Scientific Notebook # 291

Q200002170002

21
300

R

2C 1402571 CONTAINER LIFE & SOURCE TERM

CNWRA
CONTROLLED
COPY 291

The Boorum & Pease® Quality Guarantee

The materials and craftsmanship that went into this product are of the finest quality. The pages are thread sewn, meaning they're bound to stay bound. The inks are moisture resistant and will not smear. And the uniform quality of the paper assures consistent rulings, excellent writing surface and erasability. If, at any time during normal use, this product does not perform to your expectations, we will replace it free of charge. Simply write to us:

Boorum & Pease Company
71 Clinton Road, Garden City, NY 11530
Attn: Marketing Services

Any correspondence should include the code number printed at the bottom of this page as well as the book title stamped at the bottom of the spine.

One Good Book Deserves Many Others.

Look for the complete line of Boorum & Pease® Columnar, Journal, and Record books. Custom-designed books also available by special order. For more information about our Customized Book Program, contact your office products dealer. See back cover for other books in this series.

Made in U.S.A.

Initial Scientific notebook entry for A516 grade 60 carbon steel pit growth kinetics study.

Title: Pit growth in A516 grade 60

Tests Performed by: Sean Brossia; other personnel will be identified as they begin work on specific tests.

Objectives: Determine growth rate of pits in A516 grade 60 as a function of environmental conditions expected in repository. Evaluate if long-term pit propagation likely to continue and lead to perforation. Ascertain if lateral pit growth and/or development of new pits will dominate the corrosion process such that pit penetration arrest occurs. Detailed test objectives identified in initial entries or individual test entries.

Equipment: Specific equipment lists provided in initial entries or in individual test entries. Equipment will be identified and calibrated prior to testing.

Materials: A516 grade 60 carbon steel (Heat #: D84944; composition: 0.03Cr, 0.01Ni, 0.01Mo, 0.02Cu, 1.00Mn, 0.23Si, 0.009S, 0.18C, 0.014P, 0.021Al, 0.001V, 0.001Nb, bal Fe). Other materials and heats to be added and identified prior to testing.

Continuation of Notebook #260

CSB 9/16/98

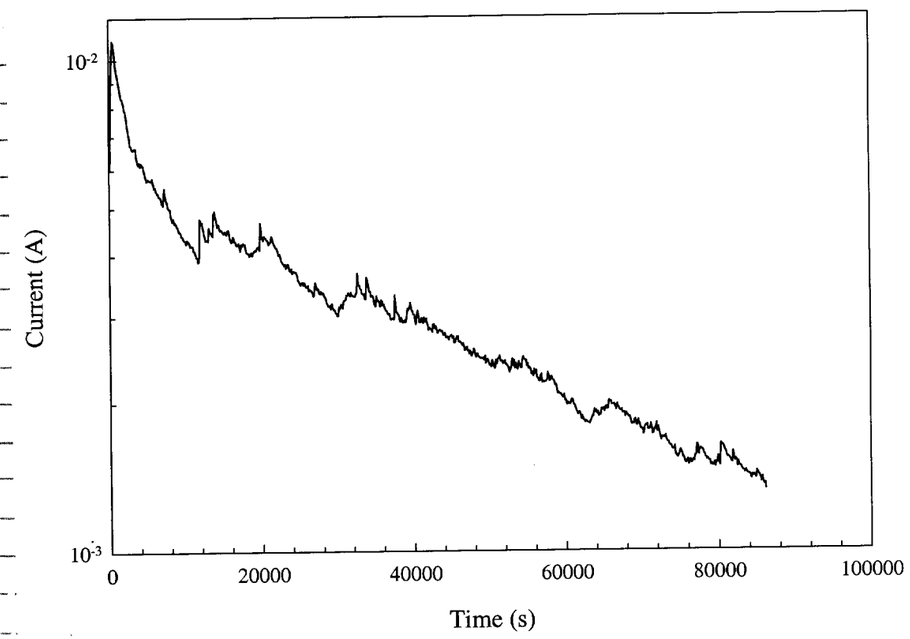
From page 160 of Book 260

Cell 3 516PS102.DAT
T=95°C
Eset=-170mv
Init wt: 28.86170g
Final wt: 28.79948g 9-17-98

Final Solution pH = 10.525 9-17-98

Observations
Some precipitate & general corrosion - crevice pitting noted around feet but not under 9-17-98

516PS102



9-16-98

To pg 8

From pg 7

9-17-98

Stock Solution

Na_2CO_3 → 3mM → .63594 g/2Lt Fisher # 960685

$NaHCO_3$ → 3mM → .50406 g/2Lt " 879789

NaCl → .12mM → .01403 g/2Lt " 972274

PH Initial = 10.163

All specimens polished to 600grit + ultrasonically cleaned in Acetone

All crevices ultrasonically cleaned in Methanol

9-17-98

To pg 9

From pg 8

Cell 1 516PS103.DAT

T = 25°C

Eset = -250mV

Initwt = 28.82723g

Final wt = 28.66056g 9-18-98

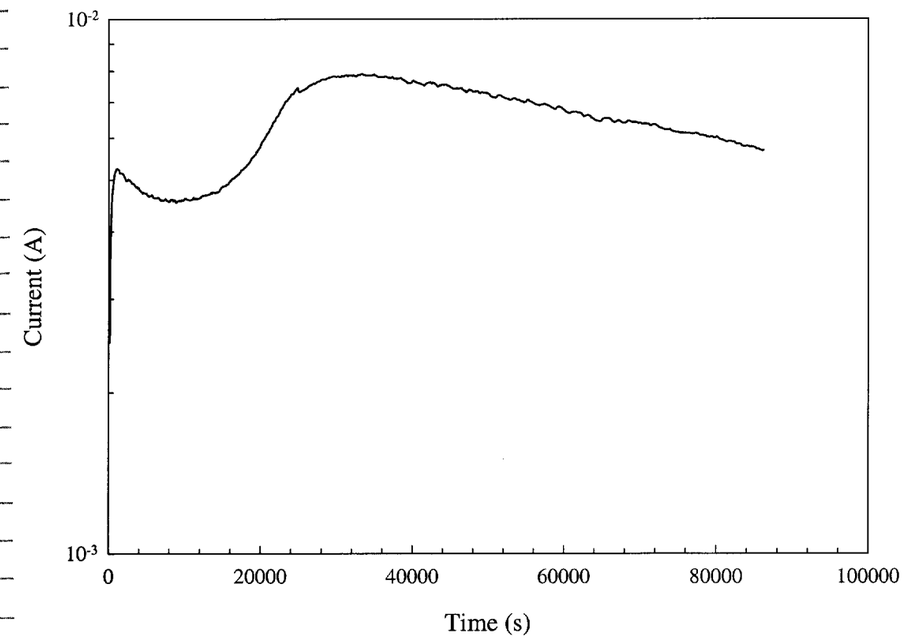
Final Solution PH = 11.009 9-18-98

Observations

Heavy precipitate + general corrosion 9-18-98

No crevice pitting

516PS103



9-17-98

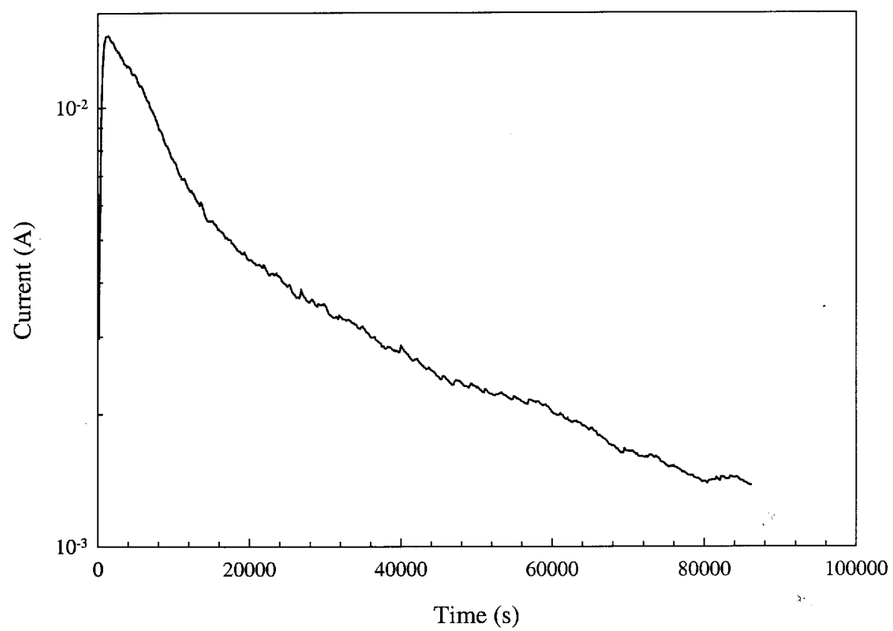
To pg 10

From pg 9

Cell 2 516PS104.DAT
T = 65°C
Eset = -220mv
Init wt = 28.92715g
Final wt = 28.85977g 9-18-98

Final Solution pH = 10.365 9-18-98
Observations
Heavy precipitate and general corrosion
No crevice pitting 9-18-98

516PS104



9-17-98

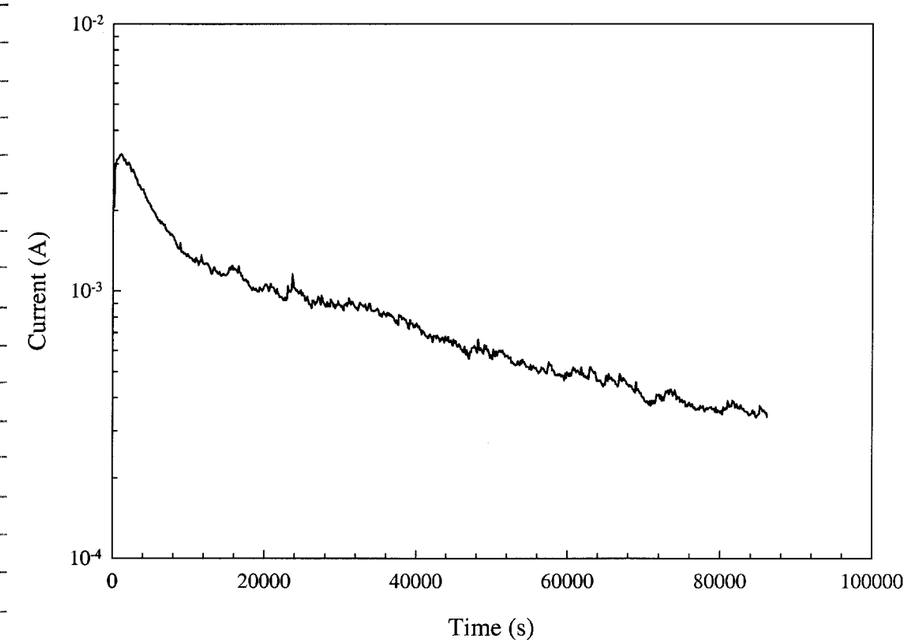
To pg 11

from pg 10

Cell 3 516PS105.DAT
T = 95°C
Eset = -150mv
Init wt = 28.76743g
Final wt = 28.75415g 9-18-98

Final Solution pH = 10.667 9-18-98
Observations
Minor precipitate some general corrosion
crevice pitting noted under and around feet 9-18-98

516PS105



9-17-98

9-21-98 Start 9:45 Am

Stock Solution

$NaHCO_3$ → 120mM → 20.1624 g/2Lt Fisher # 897789

NaCl → 1.2mM → 0.1403 g/2Lt " # 972274

Initial PH = 8.230

All specimens polished to 600 grit + ultrasonically cleaned in Acetone

All crevices ultrasonically cleaned in Methanol

9-21-98

Cell 1 516PS106.DAT

T = 25°C

Eset = -290 mV

Init wt = 28.94448 g

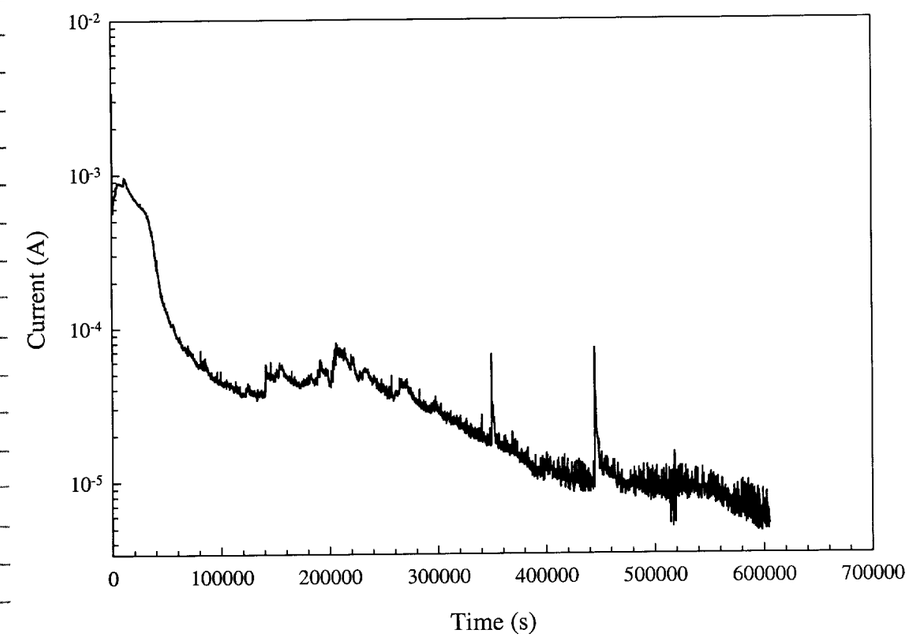
Final wt = 28.93160 g 9-28-98

Final Solution PH = 9.932 9-28-98

Observations

Some general corrosion no local crevice pitting 9-28-98

516PS106

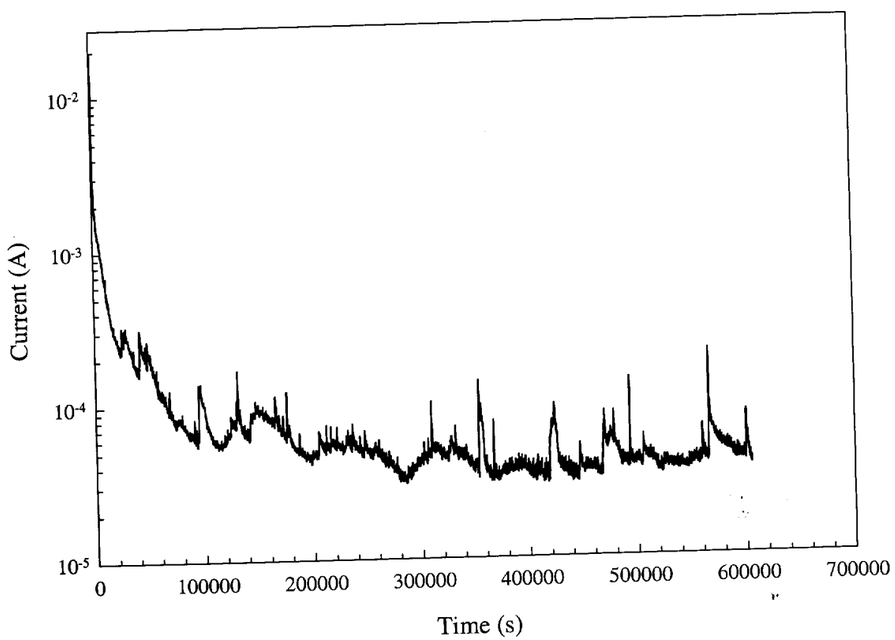


9-21-98

Cell 2 516PS107.DAT
T= 65°C
Eset= -260mv
Init wt= 28.83482g
Final wt= 28.83301g 9-28-98

Final Solution pH: 10.36 9-28-98
Observations
General corrosion noted which traveled under crevice feet in some areas 9-28-98

516PS107

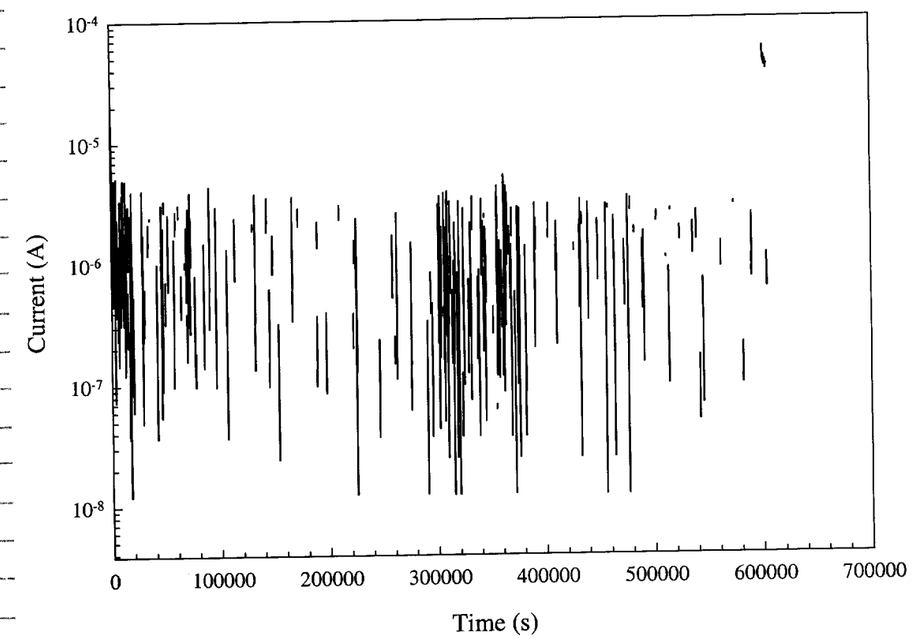


9-21-98

Cell 3 516PS108.DAT
T= 95°C
Eset= -190mv
Init wt= 28.76099g
Final wt= 28.76321g 9-28-98

Final Solution pH= 11.047 9-28-98
Observations
No general corrosion some minor crevice pitting noted appears to have film on specimen 9-28-98

516PS108



9-21-98

9-28-98 Start 11:20 Am

Stock Solution

Na_2CO_3 → 120mM → 25.4376g/2lt Fisher Lot 960685

NaCl → 6mM → 0.7013 g/2lt " " 972274

PH = 11.353

All specimens polished to 600 grit and ultrasonicall, cleaned in Acetone crevices ultrasonicall, cleaned in Methanol

9-28-98

Cell 1 516PS109.DAT

T = 25°C

Eset = -305mV

Init wt = 29.03573g

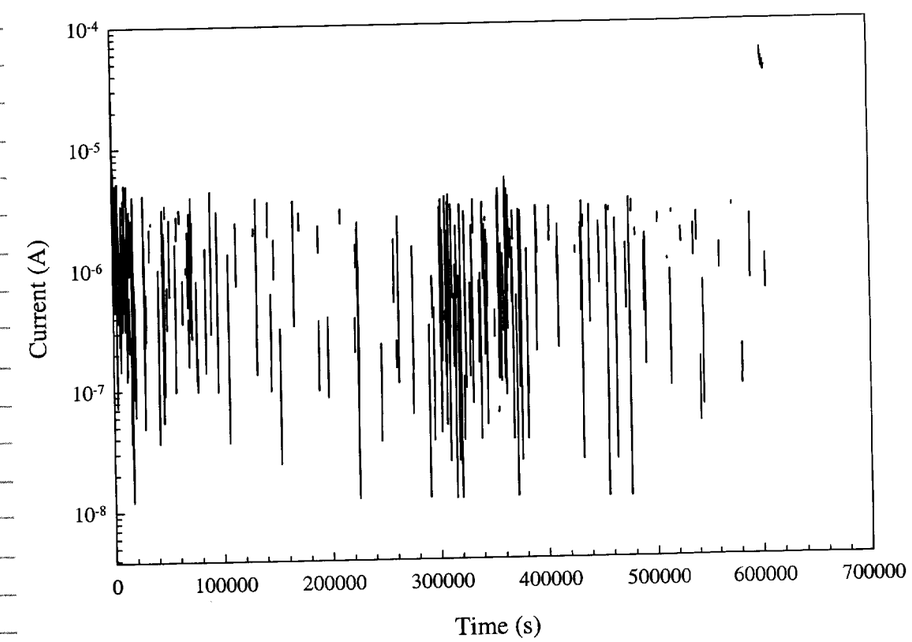
Final wt = 29.03562g 10-5-98

Final Solution PH = 11.300 10-5-98

Observations

No pervice pitting, some small general corrosion 10-5-98

516PS109

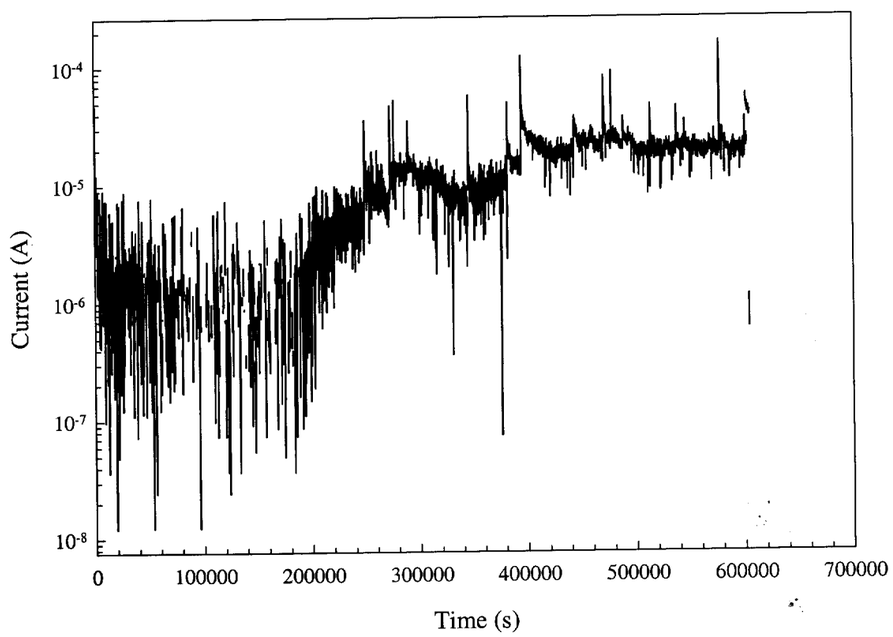


9-28-98

Cell 2 516PS110.DAT
T=65°C
Eset= -310mV
Init wt=28.81728g
Final wt= 28.81636g 10-5-98

Final Solution pH = 11.071 10-5-98
Observations
No crevice pitting, one spot of general corrosion between crevice feet
10-5-98

516PS110

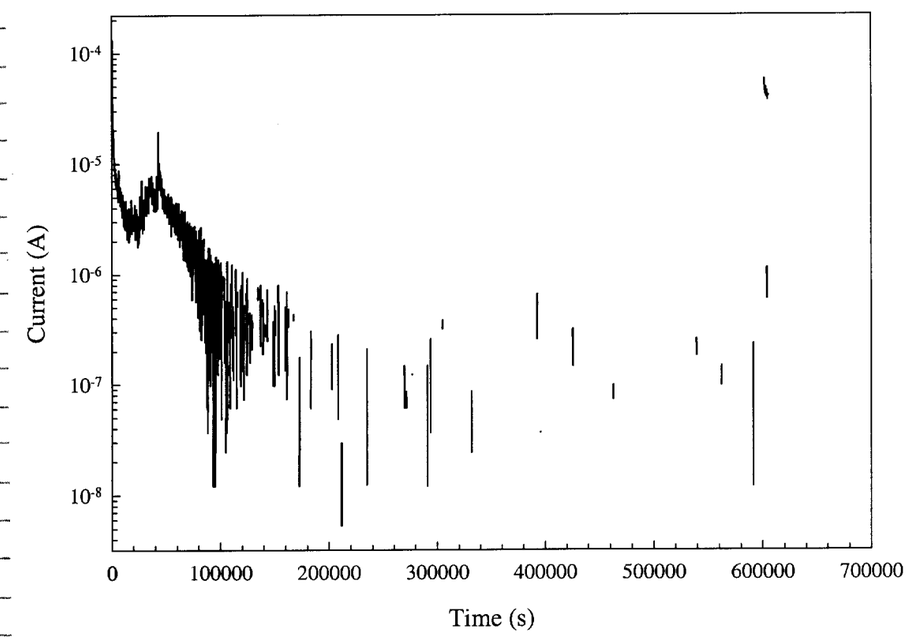


9-28-98

Cell 3 516PS111.DAT
T=95°C
Eset= -260mV
Init wt= 28.79129g
Final wt= 28.79641g 10-5-98

Final Solution pH = 11.363 10-5-98
Observations
Minor crevice pitting, film crust on specimen crystal in appearance
10-5-98

516PS111



9-28-98

from 19

10-5-98 Start 2:38

Stock Solution

$Na_2CO_3 \rightarrow 12\ mM \rightarrow 2.54376\ g/2Lt$ Fisher # 960685

$NaCl \rightarrow 1.2\ mM \rightarrow 0.1403\ g/2Lt$ 972274

pH = 11.062

All Specimens polished to 600 grit & ultrasonically cleaned in Acetone.

Crevices Ultrasonically cleaned in Methanol

Solution deaerated with CO_2 free Compressed Air

10-5-98

To 21

from 20

Cell 1 516PS12.DAT

T = 25°C

Eset = OCP (Open Circuit Potential)

Init wt = 28.56587 g

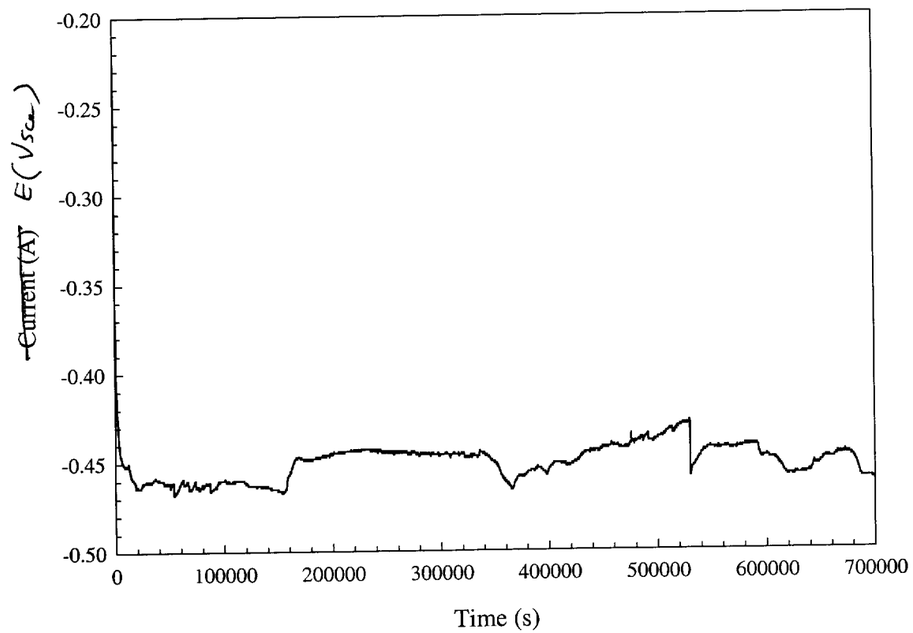
Final wt = 28.55186 g 10-15-98

Final Solution pH = 10.927 10-15-98

Observations

Two areas of general corrosion occurences between crevice feet, some on top of specimen post 10-15-98

516PS112



10-5-98

To 22

from 21

Cell 2 516PS13.DAT

T = 65°C

Eset = OCP

Init wt = 28.63444 g

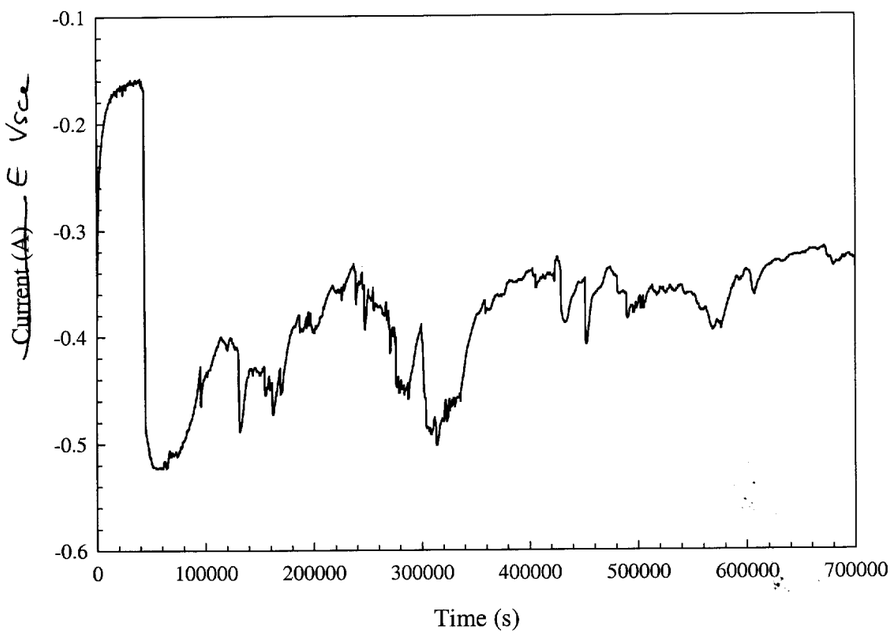
Final wt = 28.63205 g

Final Solution pH = 10.717 10-15-98

Observations

minor-med crevice pitting on 7 feet 10-15-98

516PS113



10-5-98 To 23

from 22

Cell 3 516PS114.DAT

T = 65°C

Eset = OCP

Init wt = 28.73572 g

Final wt = 28.73628 g 10-15-98

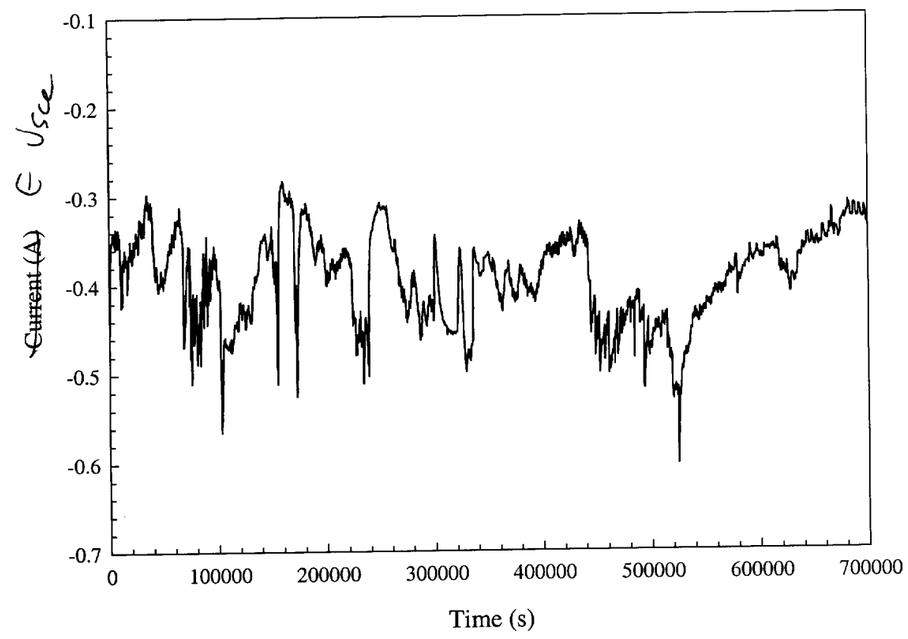
Final Solution pH = 10.789 10-15-98

Observations

minor-med crevice pitting 6 feet 10-15-98

film above vapor line

516PS114



10-5-98

from p.23

Stock Solution 10-20-98

Cell 1 120mM $NaCO_3$ → 12.7188g/Lt
1.2mM NaCl → 0.0701 g/Lt
PH= 11.299

Cell 2 120mM $NaCO_3$ → 12.7188g/Lt
2.4mM NaCl → 0.1403 g/Lt
PH= 11.310

Cell 3 120mM $NaCO_3$ → 12.7188g/Lt
12 mM NaCl → 0.7013g/Lt
PH= 11.306

All Specimens Polished to 600 grit + heat treated @ 200°C for 24 hours, the ultrasonically cleaned in Acetone before heat treat
Crevices ultrasonically cleaned in methanol
Solution Decirated in high purity Nitrogen

