LABORATORY NOTEBOOK

CNWRA/SwRI

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CONTROLLED
COPY 520

NOTEBOOK NO. 520

ISSUED TO DARRELL DUNN DD

ON 8/9/11

DEPARTMENT

RETURNED

Brian K. Dearby - BKD

Jonathan Bost - JB

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INSTRUCTIONS

1. **The primary purpose of this notebook is to protect your and the Company's Patent-Rights by keeping records of all original work in a form acceptable as evidence if any legal conflict arises.**

2. • When starting a page, enter the title, project number, and book number.
   • Use ink for permanence -- avoid pencil.
   • Record your work as you progress, including any spur-of-the-moment ideas which may be developed later.
   • Avoid making notes on loose paper to be recopied.
   • Record your work in such a manner that a co-worker can continue from where you stop. You might be ill and to protect your priority it could be urgent that the work continue while you are absent.

3. • Give a complete account of your experiments and the results, both positive and negative, including your observations.
   • Record all diagrams, layouts, plans, procedures, new ideas, or anything pertinent to your work including the details of any discussions with suppliers, or other people outside the Company.
   • Do not try to erase any incorrect entries; draw lines deleting them, note the corrections, sign and date the changes. This extra care is worthwhile because of the necessity of original data to prove priority of new discoveries.

4. • After entering your data, sign and date the entries.
   • Explain your work to at least two witnesses who are not co-inventors, and have them sign and date the pages in the place provided.
   • Record the names of operators and witnesses present during any demonstration and have at least two witnesses sign the page. If no witnesses are present during an experiment of importance, repeat it in the presence of two witnesses.

5. Since computer programs can be patented these instructions apply to the development of computer software. In this case a description of the structure and operation of the program should be recorded in the notebook, together with a basic flow diagram which illustrates the essential features of the program. In the course of developing the code, the number of lines of code written each day should be recorded in the notebook, together with a statement of the portion of the flow diagram to which the section of code is directed.

6. This notebook and its contents are the exclusive property of the Company. It is confidential and the contents are not to be disclosed to anyone unless authorized by the Company. You must return it when completed, upon request, or upon termination of employment. It should be kept in a protected place. **If loss occurs, notify your supervisor immediately, and make a written report describing the circumstances of the loss.**

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Continued Testing from Notebook #366 + #485

Copied from Notebook #485

Initial Scientific notebook entry for repassivation potential measurements

Title: Alloy 22 Repassivation Tests

Tests Preformed by: Darrell S. Dunn, Letai Yang, Div 20; Brian Derby, Div. 18

Objectives: Determine the effect of thermal aging time and temperature on the localized corrosion susceptibility of Alloy 22.

Equipment: Laboratory oven for exposure of test specimens at 600 to 900 °C, Thermocouple and thermocouple meter. Keithley 614/617. Solartron 1287 Potentiostat and CorrView Software or equivalent, Electrochemical test cell.

Materials: Alloy C-22, heat 2277-8-3175. Other materials and heats to be added and identified prior to testing.

Specimen specifications: Specimens will be equivalent to 20.01402.571.006 unless otherwise specified.

Measurement Parameters: Temperature and time of exposure, Potential and Current of specimen during test.

Required level of accuracy: Temperature ± 2 °C, Time of exposure ± 1 minute, Potentials ± 1mV, Current ± 0.01 microamp.

Uncertainty and Sources of Error: Current measurement error can occur for localized corrosion processes because the actively corroding area is not the same as the surface area of the test specimen.

5/12/02

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Repassivation Potential of Alloy C-22

objective: See Pg #1

Specimen: C22 2277-8-3175 polished To A 600 Grit Finish with 2 PTFE Crevice Washers Attached At 50 In-Oz Using Proto 6104 SN# 139072 cal 2/14/02

Start wt: 32.09878g Santorious Genius SN# 12509099 cal 12/21/01
End wt: 32.09099g

Solution: 0.1 M NaCl
11.683g NaCl Lot# 016405
+ DI water To 2000mls

pH Start: 5.911 Fisher Accumet 950 meter SN# 3340 Cal 7/24/01
pH End: 9.843

Potentiostat: EG+G model # 273 SN# 41108
Counter Electrode: PT Flag
Reference: Fisher 13-620-52 SN# 8210502

Temperature: 95°C Hg Thermometer SN# C96-327 cal 1/10/02

Ecorr: -550 mv Keithley 617 SN# 0579628 cal 3/10/02
Ept: -145 mv

Solution Deaerated with 99.999% N_2

Specimen Examination: Crevice Corrosion on 1/24 face: Gold tint stain on surfaces of specimen

Data C22R119

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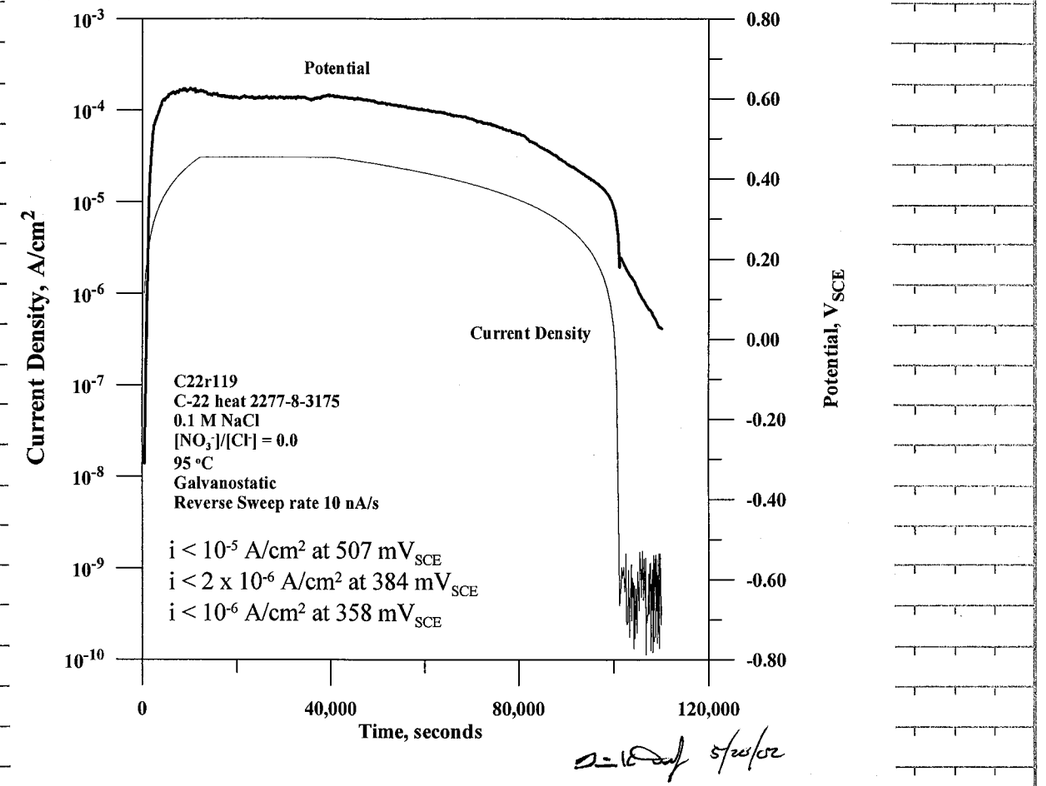

D-L Daft 5/20/02

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Repassivation Potential of Alloy C-22

objective: See pg #1

Specimen: C 22 2277-8-3175 Polished To A 600 Grit Finish with 2 PTFE Crevice Washers Attached At 50 In-Oz Using Proto 6104 sn# 139072 cal 2/14/02

start wt = 31.94920g Santorious Genius sn# 12809099 cal 12/21/0
End wt = 31.94957g

Solution: Simulated Concentrated water (SCW) - $NaNO_3$
6.189g NaF Lot #991559
12.973g KCl Lot # 005573
10.871g NaCl Lot # 016405
41.39g Na_2SO_4 Lot # 010224
192.68g $NaHCO_3$ Lot # 923337A
+ DI water To 2000 mls

pH start: 7.863 Fisher Accumet 950 meter sn# 3340 cal 7/24/01
pH End: 9.519 pH probe # 13-620-296 sn# 1100208

Potentiostat: EG+G model #273 sn# 10120

Counter Electrode: PT Flag

Reference: Fisher 13-620-52 sn# 0192121

Temperature: 95°C Hg Thermometer sn# C96-833 cal 1/14/01

Ecorr: -515 mv Keithley 617 sn# 0579628 cal 3/10/02
EpT: -750 mv

Solution Deaerated with 99.999% N_2
Specimen Examination: No Crevice Corrosion - mlb Surface Staining on Specimen
Dot C22r120 * Repolished Specimen for further Testing

