 13-620-S1 SN 9214083

-73 mV Duff 11/7/96

E CORR -5 mV KETTLER 617 SN 537418

E CORR -73 mV +5 mV " Duff 11/7/96

E APPLIED 0 mV

TEST STARTED 11/7/96 8:35 AM

TEST STOPPED 12/21/96 10:35 AM

RUNTIME 3808800 SECONDS OR 44.08 DAYS

END PN 8.981

NO SIGN OF LOCALIZED CORROSION

Duff 12/30/96

LT82SPSS.DAT

SPECIMEN ALLOY 82S HH437IFG SAME AS P106

START WT 39.08609g

END WT ~~39.08741g~~ 12/30/96 39.08612

2 PTFE CREVICE WASHERS ATTACHED TO SPECIMEN
USING C276 NUT AND BOLT TORQUED TO
40 IN.OZ WITH PROTO 6103

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-} 10 PPM NO_3^-
2 PPM F^- 2000 mL MADE AS FOLLOWS.

3.29840 g NaCl LOT 951450

0.24718 g NaHCO_3 LOT 923337A40 mL SO_4^{2-} 11/96 STOCK SOLUTION P 13720 mL NO_3^- 11/96 "4 mL F^- 11/96 "

+ DE WATER TO 2000 mL

T = 95 °C Hg THERMOMETER 183305

START pH 8.311

1000 mL SOLUTION USED IN THIS TEST

POTENTIOSTAT ESC 440 #1 CHANNEL # 5

DATA SAVED AS LT82SPSS.DAT

COUNTER ELECTRODE ~~PT FLAG~~ GRAPHITE ROD
12/11/96

REFERENCE ELECTRODE FISHER SCE 13-620-S1 SN 3106337

-65 mV

E_{CORR} ~~+40 mV~~ KETTLER 617 SN 537418E_{COUNTER} = ~~-65 mV~~ +40 mVE_{APPLIED} -100 mV

TEST STARTED. 11/7/96 8:35 AM

TEST STOPPED 12/21/96 10:35 AM

RUNTIME 3808800 SECONDS OR 44.08 DAYS

END PN 9.018

NO SIGN OF LOCALIZED CORROSION

12/30/96

OC825C1N

SPECIMEN ALLOY 82S HH437IFG SAME AS P107

START WT 39.28560g

END WT ~~39.28691g~~ 12/30/96 39.28568

2 PTFE CREVICE WASHERS ATTACHED TO SPECIMEN
USING C276 NUT AND BOLT TORQUED TO
40 IN.OZ WITH PROTO 6103

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM NO_3^-
10 PPM NO_3^- 2 PPM F^-

1000 mL SOLUTION FROM P 142

T = 95 °C Hg THERMOMETER 183303

START pH 8.311

POTENTIOSTAT ESC 440 #1 CHANNEL # 6

DATA SAVED AS ~~LT~~ 12/11/96 OC825C1N.DAT

COUNTER ELECTRODE PT FLAG

REFERENCE ELECTRODE FISHER SCE 13-620-S1 SN 3106337

E_{CORR} -50 mV KETTLER 617 SN 537418E_{PT} -21 mVE_{APPLIED} O.C.

TEST STARTED. 11/7/96 8:35 AM

TEST STOPPED 12/21/96 10:35 AM

RUNTIME 3808800 SECONDS OR 44.08 DAYS

END PN 9.202

TWO AREAS OF CREVICE CORROSION INITIATED ON MILL FINISHED
SURFACE DURING THIS TEST SEGMENT 1 AREA 30 μm DEEP
THE SECOND 56 μm DEEP NO INDICATION OF LOCALIZED
CORROSION ON POLISHED SURFACE.

12/30/96

STOCK SOLUTIONS 1/97

SO₄ - 1/97 1000 ppm SO₄²⁻ AS Na₂SO₄
 1.47022 g Na₂SO₄ LOT 901213
 PR6P 12/30/96 EXP 1/30/97

NO₃ - 1/97 1000 ppm NO₃⁻ AS NaNO₃
 1.37119 g NaNO₃ LOT 961772A
 PR6P 12/30/96 EXP 1/30/97

F - 1/97 1000 ppm F⁻ AS NaF
 2.21067 g NaF LOT 896405
 PR6P 12/30/96 EXP 1/30/97

[Signature] 12/30/96

L825P2AC

SPECIMEN ALLOY 825 NN4371FG Same AS P138

START WT 30.82112g

END WT 30.82154g

SOLUTION 1000 ppm Cl⁻ 85 ppm HCO₃⁻ 20 ppm SO₄²⁻
 10 ppm NO₃⁻ 2 ppm F⁻ 2000 mL MAKE AS FOLLOWS

3.29728 g NaCl LOT 951450

0.25542 g NaHCO₃ LOT 923337A

40 mL SO₄ - 1/97 STOCK SOLUTION P144

20 mL NO₃ - 1/97 STOCK SOLUTION P144

4 mL F - 1/97 STOCK SOLUTION P144

+ DI WATER TO 2000 mL

T = 95°C N₂ THERMOMETER 0323002

START pH 8.264

POTENTIOSTAT ESC 440 #1 CHANNEL #1

DATA SAVED AS L825P2AC.DAT

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHER SCE 13-B20-S1 SN 3106343

E_{corr} -7 KEITHLEY 617 SN 537418

E_{pe} +174 "

E_{applied} 0 mV "

TEST STARTED 12/31/96 4:45 PM

TEST STOPPED ~~2/7/97~~ 2/7/97 4:45 PM

END pH 9.334

NO SIGN OF LOCALIZED ATTACK

[Signature] 2/14/97

LT825P7T, DAT

SPECIMEN ALLOY 825 HH437IFG Same as P139

START WT 30.30867g

END WT 30.30805g

SOLUTION 1000 ppm Cl^- 85 ppm NO_3^- 20 ppm SO_4^{2-}
10 ppm NO_3^- 2 ppm F^- 2000 mL MARK AS FOLLOWS

3.29621 g NaCl LOT 951450

0.24418 g NaHCO_3 LOT 923337A40 mL SO_4^{2-} 1/97 STOCK SOLUTION P14420 mL NO_3^- 1/97 "4 mL F^- 1/97 "

+ DI WATER TO 2000 mL

T = 95°C Hg THERMOMETER 032300P

START pH 8.321

POTENTIOSTAT ESC 440 #2 CHANNEL #2

DATA SAVER AS LT825P7T, DAT

COUNTER ELECTRODE Pt FLAG

REFERENCE ELECTRODE FISHER SCE 13-620-SI SN 924083

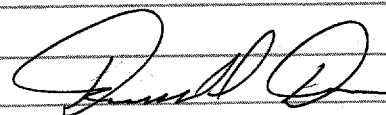
 E_{corr} +68 mV KEITHLEY 617 SN 537418 E_{PE} +121 mV " E_{APPLIED} 200 mV "

TEST STARTED 12/31/96 4:45 pm

TEST STOPPED 2/7/97 4:45 pm

END pH 9.090

NO SIGN OF LOCALIZED ATTACK

 2/14/97

LT825P8T, DAT

SPECIMEN ALLOY 825 HH437IFG Same as P140

START WT ~~30.85346~~  12/31/96 31.85346g

END WT 31.85376g

SOLUTION 1000 ppm Cl^- 85 ppm NO_3^- 20 ppm SO_4^{2-}
10 ppm NO_3^- 2 ppm F^- 2000 mL MARK AS FOLLOWS

3.30850 g NaCl LOT 951450

0.24903 g NaHCO_3 LOT ~~81~~  12/30/96 923337A40 mL SO_4^{2-} 1/97 - STOCK SOLUTION P14420 mL NO_3^- 1/97 STOCK SOLUTION P1444 mL F^- 1/97 "

+ DI WATER TO 2000 mL

T = 95°C Hg THERMOMETER 183305

START pH 8.305

1000 mL USED IN THIS TEST

POTENTIOSTAT ESC 440 #1 CHANNEL #3

DATA SAVER AS LT825P8T, DAT

COUNTER ELECTRODE ~~Pt FLAG~~  12/30/96 GRAPHITE ROD

REFERENCE ELECTRODE FISHER SCE 13-620-SI SN 924074

 E_{corr} -8 mV KEITHLEY 617 SN 537418 ~~E_{PE}~~  12/30/96 E_{GRAPHITE} +139 mV " E_{APPLIED} 100 mV "TEST STARTED 12/31/96 ~~4:45 pm~~  12/31/96 4:45 pm

TEST STOPPED 2/7/97 4:45 pm

END pH 9.030

NO SIGN OF LOCALIZED CORROSION

 2/14/97

LT825P4T.DAT

SPECIMEN ALLOY 825 HH4371FG Same AS P 141

START WT 38.95227 g

END WT 38.95224 g

2 PTFE CREVICE BLOCKS ATTACHED TO SPECIMEN
USING C276 NUT & BOLT TORQUED TO 40 IN.OZ
WITH PROTO 6103

SOLUTION 1000 PPM Cl^- 85 PPM NO_3^- 20 PPM SO_4^{2-}
10 PPM NO_3^- 2 PPM F^- 2000 mL MAKE ~~DATE~~ 12/30/96

1000 mL OF SOLUTION ON P147

T = 95°C Hg THERMOMETER 183303

START pH 8.305

POTENTIOSTAT ESC 440 #1 CHANNEL #4

DATA SAVED AS CT825P4T.DAT

COUNTER ELECTRODE. ~~P6 FLAG~~ 12/30/96 GRAPHITE ROD
REFERENCE ELECTRODE FISHER SCE 13-620-51 SN 821163

E_{corr} -73 mV KETTLER 617 SN 537418E_{graph} 12/30/96 E_{graph} +13 mV "E_{applied} 0

TEST STARTED 12/31/96 4:45 PM

TEST STOPPED 2/7/97 4:45 PM

pH GNO 9.031

NO SIGN OF LOCALIZED CORROSION

[Signature] 2/14/97

LT825P5T.DAT

SPECIMEN ALLOY 825 HH4371FG Same AS P142

START WT 39.08612

END WT 39.08798

2 PTFE CREVICE BLOCKS ATTACHED TO SPECIMEN WITH
C276 NUT & BOLT TORQUED TO 40 IN.OZ USING
PROTO 6103

SOLUTION 1000 PPM Cl^- 85 PPM NO_3^- 20 PPM SO_4^{2-}
10 PPM NO_3^- 2 PPM F^- 2000 mL MAKE AS FOLLOWS

3.30968 g NaCl LOT 951450

0.25324 g NaHCO_3 LOT 923337A40 mL SO_4^{2-} 1/97 STOCK SOLUTION P14420 mL NO_3^- -1/97 "4 mL F^- -1/97 "T = 95°C Hg THERMOMETER 183304

START pH 8.265

1000 mL SOLUTION USED IN THIS TEST

POTENTIOSTAT ESC 440 #1 CHANNEL #5
DATA SAVED AS CT825P5T.DAT

COUNTER ELECTRODE GRAPHITE ROD
REFERENCE ELECTRODE FISHER SCE 13-620-51 SN 0165403

E_{corr} -101 mV KETTLER 617 SN 537418E_{graph} +17 mV "E_{applied} -100 mV "

TEST STARTED 12/31/96 4:45 PM

TEST STOPPED 2/7/97 4:45 PM

END pH 9.215

NO SIGN OF LOCALIZED CORROSION

2/14/97 *[Signature]*

OC82SC10.DAT

SPECIMEN ALLOY 825 NH4371FG SAME AS p 143

START WT 39.28568 g

END WT 39.28570 g

2 PTFE ORGANS BLOCKS ATTACHED TO SPECIMEN
WITH C276 NUT & BOLT TORQUED TO 40 IN-OZ
USING PROTO 6103SOLUTION 1000 PPM Cl^- 85 PPM NO_3^- 20 PPM SO_4^{2-} 10 PPM NO_2^- 2 PPM F^-

1000 mL SOLUTION FROM p 149

T₂ 95°C H₂ THERMOMETER 183302

START pH 8.265

POTENTIOSTAT ESC 440 #1 CHANNEL #6

DATA SAVED AS OC82SC10.DAT

COUNTER ELECTRODE Pt FLNG

REFERENCE ELECTRODE FISHER SC6 13-620-S1 SN 2134232

E_{CORR} -93 mV KETNLOT 617 SN 537418E_{Pt} +114 mV

CAPPED O.C.

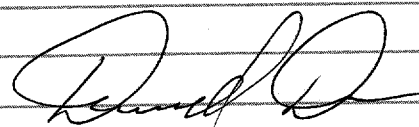
TEST STARTED 12/31/96 4:45 PM

TEST STOPPED 2/7/97 4:45 PM

END pH 9.156

END WT 39.28570 g

NO SIGN OF LOCALIZED CORROSION



2/14/97

SARTORIUS BALANCE

DATE 2/11/97

OBJECTIVE CHECK PERFORMANCE OF SARTORIUS

BALANCE MODEL RC 210P SN 10704379

ID# 2029 WITH CALIBRATED RICE LAB

WEIGHT ASTM CLASS 1 SN 63813 200 g

DATE OF CHECK WEIGHT MEASURED

2/11/97 199.99955 g

2/12/97 199.99960 g

2/12/97 EXTERNAL CALIBRATION TO 200 g WT

3/26/97 199.99800

3/27/97 EXTERNAL CALIBRATION TO 200 g WT

4/1/97 199.99940 g

4/1/97 EXTERNAL CALIBRATION TO 200 g WT

4/8/97 CALIBRATION BY CAL LAB

6/9/97 199.99990 g

11/20/97 199.99945 g

AFTER INTERNAL CAL 199.99940 g

AFTER EXT CAL 200.00000 g

I have reviewed this scientific notebook and find it in compliance with QAP-001. There is sufficient information regarding procedures used for conducting tests, acquiring and analyzing data so that another qualified individual could repeat the activity.

N. Snickel
2/14/97

Handwritten signature

2

STOCK SOLUTIONS 2/97

SO₄ - 2/97 1000 ppm SO₄²⁻ AS Na₂SO₄
1.47016 g Na₂SO₄ LOT 901213
+ DI WATER TO 1000 mL
PRBP ~~2/14/97~~ 2/14/97 EXP 3/12/97

NO₃ - 2/97 1000 ppm NO₃⁻ AS NaNO₃
1.37203 g NaNO₃ LOT 961772A
+ DI WATER TO 1000 mL
PRBP 2/12/97 EXP 3/12/97

F⁻ - 2/97 1000 ppm F⁻ AS NaF
2.21048 g NaF LOT 896405
+ DI WATER TO 1000 mL
PRBP 2/12/97 EXP 3/12/97

Handwritten signature 2/12/97

L82SP2AD

SPECIMEN ALLOY 825 NN4371FG SAME AS P145

START WT 30.82154g

END WT 30.82110g

SOLUTION 1000 PPM Cl^- 85PPM NO_3^- 20PPM SO_4^{2-} 10PPM NO_2^-
2PPM F^- 2000 mL MAKE AS FOLLOWS

3.29916 g NaCl LOT 951450

0.24519 g NaHCO_3 LOT 923337A40 mL SO_4^{2-} - 2/97 STOCK SOLUTION p 15320 mL NO_3^- - 2/97 STOCK SOLUTION p 1534 mL F^- - 2/97 STOCK SOLUTION p 153

+ DI WATER TO 2000 mL

T = 95°C N_2 THERMOMETER 0323008START pH = ~~9.074~~ 8.074

POTENTIOSTAT ESC 440 #1 CHANNEL #1

DATA SAVED AS L82SP2AD.DAT

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHER SC6 13-620-SI SN 0165403

E_{corr} +73mVE_{pt} +74mVE_{APPLIED} 0mV

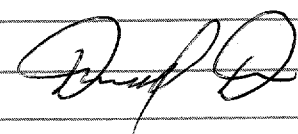
TEST STARTED 5:10 pm 2/17/97

TEST STOPPED 5:10 pm 3/19/97

RUNTIME 30.00 DAYS

END pH 9.157

NO SIGN OF LOCALIZED CORROSION

 3/27/97

LT82SP7U

SPECIMEN ALLOY 825 NN4371FG SAME AS P146

START WT 30.30805g

END WT 30.30788g

SOLUTION 1000PPM Cl^- 85PPM NO_3^- 20PPM SO_4^{2-}
10PPM NO_2^- 2PPM F^- 2000 mL MAKE AS FOLLOWS

3.29623 g NaCl LOT 951450

0.23484 g NaHCO_3 LOT 923337A40 mL SO_4^{2-} - 2/97 STOCK SOLUTION p 15320 mL NO_3^- - 2/97 "4 mL F^- - 2/97 "

+ DI WATER TO 2000 mL

T = 95°C N_2 THERMOMETER 0323004

START pH = 8.103

POTENTIOSTAT ESC 440 #2 CHANNEL #2

DATA SAVED AS LT82SP7U.DAT

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHER SC6 13-620-SI SN 2134032

E_{corr} +153mVE_{pt} +151mVE_{APPLIED} +200mV

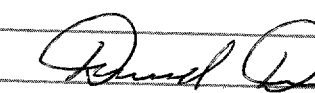
TEST STARTED 5:10 pm 2/17/97

TEST STOPPED 5:10 pm 3/19/97

RUNTIME 30 DAYS

END pH 9.005

NO SIGN OF LOCALIZED CORROSION

 3/27/97

LT82SP8U

SPECIMEN ALLOY 825 NH437IFG SAME AS P147

START WT 31.85376 g

END WT 31.81972 g

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
 10 PPM NO_3^- 2 PPM F- 2000 mL MAKE UP FOLLOWS

3.29472 g NaCl LOT 951450

0.25098 g NaHCO_3 LOT 923337A40 mL SO_4^{2-} 2/97 STOCK SOLUTION p 15320 mL NO_3^- 2/97 STOCK SOLUTION p 153

4 mL F- 2/97 STOCK SOLUTION p 153

+ DI WATER TO 2000 mL

1000 mL SOLUTION USED IN THIS TEST

T = 95°C Hg THERMOMETER 115809

START pH = 9.022 @ 2/17/97 8.022

POTENTIOSTAT ESC 440 #1 CHANNEL #3

DATA SAVED AS LT82SP8U.DAT

COUNTER ELECTRODE

GRAPHITE ROD Pt FINE

REFERENCE ELECTRODE FISHER SCE 13-620-51

SN 9214074

E_{CORR} +55 mVE_{PC} +50 mVE_{APPLIED} +100 mV

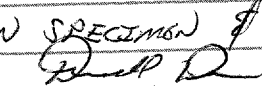
TEST STARTED 5:10 PM 2/17/97

CORROSION PRODUCTS OBSERVED ABOVE SOLUTION LEVEL
 ON 3/3/97. LAST CONTACT W/ REFERENCE ELECTRODE
 3/10/97

TEST STOPPED 5:10 PM 3/19/97

RUNTIME 30 DAYS

END pH 8.856

CRACKS CORROSION BETWEEN SPECIMEN & TEFLON GASKET
 ABOVE SOLUTION LEVEL  3/27/97

LT82SP4U,

SPECIMEN ALLOY 825 NH437IFG SAME AS P148

START WT = 38.95224 g

END WT 38.95196 g

2 PTFE CREVICE WASNERS ATTACHED TO SPECIMEN
 USING C276 NUT & BOLT TORQUED TO 40 IN.OZ
 WITH PROTO 6103

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-} 10 PPM NO_3^- 2 PPM F-

1000 mL SOLUTION ON P 156

T = 95°C Hg THERMOMETER 115814

START pH = 9.022 @ 2/17/97 8.022

POTENTIOSTAT ESC 440 #1 CHANNEL #4

DATA SAVED AS LT82SP4U

COUNTER ELECTRODE GRAPHITE ROD

REFERENCE ELECTRODE FISHER SCE 13-620-51 SN 3106343

E_{CORR} -37 mVE_{PC} @ 2/17/97 E_{GRAPHITE} -39 mVE_{APPLIED} 0 mV

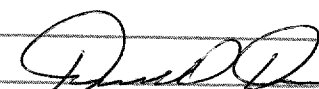
TEST STARTED 5:10 PM 2/17/97

TEST STOPPED 5:10 PM 3/19/97

RUNTIME 30 DAYS

END pH 8.771

NO SIGN OF LOCALIZED CORROSION

 3/27/97

LT82SP54.DAT

SPECIMEN ALLOY 825 HH4371FG SAME AS P149

START WT 39.08798g

END WT 39.08616g

2 PTFE CREVICE WASHERS ATTACHED TO SPECIMEN
WITH C276 NUT & BOLT TORQUED TO 40 IN-OZ
USING PROTO 6103SOLUTION 1000 PPM Cl^- 85PPM HCO_3^- 20PPM SO_4^{2-}
10PPM NO_3^- 2PPM F^- 2000 mL MAKE AS FOLLOWS

3.29682 g NaCl LOT 951456

0.24487 g NaHCO_3 LOT 923337A40 mL SO_4^{2-} 2/97 STOCK SOLUTION P15320 mL NO_3^- 2/97 "4 mL F^- 2/97 "T = 95°C H_2 THERMOMETER 61771

START pH 8.111

1000 mL SOLUTION USED IN THIS TEST

POTENTIOSTAT ESC 440 #1 CHANNEL #5
DATA SAVED AS LT82SP54.DATCOUNTER ELECTRODE GRAPHITE ROD
REFERENCE ELECTRODE FISHER SCE B-620-51 SN 9214083 E_{CORR} -75mV E_{GRAPHITE} +2mV E_{APPLIED} -100mV

TEST STARTED 5:10 PM 2/17/97

TEST STOPPED 5:10 PM 3/19/97

RUNTIME 30 DAYS

END PH 8.963

NO SIGN OF LOCALIZED CORROSION

Randy D 3/27/97

OC82SC1P.DAT

SPECIMEN ALLOY 825 HH4371FG SAME AS P150

START WT 39.28570g

END WT 39.28552g

2 PTFE CREVICE WASHERS ATTACHED TO SPECIMEN
WITH C276 NUT & BOLT TORQUED TO 40 IN-OZ
USING PROTO 6103SOLUTION 1000 PPM Cl^- 85PPM HCO_3^- 20PPM SO_4^{2-}
10PPM NO_3^- 2PPM F^-

1000 mL SOLUTION ON PAGE 158

T = 95°C H_2 THERMOMETER 115749

START pH = 8.111

POTENTIOSTAT ESC 440 #1 CHANNEL #6
DATA SAVED AS OC82SC1P.DATCOUNTERELECTRODE Pt FLAG
REFERENCE ELECTRODE -RT 2/17/97 FISHER SCE
13-620-51 SN 3106337 E_{CORR} -155mV E_{Pt} +63mV E_{APPLIED} O.C.

TEST STARTED 5:10 PM 2/17/97

MEASURED E_{CORR} INCORRECT DURING FIRST 89,000s
OF TEST DUE TO BUBBLE IN LOGGING PROBE.

RUNTIME 30 DAYS

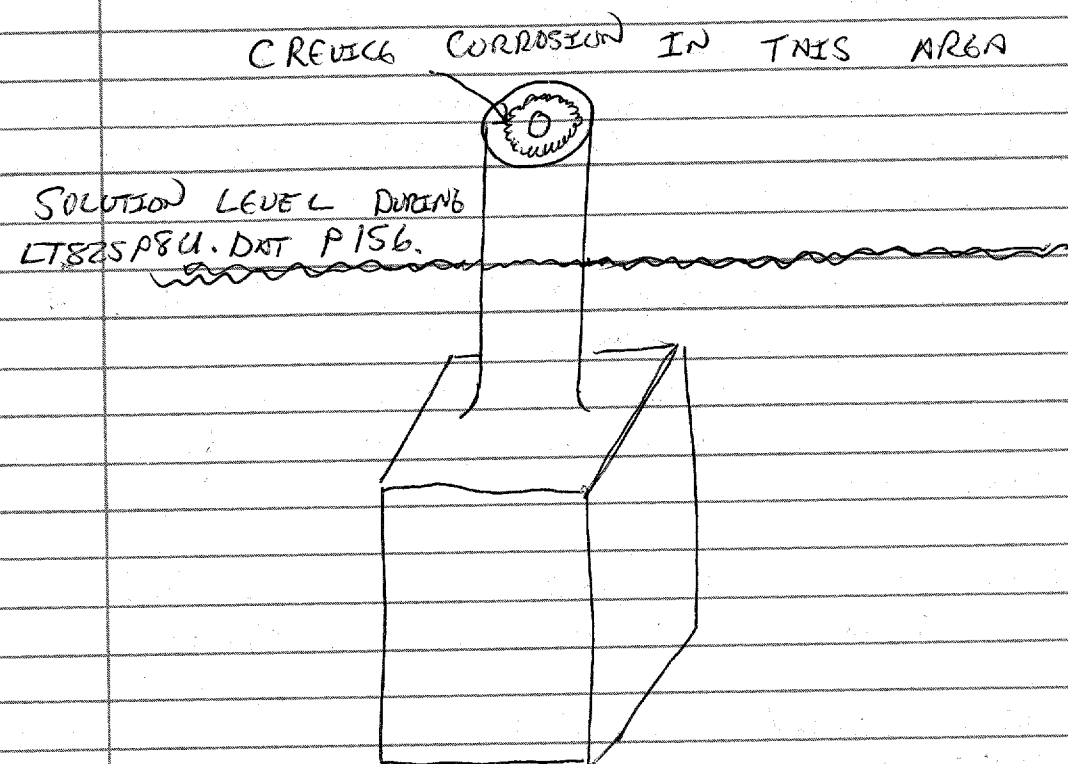
TEST STOPPED 5:16 PM 3/19/97

END PH 9.164

NO SIGN OF ADDITIONAL LOCALIZED CORROSION

Randy D 3/27/97

OBSERVATIONS OF LT82SP84, DAT T65T



CREVICE CORROSION WAS OBSERVED IN THE GASKET AREA OF THE SPECIMEN. IN PREVIOUS TESTS, THE GASKET AREA WAS IMMERSSED IN SOLUTION. NOW DUE DURING LT82SP84, DAT ON PAGE 156 THE GASKET AREA WAS MAINTAINED ABOVE THE SOLUTION LEVEL.

THE SPECIMEN WAS POLISHED TO REMOVE ALL OF THE CORRODED REGIONS AND REWEIGHED.

NEW SPECIMEN WEIGHT: 31.73676g

Paul D 4/3/97

STOCK SOLUTIONS 4/97

NO_3^- - 4/97

1000 ppm NO_3^- AS NaNO_3
1.37128g NaNO_3 LOT 961772A
+ DI WATER TO 1000 mL
PREP 4/1/97 EXP 5/1/97

F- 4/97

1000 ppm F- AS NaF
2.21081g NaF LOT 896405
+ DI WATER TO 1000 mL
PREP 4/1/97 EXP 5/1/97

SO_4^{2-} - 4/97

1000 ppm SO_4^{2-} AS Na_2SO_4
1.47206g Na_2SO_4 LOT 901213
+ DI WATER TO 1000 mL
PREP 4/1/97 EXP 5/1/97

Paul D 5/22/97

LT825 P2AE

SPECIMEN ALLOY 825 NH4371FG SAME AS P154
 START WT 30.82110 ^{8/25/97}
 END WT ~~30.31094~~ 30.82083 ^{8/22/97}

SOLUTION 1000 PPM Cl^- 85PPM HCO_3^- 20PPM SO_4^{2-}
 10 PPM NO_3^- 2PPM F^- 2000 mL MADE AS FOLLOWS

3.29890 g NaCl LOT 951450
 0.24859 g NaHCO_3 LOT 923337A
 40 mL SO_4^{2-} - 4/97 STOCK SOLUTION P161
 20 mL NO_3^- - 4/97 STOCK SOLUTION P161
 4 mL F^- - 4/97 STOCK SOLUTION P161
 + DI WATER TO 2000 mL
 T = 95°C H_2 THERMOMETER 183302
 START pH 8.315 END pH 9.002

POTENTIOSTAT ESC 440 #1 CHANNEL #1
 DATA SAVED AS LT825P2AE.DAT

COUNTER ELECTRODE Pt FLAG
 REFERENCE ELECTRODE FISHER SCE 13-620-S1 SN 0165403

E_{CORR} +15mV
 E_{PE} +170mV
 E_{APPLIED} 0mV
 TEST STARTED 4/4/97 8:45 AM
 TEST STOPPED 8/22/97 9:45 AM

David D 8/22/97

LT825P7V.DAT

SPECIMEN ALLOY 825 NH4371FG SAME AS P155
 START WT 30.30788
 END WT 30.30981

SOLUTION 1000 PPM Cl^- 85PPM HCO_3^- 20 PPM SO_4^{2-}
 10 PPM NO_3^- 2PPM F^- 2000 mL MADE AS FOLLOWS.

3.29615 g NaCl LOT 951450
 0.24390 g NaHCO_3 LOT 923337A
 40 mL SO_4^{2-} - 4/97 STOCK SOLUTION P161
 20 mL NO_3^- - 4/97 " "
 4 mL F^- - 4/97 " "
 + DI WATER TO 2000 mL
 T = 95°C H_2 THERMOMETERS 183303
 START pH 8.390 END pH 9.074

POTENTIOSTAT ESC 440 #1 CHANNEL #2
 DATA SAVED AS LT825P7V.DAT

COUNTER ELECTRODE Pt FLAG
 REFERENCE ELECTRODE FISHER SCE 13-620-S1 SN 9214083

E_{CORR} +97mV
 E_{PE} +179mV
 E_{APPLIED} 200mV
 TEST STARTED 4/4/97 8:45 AM
 TEST STOPPED 8/22/97 9:45 AM

David D 8/22/97

LT 825P8V.DAT

SPECIMEN ALLOY 825 NN4371FG SAME AS P156

START WT 31.85376 g

END WT 31.73614 g

SOLUTION 1000 ppm Cl^- 85 ppm HCO_3^- 20 ppm SO_4^{2-}
 10 ppm NO_3^- 2 ppm F- 2000 mL made AS FOLLOWS

3.29957 g NaCl LOT 951450

0.24306 g NaHCO_3 LOT 923337A40 mL SO_4^{2-} 4/1/97 STOCK SOLUTION P 16120 mL NO_3^- 4/1/97 "

4 mL F- 4/1/97 "

+ DI WATER TO 2000 mL

1000 mL SOLUTION USED IN THIS TEST

T = 95°C Hg THERMOMETER 115814

START pH 8.236 END pH 9.002

POTENTIOSTAT ESC 440 #1 CHANNEL #3

DATA SAVED AS LT825P8V.DAT

COUNTER ELECTRODE Pt FLAG

REFERENCE ELECTRODE FISHER SCE 13-620-S1 SN 9214074

E_{CORR} -90 mVE_{PE} +158E_{APPLIED} 100 mV

TEST STARTED 4/4/97 8:45 AM

Test Stopped 8/22/97 9:45 AM

Drew D 8/22/97

LT 825P4V.DAT

SPECIMEN ALLOY 825 NN4371FG SAME AS P 157

START WT 38.95196 g

END WT 38.95168 g

2 PTFE CREVICE WASHERS ATTACHED TO SPECIMEN
 WITH C276 NUT AND BOLT TORQUED TO
 40 IN.OZ USING PROTO 6103

SOLUTION 1000 ppm Cl^- 85 ppm HCO_3^- 20 ppm SO_4^{2-}
 10 ppm NO_3^- 2 ppm F-

1000 mL OF SOLUTION LISTED ON P 164

T = 95°C Hg THERMOMETER 115809

START pH 8.236 END pH 8.900

POTENTIOSTAT ESC 440 #1 CHANNEL #4

DATA SAVED AS LT 825P4V.DAT

COUNTER ELECTRODE GRAPHITE ROD

REFERENCE ELECTRODE FISHER SCE 13-620-S1 SN 3106337

E_{CORR} -68 mVE_{CAN-PWELL} +3 mVE_{APPLIED} 0 mV

TEST STARTED 4/4/97 8:45 AM

Test stopped 8/22/97 9:45 AM

Drew D 8/22/97

LT82SPSV.DAT

SPECIMEN ALLOY 825 HH4371FG SAME AS P158
 START WT 39.08616 g
 END WT 39.08558 g
 2 PTFE CREVICE WASHERS ATTACHED TO SPECIMEN
 USING C276 NUT AND BOLT TORQUED TO
 40 IN.OZ USING PROTO 6103

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
 10 PPM NO_3^- 2 PPM F^- 2000 mL MADE AS FOLLOWS

3.29837 g NaCl LOT 951450
 0.24396 g NaHCO_3 LOT 923337A
 40 mL SO_4^{2-} 4/97 STOCK SOLUTION P 161
 20 mL NO_3^- 4/97 "
 4 mL F^- 4/97 "
 1000 mL SOLUTION USED IN THIS TEST
 + DI WATER TO 2000 mL
 T = 95°C Hg THERMOMETER 81771
 START pH 8.169 END pH 9.017

POTENTIOSTAT ESC 440 #1 CHANNEL #5
 DATA SAVED AS LT82SPSV.DAT

COUNTER ELECTRODE GRAPHITE ROD
 REFERENCE ELECTRODE FISHER SCE 13-620-SI SN 4280310

E_{CORR} -81
 E_{GRAPHITE} -18
 E_{APPLIED} -100 mV
 TEST STARTED. 4/4/97 8:45 AM
 TEST STOPPED 8/22/97 9:45 AM

David D 8/22/97

OC82SC1Q.DAT

SPECIMEN ALLOY 825 HH4371FG SAME AS P159
 START WT
 END WT 39.28514 g
 2 PTFE CREVICE WASHERS ATTACHED TO SPECIMEN
 USING C276 NUT AND BOLT TORQUED TO
 40 IN.OZ USING PROTO 6103

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
 10 PPM NO_3^- 2 PPM F^-
 1000 mL SOLUTION ON P 166
 T = 95°C Hg THERMOMETER 115749
 START pH 8.169 END pH 8.787

POTENTIOSTAT ESC 440 #1 CHANNEL #6
 DATA SAVED AS OC82SC1Q.DAT

COUNTER ELECTRODE PE FLAG
 REFERENCE ELECTRODE FISHER SCE 13-620-SI SN 2134032

E_{CORR} 112 mV
 E_{PE} +70 mV
 E_{APPLIED} 0 C
 TEST STARTED 4/4/97 8:45 AM
 TEST STOPPED 8/22/97 9:45 AM

David D 8/22/97

~~SR8251.DAT~~ DD 4/5/97 SR316L1.DAT

OBJECTIVE DETERMINING E_p & E_{RP} OF ALLOYS
AS A FUNCTION OF SCAN RATE

SPECIMEN TYPE 316L P80746 DD 4/5/97
~~ALLOY 825~~ ~~NN43746~~ CROUTCH REASSURANCE
SPECIMEN W 2 PTFE CROUTCH BLOCKS ATTACHED
WITH C276 NUT AND BOLT TORQUED TO
40 IN.OZ USING PROTO 6103
AREA = 15 cm^2
START WT 29.48199g
END WT

SOLUTION 1000 PPM Cl^- 85 PPM NO_3^- 20 PPM SO_4^{2-}
10 PPM NO_3^- 2 PPM F^- 2000 mL MAKE AS FOLLOWS
3.29769 g NaCl LOT 951450
0.24092 g NaNHCO_3 LOT 923337A
40 mL SO_4^{2-} 4/97 STOCK SOLUTION P161
20 mL NO_3^- 4/97 "
4 mL F^- 4/97 "
+ DI WATER TO 2000 mL
T = 95°C N₂ THERMOMETER 183301
DEAERATED WITH 99.999% N_2
POTENTIOSTAT EG&G VERSASTAT SN 20104
W/MODEL 352C SOFTWARE

REFERENCE ELECTRODE FISHER SCE 13-620-51
SN 3106339
COUNTER ELECTRODE Pt FLAG.

SALT BRIDGE SOLUTION 1000 PPM Cl^- AS NaCl
 E_{CURR} -609
 E_{Pt} -331
TEST STARTED 4/3/97 11:55 PM
START pH 8.256
END pH 9.070

DD 4/3/97

~~SR8251.DAT~~ SR316L1.DAT.