[signature] 10-20-98 To p.25

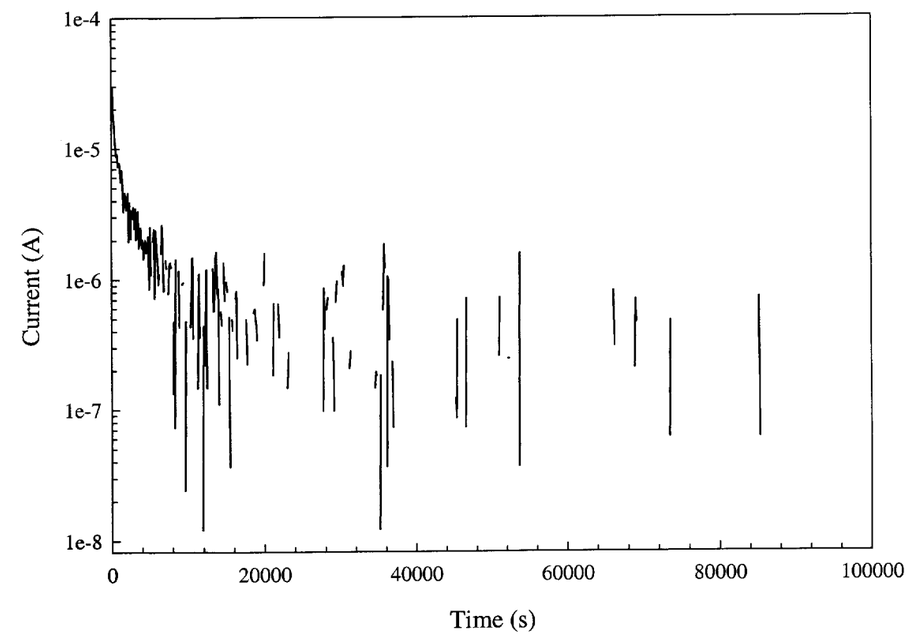
from P.24

Cell 1 516PS115.DAT
T=95°C
Eset = +225mv
Init wt = 28.98808g
Final wt = 28.98783g [signature] 10-21-98

Final Solution PH= 10.935 [signature] 10-21-98

Observations
Some minor crevice pitting noted [signature] 10-21-98
Only on 6 feet and not full coverage

516PS115



[signature] 10-20-98 To P.26

from 25

5/14/98

Stock Solution

PH = 11 ⇒ 12 mM Na_2CO_3 ⇒ 2.54376 g/2L Fisher Lot # 960685

100 ppm Cl ⇒ 0.32958 g/2L Fisher Lot # 972274

Initial PH = 11.251

All samples polished to 600 grit + ultrasonically cleaned in Acetone

Start
Change File Names for new spec
Check pulses for 2 hour
System change Copy x40
to new file names
Change Cell potentials

Note - ALT - Left Mouse Click
turns on ICON
Right Click File Run
Turn on Potentiostat

Shutdown
Double Click each Pulse for each Cell
change for 2 minutes Lowest
After both drives A+C are
accessed Right Click Select
Stop
Alt Left Click File Exit
+ System Icon

5/14/98

Cont to 27

from 26

A516PS04.DAT

Temp = 20°C

Eset = -320 mV

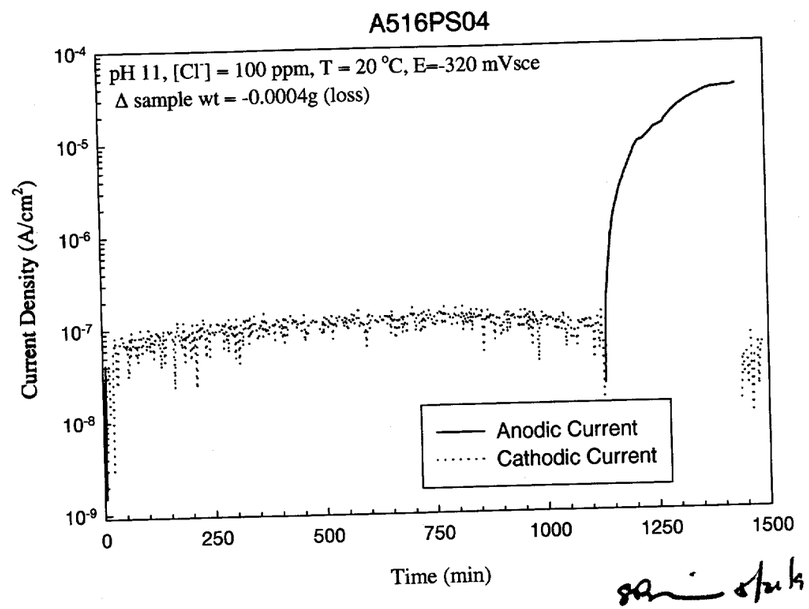
Init Sample wt = 11.42389 g

Final Sample wt = 11.42385 g 5-20-98

Final Solution PH = Dumped before ph taken 5-20-98

Observations Nitrogen low at end of test

Water line buildup on specimen 5-20-98



5/19/98

5/19/98

Cont to 28

from 27

Cell 2 A516PS05.DAT

Temp = 95°C

Eset = -420mv

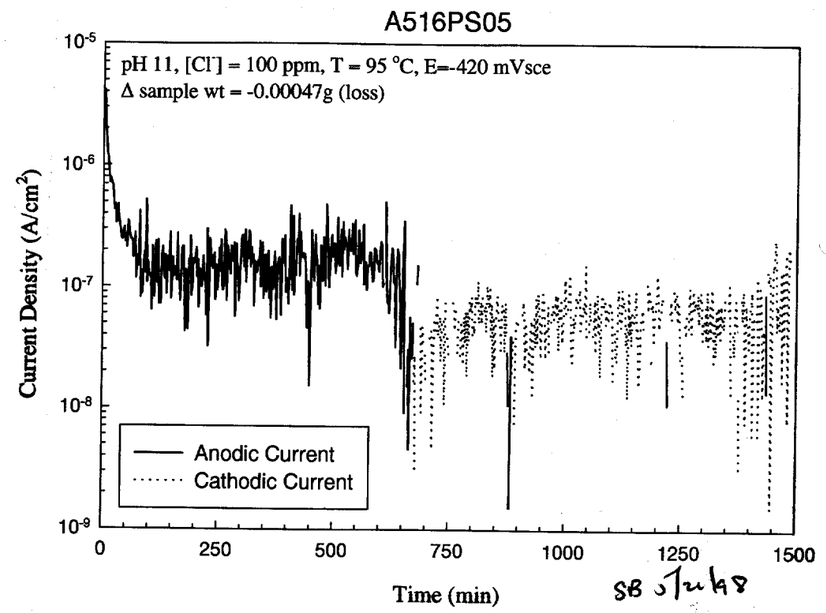
Init Sample wt = 11.40679 g

Final Sample wt = 11.40632 g 5-20-98

Final Solution PH = 10.968 5-20-98

Observations Water line film on specimen, rusting above waterline

No noticable pitting 5-20-98



SB 5/21/98

5/19/98

Cont to 29

from 28

Cell 3 A516PS06.DAT

Temp = 95°C

Eset = -320mv

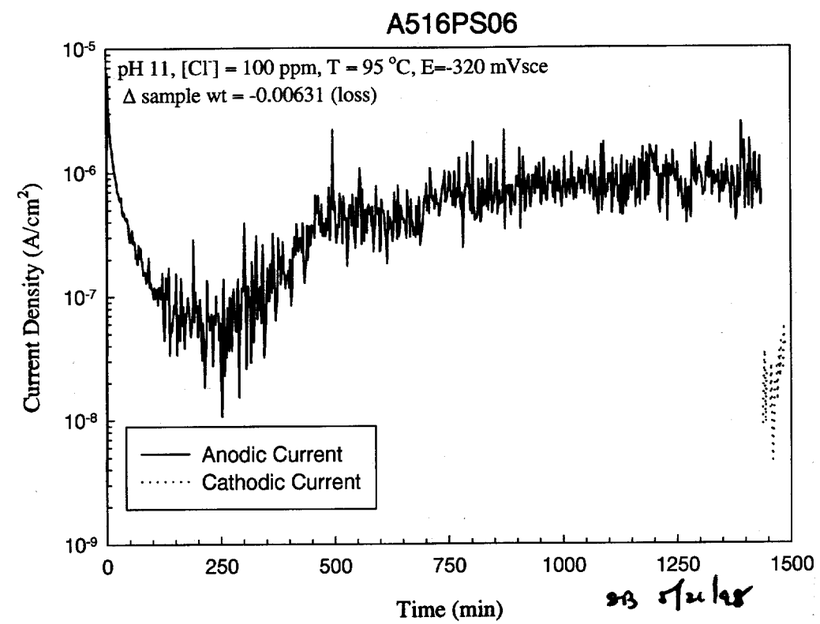
Init Sample wt = 11.40362

Final Sample wt = 11.39731 5-20-98

Final Solution PH = 10.795 5-20-98

Observations Water line film + rusting above waterline

No noticable pitting 5-20-98



SB 5/21/98

5/19/98

Cont to 30

from 29

5-20-98

Stock Solution

PH = 11 → 12 mm Na_2CO_3 => 2.54376 g/2L *Fisher Lot 960685

1000ppm Cl => 3.2958 g/2L Fisher Lot 972224

Initial PH = 11.205 5-21-98

All Samples ultrasonically cleaned in Acetone after polishing to 600 grit

5-20-98

Cont to 31

from 30

Cell 1 A516PS07.DAT

Temp = 20°C

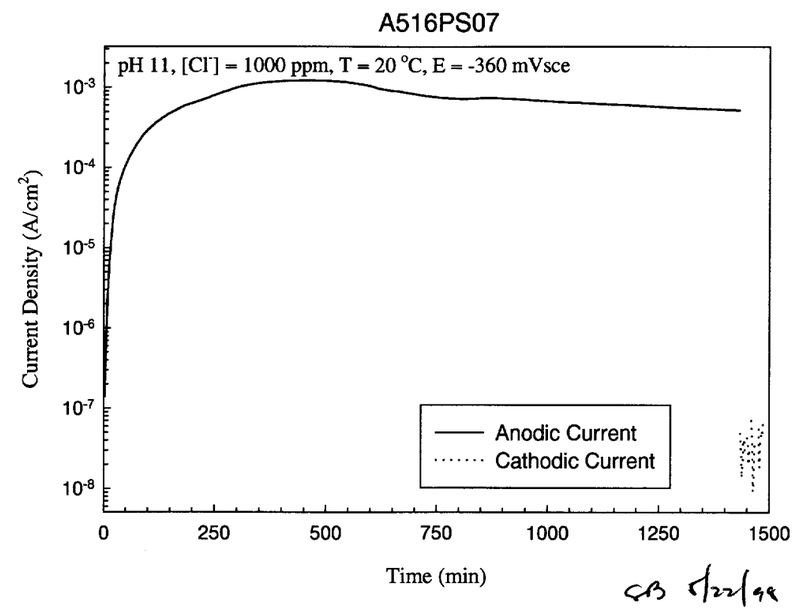
Eset = -360mv

Init Sample wt = 11.39714

Final Sample wt = 11.25644 5-22-98

Final Solution PH = 11.717 5-22-98

Observations Heavy product buildup, some pitting 5-22-98



CB 5/22/98

5-20-98

Cont to 32

from 31

Cell 2 A516PS08.DAT

Temp = 95°C

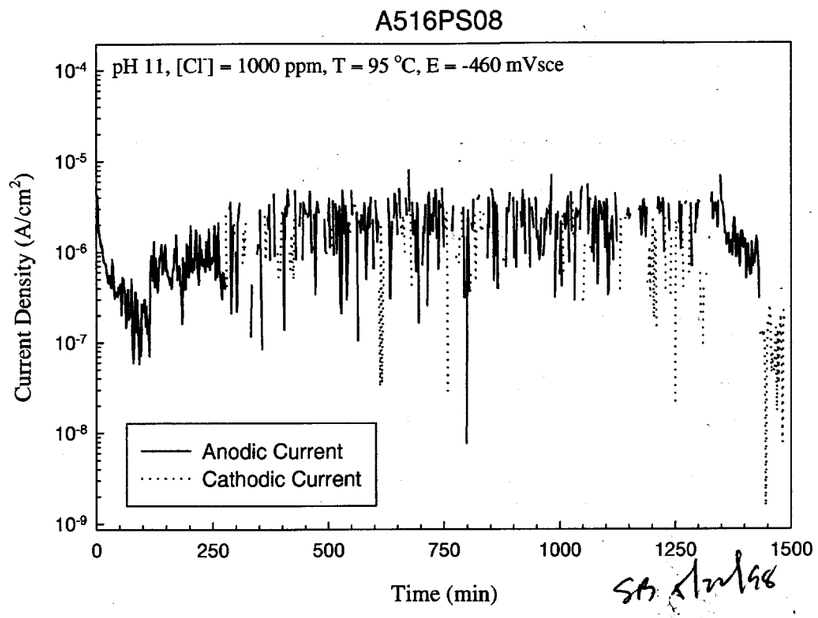
Eset = -460mv

Init Sample wt = 11.46693

Final Sample wt = 11.46901 5-22-98

Final Solution pH = 11.159 5-22-98

Observations No pitting, slight rusting above solution line 5-22



5-20-98 Cont to 33

from 32

Cell 3 A516PS09.DAT

Temp = 95°C

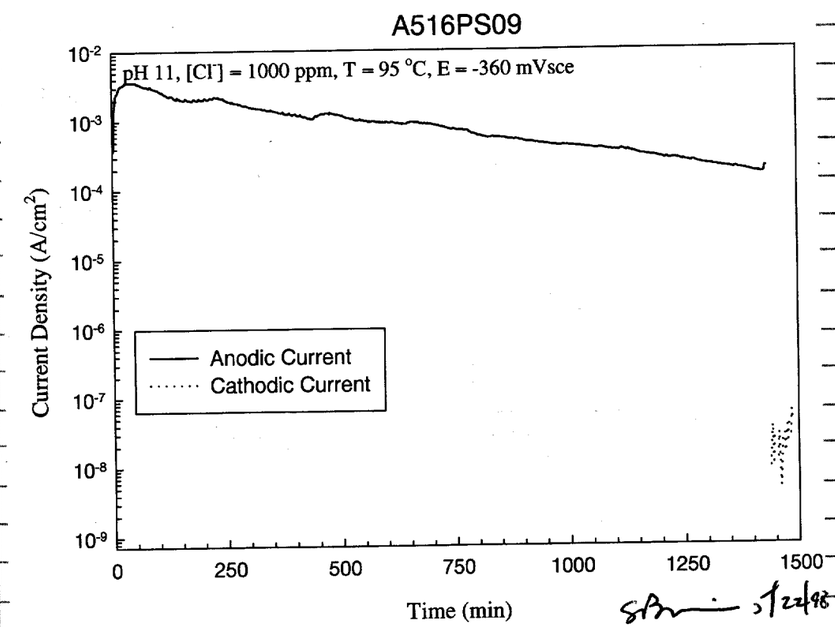
Eset = -360mv

Init Sample wt = 11.44650

Final Sample wt = 11.29136 5-22-98

Final Solution pH = ~~11.717~~ 10.822 5-22-98

Observations Heavy product buildup, rust + pitting, slight rust above solution line 5-22-98



5-20-98

5/25/98 Attempt to make pH 9.5 solution

		100 mL of soln	measured pH
#1	12 mM Na_2CO_3 – 105.986 g/mol 1 mM $NaHCO_3$ – 84.0049 g/mol	0.1272 g 0.0084 g	10.918
#2	12 mM Na_2CO_3 0.1 mM $NaHCO_3$	0.1272 g 0.00084 g actual 0.00140	11.068
#3	11 mM Na_2CO_3	0.1166 g	11.040
#4	10 mM Na_2CO_3 1 mM $NaHCO_3$	0.1060 0.0084	10.880
#5	10 mM Na_2CO_3 2 mM $NaHCO_3$	0.1060 0.0168	10.765

After discussion w/ N. Sridhar and G. Cragnolino, key issue seems to be CO_3^{2-}/Cl^- ratio to generate conditions that lead to pitting. Ratios that have worked to some extent thus far:

CO_3^{2-}	Cl^-	ratio
12 mM	1.41 mM (50 ppm)	8.51
12 mM	0.282 mM (10 ppm)	42.6 – best case

ratios that led to general corrosion

CO_3^{2-}	Cl^-	ratio
11.5 mM	2.82 mM (100 ppm)	4.1
11.5 mM	28.17 mM (1000 ppm)	0.41
12 mM	2.82 mM	4.3
12 mM	28.17 mM	0.43

SB 5/25/98

cont on p35

from p34

From tests so far given that CO_3^{2-}/Cl^- ratio is critical parameter, following experiments are proposed 5/25/98

$[CO_3^{2-}]$ as Na_2CO_3	ratio	$[Cl^-]$ mM	ppm	g NaCl/2L
12 mM	6:1	2	71	0.233768
	8:1	1.5	53	0.175326
	10:1	1.2	42.6 CSB 5/25/98	0.14026
	20:1	0.6	21	0.07013
	30:1	0.4	14	0.046754
	50:1	0.24	8.5	0.028052
	75:1	0.16	5.7	0.018701
	100:1	0.12	4.3	0.014026
	500:1	0.024	0.85	0.002805
	1000:1	0.012	0.425	0.0014026

make from stock solution:

0.48 M solution (1 L = 0.02805 g NaCl)

0.024 mM final $[Cl^-]$ in 2L → 100 mL stock Cl^- soln

0.012 mM final $[Cl^-]$ in 2L → 50 mL stock Cl^- soln

	potentials			
#	E_{rp}	E_{set} 95°C	E_{set} 95°C	E_{set} 25°C
6:1	−514	E_{rp} + 100	E_{rp} + 200	E_{rp} + 200
8:1	−509			
10:1	−505			
20:1	−493			
30:1	−486			
50:1	−477			
75:1	−470			
100:1	−465			
500:1	−437			
1000:1	−425			

SB 5/25/98

Cont Pg 36

from 35

5-26-98

Stock Solution

PH = 11 → 12mm Na_2CO_3 => 2.54376 g/2L* Fisher Lot 960685

→ 71ppm Cl^- => .233768 g/2L Fisher Lot 972274

Initial PH = 11.075 [illegible] 5-25-98

All samples polished to 600 grit & cleaned w/ Acetone in Ultrasonic

[illegible] 5-26-98

Cont Pg 37

from 36

Cell 1 A516PS10.DAT

Temp = 20°C

Eset = -314mV

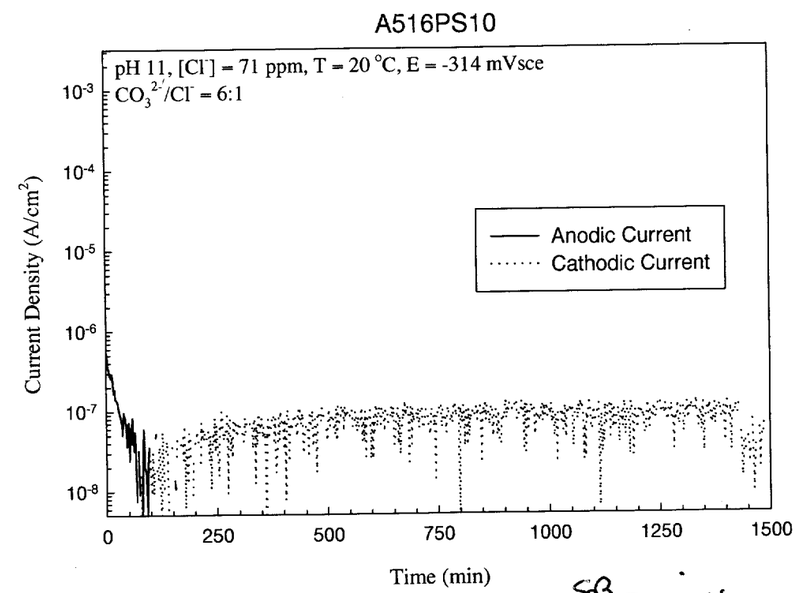
Init Sample Wt = 11.44881g

Final Sample wt = 11.44732g M.B[illegible] 5/27/98

Final Solution PH = 11.030 M.B[illegible] 5/27/98

Observations

No corrosion/pitting evident on entire sample



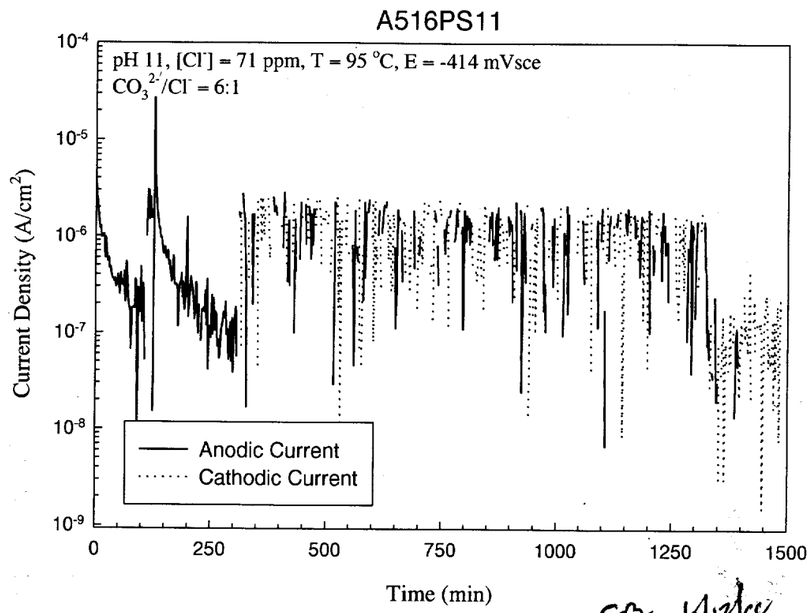
SR 6/12/98

[illegible] 5-26-98

Cont Pg 38

from 37 Cell 2 A 516 PS11.DAT
Temp: 95°C
Eset = -414 mv
Init Sample wt = 11.40642 g
Final Sample wt = 11.40461 g M.B[illegible] 5/27/98

Final Solution PH = 11.213 M.B[illegible] 5/27/98
Observations vapor phase & water line attack

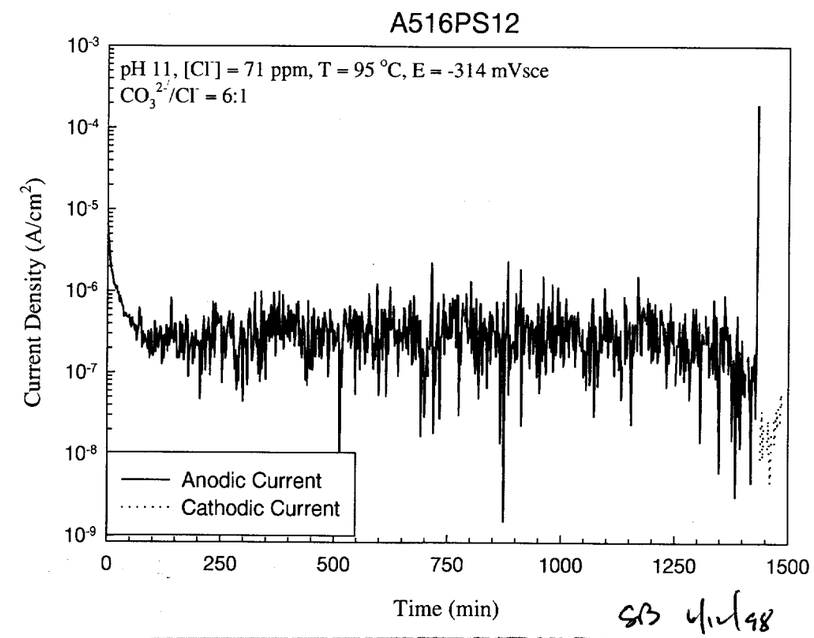


SB 6/12/98

[illegible] 5-26-98 Cont pg 39

from 38 Cell 3 A516PS12.DAT
Temp = 95°C
Eset = -314 mv
Init Sample wt = 11.38665 g
Final Sample wt = 11.38572 g M.B[illegible] 5/27/98

Final PH of Solution = 11.271 M.B[illegible] 5/27/98
Observations vapor phase and water line attack