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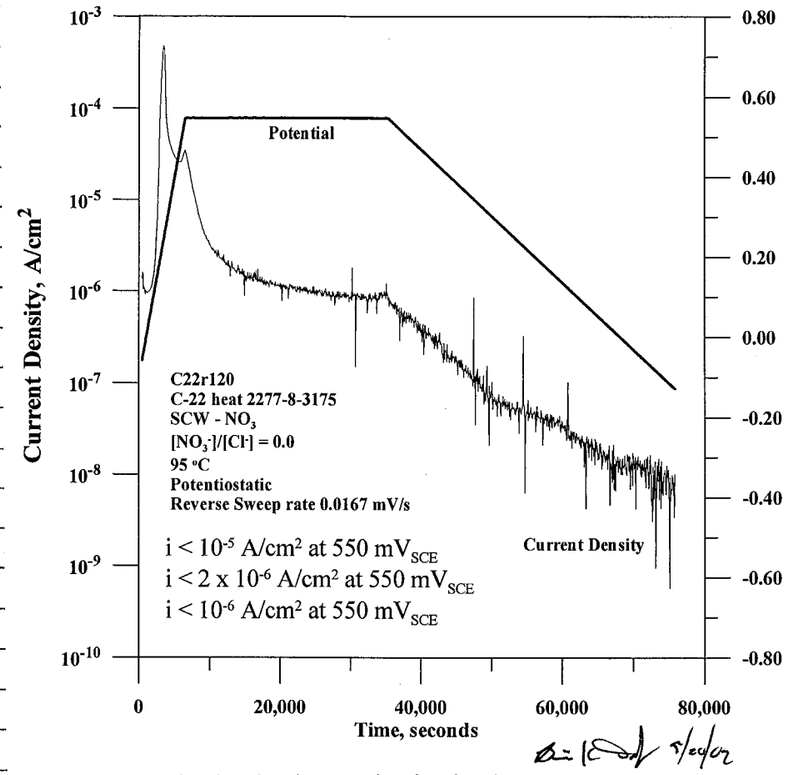

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Initial Scientific notebook entry for polarization resistance measurements

Title: Polarization Resistance Tests

Tests Preformed by: Darrell S. Dunn, Brian Derby, Div. 18, Jonathan Bost Division 20 Summer Student

Objectives: Determine uniform corrosion rate of passive alloys such as Alloy 22 using polarization resistance

Equipment: Keithley 614/617. Solartron 1287 Potentiostat and CorrWare and CorrView Software or equivalent, Electrochemical test cell.

Materials: Alloy C-22, heat 2277-8-3175. Other materials and heats to be added and identified prior to testing.

Specimen specifications: Specimens will be equivalent to 20.01402.571.006 unless otherwise specified.

Measurement Parameters: Temperature, Potential, and Current of specimen during test.

Required level of accuracy: Temperature ± 2 °C, Potentials ± 1mV, Current ± 0.01 microamp.

Uncertainty and Sources of Error: Anodic current assumed to be from anodic dissolution. Current form capacitive charging of the oxide film may interfere with corrosion rate measurement.

Initial Scientific notebook entry for electrochemical impedance measurements

Title: Electrochemical Impedance Tests

Tests Preformed by: Darrell S. Dunn, Brian Derby, Div. 18, Jonathan Bost Division 20 Summer Student

Objectives: Determine uniform corrosion rate of passive alloys such as Alloy 22 using electrochemical impedance

Equipment: Keithley 614/617. Solartron 1287 Potentiostat, Solartron 1260 Impedance/Gain-Phase Analyzer, and ZPlot and ZView Software or equivalent, Electrochemical test cell.

Materials: Alloy C-22, heat 2277-8-3175. Other materials and heats to be added and identified prior to testing.

Specimen specifications: Specimens will be equivalent to 20.01402.571.006 unless otherwise specified.

Measurement Parameters: Temperature, Potential, and Current of specimen during test.

Required level of accuracy: Temperature ± 2 °C, Potentials ± 1mV, Current ± 0.01 microamp.

Uncertainty and Sources of Error: Models for oxide solution interface. Multiple models exist and may be applicable. Models used will be identified.

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Polarization Resistance test for Alloy C-22

Objective: same as pg. 6

Specimen: C-22 2277-8-3175 Polished to a 600 grit finish

start wt: 12.44580 g Sartorius Genius S/N 128 09099 cal 6/4/02
End wt: 12.44530 g

Solution: 0.028M NaCl
3.296 g NaCl Lot: 020814
+ DI H_2O to 2000 ml

pH start: 5.659 Fisher Accumet 950 meter S/N 3390 cal 7/24/01
pH End = 7.023 pH probe # 13-620-296 S/N 1100208

Potentiostat: Solartron 1287

Counter Electrode: Pt flag

Reference: Fisher 13-620-52 S/N 005213

Temperature: 95°C Hg Thermometer S/N H98-162 cal 4/22/02

E_{corr} = -529.4 mV Keithley Model 614 S/N 704936 cal 5/26/02
E_{rt} = -40.3 mV

Solution Deaerated with 99.999% N_2

Specimen Examination: No staining or localized corrosion visible

JB 6/7/02

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Polarization Resistance test for Alloy C-22 (continued from pg. 8)

Test: C22lpr22.cor
Alloy 22; Heat 2277-8-3175; 600grit
scan: ± 0.015 V vs. Open circuit potential
scan rate: 0.0005 mV/second JB 6/10/02
results: R_p = 195 6500 Ω·cm²
E_{corr} = -0.5146 V vs. SCE JB 6/11/02
I_{corr} ~~JB 6/11/02 26.614 μA/cm² = 0.266~~ = 0.02614 μA/cm²
Taffel slopes: $b_a = \infty$
b_c = 120 mV = 0.120 V
Corrosion Rate: ~~0.261 mm/yr~~ 0.000261 mm/yr JB 7/24/02

Data C22lpr22 pg. 12
C22OC1.cor
5 hours

C22lpr23.cor
scan: ± 0.015 V vs. Open circuit potential
scan rate: 0.001 mV/second
results: R_p = 36 03400 Ω·cm²
E_{corr} = -0.4643 V vs. SCE
I_{corr} = ~~11.453 μA/cm²~~ JB 6/11/02 0.011453 μA/cm²
Taffel slopes: $b_a = \infty$
b_c = 120
Corrosion Rate: ~~0.142 mm/yr~~ 0.000142 mm/yr JB 6/14/02

Data: C22lpr23 pg. 12
C22OC2.cor
5 hours

for calculations of R_p, I_{corr}, and C.R, see formulas on pg. 11

continued on pg. 10

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Polarization Resistance Test for Alloy 22 (continued from pg. 9)

C22lpr24.cor
scan: ± 0.015V vs. open Circuit Potential
scan Rate: 0.005 mV/s
results: R_p = 3471200 Ω·cm²
E_{corr} = -0.4643 V vs. SCE
~~I_{corr} = 15.003 µA/cm²~~ JB 6/11/02 0.015002 µA/cm²
Tafel slopes: $b_a = \infty$
b_c = 120 JB 6/11/02
Corrosion Rate: ~~0.147 mm/yr~~ 0.000147 mm/yr
Data: C22lpr24 pg 13

C22 JB 6/10/02 OC3.cor
5 hours

C22lpr25.cor
scan: ± 0.015V vs. open circuit potential
scan rate: 0.01 mV/s
results: R_p = 3283400 Ω·cm²
E_{corr} = -0.4635 V vs. SCE
I_{corr} = ~~15.862 µA/cm²~~ JB 6/11/02 0.015862 µA/cm²
Tafel slopes: $b_a = \infty$
b_c = 120
C.R. = ~~0.155 mm/yr~~ JB 6/11/02 0.000155 mm/yr
Data: C22lpr25 pg. 13

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Polarization Resistance Test for Alloy 22 (cont'd from pg. 10)

Formulas for calculating R_p, I_{corr}, and C.R. using Method I

$$R_p = 1/(\partial I/\partial E)_{E_{corr}} \quad [=] \quad \Omega \cdot cm^2 \equiv$$

$$I_{corr} = \frac{0.434(b_c)}{R_p} \quad [=] \quad Amps/cm^2 \qquad b_c = 120\,mV = 0.120\,V$$

b_c [=] volts

$$C.R. = \frac{(K_1 \times I_{corr} \times E.W.)}{\rho}$$

$K_1 = 3.27 \times 10^{-3}$ mm·g/(µA·cm·yr)
I_{corr} [=] µA/cm²
E.W. = Equivalent weight = 26.04
ρ = density = 8.69 g/cm³

Formulas for calculating I_{corr} and C.R using method II

$$I_{corr} = m(E_{corr}) + b$$

JB 6/11/02
m and b specified ~~from~~ at time of calculat.