E_p -180 mV DD 4/5/97 18 mV
 E_{RP} -12 mV

DD 4/3/97

SR 316L 2

OBJECTIVE DETERMINE E_p AND E_{R_p} AS
A FUNCTION OF SCAN RATE

SPECIMEN 316L P80746 CR6 VICE REPASSIVATION
SPECIMEN WITH 2 PTFE CREVICE WASHERS
ATTACHED USING C276 NUT AND BOLT TORQUED
TO 40 IN-OZ USING PROTO 6103
AREA = 15 cm^2
START WT 29.41766g
END WT

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
10 PPM NO_3^- 2 PPM F^- SAME AS P 168
 $T = 95^\circ\text{C}$ H_2 THERMOMETER 183301
DEAERATED W/ 99.999 % N_2
POTENTIOSTAT EG&G VERSASTAT SN 20104
W/ MODEX 352C SOFTWARE

REFERENCE ELECTRODE FISHER 13-620-51 SN 3106339
COUNTER ELECTRODE Pt FLAG

SALT BRIDGE SOLUTION 1000 PPM Cl^- AS NaCl
 $E_{\text{CURR}} -750 \text{ mV}$ KODALYST 614 SN 467374
 $E_{\text{PE}} -401 \text{ mV}$
TEST STARTED 4/5/97
START pH 8.256
END pH 8.992

Quint 4/5/97

LT 825 P2 AF

Specimen: Alloy 825 HH4371FF same as p. 162
start wt. 30.82110g
end wt. 30.82082g

Solution: 1000 ppm Cl^- 85 ppm HCO_3^- 20 ppm SO_4^{2-}
10 ppm NO_3^- 2 ppm F^-
3.30094g NaCl lot # 960780
0.23784g NaHCO_3 lot # 923337A
40ml SO_4^{2-} 8/97
20ml NO_3^- 8/97
4ml F^- 8/97 } stock solutions p. 175
+ DI water to 2000 mL

start pH 8.489 end pH

$T = 95^\circ\text{C}$ Hg thermometer 0323002

Potentiostat: ESC 440 #1 channel #1
Data saved as LT825P2AF.DAT

Counter electrode: Pt flag
Reference electrode: Fisher SCE 13-620-51 S/N 0163403

$E_{\text{CURR}} -156 \text{ mV}$

$E_{\text{PE}} +5 \text{ mV}$

Test started 11:45 AM 9/3/97
PROBLEMS W/ DATA ACQUISITION SYSTEM TEST STOPPED/RESTARTED
9/8/97 9:25 AM
TEST STOPPED 11/13/97 5:30 PM $t = 5738700 \text{ seconds}$
END pH = 9.105

Quint 11/13/97

STOCK SOLUTIONS 5/97

SO₄⁻ 5/97

1000 ppm SO₄⁻ as Na₂SO₄
 1.47034 g Na₂SO₄ LOT 901213
 + DI WATER TO 1000 mL
 PREP 4/28/97 EXP 5/28/97

NO₃⁻ 5/97

1000 ppm NO₃⁻ as NaNO₃
 1.37035 g NaNO₃ LOT 961772A
 + DI WATER TO 1000 mL
 PREP 4/28/97 EXP 5/28/97

F⁻ 5/97

1000 ppm F⁻ as NaF
~~2.12~~ 2.21063 g NaF LOT 896405
 + DI WATER TO 1000 mL
 PREP 4/28/97 EXP 5/28/97

Paul D 4/28/97

Stock Solutions 6/97

SO₄⁻ - 6/97

1000 ppm SO₄⁻ as Na₂SO₄
 1.48391 g Na₂SO₄ LOT 901213
 + DI water to 1000 mL
 prep 6/2/97 EXP 7/2/97

NO₃⁻ - 6/97

1000 ppm NO₃⁻ as NaNO₃
 1.37878 g NaNO₃ LOT 961772A
 + DI water to 1000 mL
 prep 6/2/97 exp 7/2/97

F⁻ - 6/97

1000 ppm F⁻ as NaF
 2.21556 g NaF LOT 896405
 + DI water to 1000 mL
 prep 6/2/97 exp 7/2/97

Dustin Mackowski
 6/2/97

Stock Solutions 7/97

SO₄ - 7/97

1000 ppm SO₄²⁻ as Na₂SO₄
 1.48393 g Na₂SO₄ lot # 901213
 + DI water to 1000 mL
 prep 7/8/97 exp 8/8/97

F⁻ - 7/97

1000 ppm F⁻ as NaF
 2.23092 g NaF lot # 896405
 + DI water to 1000 mL
 prep 7/8/97 exp 8/8/97

NO₃⁻ 7/97

1000 ppm NO₃⁻ as NaNO₃
 1.37433 g NaNO₃ lot # 961772A
 + DI water to 1000 mL
 prep. 7/8/97 exp 8/8/97

Nathan J MacKinnon
 7/8/97

Stock Solutions 8/97

SO₄ - 8/97

1000 ppm SO₄²⁻ as Na₂SO₄
 1.48596 g Na₂SO₄ lot # 901213
 + DI water to 1000 mL
 prep 8/30/97 exp 9/30/97

NO₃⁻ 8/97

1000 ppm NO₃⁻ as NaNO₃
 1.37563 g NaNO₃ lot # 961772A
 + DI water to 1000 mL

prep. 8/30/97 exp 9/30/97

F⁻ 8/97

1000 ppm F⁻ as NaF
 2.23172 g NaF lot # 896405
 + DI water to 1000 mL

prep. 8/30/97 exp 9/30/97

LT 825 P7W

Specimen: Alloy 825 HH4371FG same as p. 163
 start wt. 30.30881 g
 end wt. 30.30564 g

Solution: 1000 ppm Cl^- 85 ppm HCO_3^- 20 ppm SO_4^{2-}
 10 ppm NO_3^- 2 ppm F^-
 3.30181 g NaCl lot # 960780
 0.23619 g NaHCO_3 lot # 923337A
 40 ml SO_4^{2-} 8/97 } stock solution p. 175
 20 ml NO_3^- 8/97 }
 4 ml F^- 8/97 }

+ DI water to 2000 mL

start pH 8.489 end pH
 8.142 8/29/97 w/NaOH

T = 95°C Hg thermometer

Potentiostat: ESC 440 #1 channel #2
 Data saved as LT825P7W.DAT

Counter electrode: Pt flag
Reference electrode: Fisher SCE 13-620-51 S/N 9214083

 $E_{\text{com}} = +85 \text{ mV}$ $E_{\text{PE}} = +166 \text{ mV}$

Test started 11:45 AM 9/3/97

PROBLEMS w/ DATA ACQUISITION SYSTEM TESTS STOPPED/RESTARTED
 9/8/97 9:25 AM

TEST STOPPED 11/13/97 5:30 PM $t = 5738700$ SECONDS
 ENDPN 9.206

Daniel D. 11/19/97

LT 825 P8W

Specimen: Alloy 825 HH4371FG same as p. 164
 start wt. 31.73614 g
 end wt. 31.73638 g

Solution: 1000 ppm Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 4 ppm 2 ppm F^-
 8/29/97 w/NaOH

3.29899 g NaCl lot # 960780

0.25813 g NaHCO_3 lot # 923337A40 ml SO_4^{2-} 8/9720 ml NO_3^- 8/974 ml F^- 8/97

+ DI water to 2000 mL used 1000 mL

start pH 8.142 end pH

8.128 8/29/97 w/NaOH

T = 95°C Hg thermometer

Potentiostat: ESC 440 #1 channel #3
 data saved as LT825P8V.DAT

Counter electrode: Pt flagReference electrode: Fisher SCE 13-620-51 S/N 9214074 $E_{\text{com}} = -33 \text{ mV}$ $E_{\text{PE}} = +149 \text{ mV}$

Test started 1:15 PM 9/3/97

PROBLEMS WITH DATA ACQUISITION SYSTEM TESTS STOPPED/RESTARTED
 9/8/97 9:25 AM

TEST STOPPED 11/13/97 5:30 PM $t = 5738700$ SECONDS
 ENDPN 9.216

Daniel D. 11/19/97

LT 825 p4W

Specimen: Alloy 825 HH4371FC same as p. 165
 start wt. 38.95168g
 end wt. 38.95159g
 2 PTFE crevice washer attached as per p. 165

Solution: Same as p. 177
 used 1000 mL of it

start pH 8.128 end pH

Temp = 95°C Hg thermometer 0323008

Potentiostat: ESC 440 #1 channel #4
 data saved as LT825P4W.DAT

Counter electrode: graphite rod

Reference electrode: Fisher SCE 13-620-51 S/N 3106337

$E_{an} = -62 \text{ mV}$

9/3/97 w/ malinchi
 $E_{an} = +3 \text{ mV}$
 E_{graph}
 $E_{APPLIED} = 0 \text{ mV}$

Test started 11:45 AM 9/3/97

PROBLEMS W/ DATA ACQUISITION SYSTEM TESTS STOPPED / RESTARTED

9/8/97 9:25 AM

TEST STOPPED 11/13/97 5:30 PM $t = 5738700$ SECONDS

END PNE 9.196

SMALL AREA OF CREVICE CORROSION ON MILL FINES NEO SURFACE

Quinn D 11/19/97

LT 825 p5W

Specimen: Alloy 825 HH4371FC same as p. 166
 start wt. 38.95168g 39.08558g 8/29/97 w/ malinchi
 end wt. 39.08534g
 2 PTFE crevice washer attached as per p. 166
 8/29/97 w/ malinchi

Solution: 1000 mL ppm Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-
 3.29408g NaCl lot # 960780
 0.24240g NaHCO_3 lot # 923337A
 40 mL SO_4^{2-} 8/97 } Stock solution p. 175
 20 mL NO_3^- 8/97 }
 4 mL F^- 8/97 }
 + DI water to 2000 mL used 1000 mL

start pH 8.131 end pH

T = 95°C Hg thermometer

Potentiostat: ESC 440 #1 channel #5
 data saved as LT825P5W.DAT

Counter electrode: graphite rod

Reference electrode: Fisher SCE 13-620-51 S/N 4280310
 9/3/97 w/ malinchi

$E_{an} = +14 \text{ mV} - 69 \text{ mV}$

$E_{graph} = +14 \text{ mV}$

Test started 1:15 PM 9/3/97

PROBLEMS W/ DATA ACQUISITION SYSTEM TESTS STOPPED / RESTARTED

9/8/97 9:25 AM

TEST STOPPED 11/13/97 5:30 PM $t = 5738700$ SECONDS

END PNE 9.068

Quinn D 11/19/97

OC825CIR

Specimen: Alloy 825 #H4371 FC same as p.167
 start wt. 39.28514 g
 end wt. 39.28507 g
 2 PTFE crevice washers attached per p.167

Solution: Same as p.179
 used 1000 mL of it

start pH 8.131 end pH

T = 95°C Hg thermometer

Potentiostat: ESC 440 #1 channel #6
 data saved as OC825CIR.DAT

Counter electrode: Pt flag

Reference electrode: Fisher SCE 13-620-51 S/N 3106321
 9/3/97 w/Druckman

$E_{com} = +81 \text{ mV} - 61 \text{ mV}$

$E_{Pt} = +280 \text{ mV} \quad 9/3/97$
 $+64 \text{ mV} \quad \text{w/Druckman}$

Test started 11:45 PM 9/3/97

PROBLEMS WITH DATA ACQUISITION SYSTEM TESTS STOPPED/RESTARTED

9/8/97 9:25 AM

TEST STOPPED 11/13/97 5:30 PM t = 5738700 SECONDS

END pH = 9.092

E_{corr} ERRATIC AND VERY HIGH > 200 mV POSSIBLE

PROBLEM WITH LUGGON PROBE DURING LAST PART

OF TEST

CREVICE CORROSION ON WELL FINISHED SURFACE.

Druckman 11/19/97

Stock Solution 9/97

SO_4^{2-} 9/97

1000 ppm SO_4^{2-} as Na_2SO_4
 1.48277 g Na_2SO_4 # 901213
 + DI water to 1000 mL
 prep. 9/22/97 exp 10/22/97

NO_3^- 9/97

1000 ppm NO_3^- as NaNO_3
 1.37198 g NaNO_3 # 961772A
 + DI water to 1000 mL
 prep. 9/22/97 exp 10/22/97

F^- 9/97

1000 ppm F as NaF
 2.23201 g NaF # 896405
 prep + DI water to 1000 mL
 prep 9/22/97 exp 10/22/97

Druckman 6/24/98

Stock Solutions 10/97

 SO_4^{2-} 10/971000 ppm SO_4^{2-} as Na_2SO_4

1.48072 g Na_2SO_4 lot # 901213
 + DI water to 1000 mL
 prep. 10/30/97 exp 11/30/97

 NO_3^- 10/971000 ppm NO_3^- as NaNO_3

1.37054 g NaNO_3 lot # 961722A
 + DI water to 1000 mL
 prep. 10/30/97 exp 11/30/97

 F^- 10/971000 ppm F^- as NaF

2.21002 g NaF lot # 896405
 + DI water to 1000 mL
 prep. 10/30/97 exp 11/30/97

Quinn D
6/24/98

LT 825 P2AG

SPECIMEN ALLOY 825 SAME AS P121

START WT 30.82082g

END WT 30.82076g

SOLUTION 1000 ppm Cl^- 85 ppm NaCO_3^{2-} 20 ppm SO_4^{2-}
 10 ppm NO_3^- 2 ppm F^-

3.29287 NaCl LOT 9607860.23543 NaHCO_3 LOT 89778940 mL SO_4 - 10/97 STOCK SOLUTION P18220 mL NO_3 - 10/97 "4 mL F^- - 10/97 "

+ DI WATER TO 2000 mL

START PH 8.324

END PH not taken

T = 95°C Hg THERMOMETER C95 819

POTENTIOSTAT ESC 446 #1 CHANNEL #1 11/19/97

DATA SAVED AS ~~LT825P2AG.DAT~~ L825P2AG.DAT

COUNTER ELECTRODE Pt FLAG

REFERENCE ELECTRODE 3106321 FISHER SC6 13-620-51

 E_{corr} +18 mV E_{pe} +153 mV E_{APPLIED} 0 mV

TEST STARTED 3:30 pm 11/19/97

Quinn D
2/2/98

LT825P7X

SPECIMEN ALLOY 825 HN437IFG SAME AS p 176

START WT 30.30564g

END WT 30.30566g

SOLUTION 1000 ppm Cl^- 85ppm HCO_3^- 20 ppm SO_4^{2-}
10 ppm NO_3^- 2ppm F^-

3.30550 NaCl LOT 960780

0.23745 NaHCO_3 LOT 89778940 mL SO_4 - 10/97 STOCK SOLUTIONS p18220 mL NO_3 - 10/97 "4 mL F^- - 10/97 "

+ DI WATER TO 2000 mL

START pH 8.314

END pH not taken

T = 95°C Hg THERMOMETER C96-742

POTENTIOSTAT ESC 440 #1 CHANNEL #2

DATA SAVER AS LT825P7X.DAT

COUNTER ELECTRODE Pt FLNG

REFERENCE CG ELECTRODE FISHER SC6 13-620-S1 SN 9214074

 E_{CORR} -83mV E_{PT} +145mV E_{APPLIED} 200mV

TEST STARTED. 3:30 pm 11/19/97

Paul D 2/2/98

20 11/19/97

~~LT825P8W~~ LT825P8X

SPECIMEN ALLOY 825 HN437IFG SAME AS p 177

START WT 31.73638g

END WT 31.73581g

SOLUTION 1000 ppm Cl^- 85ppm HCO_3^- 20 ppm SO_4^{2-}
10 ppm NO_3^- 2ppm F^-

3.29606 NaCl LOT 960780

0.23816 NaHCO_3 LOT 89778940 mL SO_4 - 10/97 STOCK SOLUTION p18220 mL NO_3 - 10/97 "4 mL F^- - 10/97 "

+ DI WATER TO 2000 mL

1000 mL USED IN THIS TEST

START pH 8.556

END pH not taken

T = 95°C Hg THERMOMETER C96-742 61771

POTENTIOSTAT ESC 440 #1 CHANNEL #3

DATA SAVER AS ~~LT825P8W.D~~ 20 11/19/97 LT825P8X.DAT

COUNTER ELECTRODE Pt FLNG

REFERENCE CG ELECTRODE FISHER SC6 13-620-S1 SN 0165403

 E_{CORR} -101mV E_{PT} +122mV E_{APPLIED} 100mV

TEST STARTED. 3:30 pm 11/19/97

Paul D 2/2/98

LT82SP4X

SPECIMEN ALLOY 825 HN437IFG SAME AS P165
 2 PTFE CRUICE WASNERS ATTACHED AS PER P165
 START WT 38.95189g
 END WT 38.95067g

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
 10 PPM NO_3^- 2 PPM F^-

1000 mL OF SOLUTION ON P185.
 START pH 8.556
 END pH not taken
 T = 95°C N₂ THERMOMETER 115809

POTENTIOSTAT ESC 440 #1 CHANNEL # 4
 DATA SAVED AS LT82SP4X.DAT

COUNTER ELECTRODE GRAPHITE ROD
 REFERENCE ELECTRODE 9214083 FISHER JCS 13-620-S1

E_{corr} -53 mV

DA 11/19/97 E_{PT} E_{COUNTER} 7 mV

E_{APPLIED} 0 mV

TEST STARTED 3:30 pm 11/19/97

Paul D 2/2/98

LT82SP5X

SPECIMEN ALLOY 825 HN437IFG SAME AS P179
 2 PTFE CRUICE WASNERS ATTACHED AS PER P166
 START WT 39.08534g
 END WT 39.08456g

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
 10 PPM NO_3^- 2 PPM F^-

3.29609 g NaCl LOT 960780

0.23688 g NaHCO_3 LOT 897789

40 mL SO_4^{2-} 10/97 STOCK SOLUTION P182

20 mL NO_3^- 10/97 "

4 mL F^- 10/97 "

+ DI WATER TO 2000 mL 1000 mL USED IN TEST

POTENTIOSTAT ESC 440 #1 CHANNEL # 5

DATA SAVED AS LT82SP5X.DAT

COUNTER ELECTRODE GRAPHITE ROD
 REFERENCE ELECTRODE FISHER JCS 13-620-S1 SN 3106337

E_{corr} -107 mV

DA 11/19/97 E_{PT} E_{COUNTER} -51 mV

E_{APPLIED} -100 mV

TEST STARTED 3:30 pm 11/19/97

START pH 8.297

END pH not taken

SOLUTION TEMP = 95°C N₂ THERMOMETER 0323002

TEST STOPPED

Paul D 2/2/98

OC825C15

SPECIMEN ALLOY 825 HH437IF6 SAME AS P 180
2 PTFE CREVICE WASHERS ATTACHED TO SPECIMEN AS PER P 167

START WT 39.28507g
END WT 39.28415g

SOLUTION 1000ppm Cl^- 85ppm HCO_3^- 20ppm SO_4^{2-}
10ppm NO_3^- 2ppm F^-

1000 mL SOLUTION ON P 187

START pH 8.297

END pH not taken

T = 95°C Hg THERMOMETER 0323008

POTENTIOSTAT ESC 440 #1 CHANNEL #6

DATA SAVED AS ~~CT~~ DD 11/19/97 OC825C15.DAT

COUNTER ELECTRODE Pt FLAG.

REFERENCE ELECTRODE FISHER SCG 13-620-SF
SN 5129569

E_{corr} -86mV

E_{Pt} +76mV

E_{APPLIED} O.C.

TEST STARTED. 3:30 PM 11/19/97

Quinn Q 2/2/98

OPEN CIRCUIT POTENTIAL TEST

OBJECTIVE MEASURE OPEN CIRCUIT POTENTIAL OF
POLISHED & PASSIVATED ALLOY 825

SPECIMEN ALLOY 825 HH437IF6 1.915" x 0.250"
1200 GRIT FINISH PASSIVATED IN 10% HNO_3

START WT 11.08696g GND WT

TEST SOLUTION 1000 ppm Cl^- 85 ppm HCO_3^-
20ppm SO_4^{2-} 10ppm NO_3^- 2ppm F^-

REMAINDER OF TEST SOLUTION ON P 183

START pH 8.324

GND pH NOT RECORDED

T = 95°C Hg THERMOMETER

POTENTIOSTAT EG&G VERSASTAT SN 20104

DATA SAVED AS:

REFERENCE FISHER SCG 13-620-SF SN 7079123

COUNTER ELECTRODE Pt FLAG

DATA OBTAINED USING EG&G SOFTWARE MODEL
352C E_{corr} VS TIME TECHNIQUE.

CONDITIONS AT START OF TEST

E_{corr} -446 mV

E_{Pt} +77mV

TEST STARTED 12/4/97 2:54 PM

Quinn Q 2/2/98

LT825P2AH

Specimen Alloy 825 same as p.183
 start wt. 30.82076 g
 end wt. 30.81863 g

Solution: 1000 ppm Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-

3.29934 g NaCl lot # 960780

0.23827 g NaHCO_3 lot # 890789

10 ml SO_4^{2-} } NB086

20 ml NO_3^- } 2/98 } p.222

4 ml F^- }

+ DI water to 2000 mL
 start pH 8.029 end pH 9.248

$T = 95^\circ\text{C}$ Hg Thermometer C96-816

Potentiostat ESC 440 #1 Channel #1
 data same as LT825P2AH.DAT

Counter electrode: Pt flag
 Reference electrode: Fisher SCE #13-620-51 S/N 3106321

E_{applied} : 0 mV

Test started 9:45 AM 2/3/98
 Test stopped 4:27 PM 8/31/98 18089400 sec

LT825P2Y

Specimen Alloy 825 same as p.184
 start wt. 30.30566 g
 end wt. 30.31275 g

Solution: 1000 ppm Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-

3.29897 g NaCl lot # 960780

0.24152 g NaHCO_3 lot # 890789

40 ml SO_4^{2-} } NB086

20 ml NO_3^- } 2/98 } p.222

4 ml F^- }

+ DI water to 2000 mL

start pH 8.126 end pH 9.192

$T = 95^\circ\text{C}$ Hg thermometer C96-852

Potentiostat ESC 440 #1 Channel #2
 data same as LT825P2Y.DAT

counter electrode: Pt flag
 ref. electrode: Fisher SCE #13-620-51 S/N 9214074

E_{applied} : 200 mV

Test started 9:45 AM 2/3/98
 Test stopped 4:27 PM 8/31/98 18089400 sec.

LT 825 P8Y

Specimen Alloy 825 same as p. 185
 start wt, 31.73581 g
 end wt, 31.73513 g

Solution: 1000 ppm Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-
 3.28355 g NaCl lot # 960780
 0.23614 g NaHCO_3 lot # 897789
 40 ml SO_4^{2-} } 2/98 } NB 086
 20 ml NO_3^- } p. 222
 4 ml F^- }
 + DI water to 2000 mL
 start pH 7.805 end pH 9.201

$T = 95^\circ\text{C}$ Hg thermometer #183303

Potentiostat ESC 440 #1 channel #3
 data saved as LT825P8Y.DAT

counter electrode: Pt flag
 ref. electrode: Fisher SCE #13-620-51 S/N 0165403

E applied: 100 mV

Test started 9:45 AM 2/3/98
 Test stopped 4:27 PM 8/31/98 18089400 sec

LT 825 P4Y

Specimen Alloy 825 same as p. 186
 start wt, 38.95062 g
 end wt, 38.95035 g

2 PTFE ceramic washers attached as per p 165

Solution: 1000 ppm Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-
 3.29175 g NaCl lot # 960780
 0.23914 g NaHCO_3 lot # 897789
 40 ml SO_4^{2-} } 2/98 } NB 086
 20 ml NO_3^- } p. 222
 4 ml F^- }

+ DI water to 2000 mL
 start pH 7.612 end pH 9.053

$T = 95^\circ\text{C}$ Hg thermometer #183304

Potentiostat ESC 440 #1 channel #4
 data saved as LT825P4Y.DAT

counter electrode: graphite rod
 ref. electrode: Fisher SCE #13-620-51 S/N 9214083

E applied: 0 mV

Test started: 9:45 AM 2/3/98
 Test stopped: 4:27 PM 8/31/98 18089400 sec.

LT825PSY

Specimen Alloy 825 same as p. 187
 start wt. 39.08456 g
 end wt. 39.08433 g
 2 PTFE crevice washer attached per p. 166

Solution: 1000 ppm Cl^- 85 ppm HClO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-

3.29333 g NaCl lot # 960780
 0.23993 g NaHCO_3 lot # 897789
 40 ml SO_4^{2-} } 2/98 } NB 086
 20 ml NO_3^- }
 4 ml F^- } p. 222

+ DI water to 2000 mL
 start pH 8.046 end pH 9.183

$T = 95^\circ\text{C}$ Hg thermometer 115880

Potentiostat ESC 440 #1 channel #5
 data saved as LT825PSY.DAT

counter electrode: graphite rod
 ref. electrode: Fisher SCE #13-620-51 S/N 3106337

E_{applied} : -100 mV

Test started: 9:45 AM 2/3/98
 Test stopped: 4:27 PM 8/31/98 18089400 secs.

OC825CIT

Specimen Alloy 825 same as p. 180
 start wt. 39.28415 g
 end wt. 39.28118 g
 2 PTFE crevice washer attached per p. 167

Solution: 1000 ppm Cl^- 85 ppm HClO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-

3.30641 g NaCl lot # 960780
 0.23517 g NaHCO_3 lot # 897789
 40 ml SO_4^{2-} } 2/98 } NB 086
 20 ml NO_3^- }
 4 ml F^- } p. 222

+ DI water to 2000 mL 9.116 w/ macromech.
 start pH 8.115 end pH 9.183 9/8/98

$T = 95^\circ\text{C}$ Hg thermometer C96-327
 aerated w/ gear air

Potentiostat ESC 440 #1 channel #6
 data saved as OC825CIT.DAT

counter electrode: Pt flag
 ref. electrode: Fisher SCE #13-620-51 S/N 5129169

E_{applied} : open circuit

Test started: 9:45 AM 2/3/98
 Test stopped: 4:27 PM 8/31/98 18089400 secs.

STOCK SOLUTIONS 7/98

~~So~~ ^{MB} 7/10/98 SO_4^{2-} 7/98
 1000 ppm SO_4^{2-} as Na_2SO_4
 1.47424 g Na_2SO_4 Lot 901213
 + DI Water to 1000 mL
 prep 7/10/98 exp 8/10/98

NO_3^- 7/98
 1000 ppm NO_3^- as NaNO_3
 1.37539 g NaNO_3 Lot 961772A
 + DI Water to 1000 mL
 prep 7/10/98 exp 8/10/98

F^- 7/98
 1000 ppm F^- as NaF
 2.20350 g NaF Lot # 896405
 + DI Water to 1000 mL
 prep 7/10/98 exp 8/10/98

Heidi Byers 7/10/98

316 CPT1.

Specimen: 316L HEAT# P80746
 Initial mass: 11.72301 g
 Initial area: 9.70852 cm^2

Solution: 1000 ppm Cl^- 20 ppm SO_4^{2-} 2 ppm F^-
 85 ppm HCO_3^{2-} 10 ppm NO_3^-
 3.29157 g NaCl Lot 972274
 0.23707 g NaHCO_3 Lot 897789
 40 mL SO_4 - 7/98 Stock Solution p. 196
 20 mL NO_3 - 7/98
 4 mL F^- - 7/98
 + DI Water to 2000 mL
 Initial pH: 8.450
 Final pH:

Immerse ^{MB} 7/13/98 316L specimen at 1:38pm 7/13/98

platinum counter electrode
 Reference electrode: SCE 13-620-51 SN: 7030126

EG&G Princeton Applied Research Potentiostat/Galvanostat Model 273
 SN: 41108

Applied potential of -0.400 volts Initially heat to 50°C

Hg thermometer C96-784

Saved as 316CPT1.dat

Increase temp. to 75°C 9:00am 7/14/98 Increase to 95°C 11:30am 7/14/98

Decrease temp. to 50°C 1:30pm 7/14/98

Apply -300 V at 5:05pm 7/14/98

7/16/98 KEITHELY 485 0.07 to 0.16 μA AT
 -300 V_{SC} AND 95°C

POTENTIAL INCREASED TO -250 mV_{SC} AT 7:25AM

$t = 224396$ SECONDS

7/16/98 POTENTIAL INCREASED TO -200 mV_{SC} AT 9:50 AM

$t = 233100$ SECONDS CURRENT POLARITY REVERSED

316CPT1. CONT FROM p 197

7/16/98 POTENTIAL INCREASED TO $-150 \text{ mV}_{\text{SC6}}$
 AT 1:42 pm $t = 247100 \text{ seconds}$

7/17/98 POTENTIAL INCREASED TO $-100 \text{ mV}_{\text{SC6}}$
 AT 7:32 am $t = 311280 \text{ s}$ $I = 0.34 \mu\text{A}$

~~7/18/98~~ ~~DD~~ 7/17/98 POTENTIAL INCREASED TO $-0 \text{ mV}_{\text{SC6}}$
 AT 10:15 am $t = 321100 \text{ s}$ $I = 0.68 \mu\text{A}$

7/17/98 POTENTIAL INCREASED TO $100 \text{ mV}_{\text{SC6}}$
 AT 1:50 pm $t = 333950 \text{ seconds}$ $I = 1.0 \mu\text{A}$

7/17/98 $E = 150 \text{ mV}_{\text{SC6}}$ $t = 347860 \text{ s}$ 5:42 pm

Mark Bryan 7/28/98

316 C PT2.DAT

Specimen: See p. 197

Solution: 1000 ppm Cl^- 20 ppm SO_4^{2-} 2 ppm F^-

85 ppm HCO_3^- 10 ppm NO_3^-

3.29234g NaCl Lot # 972274

0.23642g NaHCO_3 Lot # 897789

40 mL SO_4 7/98 Stock Solution p.196

20 mL NO_3 7/98

4 mL F 7/98

+ DI Water to 2000 mL

Initial pH: 7.978

Final pH:

Immerse at 9:30 am 7/21/98 and degassed

Heat to 95°C and apply $+200 \text{ mV}_{\text{SC6}}$ at 10:35 am 7/21/98

After initializing pitting, reduce potential to $0 \text{ mV}_{\text{SC6}}$ 95°C 1:25 pm 7/21/98

Decrease temp. to 85°C at $0 \text{ mV}_{\text{SC6}}$ 8:05 am 7/22/98 $t = 77520 \text{ sec}$

Decrease temp. to 75°C at $0 \text{ mV}_{\text{SC6}}$ 8:05 am 7/23/98 $t = 164100 \text{ sec}$

Decrease to 65°C at $0 \text{ mV}_{\text{SC6}}$ 8:10 am 7/24/98 $t = 250689 \text{ sec}$

Decrease to 55°C at $0 \text{ mV}_{\text{SC6}}$ 9:15 am 7/27/98 $t = 513911 \text{ sec}$

Remove specimen 8:30 am 7/29/98 $t = 685700 \text{ sec}$

Mark Bryan 7/28/98

316CPT3.DAT

Specimen: 316L Heat # P80746

initial mass: 11.79264g

initial area: 9.72878 cm²

Solution: 1000 ppm Cl⁻ 20 ppm SO₄²⁻ 2 ppm F⁻
 85 ppm HCO₃²⁻ 10 ppm NO₃⁻

3.27935 g NaCl Lot # 972274

0.23967 g NaHCO₃ Lot # 89778940 mL SO₄ 7/98 Stock Solutions p. 19620 mL NO₃ 7/98

4 mL F 7/98

+ DI H₂O to 2000 mL

Initial pH: 8.263

Immerse at 9:00 am 7/29/98 and deaerate. Re-test of p. 199

Heat to 95°C and apply a +200 mV_{sce} potential (9:15 am 7/29/98)Decrease applied potential to 0 mV_{sce} 12:20 pm 7/29/98

Decrease temp. to 85°C Computer system crashed 7/30/98

Decrease temp. to 75°C 7/31/98 8:00 am 70051 + crash = t

Decrease temp. to 65°C 8/3/98 8:20 am 331215 + crash = t

Decrease temp. to 55°C 8/4/98 8:00 am 6:416300 + crash

Lost data file. Cool specimen. Final test temp 59°C.

New file 316CPT4.DAT:

Heat to 95°C 8/4/98 1:33 pm t=0 apply +200 mV potential

Stock Solution

SO₄²⁻ 9/981000 ppm SO₄²⁻ as Na₂SO₄1.47446 g Na₂SO₄ Lot # 901213

dil. to 1 Liter w/ DI water

prep 9/8/98 exp. 10/8/98

NO₃⁻ 9/981000 ppm NO₃⁻ as NaNO₃1.37541 g NaNO₃ Lot # 961772A

dil. to 1 Liter w/ DI water

prep. 9/8/98 exp. 10/8/98

F⁻ 9/981000 ppm F⁻ as NaF

2.30796 g NaF Lot # 896405

dil. to 1 Liter w/ DI water

prep 9/8/98 exp 10/8/98

Walter J. Macchini
 9/8/98

LT825P2AI

Specimen: Alloy 825 same as p.190
 start wt. 30.81863 g
 end wt. 30.81478 g

Solution: 1000 ppm Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-

3.29931 g NaCl Lot # 972274
 0.23771 g NaHCO_3 " 923337A
 40 ml SO_4^{2-}
 20 ml NO_3^-
 4 ml F^- } 9/98 } NB 157 p.201
 + DI water to 2000 mL

start pH 8.244 end pH 8.767

$T = 95^\circ\text{C}$ Hg thermometer #183302

Potentiostat ESC 440 #1 Channel #1
 Data saved as: LT825P2AI.DAT

Counter electrode: Pt flag
 Ref electrode: Fisher SCE 13-620-51 S/N 3106345

E applied: 0 mV

Test started 10 AM 9/9/98
 Test stopped 8:30 AM 10/27/98

Walter J Macomber
 10/28/98

LT825P7Z

Specimen: Alloy 825 same as p.191
 start wt. 30.31775 g
 end wt. 30.31720 g

Solution: 1000 ppm Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-

3.29728 g NaCl Lot # 972274
 0.23438 g NaHCO_3 " 923337A
 40 ml SO_4^{2-}
 20 ml NO_3^-
 4 ml F^- } 9/98 } NB 157 p.201
 + DI water to 2000 mL

start pH 7.984 end pH 8.906

$T = 95^\circ\text{C}$ Hg thermometer #183303
 Potentiostat ESC 440 #1 Channel #2
 Data saved as: LT825P7Z.DAT

Counter electrode: Pt flag
 Ref electrode: Fisher SCE 13-620-51 S/N 9214074
 E applied 200 mV

Test started: 10 AM 9/9/98
 Test stopped 8:30 AM 10/27/98

Walter J Macomber
 10/28/98

LT 825 P8 Z

Specimen: Alloy 825 same as p. 192
 start wt. 31.73513 g
 end wt. 31.73728 g

Solution: 1000 ppm Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-
 3.30364 g NaCl Lot # 972274
 0.23783 g NaHCO_3 " 923337A
 40 ml SO_4^{2-}
 20 ml NO_3^-
 4 ml F^-
 } 9/98 } NB 157 p. 201
 + DI water to 2000 mL

start pH 8.374 end pH 9.212

$T = 95^\circ\text{C}$ Hg thermometer C96-616

Potentiostat ESC 440 #1 Channel #3
 data saved as: LT 825 P8 Z. DAT

counter electrode: Pt flag
 ref. electrode: Fisher SCE 13-620-51 S/N 0165403

E applied 100 mV

Test started 9/9/98 @ 10 AM
 Test stopped 10/27/98 @ 8:30 AM

Walter J. Moench
 10/28/98

LT 825 P4 Z

Specimen: Alloy 825 same as p. 193
 start wt. 38.95035 g
 end wt. 38.95111 g
 2 PTFE washers attached as per p. 165

Solution: same solution as p. 204

start pH 8.374 end pH 9.291

$T = 95^\circ\text{C}$ Hg thermometer

Potentiostat ESC 440 #1 Channel #4
 data saved as: LT 825 P4 Z. DAT

counter electrode: graphite rod
 ref. electrode: Fisher SCE 13-620-51 S/N 9214083
 E applied: 0 mV

Test started 10 AM 9/9/98
 Test stopped 8:30 AM 10/27/98

Walter J. Moench
 10/28/98

LT 825P5 Z

Specimen: Alloy 825 same as p. 194

start wt. 39.08433 g

end wt. 39.08712 g

2 PTFE washers attached as per p. 166

Solutions: 1000 ppm Cl^- 85 ppm S^{2-} 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-

3.29553 g NaCl Lot # 972274

0.24688 g NaHCO_3 " 923337A40 ml SO_4^{2-} 20 ml NO_3^- 4 ml F^-

+ DI water to 2000 mL

start pH 8.274 end pH 9.351

T = 95°C Hg thermometer

Potentiostat ESC 440 #1 Channel #5
data saved as: LT 825P5Z.DATcounter electrode: graphite rod
ref. electrode: Fisher SCE 13-620-51 S/N 3106337

E applied: -100 mV

Test Started: 10 AM 9/9/98

Test Stopped: 8:30 AM 10/27/98

Walter J. MacKorovich
10/28/98

OC 825CIW

Specimen: Alloy 825 same as p. 195

start wt. 39.28118 g

end wt. 39.28138 g

Solution: same solution as p. 206

start pH 8.274

end pH 9.265

T = 95°C aerated w/ gen air
Hg thermometer 183301Potentiostat ESC 440 #1 channel #6
data saved as OC 825CIW.DATcounter electrode: Pt flag
ref. electrode: Fisher SCE 13-620-51 S/N 5129169

E applied: open circuit

Test Started: 10 AM 9/9/98

Test Stopped: 8:30 AM 10/27/98

CUMULATIVE TEST TIME 1041.7 DAYS

Walter J. MacKorovich
10/28/98

Initial Scientific notebook entry for corrosion resistant material potentiostatic and potentiodynamic polarization tests.