SB 6/12/98

[illegible] 5-26-98 Cont 40

from 39

5-28-98

Stock Solution

pH-11 → 12 mm Na_2CO_3 => 2.54376 g/2Lt Fisher Lot 960685

1 → 53 ppm Cl => .175326 g/2Lt Fisher Lot 972274

Initial PH = 11.058 [illegible] 5-28-98

All Samples polished to 600 grit & ultrasonically cleaned in Acetone

[illegible] 5-28-98

Cont 41

from 40

Cell 1 File A516PS13.DAT

Temp = 20°C

Eset = -309 mv

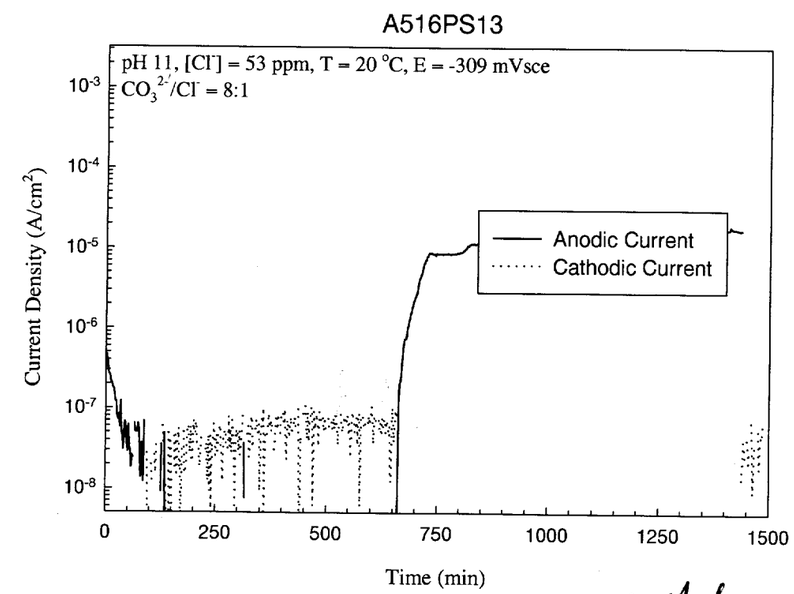
Init Sample wt = 11.45128 g

Final Sample wt = 11.45098 g [illegible] 5-29-98

Final Solution PH = 11.058 [illegible] 5-29-98

Observations

No pitting, slight buildup at vapor line [illegible] 5-29-98



SB 6/12/98

[illegible] 5-28-98

Cont 42

from 41

Cell 2 A516PS14.DAT

Temp = 95°C

Eset = -409 mV

Initial Sample wt = 11.40596g

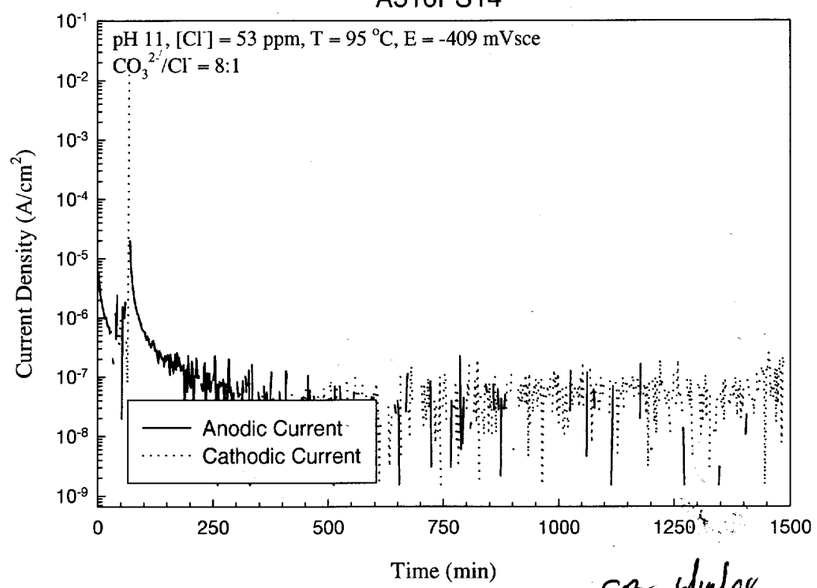
Final Sample wt = 11.40569g 5-29-98

Final Solution PH = 10.732 5-29-98

Observations

No Pitting, slight vapor changes 5-29-98

A516PS14



SB 6/1/98

5-28-98

Cont 43

from 42 Cell 3 A516PS15.DAT

Temp = 95°C

Eset = -309 mV

Initial Sample wt = 11.46107g

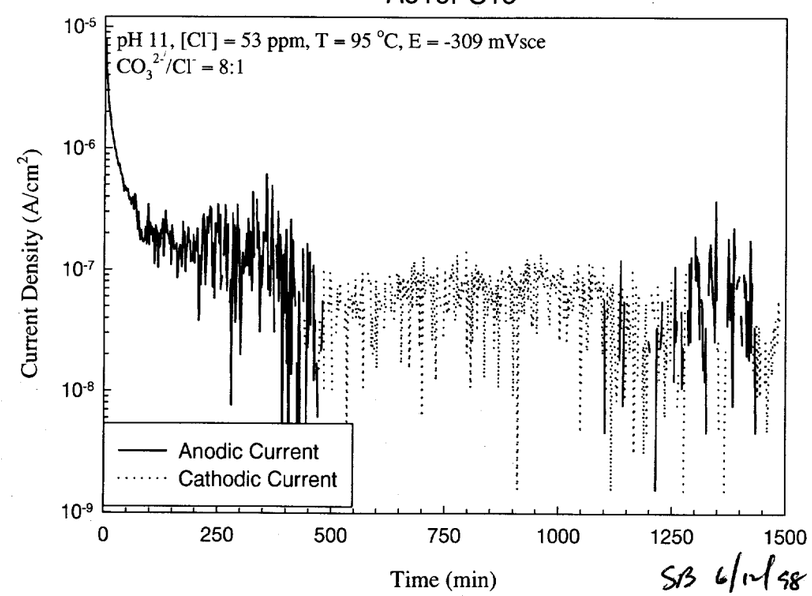
Final Sample wt = 11.46065g 5-29-98

Final Solution PH = 11.102 5-29-98

Observations

No Pitting, slight vapor attack 5-29-98

A516PS15



SB 6/1/98

5-28-98

Cont 44

from 43

6-1-98

Stock Solution

pH=11 → 12 mm Na_2CO_3 => 2.54376g/2Lt Fisha Lot# 960685

→ 42ppm Cl => .14026g/2Lt Fisha Lot# 972274

Initial pH= 11.071 6-1-98

All Samples polished to 600grit + ultrasonically cleaned in Acetone

6-1-98

Cont 45

from 44

Cell 1 A516PS16.DAT

Temp = 20°C

Eset = -305 mv

Init Sample wt = 11.37783g 6-1-98

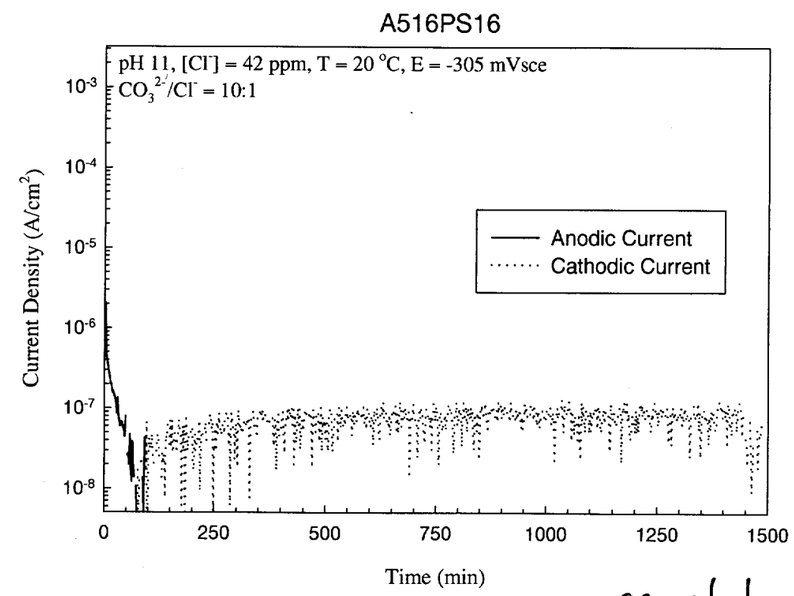
Final Sample wt = 11.37754g 6-2-98

Final Solution pH = 10.842 6-2-98

Observations

No Pitting or changes noticed below vapor line

some small marks in vapor area 6-2-98



SB 6/12/98

6-1-98

Cont 46

from 45 Cell 2 A516PS17.DAT

Temp = 95°C

Eset = -405 mv

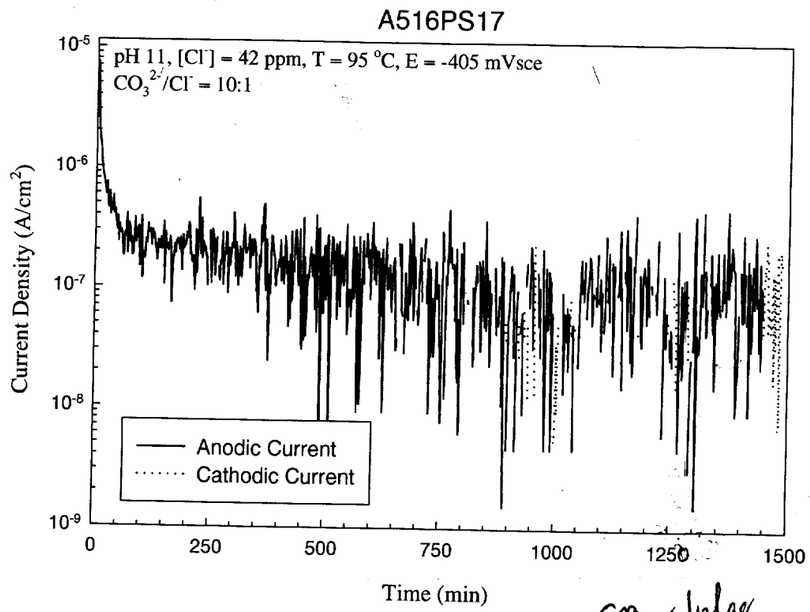
Init Sample wt = 11.30289 g 6-1-98

Final Sample wt = 11.29953 g 6-2-98

Final Solution pH = 10.770 6-2-98

Observations

No pitting noted below vapor line, discoloration in vapor area 6-2-98



SB 6/12/98

6-1-98 Cont 47

from 46 Cell 3 A516PS18.DAT

Temp = 95°C

Eset = -305 mv

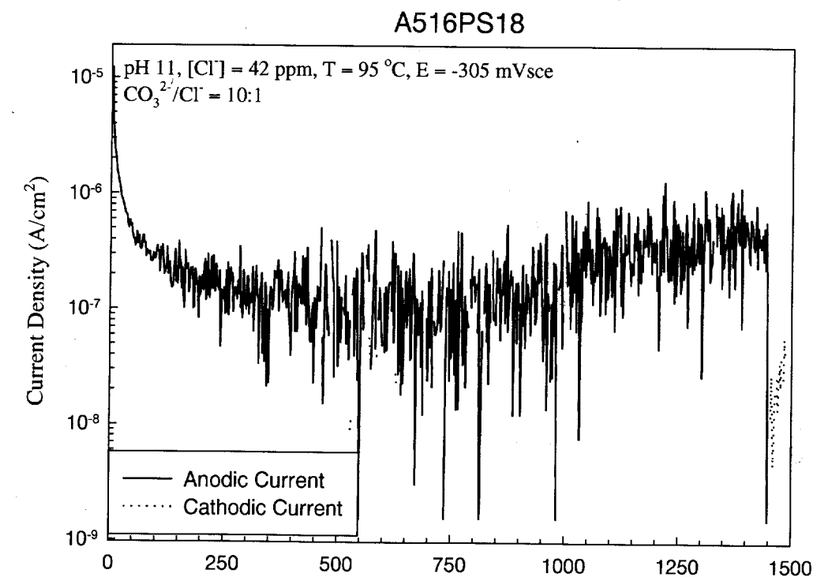
Init Sample wt = 11.41842 g 6-1-98

Final Sample wt = 11.41528 g 6-2-98

Final Solution pH = 10.861

Observations

No pitting noted below vapor line, discoloration and slight rusting in vapor area 6-2-98



SB 6/12/98

6-1-98 Cont 48

from 47

6-2-98

Stock Solution

PH=11 → 12mm Na_2CO_3 => 2.54376 g/2Lt Fisher Lot# 960685

→ 21 ppm Cl => .07013 g/2Lt Fisher Lot# 972274

Initial PH= 11.047 6-2-98

All Samples polished to 600 Grit + ultrasonicated, cleaned in Acetone

6-2-98

Cont 49

from 48

Cell1 A516PS19.DAT

Temp = 20°c

Eset = -293mv

Init Sample wt = 11.38535g 6-2-98

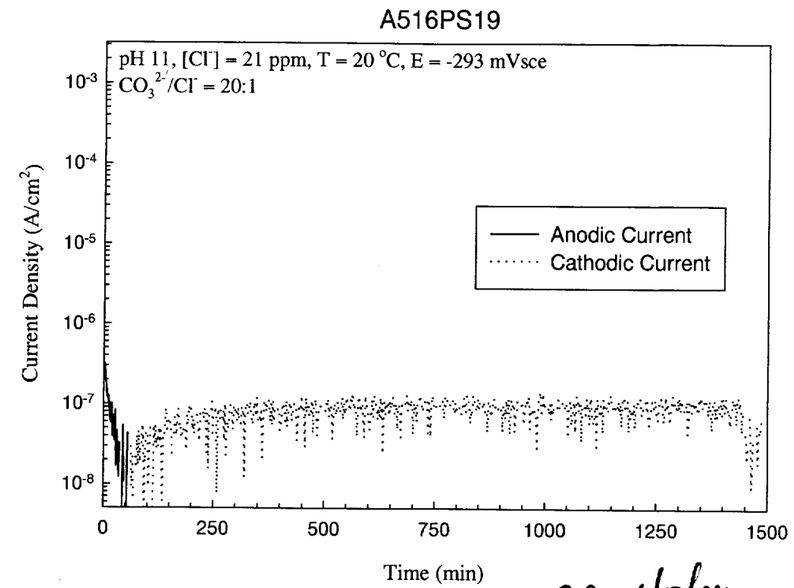
Final Sample wt = 11.38623g 6-3-98

redried = 11.38593g

Final Solution PH = 11.029 6-3-98

Observations

No pitting observed 6-3-98



SB 6/12/98

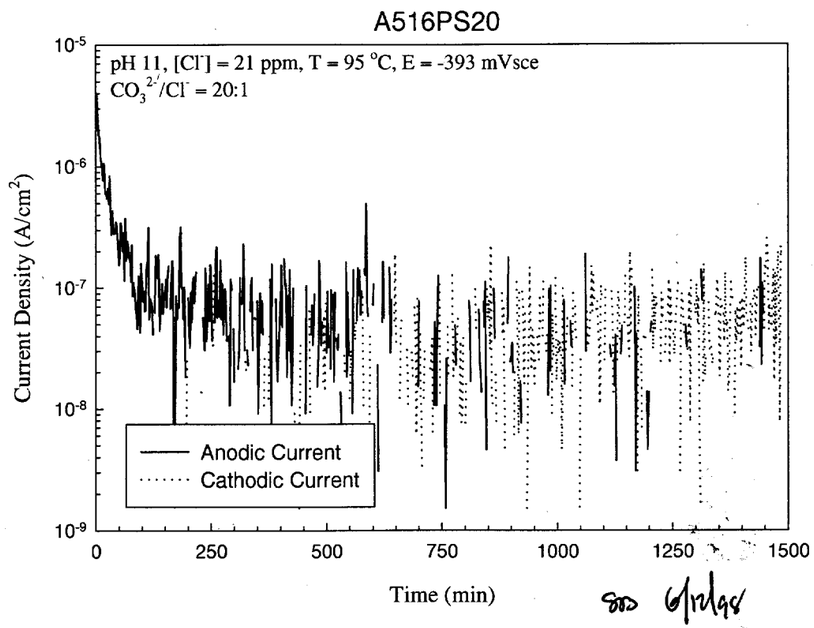
6-2-98

Cont 50

from 49

Cell 2 A516PS20.DAT
Temp = 95°C
Eset = -393 mv
Init Sample wt = 11.43569 g 6-2-98
Final Sample wt = 11.43494 g 6-3-98

Final Solution PH = 10.741 6-3-98
Observations
1/4" loss of solution Some rusting in vapor area
None in solution 6-3-98



SDS 6/12/98

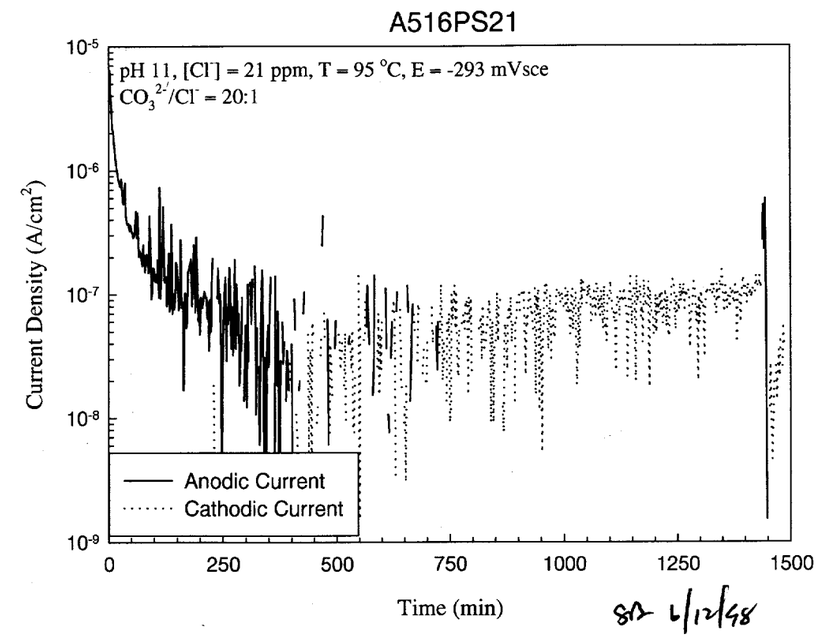
6-2-98

Cont 51

from 50

Cell 3 A516PS21.DAT
Temp = 95°C
Eset = -293 mv
Init Sample wt = 11.39660 6-2-98
Final Sample wt = 11.39482

Final Solution PH = 11.117
Observations
~~1/4" loss of solution. 6-3-98~~
Some rusting in vapor area None in solution



SDS 6/12/98

6-2-98

Cont 52

from 51

6-3-98

Stock Solution

PH = 11 → 12mm Na_2CO_3 => 2.54376g/2Lt Fisher Lot # 960685

→ 14ppm Cl => .046754g/2Lt Fisher Lot # 972274

PH Initial = 10.969

All samples polished to 600 grit + ultrasonically cleaned in Acetone

6-3-98

Cont 53

from 52

Cell 1 A516PS22.DAT

Temp = 20°C

Eset = -286mv

Init wt = 11.34903g

Final wt = ~~11.053~~ 11.34569g 6-4-98

6-4-98

Final Solution PH = 11.053 6-4-98

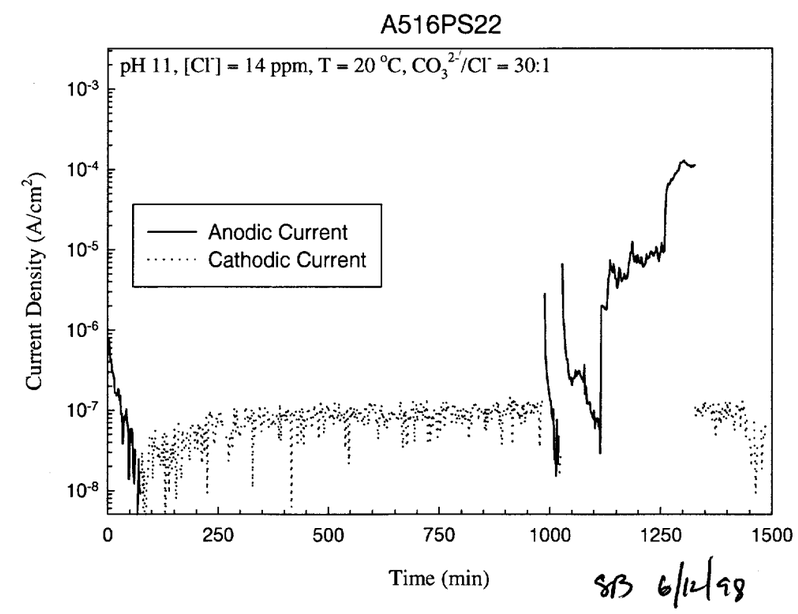
Observations - no attack observed SSB 6/4/98 incr. potential to ~~+40~~ +62 V sce @ 8:10 Am 6/4/98

SSB 6/4/98

no pitting - increased E to +490 mV - 1 small pit observable 10:15 Am - incr. E to Eout +200 (790 mV)

Find at 2:00pm pitting + participate on specimen 6-4-98

A516PS22



SB 6/12/98

6-3-98

Cont 54

from 53

Cell 2 A516PS23.DAT

Temp = 95°C

Eset = -386mv

Init wt = 11.35095g

Final wt = 11.35102g 6-4-98

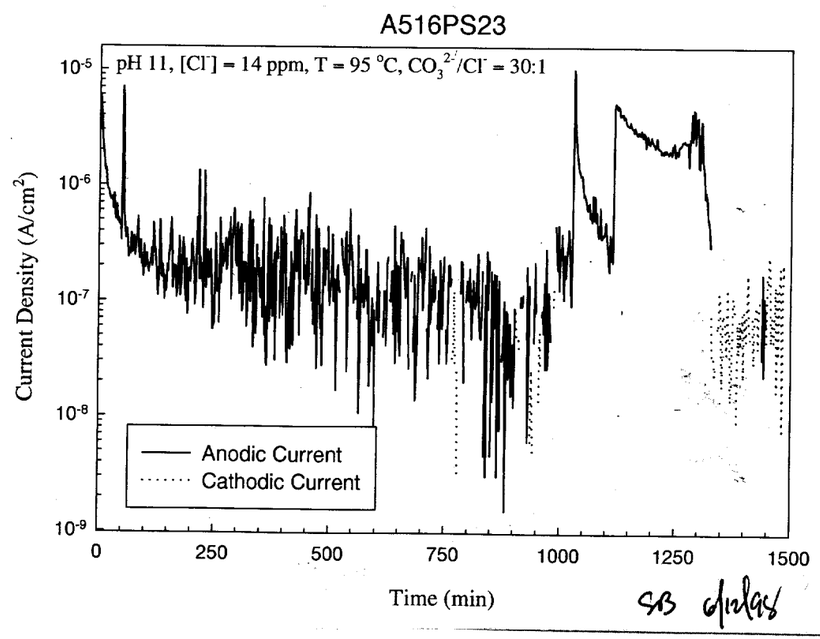
Final Solution PH = 11.009 6-4-98

Observations - no pitting obs. Erp @ 95C w/ 14 ppm Cl^- is approx -438 mVsce (-196 mVshe) Epit = 590 mVsce; potential increased to Erp + 250 = -188 @ 810 am 6/4/98 CSB

9am no pitting - increased E to Epit - 200 = +390

10^15 no pits observable, E incr. to Epit + 100 = 690 mV

End 2:00pm corrosion above water in vapor area no pitting observed in solution 6-4-98



SB 6/12/98

6-3-98 Cont 55

from 54

Cell 3 A516PS24.DAT

Temp = 95°C

Eset = -286mv

Init wt = 11.36644g

Final wt = 11.36351g 6-4-98

Final Solution PH = 11.165 6-4-98

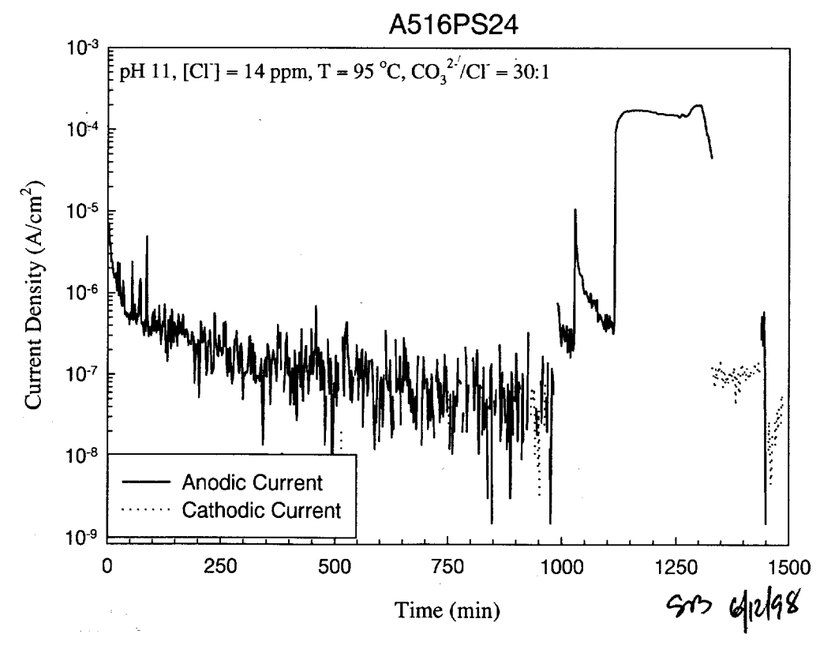
Observations - no pitting as Erp @ 95°C w/ 14ppm Cl^- is approx -438 mVsce (-196 mVshe); Epit ≈ 580 mVsce

CSB 6/4/98 E increased to Erp + 500 = +62 @ 810 am 6/4/98 CSB

9am no pitting, increased E to Epit - 100 = +490

10^15 no pits observable - E incr. to Epit + 200 = 790 mV

End 2:00pm corrosion in vapor area no pitting observed in solution 6-4-98



SB 6/12/98

6-3-98 Cont 56

from 55 6-4-98

Stock Solution

→ 60 mm Na_2CO_3 => 12.71880 g/2lt

→ 100ppm Cl => .32958 g/2lt

Initial PH = 11.277

All samples polished to 600 Grit + ultrasonically cleaned in Acetone

6-4-98

Cont 57

from 56 Cell 1 A516PS25.DAT

Temp = 20°C

Eset = -200mV

Initwt = 11.37092g

Finalwt = 11.36997g 6-5-98

Final Solution PH = 11.286 6-5-98

Observations 8^05 Am no noticeable pitting 6/5/98

Emer to 243 mV/sec @ 8^15

9 am - cathode hold for 10 min @ -750 mV

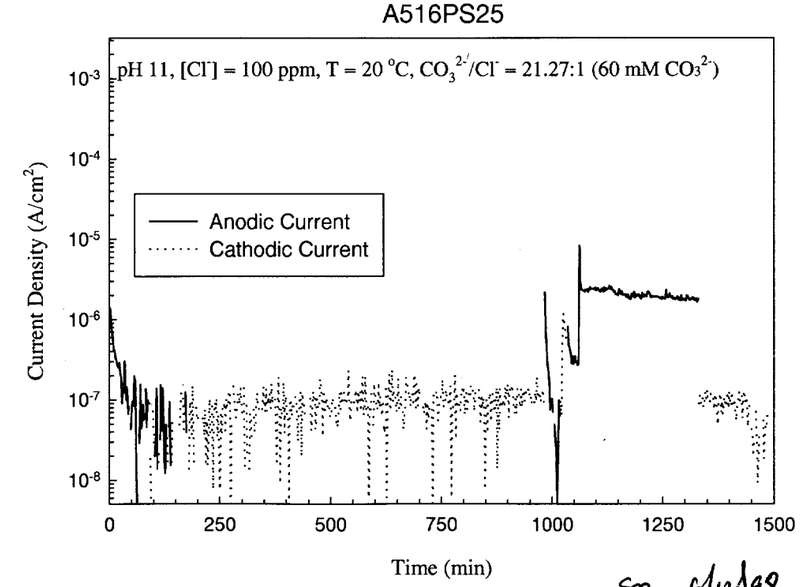
then reinstated to previous potential (+243)

9^30 incr. potential to + 750

End 2:00pm 6-5-98 79912 seconds

Some small pitting on sample base to side into fire

slight discoloration overall 6-5-98



SB 6/12/98

6-4-98

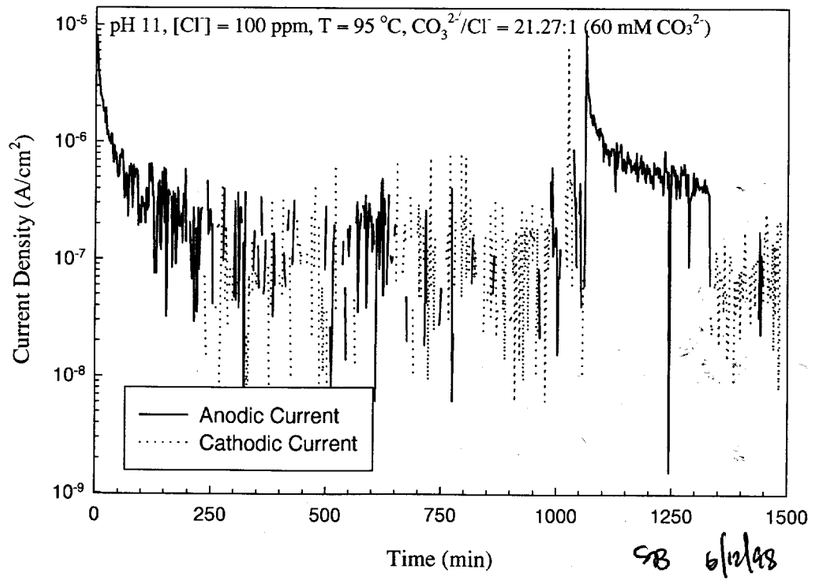
Cont 58

from 57

Cell 2 A516PS26.DAT
Temp = 95°C
Eset = -300 mV
Init wt = 11.36067 g
Final wt = 11.36031 g 6-5-98

Final PH of Solution = 10.981 6-5-98
Observations 8⁰⁵ no noticable pitting 6/5/98
Epit (mV SHE) = -159 - 242 log [Cl⁻] = +343 mVsce
E incr. to Epit -200 = 143 mVsce @ 8¹⁵
9am - cathodic hold @ -750 mV for 10 min then
reinstated to previous potential (+143)
9³⁰ incr. potential to +650
No pitting observed, slight change in vapor area 6-5-98

A516PS26



SB 6/12/98

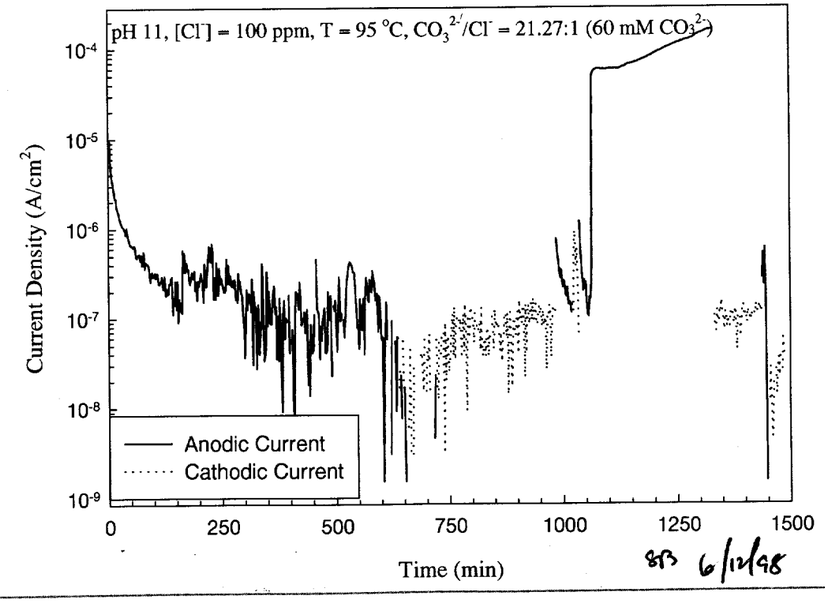
6-4-98

Cont 59

Cell 3 A516PS27.DAT
Temp = 95°C
Eset = -200 mV
Init wt = 11.30834 g
Final wt = 11.30820 g 6-5-98

Final Solution PH = 11.315 6-5-98
Observations 8⁰⁵ AM no noticeable pitting 6/5/98
E incr. to Epit -100 = 243 mVsce @ 8¹⁵
9am - cathodic hold @ -750 mV for 10 min then
reinstated to previous potential (+243)
9³⁰ incr. potential to +750
no pitting. 6-5-98

A516PS27



SB 6/12/98

6-4-98

Cont 60

from 59

6-8-98

Stock Solution

→ 12 mM Na_2CO_3 => 2.54376 g/2lt Fisher Lot# 960685

→ 1000 ppm Cl => 3.2958 g/2lt Fisher Lot#972274

Initial PH = 11.036 [illegible] 6-8-98

Crevice sample area ~ 170 mm^2 for total sample incl. hole CSB 6/8/98

All samples polished to 600 grit + ultrasonically cleaned in Acetone

Crevices cleaned in Methanol (ultrasonic)

Switched to crevice samples to try to induce attack @ specific locations on sample CSB 6/8/98

Crevice formers loaded to 40 in oz torque using torque wrench #2. CSB 6/8/98

[illegible] 6-8-98

Cont 61

from 60

cell: A516PS28.DAT - CREVICE

Temp = 20°c

Eset = -.450 v

Init wt = 29.29312 g

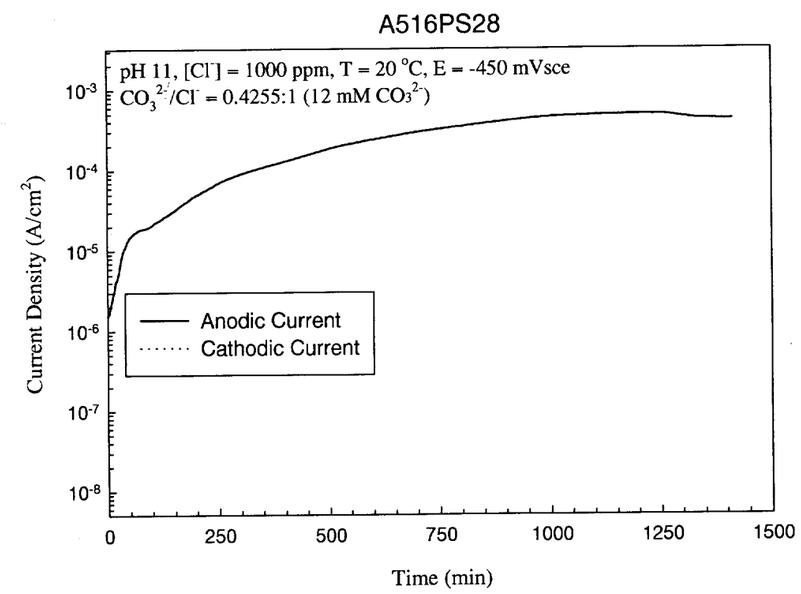
Final wt = 29.17318 g [illegible] 6-9-98

Final Solution PH = 11.434 [illegible] 6-9-98

Observations Acquisition began @ 1685 s

Particle build occured much later in test

Massive pitting observed. [illegible] 6-9-98



GRB 6/12/98

[illegible] 6-8-98

Cont 62

from 61

Cell 2 A516PS29.DAT – CREVICE

Temp = 65°C

Eset = -.300 v

Int wt = 29.29714 g

Final wt = 28.67316 g 6-9-98

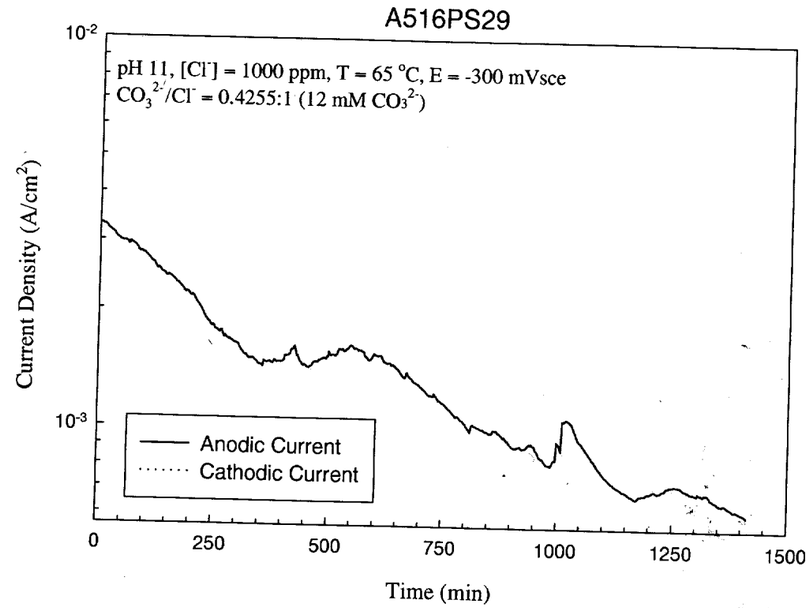
Final Solution PH = 11.507 6-9-98

Observations

Immediately after applying potential, noted buildup accumulating

Acquisition began @ 1685 s 6-9-98

Massive pitting



SB 6/12/98

6-8-98

Cont 63

from 62

Cell 3 A516PS30.DAT – CREVICE

Temp = 95°C

Eset = -.050 v

Int wt = 29.34919 g

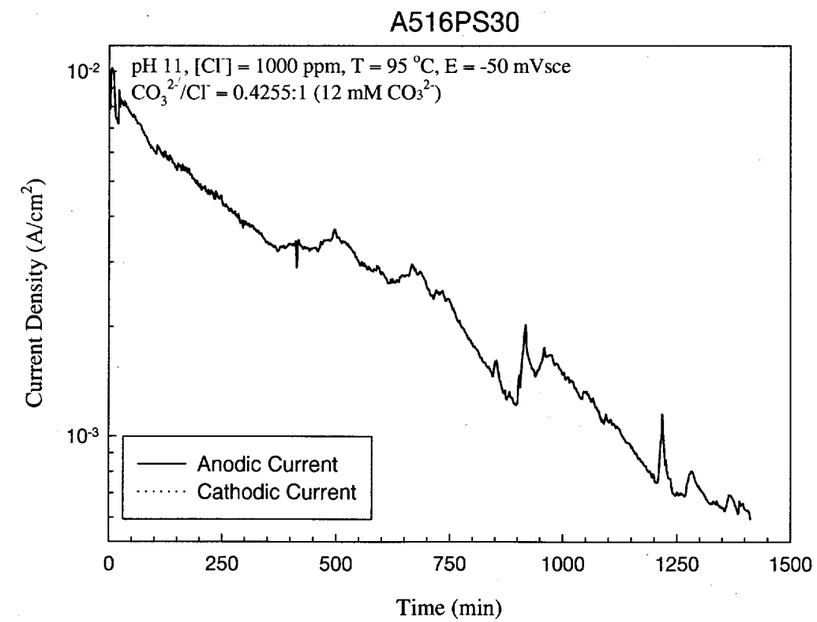
Final wt = 28.08745 g 6-9-98

Final Solution PH = 10.850 6-9-98

Observations

Immediately after applying potential, noted buildup accumulating and rusting taking place. Acquisition began @ 1685 s