$$C.R. = (K_1 \times I_{corr} \times E.W)/\rho$$

continued on pg. 12

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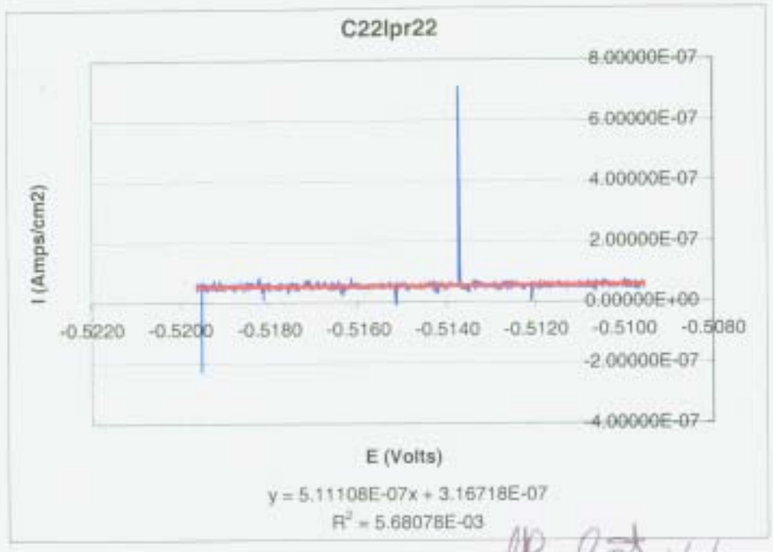
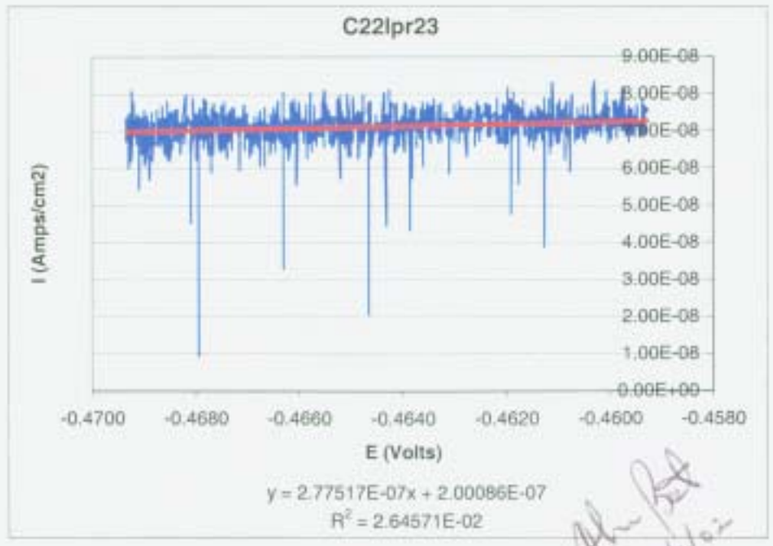
Polarization Resistance ~~for~~ Test for Alloy 22 (continued from pg. 11)
B 6/4/02

Data:



Alan Bast 6/11/02



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Recorded by Alan Bast
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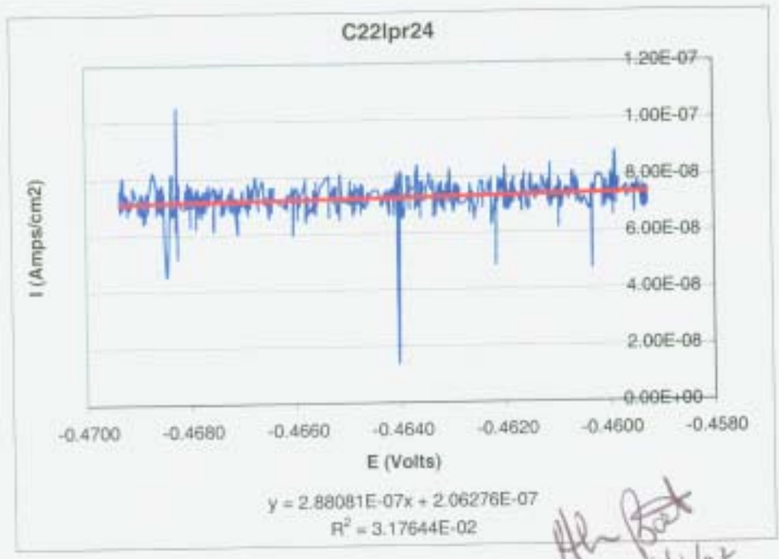
Polarization Resistance Test for Alloy 22 (continued from pg. 12)



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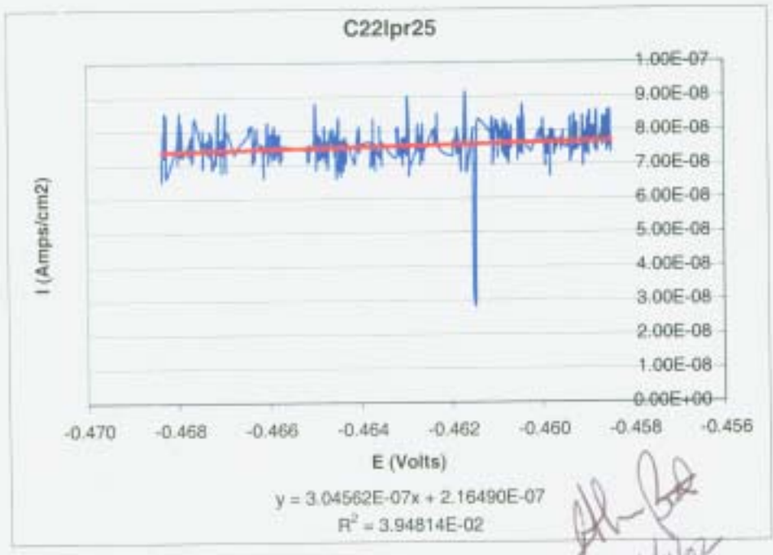

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From Page No. JB 6/11/02 ~~Polarization Potential~~ Polarization Resistance Test for Alloy 22 (continued from pg. 13) JB 6/11/02

Test: C22 lpr 26 JB 6/11/02

Scan: -0.015V (vs. open circuit) to 0.040V (vs. open circuit)

Scan Rate: 0.005 mV/s

Data: C22 lpr 26 (Method I) pg. 15

C22 lpr 26 (Method II) pg. 15

Results: Method I

$R_p = 3656600\ \Omega\ cm^2$

~~$I_{corr} = 1.4243 \times 10^{-5}\ A/cm^2 = 14.243\ \mu A/cm^2$~~ JB 6/17/02

C.R. = ~~0.140 mm/yr~~ JB 6/17/02 0.000140 mm/yr 0.014243 μA/yr

Method II

$b = 2.065911 \times 10^{-7}$

$m = 2.840116 \times 10^{-7}$

$E_{corr} = -0.4689V$ vs. SCE

$I_{corr} = 0.07342\ \mu A/cm^2$

C.R. = 0.000719 mm/yr

Data continued on pg. 15

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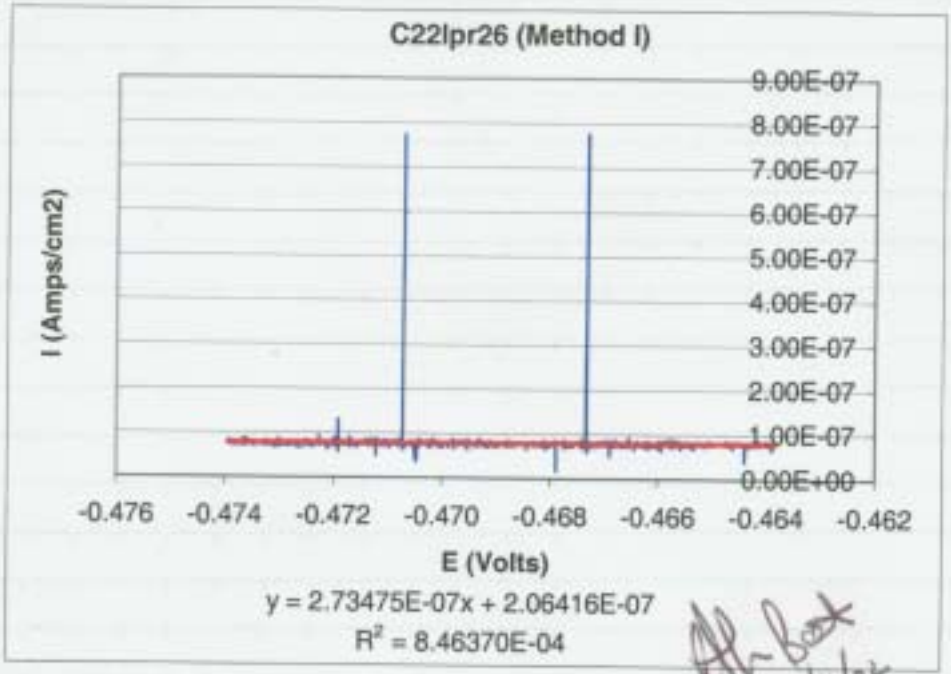
3/6/02 ~~Repassivation Potential~~ Test for Alloy 22 (Continued from pg. 14)
Polarization Resistance

Data:



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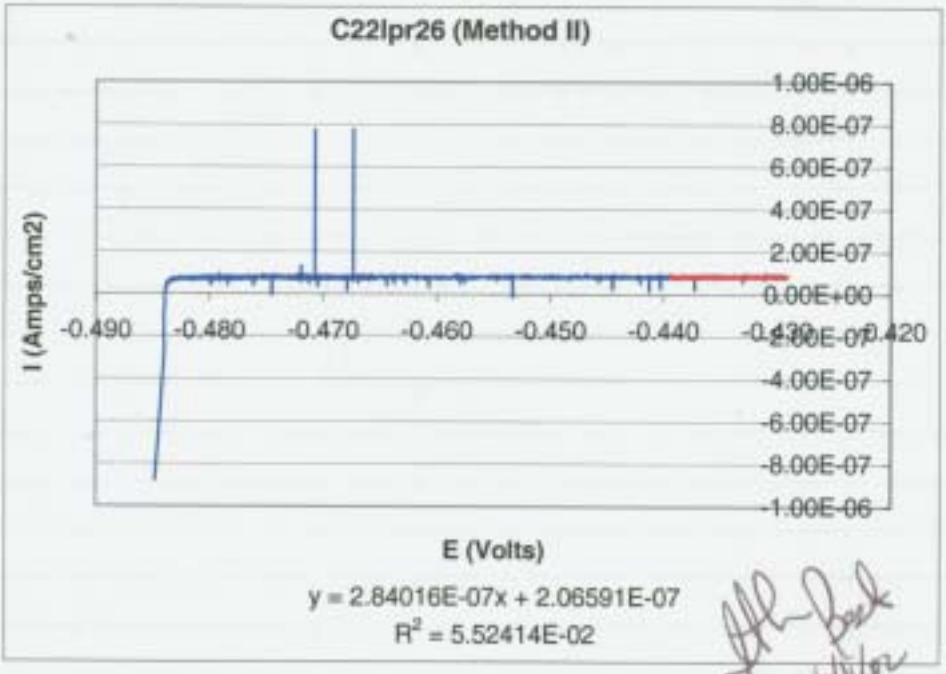

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~~Repassivation Potential~~ Test for Alloy 22 (Continued from pg. 15)

JB 6/12/02 Polarization Resistance

Test: C22lpr27

Scan: ~~-0.015~~ 0.015V ~~-0.05~~ vs. Open circuit potential to 0.040V vs. open circuit potential JB 6/11/02

Scan rate: 0.005 mV/s

Results: Method I

R_p = ~~5414800~~ 5305900 JB 6/11/02 Ω·cm² 6/17/02 JB

I_{corr} = ~~4.818~~ JB 6/11/02 ~~4.815 μA/cm²~~ 0.0098154 μA/cm²

C.R. = ~~0.09423~~ mm/yr JB 6/14/02 0.0000962 mm/yr

~~0.0962~~ JB 6/17/02

Method II

$b = 1.56784 \times 10^{-7}$

$m = 1.74144 \times 10^{-7}$

$E_{corr} = -0.4653$V vs. SCE

$I_{corr} = 7.677 \times 10^{-8}$ A/cm² = 0.07677 μA/cm²

C.R. = 0.000752 mm/yr

Data: C22lpr27 (Method I) pg. 17

C22lpr28 (Method II) pg. 17

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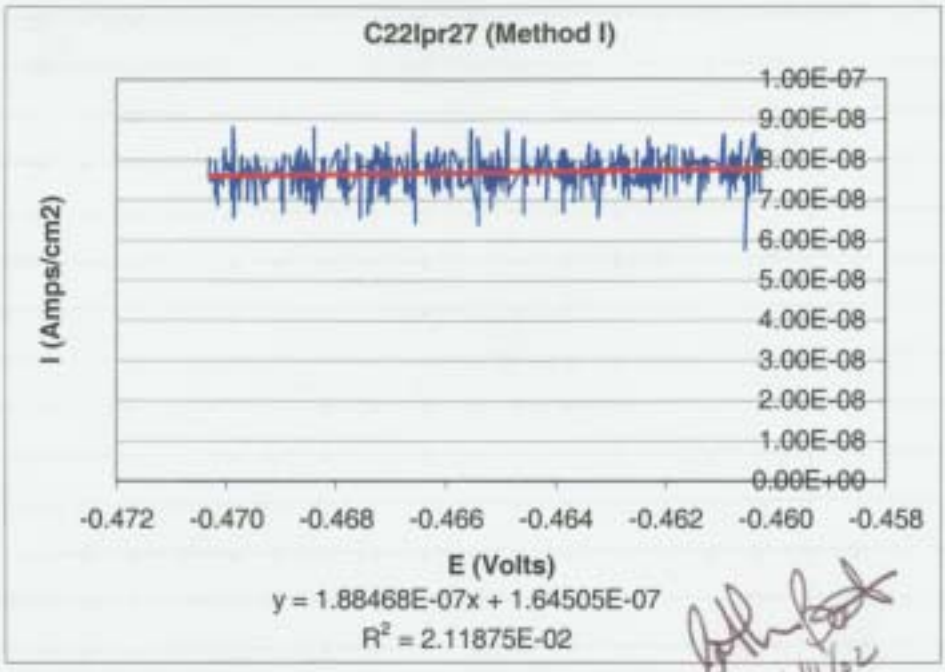
Data:

Polarization Resistance



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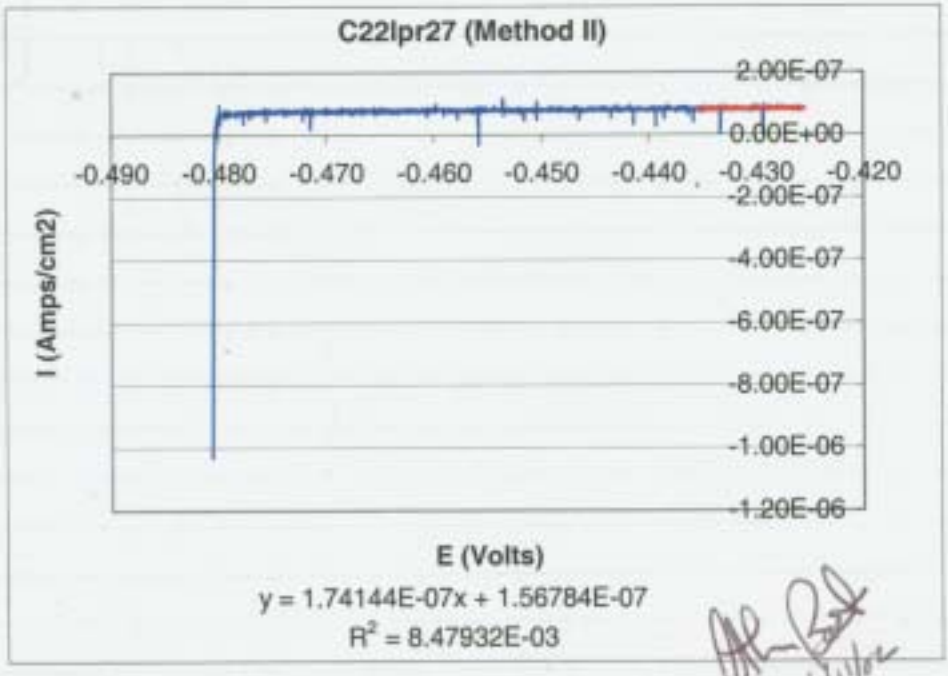

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JB 6/12/02 ~~Repassivation Potential~~ Test for Alloy 22 (continued from pg. 17)

Polarization Resistance

Test: C22 lpr 28

Scan: -0.015V vs. open circuit potential to 0.060V vs. open circuit potential

Scan Rate: 0.005mV/s

Results: Method I

R_p = 4938800 Ω·cm²

JB 6/11/02 JB 6/11/02

I_{corr} = ~~10.545 μA/cm²~~ 0.010545 μA/yr

C.R. = ~~0.103 mm/yr~~ 0.000103 mm/yr

Method II

A. from Data: -0.4349 < E < -0.4249 V

b = 1.80718 x 10⁻⁷

JB 6/11/02 JB 6/11/02

m = ~~2.3226~~ 2.32291 x 10⁻⁷

E_{corr} = -0.4649 V vs. SCE

I_{corr} = 7.272 x 10⁻⁸ A/cm² = 0.07272 μA/cm²

C.R. = 0.000713 mm/yr

JB 6/11/02

~~Method~~

B. from Data: E > ~~0.0~~ JB 6/11/02 -0.4249 V

b = 1.72662 x 10⁻⁷

m = 2.14794 x 10⁻⁷

E_{corr} = -0.4649 V vs. SCE

I_{corr} = 0.07280 μA/cm²

C.R. = 0.000713 mm/yr

Data: C22 lpr 28 (Method I) pg. 14

C22 lpr 28 (Method II) pg. 14

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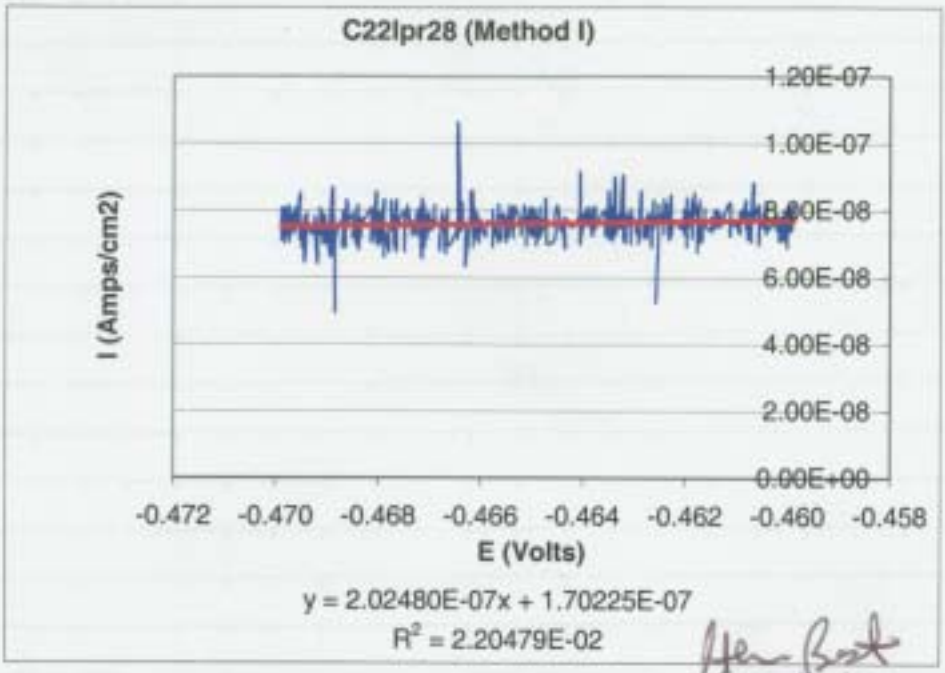
Repassivation Potential Test for Alloy 22 (continued from pg. 18)
Polarization Resistance