Title: Potentiostatic tests, cyclic polarization tests, crevice repassivation tests, passive current density tests, critical pitting temperature tests critical repassivation temperature tests.

Tests Performed by: Darrell S. Dunn

Objectives: Measure passive current densities, crevice repassivation potentials, critical pitting temperature and critical repassivation temperature for corrosion resistant candidate materials.

Equipment: EG&G Versastat Serial Number 20104. EG&G model 352 corrosion software. NEC 586 computer. Keithley Electrometer model 614 SN 555368 or equivalent. ASTM G-5 polarization cell, Large 2 L glass cells with Teflon tops, Electrochemical Impedance Spectroscopy system including Solartron 1260 FRA and Solartron 1287 Potentiostat. ESC 440 multichannel potentiostats with National Instruments Labview data acquisition software or Strawberry Tree data acquisition software.

Materials: Alloy C-22, Alloy 825, Alloy 625 and Type 316 L stainless steel

Specimen specifications: Cylindrical CPP specimens 1.915" $\times$ 0.250" and Crevice repassivation specimens with Teflon crevice washers attached to surface.

Measurement Parameters: Current and Potential as described in TOP-008. Temperature of solution $\pm 2^\circ\text{C}$

Required level of accuracy: Potentials $\pm 5\text{mV}$. Current less than 0.1 microamp.

Uncertainty and Sources of Error: Current density calculated as current divided by sample area. Actual current density of corroding areas is not determined. Resolution limit of data acquisition systems may limit accuracy of passive current density measurements.

C22 PASSIVE CURRENT DENSITY

OBJECTIVE: Measure Passive Current Density

SPECIMEN. ALLOY C-22 HEAT 2277-8-3175
1.915" $\times$ 0.250" POLISHED TO 600 GRIT FINISH

TEST SOLUTION: 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
10 PPM NO_3^- 2 PPM F^-

3.29563 g NaCl LOT 972274

0.24816 g NaHCO_3 LOT 9233374

40 mL SO_4^{2-} 9/98 STOCK SOLUTION NB 157 p 201

20 mL NO_3^- 9/98 "

4 mL F^- 9/98 "

+ DI WATER TO 2000 mL

SOLUTION ~~PREPARED~~ DD 10/12/98 DEGASSED W/ 99.999% N_2

TEMPERATURE = 95°C

Hg THERMOMETER = 115858

POTENTIOSTAT EG&G VERSASTAT

COUNTERELECTRODE Pt FLAG

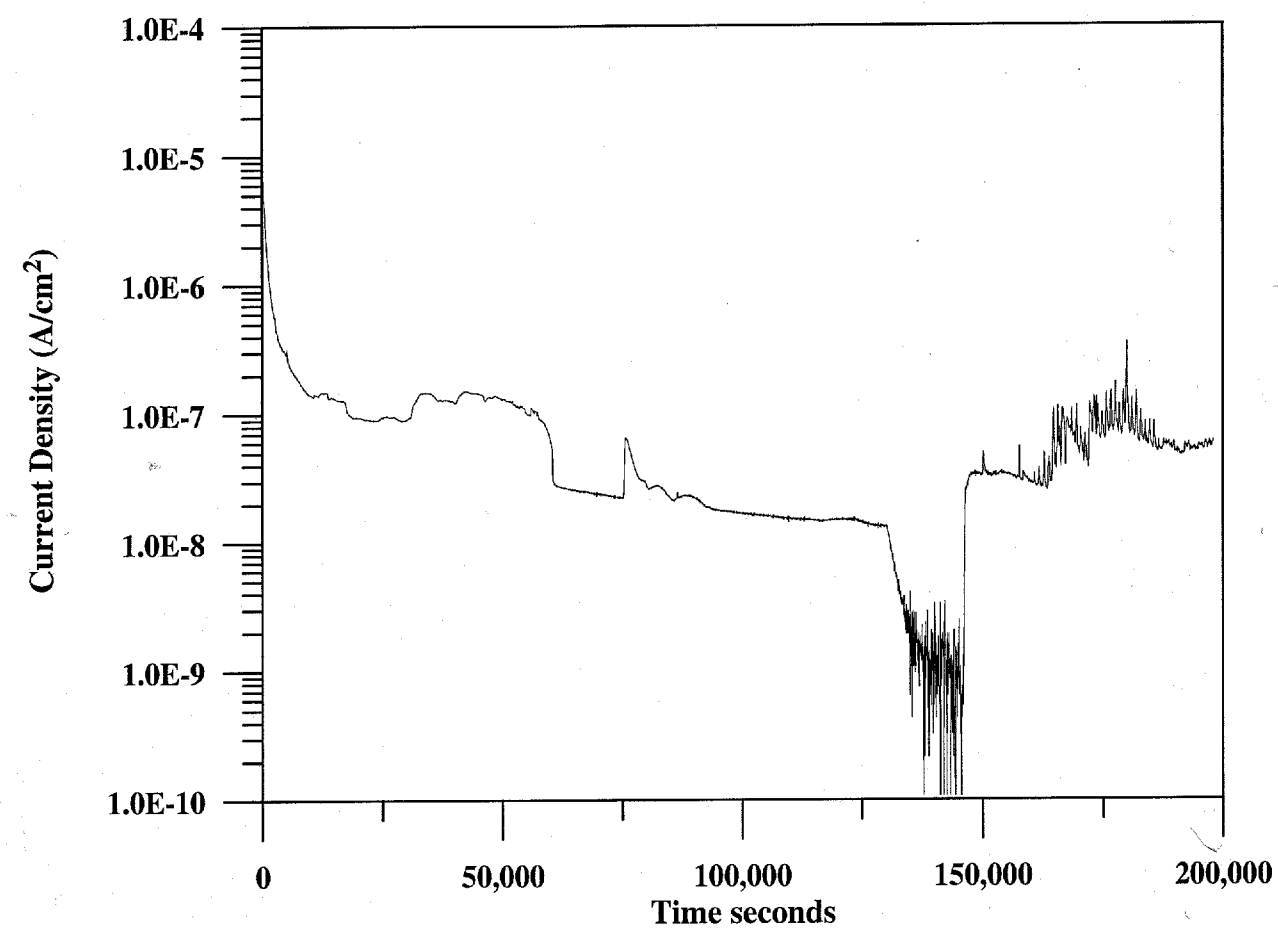
REFERENCE FISHER SCE 13-620-51 SN 7030126

E_{CORR} -162 mV/SCE

E_{POL} = +200 mV/SCE

TEMPERATURE NOT MAINTAINED AT ~~95°C~~ DD 10/12/98
 95°C DUE TO POWER FAILURE

CURRENT DENSITY PLOTTER p210



C22 PASSIVE CURRENT DENSITY

OBJECTIVE MEASURE PASSIVE CURRENT DENSITY OF C-22

SPECIMEN C-22 NGAT 2277-8-3175 SAME AS P209

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}

10 PPM NO_3^- 2 PPM F^- SAME AS P209

SOLUTION DEGASSED W/ 99.99% N_2

TEMPERATURE 95°C

Hg THERMOMETER 115858

POTENTIOSTAT EG&G VERSASTAT

COUNTER ELECTRODE Pt FLAG

REFERENCE ELECTRODE FISHER SCE 13-620-SI SN 7030126

E_{CORR}

E_{APPLIED} 200 mV SCE

COMPUTER CRASHED ALL DATA LOST

David D 10/14/88

Stock Solutions

SO_4^{2-} 10/98
 1000 ppm SO_4^{2-} as Na_2SO_4
 1.47975 g Na_2SO_4 Lot # 901213

prep 10/14/98
 exp 11/14/98

NO_3^- 10/98
 1000 ppm NO_3^- as NaNO_3
 1.37480 g NaNO_3 Lot # 961722A
 prep 10/14/98
 exp 11/14/98

F^- 10/98
 1000 ppm F^- as NaF
 2.21617 g NaF Lot # 896405
 prep 10/14/98 exp 11/14/98

Walter J. Mochowski
 10/14/98

PS625t1

Channel 1

Specimen: Alloy 625 600 grit polished
 start wt. 31.48739 g
 end wt. 31.48471 g

TFE crevice blocks bolted on as described
 on p. 15

Solution: 1 M Cl^- as NaCl 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-
 116.88613 g NaCl Lot # 972274
 0.23375 g NaHCO_3 Lot # 923337A
 40 ml SO_4^{2-}
 20 ml NO_3^-
 4 ml F^-
 + DI water to 2000 mL

start pH 7.914 end pH 8.736

pH electrode: Fisher SCE 12-620-51 S/N 8122003

Start @ 1:39 PM 10/20/98 @ +200 mV vs SCE
 Stop @ 9 AM 11/10/98

Walter J. Mochowski
 11/10/98

PSC25t2

Channel 2

Specimen: alloy 625 600 grit polished

start wt. 31.45507g

end wt. 30.98030g

TFE crevice blocks attached as described
on p. 15Solution: 4M Cl⁻ as NaCl 85 ppm HCO₃⁻
20 ppm SO₄²⁻ 10 ppm NO₃⁻ 2 ppm F⁻

467.43881 g NaCl Lot # 972274

0.23632 g NaHCO₃ " 923337A40 ml SO₄²⁻20 ml NO₃⁻ } 10/98 } Stock Sol'n NB157 p. 2124 ml F⁻

+ DI water to 2000 mL

start pH 7.392

end pH 8.039

pH electrode: Fisher SCE 13-620-51 S/N 3106339

Start @ 11:40 PM 10/20/98 @ 0 mV vs SCE
sol'n started to boil - shut off potential at 8600 secs
until cool down
back on @ 10000 secsWalter J. Moench
11/10/98

PSC22t1

Channel 3

Specimen Alloy C22 600 grit polished

start wt. 47.98007g

end wt. 47.97045g

TFE crevice blocks attached as described on p. 15

Solution: 1M Cl⁻ as NaCl 85 ppm HCO₃⁻20 ppm SO₄²⁻ 10 ppm NO₃⁻ 2 ppm F⁻

116.88341 g NaCl Lot # 972274

0.23812 g NaHCO₃ " 923337A40 ml SO₄²⁻20 ml NO₃⁻4 ml F⁻

} 10/98 } Stock Sol'n NB157 p. 212

+ DI water to 2000 mL

start pH 7.895

end pH 8.612

pH electrode: Fisher SCE 13-620-51 S/N 5081405

Start @ 1:41 PM 10/20/98 @ +400 mV vs SCE

Stop @ 9 AM 11/10/98

Walter J. Moench
11/10/98

PSC 22T 2

Channel 4

Specimen C-22 600 grit polished

start wt. 47.86974 g

end wt. 47.86898 g

TFE crevice block attached as described on p. 15

Solution: 4M Cl^- as NaCl 85 ppm HCO_3^- 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-

467.53618 g NaCl Lot # 972274

0.23529 g NaHCO_3 " 923337A40 ml SO_4^{2-} 20 ml NO_3^- 4 ml F^-

10/98 } Stock Sol'n NB 157 p. 212

start pH 7.664

end pH 8.534

pH electrode: Fisher SCE 13-620-51 S/N 8118182

Start @ 1:42 PM 10/20/98 @ +200 mV vs SCE

Stop @ 9 AM 11/10/98

Walter J. Moehrhauer
11/10/98

C-22 PASSIVE CURRENT DENSITY

OBJECTIVE MEASURE PASSIVE CURRENT DENSITY

SPECIMEN C-22 HEAT # 2277-8-3175 SAME AS P 209

SOLUTION 1000 PPM Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-} 10 PPM NO_3^- 2 PPM F^- SAME AS P 209SOLUTION PREPARED w/ 99.999 % N_2

TEMPERATURE 95°C

 H_2 THERMOMETER 0323057

POTENTIOSTAT EG&G VERSASTAR SN 20104

COUNTER ELECTRODE Pt FLAG

REFERENCE ELECTRODE FISHER 13-C20-51 SN 7030126

Ecorr -200 mV KEITHLEY 6517 599913

E APPLIED 400 mV vs SCE 200 mV/s

DATA PLOT AND REPORT ON P 218

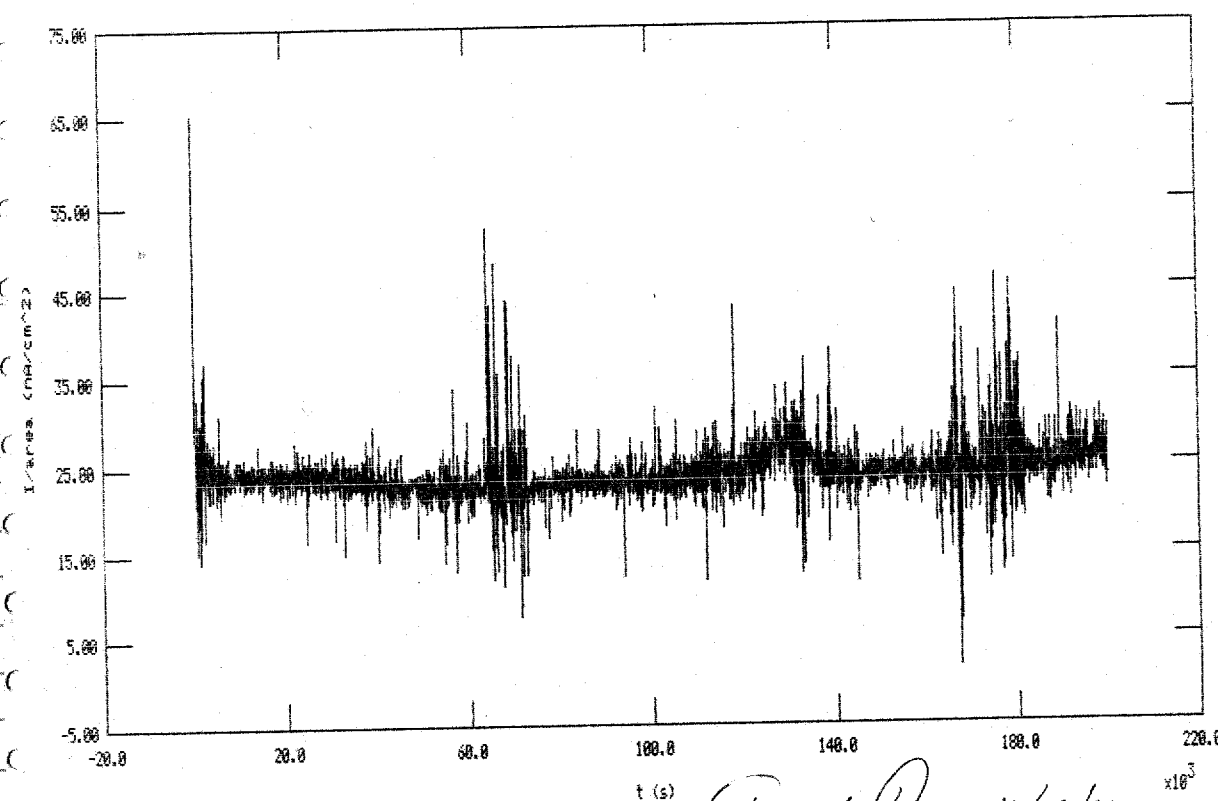
FILE SAVED AS C22PC2.DAT

PASSIVE CURRENT DENSITY = 25 TO 35 mA/cm^2 Walter J. Moehrhauer
10/20/98

C-22 PASSIVE CURRENT DENSITY

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 10-15-98 Time Run: 19:49:27
 CF PASS vs. R CT PASS IP 0.200 vs. R ID 10 S TP 6.667E+01 T1 2.000E+05
 CR AUTO NP 3000 SO Pass IR NONE FL NONE RT HIGH STABILITY
 REF 0.24150 SCE WVK SOLID AR 8.000E+00 LS YES EH 8.000E+00 DEN 8.140E+00 AU NO
 OC 0.198
 Comment: C-22 200 mV/sce 1000 ppm Cl 95 C deaerated

Atc22pc2a.da



Model 352/252 Corrosion Analysis Software, v. 2.30

Filename: Atc22pc2a.dat

Pstat: VStat11 Ver 2

PS POTENTIOSTATIC

Date Run: 10-15-98

File Status: NORMAL

Time Run: 19:49:27

Cond. Time	CT	pass	s	Initial Pot.	IP	200.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	200.0E3	s
Initial Delay	ID	10	s	Stop On	SO	Pass	
Time/Pt.	TP	66.67	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	OFF	
Working Elec.	WE	Solid	Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	8.000	cm ²	Equiv. Wt.	EW	8.0000
Density	DE	8.140	g/ml	AUX A/D	AU	no
Open Circuit	OC	198.0E-3	V			

Comment: C-22 200 mV/sce 1000 ppm Cl 95 C deaerated

Fund Q 10/19/98

C-22 PASSIVE CURRENT DENSITY

OBJECTIVE MEASURE PASSIVE CURRENT DENSITY OF C-22

SPECIMEN C22 HGT 2277-8-3175 SAME AS P209

SOLUTION 1000 PPM Cl⁻ 85 PPM HCO₃⁻ 20 PPM SO₄⁻10 PPM NO₃⁻ 2 PPM F⁻ SAME AS P 209DEAERATOR w/ 99.999 % N₂

TEMPERATURE = 95°C

N₂ THERMOMETER. 0323007

POTENTIOSTAT EG&G V6ASSTAT SN 20104

COUNTER ELECTRODE Pt FLAG

REFERENCE ELECTRODE FISHER SCE 13-620-51 SN 7030126

ECELL -244 mV SCE KEITHLEY 6517 SN 594913

EAPPLIED 400 mV SCE

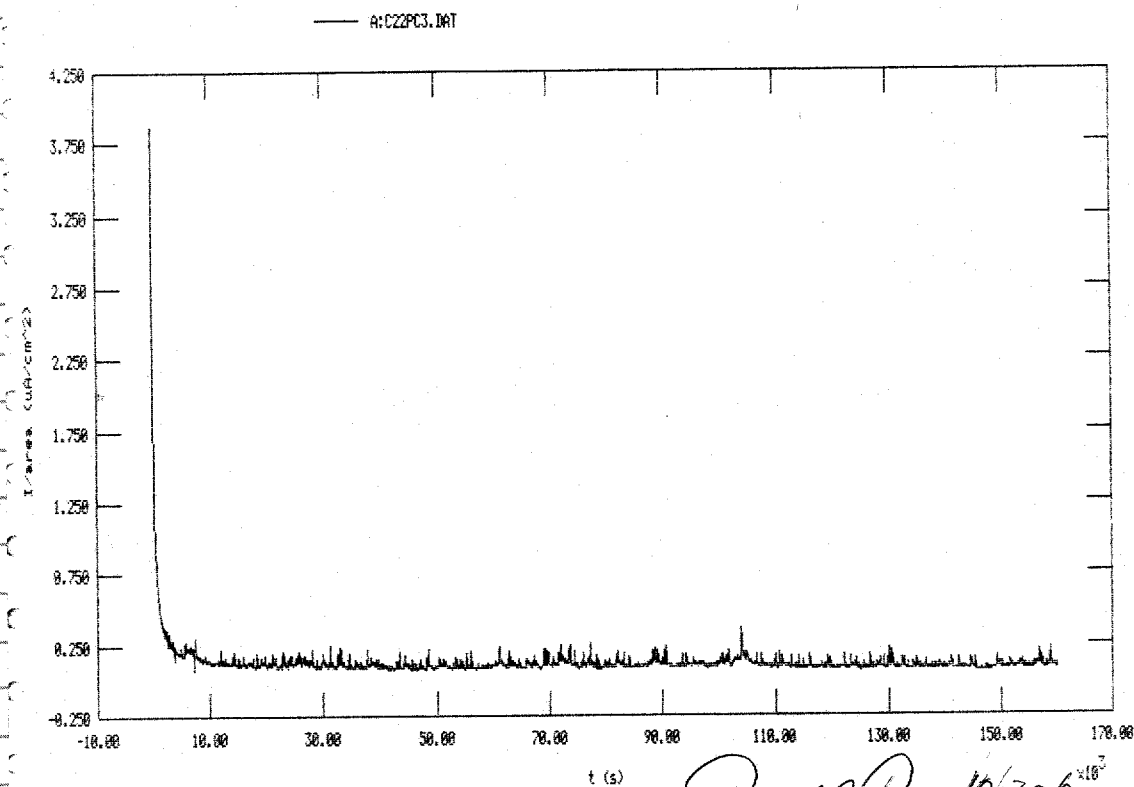
TEST STARTED 10/19/98 12:40 PM

PASSIVE CURRENT DENSITY 0.07 TO 0.35 μ A/cm²

GRAPH ON PAGE 220

Fund Q 10/23/98

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 10-17-98 Time Run: 09:48:47
 CP PASS vs. R CT PASS IP 0.400 vs. R ID 10 S TP 5.333E+01 T1 1.600E+05
 OR AUTO NP 3000 SD Pass IR NONE FL NONE RT HIGH STABILITY
 REF 0.24150 SCE ANK SOLID AR 0.000E+00 LS YES EN 0.000E+00 DEN 0.140E+00 AU NO
 OC -0.250
 Comment: C-22 400 mV/sce 1000 ppm Cl 95 C deaerated



Model 352/252 Corrosion Analysis Software, v. 2.30
 Filename: A:\C22PC3.DAT
 Pstat: VStat() Ver 2
 PS POTENTIOSTATIC
 Date Run: 10-17-98

File Status: NORMAL
 Time Run: 09:48:47

Cond. Time	CT	pass	s	Initial Pot.	IP	400.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	160.0E3	s
Initial Delay	ID	10	s	Stop On	SD	Pass	
Time/Pt.	TP	53.33	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	OFF
Working Elec.	WE	Solid	Ref. Elec.	RE	SCE 241.5E-3V
Sample Area	AR	8.000 cm ²	Equiv. Wt.	EW	0.0000 g
Density	DE	8.140 g/ml	AUX A/D	AU	no
Open Circuit	OC	-250.0E-3 V			

Comment: C-22 400 mV/sce 1000 ppm Cl 95 C deaerated

DD 10/23/98

C-22 PASSIVE CURRENT DENSITY.

OBJECTIVE MEASURE PASSIVE CURRENT DENSITY OF C-22

SPECIMEN. C-22 HEAT 2277-8-3175 SAME AS P209

SOLUTION 1000 PPM Cl⁻ 85 PPM HCO₃⁻ 20 PPM SO₄²⁻

10 PPM NO₃⁻ 2 PPM F⁻ SAME AS PAGE 209

~~QC DD~~ 10/26/98

DEAERATED w/ 99.999% N₂

TEMP = 95 °C

N₂ THERMOMETER 0323007

POTENTIOSTAT EG & G V605ASTAT 20104

COUNTER ELECTRODE Pt FLAG

REFERENCE ELECTRODE FISHER SCE 13-620-S1 SN 7030126

E_{corr} 0.100 V_{SCE}

E_{APPLIED} 600 mV_{SCE}

PASSIVE CURRENT DENSITY 0.14 - 0.85 μ A/cm²

DATA SAVED AS C22PC4.DAT

PLOT PAGE 222

PASSIVE CURRENT DENSITY AT 800 mV_{SCE}

SAME SOLUTION SPECIMEN AND TEST SETUP AS ABOVE

E_{corr} 95 mV_{SCE}

E_{APPLIED} 800 mV_{SCE}

PASSIVE CURRENT DENSITY 40 - 600 μ A/cm²

DATA SAVED AS: C22PC5.DAT

PLOT PAGE 223

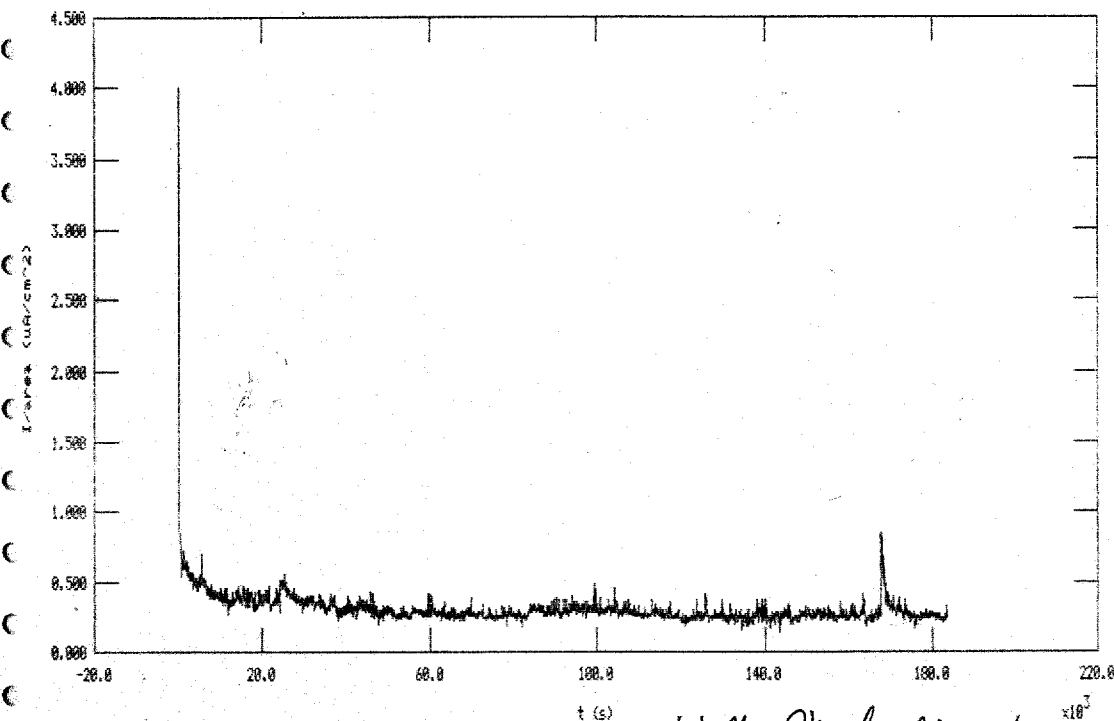
ENP PN 8.842 FISHER 950 SN 3340 PNPNOB6 FL 13-620-296

DD 10/26/98

SN 5046380

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 10-19-98 Time Run: 07:17:20
 CP PASS vs. R CT PASS IP 0.600 vs. R ID 10 S TP 6.120E+01 T1 1.836E+05
 CR AUTO NP 3000 SO Pass IR NONE FL NONE RT HIGH STABILITY
 REF 0.24150 SCE WPK SOLID AR 0.000E+00 LS YES EW 0.000E+00 DEN 0.140E+00 AU NO
 OC 0.100
 Comment: C-22 600 mV/sce 1000 ppm Cl 95 C deaerated

a1c22pc4.dat



Walter J Machurski 10/20/98

Model 352/252 Corrosion Analysis Software, v. 2.30
 Filename: a1c22pc4.dat
 Pstat: VStat[] Ver 2
 PS POTENTIOSTATIC
 Date Run: 10-19-98

File Status: NORMAL
 Time Run: 07:17:20

Cond. Time	CT	pass	s	Initial Pot.	IP	600.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	183.6E3	s
Initial Delay	ID	10	s	Stop On	SO	Pass	
Time/Pt.	TP	61.20	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	Off	
Working Elec.	WE	Solid		Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	0.000	cm ²	Equiv. Wt.	EW	0.0000	g
Density	DE	8.140	g/ml	AUX A/D	AU	no	
Open Circuit	OC	100.0E-3	V				

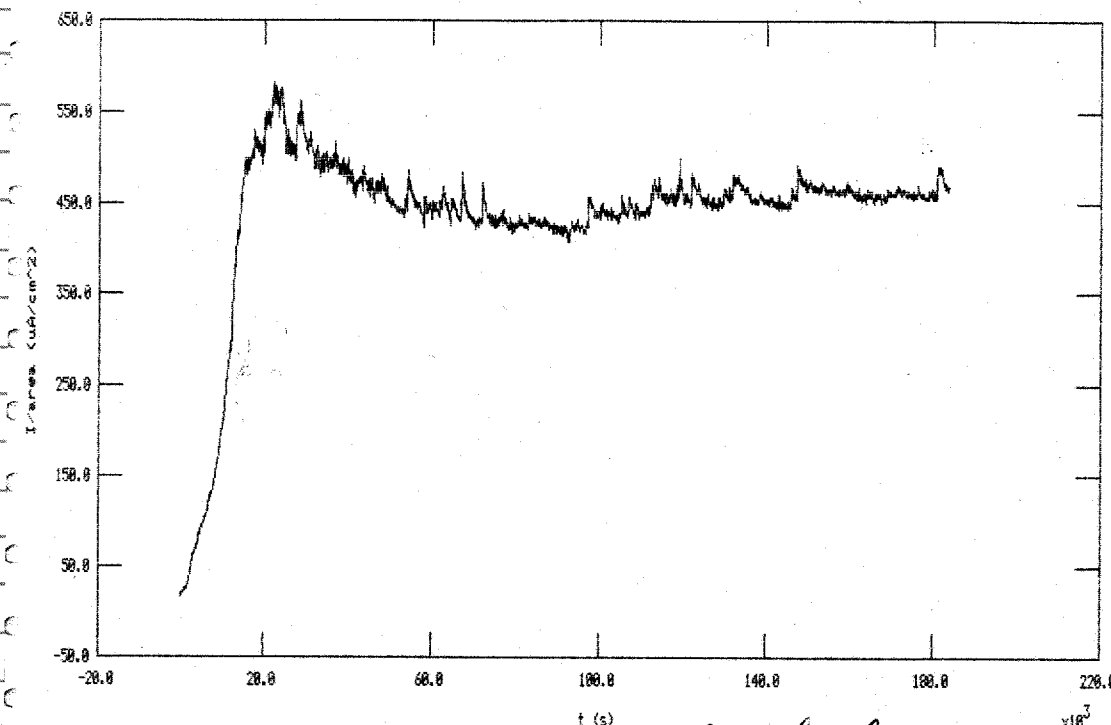
Comment: C-22 600 mV/sce 1000 ppm Cl 95 C deaerated

10/20/98
 Walter J Machurski

Walter J Machurski
 10/20/98

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 10-20-98 Time Run: 14:36:29
 CP PASS vs. R CT PASS IP 0.800 vs. R ID 10 S TP 6.120E+01 T1 1.836E+05
 CR AUTO NP 3000 SO Pass IR NONE FL NONE RT HIGH STABILITY
 REF 0.24150 SCE WPK SOLID AR 0.000E+00 LS YES EW 0.000E+00 DEN 0.140E+00 AU NO
 OC 0.095
 Comment: C-22 800 mV/sce 1000 ppm Cl 95 C deaerated

a1c22pc5.dat



Walter J Machurski 10/30/98

Model 352/252 Corrosion Analysis Software, v. 2.30
 Filename: a1c22pc5.dat
 Pstat: VStat[] Ver 2
 PS POTENTIOSTATIC
 Date Run: 10-20-98

File Status: NORMAL
 Time Run: 14:36:29

Cond. Time	CT	pass	s	Initial Pot.	IP	800.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	183.6E3	s
Initial Delay	ID	10	s	Stop On	SO	Pass	
Time/Pt.	TP	61.20	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	Off	
Working Elec.	WE	Solid		Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	0.000	cm ²	Equiv. Wt.	EW	0.0000	g
Density	DE	8.140	g/ml	AUX A/D	AU	no	
Open Circuit	OC	95.00E-3	V				

Comment: C-22 800 mV/sce 1000 ppm Cl 95 C deaerated

Walter J Machurski 10/30/98

Walter J Machurski 10/30/98

C-82 PASSIVE CURRENT DENSITY

OBJECTIVE

SPECIMEN C22 NGAT 2277-8-3175

START WT 12.38058g

END WT 12.37935g

SOLUTION 0.5 M Cl^- 85ppm NO_3^- 20ppm SO_4^{2-} 10ppm NO_3^- 2ppm F^- PN 7.834 58.44318g NaCl LOT 972274 / 0.23610g NaHCO_3
LOT 897789DEAERATED w/ 99.999% N_2

TEMP = 95°C, 10/27/98 DD T = 20°C

Hg Thermometer 183305

POTENTIOSTAT EG&C VERSASTAT SN 20107

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHER SCE 13-620-S1 SN 7030126

 ~~E_{corr}~~ + 85 mV SCE DD 10/27/98 E_{APPLIED} + 200 mV SCE E_{Pt} = + 85 mV SCE E_{corr} = - 455 mV SCEPASSIVE CURRENT DENSITY. 5-16 nA/cm²ONCE CURRENT SPIKE 49 nA/cm²

SPECIMEN HAS LIGHT GOLD COLORED FILM

AFTER FINAL WEIGHT WAS MEASURED SPECIMEN

WAS REIMMERSED IN TEST SOLUTION WITHOUT

POLISHING FOR FURTHER TESTS.

NO SIGNS OF PITS OR LOCALIZED CORROSION

PLOT PAGE 231

Daniel D 10/30/98

AJ

LT 825P2AJ

Specimen: Alloy 825 same as p.190

start wt. 30.81478g

end wt. 30.81309g

Solution: 1000ppm Cl^- 85ppm HCO_3^-
20ppm SO_4^{2-} 10ppm NO_3^- 2ppm F^-

3.29329g NaCl Lot # 972274

0.23702g NaHCO_3 " 89778940ml SO_4^{2-} 20ml NO_3^- 4ml F^- 10/98 Stock Sol'n NB157 p.212
+ DI water to 2000mL

start pH 8.163

end pH 9.114

T = 95°C

Hg Thermometer 10323004

Potentiostat ESC 440#1 Channel #1

Data saved as LT 825P2AJ.DAT

Counter electrode: Pt flag

Ref electrode: Fisher SCE 13-620-S1 S/N 3106345

 E_{applied} 0mV E_{corr} + 29 mV } Keithly 914 S/N 0555368 E_{Pt} + 93 mV } cal 11/06/98 due 11/06/99

Start @ 10:30 AM 11/11/98

computer stopped taking data @ 4477333 sec.

Walter J Macintosh
1/19/99

LT825P7AA

Specimen: Alloy 825 same as p.191
 start wt. 30.31220 g
 end wt. 30.30588 g

Solution: 1000 ppm Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-
 3.29938 g NaCl Lot # 972274
 0.236626 g NaHCO_3 " # 897789
 40 ml SO_4^{2-}
 20 ml NO_3^- } 10/98 } Stock Sol'n NB 157 p.212
 4 ml F^- }
 + DI water to 2000 mL

start pH 8.215 end pH 9.043

$T = 95^\circ\text{C}$ Hg thermometer 10323004

Potentiostat ESC 440 #1 Channel #2
 Data saved as L825P7AA

Counter electrode: Pt flag

Reference electrode: Fisher SCE 13-620-51 S/N 0165403
 WJ Machowski 10/28/98
 3126345

E applied 200 mV

$E_{\text{corr}} -94 \text{ mV}$ } Keithley 914 S/N 0555368
 $E_{\text{Pt}} +103 \text{ mV}$ } cal 11/06/98 due 11/06/99

Start @ 10:30 AM 11/11/98
 Computer crash @ 4477333 secs.

Walter J. Machowski
 1/19/99

LT825P8AA

Specimen: Alloy 825 same as p.192
 start wt. 31.73728 g
 end wt. 31.73681 g

Solution: 1000 ppm Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-
 3.29983 g NaCl Lot # 972274
 0.23086 g NaHCO_3 " # 897789
 40 ml SO_4^{2-}
 20 ml NO_3^- } 10/98 } Stock Sol'n NB 157 p.212
 4 ml F^- }
 + DI water to 2000 mL

start pH 8.366 end pH 9.101

$T = 95^\circ\text{C}$ Hg thermometer 10323004

Potentiostat ESC 440 #1 Channel #3
 Data saved as L825P8AA

Counter electrode: Pt flag

Ref. electrode: Fisher SCE 13-620-51 S/N 9214083

E applied 100 mV

$E_{\text{corr}} -78 \text{ mV}$ } Keithley 914 S/N 0555368
 $E_{\text{Pt}} +68 \text{ mV}$ } cal 11/06/98 due 11/06/99

Start @ 10:30 AM 11/11/98
 Computer crash @ 4477333 secs.

Walter J. Machowski
 1/19/99

LT 825P4AA

Specimen: Alloy 825 same as p. 193
 start wt. 38.95111 g
 end wt. 38.95002 g
 2 PTFE washers as per p. 165

Solution: same solution as p. 227

start pH 8.366 end pH 9.025

T = 95°C Hg thermometer 10323004

Potentiostat ESC 440 #1 Channel #4
 data saved as L825P4AA

Counter electrode: graphite rod
 Ref. electrode: Fisher SCE 13620-51 S/N 9214074

E applied 0 mV

E_{can} -83 mV } Keithley 914 S/N 0555368
 E_{counter} -101 mV } cal 11/06/98 due 11/06/99

Start @ 10:30 AM 11/11/98
 computer crash @ 4477333 sec.