Massive pitting 6-9-98



SB 6/12/98

6-8-98

from 63

6-9-98

Stock Solution

→ 12 mm Na_2CO_3 => 2.54376g/2lt Fisher Lot # 960685

→ 100 ppm Cl => .32958g/2lt Fisher Lot # 972274

Initial PH = 11.087

All samples polished to 600 Grit + ultrasonically cleaned in Acetone

Crevice material ultrasonically cleaned in Methanol

6-9-98

Cont 64

from 64

Cell 1 A516 PS31, DAT – CREVICE

Temp = 20 °C

Eset = -400 mV

Init wt = 29.32179g

Final wt = 29.32128g 6-10-98

Final Solution PH = 11.053 6-10-98

Observations Start 6-9-98 / 15:50

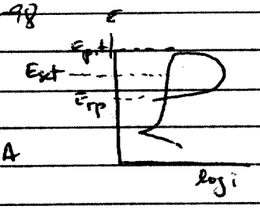
Change Eset to -530 mV @ 600 s

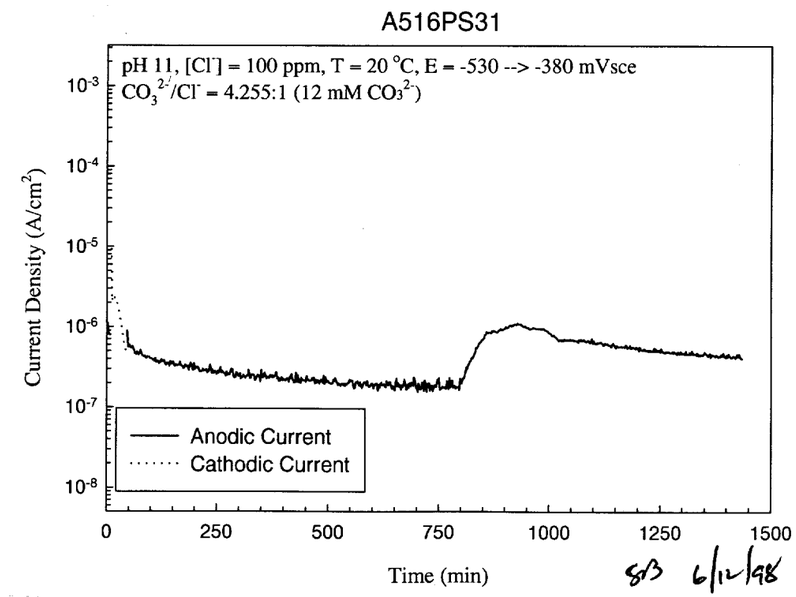
Eset ↑ to -380 mV @ 2700 s ~1/2 passive range

Crevice pitting observed 6-10-98

Note "1/2 passive range" = [Epit − Erp]/2

Epit & Erp were from Cragnolino et al (Corrosion/98) and other work in ASIL & CNWRA in Lab Notebook #157





SB 6/12/98

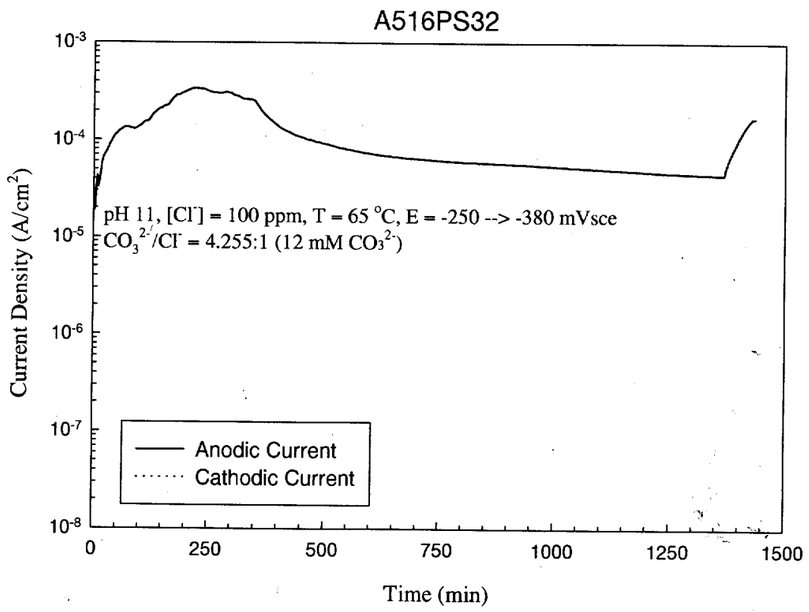
6-9-98

Cont 65

from 65

Cell 2 A516PS32.DAT - CREVICE
Temp = 65°C
Eset = -250mv
Int wt = 29.37832g
Final wt = 29.32809g 6-10-98

Final Solution PH = 10.983 6-10-98
Observations
Charge Eset -380mv — 1/2 passive range
Pitting noted on both crevice surfaces but not where crevice made contact. 6-10-98



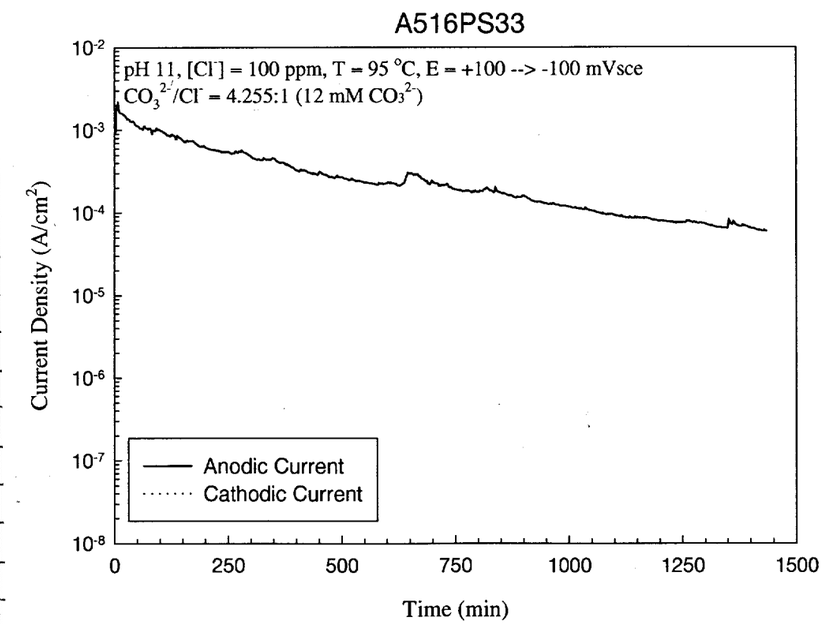
SB 6/12/98

6-9-98

from 66

Cell 3 A516PS33.DAT - CREVICE
Temp = 95°C
Eset = +100mv
Int wt = 29.32629g
Final wt = 29.19822g 6-10-98

Final Solution PH = 10.668 6-10-98
Observations
Immediate signs of attacking directly after applied potential
Charge Eset -100mv 600 sec into test - 1/2 passive range
Massive pitting on all surfaces, not where crevice made contact. 6-10-98



SB 6/12/98

6-9-98

from 67

6-11-98

Stock Solution

→ 12mm Na_2CO_3 => 2.54376g/2Lt

→ 10ppm Cl => .032958 g/2Lt

Initial PH = 11.070 6-11-98

All samples polished to 600grit + ultrasonically cleaned in Acetone

Crevices ultrasonically cleaned in Methanol

6-11-98

Cont 69

from 68

Cell 1 A516PS34.DAT – CREVICE

Temp = 20°c

Eset = -300 mv w/in passive range

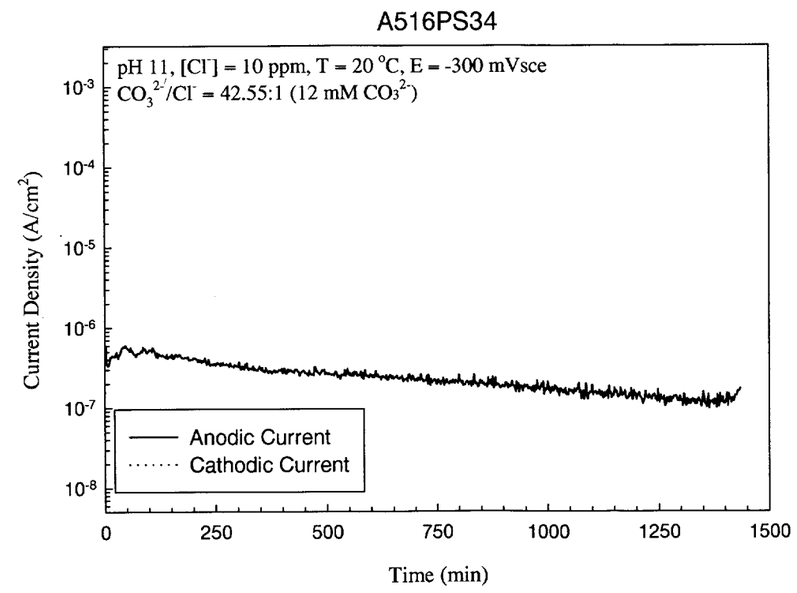
Int wt = 29.23887g

Final wt = 29.23634g 6-12-98

Final Solution PH = 11.048 6-12-98

Observations Begin Test 6-11-98 10:20am

Crevice pitting observed 6-12-98



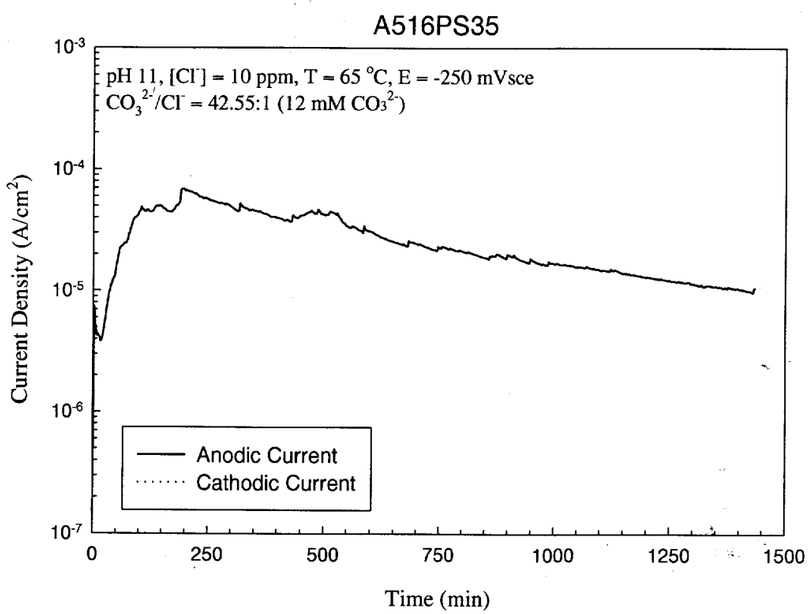
CB 6/12/98

6-11-98

Cont 70

from 69 Cell 2 A516PS35.DAT
Temp = 65°C
Eset = -250 mv ~ 1/2 passive range
Init wt = 29.25021g
Final wt = 29.239.30g 6-12-98

Final Solution PH = 10.774 6-12-98
Observations
Crevice pitting observed with some pitting attack outside crevice foot area. 6-12-98

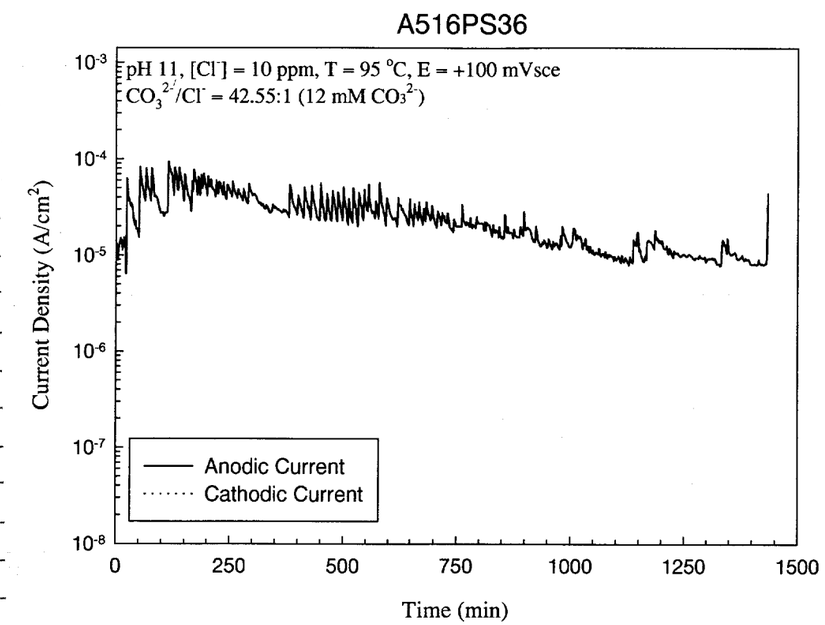


SBS 6/12/98

6-11-98 Cont 71

from 70 Cell 3 A516PS36.DAT
Temp = 95°C
Eset = +100 mv ~ 1/2 passive range
Init wt = 29.29444g
Final wt = 29.28630g 6-12-98

Final Solution PH = 10.796 6-12-98
Observations
Crevice pitting observed. 6-12-98



SBS 6/12/98

6-11-98

from 71

6-15-98

Stock Solution

→ 120 mm Na_2CO_3 => 25.4376 g /2Lt Fisher lot # 960685

→ 100 ppm Cl => .32958 g /2Lt Fisher lot # 972274

Initial pH = 11.386

All specimens polished to 600 grit and ultrasonically cleaned in Acetone

Crevices ultrasonically cleaned in methanol

6-15-98

Cont 73

from 72

Cell 1 A516 PS 37.MAT - crevice

Temp = 20°C

Eset = -380 mv

Init wt = 29.27947 g

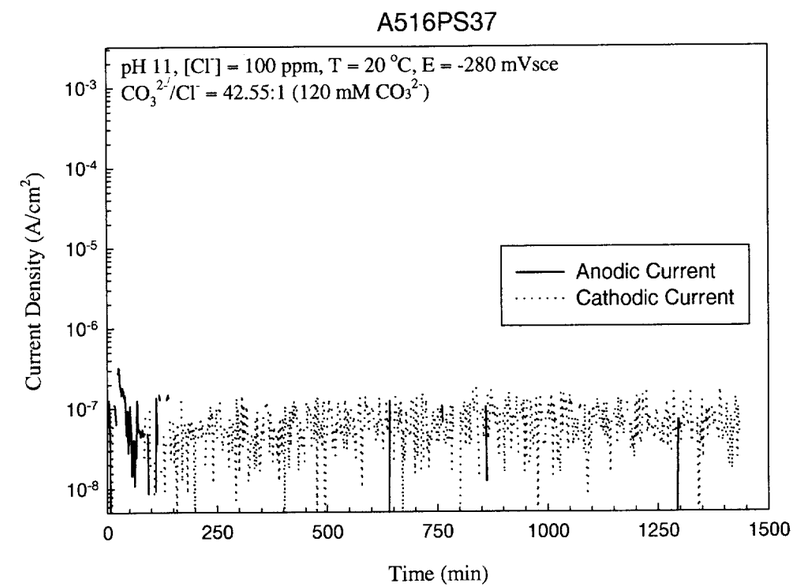
Final wt = 29.27554 g 6-16-98

Final Solution pH = 11.352 6-16-98

Observations Start 10:33

Error to -280 mV @ 1420 s

No Pitting 6-16-98



6-15-98

Cont 74

from 73

Cell 2 A516 PS38.DAT - crevice

Temp = 65°C

Eset = -350 mv

Init wt = 29.23673 g

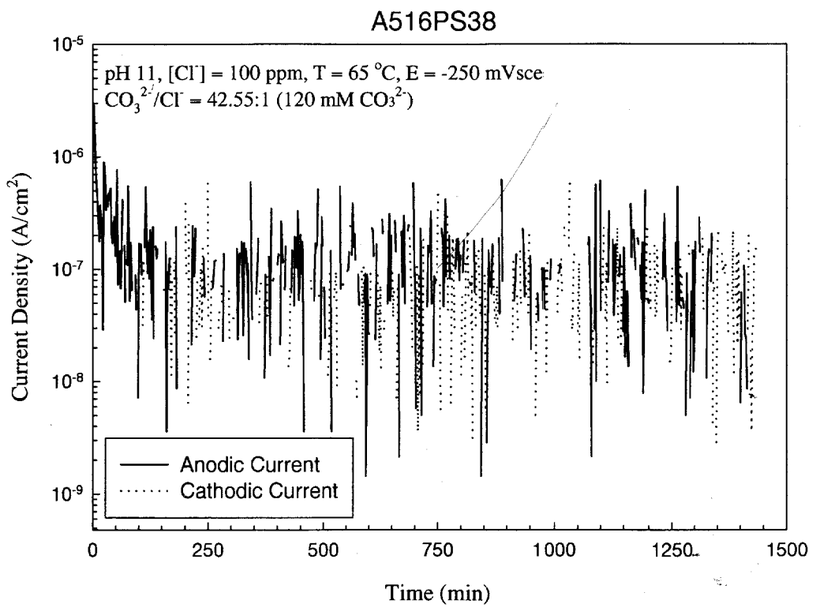
Final wt = 29.23348 g 6-16-98

Final Solution PH = 11.114 6-16-98

Observations

E incr. to -250 @ 1420 s

No Pitting 6-16-98



6-15-98

from 74

Cell 3 A516 PS39.DAT - crevice

Temp = 95°C

Eset = -100 mv

Init wt = 29.33130 g

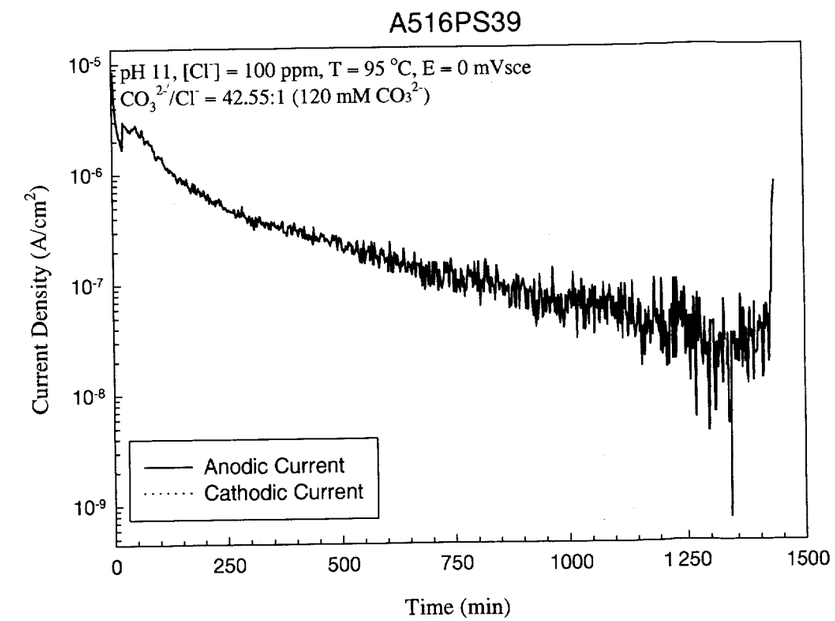
Final wt = 29.32791 g 6-16-98

Final Solution PH = 11.107 6-16-98

Observations

E incr. to 0 @ 1420 s

Some minor crevice pitting 6-16-98



6-15-98

from 75

6-16-98

Start Solution

→ 120mm Na_2CO_3 => 25.4376g/2Lt Fisher Lot# 960685

→ 1000ppm Cl => 3.2958g/2Lt Fisher Lot# 972274

Initial PH = 11.366

All specimens polished to 600 grit and ultrasonically cleaned in Acetone

All crevices ultrasonically cleaned in Methanol

6-16-98

Cont 77

from 76

Cell 1 A516PS40.DAT – crevice

Temp = 20°C

Eset = -450 mv

Int wt = ~~29.30146g~~ 29.29899g 6-16-98

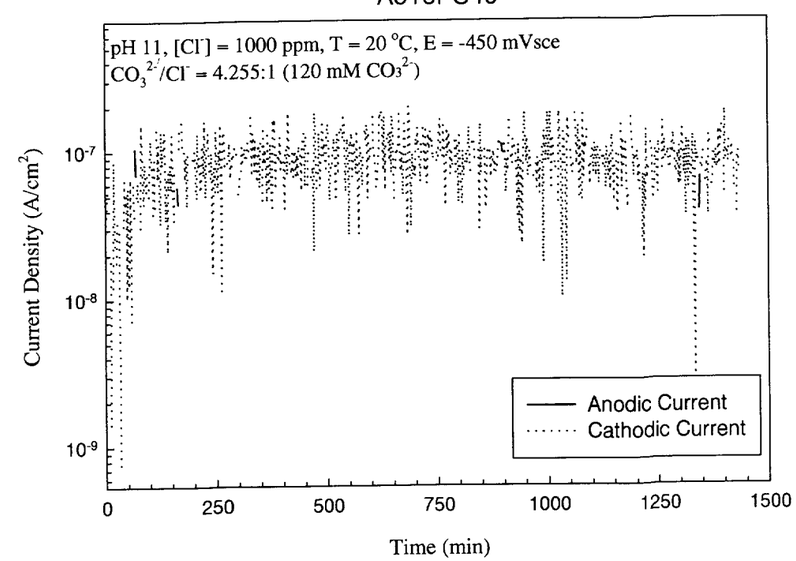
Final wt = 29.29662g 6-17-98

Final Solution PH = 11.344 6-17-98

Observations Start 1:43pm

No Pitting 6-17-98

A516PS40



6-16-98

Cont 78

from 77 Cell 2 A516PS41.DAT - crevice

Temp = 65°C

Eset = -300mv

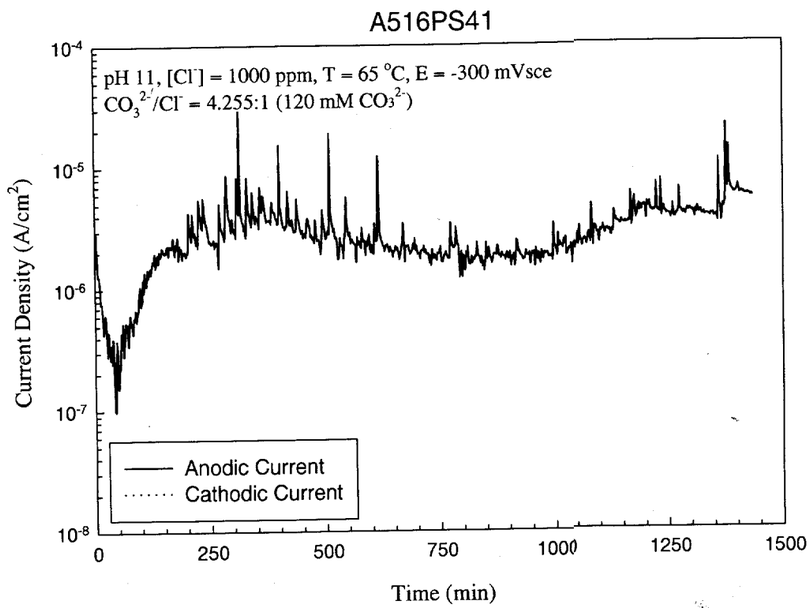
Int wt = 29.24151g

Final wt = 29.23757g 6-17-98

Final Solution PH = 11.129 6-17-98

Observations

MODERATE CREVICE PITTING 6-17-98



6-15-98

Cat 79

from 78 Cell 3 A516PS42.DAT - crevice

Temp = 95°C

Eset = -50mv

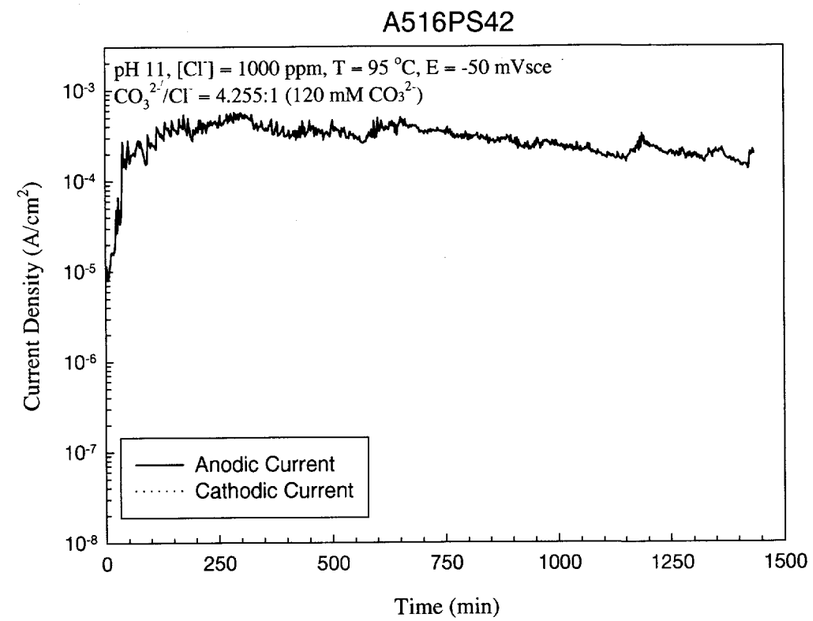
Int wt = 29.32231g

Final wt = 29.31065g 6-17-98

Final Solution PH = 11.253 6-17-98

Observations

Heavy crevice pitting, corrosion inside crevice bolt hole. 6-17-98



6-16-98

from 79

6-17-98

Stat Solution

12mm Na_2CO_3 => 2.54376g/2lt

100ppm Cl => .32958g/2lt

Initial pH= 11.042

All samples polished on edges to 600 grit + ultrasonically degreased in Acetone

Testing of mill specimens

mill scale area - 12.5 cm^2

machined area - 12.5 cm^2

overall area - 25 cm^2

6-17-98

Cont 81

from 80

Cell 1 A516 PS 43.DAT - mill scale

Temp = 20°C

Eset = -380mV

Initial wt = ~~69.088~~ ML 69.08234g

Final wt = 69.07892 6-18-98

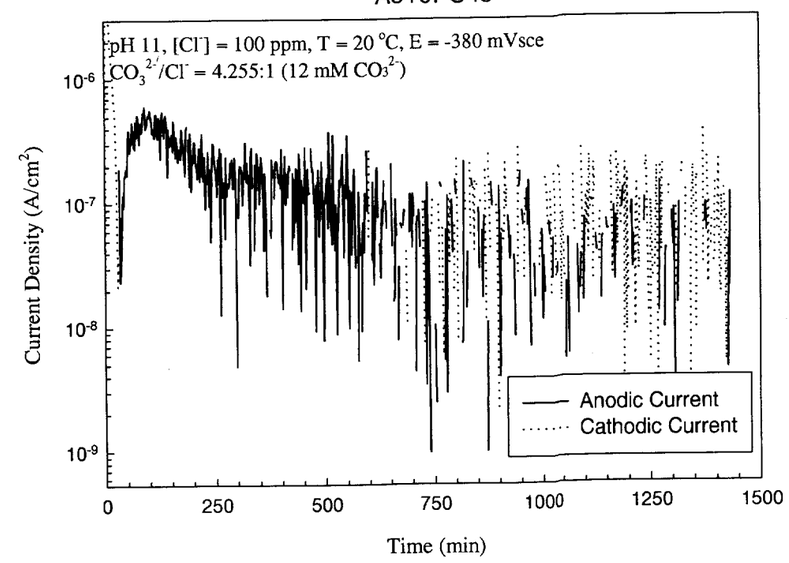
Final Solution pH = 11.085 6-18-98

Observations Start 3:20pm

No pitting on polished edges or mill surface

some corrosion above vapor line 6-18-98

A516PS43



6-17-98

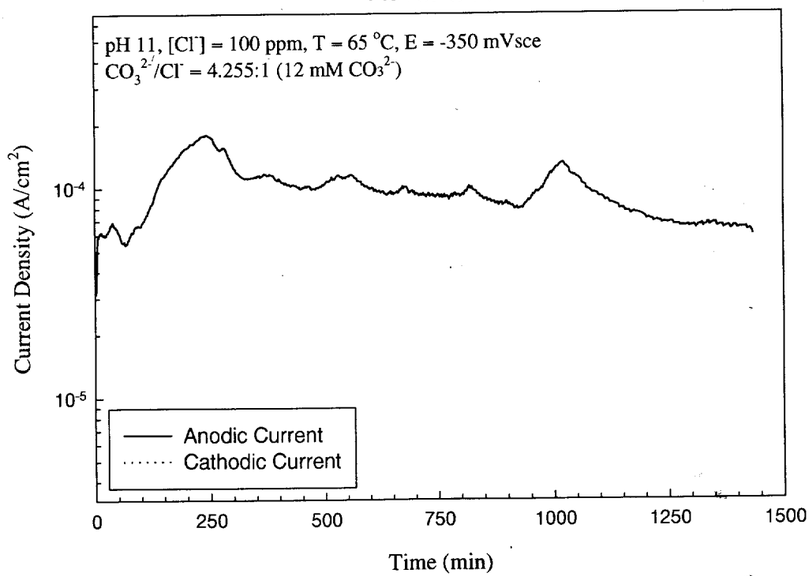
Cont 82

from 81

Cell 2 A516PS44.DAT – mill scale
Temp = 65°C
Eset = -350mv
Initwt = 69.81044g
Final wt = 69.75538g 6-18-98

Final Solution PH = 10.962 6-18-98
Observations
No pitting on polished edges or mill surface
some corrosion on top machined surface 6-18-98

A516PS44



6-17-98

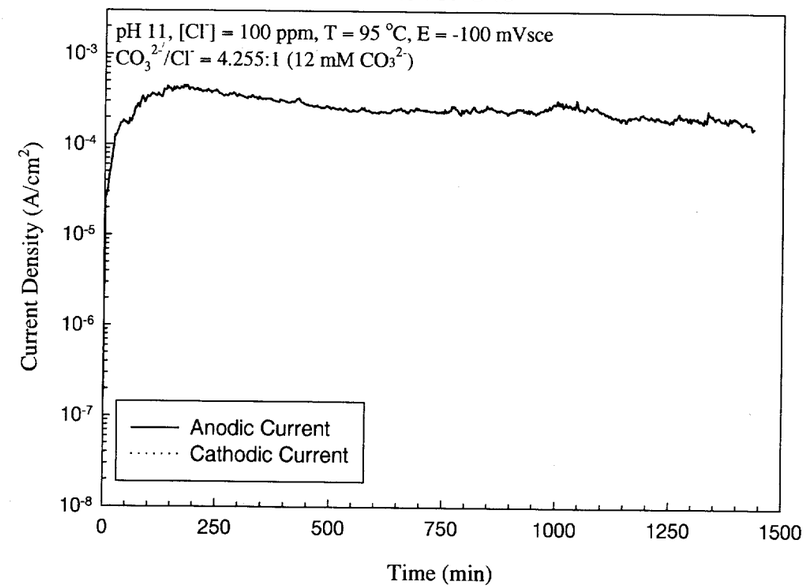
Cont 83

from 82

Cell 3 A516PS45.DAT – mill scale
Temp = 95°C
Eset = -100mv
Initwt = 69.88012g
Final wt = 69.73813g 6-18-98