Data 1



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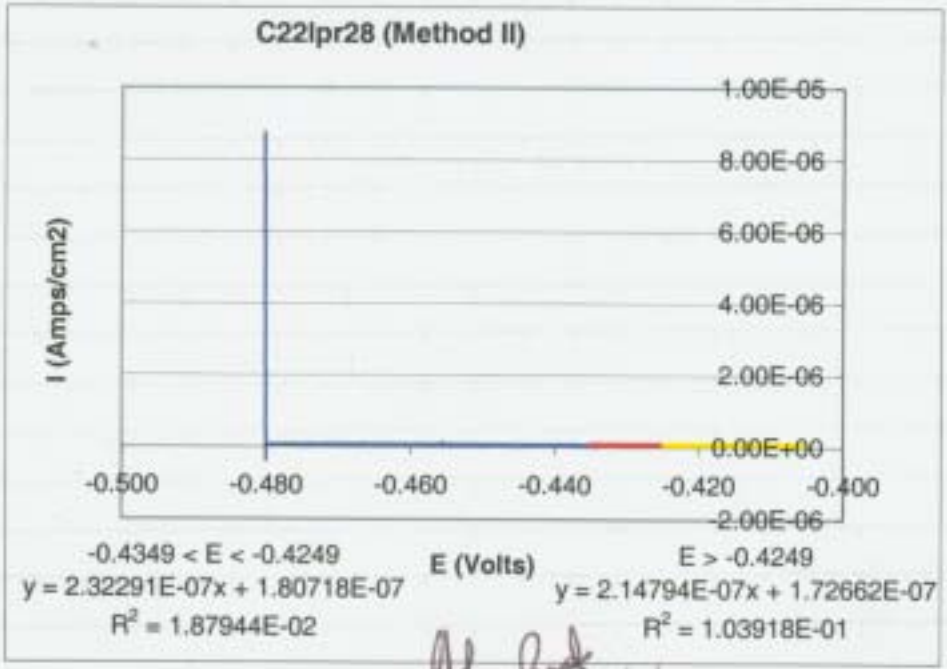

Alan Bott 6/6/02

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Invented by

Recorded by Alan Bott

Date 6/11/02

From Page No.___ | Electrochemical Impedance ~~Measurements~~ Test for Alloy C22 JS 6/12/02

Objective: same as pg. 7

Specimen: C-22 2277-8-3175 Polished to 600 grit finish
start wt: 12.44580 g Sartorius Genius S/N 12809095 cal 6/4/02
End wt: 12.44530 g
same test specimen as pg 8

Solution: 0.028 M NaCl
3.296 g NaCl Lot 020814
+DI H2O to 2000 ml

pH start: 5.65 Fisher Accumet 150 meter S/N 3390 cal 7/24/01
pH End: 7.023 pH probe # 13-620-296 S/N 1100208

Impedance Analyzer: Solartron 1260

Counter Electrode: Pt flag

Reference: Fisher 13-620 52 S/N 0052132

Temperature: 95°C Hg Thermometer S/N H98-162 cal 4/22/02

E_{corr} = -524.7 mV Kithley Model 614 S/N 701936 cal 5/26/02
E_{pt} = -40.3 mV

Solution Deaerated with 99.995% N_2

Specimen Examination: No staining or localized corrosion visible.

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Recorded by [signature] | 6/12/02

From Page No.___ | Electrochemical Impedance Test for Alloy C-22 Continued from pg. 20

Test: C22 eis 13

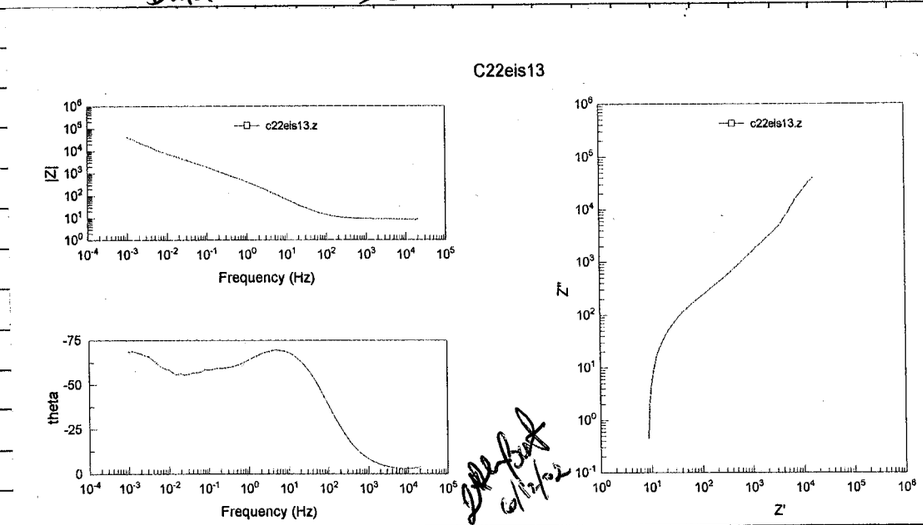
Initial Frequency: 20000 Hz.
Final Frequency: 0.001 Hz.

10 steps per decade

Integration time: 5 seconds
Delay: 2 seconds

Cell info: Area: 8 cm^2
Density: 8.69 g/cm^3
Equivalent weight: 26.04

Data: C22 eis13



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Project No._____
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From Page No.___ | Electrochemical Impedance test for Alloy C-22 (continued from pg 21)

Test: C22 eis 14

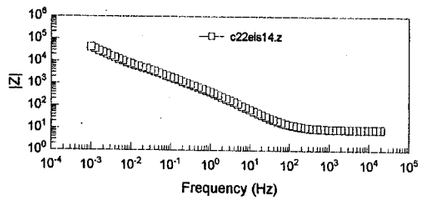
Initial frequency: 20000 Hz
Final frequency: 0.001 Hz

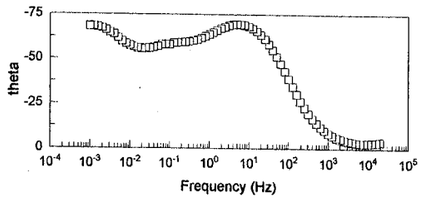
10 steps per decade
Integration time: 5sec.
Delay: 2sec.

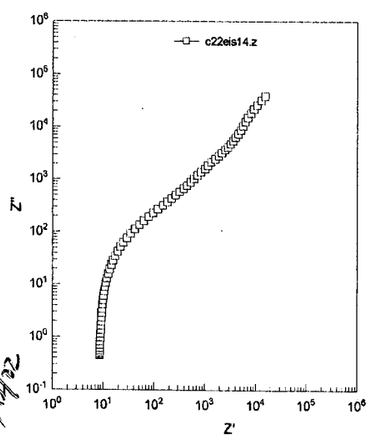
Cell info: Area: 8 cm^2
Density: 8.69 g/cm^3
Eq. wt. = 26.09

Data: C22eis 14

C22eis14







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Project No._____
TITLE _____ Book No._____

From Page No.___ | Electrochemical Impedance Test for Alloy C-22 (continued from 22)

Test: C22 eis 15

Initial frequency = 20000 Hz
Final frequency = 0.0001 Hz

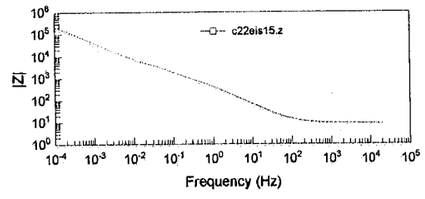
10 steps per decade

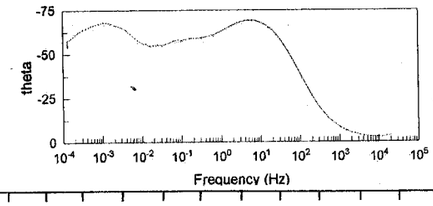
Integration time: 5 seconds
Delay 2 seconds