Walter J. Macchowski
 1/19/99

LT825P5AA

Specimen: Alloy 825 same as p. 194
 start wt. 39.08712 g
 end wt. 39.07964 g
 2 PTFE washers as per p. 166

Solution: 1000 ppm Cl⁻ 85 ppm HCO₃⁻
 20 ppm SO₄²⁻ 10 ppm NO₃⁻ 2 ppm F⁻
 3.29707 g NaCl Lot # 972274
 0.23678 g NaHCO₃ " 897789
 40 ml SO₄²⁻ }
 20 ml NO₃⁻ } 10/98 } Stock Sol'n NB157 p. 212
 4 ml F⁻ }
 + DI water to 2000 mL

start pH 8.095 end pH 9.143

T = 95°C Hg thermometer 10323004

Potentiostat ESC 440 #1 Channel #5
 data saved as L825P5AA

Counter electrode: graphite rod
 Ref. electrode: Fisher SCE 13620-51 S/N 3106337

E applied -100 mV

E_{can} -112 mV } Keithley 914 S/N 0555368
 E_{counter} -143 mV } cal 11/06/98 due 11/07/99

Start @ 10:30 AM 11/11/98
 Computer crash @ 4477333 sec.

CUMULATIVE TEST TIME 1234.03 DAYS

Walter J. Macchowski
 1/19/99

OC825C1X

Specimen: alloy 825 same as p. 195
 start wt. 39.28138 g
 end wt. 39.28743 g

Solution: Same solution as p. 229

Start pH 8.095 end pH 9.077

T = 95°C aerated w/ g/eu air
 Hg thermometer 10323004

PotentioStat ESC 440 #1 Channel #6
 data saved as OC825C1X

Counter electrode: Pt flag
 Ref. electrode: Fisher SCE 13-620-51 S/N 5129169

E applied open circuit

E_{corr} +132 mV } Keithley 914 S/N 0555368
 E_{pr} +71 mV } cal 11/06/98 due 11/06/99

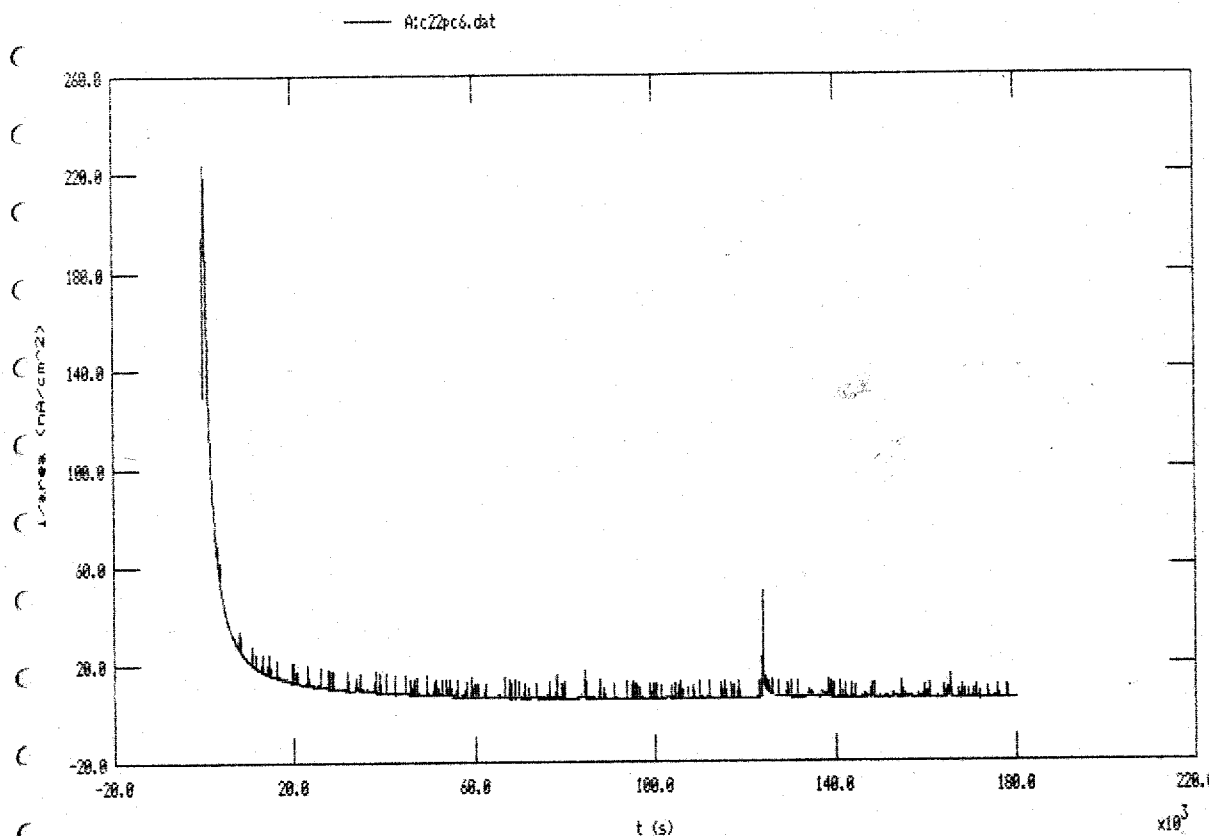
Start @ 10:30 AM 11/11/98

Computer crash @ 4477333 secs.

CUMULATIVE TEST TIME 1093.52 DAYS

Walter J. MacKowski
 1/19/99

Model 352/252 Corrosion Analysis Software, v. 2.38
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 10-28-98 Time Run: 08:18:39
 CP PASS vs. R CT PASS IP 0.200 vs. R ID PASS TP 6.000E+01 T1 1.800E+05
 CR AUTO NP 3000 SO Pass IR NONE FL 1 5.3Hz RT HIGH STABILITY
 REF 0.24150 SCE NPK SOLID AR 9.500E+00 LS YES EN 6.355E+01 DEN 8.900E+00 AU NO
 OC 0.174



James D. 10/30/98

Model 352/252 Corrosion Analysis Software, v. 2.38
 Filename: A/c22pc6.dat
 Pstat: VStat11 Ver 2
 PS POTENTIOSTATIC
 Date Run: 10-28-98
 File Status: NORMAL
 Time Run: 08:18:39

Cond. Time	CT	pass	s	Initial Pot.	IP	200.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	100.0E3	s
Initial Delay	ID	pass	s	Stop On	SO	Pass	
Time/Pt.	TP	60.00	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	1 5.3Hz	
Working Elec.	WE	Solid		Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	9.500	cm²	Equiv. Wt.	EW	63.55	g
Density	DE	8.900	g/ml	AUX A/D	AU	no	
Open Circuit	OC	174.0E-3	V				

James D. 10/30/98

C-22 PASSIVE CURRENT DENSITY

OBJECTIVE MEASURING PASSIVE CURRENT DENSITY OF C-22

SPECIMEN C-22 NEAT 2277-8-3175

START WT 12.37935

END WT 12.37932g

SAME SPECIMEN AND SOLUTION AS PAGE 224

SOLUTION PAGE 224

TEMP = 20°C

N₃ THERMOMETER 18330S

POTENTIOSTAT EG&L VERSTAT SN 20104

COUNTER ELECTRODE Pt FLAG

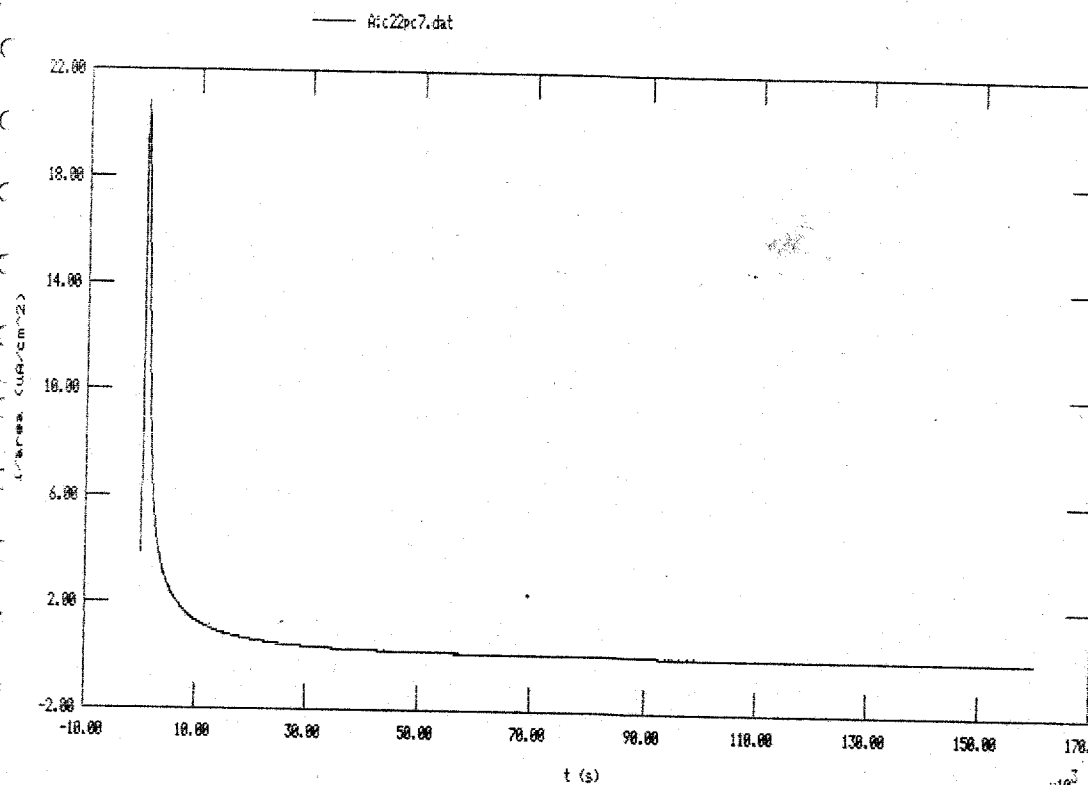
REFERENCE ELECTRODE FISHER SCE 13-620-S1 SN 7030126

E_{corr} + 0.019 V_{SCE}E_{APPLIED} + 400 mV_{SCE}E_{Pt} + 0.079 V_{SCE}PASSIVE CURRENT DENSITY 0.03 to 0.3 $\mu\text{A}/\text{cm}^2$
AFTER INITIAL CURRENT SPIKE

PLOT PAGE 233

SPECIMEN WEIGHED AT END OF TEST AND
REIMMERSED IN SOLUTION WITHOUT ADDITIONAL
SURFACE PREPARATION.

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 10-29-98 Time Run: 15:43:59
 CP PASS vs. R CT PASS IP 0.400 vs. R ID PASS TP 5.333E+01
 CR AUTO NP 3000 SO Pass IR NONE FL 1.5.3Hz T1 1.000E+05
 REF 0.24150 SCE REF SOLID AR 8.000E+00 LS YES EM 5.335E+01 RT HIGH STABILITY
 DC 0.012 DEN 8.900E+00 AU NO
 Comment: C22 in 0.5 M Cl at 20 C and 400 mV vs SCE



James Dunn 11/2/98

Model 352/252 Corrosion Analysis Software, v. 2.30
 Filename: Aic22pc7.dat
 Pstat: VStat() Ver 2
 PS POTENTIOSTATIC File Status: NORMAL
 Date Run: 10-29-98 Time Run: 15:43:59
 Cond. Time CT Pass s Initial Pot. IP 400.0E-3 V
 Cond. Pot. CP Pass V Time Step 1 T1 100.0E3 s
 Initial Delay ID Pass s Stop On SO Pass
 Time-Pt. TP 53.33 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 1.5.3Hz
 Working Elec. WE Solid Ref. Elec. RE SCE 241.5E-3V
 Sample Area AR 8.000 cm^2 Equiv. Wt. EW 63.55 g
 Density DE 8.900 g/ml AUX A/D AU no
 Open Circuit OC 12.00E-3 V

Comment: C22 in 0.5 M Cl at 20 C and 400 mV vs SCE

James Dunn 11/2/98

C-22 PASSIVE CURRENT DENSITY

OBJECTIVE MEASURE PASSIVE CURRENT DENSITY OF C-22

SPECIMEN ALLOY C-22 HEAT 2277-8-3175

SAME AS PAGE 232

START WT 12.37932g

END WT 12.38090g

SOLUTION SAME AS P 224

0.5M NaCl 58.44318g NaCl LOT 972274

85 PPM HCO_3 0.23610g NaHCO_3 LOT 89778940 mL SO_4 -10/98 STOCK SOLUTION20 mL NO_3 -10/98

4 mL F -10/98

START pH 7.834

TEMP 20°C

Hq TNGR MONSTER 183305

POTENTIOSTAT EG&G VERSASTAD SN 20104

COUNTER ELECTRODE Pt FLUG

REFERENCE ELECTRODE FISHER SCE 13-620-51 SN 7030126

 $E_{\text{CORR}} + 63 \text{ mV/sec}$ K657N64 6517 SN 599913 $E_{\text{APPROX}} + 600 \text{ mV/sec}$ $E_{\text{PT}} + 77 \text{ mV/sec}$ K657N64 6517 SN 599913PASSIVE CURRENT DENSITY 0.04 TO 0.4 mA/cm^2

DATA SAVED AS C22PC8.DAT

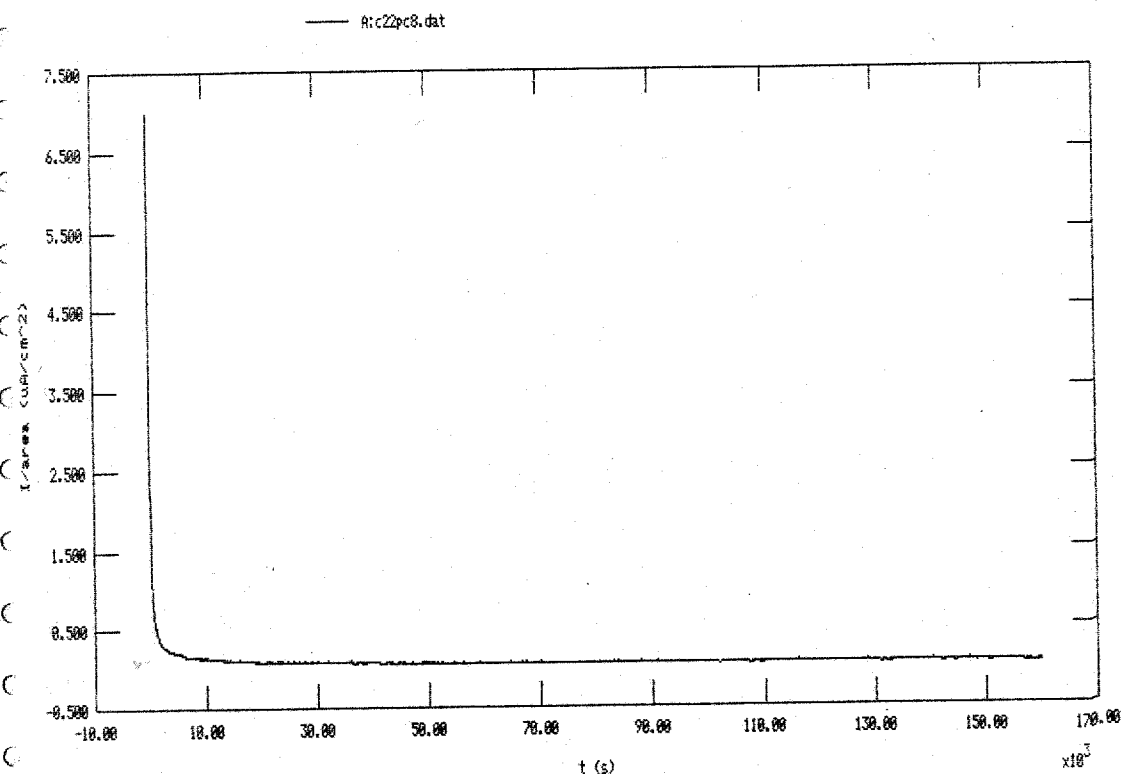
PLOT P 235

 11/5/98

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 10-31-98
 CP PASS vs. R CT PASS IP 0.600 vs. R
 CR AUTO HP 3000 SD Pass IR NONE
 REF 0.24150 SCE WNK SOLID AR 0.000E+00 LS YES
 OC 0.061
 Comment: C22 in 0.5 M Cl at 20 C and 600 mV vs SCE

Filename: Arc22pc8.dat
 Time Run: 06:07:37
 ID PASS
 IR NONE
 EN 6.355E+01

Pstat: VStat[] Ver 2
 T1 1.600E+05
 RT HIGH STABILITY
 DEN 0.900E+00 AU NO


 11/9/98

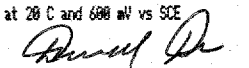
Model 352/252 Corrosion Analysis Software, v. 2.30
 Filename: Arc22pc8.dat
 Pstat: VStat[] Ver 2
 PS POTENTIOSTATIC File Status: NORMAL
 Date Run: 10-31-98 Time Run: 06:07:37

Cond. Time	CT	pass	s	Initial Pot.	IP	600.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	100.0E3	s
Initial Delay	ID	pass	s	Stop On	SO	Pass	

Time/Pt.	TP	53.33	s	Curr. Range	CR	Auto
No. of Points	HP	3000				

Line Sync.	LS	yes	IR Mode	IR	none	
Rise Time	RT	high stability	Filter	FL	1 5.3Hz	
Working Elec.	WE	Solid	Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	8.000	cm²	Equiv. Wt.	EW	63.55 g
Density	DE	8.900	g/cm³	AUX A/D	AU	no
Open Circuit	OC	61.00E-3	V			

Comment: C22 in 0.5 M Cl at 20 C and 600 mV vs SCE

 11/9/98

C-22 PASSIVE CURRENT DENSITY

OBJECTIVE MEASURE PASSIVE CURRENT DENSITY

SPECIMEN ALLOY C22 H6AT 2277-8-373

SAMPLE AS P 234

START WT 12.38090g

END WT

SOLUTION SAMPLE AS P234

0.5M Cl^- 85PPM HClO_3^- 20PPM SO_4^{2-} 10PPM NO_3^- 2PPM F^-

SEG PAGE 234 FOR COMPOSITION

START PH 7.834

TEMP 20°C

BY THERMOMETER 183905

POTENTIOSTAT EG&G-273 2D 11/5/98 VERSASTAT SN 2010P

COUNTER ELECTRODE Pt FLAG

REFERENCE ELECTRODE FISHER SCE 13-620-S1 SN 7030126

 E_{corr} +86 mV K6ITALEY 6527 SN 599913 E_{APPLIED} 800 mV/SCE E_{pt} +101 mV SCE K6ITALEY 6527 SN 599913PASSIVE CURRENT DENSITY 48-114 $\mu\text{A}/\text{cm}^2$

DATA SAVED AS C22PC9.DAT

PLOT PAGE 237

Dunlop 11/9/98

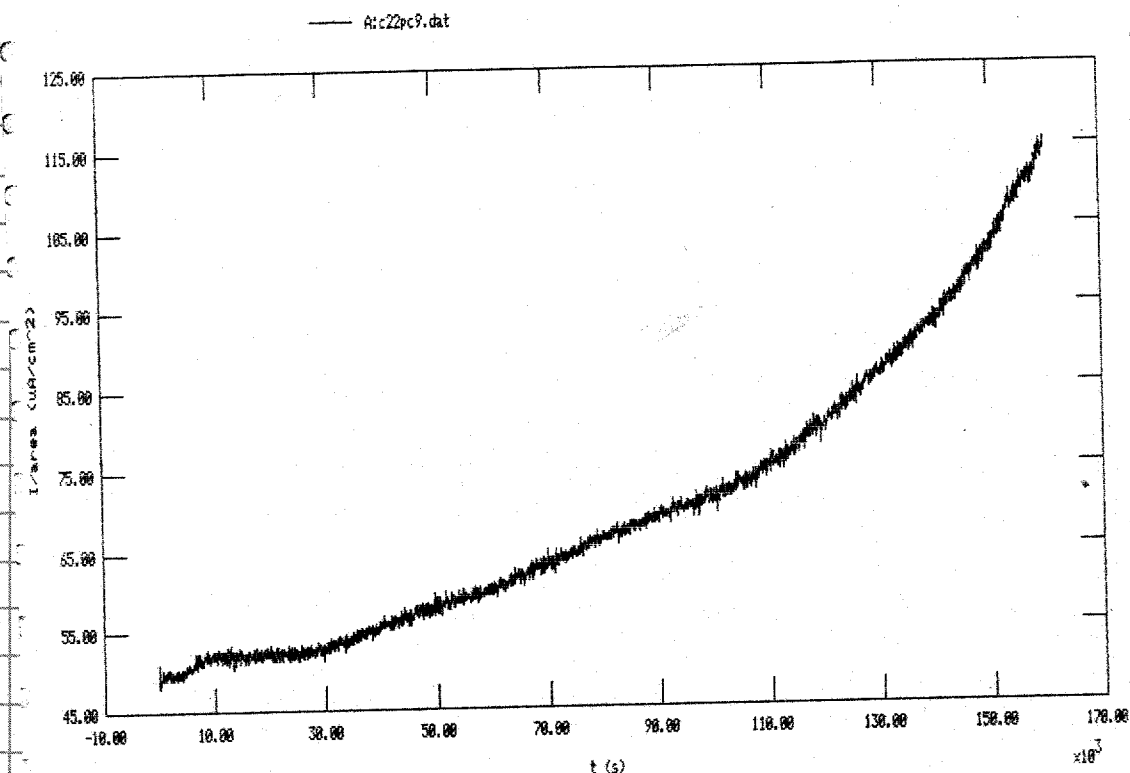
Model 352/252 Corrosion Analysis Software, v. 2.38
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 11-02-98
 CP PASS vs. R CT PASS IP 0.000 vs. R
 CR AUTO NP 3000 SO Pass IR NONE
 REF 0.24150 SCE WKK SOLID AR 8.000E+00 LS YES
 OC 8.061
 Comment: C22 in 0.5 M Cl at 20 C and 800 mV vs SCE

Filename: Acc22pc9.dat
 Time Run: 15:29:20
 ID 5 S
 IR NONE
 LS YES

TP 5.333E+01
 FL 1.5.3Hz
 EM 6.335E+01

Pstat: VStat() Ver 2
 T1 1.600E+05
 RT HIGH STABILITY
 DEN 8.900E+00

AU NO



Dunlop 11/9/98

Model 352/252 Corrosion Analysis Software, v. 2.38
 Filename: Acc22pc9.dat
 Pstat: VStat() Ver 2
 PS POTENTIOSTATIC
 Date Run: 11-02-98

File Status: NORMAL
 Time Run: 15:29:20

Cond. Time	CT	pass	s	Initial Pot.	IP	000.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	160.0E3	s
Initial Delay	ID	5	s	Stop On	SO	Pass	
Time/Pt.	TP	53.33	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	1.5.3Hz	
Working Elec.	WE	Solid		Ref. Elec.	RE	SCE 241.3E-3V	
Sample Area	AR	8.000	cm ²	Equiv. Wt.	EM	63.55	g
Density	DE	8.900	g/ml	AUX A/D	AU	no	
Open Circuit	OC	81.00E-3	V				

Comment: C22 in 0.5 M Cl at 20 C and 800 mV vs SCE

Dunlop 11/9/98

C-22 PASSIVE CURRENT DENSITY

OBJECTIVE MEASURE PASSIVE CURRENT DENSITY OF C-22

SPECIMEN C-22 HEAT 2277-8-3175

START WT = 12.24546 g

END WT = 12.24546 g

SOLUTION 0.5 M Cl^- 85 PPM HCO_3^- 20 PPM SO_4^{2-}
10 PPM NO_3^- 2 PPM F^- 2000 mL MADE AS FOLLOWS

58.44 g NaCl LOT 972274

0.240 g NaHCO_3 LOT 89778940 mL SO_4 - 10/9820 mL NO_3 - 10/984 mL F^- - 10/98

+ DI WATER TO 2000 mL

START pH 7.744

END pH NOT RECORDED.

TEMP = 95°C Hg THERMOMETER ~~183308~~ ^{11/13/98} 113 183305

POTENTIOSTAT EG&G VERSASTAT SN 20104

COUNTER ELECTRODE Pt FLAG

REFERENCE ELECTRODE FISHER SCE 13-620-51 SN 7030126

 E_{corr} -470 mV KETNER 6517 SN 599913 E_{pt} -137 mV " E_{APPLIED} +200 mV/SCEPASSIVE CURRENT DENSITY. 0.0095 - 0.0290 $\mu\text{A}/\text{cm}^2$

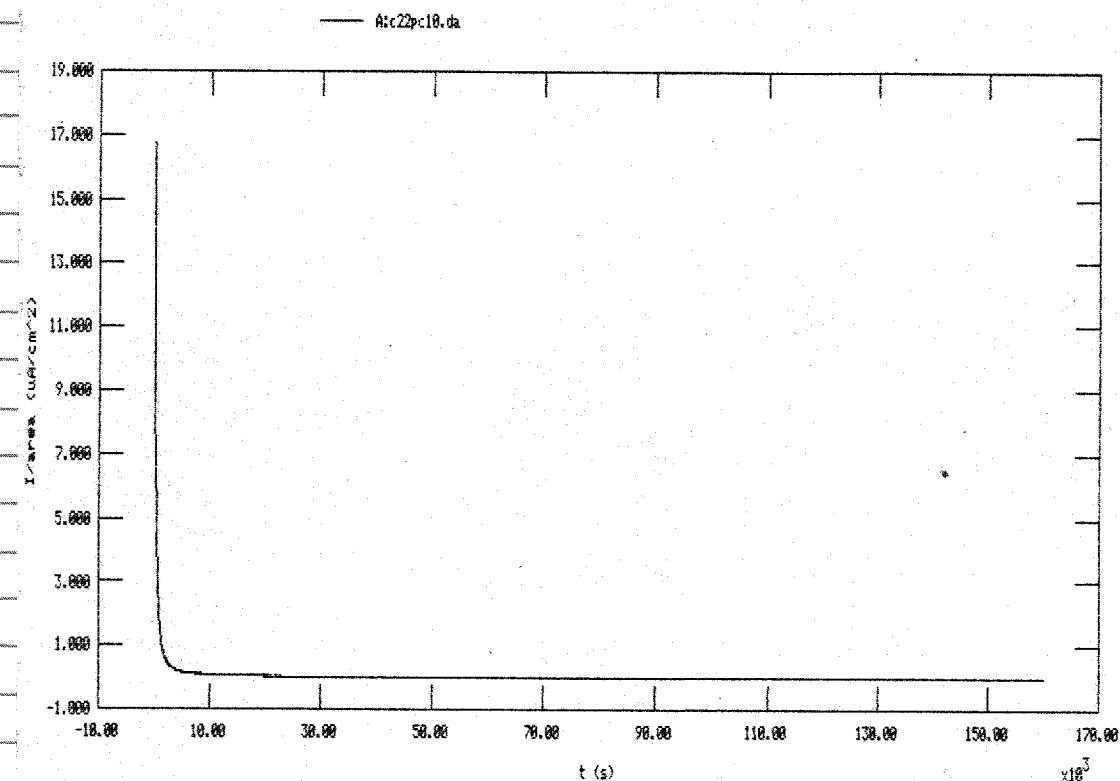
DATA SAVED AS C22 PCID.DAT

SPECIMEN REIMMERSED AFTER FINAL WT MEASUREMENT

PLOT PAGE 239.

[Signature] 11/13/98

Model 352/252 Corrosion Analysis Software, v. 2.38
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 11-05-98 Time Run: 15:38:19
 CP PASS vs. R CT PASS IP 0.200 vs. R ID 5 s TP 5.333E+01 T1 1.600E+05
 CR AUTO NP 3000 SO Pass IR NONE FL 1 5.3Hz RT HIGH STABILITY
 REF 0.24150 SCE MRK SOLID AR 8.000E+00 LS YES EM 6.355E+01 DEN 8.900E+00 AU NO
 OC -0.454
 Comment: C22 in 0.5 M Cl at 95 C and 200 mV vs SCE

*[Signature]* 11/13/98

Model 352/252 Corrosion Analysis Software, v. 2.38
 Filename: Aic22pc18.dat
 Pstat: VStat[] Ver 2
 PS POTENTIOSTATIC File Status: NORMAL
 Date Run: 11-05-98 Time Run: 15:38:19

Cond. Time	CT	pass	s	Initial Pot.	IP	200.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	160.0E3	s
Initial Delay	ID	5	s	Stop On	SO	Pass	
Time/Pt.	TP	53.33	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	1 5.3Hz	
Working Elec.	WE	Solid		Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	8.000	cm ²	Equiv. Wt.	EW	63.55	g
Density	DE	8.900	g/ml	AUX A/D	AU	no	
Open Circuit	OC	-454.0E-3	V				

Comment: C22 in 0.5 M Cl at 95 C and 200 mV vs SCE

[Signature] 11/13/98

C-22 REPASSIVATION POTENTIAL

OBJECTIVE: MEASURE E_{rp} OF C-22

SPECIMEN C-22 HEAT 2277-8-3175

CREVICE REPASSIVATION SPECIMEN

WITH PTFE CREVICE BLOCKS ATTACHED USING

C-276 NUT & BOLT TORQUED TO 40 IN-OZ USING PROTO 61D3

START WT 47.44318g

END WT

SOLUTION 4 M Cl^- , 85 PPM HCO_3^- , 20 PPM SO_4^{2-} , 10 PPM NO_3^- 2 PPM F^- 2000 mL MAKE AS FOLLOWS

467.53181 g NaCl LOT 972274

0.235 g $NaHCO_3$ LOT 89778940 mL SO_4 - 10/98 STOCK SOLUTION20 mL NO_3 - 10/98 "2 mL F^- - 10/98 "

START pH 7.510

END pH 5.510

POTENTIOSTAT EG&G 273 SN 41108

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHER SCE 13-620-S1 SN 9214080

POTENTIOSTAT CONTROLLER USING FRONT PANEL

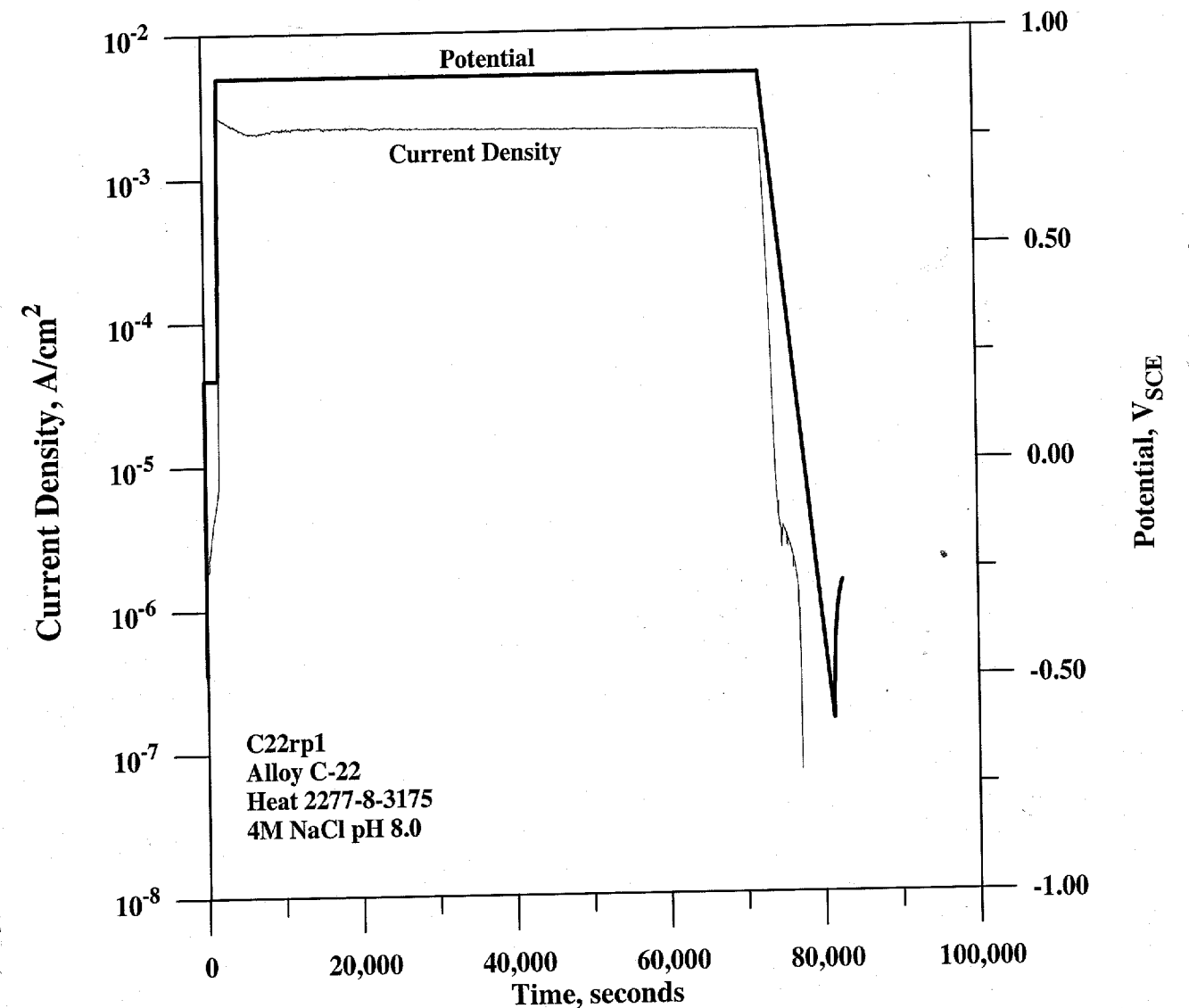
DATA COLLECTOR USING WORKBENCH SOFTWARE

AND DATA SNUTTLE DATA ACQUISITION BOARD

DATA SAVED AS C22RP1.DAT

 E_{corr} - 513 mV E_{pt} - 101 mV

PLOT PAGE 241

~~SPECIMEN~~ REPASSIVATION DD 11/16/98 $i < 10^{-5}$ A/cm² AT 570 mV_{SCE} $i < 10^{-6}$ A/cm² AT 135 mV_{SCE} $i < 0$ (NEGATIVE CURRENT) AT 119 mV_{SCE}

Daniel D 11/17/98

2 CLEAR AREAS OF CREVICE CORROSION 120 & 100 μ m DEEP.

Daniel D 11/17/98

C-22 PASSIVE CURRENT DENSITY

OBJECTIVE MEASURE C-22 PASSIVE CURRENT DENSITY

SPECIMEN C-22 HSMT 2217-8-3175 SAME AS P238

START WT 12.24546g

END WT 12.24593g

SOLUTION 0.5 M Cl^- 85PPM HCO_3^- 20PPM SO_4^{2-} 10PPM NO_3^- 2PPM F^- 2000 mL

SOLUTION COMPOSITION PAGE 238

TEMP = 95°C Hg THERMOMETER 183305

POTENTIOSTAT EG&G VERSASTAT SN 20104

COUNTER ELECTRODE Pt FLAC

REFERENCE ELECTRODE FISHER SCE 13-620-51 SN 7030126

 $E_{\text{CORR}} = -445 \text{ mV}_{\text{SCE}}$ KEITHLEY 6517 SN 59913 $E_{\text{PT}} = -43 \text{ mV}_{\text{SCE}}$ $E_{\text{APPLIED}} = +400 \text{ mV}_{\text{SCE}}$ PASSIVE CURRENT DENSITY 0.013 TO 0.035 $\mu\text{A}/\text{cm}^2$