Final Solution PH = ~~11.085~~ 6-18-98 11.478 6-18-98
Observations
Pitting on polished edges but not mill surface
Some corrosion on machined top surface 6-18-98

A516PS45



6-17-98

6-18-98

Stock Solution -

12mM Na_2CO_3 => 2.54376g/2Lt

10ppm Cl => .03296g/2Lt

Initial PH = 11.068

All samples edge polished to 600 grit & ultrasonically cleaned in acetone

CSB 6/24/98

Cell1 A516PS46.DAT - mill scale 6/18/98

Temp = 20°C

Eset = -300mV

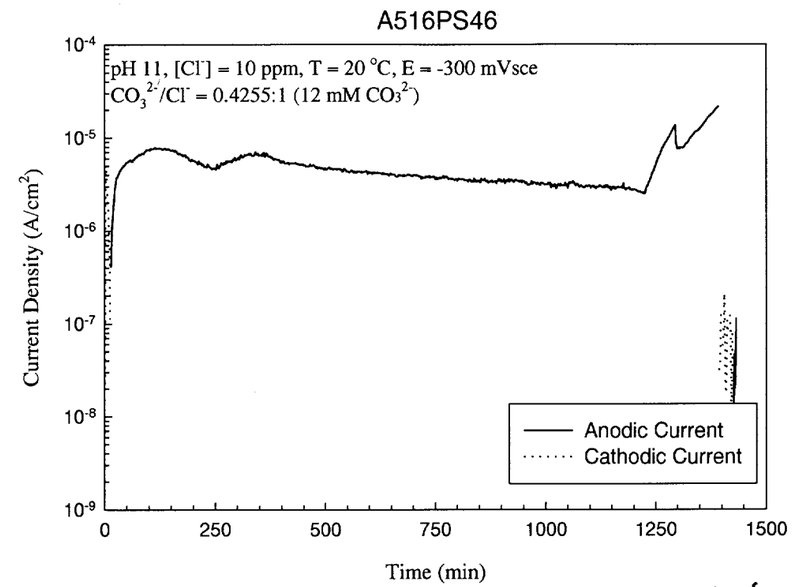
Initwt = 70.00812g

Finalwt = 70.00176g CSB 6/18/98

Final Solution PH = 10.950 CSB 6/18/98

Observations

some water-line attack, and corrosion on top of specimen



CSB 6/22/98

6/18/98 Cell 2 A516PS47.DAT – mill scale

Temp = 65°C

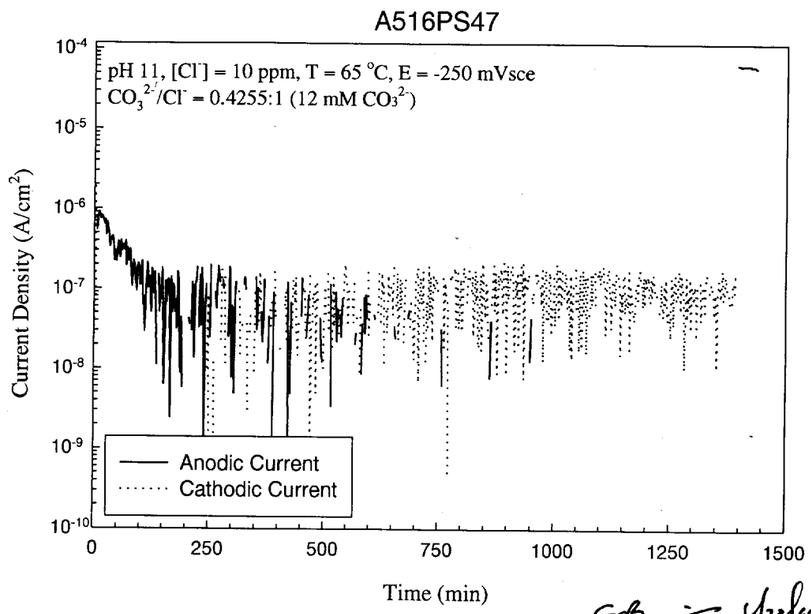
Eset = -250mv

Initwt = 69.90712g

Finlwt = ~~69.40444g~~ 69.9044g CSB 6/19/98 – suspect wt loss may be due to auth. removal of mill scale

Final Solution pH = ~~11.071~~ CSB 6/19/98 10.659 CSB 6/18/98

Observations no noticeable corrosion



SB 6/22/98

Cell 3 A516PS48.DAT – mill scale 6/18/98

Temp = 95°C

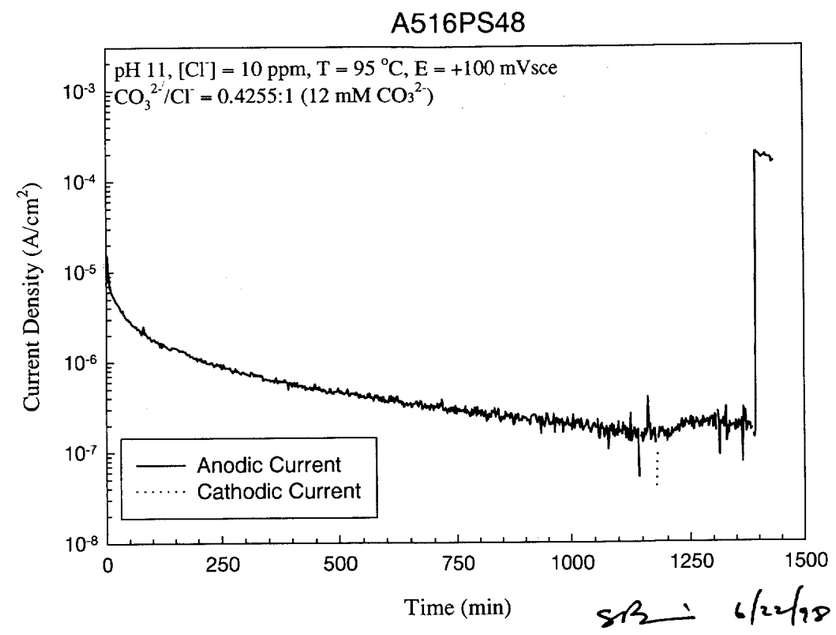
Eset = +100mv

Initwt = 69.51632g

Finlwt 69.4044g CSB 6/19/98

Final Solution pH = 10.840 6/19/98

Observations small pits observable on polished areas, but no noticeable attack on mill scale



SB 6/22/98

6/22/98

Performance Verification — Actual R = 10.048114

Applying Potential to 10Ω resistor (SN 171002) and measuring current response

PSTAT 7 (Cell 1)

E applied (Strawberry Tree DAQ)	E read	I
-1	-0.9979	-9.4247×10^{-2} A
-0.75	-0.7484	-7.0688×10^{-2} A
-0.50	-0.4994	-4.7157×10^{-2} A
-0.25	-0.2509	-2.3719×10^{-2} A
0	0.0003	6.0177×10^{-6} A
+0.25	0.2579	2.3762×10^{-2} A
+0.50	0.4999	4.7153×10^{-2} A
+0.75	0.7489	7.0644×10^{-2} A
+1	0.9980	9.4145×10^{-2} A

PSTAT 3 (Cell 2)

-1	-0.9918	-9.5067×10^{-2} A
-0.75	-0.7441	-7.1356×10^{-2} A
-0.5	-0.4943	-4.7443×10^{-2} A
-0.25	-0.2476	-2.3852×10^{-2} A
0	0.0020	4.0667×10^{-6} A
+0.25	0.2514	2.3900×10^{-2} A
+0.50	0.4976	4.7433×10^{-2} A
+0.75	0.7472	7.1290×10^{-2} A
+1	0.9945	9.4939×10^{-2} A

CSB 6/22/98

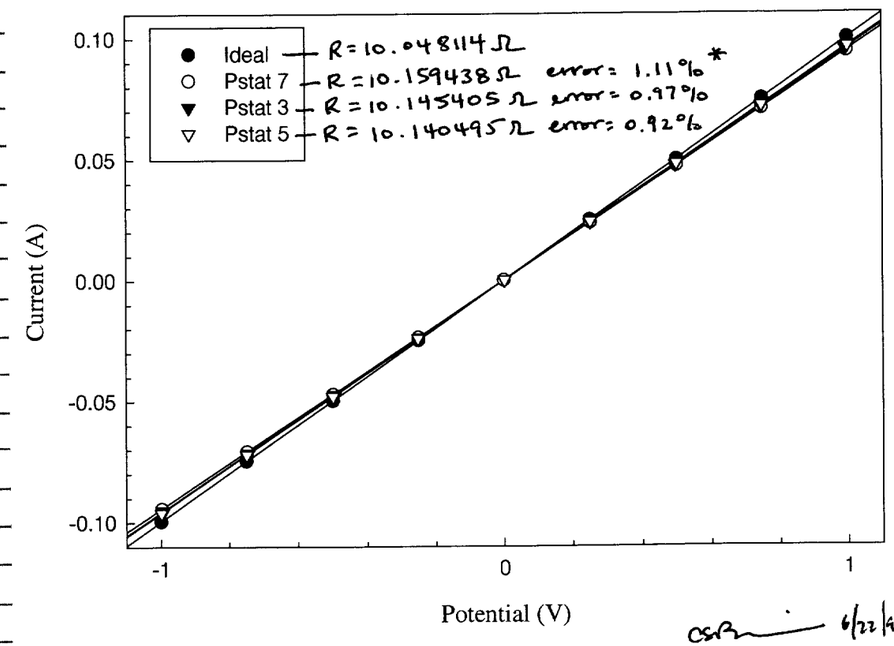
Cont on p89

from p88

6/22/98

PSTAT ~~3~~ 5 (Cell 3)

E applied	E read	I
-1	-0.9985	-9.6002×10^{-2} A
-0.75	-0.7489	-7.1999×10^{-2} A
-0.50	-0.4998	-4.8050×10^{-2} A
-0.25	-0.2513	-2.4165×10^{-2} A
0	0.0024	2.315×10^{-5} A
+0.25	+0.2517	2.4204×10^{-2} A
+0.50	+0.4998	4.8026×10^{-2} A
+0.75	+0.7488	7.1952×10^{-2} A
+1	1.0006	9.6111×10^{-2} A



CSB 6/22/98

* Note, outside of tolerance of resistor; according to TOP-22, Potentiostat/data acquisition system is not functioning properly. However, based on limitations of 12-bit control system being used and the small error (< 1.1%) noted between measured & known resistance, it is felt that the system is operating properly.

CSB 6/22/98

from 89

8-10-98

Stock Solution

12mm Na_2CO_3 => 2.54376g/2Lt

100ppm Cl => .32958g/2Lt

Initial PH = 11.007

All Samples Degreased in Acetone

8-10-98

To 91

from 90

Cell 1 A516PS49.DAT Mill scale samples

Temp = 25°C

Eset = -300

Init wt = 70.10206g 8-17-98

Final wt = 69.82202g

Final Solution PH = 11.465 8-17-98

Observations started @ 12:25 pm 8/10/98

General corrosion product and pitting on machined edges 8-17-98

CSB 8/10/98

To 92

from 91

Cell 2 A516 PS 50.DAT Mill scale Samples

Temp = 65°C

Eset = -250

Init wt = 70.10938g

Final wt = 69.20446g

Final Solution PH 11.234 8-17-98

Observations started @ 12^25 pm 8/10/98

Heavy corrosion product + pitting on machined surfaces

corrosion on non machined surfaces 8-17-98

to 93

8/10/98 CSB

from 92

Cell 3 A516 PS 51.DAT Mill scale samples

Temp = 95°C

Eset = +100

Init wt = 70.06316g

Final wt = 69.06042g 8-17-98

Final Solution PH = 10.664 8-17-98

Observations started @ ~~to~~ 12^25 pm CSB 8/10/98

Heavy corrosion product and pitting on machined surfaces

corrosion on non machined surfaces. Corrosion 8-17-98

above vapor line.

to 94

CSB 8/10/98

from 93

8-17-98 Crevice Specimens

Stock Solution

120 mm Na_2CO_3 → 25.4376g/2Lt

12 mm Cl → 1.4026g/2Lt

Initial pH = 11.322

All Samples polished to 600 grit and ultrasonically cleaned in Acetone

8-17-98

To 95

from 94

Cell 1 A516PS52.DAT

Temp = 25°C

Eset = -250mv

Init wt = 28.68414g

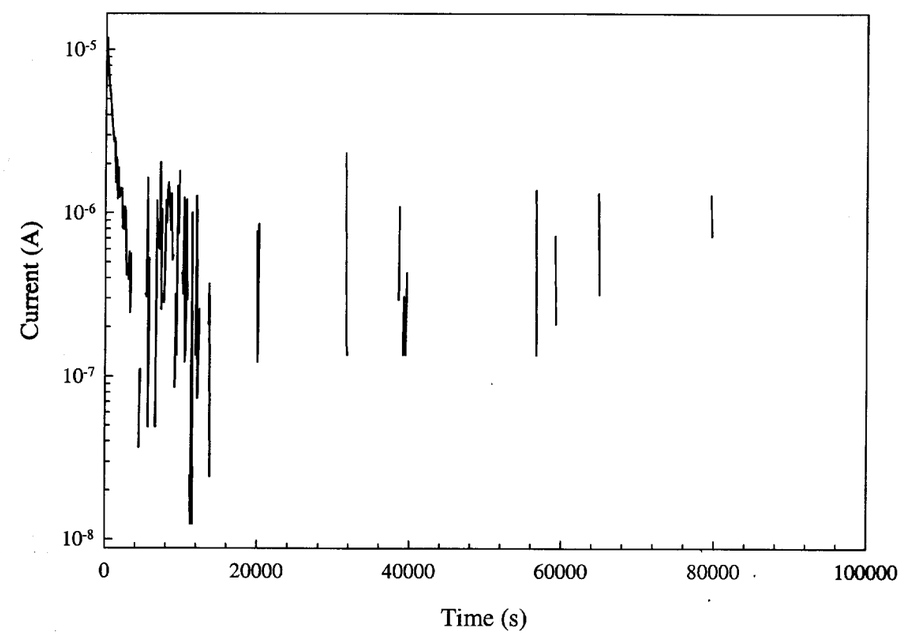
Final wt = 28.68434g 8-18-98

Final Solution pH = 11.301 8-18-98

Observations

No corrosion or pitting 8-18-98

A516PS52



8-17-98

To 96

from 95

Cell 2 A516 PS53.DAT

Temp = 65°C

Eset = -200 mV

Init wt = 28.67494g

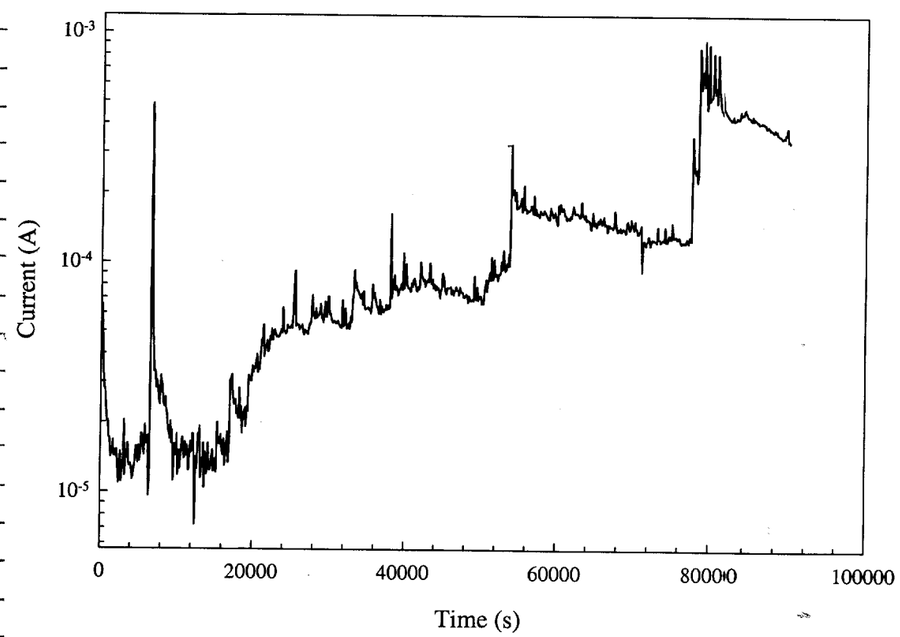
Final wt = 28.67368g 8-18-98

Final Solution pH = 11.145 8-18-98

Observations

Crevice pitting. Some corrosion in inner hole. 8-18-98

A516PS53



To 97

8-17-98

from 96

Cell 3 A516 PS54.DAT

Temp = 95°C

E Set = 0mv

Init wt = 28.97623g

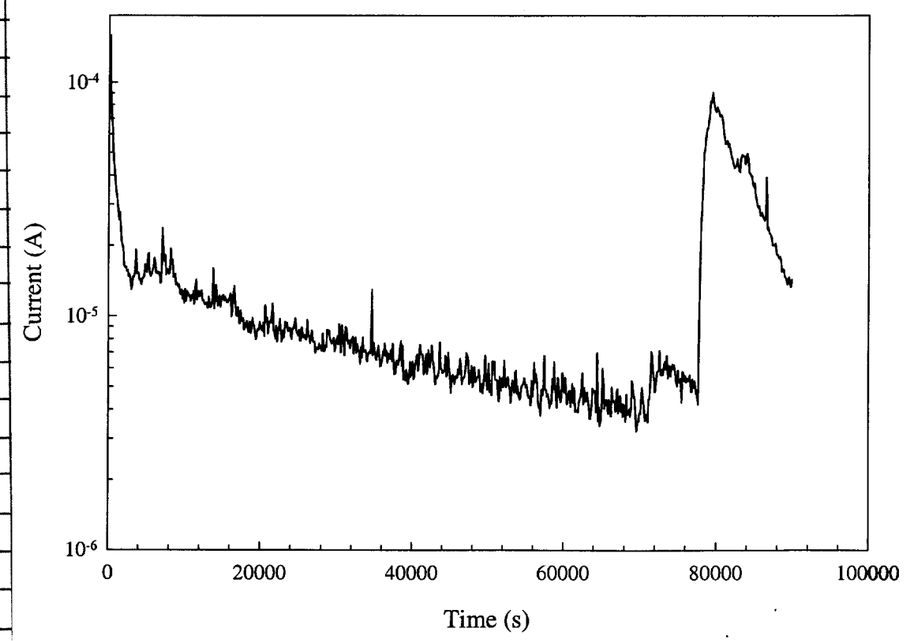
Final wt = 28.97715g 8-18-98

Final Solution pH = 10.857 8-18-98

Observations

Crevice pitting 8-18-98

A516PS54



8-17-98

To 98

from 97

8-18-98
Stock Solution
120 mm Na_2CO_3 → 25.4376 g/2 lt
4.8 mm Cl → 0.5610 g/2 lt

Initial pH = 11.324

All samples polished to 600 grit & cleaned ultrasonically in Acetone
crevices cleaned in methanol.

8-18-98

To 99

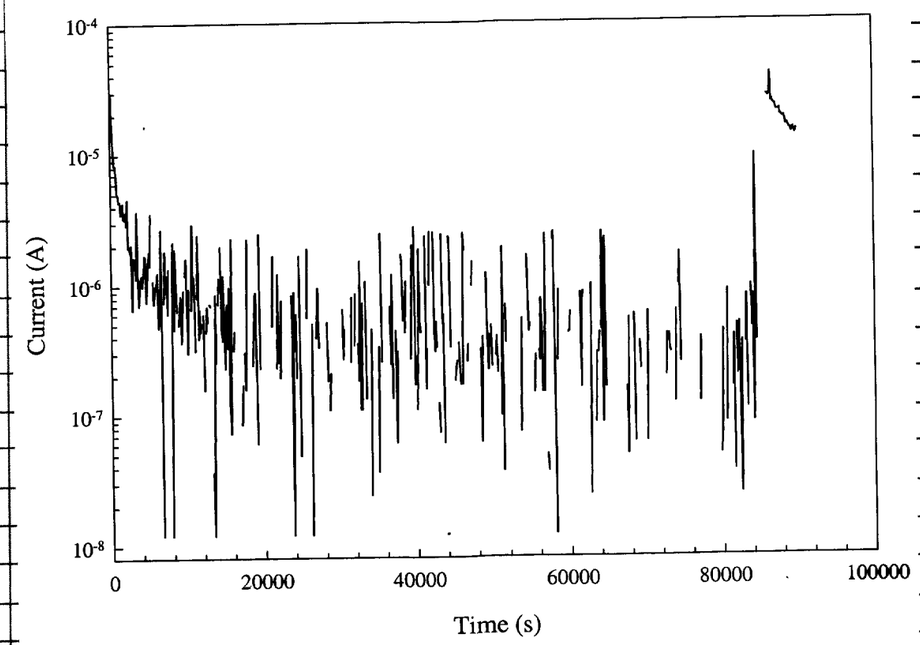
from 98

cell: A516PS55.DAT
Temp = 25°C
Eset -- -200mv
Initial wt = 28.81722g
Final wt = 28.81727g 8-19-98

Final pH = 11.288 8-19-98

Observations
No pitting, very light markings at crevice feet 8-19-98

A516PS55



8-18-98

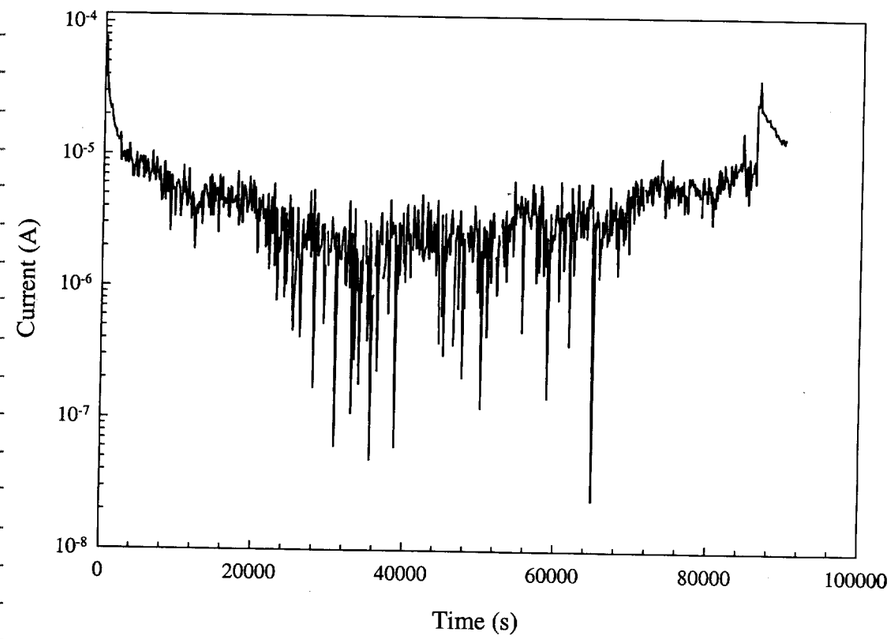
To 100

from 99

Cell 2 A516PS56.DAT
Temp 65°C
Est
Init wt = 28.68480
Final wt = 28.68535 g 8-19-98

Final PH 11.144 8-19-98
Observations
very slight pitting on one side of specimen 8-19-98

A516PS56



8-18-98

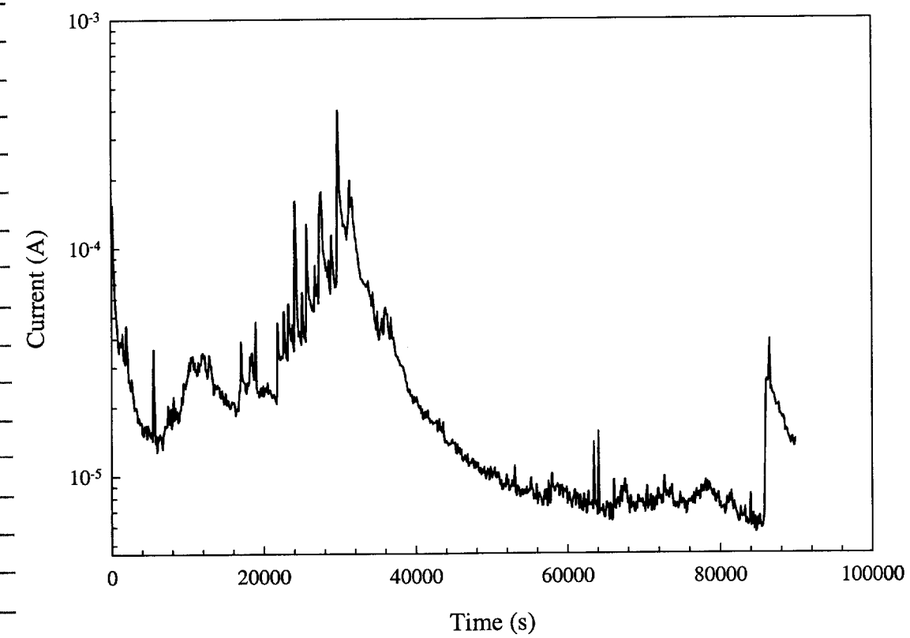
To 101

from 100

Cell 3 A516PS57.DAT
Temp 95°C
Est
Init wt 28.58329g
Final wt 28.58506 g 8-19-98

Final pH 10.985 8-19-98
Observations
Very slight pitting at crevice feet on one side of specimen, Uniform pitting on the other 8-19-98

A516PS57



8-18-98

To 102

from 101

8-19-98 Start 10:00 AM

Start Solution

120 mm Na_2CO_3 → 25.4376g/2Lt Fisher Lot # 960685

2.4 mm Cl → 0.2805g/2Lt " 972274

Initial pH = 11.307

All Specimens polished to 600 grit & ultrasonically cleaned in Acetone, previous ultrasonically cleaned in Methanol

8-20-98

To 103

from 102

Cell 1 A516PS58.DAT

T 25°C

Eset = -175mv

Init wt = 28.86627g

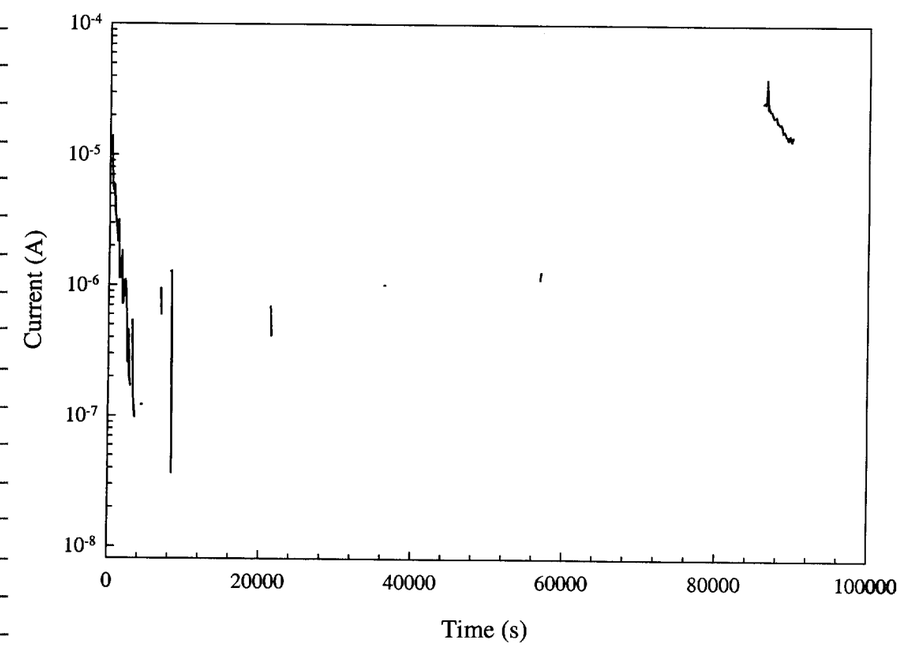
Final wt = 28.80679g 8-21-98

Final Solution pH = 11.283 8-21-98

Observations

No pitting on specimen 8-21-98

A516PS58



8-20-98

To 104

from 103

Cell 2 A516PS59.DAT

T = 65°c

Eset = -125 mv

Init wt = 28.73656 g

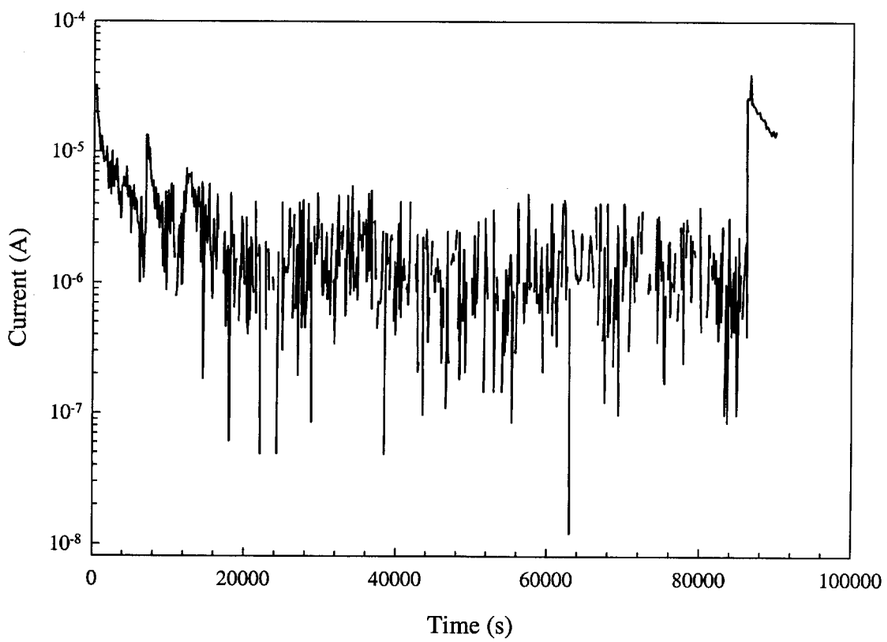
Final wt = 28.73727 g 8-21-98

Final Solution PH = 11.110 8-21-98

Observations

Very minor creuice pitting in some sporadic areas 8-21-98

A516PS59



8-20-98

To 105

from 104

Cell 3 A516PS60.DAT

T = 95°c

Eset = 150 mv

Init wt = 28.94290 g

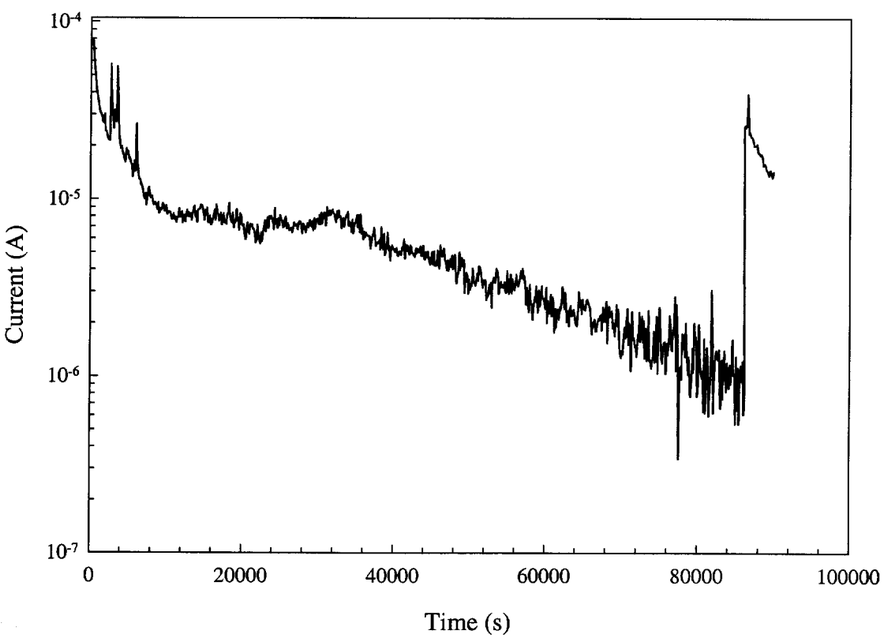
Final wt = 28.94391 g 8-21-98

Final Solution PH = 11.048 8-21-98

Observations

Small creuice pitting noted 8-21-98

A516PS60



8-20-98

to 106

from 105

8-24-98

Stock Solution — Fisher Lot #

Na_2CO_3 = 120mm → 25.4376g/2Lt — 960685

Cl = 1.6mm → 0.1870g/2Lt — 972274

Initial pH = 11.304

All specimens polished to 600 grit + ultrasonically cleaned in Acetone, crevices ultrasonically cleaned in Methanol