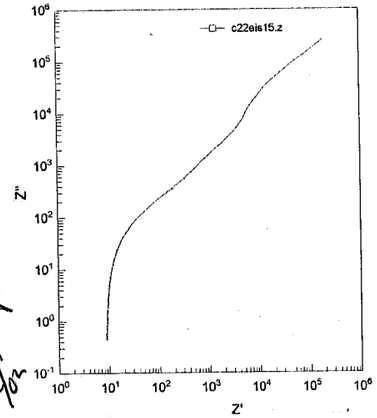
Cell info: Area 8 cm^2
Density: 8.69 g/cm^3
Equivalent: 26.09

Data: C22 eis 15

C22eis15







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Repassivation Potential of Alloy C-22

objective: See pg # 1

specima: C 22 2277-8-3175 Thermally Aged @ 870°C for 5 min See N.B. # 485 pg # 418-419 with 2 PTFE Crevice Washers Attached At 50 In-Oz Using Proto 6104 SN# 139072 cal 2/14/02 - Specimen Polished To 600 Grit Finish

start wt: 39.22810 g Sartorious Genius SN# 12809099 cal 12/21/01

End wt: 39.22801 g

Solution: ~~0.1 M~~ 0.05 M NaCl
5.845 g NaCl Lot # 020814
+ DI water To 2000 mls

pH start: 6.278 Fisher Accumet 950 meter SN# 3340 cal 7/24/01

pH End: 7.127 pH probe # 13-620-296 SN# 1100208

potentiostat: EG&G model # 273 SN# 41108

Counter Electrode: PT Flag

Reference: Fisher 13-620-52 SN# 8210502

Temperature: ~~95°C~~ 60°C M, Thermometer SN# C96-377 cal 1/10/02

Ecorr: -274 mv Keithley 617 SN# 0579628 cal 3/10/02

Ept = +74 mv

Solution Deaerated with 99.999% N_2

Specime Examination: No ~~Sign~~ of Corrosion - No Staining on Specime

* Will Repolish for further Testig

Data C22R121.dat

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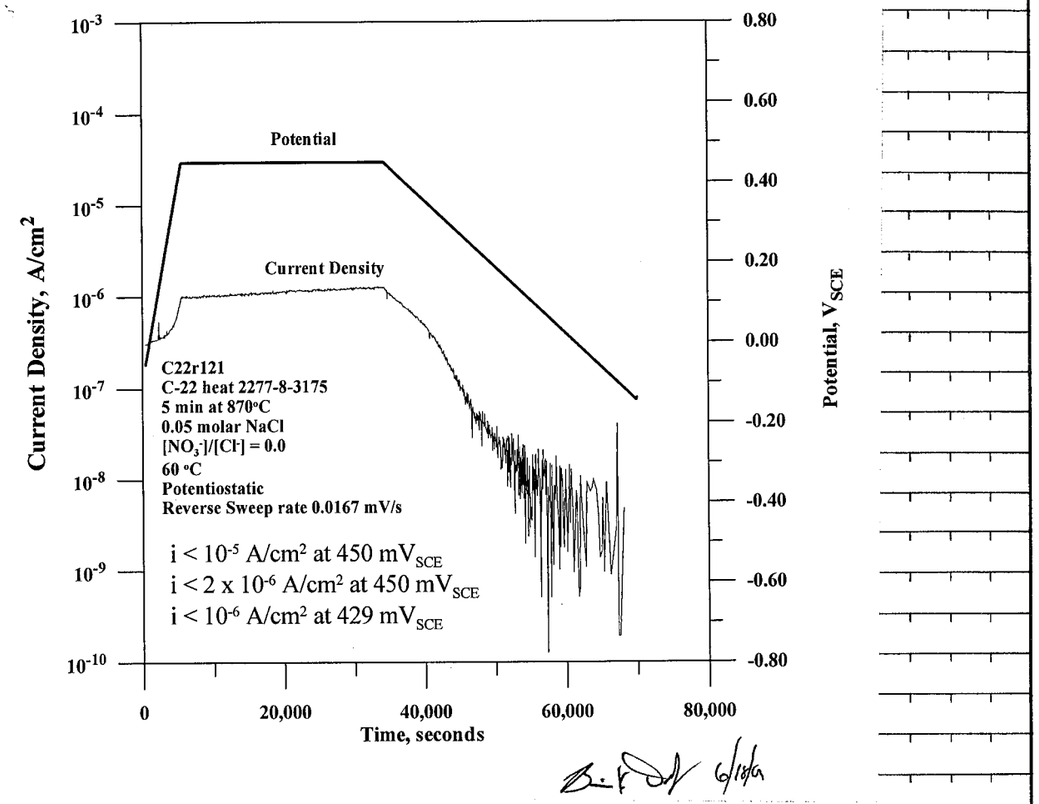

6/18/02

— New Thermally Aged Specimens —

* Thermally Age Procedure of C-22 Alloy Specimens *

7 Total Specimens of C-22 Heat 2277-8-3175

Oven: Lindberg Model # 51333

Checked oven Temp with Omega model HH22 Microprocessor Thermometer SN# T-94140 cal 3/22/02

Thermocouple SN# 326 cal 1/11/02

Oven set Point @ 890°C meter Temperature Reading 899-902°C

Thermally Aged Specimens for 5 min

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Repassivation Potential of Alloy C-22

objective: See pg #1

Specimen: C-22 2277-8-3175 Thermally Aged @ 870 °C for 5 min
polished To A 600 Grit Finish with 2 PTFE Crevice washers Attached At
50 In-oz Using Proto 6104 SN# 139072 cal 2/14/02

Start wt: 32.10787g Sartorious Genius SN# 12809099 cal 12/21/01
End wt: 32.11110g
0.05 M NaCl solution
Solution: ~~0.1~~ M NaCl
5.846g NaCl Lot# 020814
+ DI water To 2000 mls

pH Start: 6.375 Fisher Accumet 950 meter SN# 3340 cal 7/24/01
pH End: 7.432 pH probe # 13-620-296 SN# 1100208

potentiostat: EG & G Model #273 SN# 10130

Counter Electrode: PT Flag

Reference: Fisher 13-620-52 SN# 0192121

Temperature: 80°C Hg Thermometer SN# C96-833 cal 1/10/01

Ecorr: -328mv Keithley 617 SN# 0579628 cal 3/10/02
Ept: -23mv

Solution Deaerated with 99.999% N_2

Specimen Examination: No Crevice Corrosion: M/o staining on surface

* will Replish for further Testing

Data C22r122.dat

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		Recorded by [signature]	6/6/02

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TITLE _____ Book No._____

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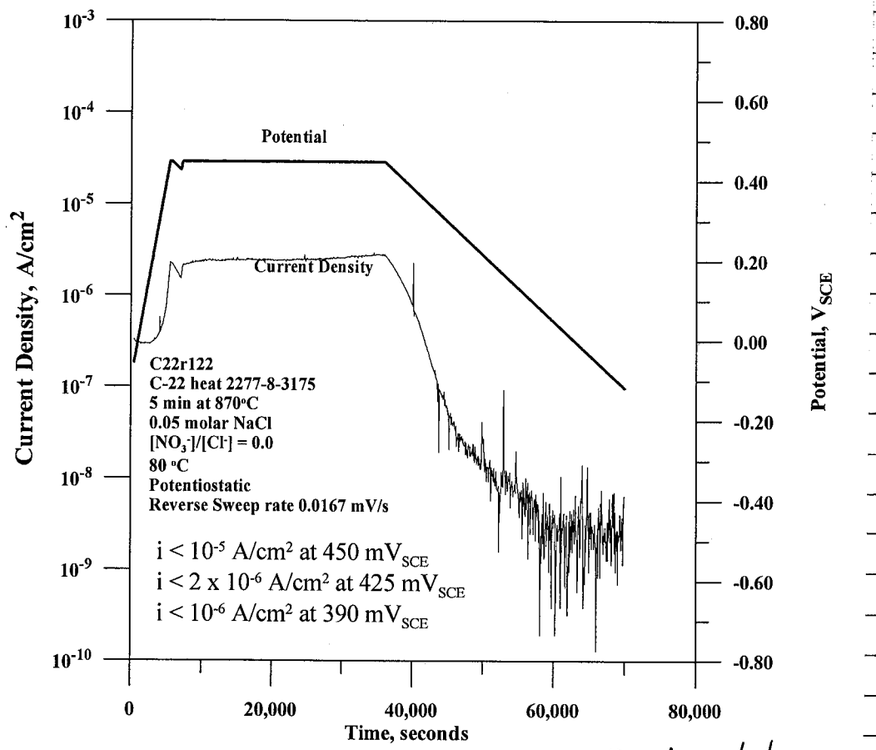

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		Recorded by [signature]	6/18/02

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Repassivation Potential of Alloy C-22

objective: same as pg. 1

Specimen: C22 2277-8-3175 polished to a 600 grit finish with 2 PTFE crevice washers Attached at 50 in-oz using Proto 6104 S/N 139072 cal 2/14/02
Specimen thermally aged @ 870° for five minutes

start wt: 39.2143g Sartorius Genius S/N 128090594 cal 6/4/02
End wt: 39.2129g
0.05 m 6/18/02 gkp