DATA SAVED AS C22PC11.DAT

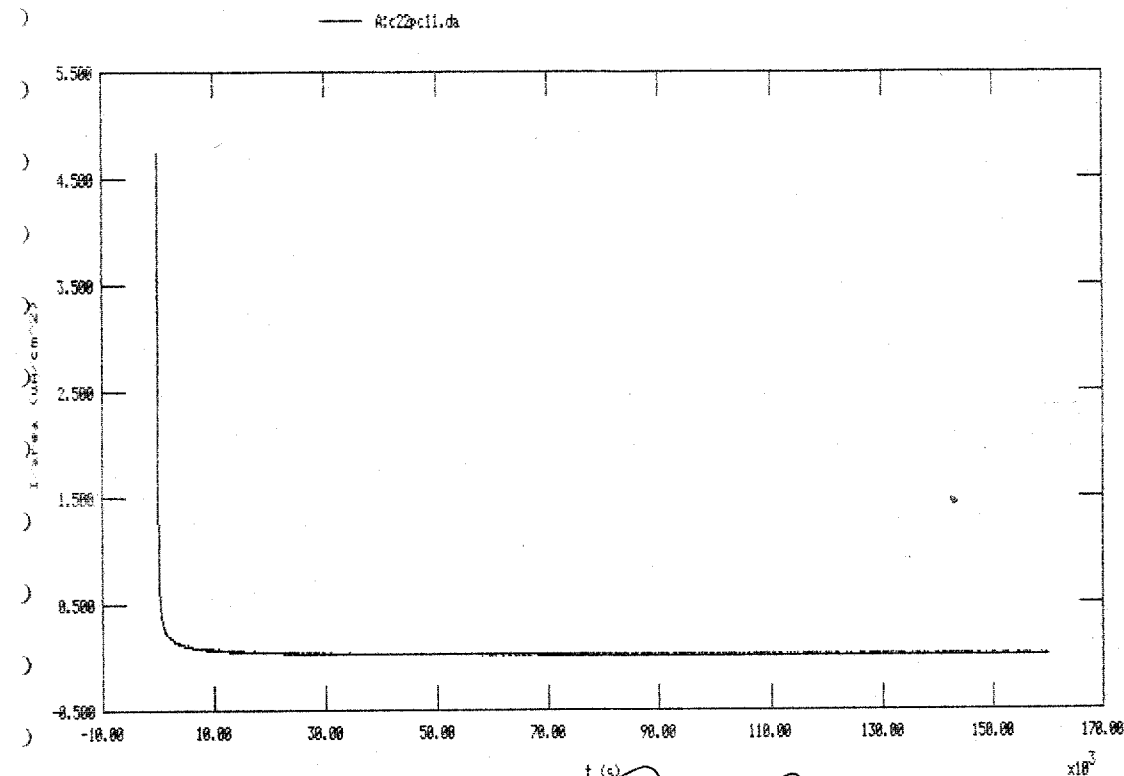
PLOT PAGE 243

SPECIMEN HAS SLIGHT GOLD COLOR

AFTER FINAL WEIGHT SPECIMEN WAS

REIMMERSED IN TEST SOLUTION

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 11-07-98 Time Run: 11:40:25
 CP PASS vs. R CT PASS IP 0.400 vs. R ID 5 S TP 5.333E+01 T1 1.000E+05
 CR AUTO HP 3000 SO Pass IR NONE FL 1 5.3Hz RT HIGH STABILITY
 REF 0.24150 SCE MPK SOLID AR 0.000E+00 LS YES EN 6.355E+01 DEN 8.900E+00 AU NO
 OC -0.445
 Comment: C22 in 0.5 M Cl at 95 C and 400 mV vs SCE



11/16/98

Model 352/252 Corrosion Analysis Software, v. 2.30
 Filename: Arc22pc11.dat
 Pstat: VStat() Ver 2
 PS POTENTIOSTATIC File Status: NORMAL
 Date Run: 11-07-98 Time Run: 11:40:25

Cond. Time	CT	pass	s	Initial Pot.	IP	400.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	100.0E3	s
Initial Delay	ID	5	s	Stop On	SO	Pass	

Time/Pt.	TP	53.33	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	1 5.3Hz
Working Elec.	WE	Solid	Ref. Elec.	RE	SCE 241.5E-3V
Sample Area	AR	0.000	Equiv. Wt.	EN	63.55 g
Density	DE	8.900	AUX A/D	AU	no
Open Circuit	OC	-445.0E-3	V		

Comment: C22 in 0.5 M Cl at 95 C and 400 mV vs SCE

11/16/98

C-22 REPASSIVATION POTENTIAL

OBJECTIVE MEASURE E_{RP} OF C-22

SPECIMEN C-22 HEAT 2277-8-3175

CRUICK REPASSIVATION SPECIMEN W/ PTFE

CRUICK WASHERS ATTACHED W/ C-276 NUT

AND BOLT TORQUED TO 40 IN-OZ USING PRTO 6103

START WT 47.14663g

END WT

SOLUTION 1 MCl⁻ 85 PPM NO_3^- 20 PPM SO_4^{2-} 10 PPM NO_3^- 2 PPM F^- 2000 mL MADE AS FOLLOWS

116.88713 g NaCl LOT 972274

0.23587 g $NaHCO_3$ LOT 923337A40 mL SO_4^{2-} 10/98 STOCK SOLUTION20 mL NO_3^- 10/98 "4 mL F^- 10/98 "

START pH 7.992

END pH

POTENTIOSTAT EG&G 273 SN 41108

COUNTER ELECTRODE Pt FLAG

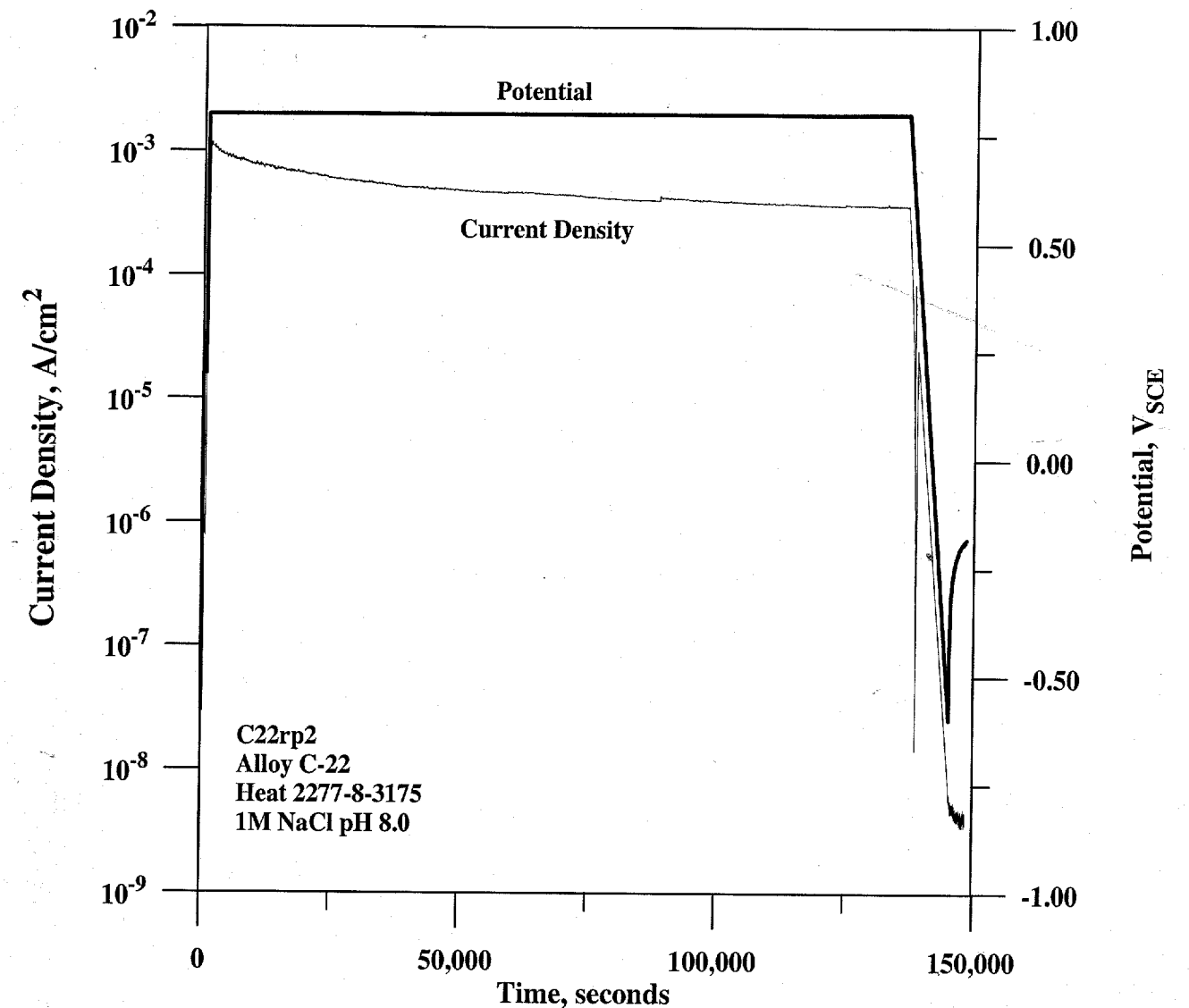
REFERENCE FERRI SEE 13-620-S1 SN 9214080

DATA SAVED AS C-22 RP2.DAT USING WORKBOOK

 E_{CORR} -581 mV E_{RP} -370 mV

NO CRUICK CORROSION. SOME GENERAL
CORROSION AND INTERGRANULAR ATTACK OUTSIDE
OF CRUICK AREA

Daniel Dunn 11/17/98

 $i < 10^{-5}$ A/cm² at 558 mV_{SCE} $i < 10^{-6}$ A/cm² at 523 mV_{SCE} $i < 0$ (NEGATIVE CURRENT) at 496 mV_{SCE}

Daniel Dunn 11/17/98

Daniel Dunn 11/17/98

C-22 PASSIVE CURRENT DENSITY

OBJECTIVE MEASURE PASSIVE CURRENT DENSITY OF C-22

SPECIMEN C-22 HEAT 2277-8-3175 SAME ASP 242

START WT 12.24593 g

END WT 12.23515 g

SOLUTION 0.5 M Cl⁻ 85 PPM HCO₃⁻ 20 PPM SO₄²⁻10 PPM NO₃⁻ 2 PPM F⁻ 2000 mL

SOLUTION COMPOSITION P 238

TEMP = 95°C

M₇ THERMOMETER 183305

POTENTIOSTAT EG&G VEGASTAT SN 20104

COUNTER ELECTRODE Pt FLAG

REFERENCE ELECTRODE FISHBONE SCE 13-620-51 SN 7030126

E_{corr} -94 mV_{SCE} KEITHLEY 6517 SN 599913E_{PE} -40 mV_{SCE}E_{APPLIED} +600 mV_{SCE}PASSIVE CURRENT DENSITY 39 TO 50 $\mu\text{A}/\text{cm}^2$

DATA SAVED AS C22PC12.DAT

PLOT PAGE 247

SPECIMEN GOLD ON TOP PORTION AND

BLACK / BROWN NEAR BOTTOM SOME

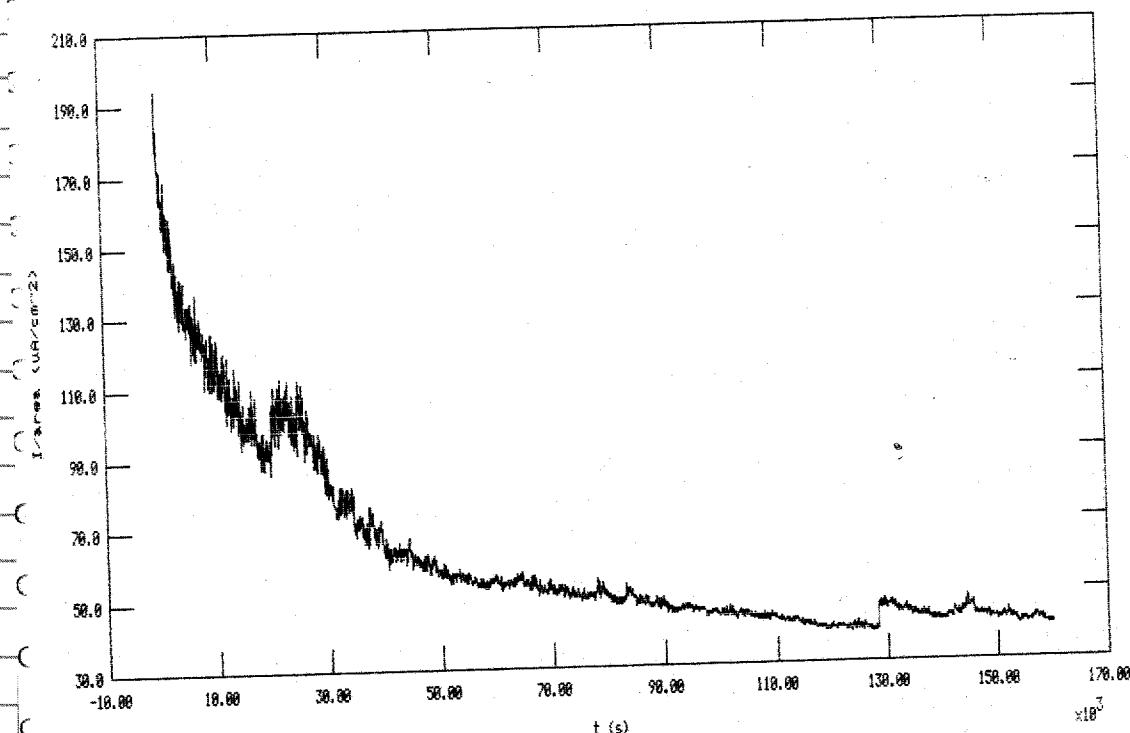
GREEN CORROSION PRODUCTS.

Russell Dunn 11/18/98

Model 352/252 Corrosion Analysis Software, v. 2.38
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 11-09-98 Time Run: 13:41:58
 CP PASS vs. R CT PASS IP 0.600 vs. R ID 5.5 TP 5.333E+01 T1 1.600E+05
 CR AUTO NP 3000 SO Pass IR NONE FL 1.5.3Hz RT HIGH STABILITY
 REF 0.24150 SCE WK SOLID RP 8.000E+00 LS YES EN 6.355E+01 DEN 8.900E+00 AU NO
 OC -8.897
 Comment: C22 in 0.5 M Cl at 95 C and 600 mV vs SCE

Pstat: VStat[] Ver 2

— Hic22pc12.da



Model 352/252 Corrosion Analysis Software, v. 2.38

Filename: Hic22pc12.dat

Pstat: VStat[] Ver 2

Date Run: 11-09-98

File Status: NORMAL

Time Run: 13:41:58

Cond. Time	CT	pass	s	Initial Pot.	IP	600.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	160.0E3	s
Initial Delay	ID	5	s	Stop On	SO	Pass	

Time/Pt.	TP	53.33	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	1.5.3Hz
Working Elec.	WE	Solid	Ref. Elec.	RE	SCE 241.5E-3V
Sample Area	AR	8.000	Equiv. Wt.	EW	63.55 g
Density	DE	8.900	AUX A/D	AU	no
Open Circuit	OC	-97.00E-3			

Comment: C22 in 0.5 M Cl at 95 C and 600 mV vs SCE

Russell Dunn 11/18/98

C-22 REPASSIVATION POTENTIAL

OBJECTIVE: MEASURE REPASSIVATION POTENTIAL OF C-22

SPECIMEN ALLOY C-22 HEAT 2277-8-3175

START WT 47.34191g

END WT 46.72289

SPECIMEN w/ PTFE CRUICKS BLOCKS TORQUE = 100 in-oz

SOLUTION 4 MCl⁻ 20PPM SO₄²⁻ 10PPM NO₃⁻ 2PPM F⁻

467.56183g NaCl LOT 985302

40 mL SO₄²⁻ - 11/9820 mL NO₃⁻ - 11/98 } Stock Solutions NB157 p.2504 mL F⁻ - 11/98

PH ADJUSTED w/ HCl

+ DI WATER TO 2000 mL

Temp = 95°C

Hg THERMOMETER C96-833

START pH 1.005 END pH 1.365

POTENTIOSTAT EG&G 273 SN 41108

COUNTER ELECTRODE Pt FLAG

REFERENCE ELECTRODE FISHER 13-620-S1 SN 9214080

DATA SAVED AS C22RP3.DAT USING WORK BENCH

Ecorr -255mV Keithley 614 SN 553368

E_{pt} -29mV "

SPECIMEN COMPLETELY IMMERSSED SPECIMEN

HOLDER MODIFIED TO INCLUDE NEOPRENE GASKET

BETWEEN TEFCON AND TOP OF SPECIMEN

Specimen showed signs of transpassive dissolution - grain boundaries were clearly visible on surfaces exposed
SEE PLOT on p. 281

Walter J. Macchiarini
11/24/98

C-22 REPASSIVATION POTENTIAL

Objective: Measure re-passivation potential of C-22

Specimen: Alloy C-22 Heat 2277-8-3175

Start WT. 47.24678g

End WT. 46.75756g

Specimen w/PTFE crucible blocks Torque = 100 in-oz

Solution: Sat'd NaCl 85ppm NaCl⁻ 20ppm SO₄²⁻ 10ppm NO₃⁻ 2ppm F⁻

720g NaCl Lot # 985302

0.2409g NaHCO₃ Lot # 89278940ml SO₄²⁻20ml NO₃⁻ } 11/98 } Stock Solutions NB157 p.2504ml F⁻

+ DI Water to 2000 mL

Start pH 7.087

End pH 6.668

Temp = 95°C Hg thermometer C96-833
de-aerated w/ 99.999% N₂

Potentiostat EG&G 273 S/N 41108

Counter electrode Pt flag

Reference electrode Fisher 13620-S1 S/N 9214080

Data saved as C22RP4.DAT using Work Bench

Ecorr -301mV Keithley 614 S/N 553368

E_{pt} +149 "

Completely immersed as described on p. 248

Specimen somewhat darkened - signs of transpassive dissolution

SEE PLOT on p. 282

Walter J. Macchiarini
11/30/98

Stock Solutions

SO_4^{2-} 11/98
 1000 ppm SO_4^{2-} as Na_2SO_4
 1.47864 g Lot # 901213
 prep. 11/12/98 exp 12/12/98

NO_3^- 11/98
 1000 ppm NO_3^- as NaNO_3
 1.37016 g Lot # 961772A
 prep 11/17/98 exp 12/17/98

F^- 11/98
 1000 ppm F^- as NaF
 2.21781 g Lot # 896405
 prep. 11/12/98 exp 12/17/98

Walter J. Macchiusi
 11/17/98

C-22 PASSIVE CURRENT DENSITY

OBJECTIVE MEASURE PASSIVE CURRENT DENSITY FOR C-22

SPECIMEN ALLOY C-22 HGT 2277-F-3175

SAMPLE AS P246
 START WT 12.30890 g
 END WT 12.30889 g

SOLUTION 4MCl⁻ 85PPM NO_3^- 20PPM SO_4^{2-} 10PPM NO_3^-
 2PPM F^- 2000 mL

SAMPLE SOLUTION AS P252

TEMP = 95°C

100 THERMOMETER 183305

START PH 7.635

SOLUTION DEAERATED w/ 99.999% N_2

POTENTIOSTAT EG&G VASA STD SN 20104

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHKIN SCE 13-620-S1 SN 7030126

E_{CORR} -18 mV/sec KETTLER 6517 SN S99913

E_{PT} -127 mV/sec

E_{APPLIED} +400 mV/sec

PASSIVE CURRENT DENSITY 0.032 TO 0.054 mA/cm²

SPECIMEN VERY LIGHT GOLD COLOR NO PITS

PLOT PAGE 253

11/23/98

C-22 PASSIVE CURRENT DENSITY

OBTAINING MEASURE PASSIVE CURRENT DENSITY OF C-22

SPECIMEN C-22 NEAT 2277-8.3175

START WT 12.30892g

END WT 12.30890g

SOLUTION 4M Cl⁻ 233.76g NaCl LOT 98530285PPM HCO₃⁻ 0.24132g NaHCO₃ LOT 89778920 ppm SO₄⁻ 40 mL SO₄ -11/9810 ppm NO₃⁻ 20 mL NO₃ -11/982 ppm F⁻ 4 mL F⁻ -11/98

+ DI WATER TO 2000 mL

TEMP = 95°C

H₂ THERMOMETER 183305

START pH 7.635

POTENTIOSTAT EG&G VERSASTAT SN 20104

COUNTER ELECTRODE Pt FLAG

REFERENCE ELECTRODE FISHER SCC 13-620-S1 SN 7030126

E_{corr} -668 mV_{SCC} KEITHLEY 6517 SN 599913E_{ref} -168 mV_{SCC}E_{APPLIED} +200 mV_{SCC}

COMPUTER CRASHED DATA NOT SAVED

VISUAL OBSERVATION OF CURRENT DENSITY

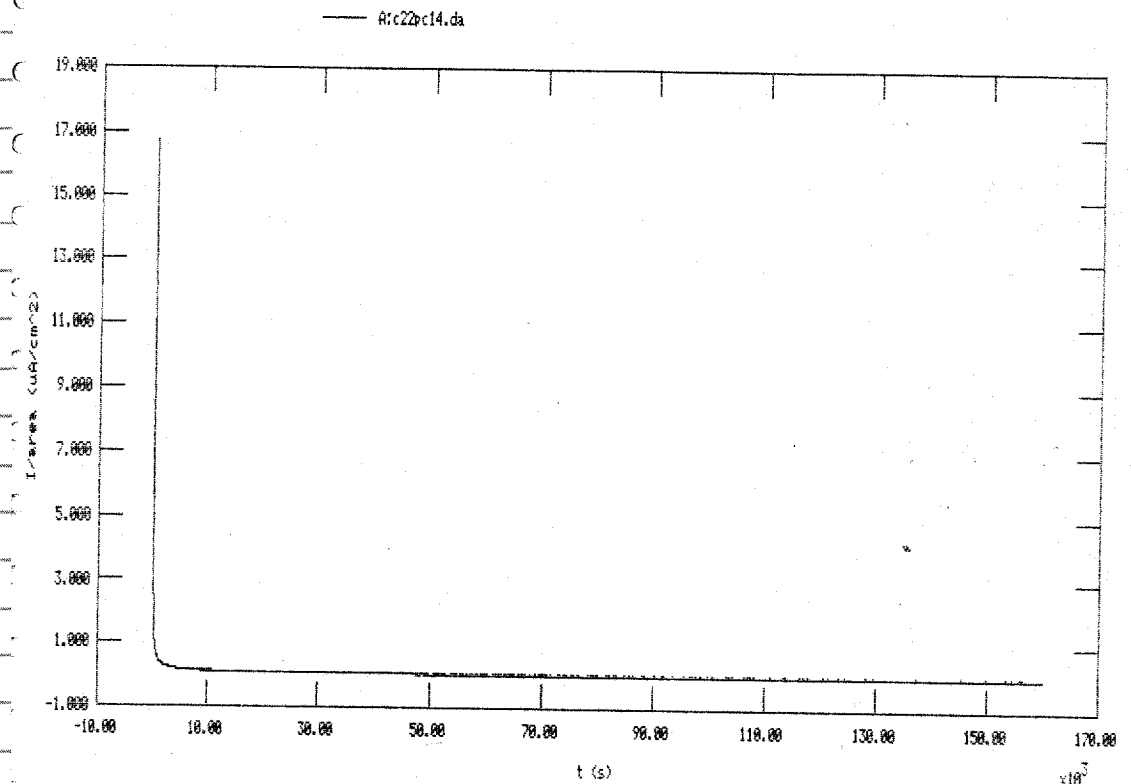
WAS 1.2×10^{-8} A/cm² TO 4×10^{-8} A/cm² AFTER24 hr AT 200 mV_{SCC} NO LARGE SPIKES

IN CURRENT DENSITY OBSERVATION.

SOLUTION DEGRATED w/ 99.999 % N₂

Daniel D 11/23/98

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 11-11-98 Time Run: 15:07:24
 CP PASS vs. R CT PASS IP 0.400 vs. R ID 5 s TP 5.333E+01 T1 1.600E+05
 CR AUTO HP 3000 SD Pass IR NONE FL 15.3Hz RT HIGH STABILITY
 REF 0.0000 User HPK SOLID AR 8.000E+00 LS YES EN 0.000E+00 DEN 0.000E+00 AU NO
 OC -0.018
 Comment: 4 molar Cl at 95 C and 400 mV_{SCC}



Daniel D 11/23/98

Model 352/252 Corrosion Analysis Software, v. 2.30

Filename: Arc22pc14.da

Pstat: VStat[] Ver 2

PS POTENTIOSTATIC

Date Run: 11-11-98

File Status: NORMAL

Time Run: 15:07:24

Cond. Time	CT	pass	s	Initial Pot.	IP	400.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	160.0E3	s
Initial Delay	ID	5	s	Stop On	SD	Pass	
Time/Pt.	TP	53.33	s	Curr. Range	CR	Auto	
No. of Points	HP	3000					

Line Sync.	LS	yes	IR Mode	IR	none
Rise Time	RT	high stability	Filter	FL	15.3Hz
Working Elec.	WE	Solid	Ref. Elec.	RE	User 0.0000 V
Sample Area	AR	8.000	Equiv. Wt.	EW	0.0000 g
Density	DE	8.900	AUX A/D	AU	no
Open Circuit	OC	-10.00E-3			

Comment: 4 molar Cl at 95 C and 400 mV_{SCC}

Daniel D 11/23/98

C-22 PASSIVE CURRENT DENSITY

OBJECTIVE MEASURE PASSIVE CURRENT DENSITY

SPECIMEN C-22 AGAT 2277-8-3175

SAME SPECIMEN AS P 251, 252

START WT 12.30887g

END WT 12.30874g

SOLUTION 4M Cl^- 85PPM HCO_3^- 20PPM SO_4^{2-} 10PPM NO_3^- 2PPM F^- 2000 mL

SAME SOLUTION AS P 252

START pH 7.635

TEMP = 95°C

Hg THERMOMETER 183305

SOLUTION DE AERATED w/ 99.999% N_2

POTENTIOSTAT ECKE VERSASTAT SN 20104

COUNTER ELECTRODE Pt FLAG

REFERENCE FISHER SCE-13-626-SI SN 7030126

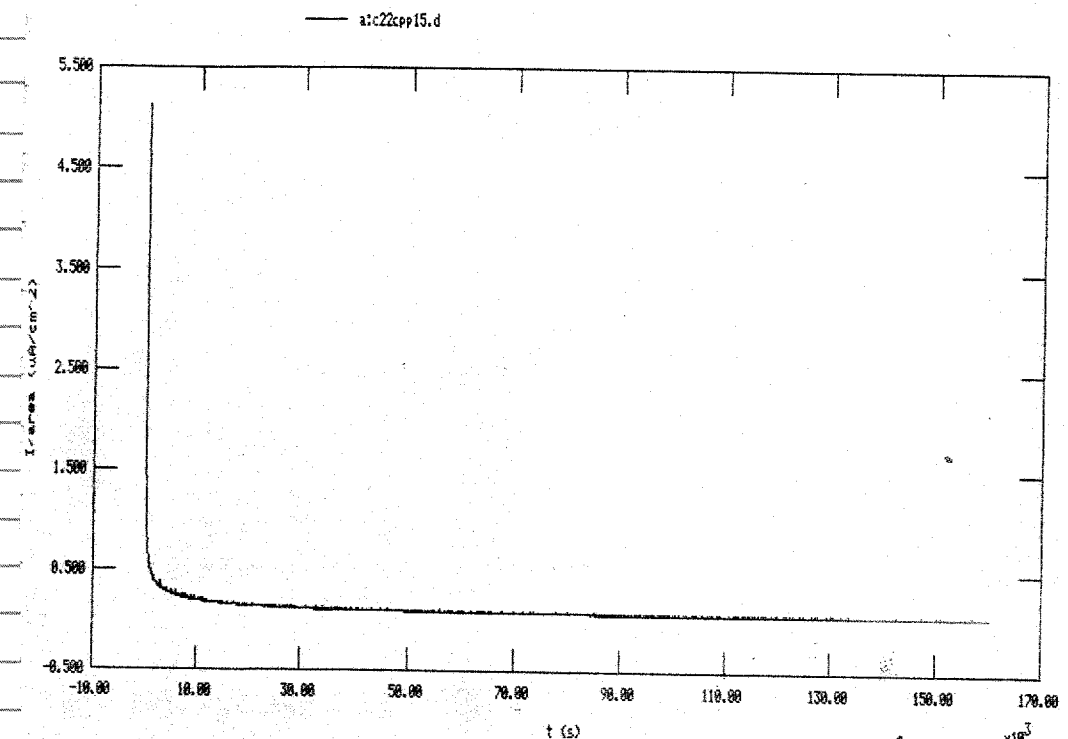
 E_{corr} -23 mV_{SCE} KEITHLEY 6517 SN 599913 E_{pt} -49 mV_{SCE} E_{APPLIED} +600 mV_{SCE}

Specimen had no pits; no obvious film

Passive current density 68-103 $\mu\text{A}/\text{cm}^2$

Walter J. Macdonald
11/17/98

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 11-13-98 Time Run: 06:27:12 Pstat: VStat() Ver 2
 CP PASS vs. R CT PASS IP 8.600 vs. R ID 5 S TP 5.333E+01 T1 1.600E+05
 CR AUTO NP 3000 SO Pass IR NONE FL 1 S.3Hz RT HIGH STABILITY
 REF 8.24150 SCE HW SOLID AR 8.000E+00 LS YES EN 8.000E+00 DEN 8.900E+00 AU NO
 OC -0.026
 Comment: 4 molar Cl at 95 C and 600 mV_{SCE}



Walter J. Macdonald 11/17/98

Model 352/252 Corrosion Analysis Software, v. 2.30
 Filename: aic22cpp15.dat
 Pstat: VStat() Ver 2
 PS POTENTIOSTATIC File Status: NORMAL
 Date Run: 11-13-98 Time Run: 06:27:12
 Cond. Time CT pass s Initial Pot. IP 600.0E-3 V
 Cond. Pot. CP pass V Time Step 1 T1 160.0E3 s
 Initial Delay ID 5 s Stop On 90 Pass
 Time/Pt. TP 53.33 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 1 S.3Hz
 Working Elec. WE Solid Ref. Elec. RE SCE 241.5E-3V
 Sample Area AR 8.000 cm² Equiv. Wt. EW 8.000 g
 Density DE 8.900 g/ml AUX A/D AU no
 Open Circuit OC -26.00E-3 V

Comment: 4 molar Cl at 95 C and 600 mV_{SCE}

Walter J. Macdonald
11/17/98

C-22 Passive Current Density

Objective: Measure Passive Current Density

Specimen: C-22 Heat 2277-8-3175
 Same Specimen as p. 251, 252, 254
 Start wt. 12.30874 g
 End wt. 12.06474 g
 11/25/98 WJ Machumski

Solution: 4M Cl^- 85 ppm Cl^- HClO_2^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-
 Same Solution as p. 252
 Start pH 7.635 End pH 7.098

Temp = 95°C Hg thermometer 183305
 Solution de-aerated w/ 99.999% N_2

Potentiostat EG&G Versastat S/N 20104
 Counter electrode Pt flag
 Reference Fisher SCE 13620-51 S/N 7030126

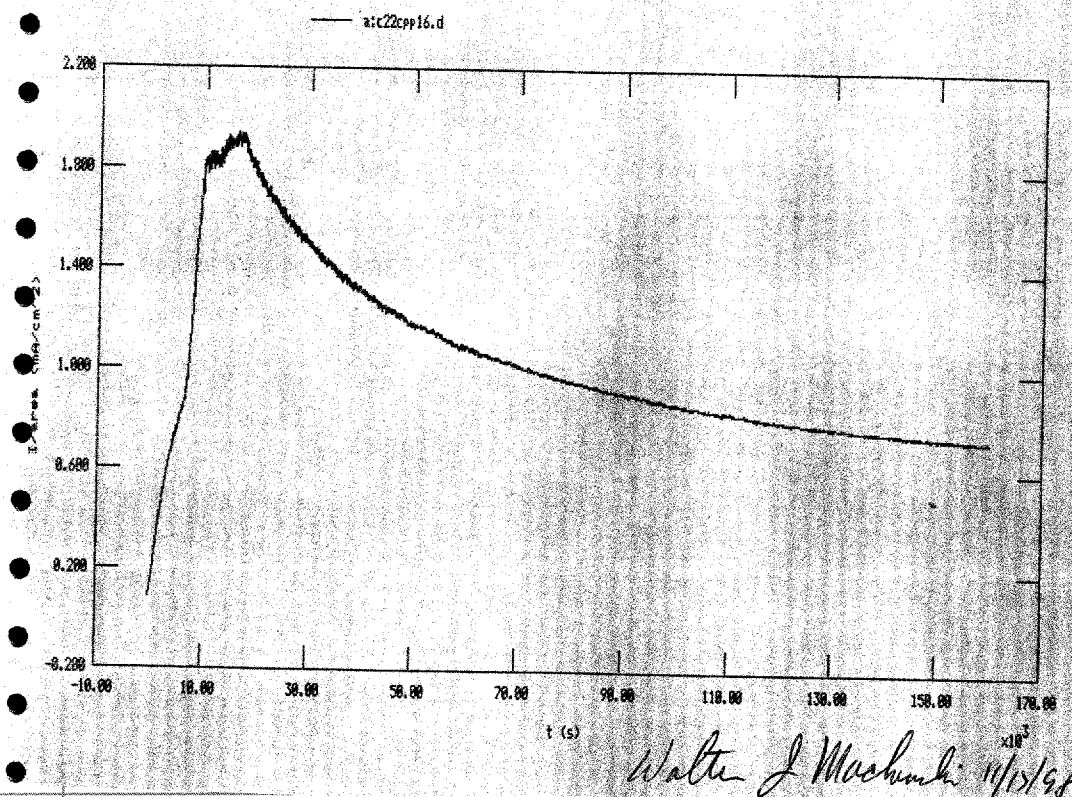
E_{corr} +124 mV SCE Keithly 6517 S/N 599913
 E_{Pt} -80 mV SCE
 E_{applied} +800 mV SCE

Specimen had dark film - no pits
 some attack @ liquid-gas interface

Passive current density 0.73-1.26 mA/cm²

Walter J Machumski
 11/15/98

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 11-14-98 Time Run: 13:51:52
 CP PASS vs. R CT PASS IP 0.000 vs. R ID 5 S TP 5.333E+01 T1 1.600E+05
 CR AUTO NP 3000 SD Pass IR NONE FL 1 5.3Hz RT HIGH STABILITY
 REF 0.24150 SCE HMK SOLID AR 0.000E+00 LS YES EM 0.000E+00 DEN 0.000E+00 AU NO
 OC 0.121
 Comment: 4 Molar Cl at 95°C and 800 mV SCE



Model 352/252 Corrosion Analysis Software, v. 2.30
 Filename: a/c22cpp16.d
 Pstat: VStatII Ver 2
 PS POTENTIOSTATIC File Status: NORMAL
 Date Run: 11-14-98 Time Run: 13:51:52

Cond. Time	CT	pass	s	Initial Pot.	IP	000.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	160.0E3	s
Initial Delay	ID	5	s	Stop On	SD	Pass	
Time/Pt.	TP	53.33	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	1 5.3Hz	
Working Elec.	WE	Solid		Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	8.000	cm ²	Equiv. Wt.	EW	0.0000	g
Density	DE	8.900	g/ml	AUX A/D	AU	no	
Open Circuit	OC	121.0E-3	V				

Comment: 4 Molar Cl at 95°C and 800 mV SCE

Walter J Machumski 11/15/98

C-22 Passive Current Density

Objective: Measure Passive Current Density

Specimen: C-22 Heat 2277-8-3715
 Start wt. 12.36108 g
 end wt.

Solution: 0.5M Cl^- 85ppm HCO_3^-
 20ppm SO_4^{2-} 10ppm NO_3^- 2ppm F^-
 58.49109 g NaCl Lot # 985302
 0.23589 g NaHCO_3 " 923337A
 40ml SO_4^{2-}
 20ml NO_3^- } 11/98 Stock Sol'n NB157p. 250
 4ml F^-
 + DI water to 2000 mL

Start pH 7.683 End pH 7.