DH 8-24-98 to 107

from 106

Cell 1 A516PS61.DAT

T = 25°C

Eset = -150mv

Initial wt = 28.85143g

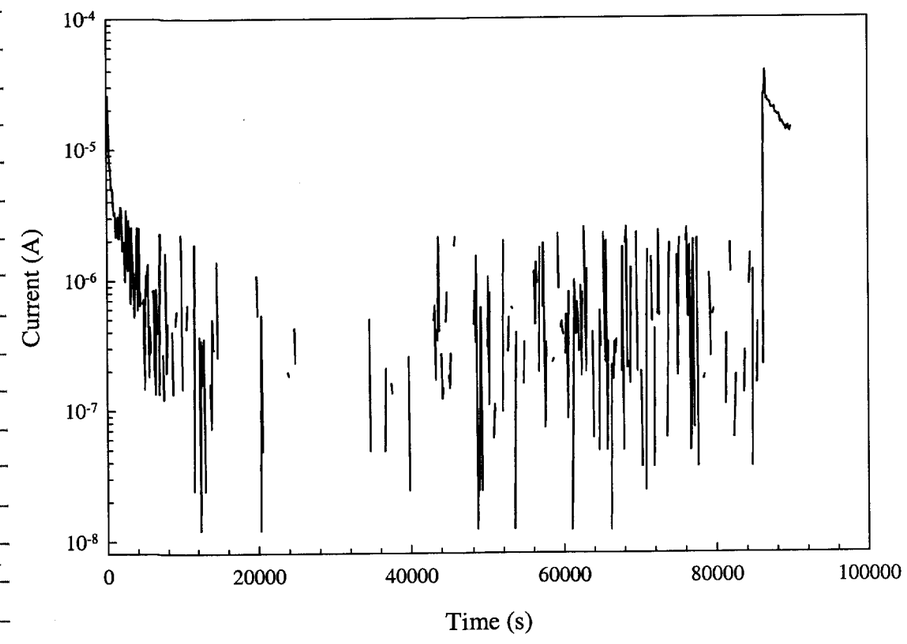
Final wt = 28.85080g DH 8-25-98

Final Solution pH = 11.281 DH 8-25-98

Observations

Very light crevice pitting DH 8-25-98

A516PS61



DH 8-24-98 to 108

from 107

Cell 2 A516 PS 62.DAT

T = 65°C

Eset = -100 mv

Init wt = 28.95778 g

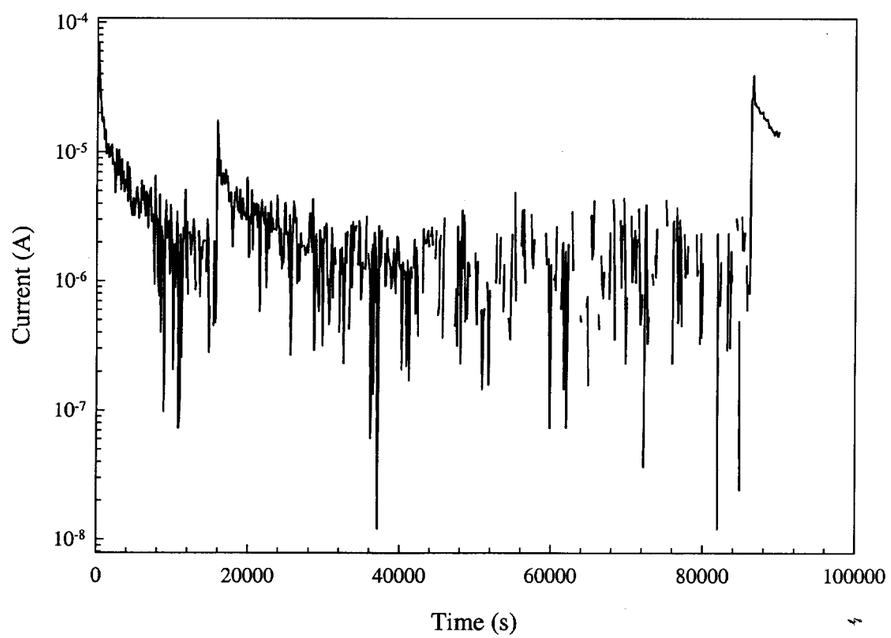
Final wt = 28.95762 g 8-25-98

Final Solution pH = 11.120 8-25-98

Observations

Very light crevice pitting 8-25-98

A516PS62



8-24-98

to 109

from 108

Cell 3 A516 PS 63.DAT

T = 95°C

Eset = 200 mv

Init wt = 28.76252 g

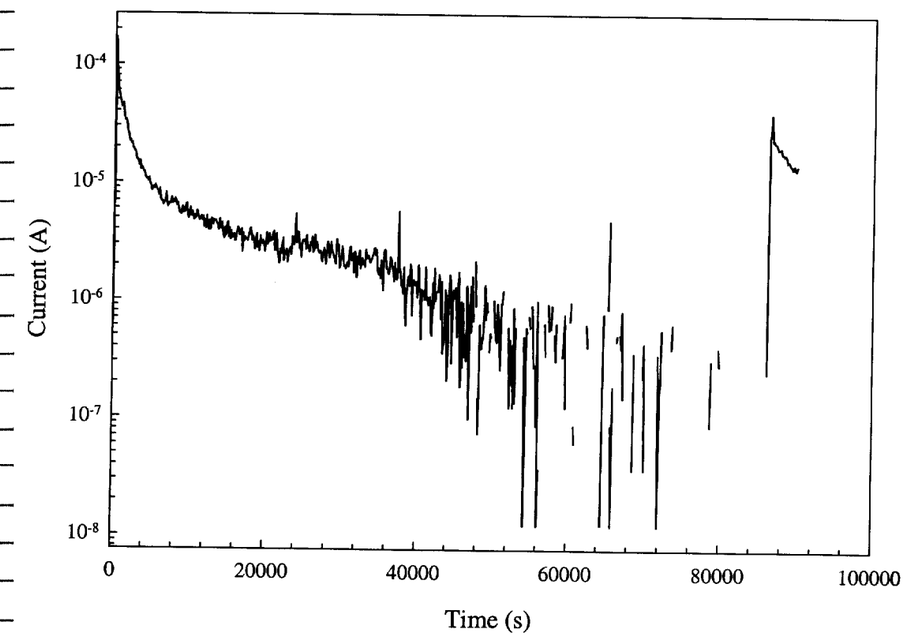
Final wt = 28.76363 g 8-25-98

Final Solution pH = 11.084 8-25-98

Observations

Very light crevice pitting 8-25-98

A516PS63



8-24-98

to 110

from 109

8-25-98 Start 11:33 Am

Stock Solution

Na_2CO_3 → 120 mm → 25.4376g/2Lt Fisher Lot 960685

Cl → 1.2 mm 0.1403g/2Lt 972274

Initial PH = 11.319

All

8-25-98 to 111

from 110

Cell 1 A516PS64.DAT

T = 25°c

Eset = −150mv

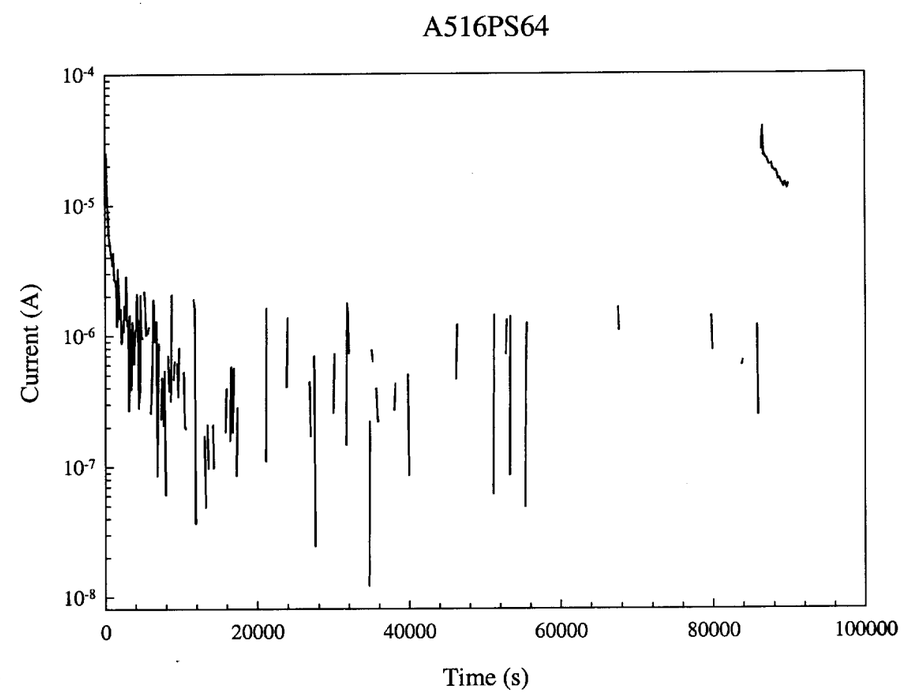
Initwt = 28.97570g

Final wt = 28.96836g 8-26-98

Final Solution PH = 11.297 8-26-98

Observations

No pitting 8-26-98



8-25-98 to 112

from 111

Cell 2 A516PS65.DAT

T = 65°c

Eset = -100 mv

Init wt = 28.90922g

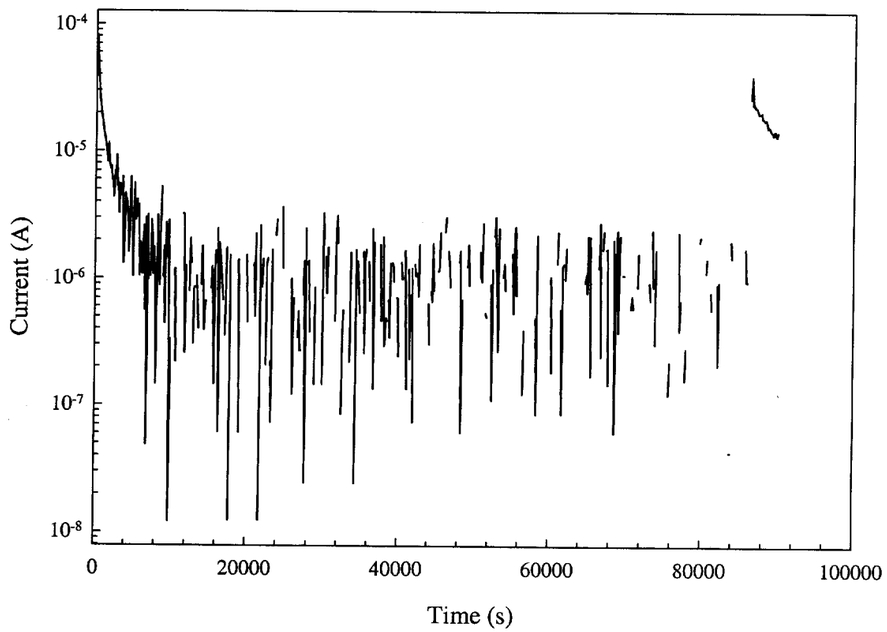
Final wt = 28.90955g 8-26-98

Final Solution pH = 11.132 8-26-98

Observations

Two small pitted spots, very small 8-26-98

A516PS65



8-25-98 to 113

from 112

Cell 3 A516PS66.DAT

T = 95°c

Eset = 225mv

Init wt = 28.77015g

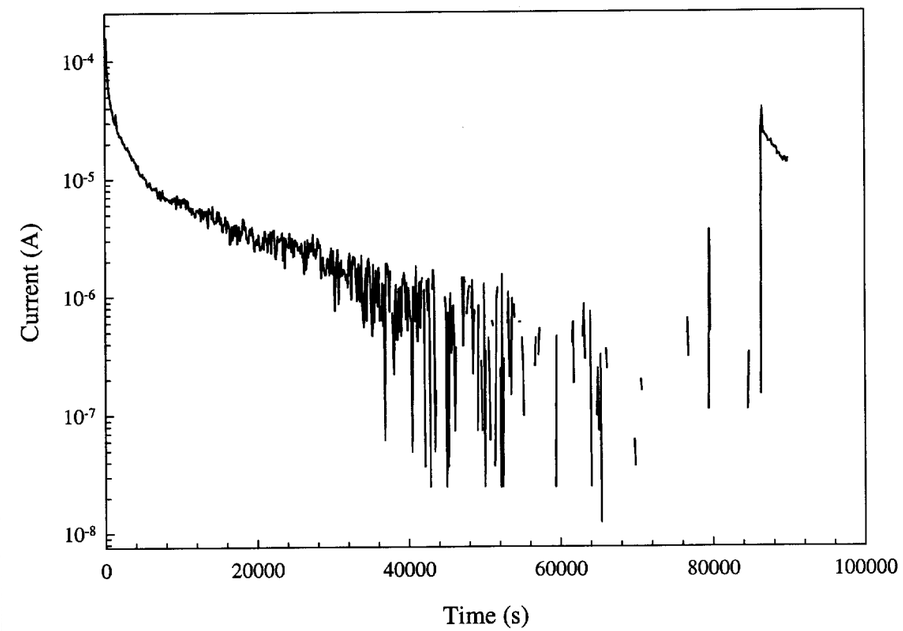
Final wt = 28.77013g 8-26-98

Final Solution pH = 10.944 8-26-98

Observations

Several pits on both sides but very small 8-26-98

A516PS66



8-25-98 to 114

from 113

8-26-98

Stock Solution

		Fisher Lot
$NaHCO_3$ → 120mM → 20.1624g/2Lt		#897789
Cl → 30mM → 3.5065g/2Lt		972274

Initial PH = 8.143

All Specimens polished to 600 grit & ultra sonicated cleaned in Acetone, crevices ultra sonicated cleaned in Methanol

8-26-98

to 115

from 114

Cell 1 A516PS67.DAT

T = 25°C

Eset = -300mv

Init wt = 29.01942g

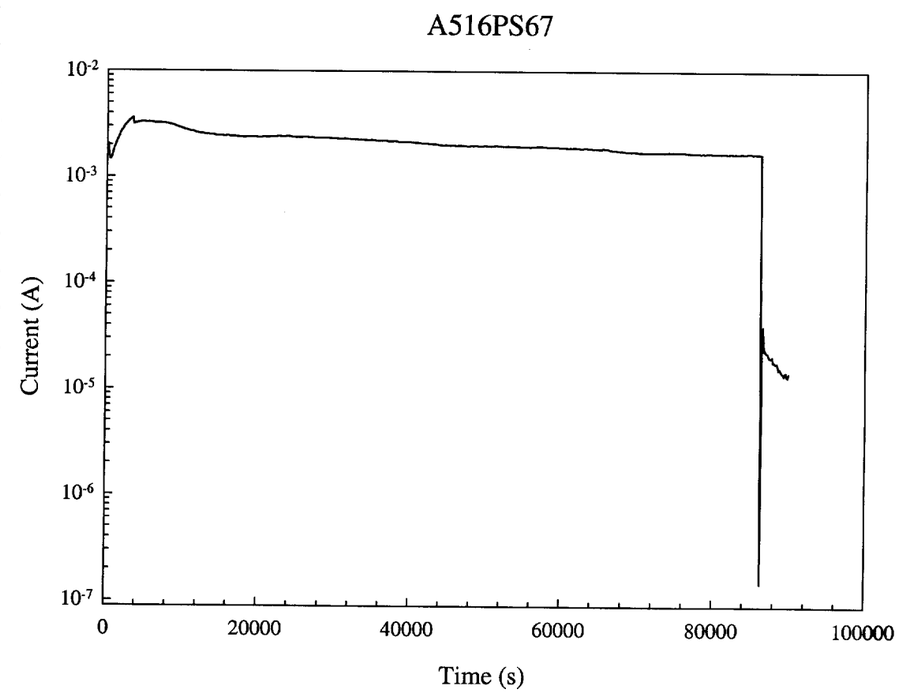
Final wt = 28.97915g 8-27-98

Final PH = 9.359 8-27-98

Observations

General corrosion on specimen.

Crevice test protected specimen from pitting 8-27-98



8-26-98

to 116

from 115

Cell 2 A516PS68.DAT

T=65 °C

Eset= -370 mv

Init wt= 29.06937 g

Final wt= 28.97912 g 8-27-98

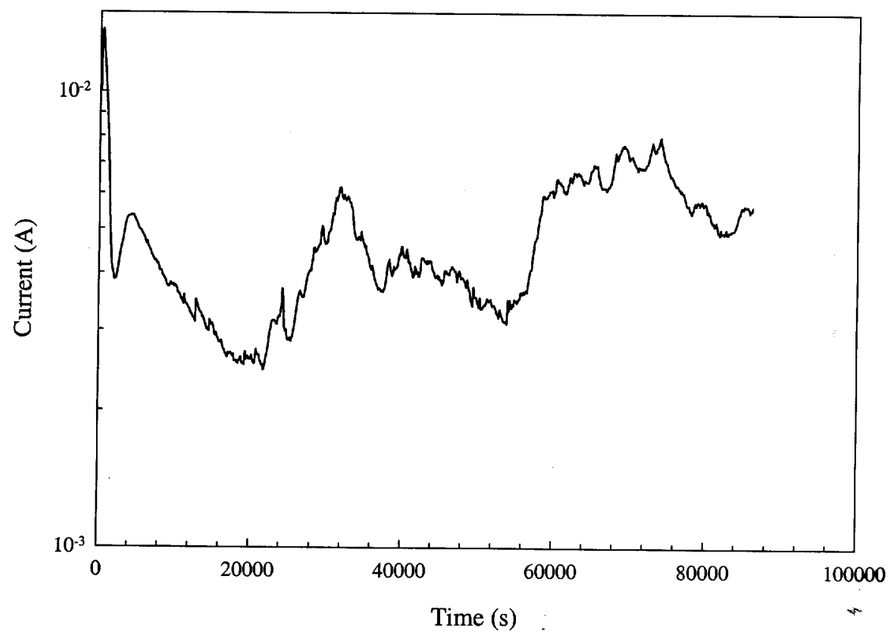
Final PH= 9.859 8-27-98

Observations

General corrosion on specimen with modest deposits

Crevice feet protected specimen from pitting 8-27-98

A516PS68



8-26-98

to 117

from 116

Cell 3 A516PS69.DAT

T=95°C

Eset= -290 mv

Init wt= ~~29.01942 g~~ 28.82012 g

Final wt= 28.83614 8-27-98

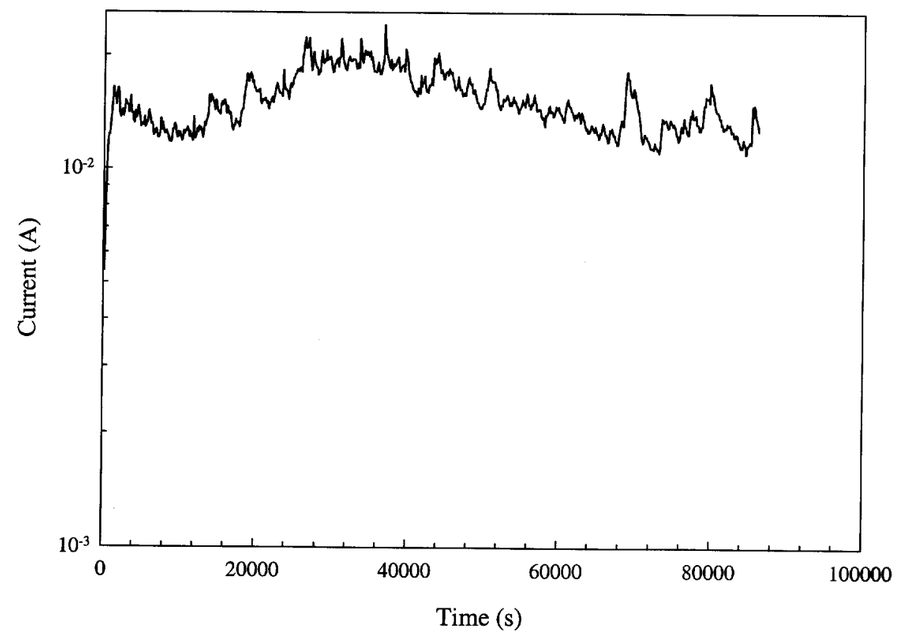
Final PH= 10.170 8-27-98

Observations

General corrosion on specimen with moderate deposits

Crevice feet protected from pitting 8-27-98

A516PS69



8-26-98

to 118

from 117

8-27-98

Stock Solution — Fisher Lot

$NaHCO_3$ → 120mM → 20.1624g/2lt — # 897789

NaCl → 12mM → 1.4026g/2lt — # 972274

Initial pH = 8.125

All specimens polished to 600grit & ultrasonically cleaned in Acetone, crevices ultrasonically cleaned in methanol

8-27-98

to 119

from 118

Cell 1 A516PS70.DAT

T = 25°C

Eset = -315mV

Init wt = 28.90293

Final wt = 28.89718g 8-28-98

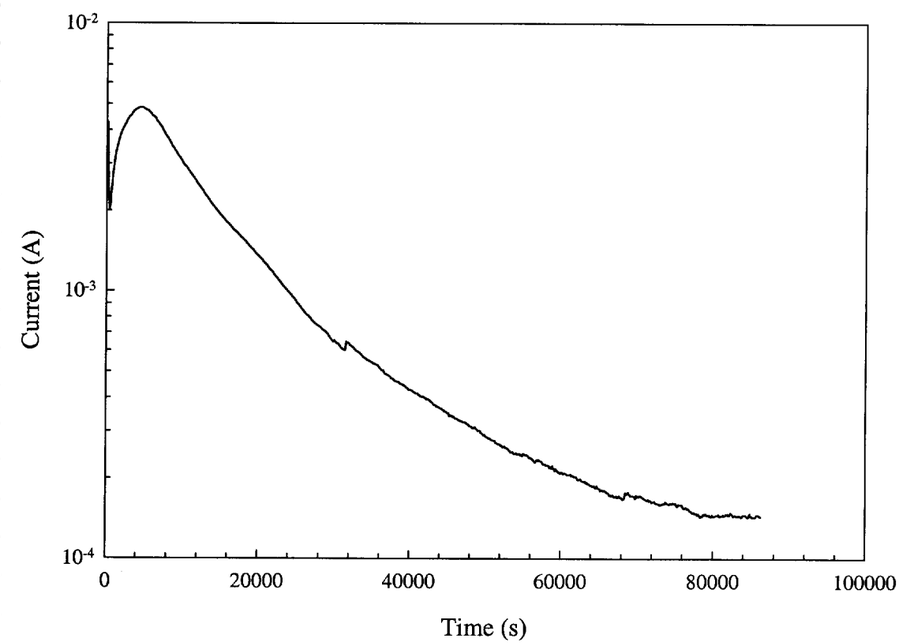
Final Solution ph = 9.169 8-28-98

Observations

General corrosion on specimen

no pitting under feet 8-28-98

A516PS70



8-27-98

to 120

from 119

Cell 2 A516PS71.DAT

T = 65°C

Eset = -340mV

Init wt = 28.79780

Final wt = 28.77355g 8-28-98

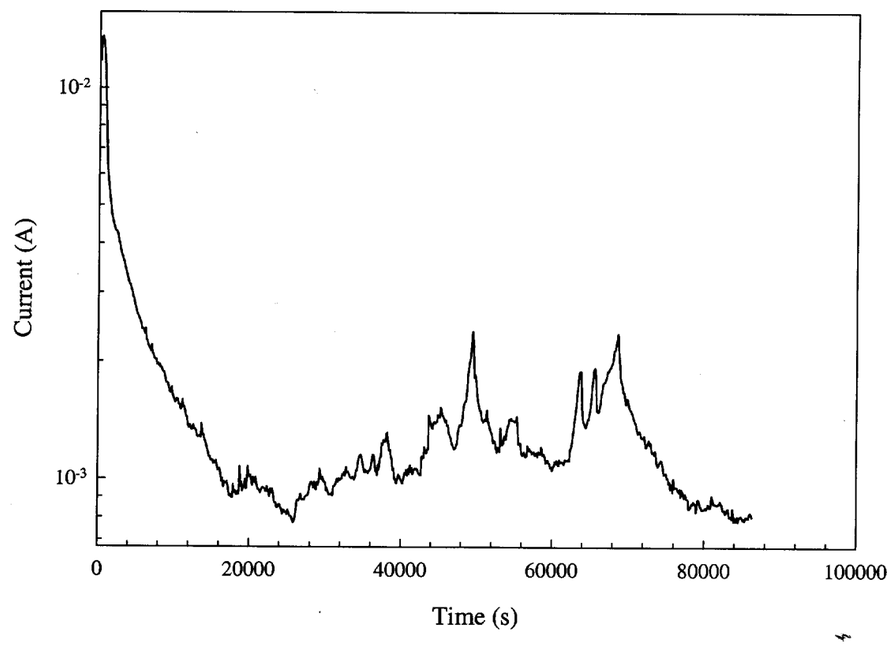
Final Solution pH = 9.821 8-28-98

Observations

General corrosion product on Spec 8-28-98

minor pitting under crevice feet

A516PS71



8-27-98

to 121

from 120

Cell 3 A516PS72.DAT

T = 95°C

Eset = -260mV

Init wt = 28.87609g

Final wt = 28.84266g 8-24-98

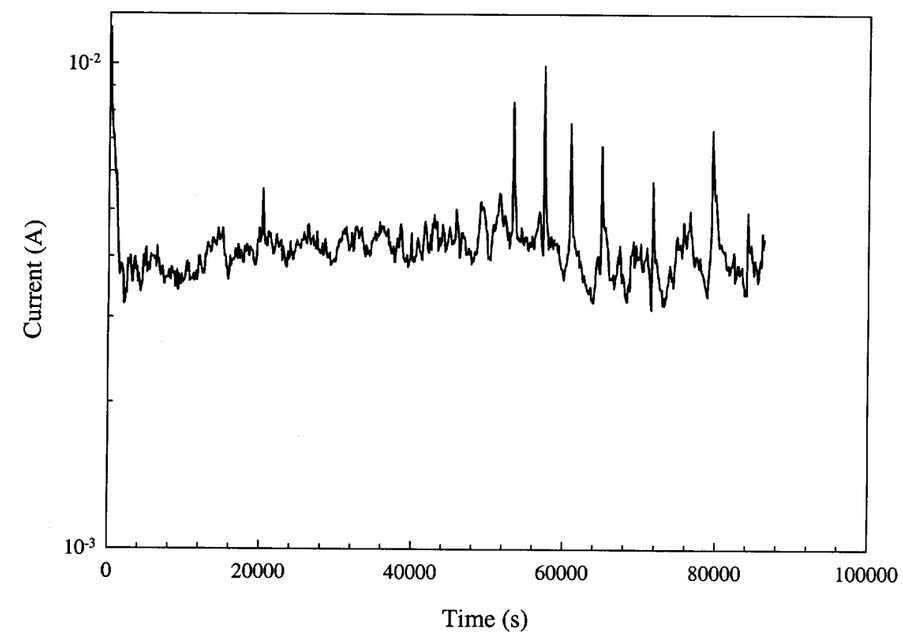
Final Solution pH = 10.077 8-28-98

Observations

General corrosion product on Spec

No pitting under feet 8-28-98

A516PS72



8-27-98

to 122

from 121

8-31-98 Start 9:46 Am

Stock Solution Fisher lot

$NaHCO_3$ → 120mM → 20.1624g/2Lt # 897789*

NaCl → 4.8mM 0.5610g/2Lt 972274

Init PH = 8.142

All specimens polished to 600 grit + ultrasonically cleaned in Acetone
Crevices ultrasonically cleaned in Methanol

NOTE:
Power Failure occurred 9-1-98
Data Acquisition Shutdown

8-31-98

to 123

from 122 Cell 1 A516PS73.DAT

T = 25°C

Eset = -305 mV

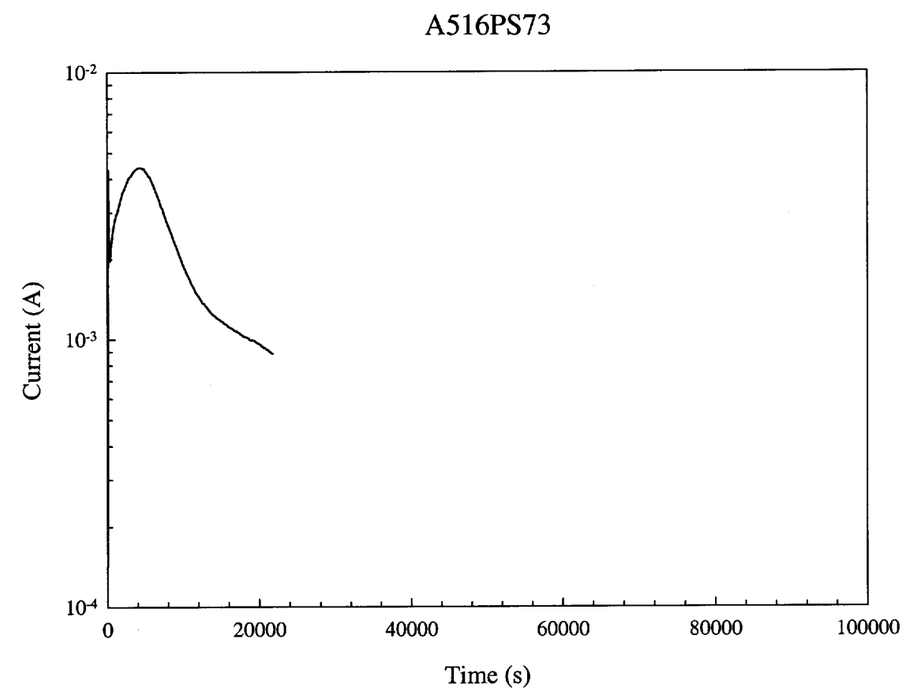
Init wt = 28.79218 g

Final wt = 28.78509 g 9-1-98

Final Solution PH = 9.134 9-1-98

Observations

Some general corrosion, none under closure feet 9-1-98



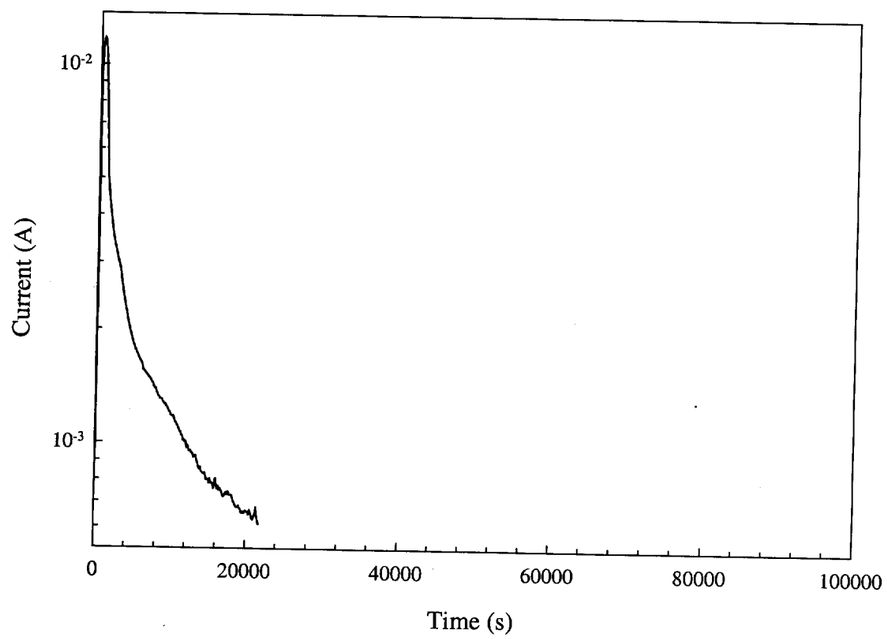
8-31-98

to 124

from 123 Cell 2 A516PS74.DAT
T = 65°C
Eset = -310 mV
Init wt = 28.73502g
Final wt = 28.73270g 9-1-98