Solution: ~~0.1M~~ NaCl
5.844g NaCl Lot: 020814
+ DI H_2O to 2000 ml

pH start: 6.158 Fisher Accumet 950 meter S/N 3340 cal 7/24/01
pH End: 7.163 pH probe 13-620-296 S/N 1108208

Potentiostat: EG&G model #273 S/N 41108

Counter Electrode: Pt fly

Reference: Fisher 13-620-52 S/N 821052

Temperature: 60°C Hg Thermometer S/N C96-277 cal 1/10/02

$E_{60°C}$ = -226.8 mV Keithley 617 S/N 0575628 cal 3/10/02
E_{Pt} = 262.0 mV JB 6/12/02

Solution Deaerated with 99.999% N_2

Specimen Examination: No crevice corrosion (0 of 24 feet)
No staining
*will repolish for further tests

Data: C22R123

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Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/12/02

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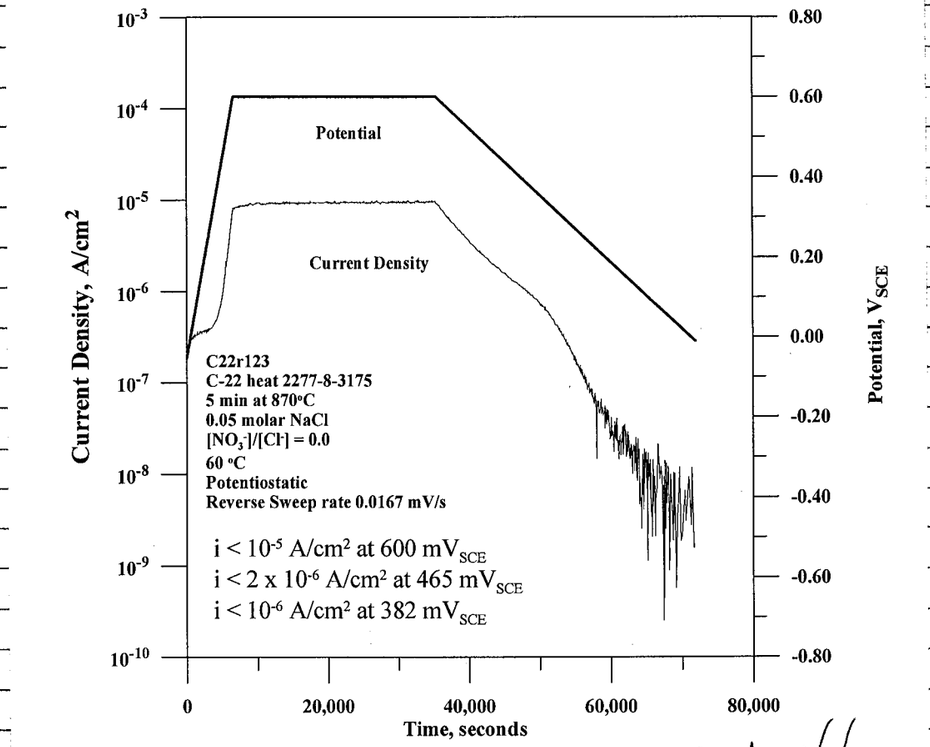

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		Recorded by	6/18/02

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Repassivation Potential of Alloy C-22

objective: Same as pg. 1

Specimen: C-22 2277-8-3175 polished to a 600 grit finish with 2 PTFE crevice washers attached using Ti to 610 in-oz at 50 in-oz S/N 139072 cal 2/14/02
Specimen thermally aged at 870°C for 5 min

Start wt: 32.08496 g Sartorius Genius S/N 128890 99
End wt: 32.08029 g

Solution: ~~0.1 M~~ 0.05 M 6/18/02 6/12 $NaCl$
5.844 g NaCl Lot 020814
+DI H_2O 2000 ml

pH start: 5.965 Fisher Accumet 950 meter S/N 3340 cal 7/29/21
pH End: 7.797 pH probe # 13-620-296 S/N 1100208

Potentiostat: EG&G Model #273 S/N 1020

Counter Electrode: Pt Alloy

Reference: Fisher 13-620-52 S/N 014212 1

Temperature: 80°C Hg Thermometer S/N C96-832 cal 1/10/01

E_{corr} = -221.6 mV Kiethley 617 S/N 0579628 cal 3/14/02
E_{pt} = 45.3 mV

Solution Deaerated with 99.999 % N_2

Specimen Examination: Crevice corrosion on 6 of 24 feet:
mild staining on all surfaces.

Data: C22R124

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Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/12/02

TITLE _____ Book No._____ Project No._____

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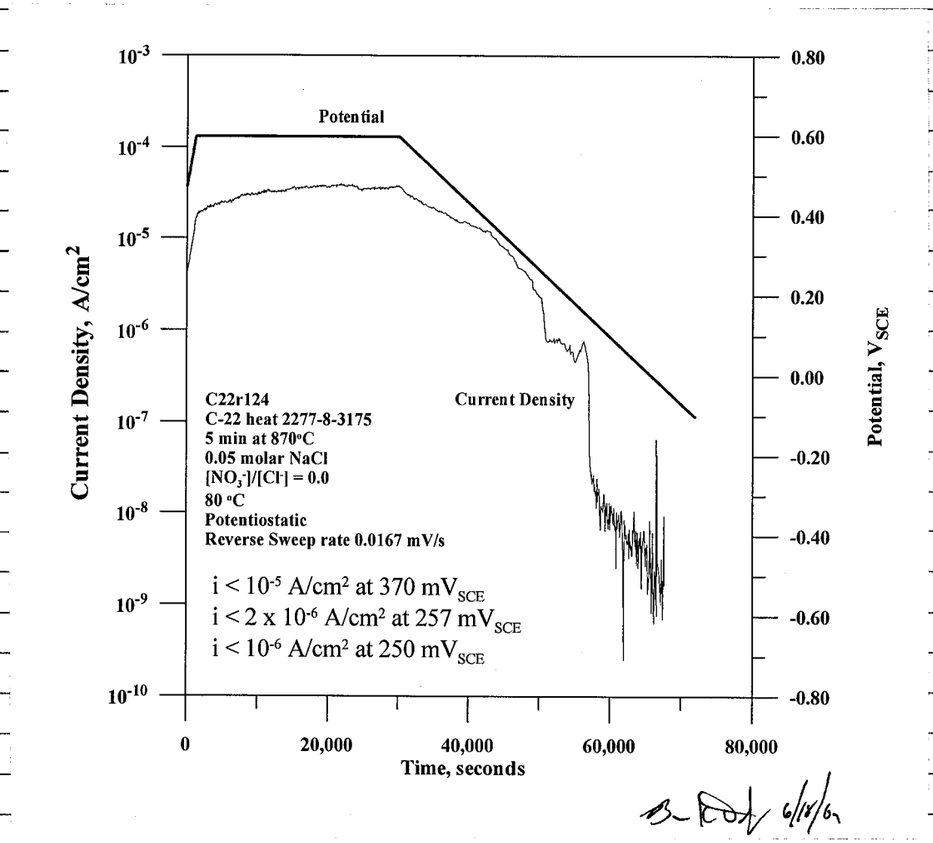

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Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/18/02

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Repassivation Potential of Alloy C-22

objective: same as pg. 1

specimen: C-22 2277-8-3175 polished to a 600 grit Finished with 2 PTFE crevice washers attached at 50 in-oz using Proto 6104 s/N 129072 cal 2/14/02
specimen thermally aged @ 870°C for 5 min

start wt: 32.21233 g Sartorius Genius s/N 12809894 cal 6/4/02
End wt: 32.20578 g
0.25 m 6/18/02

Solution: ~~0.5~~ m NaCl
29.222 g NaCl Lot 020814
+DI H_2O to 2000 ml

pH start: 5.715 Fisher Accumet 950 meter s/N 3340 cal 7/24/01
pH End = 7.354 pH probe # 13-620-296 s/N ~~#~~ 1100208 6/13/02

potentiostat: EG&G model #273 s/N 4108

Counter Electrode: Pt flag

Reference: Fisher 13-620-52 S/N 8210582

Temperature: 60°C Hg Thermometer S/N C96-377 cal 1/11/02

E_{corr} = -378.1 mV Keithley 617 S/N 0579627 cal 5/10/02
E_{pt} = 178.7 mV

Solution Deaerated with 99.999% N_2

Specimen Examination: crevice corrosion initiated on 4 of 24 feet
mild staining on all surfaces

Data: C22R12 6/18/02

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Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/13/02