Temp = 95°C Hg thermometer 183305
 Solution de-aerated w/99.999% N_2

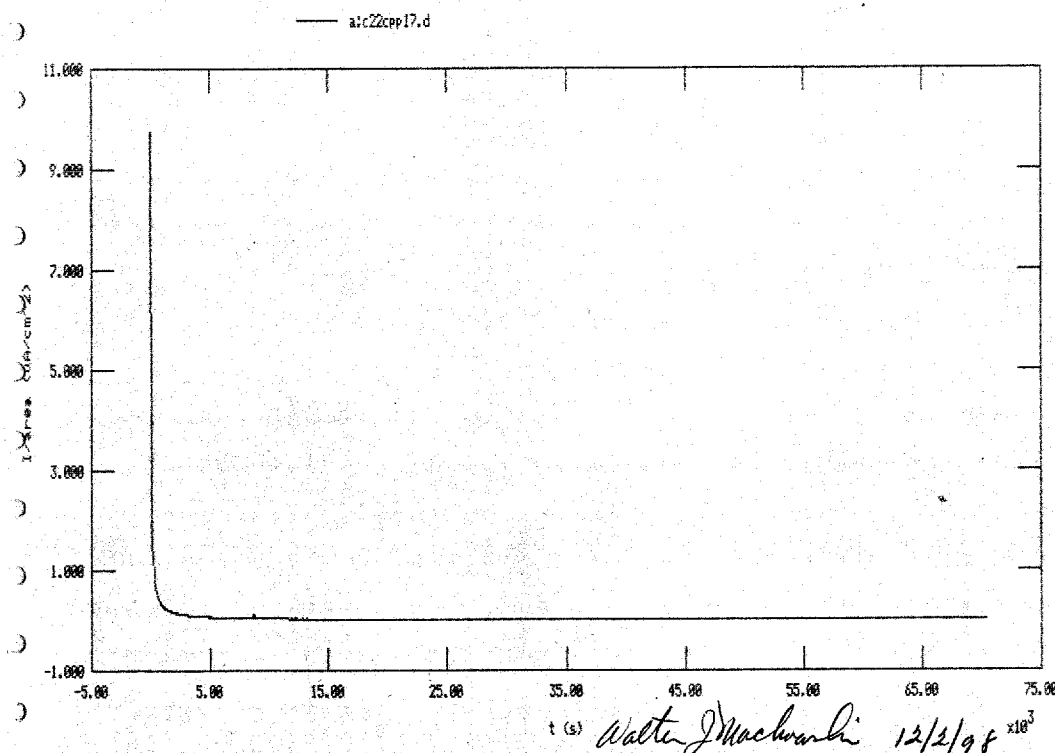
Potentiostat EG&G Versastat S/N 20104
 Counter electrode Pt flag
 Reference Fisher SCE 13-620-51 S/N 7030126

E_{corr} -470 mV Keithly 6517 S/N 599913
 E_{PE} -80 mV " " "
 E_{applied} 0 mV

Computer locked up - restarted
 current density $\sim 14-20 \text{ nA/cm}^2$

Walter J Machowski
 12/2/98

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 11-30-98
 CP PASS vs. R CT PASS IP 0.000 vs. R ID 5 S TP 5.333E+01 T1 1.600E+05
 CB AUTO NP 1318 SQ Pass IR NONE FL 1 5.342 RT HIGH STABILITY
 REF 0.24150 SCE WRT SOLID NR 0.000E+00 LS YES EM 0.000E+00 DEN 0.000E+00 AU NO
 OC -0.478
 Comment: C22: 0.5 Molar Cl at 95°C and 0.0 mV



Model 352/252 Corrosion Analysis Software, v. 2.30
 Filename: atc22cpp17.dat
 Pstat: VStat1 Ver 2
 PS POTENTIOSTATIC File Status: NORMAL
 Date Run: 11-30-98 Time Run: 11:37:52
 Cond. Time CT pass s Initial Pot. IP 0.0000 V
 Cond. Pot. CP pass V Time Step 1 T1 160.0E3 s
 Initial Delay ID 5 s Stop On SQ Pass s
 Time/Pt. TP 53.33 s Curr. Range CR Auto
 No. of Points NP 1318
 Line Sync. LS yes IR Mode IR none
 Rise Time RT high stability Filter FL 1 5.342
 Working Elec. WE Solid Ref. Elec. RE SCE 241.5E-3V
 Sample Area AR 0.000 cm² Equiv. Wt. EW 0.0000 g
 Density DE 8.900 g/ml AUX A/D AU no
 Open Circuit OC -470.0E-3 V

Comment: C22: 0.5 Molar Cl at 95°C and 0.0 mV

Walter J Machowski 12/2/98

C-22 Passive Current Density

Objective: Measure Passive Current Density

Specimen: C-22 Heat 2277-8-3715
 Same specimen as p. 258 12/5/98 WJ Machowski
 Start wt. ~~12.38163 g~~ 12.36097 g
 end wt. 12.26880

Solution: 0.5M Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F
 Same solution as on p. 258
 Start pH 7.683 end pH 8.207

Temp = 95°C Hg thermometer # 183305
 de-aerated w/ 99.999% N_2

Potentiostat EG&G Versastat S/N 20104
 Counter electrode Pt flag
 Reference: Fisher SCE 13-620-51 S/N 7030126

E_{corr} - not measured

E_{ox} - "

E applied +600 mV

Specimen had dark film
 no pits

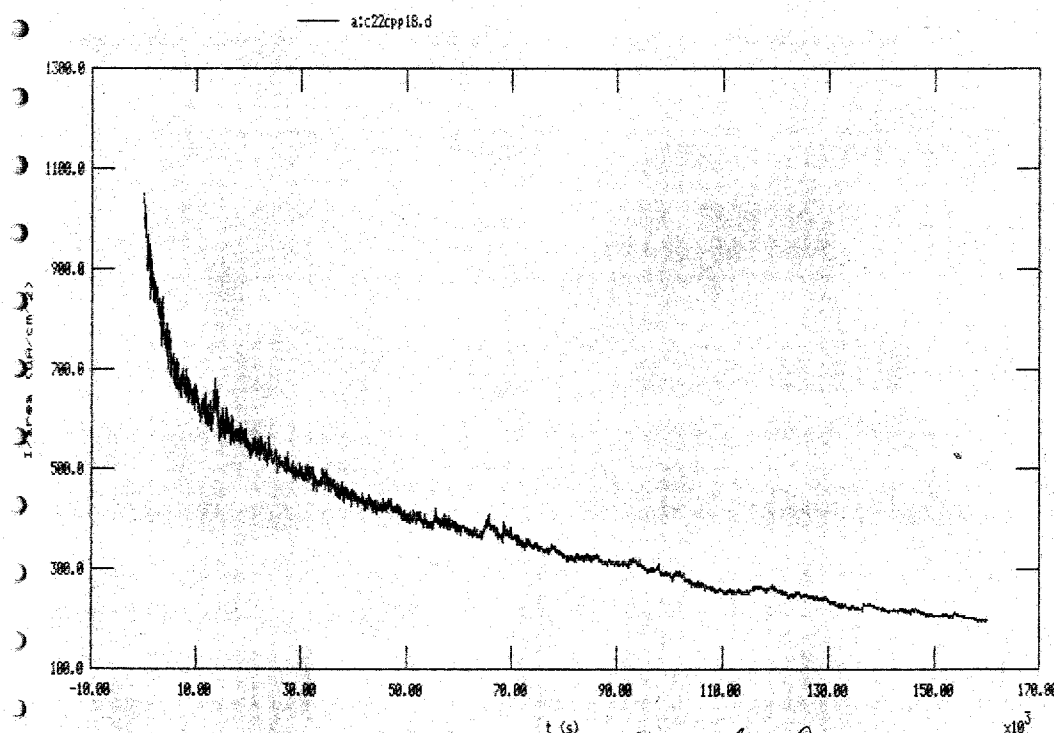
2/9/99 WJM

Current Density 203-390 $\mu\text{A}/\text{cm}^2$

Walter J Machowski

12/8/98

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 12-02-98 Time Run: 14:21:58
 CP PASS vs. R CT PASS IP 0.600 vs. R ID 5 S TP 5.333E+01 T1 1.600E+05
 CR AUTO NP 3800 SD Pass IR NONE FL 1 5.3Hz RT HIGH STABILITY
 REF 0.24158 SCE WKK SOLID AR 8.000E+00 LS YES EN 0.000E+00 DEN 8.900E+00 AU NO
 OC -0.629
 Comment: C22: 0.5 Molar Cl at 95°C and 600mV



Walter J Machowski 12/8/98

Model 352/252 Corrosion Analysis Software, v. 2.30
 Filename: a:c22cpp18.d
 Pstat: VStat11 Ver 2
 PS POTENTIOSTATIC File Status: NORMAL
 Date Run: 12-02-98 Time Run: 14:21:58
 Cond. Time CT pass s Initial Pot. IP 600.0E-3 V
 Cond. Pot. CP pass V Time Step 1 T1 160.0E3 s
 Initial Delay ID 5 s Stop On SD Pass
 Time/Pt. TP 53.33 s Curr. Range CR Auto
 No. of Points NP 3800
 Line Sync. LS yes IR Mode IR none
 Rise Time RT high stability Filter FL 1 5.3Hz
 Working Elec. WE Solid Ref. Elec. RE SCE 241.5E-3V
 Sample Area AR 8.000 cm² Equiv. Wt. EW 0.0000 g
 Density DE 8.900 g/ml AUX A/B AU no
 Open Circuit OC -29.00E-3 V

Comment: C22: 0.5 Molar Cl at 95°C and 600mV

Walter J Machowski 12/8/98

C-22 Passive Current Density

Objective: Measure Passive Current Density

Specimen: C-22 Heat 2277-8-3715
 Start wt. 12.38163 g
 End wt. 12.38041 g

Solution: 4M Cl⁻ pH 2.7

467.52 g NaCl Lot # 985302
 adj to pH 2.7 w/ HCl Lot # 921828
 dil to 2000 mL w/ DI water

Start pH 2.698 End pH

Temp = 95°C Hg thermometer #183305
 de-aerated w/ 99.999% N₂

Potentiostat EG&G Versastat S/N 20104

Counter electrode: Pt flange

Reference: Fisher SCE 15-620-51 S/N 7030126

E_{com} +15 mV Keithly 6517 S/N 599913
 E_{PT} +253 mV " " "

E_{applied} +200 mV

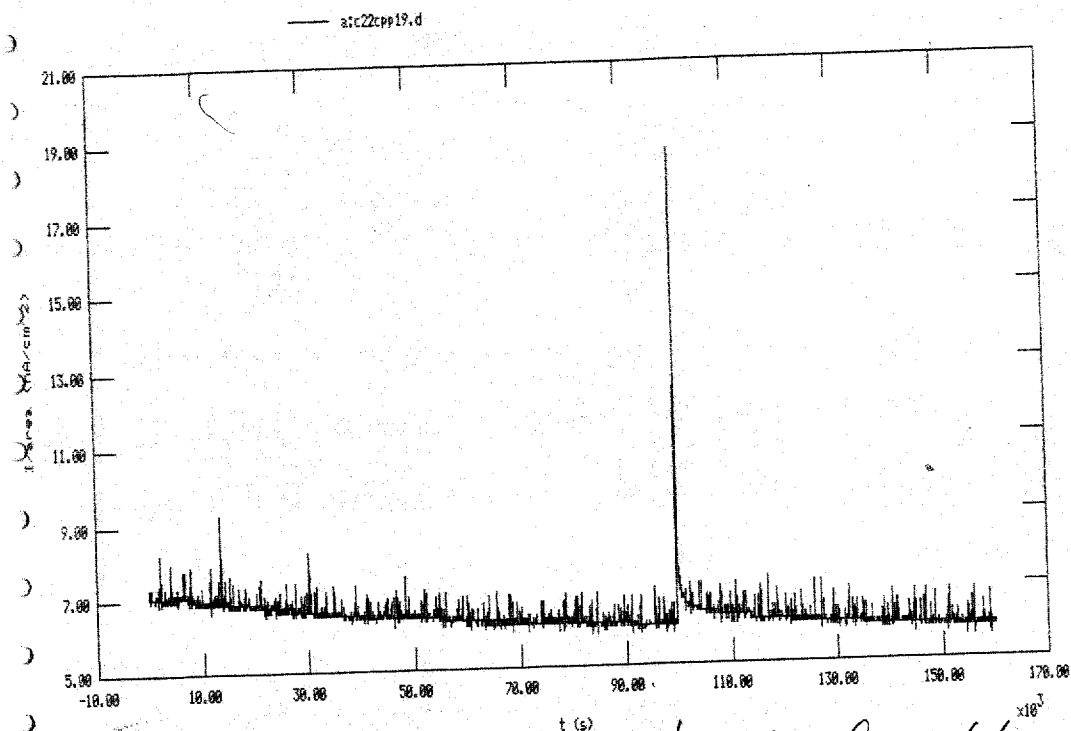
Computer locked up - restarted on 12/8/98 + stopped
 on 12/10/98

no pitting visible
 current density 5-7 nA/cm²

Walter J. Machowski

12/10/98

Model 352/252 Corrosion Analysis Software, v. 2.38
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 12-08-98 Time Run: 07:29:38
 CP PASS vs. R CT PASS IP 0.200 vs. R ID 5 S TP 5.333E+01 T1 1.000E+05
 CR AUTO HP 3000 SD Pass IR NONE FL 1.53Hz RT HIGH STABILITY
 REF 0.24150 SCE HXK SOLID AR 8.900E+00 LS NO EN 0.000E+00 DEN 6.900E+00 AU NO
 OC 0.211
 Comment: C-22: 4M Cl pH 2.7 95°C 200mV vs SCE



Walter J. Machowski 12/10/98

Model 352/252 Corrosion Analysis Software, v. 2.38
 Filename: aic22cpp19.dat
 Pstat: VStat[] Ver 2
 PS POTENTIOSTATIC
 Date Run: 12-08-98
 File Status: NORMAL
 Time Run: 07:29:38
 Cond. Time CT pass s Initial Pot. IP 200.0E-3 V
 Cond. Pot. CP pass V Time Step 1 T1 100.0E3 s
 Initial Delay ID 5 Stop On SO Pass
 Time/Pt. TP 53.33 s Curr. Range CR Auto
 No. of Points NP 3000
 Line Sync. LS no IR Mode IR none
 Rise Time RT high stability Filter FL 1.53Hz
 Working Elec. WE Solid Ref. Elec. RE SCE 241.5E-3V
 Sample Area AR 8.900 cm² Equiv. Wt. EN 0.0000 g
 Density DE 8.900 g/ml AUX A/D AU no
 Open Circuit OC 211.0E-3 V

Comment: C-22: 4M Cl pH 2.7 95°C 200mV vs SCE

Walter J. Machowski 12/10/98

C-22 Passive Current Density

Objective: Measure Passive Current Density

Specimen: C-22 Heat 2277-8-3715
 Same specimen as p. 262
 Start wt, 12.38041 g
 End wt, 12.37872 g

Solution: 4M Cl^- 2.7 pH
 Same solution as p. 262

Temp = 95°C Hg thermometer # 183305
 de-aerated w/ 99.999% N_2

Potentiostat EG&G Versastat S/N 20104
 Counter electrode Pt flag
 Reference: Fisher SCE 13-620-51 S/N 7030126

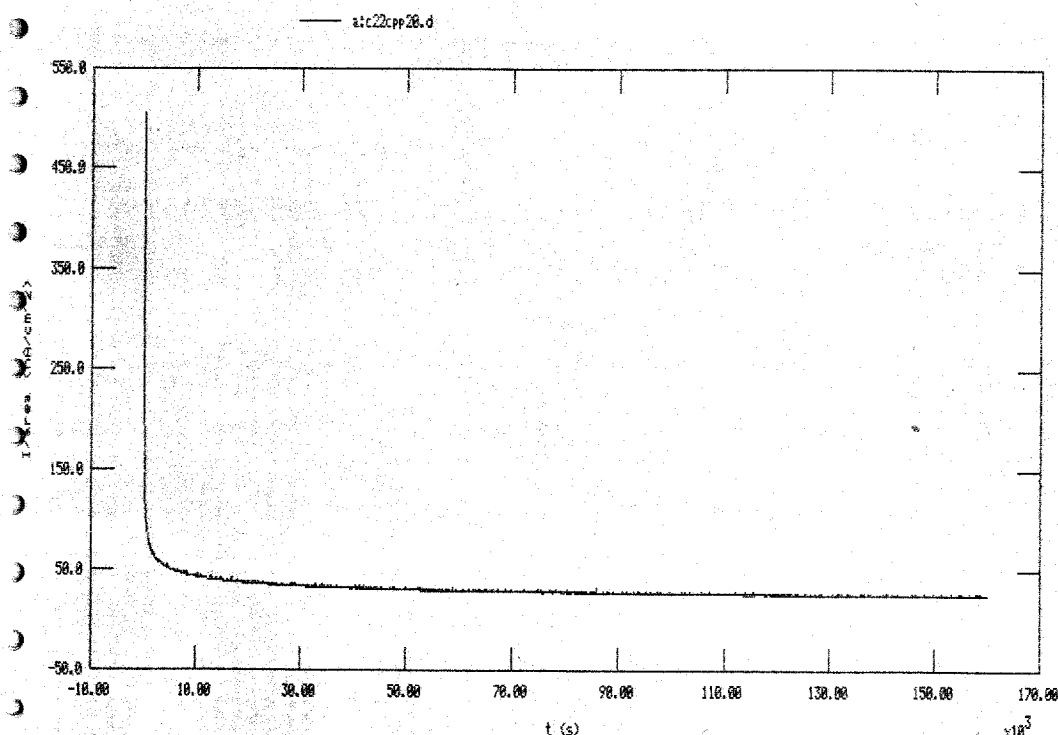
$E_{\text{com}} -64\text{mV}$ Keithley 651? S/N 599913
 $E_{\text{PR}} +274\text{mV}$ " " "
 $E_{\text{applied}} +400\text{mV SCE}$

no pitting visible

passive current density 25-30 nA/cm^2

Walter J Machrowski
 12/11/98

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 12-09-98 Time Run: 12:00:37
 CP PASS vs. R CT PASS IP 0.400 vs. R ID 5 S TP 5.333E+01 TI 1.600E+05
 CR AUTO HP 3000 SO Pass IR NONE FL 15.3Hz RT HIGH STABILITY
 REF 0.24150 SCE WKK SOLID AR 8.900E+00 LS NO EN 0.000E+00 DEN 8.900E+00 AU NO
 OC -0.066
 Comment: C-22: 4M Cl pH 2.7 95°C 200mV vs SCE



Model 352/252 Corrosion Analysis Software, v. 2.30
 Filename: aic22cpp26.d
 Pstat: VStat() Ver 2
 PS POTENTIOSTATIC
 Date Run: 12-09-98 File Status: NORMAL Time Run: 12:00:37

Cond. Time	CT	pass	s	Initial Pot.	IP	400.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	TI	160.0E3	s
Initial Delay	ID	5	s	Stop On	SO	Pass	
Time/Pt.	TP	53.33	s	Curr. Range	CR	Auto	
No. of Points	HP	3000					
Line Sync.	LS	no		IR Mode	IR	none	
Rise Time	RT	high stability		Filter	FL	15.3Hz	
Working Elec.	WE	Solid		Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	8.900	cm²	Equiv. Wt.	EN	0.0000	g
Density	DE	8.900	g/ml	AUX A/D	AU	no	
Open Circuit	OC	-66.00E-3	V				

Comment: C-22: 4M Cl pH 2.7 95°C 200mV vs SCE

Walter J Machrowski 12/11/98

C-22 Passive Current Density

Objective: Measure Passive Current Density

Specimen: C-22 heat 2277-8-3715
 Same specimen as p. 262
 Start wt. 12.37872 g
 end wt. 12.37345 g

Solution: 4M Cl⁻ 2.7 pH
 same solution as p. 262

T = 95°C Hg thermometer #183305
 de-aerated w/99.999% N₂

Potentiostat EA & A Versastat S/N 20104
 Counter electrode Pt flag
 Reference: Fisher SCE 13-620-51 S/N 7030126

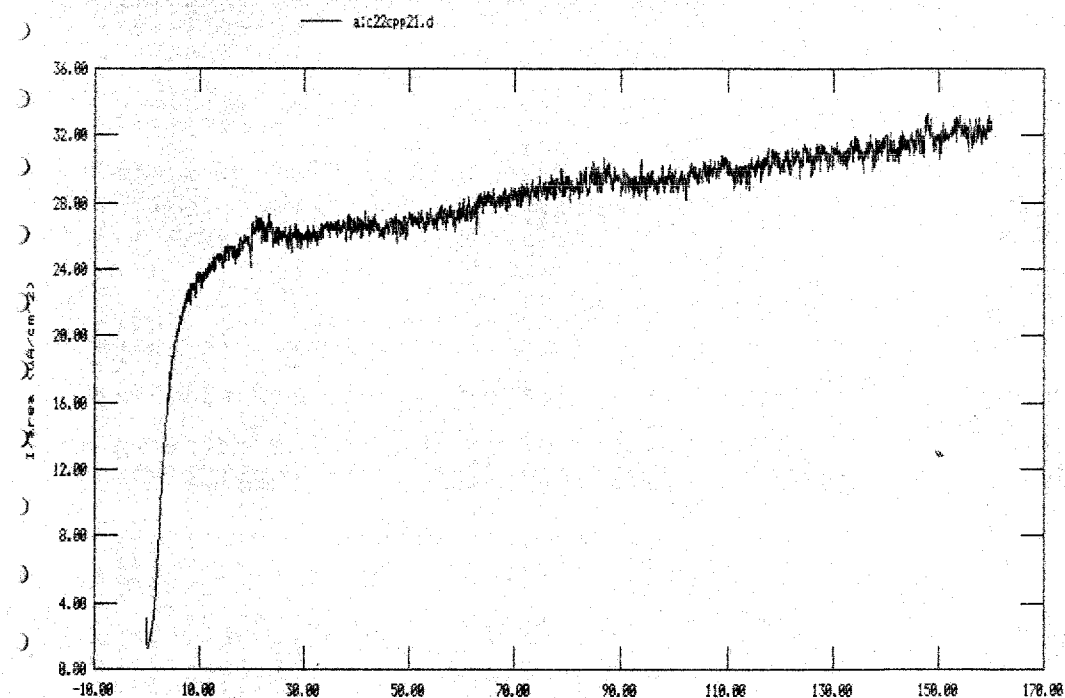
E_{can} -122 mV Keithley 6517 S/N 599913
 E_{pt} +259 mV
 E_{applied} +600 mV SCE

specimen had a golden brown film - no pits

Passive Current Density 27-33 $\mu\text{A}/\text{cm}^2$

Walter J. Machwinski
 12/15/98

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 12-11-98 Time Run: 13:37:49
 CP PASS vs. R CT PASS IP 0.000 vs. R ID 5.5 TP 5.33E+01 T1 1.000E+05
 CR AUTO HP 3000 SQ Pass IR NONE FL 1 5.3Hz RT HIGH STABILITY
 REF 0.24150 SCE WKK SOLID AR 8.900E+00 LS NO EW 0.000E+00 DEN 8.900E+00 AU NO
 OC -0.123
 Comment: C-22: 4M Cl pH 2.7 95°C 200mV vs SCE



Walter J. Machwinski 12/15/98

Model 352/252 Corrosion Analysis Software, v. 2.30
 Filename: arc22cpp21.d
 Pstat: VStat[] Ver 2
 PS POTENTIOSTATIC File Status: NORMAL
 Date Run: 12-11-98 Time Run: 13:37:49

Cond. Time	CT	pass	s	Initial Pot.	IP	0.00E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	1.00E3	s
Initial Delay	ID	5	s	Stop On	SO	Pass	
Time/Pt.	TP	53.33	s	Curr. Range	CR	Auto	
No. of Points	HP	3000					
Line Sync.	LS	no		IR Mode	IR	none	
Rise Time	RT	high stability		Filter	FL	1 5.3Hz	
Working Elec.	WE	Solid		Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	8.900	cm ²	Equiv. Wt.	EW	8.6000	g
Density	DE	8.900	g/ml	AUX A/D	AU	no	
Open Circuit	OC	-123.0E-3	V				

Comment: C-22: 4M Cl pH 2.7 95°C 200mV vs SCE

Walter J. Machwinski 12/15/98

C-22 Repassivation Potential

Objective: Measure repassivation potential of C22

Specimen: C-22 Heat 2277-8-3175

Start wt. 46.90641 g

End wt. 46.84527 g

use PTFE crevice blocks @ 100 in.-oz torque

Solution: Sat'd NaCl 85 ppm HCO_3^- pH 2.085

20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-

91.8 g NaCl Lot # 985302

0.23510 g NaHCO_3 Lot # 923337A

WJ Macdonald
12/30/98
40 ml SO_4^{2-} } 11/98 } Stock Sol'n NB 157 p. 250
20 ml NO_3^- } 12/98 }
4 ml F^-

+ DI water to 2000 mL

pH adjusted w/HCl

Start pH 2.085

Temp = 95°C Hg thermometer C96-833
de-aerated w/99.999% N_2

Potentiostat EG&C 273 S/N 41108

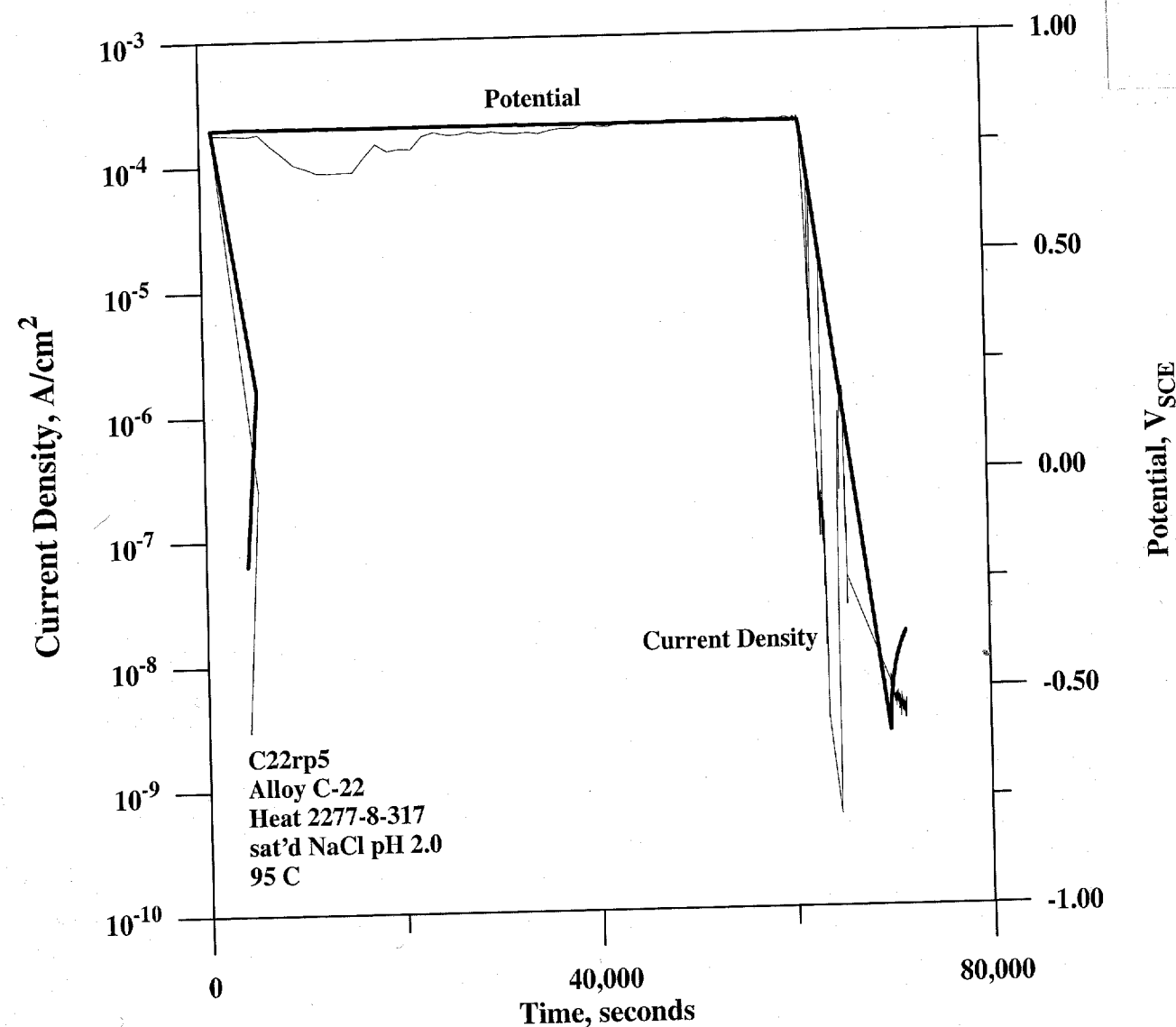
Counter electrode Pt flange

Reference: Fisher SCE 13-620-51 S/N 9214080

sampled as C22RP5, D87 using Workbench

no pitting - some grain boundaries visible

Walter J Macdonald
1/5/99



$i < 10^{-5} \text{ A}/\text{cm}^2$ 645 mV_{SCE}

$i < 10^{-6} \text{ A}/\text{cm}^2$ 618 mV_{SCE}

$i < 0$ AT 443 mV_{SCE}

Walter J Macdonald

1/5/99

Walter J Macdonald 1/5/99

C-22 Passive Current Density

Objective: Measure Passive Current Density

Specimen: C-22 Heat 2277-8-3715
 Same specimen as p. 262
 Start wt. 12.37345 g
 End wt. 12.21124 g

Solution: 4M Cl^- 2.7 pH Final pH 5.134
 Same solution as p. 262

T = 95°C Hg thermometer #183305
 de-aerated w/99.999% N_2

Potentiostat EG&G Versastat S/N 20104

Counter electrode Pt flag

Reference: Fisher SCE 13-620-51 S/N 7030126

E_{com} +399 mV SCE Keithley 6517 S/N 599913E_{pt} +43 mV SCEE_{applied} +800 mV SCE

~~no pitting~~
 w/ Macdonald
 1/5/99

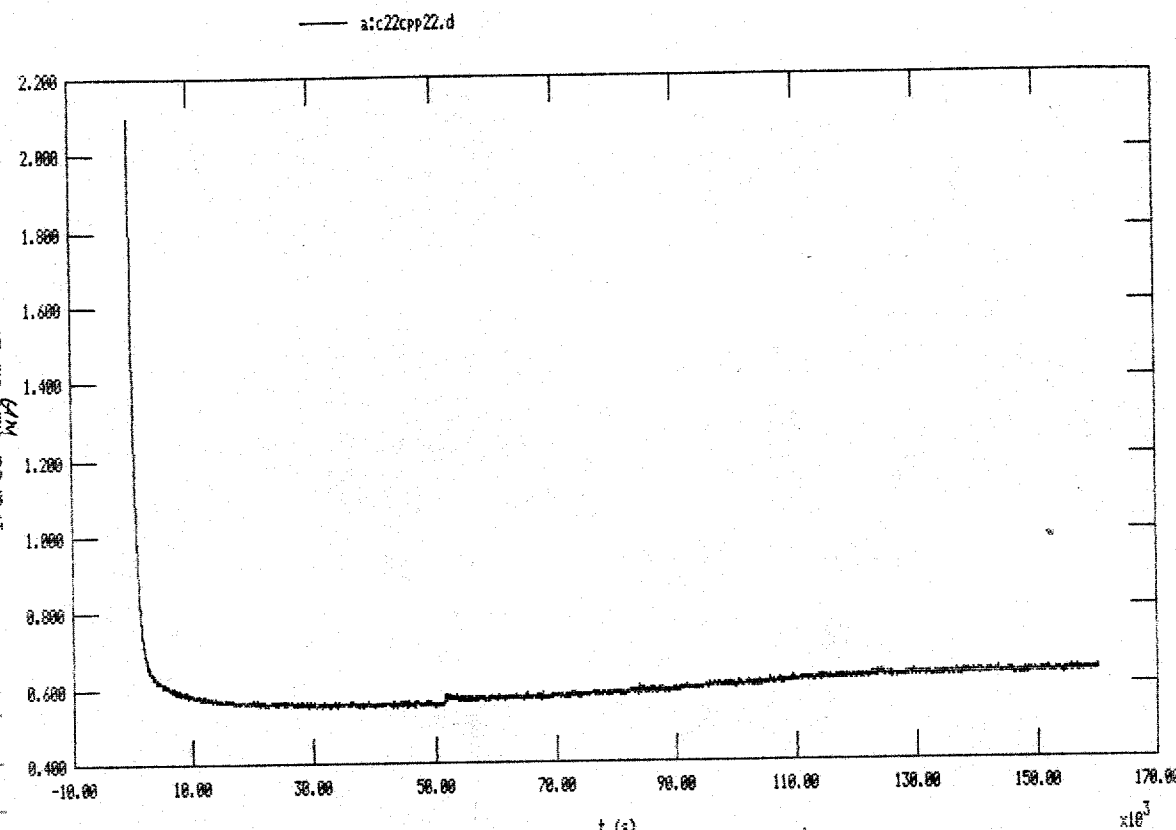
current density 0.50 → 0.65 mA/cm²

Walter J Macdonald 1/5/99

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 12-17-98
 CP PASS vs. R CT PASS IP 8.888 vs. R
 CR AUTO HP 3800 SO Pass IR NONE
 REF 0.24150 SCE MK SOLID AR 8.900E+00 LS NO
 OC 0.396
 Comment: C-22: 4M Cl pH 2.7 95°C 200mV vs SCE

Filename: aic22cpp22.dat
 Time Run: 07:57:32
 ID 5 S TP 5.333E+01
 IR NONE FL 1 5.3Hz
 EW 0.000E+00

Pstat: VStat[] Ver 2
 T1 1.600E+05
 RT HIGH STABILITY
 DEN 8.900E+00 AU NO



Walter J Macdonald 1/5/99

Model 352/252 Corrosion Analysis Software, v. 2.30
 Filename: aic22cpp22.dat
 Pstat: VStat[] Ver 2
 PS POTENTIOSTATIC File Status: NORMAL
 Date Run: 12-17-98 Time Run: 07:57:32
 Cond. Time CT pass s Initial Pot. IP 888.8E-3 V
 Cond. Pot. CP pass V Time Step 1 T1 168.8E3 s
 Initial Delay ID 5 s Stop On SO Pass
 Time/Pt. TP 53.33 s Curr. Range CR Auto
 No. of Points NP 3800
 Line Sync. LS no IR Mode IR none
 Rise Time RT high stability Filter FL 1 5.3Hz
 Working Elec. WE Solid Ref. Elec. RE SCE 241.5E-3V
 Sample Area AR 8.900 cm² Equiv. Wt. EW 0.0000 g
 Density DE 8.900 g/cm³ AUX A/D AU no
 Open Circuit OC 396.8E-3 V

Comment: C-22: 4M Cl pH 2.7 95°C 200mV vs SCE

Walter J Macdonald 1/5/99

Walter J Macdonald 1/5/99

C-22 Repassivation Potential

Objective: Measure repassivation potential

Specimen: C-22 Heat 2277-8-3175

Start wt. 47.46866 g

End wt. 47.44666 g

use PTFE crevice blocks @ 100 in-vy torque

Solution: Sat'd NaCl pH 11.427

20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-

715 g NaCl Lot # 985302

0.23589 g NaHCO_3 Lot # 923337A40 ml SO_4^{2-} } 11/9820 ml NO_3^- } 12/984 ml F^- }

Stock Sol'n NB157 p. 250

+ DI Water to 2000 mL pH adjusted w/ NaOH

Lot # 897895

Start pH 11.427

Final 10.341

Temp = 95°C Hg thermometer C96 833
de-aerate w/ 99.999% N_2

Potentiostat EG&G 273 S/N 41108

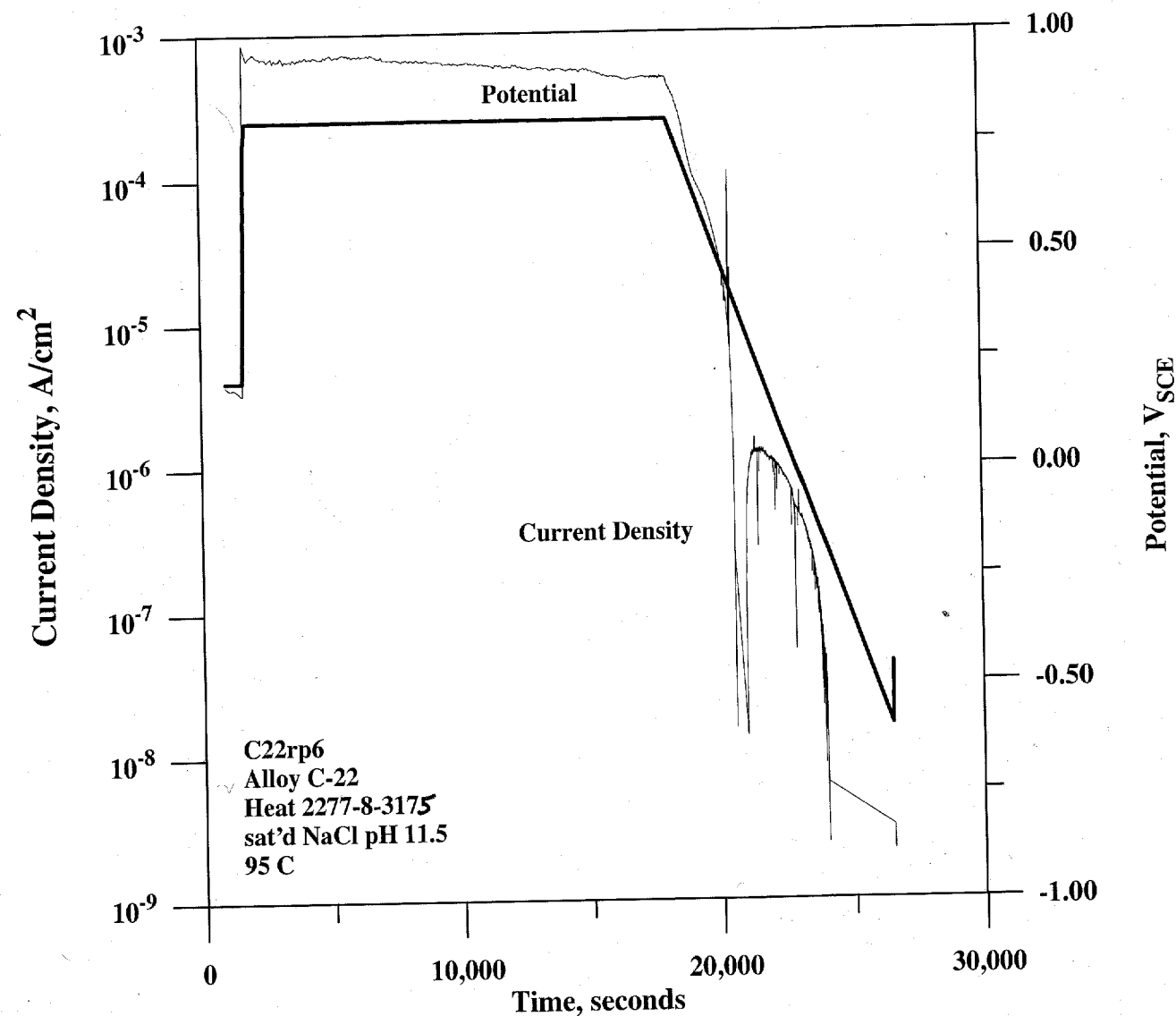
Counter electrode Pt flag

Reference: Fisher SCE 13-620-51 S/N 9214080

 $E_{\text{com}} = -306 \text{ mV}$ $E_{\text{Pt}} = -212 \text{ mV}$

same as C22 RP6.DAT WORKBENCH

no pitting

Walter J Machowski
1/5/99 $i < 10^{-5} \text{ A/cm}^2$ AT 407 mV SCE $i < 10^{-6} \text{ A/cm}^2$ AT 387 mV SCE $i < 0 \text{ A/cm}^2$ AT 383 mV SCE