Final Solution pH = 9.795 9-1-98
Observations
Some general corrosion, none under feet 9-1-98

A516PS74

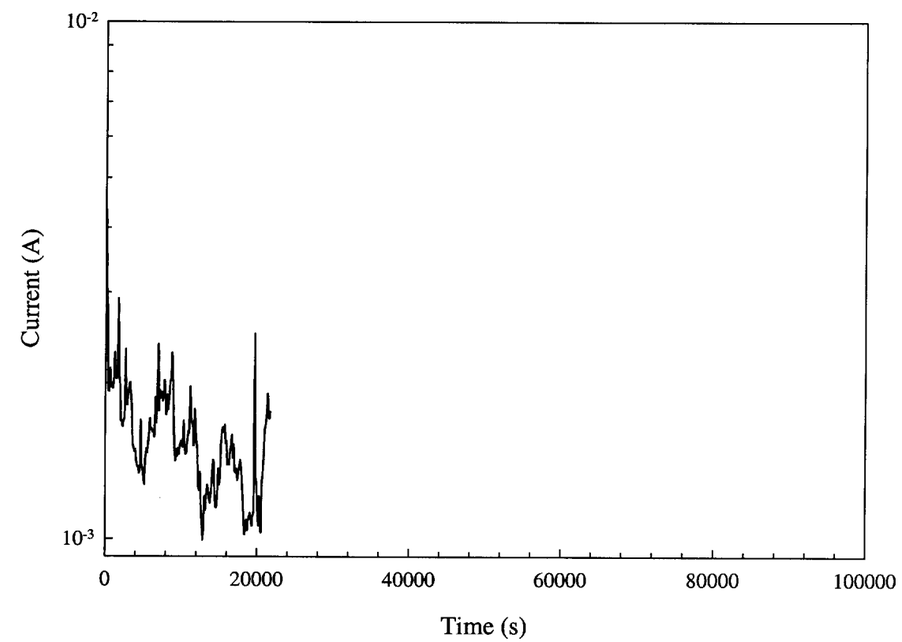


8-31-98 to 125

from 124 Cell 3 A516PS75.DAT
T = 95°C
Eset = -230 mV
Init wt = 29.03454g
Final wt = 29.02792g 9-1-98

Final Solution pH = 10.526 9-1-98
Observations
Some corrosion pitting on bottom of specimen
crevice pitting under feet and on edges of feet 9-1-98

A516PS75



8-31-98 to 126

from 125

9-1-98

Stock Solution

$NaHCO_3$ → 120 mM → 20.1624 g/2Lt Fisher # 897789

NaCl → 4.8 mM → .5610 g/2Lt " 972274

Init pH = 8.149

All Specimens polished to 600 grit + ultrasonically cleaned in Acetone

Crevices ultrasonically cleaned in Methanol

9-1-98

~~to~~ to 127

from 126

Cell 1 A516PS76.DAT

T = 25°C

Eset = -305 mV

Init wt = 28.96249 g

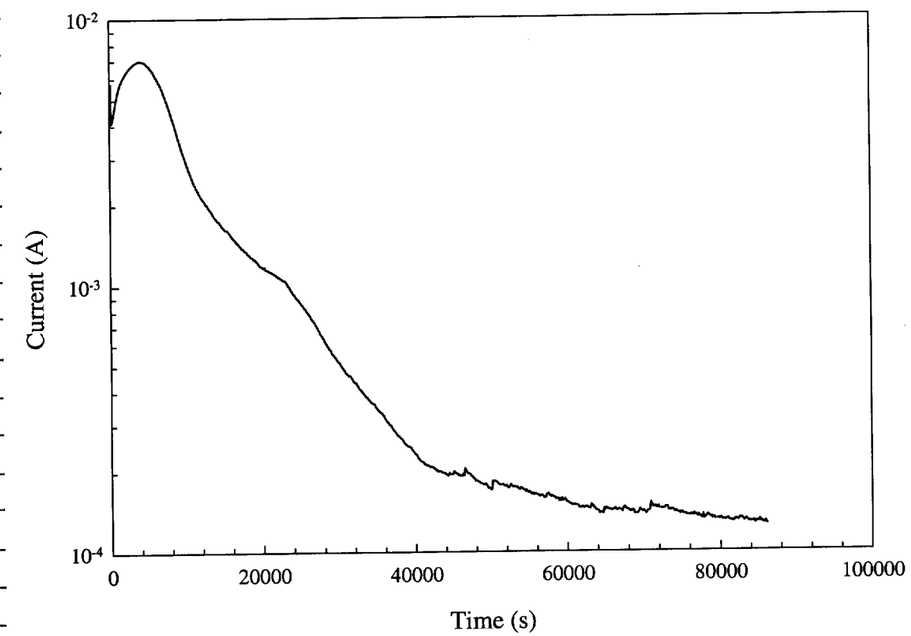
Final wt = 28.95584 g 9-2-98

Final Solution pH = 9.161 9-2-98

Observations

General Corrosion, none under feet 9-2-98

A516PS76



9-1-98

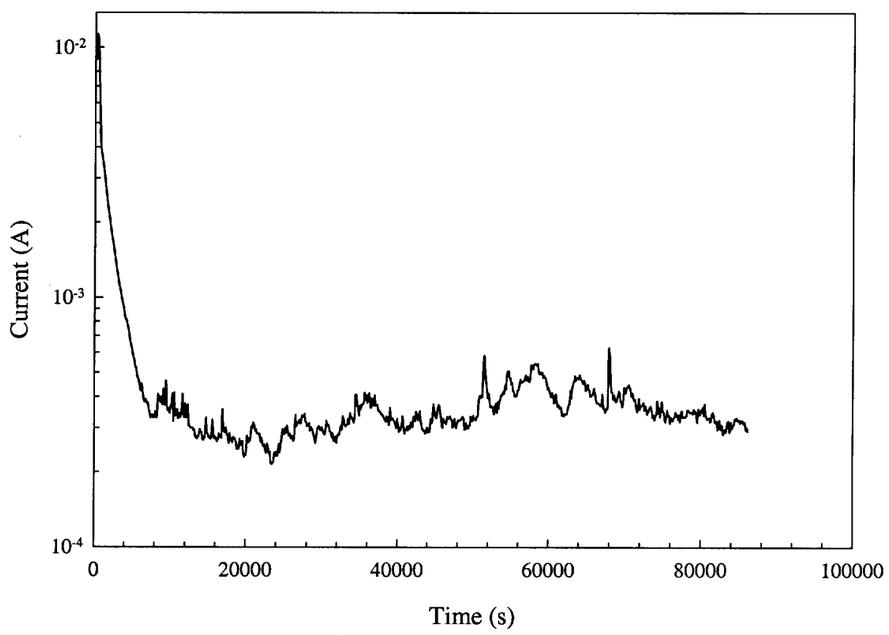
to 128

from 127

Cell 2 A516PS77.DAT
T = 65°C
Eset = -310 mv
Init wt = 28.81691g
Final wt = 28.81041g 9-2-98

Final Solution pH = 9.947 9-2-98
Observations
Corrosion above vapor line, some pitting under crevice foot. 9-2-98

A516PS77



9-1-98

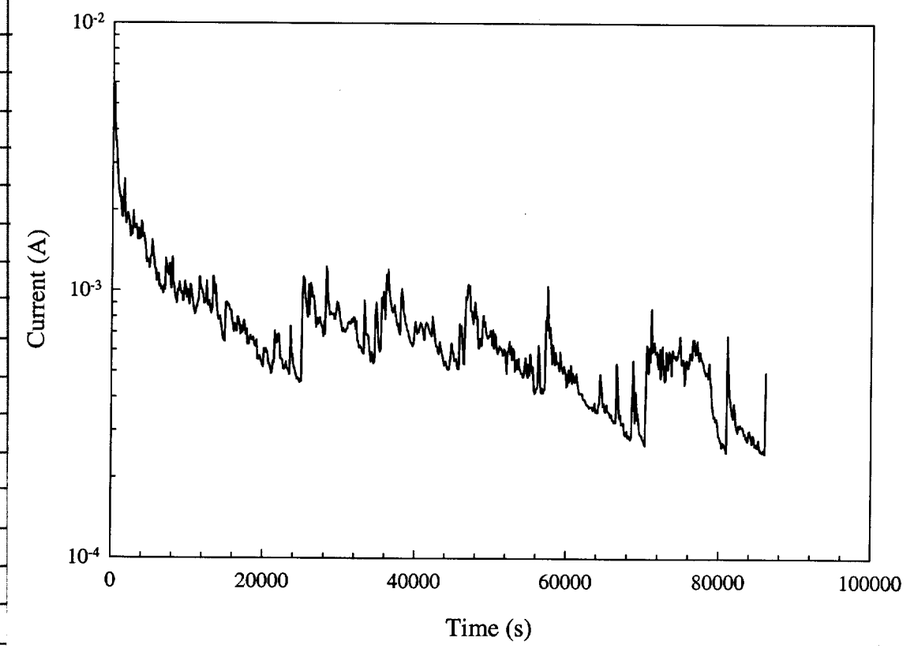
To 129

from 128

Cell 3 A516PS78.DAT
T = 95°C
Eset = -230
Init wt = 28.75483g
Final wt = 28.75318g 9-2-98

Final Solution pH = 11.223 9-2-98
Observations
Crevice pitting, some general corrosion 9-2-98

A516PS78



9-1-98

to 130

from 129 9-2-98 F. Sherlot

Stock Solution #

$NaHCO_3$ → 120 mM → 20.1614 g /2 Lt 897789

NaCl → 2.4 mM 0.2805 g /2 Lt 972274

Initial PH = 8.166

All specimens polished to 600 grit + ultrasonically cleaned in Acetone
Crevices ultrasonically cleaned in Methanol

9-2-98 To 131

From 130 Cell 1 A516PS79.DAT

T = 25°C

Eset = -300 mv

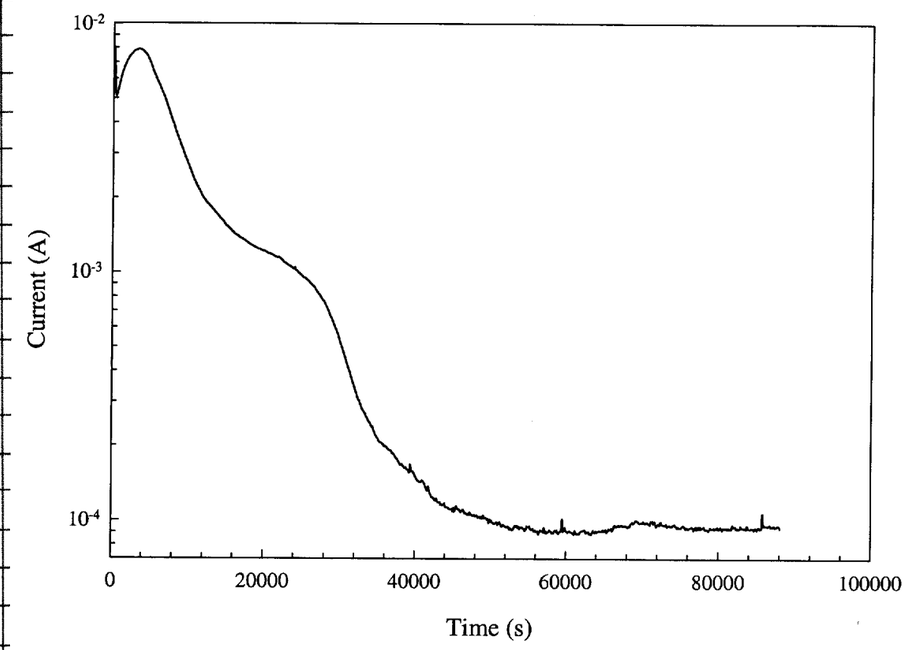
Init wt 28.70445 g

Final wt 28.69709 g 9-3-98

Final PH 9.168 9-3-98

Observations

General corrosion, none under crevice feet 9-3-98



9-2-98 To 132

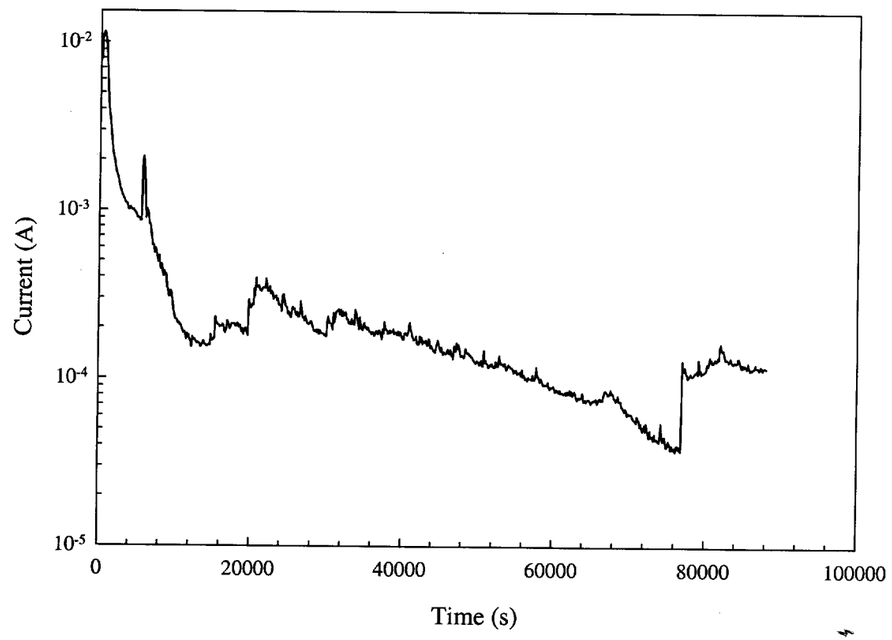
from 131

Cell 2

A516PS80.DAT
T = 65°C
Eset = -280 mV
Init wt = 28.93610g
Final wt = 28.93348g 9-3-98

Final Solution = 9.983 9-3-98
Observation:
Some general corrosion on shaft
minor crevice pitting 9-3-98

A516PS80



9-2-98

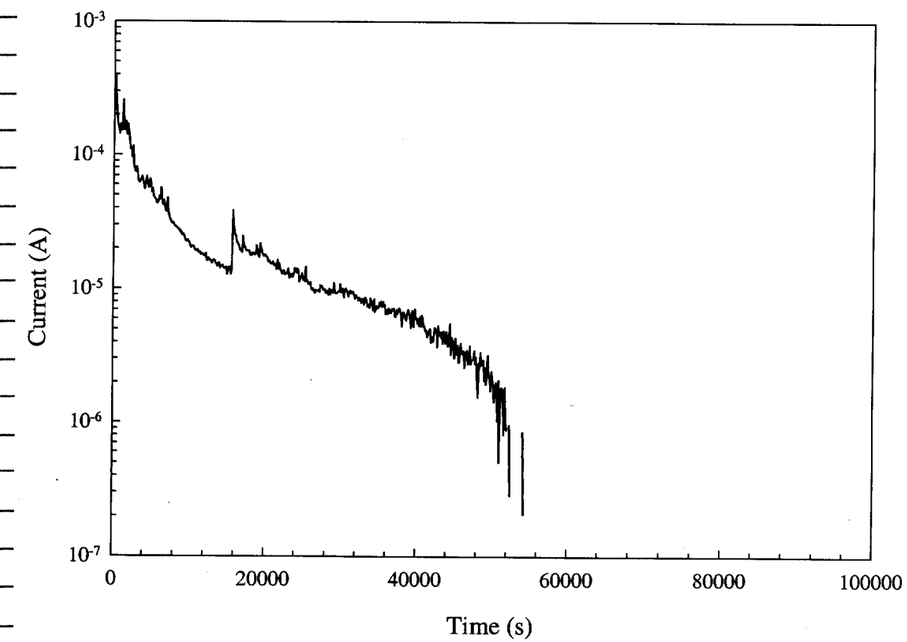
To 133

from 132

A516PS81.DAT
T = 95°C
Eset = -210 mV
Init wt = 28.60858g
Final wt = 28.60984g 9-3-98

Final PH = 11.030 9-3-98
Observations
No general corrosion fairly uniform
crevice pitting 9-3-98

A516PS81



9-2-98

to 134

from 133

Stock Solution Start 2:37 pm

$NaHCO_3$ → 120mM → 20.16Mg/2Lt Fisher # 897798

NaCl → 1.6mM → 0.1870g/2Lt Fisher # 972274

Initial pH= 8.164

All specimens polished to 600grit + ultrasonically cleaned in Acetone
crevices cleaned in methanol ultrasonically

9-3-98

to 135

from 134

Cell 1 A516PS82.DAT

T= 25°C

Eset= -290mV

Initial wt= 28.96751g

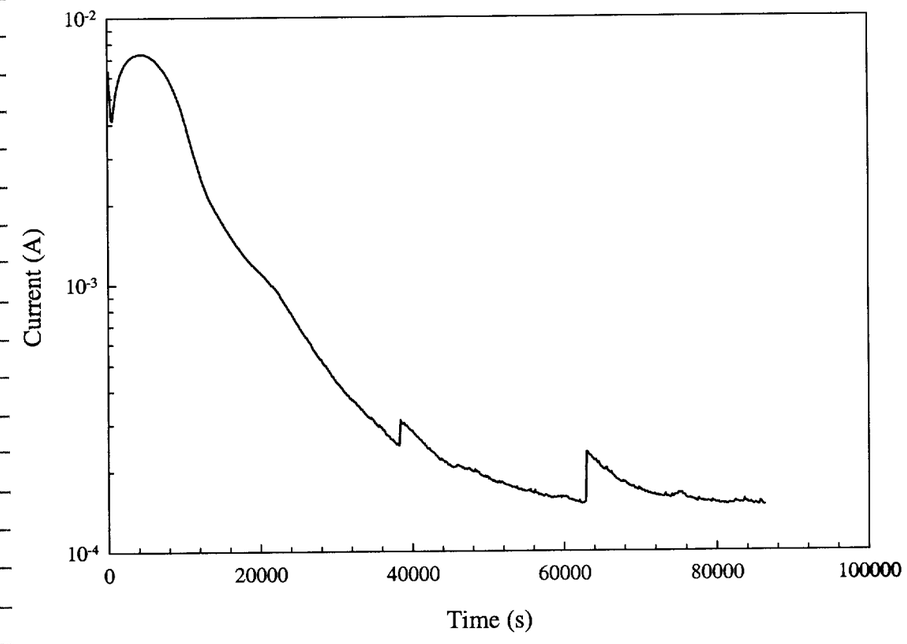
Final wt= 28.95940g 9-4-98

Final Solution pH= 9.145 9-4-98

Observations

General corrosion, none under foot 9-4-98

A516PS82



9-3-98

To 136

from 135

Cell 2 A516PS83.DAT

T = 65°C

Eset = -270 mv

Initwt = 28.88775g

Final wt = 28.88693g 9-4-98

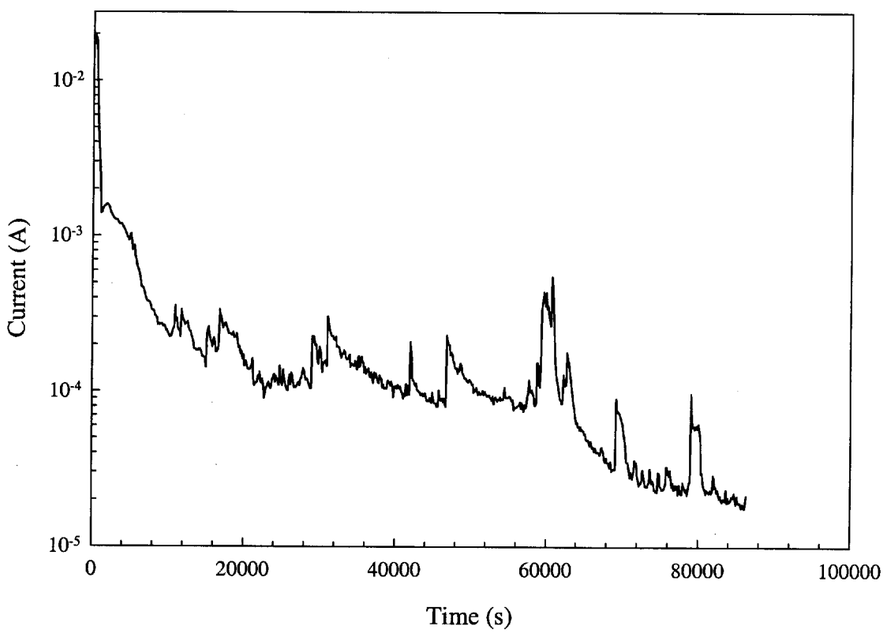
Final Solution pH = 9.858 9-4-98

Observations

Some corrosion above vapor line

minor pitting under crevice feet 9-4-98

A516PS83



9-3-98

To 137

from 136

Cell 3 A516PS84.DAT

T = 95°C

Eset = -200 mv

Initwt = 29.07900g

Final wt = 29.07920g 9-4-98

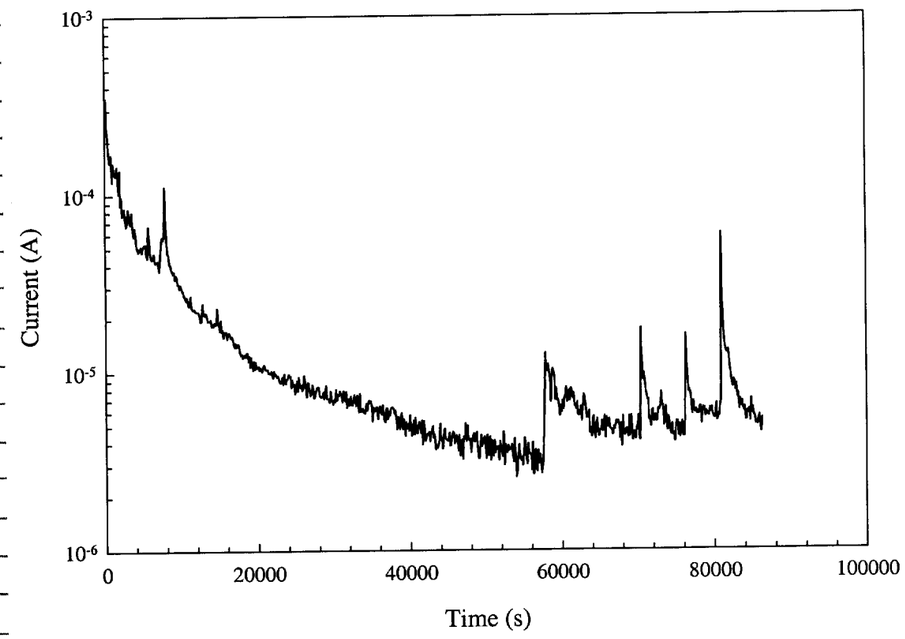
Final Solution pH = 10.685 9-4-98

Observations

crevice pitting under feet 9-4-98

no other corrosion noted

A516PS84



9-3-98

To 138

from 137

9-8-98 Start 9:50

Stock Solution Fisher #

$NaHCO_3$ → 120 mM → 20.1624 g/2 L 897789

NaCl → 1.2 mM → 0.1403 g/2 L 972274

Initial pH: 8.180

All specimens polished to 600 grit & ultrasonically cleaned in Acetone

All crevices ultrasonically cleaned in methanol

9-8-98

To 139

from 138

Cell 1 A516PS85.DAT

T = 25°C

Eset: -290 mV

Init wt: 28.92722 g

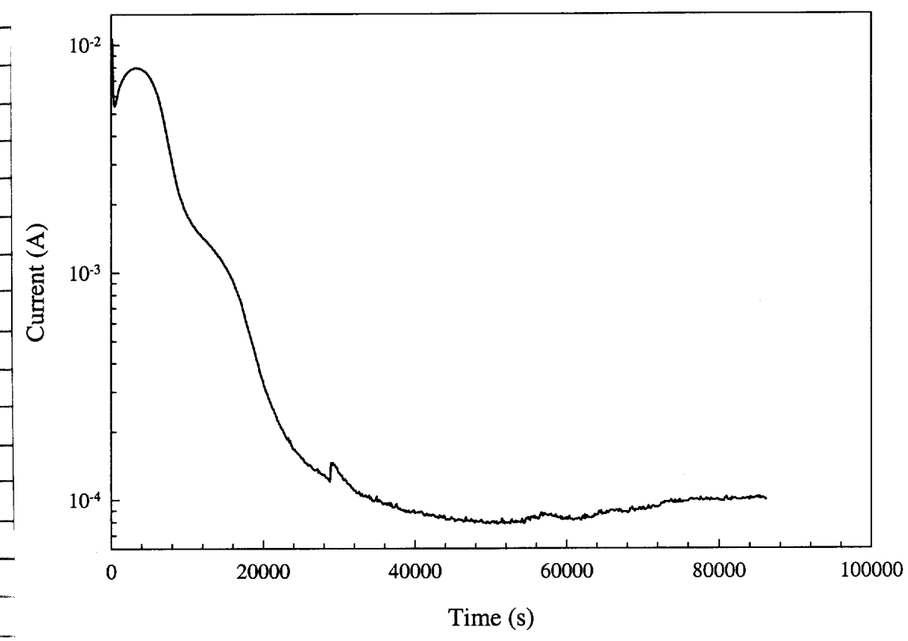
Final wt: 28.91933 g 9-9-98

Final Solution pH: 8.958 9-9-98

Observations

General Corrosion, no crevice pitting 9-9-98

A516PS85



9-8-98

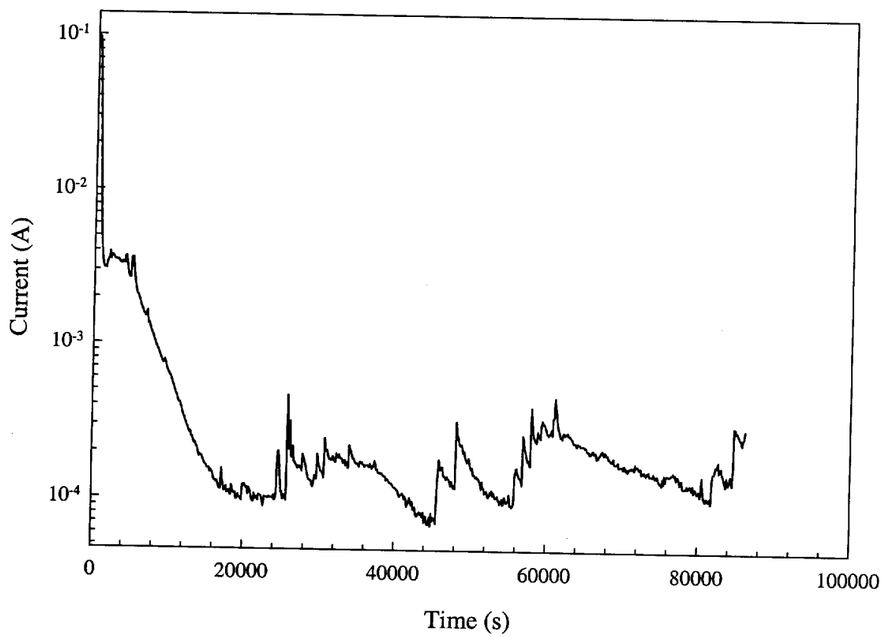
To 140

from 139

Cell 2 A516PS86.DAT
T = 65°C
Eset = -260 mv
Init wt = 28.79420g
Final wt = 28.79300g 9-9-98

Final Solution pH = 9.465 9-9-98
Observations
General Corrosion, no crevice pitting 9-9-98

A516PS86



9-8-98

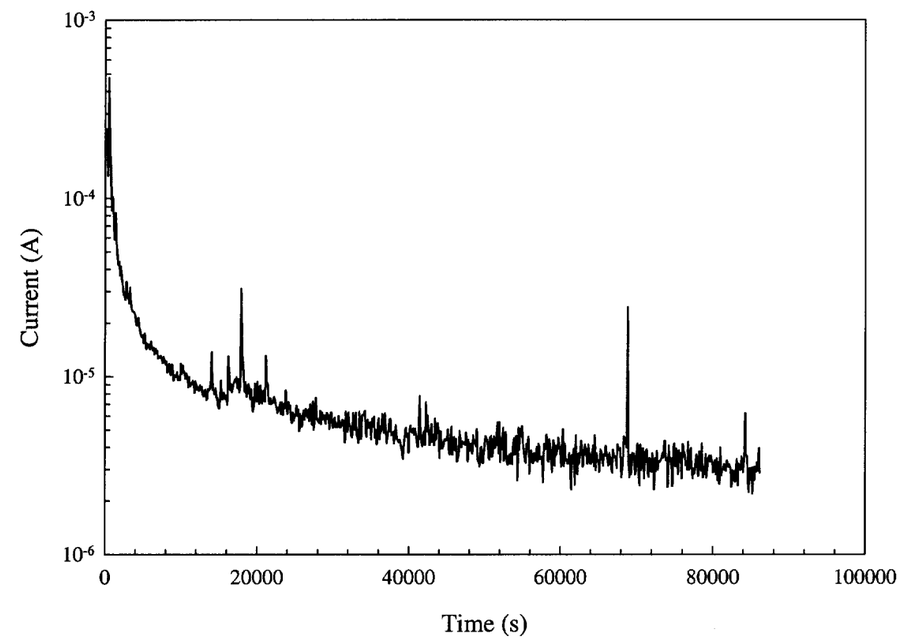
To 141

From 140

Cell 3 A516PS87.DAT
T = 95°C
Eset = -190 mv
Init wt = 28.73913g
Final wt = 28.73965g 9-9-98

Final Solution pH = 10.961 9-9-98
Observations
No general Corrosion, minor crevice pitting 9-9-98