Walter J Machowski 1/5/99

Walter J Machowski 1/5/99

C-22 Passive Current Density

Objective: Measure Passive Current Density

Specimen: C-22 Heat 2277-8-3715
 Start wt. 12.21448 g
 End wt. 12.21315 g

Solution: 4M Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F
 467.5819 g NaCl Lot # 958302
 0.23518 g NaHCO_3 Lot # 923337A
 40 ml SO_4
 20 ml NO_3^- } 12/98 { Stock solution NB 157 p. 250
 4 ml F-
 + DI water to 2000 mL

Start pH 7.036 End pH

Room Temperature
 de-aerated w/ 99.999% N_2

Potentiostat EG&G Versastat S/N 20104
 Counter electrode Pt flag
 Reference: Fisher SCE 93-620-51 S/N 7030126

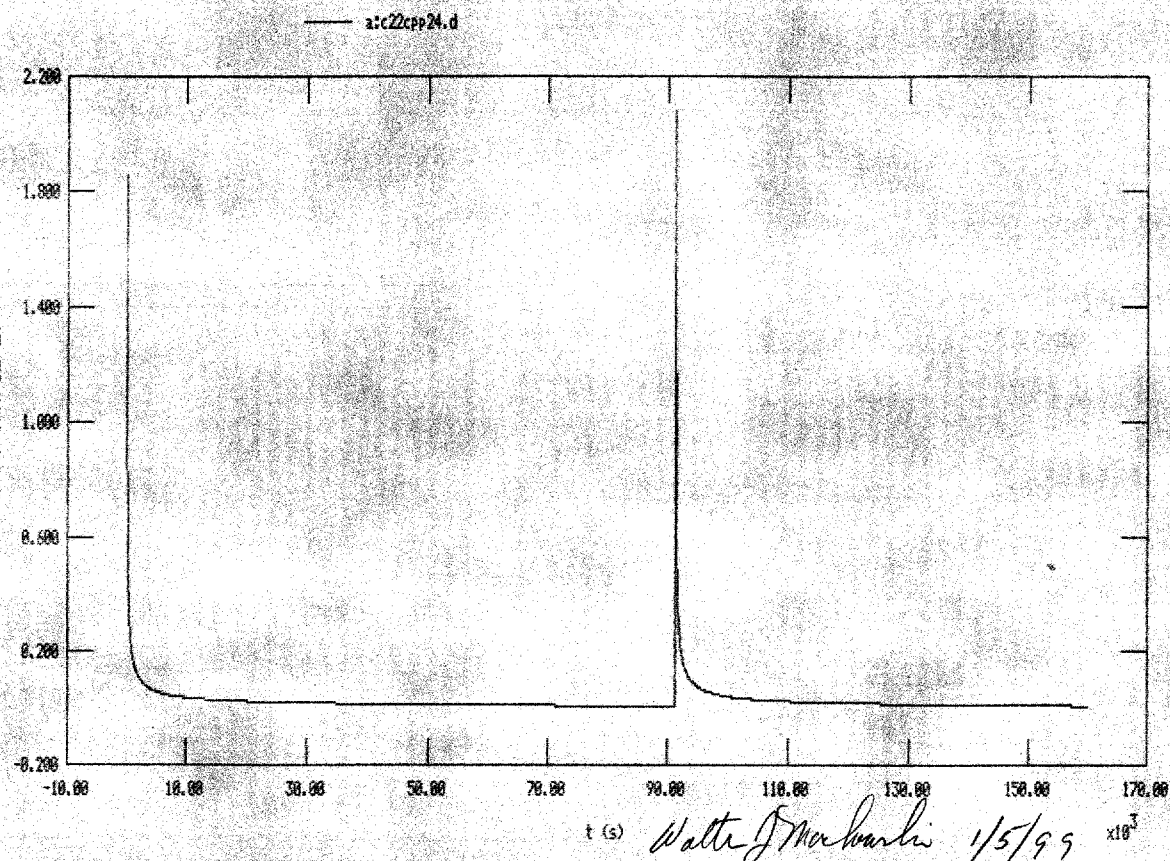
E_{com} -495 mV SCE Keithley 6517 S/N 599913
 E_{Pt} +91 mV SCE
 E_{applied} +200 mV SCE

restart experiment after ~18 hrs. → saved as C22CAP23.dat
 let experiment run for 48 hrs. saved as C22cpp24.
 DAT.

no pits current density 11-20 nA/cm²

Walter J Maclewschi
 1/5/99

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 12-22-98 Time Run: 06:58:19
 CP PASS vs. R CT PASS IP 0.200 vs. R ID 5 S TP 5.333E+01 T1 1.600E+05
 CR AUTO HP 3000 SD Pass IR NONE FL 1 5.3Hz RT HIGH STABILITY
 REF 0.24150 SCE WPK SOLID AR 8.900E+00 LS NO EN 0.000E+00 DEN 8.900E+00 AU NO
 OC -0.112
 Comment: 4M Cl at Room Temp 200mV vs SCE



Model 352/252 Corrosion Analysis Software, v. 2.30
 Filename: a:c22cpp24.d
 Pstat: VStat[] Ver 2
 PS POTENTIOSTATIC File Status: NORMAL
 Date Run: 12-22-98 Time Run: 06:58:19

Cond. Time	CT	pass	s	Initial Pot.	IP	200.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	160.0E3	s
Initial Delay	ID	5	s	Stop On	SO	Pass	
Time/Pt.	TP	53.33	s	Curr. Range	CR	Auto	
No. of Points	HP	3000					
Line Sync.	LS	no		IR Mode	IR	none	
Rise Time	RT	high stability		Filter	FL	1 5.3Hz	
Working Elec.	WE	Solid		Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	8.900	cm ²	Equiv. Wt.	EW	0.0000	g
Density	DE	8.900	g/ml	AUX A/D	AU	no	
Open Circuit	OC	-112.0E-3	V				

Comment: 4M Cl at Room Temp 200mV vs SCE

Walter J Maclewschi
 1/5/99

Walter J Maclewschi
 1/5/99

C-22 Repassivation Potential

Objective: Measure repassivation potential

Specimen: C-22 Heat 2277-8-3175

Start wt, 47.04872 g

End wt, 46.86313 g

use PTFE wire block @ 100 in.-oz torque

Solution: 4M Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-
 467.64 g NaCl # 985302
 0.23611 g NaHCO_3 # 923337A
 40 ml SO_4^{2-}
 20 ml NO_3^- } 12/98 } Stock sol'n p. 278
 4 ml F^-

+ DI water to 2000 mL

Start pH 7.004

End pH not taken

Temp = 95°C

Hz thermometer # 183305

de-aerate w/ 99.999% N_2 WJ Machowski
1/6/99

Potentiostat: EG&G Versastat S/N 20104

Counter electrode: Pt flag

Reference: Fisher SCE 13-620-51 S/N 7030126

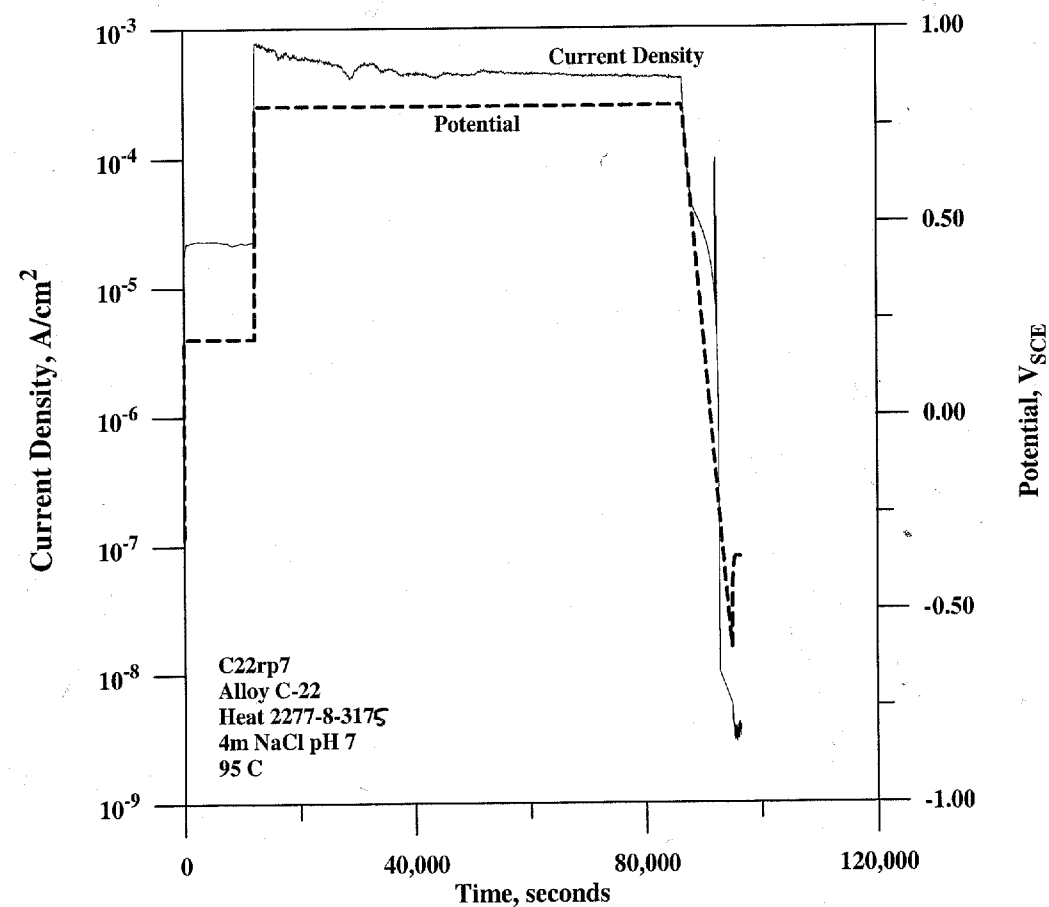
data saved as C22RP7.DAT

 $E_{\text{can}} = -313 \text{ mV SCE}$

Rochly 614 S/N 553368

 $E_{\text{Pt}} = -213 \text{ mV SCE}$

no localized corrosion

Walter J. Machowski
1/6/99 $i < 10^{-5} \text{ A/cm}^2$ AT $-105 \text{ mV}_{\text{SCE}}$ $i < 10^{-6} \text{ A/cm}^2$ AT $-231 \text{ mV}_{\text{SCE}}$ $i < 0$ AT $-238 \text{ mV}_{\text{SCE}}$

Dwight D 5/7/99

Stock Solution

SO_4^{2-} 12/98
 1000 ppm SO_4^{2-} as Na_2SO_4
 1.47810 g Lot # 901213
 prep 12/30/98 exp 1/30/99

NO_3^- 12/98
 1000 ppm NO_3^- as NaNO_3
 1.37497 g Lot # 961772A
 prep 12/30/98 exp 1/30/99

F^- 12/98
 1000 ppm F^- as NaF
 2.21893 g Lot # 8964005
 prep 12/30/98 exp 1/30/99

Walter J Machorski
 12/30/98

C-22 Passive Current Density

Objective: Measure Passive Current Density

Specimen: C-22 Heat 2277-8-3715
 Start wt. 12.21315 g
 End wt. 12.19241 g
 same specimen as p. 274

Solution: 4M Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-
 same solution as p. 274

End pH ~~8.374~~ w/monobrom
 pH not taken 1/10/99

Room Temperature
 de-aerated w/99.999% N_2

Potentiostat EG&G Versastat S/N 20104
 Counter electrode Pt flag
 Reference: Fisher SCE 13-620-51 S/N 7030154

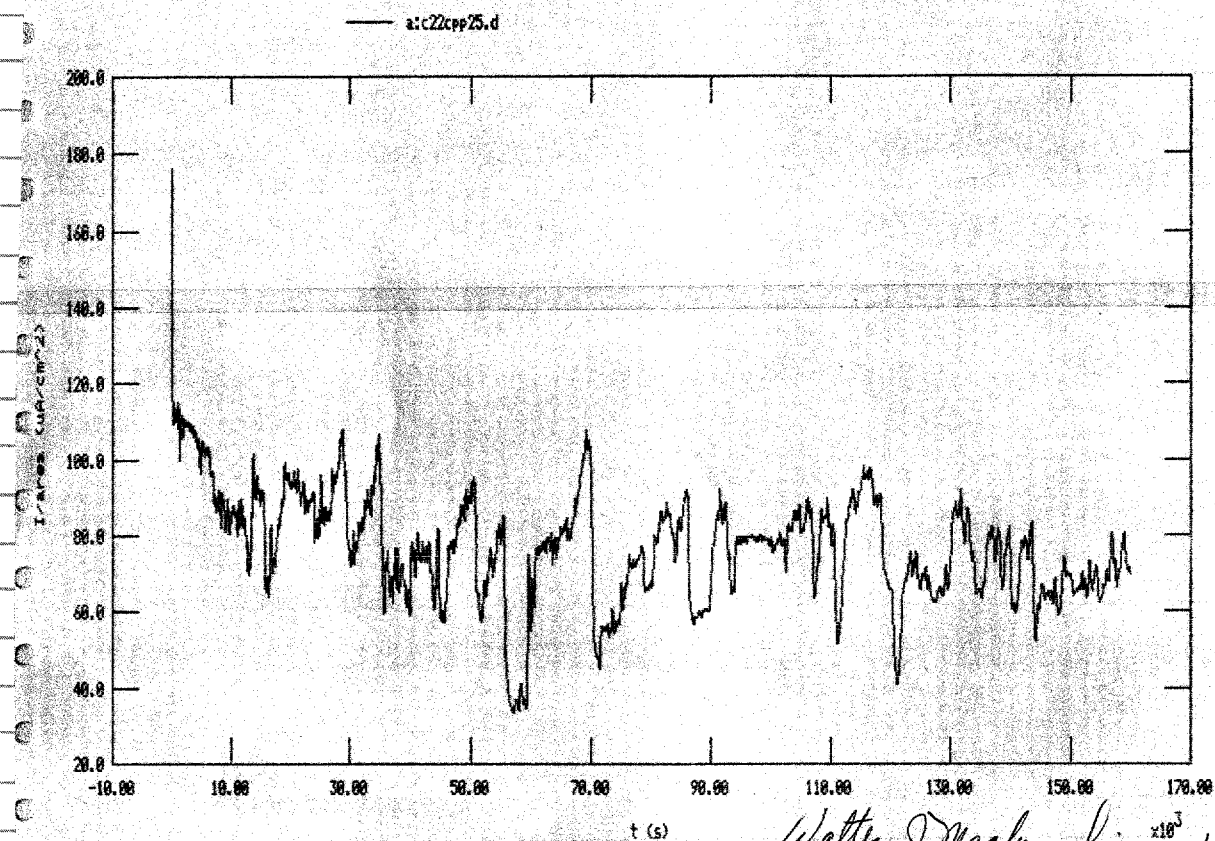
E_{com} -143 mV Keithly 6517 S/N 599913
 E_{Pt} +138 mV " " "
 E_{applied} +800 mV SCE

data saved as C22CPP25.DAT

Passive current density 50 → 90 $\mu\text{A}/\text{cm}^2$

Walter J Machorski
 1/20/99

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 12-25-98 Time Run: 07:52:10
 CP PASS vs. R CT PASS IP 0.000 vs. R ID 5 S TP 5.333E+01 T1 1.600E+05
 CR AUTO HP 3000 SO Pass IR NONE FL 15.3Hz RT HIGH STABILITY
 REF 0.24150 SCE WRK SOLID AR 8.900E+00 LS NO EN 0.000E+00 DEN 8.900E+00 AU NO
 OC -0.117
 Comment: 4M Cl at Room Temp 800mV vs SCE



Walter J Macdonald 1/20/99

Model 352/252 Corrosion Analysis Software, v. 2.30
 Filename: a:c22cpp25.dat
 Pstat: VStat[] Ver 2
 PS POTENTIOSTATIC
 Date Run: 12-25-98 File Status: NORMAL
 Time Run: 07:52:10

Cond. Time	CT	pass	s	Initial Pot.	IP	800.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	160.0E3	s
Initial Delay	ID	5	s	Stop On	SO	Pass	

Time/Pt.	TP	53.33	s	Curr. Range	CR	Auto
No. of Points	NP	3000				

Line Sync.	LS	no	IR Mode	IR	none	
Rise Time	RT	high stability	Filter	FL	15.3Hz	
Working Elec.	WE	Solid	Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	0.900	cm²	Equiv. Wt.	EW	0.0000
Density	DE	8.900	g/ml	AUX A/D	AU	no
Open Circuit	OC	-117.0E-3	V			

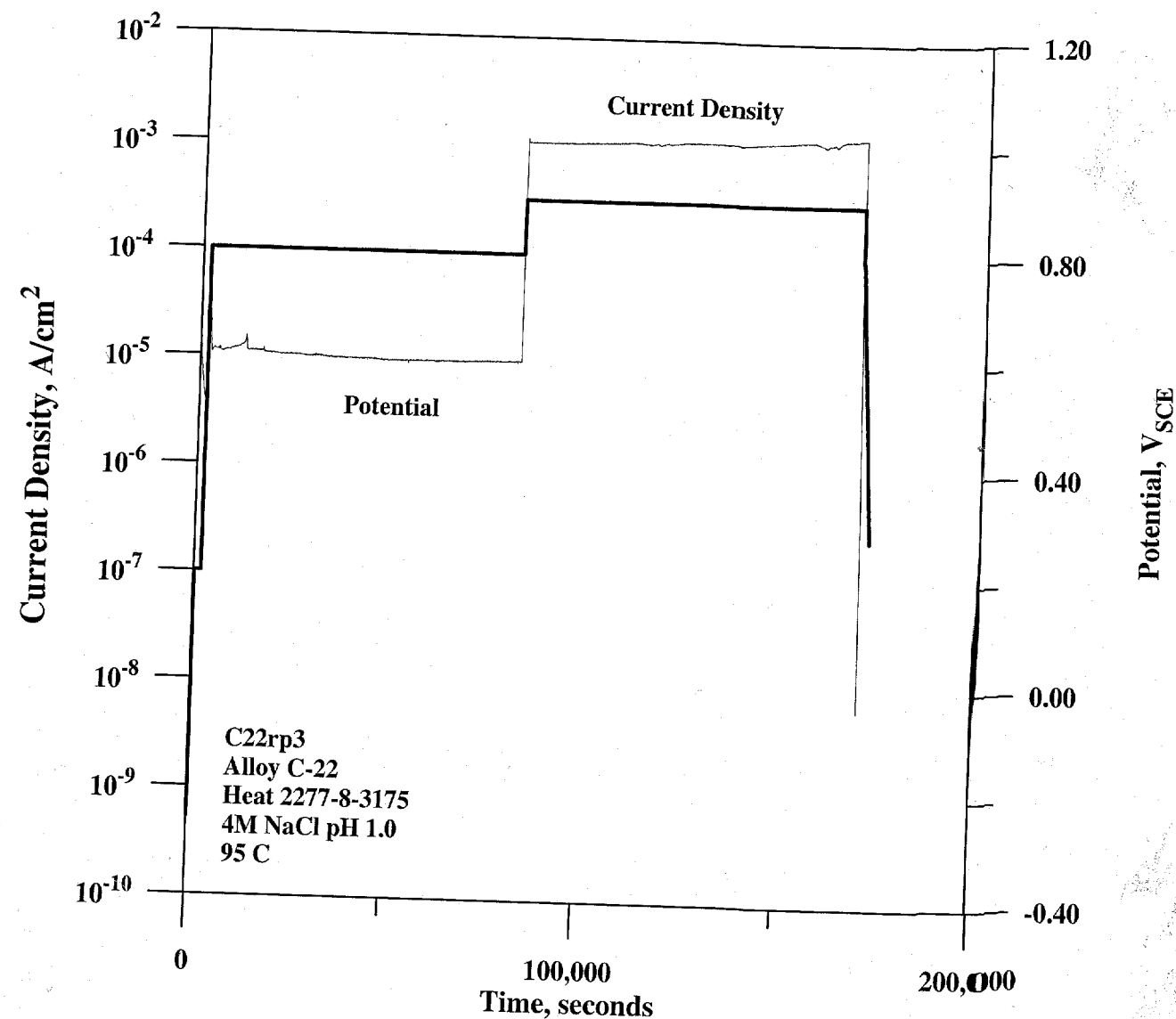
Comment: 4M Cl at Room Temp 800mV vs SCE

Walter J Macdonald 1/20/99

Walter J Macdonald 1/20/99

C-22 Repassivation Potential

C22RP3.DAT



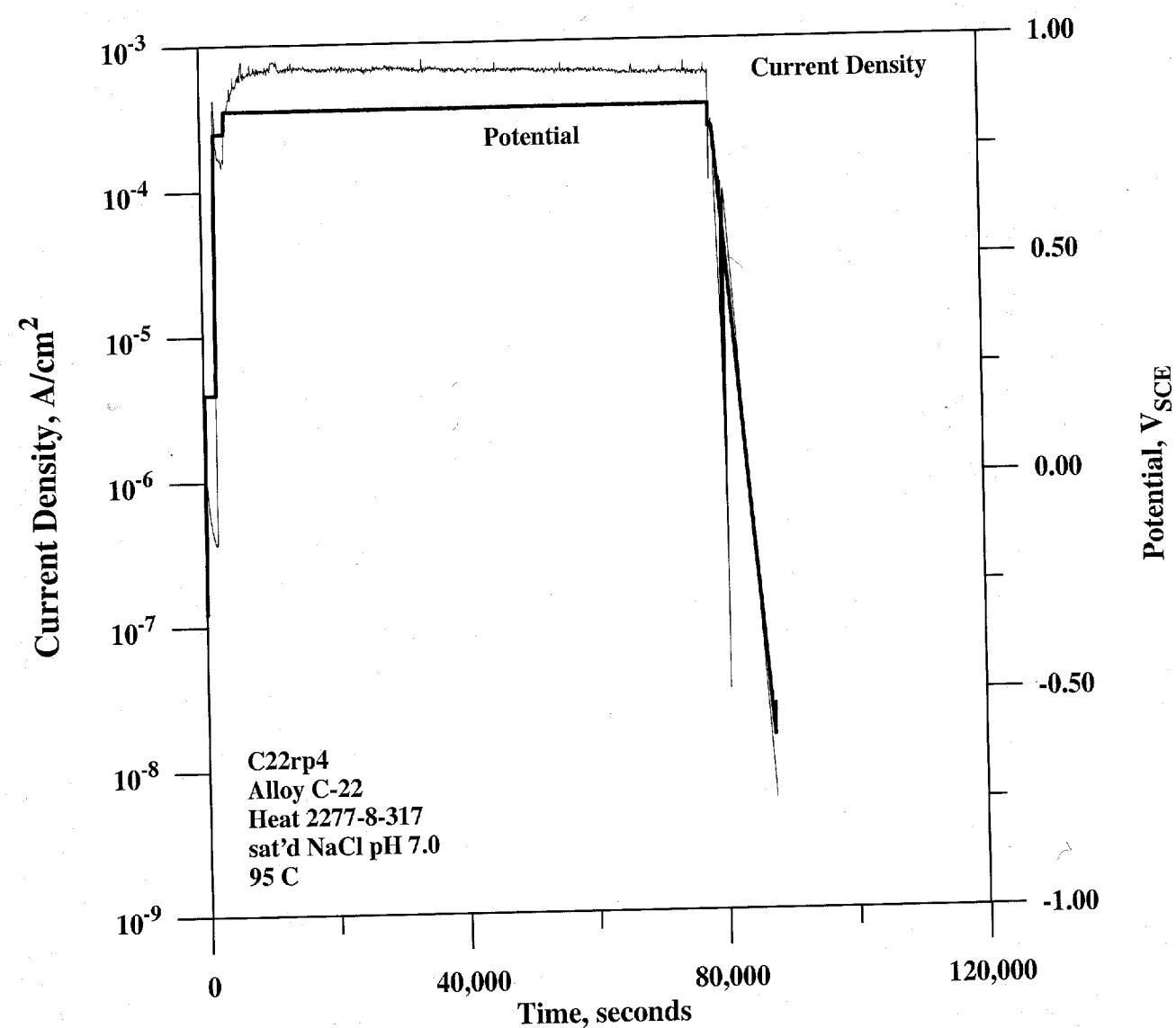
$i < 10^{-5} \text{ A/cm}^2$ AT $776 \text{ mV}_{\text{SCE}}$
 $i < 10^{-6} \text{ A/cm}^2$ AT $728 \text{ mV}_{\text{SCE}}$
 $i < 0$ (NEGATIVE CURRENT) AT $684 \text{ mV}_{\text{SCE}}$

Walter J Macdonald 1/16/99

Walter J Macdonald 1/16/99

C-22 Repassivation Potential

C22RP4.DAT



$i < 10^{-5}$ A/cm² at 570 mV_{SCE}
 $i < 10^{-6}$ A/cm² at 547 mV_{SCE}
 $i < 0$ (neg. current) at 523 mV_{SCE}

Walter J Machowski 1/5/99

Walter J Machowski 1/5/99

C-22 Repassivation Potential

C22RP8.DAT

Objective: Measure repassivation potential

Specimen: C-22 Heat 2277-8-3175

Start wt. 46.89704 g

End wt. 46.80581 g

use PTFE crevice block @ 100 in-oz torque

Solution: 4M Cl⁻ pH 11.34220 ppm SO₄²⁻ 10 ppm NO₃⁻ 2 ppm F⁻

467.53 g NaCl Lot # 985302

pH adjusted w/NaOH Lot # 897895

40 ml SO₄²⁻20 ml NO₃⁻ } 12/98 } stock sol'n NB 157 p. 2784 ml F⁻

+ DI water to 2000 ml

Start pH 11.342

End pH 9.013

Temp = 95°C Hg thermometer # 183305

de-aerated w/99.999% N₂

Potentiostat: EG&P 273 S/N 41108

Counter electrode: Pt flag

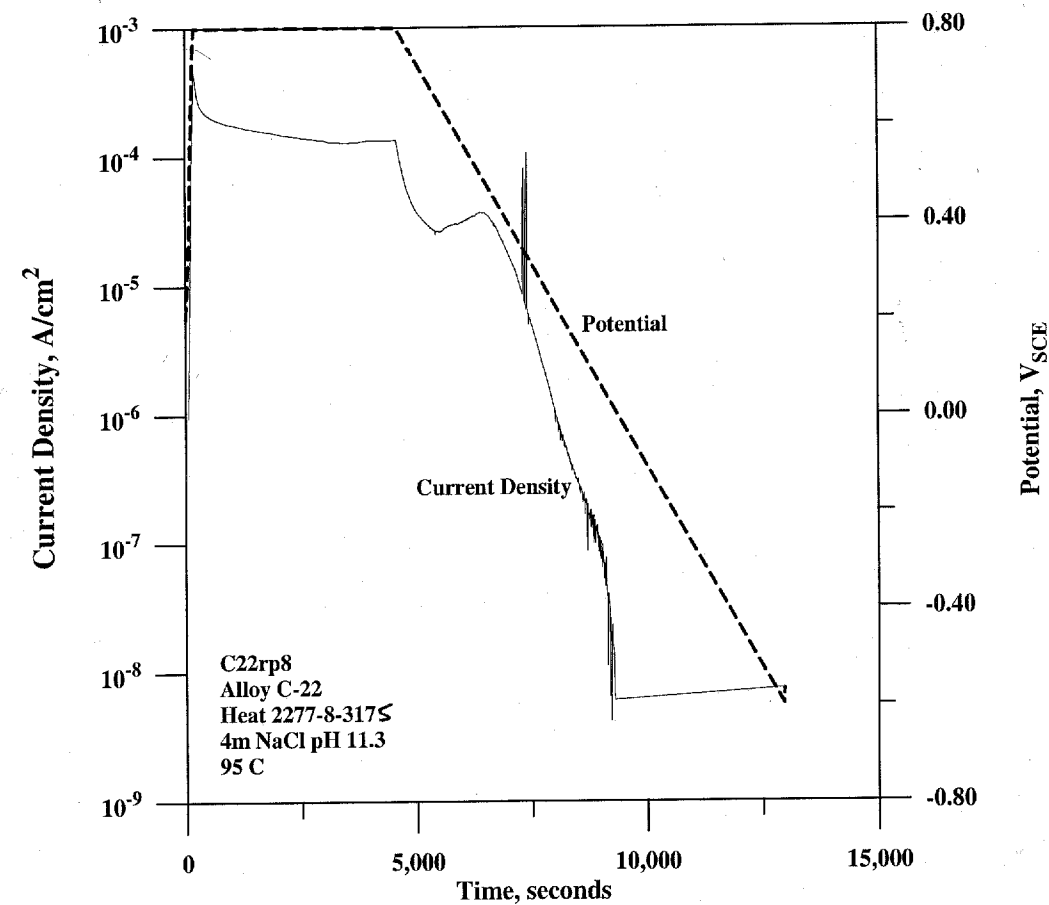
Reference: Fisher SCE 13-620-51 S/N 9214080

E_{corr} -389E_{RT} -273

experiment accidentally interrupted and restarted after holding @ +800 mV for 2+ hours

data saved as C22RP8 and C22RP8a.DAT

specimen had a golden-brown color, except @ crevice contact area
no crevice corrosion evidentWalter J Machowski
1/18/99



$i < 10^{-5} \text{ A/cm}^2$ AT 332 mV_{SCE}
 $i < 10^{-6} \text{ A/cm}^2$ AT 221 mV_{SCE}
 $i < 0$ AT 22 mV_{SCE}

David D 1/15/99

CPP Test on 625

Objective: To obtain a cyclic polarization curve of 625 under crevice conditions

Specimen: Alloy 625 600 grit polished
 Start wt. 31.36090 g
 End wt. 31.24635 g

use PTFE crevice blocks @ 40 in.-oz torque

Solution: 1000 ppm Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-
 3.29266 g NaCl Lot # 972274
 0.23891 g NaHCO_3 Lot # 897789
 40 ml SO_4^{2-}
 20 ml NO_3^- } Stock solutions NB157 p. 278
 4 ml F^-
 + DI water to 2000 mL
 Start pH 8.314 End pH 9.838

Temp = 60°C
 de-aerated w/ 99.999% O_2

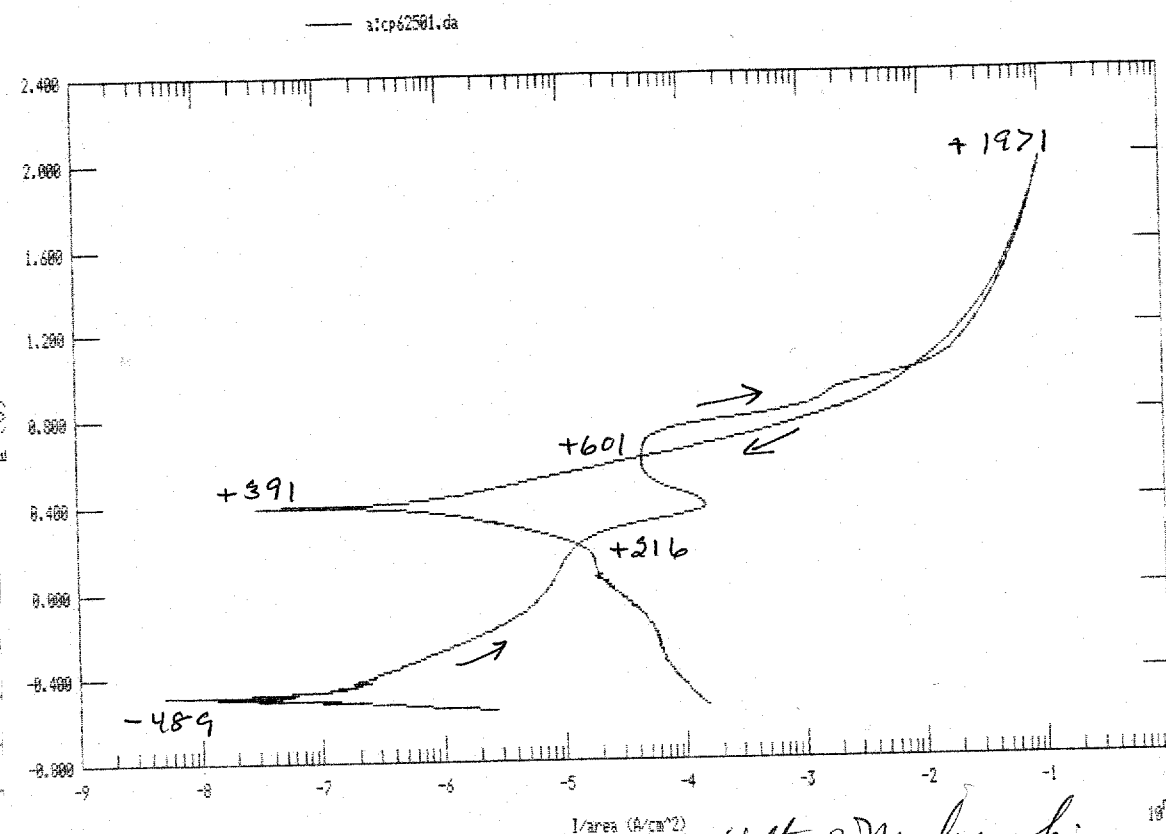
Potentiostat Versostat S/N 20104
 Counter electrode Pt flag
 Reference: Fisher SCS 13-620-51 S/N 7030126

data saved as CP62501.DAT

No crevice attack - maybe some transpassive dissolution

Walter J. Muckewich
 1/15/99

Model 352/252 Corrosion Analysis Software, v. 2.30
 CP CYCLIC POLARIZATION
 File Status: NORMAL
 Date Run: 12-27-98
 Time Run: 06:35:27
 Pstat: VStat[] Ver 2
 Cond. Time CT pass s Initial Pot. IP -100.0E-3 V oc
 Cond. Pot. CP pass s Vertex I Pot. VI 100.0E-3 V oc
 Initial Delay ID 30 s I Threshold IT 100.0E-3 A/cm²
 Final Pot. FP -100.0E-3 V oc
 Scan Rate SR 167.1E-3 mV/s Curr. Range CR Auto
 Scan Incr. SI 5.000 mV Step Time ST 29.92 s
 No. of Points NP 1014
 Line Sync. LS yes GI Time Const. TC Off
 Rise Time RT high stability IR Mode IR none
 Working Elec. WE Solid Filter FL 1 5.3Hz
 Sample Area AR 1.000 cm² Ref. Elec. RE SCE 241.5E-3V
 Density DE 8.440 g/ml Equiv. Wt. EW 0.0000 g
 Open Circuit OC -454.0E-3 V AUX A/D AU no
 Comment: Alloy 625 creviced; 1000ppm Cl @ 60°C



Walter J Macbroschi
 1/15/99

Model 352/252 Corrosion Analysis Software, v. 2.30
 File Name: atcp62501.dat
 Pstat: VStat[] Ver 2
 Date Run: 12-27-98
 File Status: NORMAL
 Time Run: 06:35:27
 Cond. Time CT pass s Initial Pot. IP -100.0E-3 V oc
 Cond. Pot. CP pass s Vertex I Pot. VI 100.0E-3 V oc
 Initial Delay ID 30 s I Threshold IT 100.0E-3 A/cm²
 Final Pot. FP -100.0E-3 V oc
 Scan Rate SR 167.1E-3 mV/s Curr. Range CR Auto
 Scan Incr. SI 5.000 mV Step Time ST 29.92 s
 No. of Points NP 1014
 Line Sync. LS yes GI Time Const. TC Off
 Rise Time RT high stability IR Mode IR none
 Working Elec. WE Solid Filter FL 1 5.3Hz
 Sample Area AR 1.000 cm² Ref. Elec. RE SCE 241.5E-3V
 Density DE 8.440 g/ml Equiv. Wt. EW 0.0000 g
 Open Circuit OC -454.0E-3 V AUX A/D AU no
 Comment: Alloy 625 creviced; 1000ppm Cl @ 60°C

Walter J Macbroschi
 1/15/99

CPP Test on 625

Objective: To generate CP curve on alloy 625 under crevice conditions

Specimen: Alloy 625 600 grit polished
 start wt. 31.44022 g
 end wt. 31.38784 g
 use PTFE crevice blocks @ 40 in. by Tangue

Solution: 0.1M Cl⁻ 85 ppm NO₃⁻
 20 ppm SO₄²⁻ 10 ppm NO₃⁻ 2 ppm F⁻
 11.67656 g NaCl #972274
 0.23876 g NaNO₃ #897789
 40 ml SO₄²⁻
 20 ml NO₃⁻ } 12/98 NB157 p. 278
 4 ml F⁻
 + DI water to 2000 mL
 start pH 8.548 end pH 5.532

Temp = 60°C
 de-aerated w/ 99.999% N₂

Potentiostat: EG+C Versastat S/N 20104
 Counter electrode: Pt flag
 Reference: Fisher SCE 13620-51 S/N 7030126

data saved as CP62502.DAT

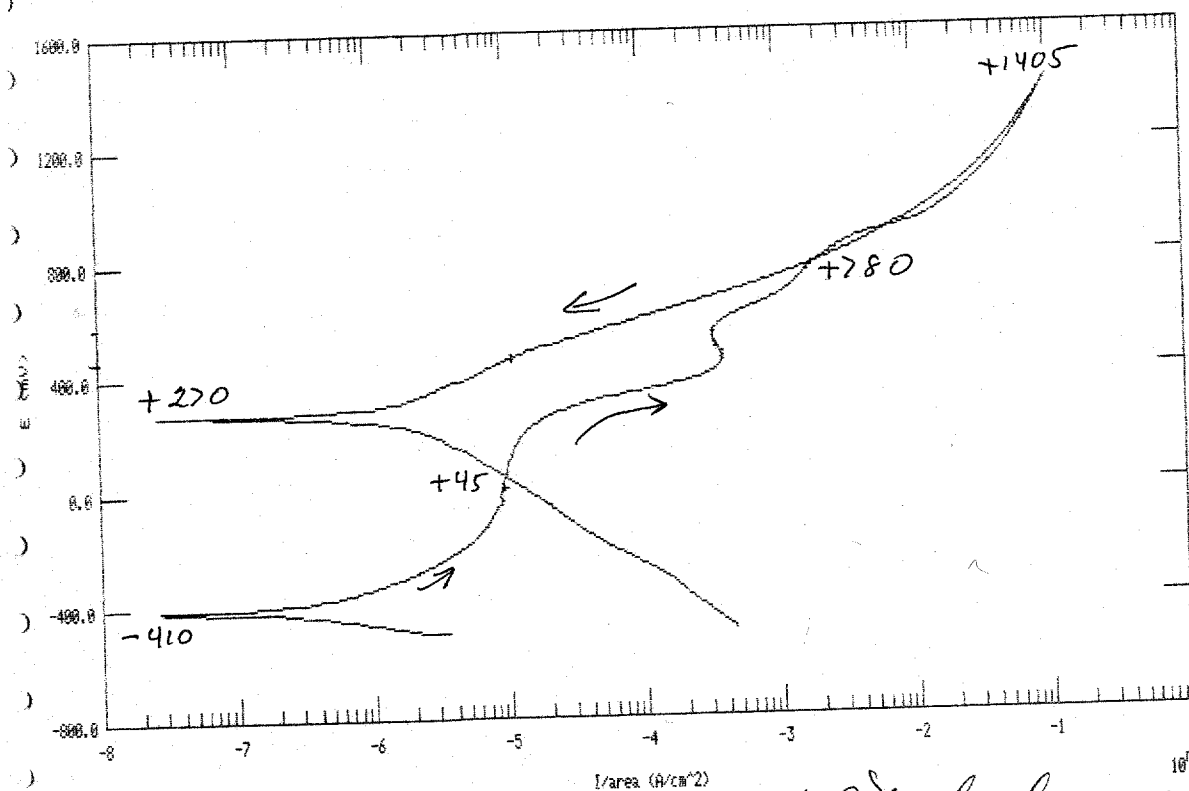
no local attack

Walter J Macbroschi
 1/15/99

Walter J Macbroschi
 1/18/99

Model 352/252 Corrosion Analysis Software, v. 2.38
 CP CYCLIC POLARIZATION
 CP PASS vs. R CT PASS
 SI 5.000E-03 SR 1.571E-04
 FL 15.3Hz RT HIGH STABILITY
 IT 1.000E-01 ITA 1.000E+00
 Comment: Alloy 625 creviced 0.1M Cl @ 60°C

Filename: a/cp62502.dat
 Date Run: 12-28-98 Time Run: 09:43:32
 ID 38 S V1 0.100 vs. OC
 CR AUTO NP 764
 WPK SOLID AR 1.000E+00
 DEN 8.440E+00 AU NO
 Pstat: VStat() Ver. 2
 IP -0.100 vs. OC
 ST 2.992E+01
 REF 0.24150 SCE
 EW 0.000E+00
 FP -0.100 vs. OC
 IR NONE
 LS YES
 OC -0.400



Walter J Macdonald 1/18/99

Model 352/252 Corrosion Analysis Software, v. 2.38
 Filename: a/cp62502.dat
 Pstat: VStat() Ver. 2
 CP CYCLIC POLARIZATION
 Date Run: 12-28-98
 File Status: NORMAL
 Time Run: 09:43:32

Cond. Time	CT	pass	s	Initial Pot.	IP	-100.0E-3	V oc
Cond. Pot.	CP	pass	V	Vertex 1 Pot.	V1	100.0E-3	V oc
Initial Delay	ID	30	s	I Threshold	IT	100.0E-3	A/cm²
				Final Pot.	FP	-100.0E-3	V oc

Scan Rate	SR	167.1E-3	mV/s	Cur. Range	CR	Auto
Scan Incr.	SI	5.000	mV <td>Step Time</td> <td>ST</td> <td>29.92</td>	Step Time	ST	29.92
No. of Points	NP	764				

Line Sync.	LS	yes	GI Time Const.	TC	Off	
Rise Time	RT	high stability	Filter	FL	15.3Hz	
Working Elec.	WE	Solid	Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	1.000	cm²	Equiv. Wt.	EW	8.0000
Density	DE	8.440	g/ml	AUX A/D	AU	no
Open Circuit	OC	-400.0E-3	V			

Comment: Alloy 625 creviced 0.1M Cl @ 60°C

Walter J Macdonald 1/18/99

C-22 Passive Current Density

Objective: Measure passive current density.

Specimen: C-22 Heat 2277-8-3715
 Start wt. 12.32790 g
 end wt. 12.33009 g

Solution: 1M Cl⁻ 85 ppm HClO₃⁻
 20 ppm SO₄²⁻ 10 ppm NO₃⁻ 2 ppm F⁻
 116.88450 g NaCl Lot # 985302
 0.23508 g NaHCO₃ Lot # 897789
 40 ml SO₄²⁻
 20 ml NO₃⁻ } 12/98 } stock sol NA 157 p. 278
 4 ml F⁻
 + DI water to 2000 mL

Start pH 8.103 End pH 7.574

Temp = 95°C Hg thermometer #183302
 de-aerated w/ 99.999% N₂

Potentiostat EG&G Versastat S/N 20104
 Counter electrode: Pt flag
 Reference: Fisher SCE 15-620-51 S/N 7030126

E_{can} -496 mV Keithly 6517 S/N 599913
 E_{pt} -340 mV " " "
 E_{applied} +200 mV SCE
 data saved as C22CPP26.DAT

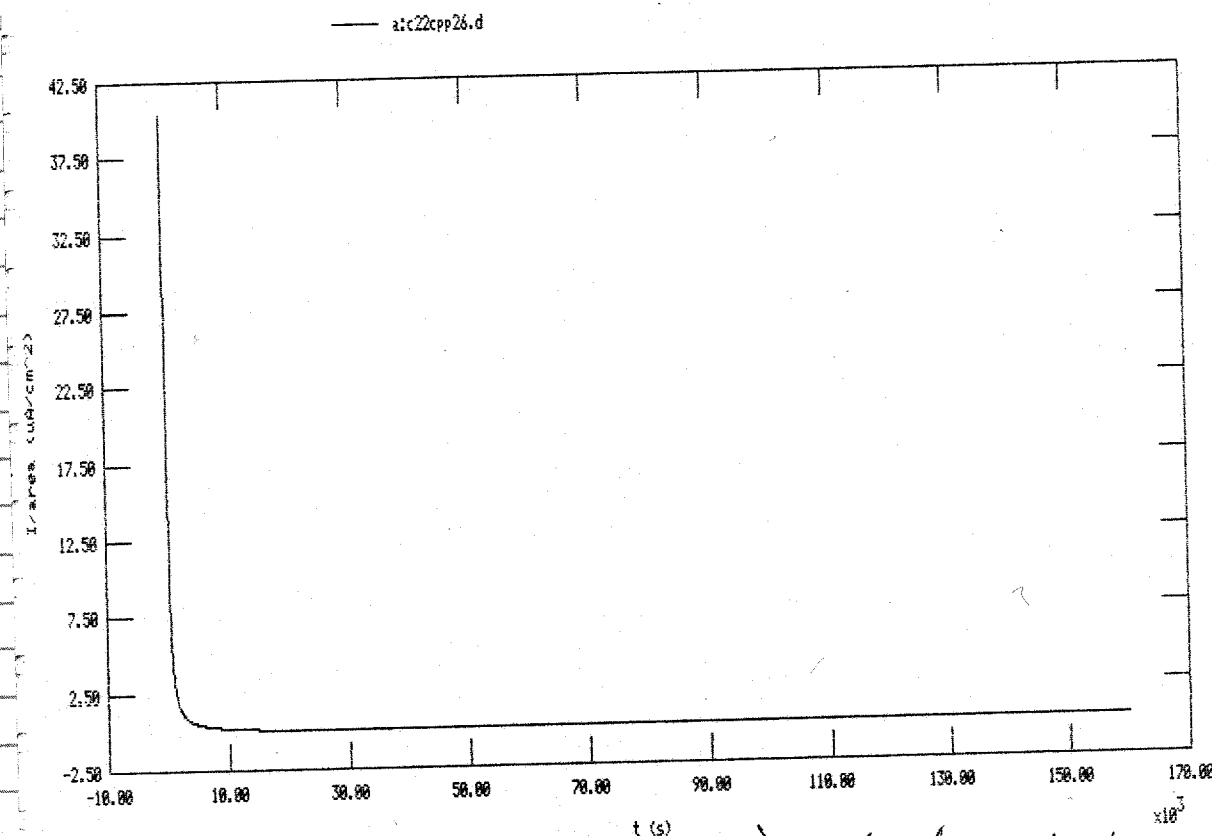
specimen still silvery w/ no pite
 passive current density 9 - 24 nA/cm²

Walter J Macdonald

1/18/99

Walter J Macdonald
 1/20/99

Model 352/252 Corrosion Analysis Software, v. 2.38
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 12-29-98 Time Run: 11:04:42
 CP PASS vs. R CT PASS IP 0.200 vs. R ID 5 S TP 5.33E+01 T1 1.00E+05
 CR AUTO HP 3000 SO Pass IR NONE FL 15.3Hz RT HIGH STABILITY
 REF 0.24150 SCE WRK SOLID AR 8.900E+00 LS NO EW 0.000E+00 DEH 8.900E+00 AU NO
 OC -0.497
 Comment: C-22: 1M Cl @ 95°C 200mV SCE



Walter J. Machowski 1/20/99

Model 352/252 Corrosion Analysis Software, v. 2.38
 Filename: a:c22cpp26.dat
 Pstat: UStat[] Ver 2
 PS POTENTIOSTATIC File Status: NORMAL
 Date Run: 12-29-98 Time Run: 11:04:42

Cond. Time	CT	pass	s	Initial Pot.	IP	200.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	160.0E3	s
Initial Delay	ID	5	s	Stop On	SO	Pass	
Time/Pt.	TP	53.33	s	Curr. Range	CR	Auto	
No. of Points	NP	3000					

Line Sync. LS no IR Mode IR none
 Rise Time RT high stability Filter FL 15.3Hz
 Working Elec. WE Solid Ref. Elec. RE SCE 241.5E-3V
 Sample Area AR 8.900 cm² Equiv. Wt. EW 0.0000 g
 Density DE 8.900 g/ml AUX A/D AU no
 Open Circuit OC -497.0E-3 V

Comment: C-22: 1M Cl @ 95°C 200mV SCE

Walter J. Machowski
1/20/99

Walter J. Machowski
1/20/99

C-22 Passive Current Density

Objective: Measure passive current density

Specimen: C-22 Heat 2277-8-3715

Start wt. 12.33009 g

End wt. 12.02034 g

Same specimen as p. 289

W. Machowski 1/20/99

Solution: 4M Cl⁻ 1M Cl⁻ 85 ppm HClO₂⁻

Same solution as p. 289

Temp = 95°C Hg thermometer #183302

de-aerated w/ 99.999% N₂

Potentiostat: EG&G Versastat S/N 20104

Counter electrode: Pt flag

Reference: Fisher SCE 13-620-51 S/N 7030126

W. Machowski 1/20/99

E_{com} +48 mV

Keithly 6517 S/N 599913

E_{Pt} -130 mV

E_{applied} +800 mV vs SCE

Data saved as C22CPP27.DAT

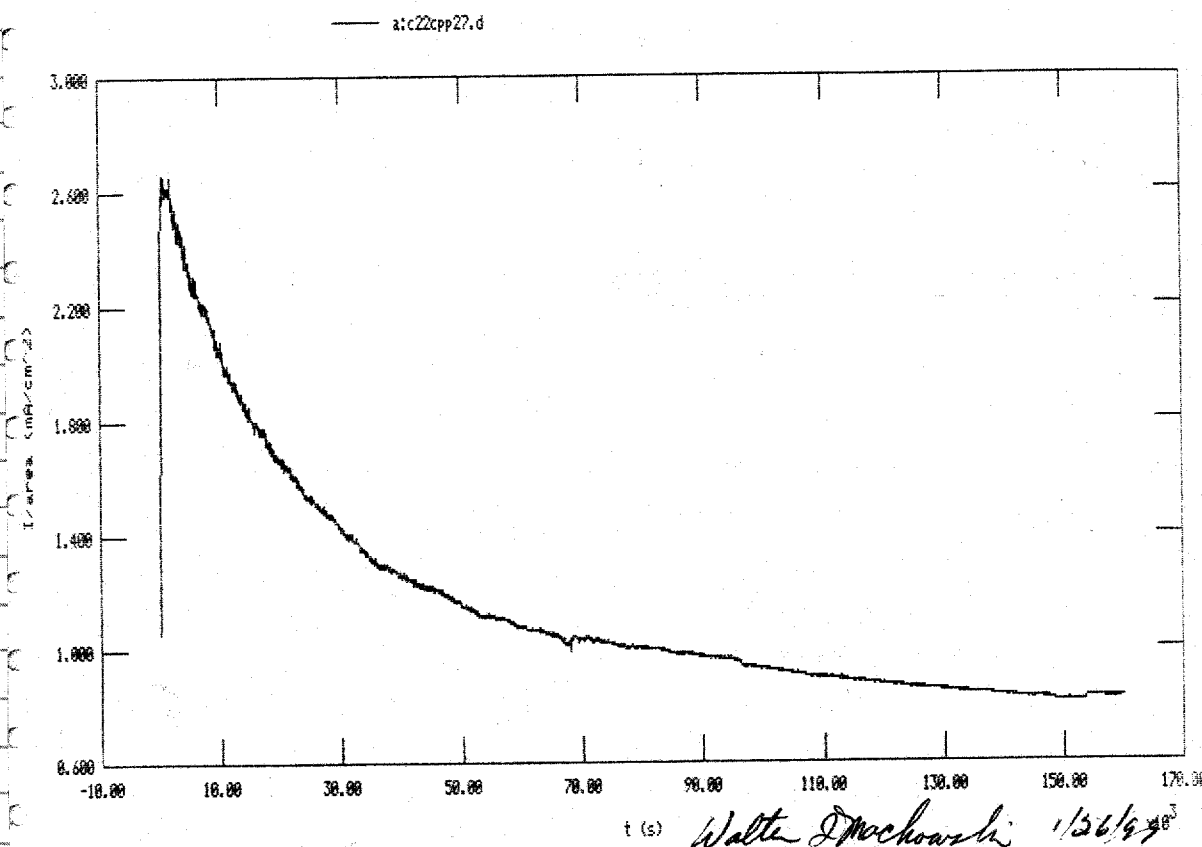
Current density 0.80 - 1.15 mA/cm²

specimen covered w/ a very dark film that was easily removed

showed signs of transpassive dissolution

Walter J. Machowski
1/26/99

Model 352/252 Corrosion Analysis Software, v. 2.30
 PS POTENTIOSTATIC File Status: NORMAL Date Run: 12-30-98 Time Run: 12:11:29
 CP PASS vs. R CT PASS IP 0.000 vs. R ID 5 S TP 5.333E+01 T1 1.600E+05
 CR AUTO MP 3000 SO Pass IR NONE FL 1 5.3Hz RT HIGH STABILITY
 REF 0.24150 SCE NPK SOLID AR 8.900E+00 LS NO EW 0.000E+00 DEN 8.900E+00 AU NO
 OC -0.858
 Comment: C-22: 1M Cl @ 95°C 800mV SCE



Model 352/252 Corrosion Analysis Software, v. 2.30
 Filename: aic22cpp27.dat
 Pstat: VStat1 Ver 2
 PS POTENTIOSTATIC
 Date Run: 12-30-98 File Status: NORMAL Time Run: 12:11:29

Cond. Time	CT	pass	s	Initial Pot.	IP	000.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	160.0E3	s
Initial Delay	ID	5	s	Stop On	SO	Pass	
Time/Pt.	TP	53.33	s	Curr. Range	CR	Auto	
No. of Points	MP	3000					
Line Sync.	LS	no		IR Mode	IR	none	
Rise Time	RT	high stability		Filter	FL	1 5.3Hz	
Working Elec.	WE	Solid		Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	8.900	cm²	Equiv. Wt.	EW	8.0000	g
Density	DE	8.900	g/ml	AUX A/D	AU	no	
Open Circuit	OC	-50.00E-3	V				

Comment: C-22: 1M Cl @ 95°C 800mV SCE

Walter J Machowski 1/26/99

Walter J Machowski
1/26/99

C-22 Repassivation Potential

Objective: To measure repassivation potential

Specimen: C-22 Heat 2272-8-3175

Start wt. 47.96770 g

End wt 47.82264 g

use PTFE crevice block @ 100 in-oz torque
 specimen not polished: just degreased and run
 in the as machined condition

Solution: 4M Cl⁻ 85 ppm HCO₃⁻
 20 ppm SO₄⁼ 10 ppm NO₃⁻ 2 ppm F⁻
 467.16 g NaCl Lot # 985302
 0.23961 g NaHCO₃ Lot # 897789
 40 ml SO₄⁼ }
 20 ml NO₃⁻ } 12/98 } Stock Sol'n MB157 p.278
 4 ml F⁻ }
 + DI water to 2000 mL
 Start pH 6.587 end pH 8.613
 data saved as C22RP9.DAT

Temp = 95°C Hg thermometer # 183305
 de-aerated w/ 99.999% N₂

Potentiostat: EG&G 273 S/N 41108

Counter electrode: Pt flag

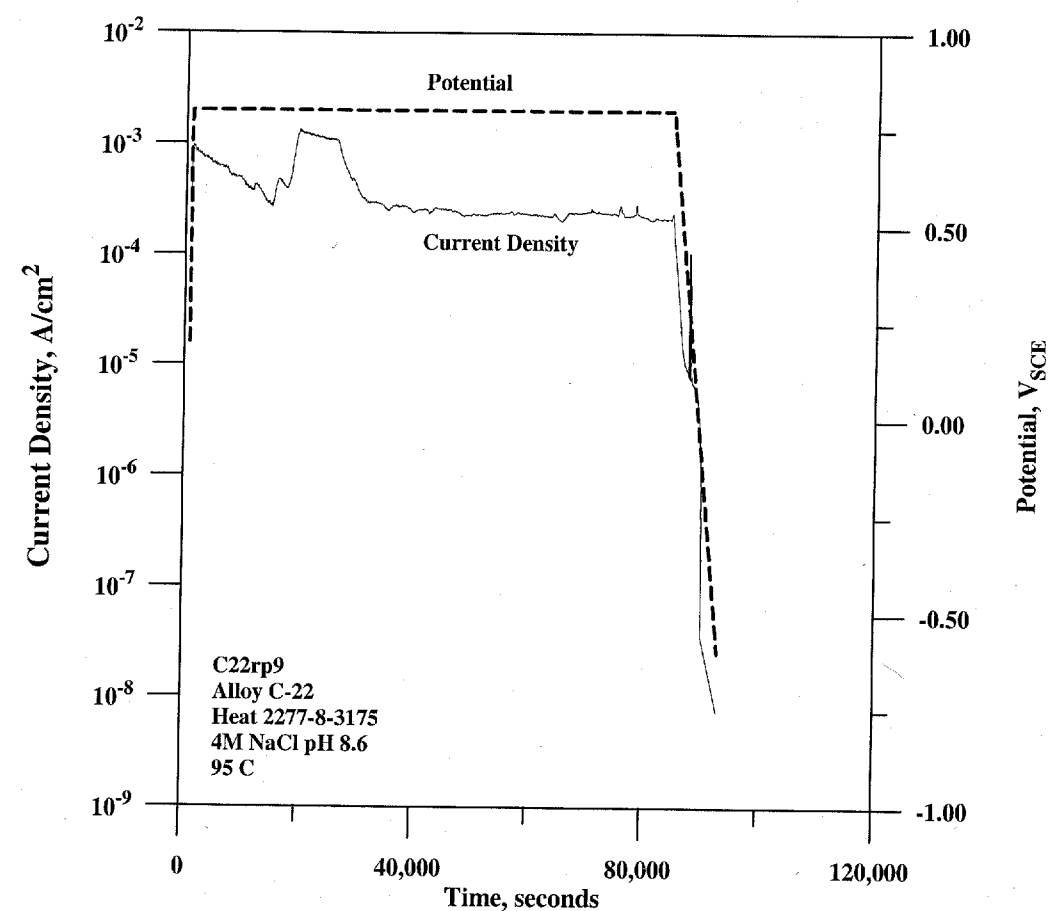
Reference: Fisher SCB 13-620-51 S/N 9214080

E_{can} -405 mV Keithley 614 S/N 555368

E_{PT} -533 mV

specimen has a dark brown film + crevice corrosion

Walter J Machowski
1/26/99



$i < 10^{-5}$ A/cm² AT 397 mV_{SCE}
 $i < 10^{-6}$ A/cm² AT -88 mV_{SCE}
 $i < 0$ AT -112 mV_{SCE}

LT825

Specimen: Alloy 825 HH 4371 FC
 Start wt. 39.07988 g
 End wt.

Solution: 4M Cl⁻ 85 ppm HCO₃⁻
 20 ppm SO₄²⁻ 10 ppm NO₃⁻ 2 ppm F⁻
 467.52 g NaCl Lot # 985302
 0.23581 g NaHCO₃ Lot # 897289
 40 ml SO₄²⁻
 20 ml NO₃⁻ } 12/98 } Stock Sol'n NB157 p. 228
 4 ml F⁻
 & DI water to 2000 mL
 Start pH 2.077

T = 95°C Hg thermometer # 0323007

Potentiostat ESC 440 #1 Channel #1

Counter electrode: Pt flag
 Reference: Fisher SCE 13-620-51 S/N 5129169

E_{com}
 E_{Pt}

④ Cell filled w/ wrong solution, experiment aborted before startup.

Walter J. Macchiarri
 2/4/99

2/2/99 Wgm

~~LT 825~~ OCV 825

Specimen: Alloy 825 HH4371FG
 Start wt. 39.28229 g
 End wt.

Solution: 4M Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-
 467.52 g NaCl Lot # 985302
 0.53716 g NaHCO_3 Lot # 897789
 40 ml SO_4^{2-}
 20 ml NO_3^- } 12/98 } Stock Sol'n NB157 p. 278
 4 ml F^-

+ DI water to 2000 mL
 Start pH 7.036

$T = 95^\circ\text{C}$ aerated w/ gcr air
 Hg thermometer 183302
 Potentiostat FSC 440 #1 Channel #5

Counter electrode: none
 Reference: Fisher SCE 13-620-51 S/N 9214083

E_{cor}
 E_{PE}

⊗ Cell filled with wrong solution,
 experiment aborted before startup.

Walter J. Mocharshi
 2/4/99

2/2/99 Wgm

~~LT C22~~ C22L1A

Specimen: C22 Heat 2277-8-3175
 Start wt. 47.42988 g
 End wt. 47.43068 g
 2 PTFE washers as per p. 165

Solution: 4M Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-
 467.52 g NaCl Lot # 985302
 0.53681 g NaHCO_3 Lot # 897789
 40 ml SO_4^{2-}
 20 ml NO_3^- } 12/98 } Stock Sol'n NB157 p. 278
 4 ml F^-
 + DI water to 2000 mL
 Start pH 7.050 End pH 8.517

$T = 95^\circ\text{C}$

Potentiostat FSC 440 #1 Channel #2

Counter electrode: Pt flag
 Reference: Fisher SCE 13-620-51 S/N 3106345

$E_{\text{cor}} -250$ Keithly 614 S/N 555348
 $E_{\text{PE}} +162$ " " "

$E_{\text{applied}} +300 \text{ mV}$

Start 1:05 PM 2/4/99

Stop 1 PM 4/19/99

2/3/99 WJM

~~LTC22~~ C22L2A

Specimen: C22 Heat 2277-8-3175

Start wt. 47.09899 g

End wt.

2 PTFE washers as per p.165

Solution: 4M Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-
 467.52 g NaCl Lot # 985302
 0.23611 g NaHCO_3 Lot # 897789
 40 ml SO_4^{2-}
 20 ml NO_3^- } 12/98 } Stock Sol'n NB157 p.278
 4 ml F^-

+ DI water to 2000 mL

Start pH 6.516

End pH 5.030

T = 95°C

Potentiostat ESC 440 #1 channel #3

Counter electrode: Pt flag

Reference: Fisher SCE 13-620-51 S/N 3106337

E_{on} -250 Keithley 614 S/N 555368
 E_{pt} +180

E_{applied} +700 mV

Start 1:05 PM 2/4/99

Stop 1 PM 4/19/99

Test solution bright yellow Pt corroded
 Specimen dark & corroded, except under PTFE
 Pt not corroded but covered w/ scale

2/3/99 WJM

~~LTC22~~ C22L3A

Specimen: C22 Heat 2277-8-3175

Start wt. 47.23243 g.

End wt. 47.42068 g 4/21/99 WJM
47.23166 g

2 PTFE washers as per p.165

Solution: 4M Cl^- 85 ppm HCO_3^-
 20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-
 467.52 g NaCl Lot # 985302
 0.24101 g NaHCO_3 Lot # 897789
 40 ml SO_4^{2-}
 20 ml NO_3^- } 12/98 } Stock Sol'n NB157 p.278
 4 ml F^-

+ DI water to 2000 mL

Start pH 6.628

End pH 8.349

T = 95°C

aerated w/ zero air

Potentiostat ESC 440 #1 channel #4

Counter electrode: Pt flag

Reference: Fisher SCE 13-620-51 S/N 0145403

E_{on} -290 Keithley 614 S/N 555368
 E_{pt} +138

E_{applied} → kept at open circuit

Start 1:05 PM 2/4/99

Stop 1 PM 4/19/99

LT 825P5AB

Specimen: Alloy 825 HH 4371FG

Start wt. 39.08634 g

End wt. 39.09134 g

2 PTFE washes as per p. 165

Solution: 1000 ppm Cl^- 85 ppm HCO_3^-
20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-

3.29864 g NaCl Lot # 972274

0.23681 g NaHCO_3 Lot # 89778940 ml SO_4^{2-} 20 ml NO_3^- 4 ml F^-

+ DI water to 2000 mL

Start pH 8.318 End pH 9.212

T = 95°C Hg thermometer # 0323007

Potentiostat: ESC 440 #1 Channel #1

Counter electrode: Pt flag

Reference: Fisher SCE 13-620-51 S/N 5129169

E_{com} -115 Keithly 614 S/N 555368E_{px} +156E_{applied} +100 mV

Start 1:05 PM 2/4/99

CUMULATIVE TEST TIME AT START 1239.03 DAYS

Stop 1 PM 4/19/22

OC 825CZY

Specimen: Alloy 825 HH 4371FG

Start wt: 39.28941 g

End wt: 39.29286 g

2 PTFE washes as per p. 165

Solution: 1000 ppm Cl^- 85 ppm HCO_3^-
20 ppm SO_4^{2-} 10 ppm NO_3^- 2 ppm F^-

same solution as p. 300 (other half)

Start pH 8.318

End pH 9.230

T = 95°C

Hg thermometer 183302
aerated w/ gvw air

Potentiostat: ESC 440 #1 Channel #5

Counter electrode: none

Reference: Fisher SCE 13-620-51 S/N 5129169

E_{com} -160 Keithly 614 S/N 555368

Rept @ open circuit

Start 1:05 PM 2/4/99

CUMULATIVE TEST TIME AT START OF TEST 1093.58 DAYS

Stop 1 PM 4/19/99

Stock Solutions

SO_4^{2-} 2/99
 1000 ppm SO_4^{2-} as Na_2SO_4
 1.47904 g Na_2SO_4 Lot # 901213
 + DI water to 1000 mL
 uom
 prep. ~~3/2~~ 2/3/99 exp 3/3/99

NO_3^- 2/99
 1000 ppm NO_3^- as NaNO_3
 1.37641 g NaNO_3 Lot # 961222A
 + DI water to 1000 mL
 prep 2/3/99 exp 3/3/99

F^- 2/99
 1000 ppm F^- as NaF
 2.31493 g NaF Lot # 896405
 + DI water to 1000 mL
 prep 2/3/99 exp 3/3/99

Walter J. MacKowski
 2/3/99

C-22 Passive Current Density

Objective: Measure passive current density

Specimen: C-22 Heat 2277-8-3715
 Start wt. 12.34698 g
 End wt. 12.34035 g

Solution: 1000 ppm Cl^- @ pH < 1
 3.29857 g NaCl Lot # 972274
 + DI water to 2000 mL
 adjust pH w/ HCl Lot # 971828
 Start pH 0.738

Temp = 95°C Hg thermometer #183303
 de-aerated w/ 99.999% N_2

Potentiostat: Versastat S/N 20104
 Counter electrode: Pt flag
 Reference: Fisher SCE 13620-51 S/N 7030126

E_{cor} -11 mV Keithly 6517 S/N 599913
 E_{pt} +585 " " "

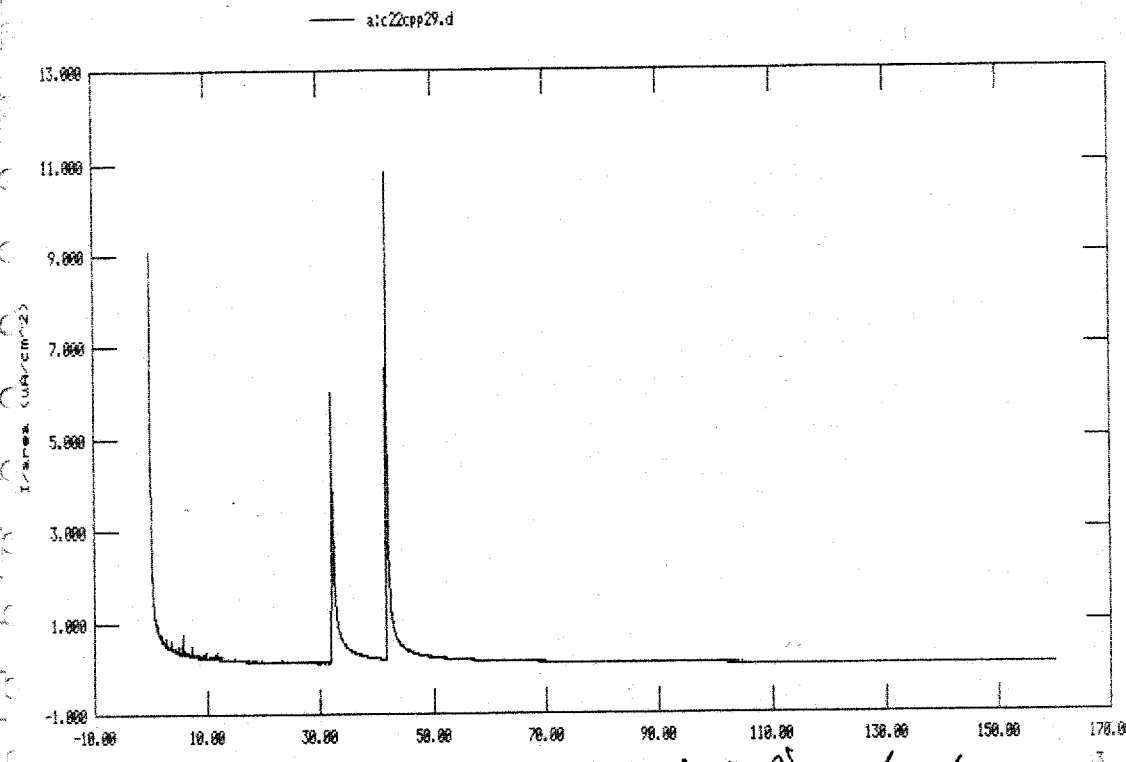
Applied +200 mV SCE

no colored film, no pitting

0.06 - 0.09 $\mu\text{A}/\text{cm}^2$

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 2/9/99

Model 352/252 Corrosion Analysis Software, v. 2.30
PS POTENTIOSTATIC File Status: NORMAL Date Run: 01-03-99 Time Run: 12:11:51
CP PASS vs. R CT PASS IP 0.200 vs. R TP 5.33E+01 T1 1.600E+05
CR AUTO HP 3000 SO Pass IR NONE FL 15.3Hz RT HIGH STABILITY
REF 0.24150 SCE WPK SOLID AR 8.900E+00 LS NO EN 0.000E+00 DEN 0.000E+00 AU NO
OC -0.012
Comment: C-22: 1000ppm Cl @ pH 0.738 @ 95°C +200mV SCE



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Model 352/252 Corrosion Analysis Software, v. 2.30
Filename: a/c22cpp29.d
Pstat: VStat() Ver 2
PS POTENTIOSTATIC File Status: NORMAL
Date Run: 01-03-99 Time Run: 12:11:51
Cond. Time CT pass s Initial Pot. IP 200.0E-3 V
Cond. Pot. CP pass V Time Step 1 T1 160.0E3 s
Initial Delay ID 5 s Stop On SO Pass
Time/Pt. TP 53.33 s Curr. Range CR Auto
No. of Points HP 3000
Line Sync. LS no IR Mode IR none
Rise Time RT high stability Filter FL 15.3Hz
Working Elec. WE Solid Ref. Elec. RE SCE 241.5E-3V
Sample Area AR 8.900 cm^2 Equiv. Wt. EN 0.0000 g
Density DE 8.900 g/ml AUK A/D AU no
Open Circuit OC -12.00E-3 V
Comment: C-22: 1000ppm Cl @ pH 0.738 @ 95°C +200mV SCE

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I have reviewed this notebook and find it in compliance with QAP-001. There is sufficient information regarding procedures used for conducting tests, acquiring and analyzing data so that another qualified individual could repeat the activity.

6/8/2000
N. S. Smith

ADDITIONAL INFORMATION FOR SCIENTIFIC NOTEBOOK #: 157

Document Date:	10/13/1995
Availability:	Southwest Research Institute® Center for Nuclear Waste Regulatory Analyses 6220 Culebra Road San Antonio, Texas 78228
Contact:	Southwest Research Institute® Center for Nuclear Waste Regulatory Analyses 6220 Culebra Road San Antonio, TX 78228-5166 Attn.: Director of Administration 210.522.5054
Data Sensitivity:	☒ "Non-Sensitive" ☐ Sensitive ☐ "Non-Sensitive - Copyright" ☐ Sensitive - Copyright
Date Generated:	03/04/1996
Operating System: (including version number)	IMB compatible
Application Used: (including version number)	NA
Media Type: (CDs, 3 1/2, 5 1/4 disks, etc.)	1 CD
File Types: (.exe, .bat, .zip, etc.)	dat, xls
Remarks: (computer runs, etc.)	Media contains: Data files containing electrochemical information