A516PS87



9-8-98

To 142

From 141

9-9-98

Stock Solution

$NaHCO_3$ → 6mM → 1.008g/2Lt Fisher # 897789

NaCl → 1.2mM → 0.1403g/2Lt " 972274

Init PH = 7.57 @ 1min 8.36 after 5min

All specimens polished to 600grit & ultrasonically cleaned in Acetone

All crevices ultrasonically cleaned in Methanol

9-9-98

To 143

From 142

Cell 1 A516PS88.DAT

T = 25°C

Eset = -290mV

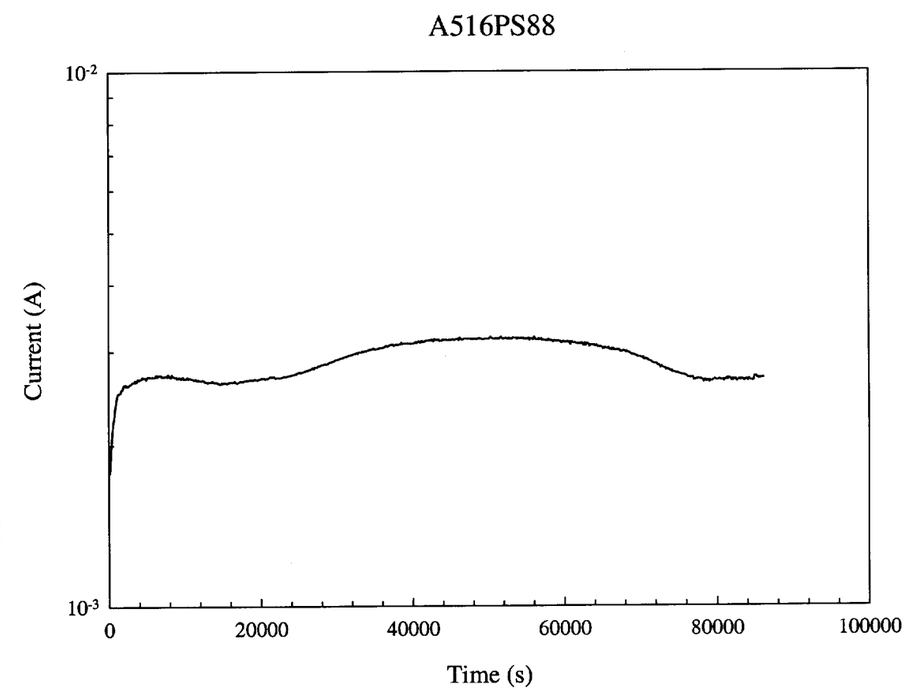
Init wt = 28.92371g

Final wt = 28.84964g 9-10-98

Final Solution PH = 9.428 9-10-98

Observations

General corrosion, crevice foot showed no pitting 9-10-98



9-9-98

To 144

From 143

Cell 2 A516 PS89.DAT

T = 65°C

Eset = - 260mv

Init wt = 28.78665g

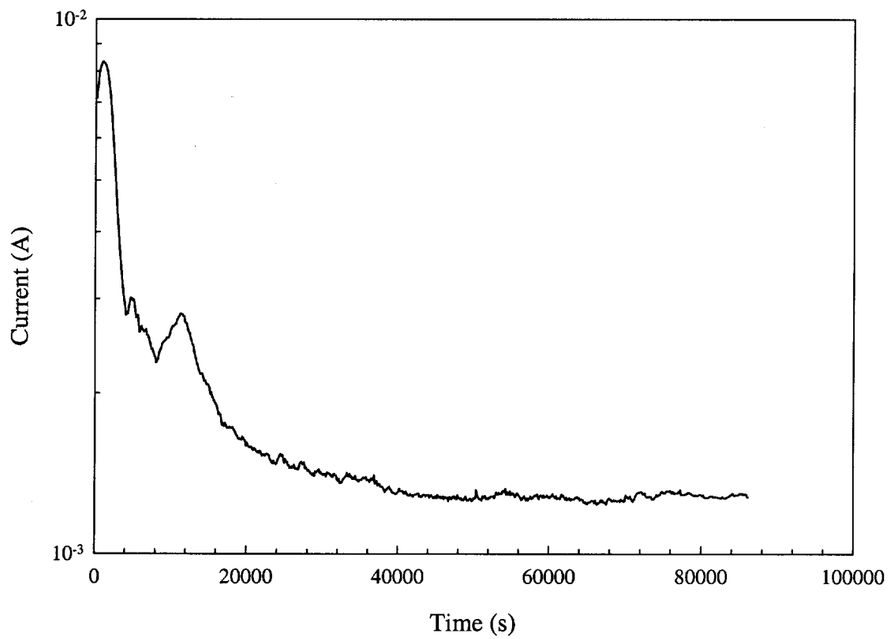
Final wt = 28.75611g 9-10-98

Final Solution PH = 9.625 9-10-98

Observations

General corrosion, no crevice pitting 9-10-98

A516PS89



9-9-98

To 145

From 144

Cell 3 A516 PS90.DAT

T = 95°C

Eset = -190mv

Init wt = 29.00214g

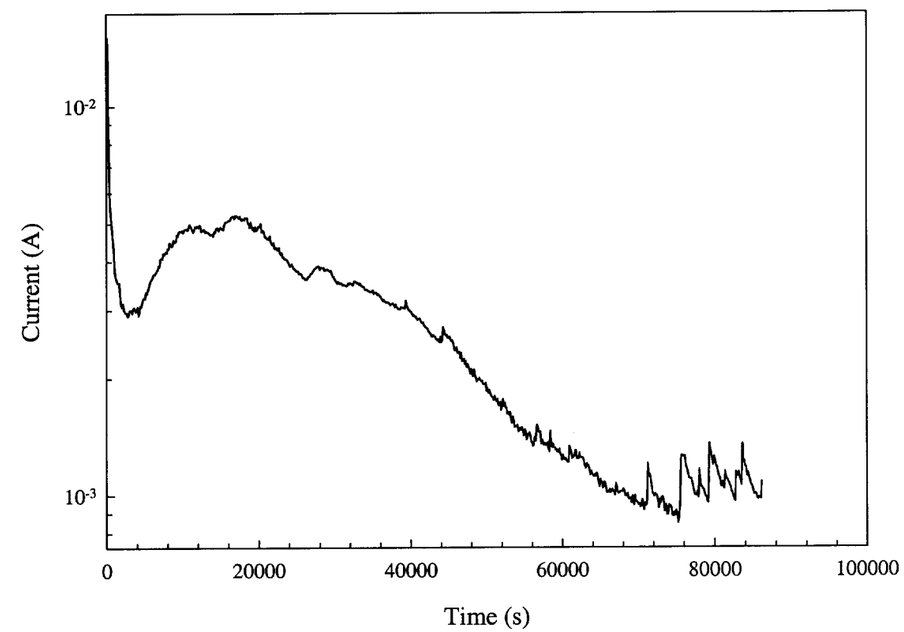
Final wt = 28.95150g 9-10-98

Final Solution PH = 10.342 9-10-98

Observations

Some general corrosion and start of pitting around crevice foot but not under foot 9-10-98

A516PS90



9-9-98

To 146

from 145

9-10-98 Start 1:20pm

Stock Solution

		Fisher #
$NaHCO_3$	→ 6 mM → 1.008 g/2Lt	897789
NaCl	→ .48 mM → .0561g/2Lt	972274

Init PH = 7.499 @ 1min 8.49 after 5

All specimens polished to 600 grit & ultrasonically cleaned in Acetone
All crevices ultrasonically cleaned in Methanol

9-10-98

To 147

From 146

Cell 1 A516PS91.DAT

T = 25°C

Eset = -270

Initwt = 28.80670g

Final wt = 28.68025g 9-11-98

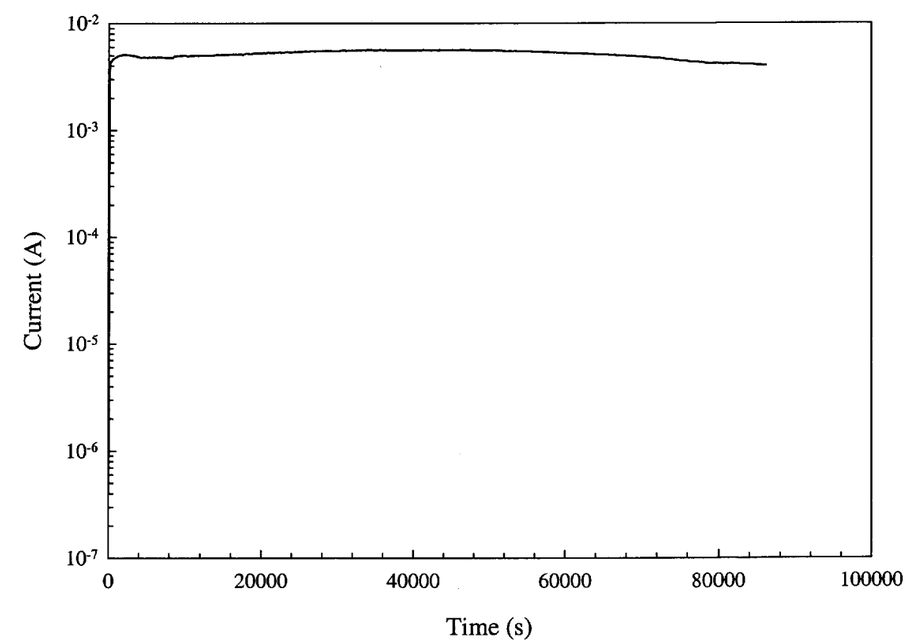
Final Solution PH = 10.082 9-11-98

Observations

Precipitate on specimen, general corrosion 9-11-98

No crevice pitting

A516PS91



9-10-98

To 148

From 147

Cell 2 A516 PS 92 .DAT

T = 65°C

Eset = -250 mV

Initwt = 29.04890 g

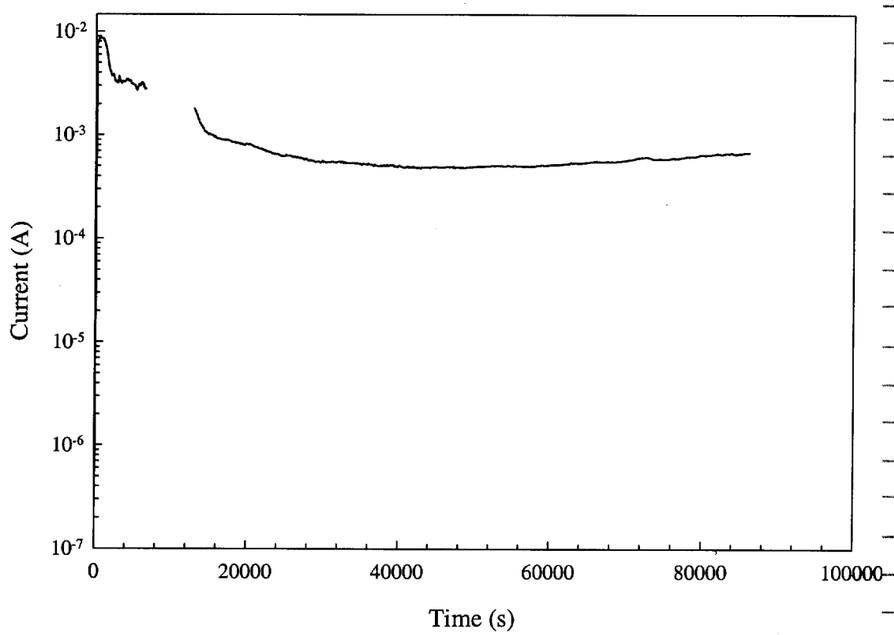
Final wt = 29.03300 g 9-11-98

Final Solution PH = 9.756 9-11-98

Observations

General Corrosion, no crevice pitting 9-11-98

A516PS92



9-10-98

To 149

From 148

Cell 3 A516 PS 93 .DAT

T = 95°C

Eset = -170 mV

Initwt = 28.94460 g

Final wt = 28.91372 g 9-11-98

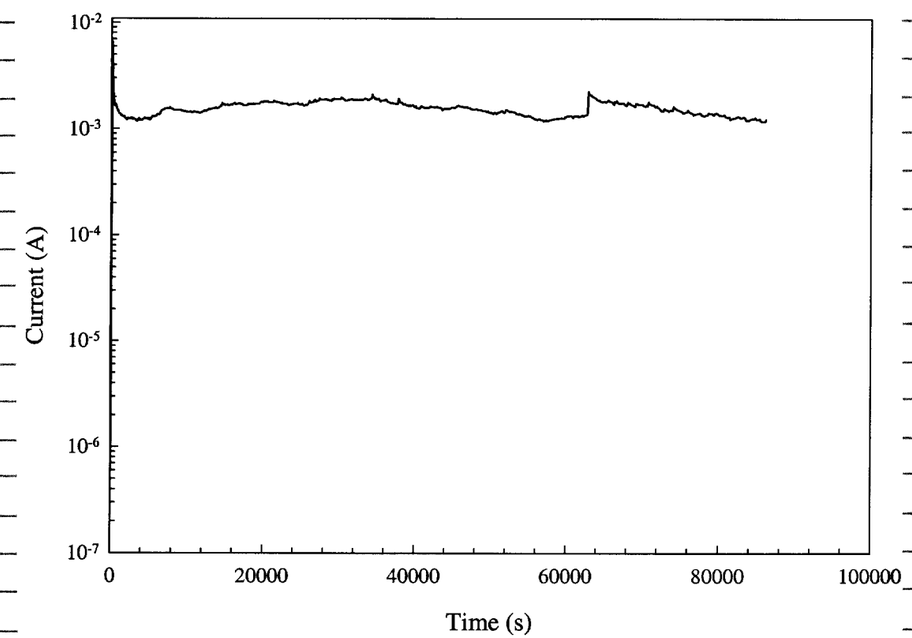
Final Solution PH = 9.743 9-11-98

Observations

Some minor general corrosion

crevice pitting 9-11-98

A516PS93



9-10-98

To 150

From 149

Stock Solution
9-14-98
$NaHCO_3$ → 6mM → 1.008g/2lt Fisher # 897789
NaCl → .12mM → .01403g/2lt " # 972274

Initial pH = 8.428

All Specimens polished to 600grit + ultrasonically cleaned in Acetone
Crevices cleaned ultrasonically in Methanol

9-14-98

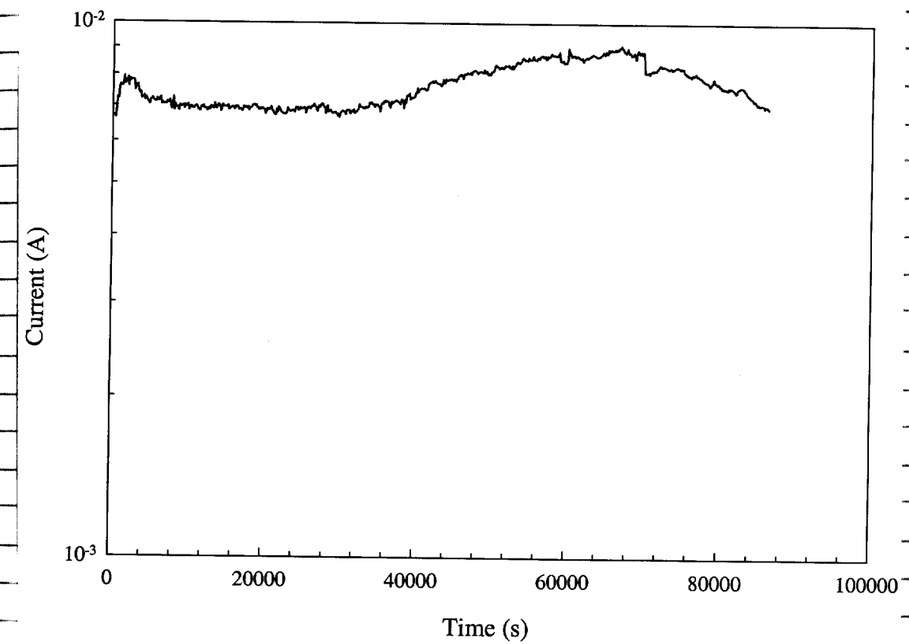
To 151

From 150

Cell 1 A516PS94.DAT
T = 25°C
Eset = −250mV
Init wt = 28.90233g
Final wt = 28.71316g 9-15-98

Final Solution pH = 10.247 9-15-98
Observations
General Corrosion, no crevice pitting 9-15-98

A516PS94



9-14-98

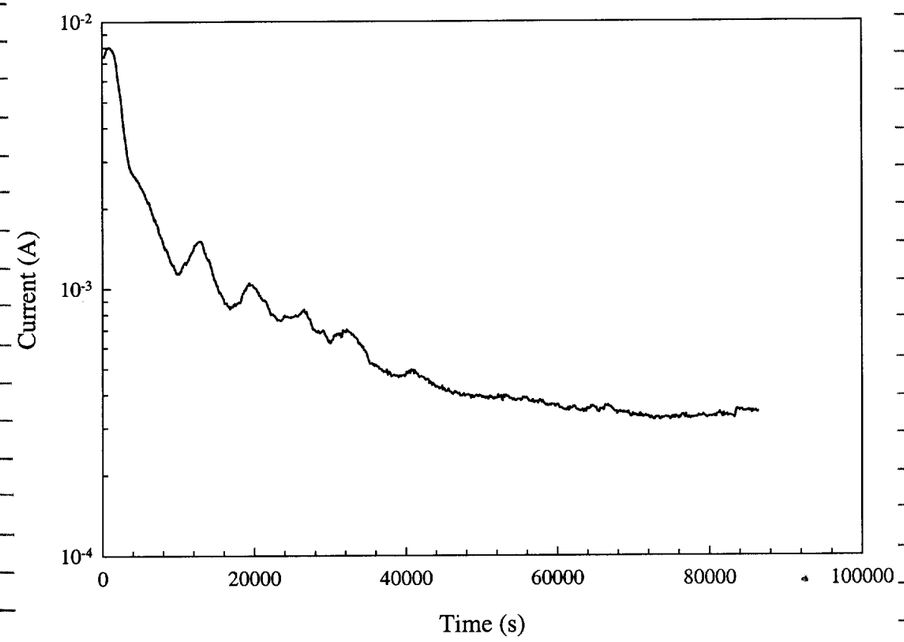
To 152

From 151

Cell 2 A516PS95.DAT
T=65°C
Eset: ~220mv
Initwt: 29.01220g
Final wt: 29.00144g 9-15-98

Final Solution pH=9.598 9-15-98
Observations
General Corrosion, No crevicepitting 9-15-98

A516PS95



9-14-98

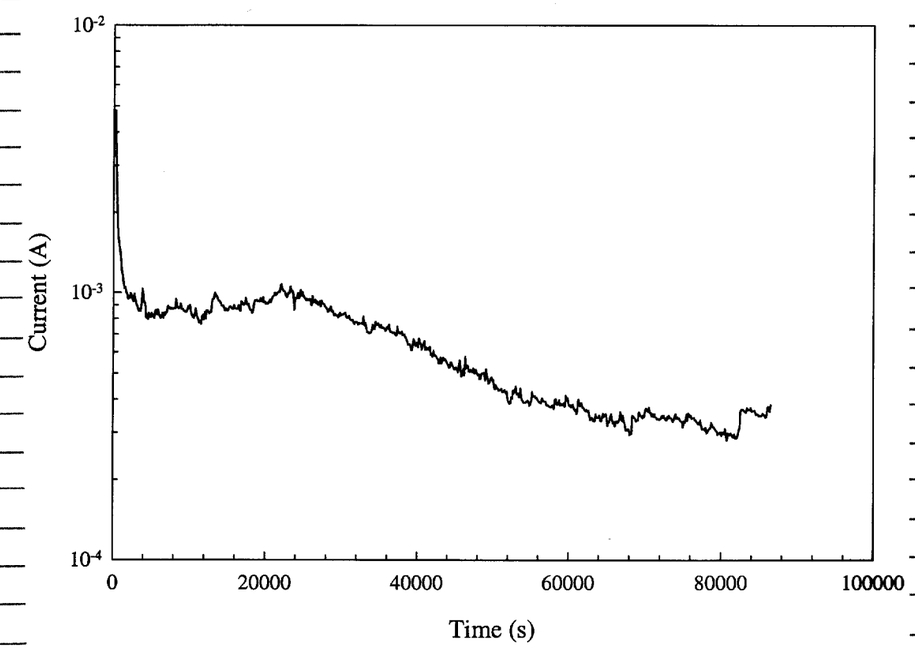
To 153

From 152

Cell 3 A516PS96.DAT
T=95°C
Eset: -150mv
Initwt: 29.00522g
Final wt: 28.99275g 9-15-98

Final Solution pH: 10.504 9-15-98
Observations
One spot of pitting on sample bottom
crevice pitting around crevice edges 9-15-98

A516PS96



9-14-98

To 154

From 153

Stock Solution

Na_2CO_3 → 3mM → .63594g / 2Lt Fisher # 960685

$NaHCO_3$ → 3mM → .50406 g / 2Lt " 879789

NaCl → 1.2mM → .1403 g / 2Lt " 972274

Solution pH = 10.159

All specimens polished to 600grit & ultrasonically cleaned in Acetone
Crevices ultrasonically cleaned in Methanol

9-15-98 To 155

From 154

Cell 1 A516PS97.DAT

T = 25°C

Eset = -290 mV

Initial wt = 28.81978g

Final wt = 28.63596g 9-16-98

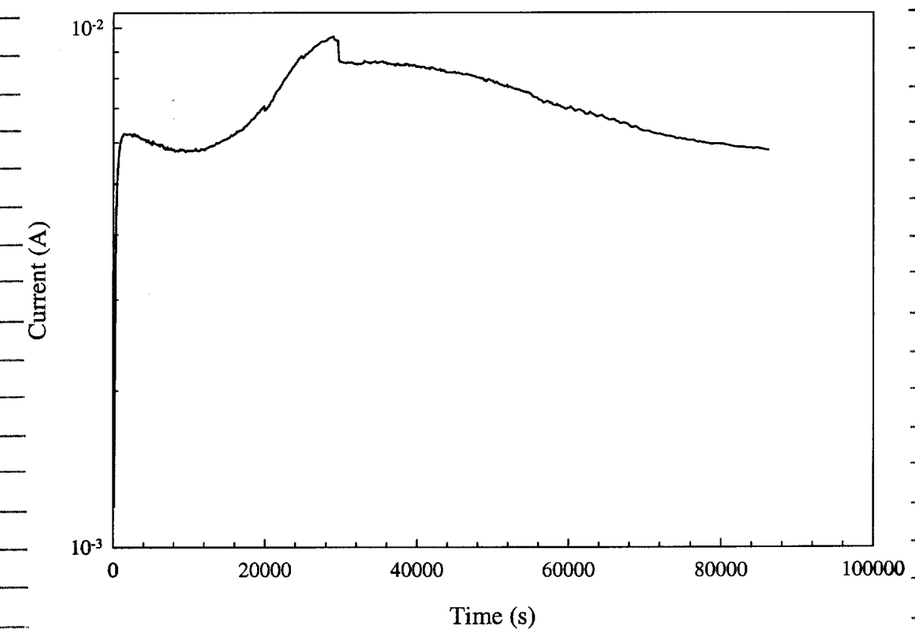
Final Solution pH: ~~10.~~ 11.012 9-16-98

Observations

Large amount of precipitate & general corrosion

No crevice pitting 9-16-98

A516PS97



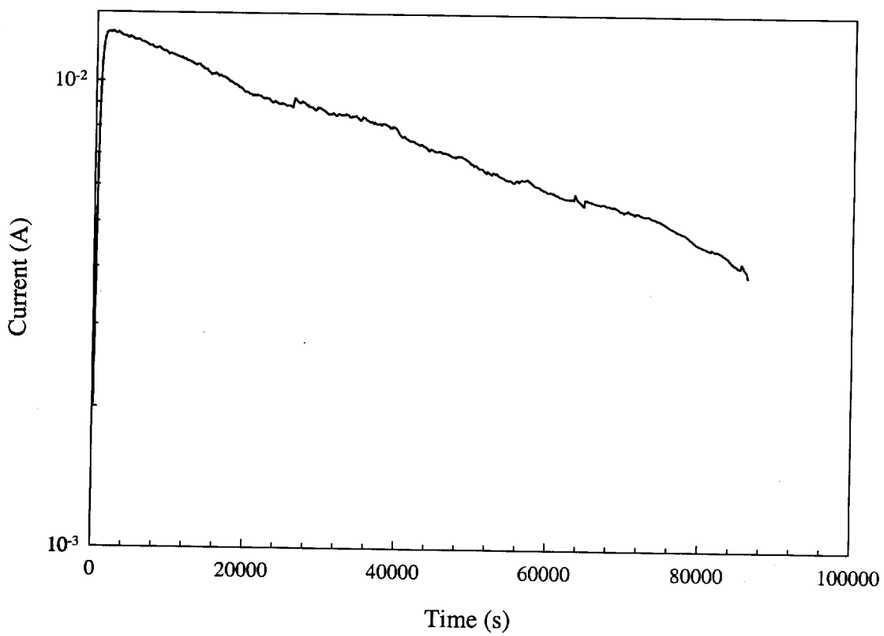
9-15-98 To 156

From 155

Cell2 A516PS98.DAT
T=65°C
Eset=-260mv
Init wt: 28.85600g
Final wt: 28.66316g 9-16-98

Final Solution PH: 10.762 9-16-98
Observations
Large amount of precipitate and general corrosion
No crevice pitting 9-16-98

A516PS98



9-15-98

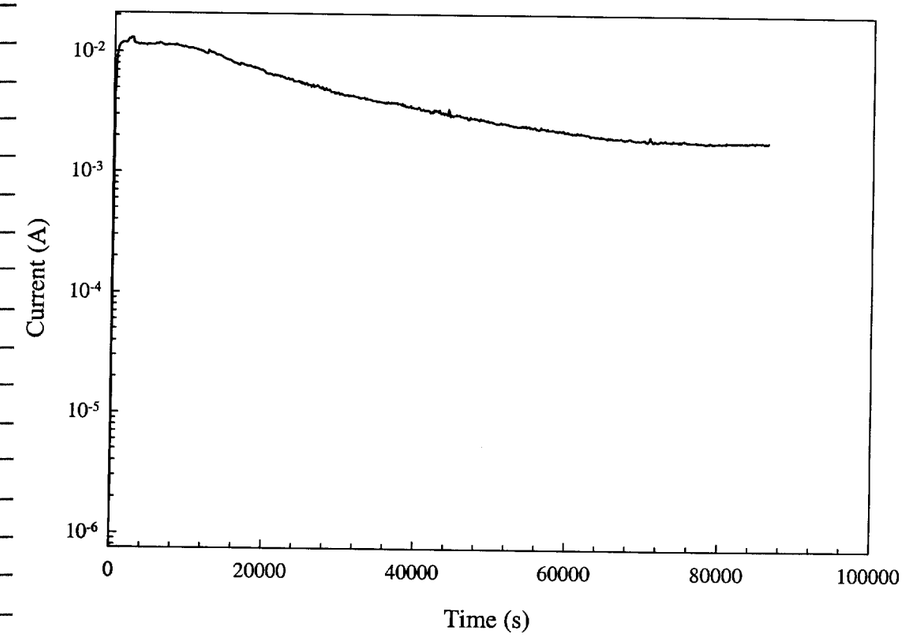
To 157

From 156

Cell3 A516PS99.DAT
T=95°C
Eset=-190mv
Init wt: 28.83070g
Final wt: 28.72598g 9-16-98

Final Solution PH: 10.743 9-16-98
Observations
Some general corrosion with precipitate
crevice pitting evident 9-16-98

A516PS99



9-15-98

To 158

From 157

9-16-98

Stock Solution

Na_2CO_3 → 3mM → .63594g/2Lt Fisher # 960685

$NaHCO_3$ → 3mM .50406g/2Lt " 879789

NaCl → .48mM → .0561g/2Lt " 972274

PH = 10.170

All specimens polished to 600grit + ultrasonically cleaned in Acetone
crevices ultrasonically cleaned in Methanol

9-16-98

To 159

From 158

Cell 1 516PS100.DAT

T = 25°C

Eset = -270mv

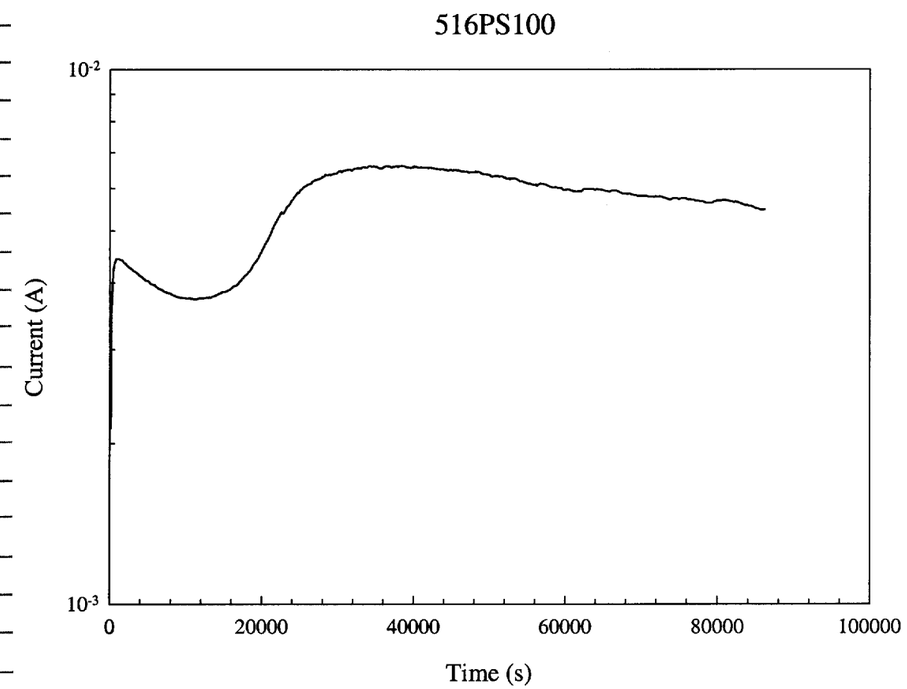
Initial = 28.67141

Final = 28.52590 9-17-98

Final Solution PH = 10.882 9-17-98

Observations

large amount of precipitate + general corrosion
no crevice pitting 9-17-98



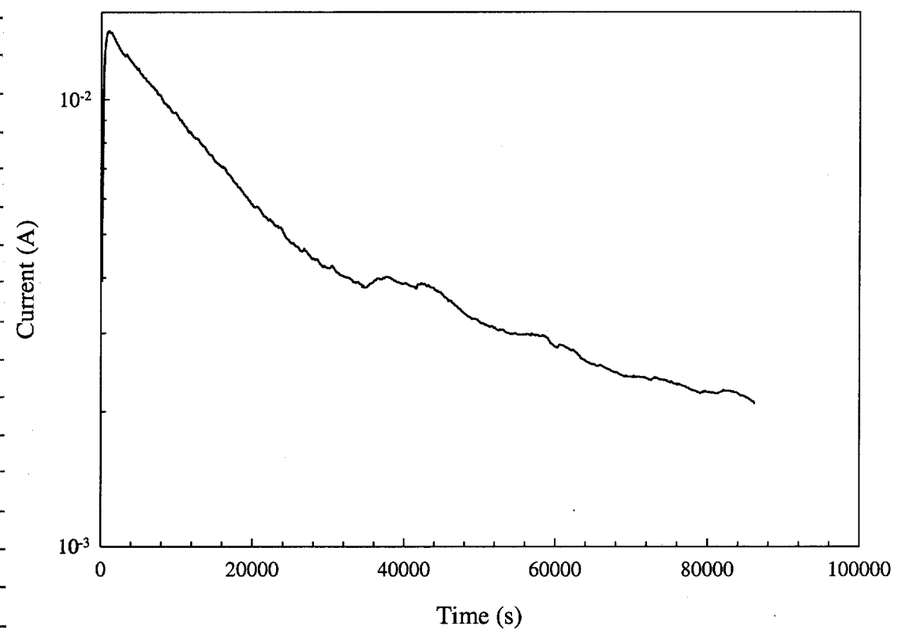
9-16-98

To 160

Cell 2 516 PS101.DAT
T=65°C
Eset= -240mv
Init wt= 29.17760g
Final wt= 29.08168g [signature] 9-17-98

Final PH= 10.444 [signature] 9-17-98
Observations
large amounts of precipitate + general corrosion [signature] 9-17-98
No cervice pitting

516PS101



[signature] 9-16-98

Cont on Page 7 of Book 291

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 than another qualified individual could repeat the activity.

[signature] 2/11/2000