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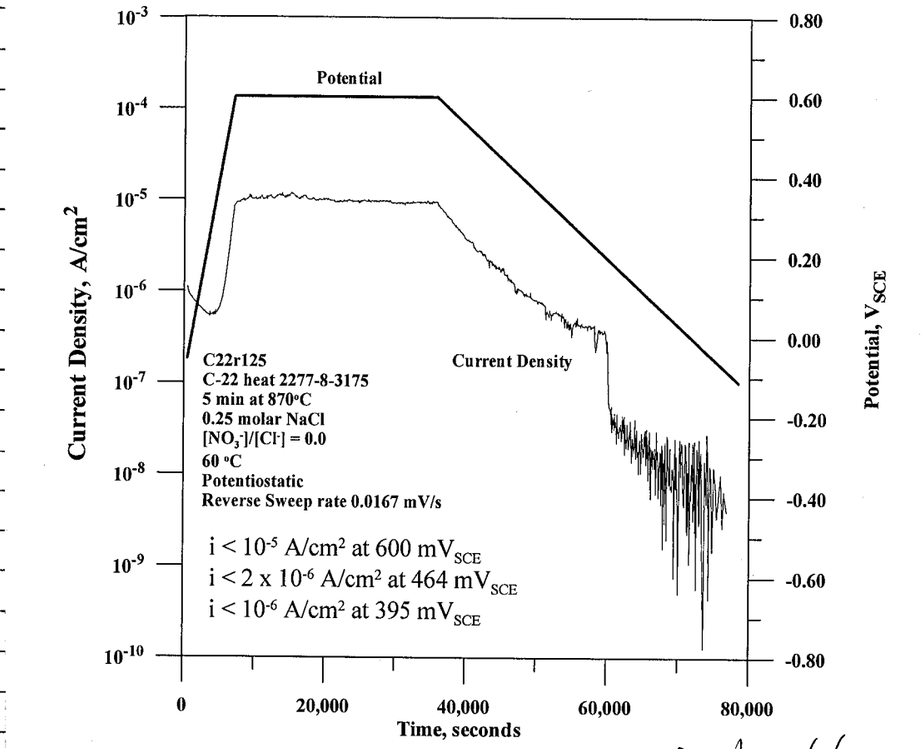

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Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/18/02

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Book No._____ TITLE _____

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Repassivation Potential of Alloy C-22

Objective: Same as page 1

Specimen: C-22 heat: 2277-8-3175 polished to a 600 grit finish with 2 PTFE crevice washers attached at 50 in-oz using Proto 6104 S/N 139072 cal 3/14/02
Specimen thermally aged ~~for~~ 3/6/24/hr @870°C for 5 min.

start wt: 31.99489 g Sartorius beam S/N 12809049 cal: 6/4/02

End wt: 31.98846 g

0.25 m 6/18/02

Solution: ~~0.5 M~~ NaCl
29.221 g NaCl Lot 020814
+DI H_2O up to 2000 ml

pH start: 5.760 Fisher Accumet 950 meter S/N 3340 cal 7/24/01
pH End: 7.926 pH probe #13-620-296 S/N 1100208

potentiostat: EG&G Model #273 S/N 10120

Counter Electrode: Pt fly

Reference: Fisher 13-~~620~~-52 S/N 0192121
6/4/02

Temperature: 80°C Hg Thermometer S/N C96-833 cal 1/10/02

E_{corr}: -488.2 mV Keithley 617 S/N 0579628 cal 3/10/02
E_{pt}: -27.2 mV

Solution Deaerated with 99.999% N_2

Specimen Examination: Crevice corrosion initiated in 3 of 24 feet
mild staining on all surfaces

Date: C22R126 ~~3/6/18/02~~

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Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/13/02

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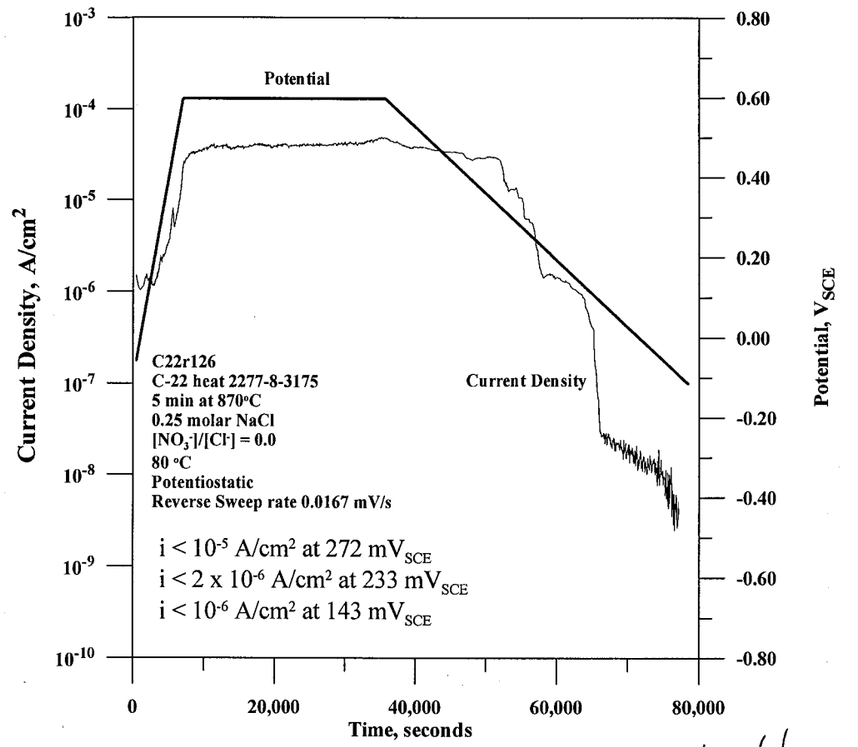

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Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/18/02

Project No.

Book No. TITLE

From Page No. | Polarization Resistance Test for Alloy C-22 (cont'd from pg. 19)

Test: C22lpr29

Scan: -0.015 V vs. open circuit to +0.060 V vs. open circuit potential

Scan Rate: 0.1 mV/s

E_{corr} = -0.4841 V vs. SCE

Results: Method I

R_p = 83211.3 Ω·cm² 6/17/02

I_{corr} = ~~625.877 μA/cm²~~ 0.62588 μA/cm²

C.R. = ~~6.13 mm/yr~~ 0.00613 mm/yr

JB 7/24/02

Method II

A. From Data -0.484 < E < -0.4441 vs. SCE ~~Open Circuit~~

JB 6/14/02

b = 6.51364 x 10^{-7}

m = -9.19 64~~88~~ JB 7/24/02

I_{corr} = 0.6959 μA/cm²

C.R. = 0.00682 mm/yr

B. From Data E_{corr} + 40 mV to + E + 60 mV vs. Open Circuit (E > -0.4441)

b = 6.17759 x 10^{-7}

m = -1.40509 x 10^{-7}

I_{corr} 1.298 μA/cm²

C.R. = ~~0.012 mm/yr~~ 0.00672 mm/yr

JB 6/14/02

Data: C22lpr 29 (Method I) pg. 37

C22lpr 29 (Method II) pg. 37

Continued on pg. 37

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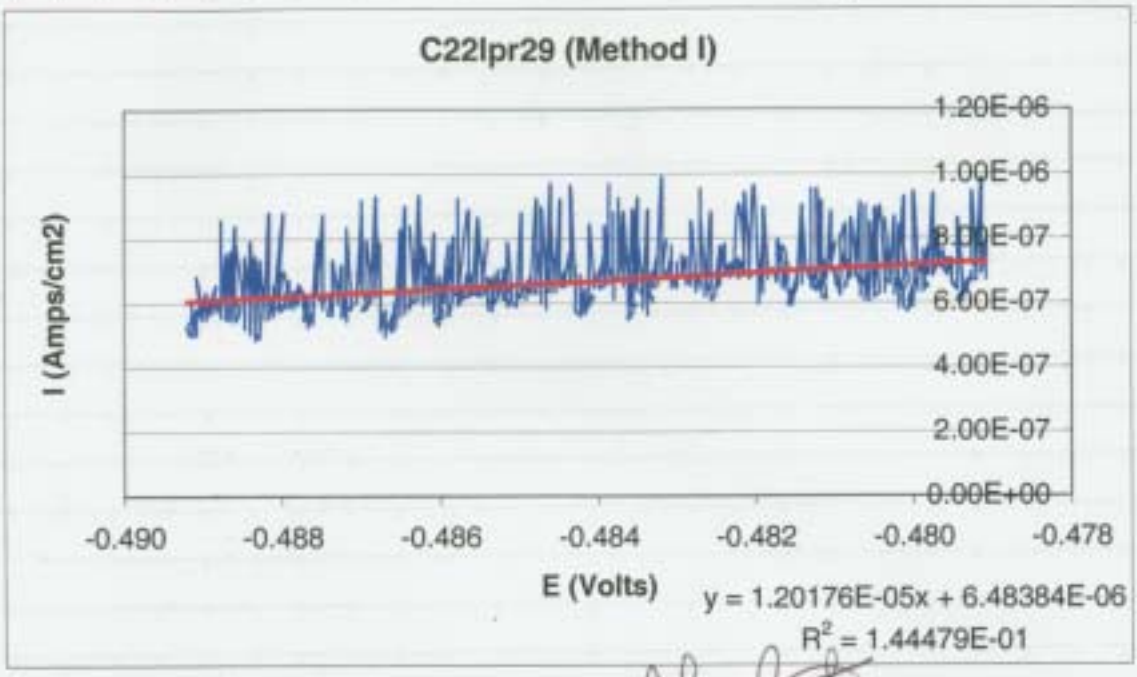
Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by John Best	6/17/02

From Page No. Polarization Resistance Test for Alloy C-22 (cont'd from pg. 36



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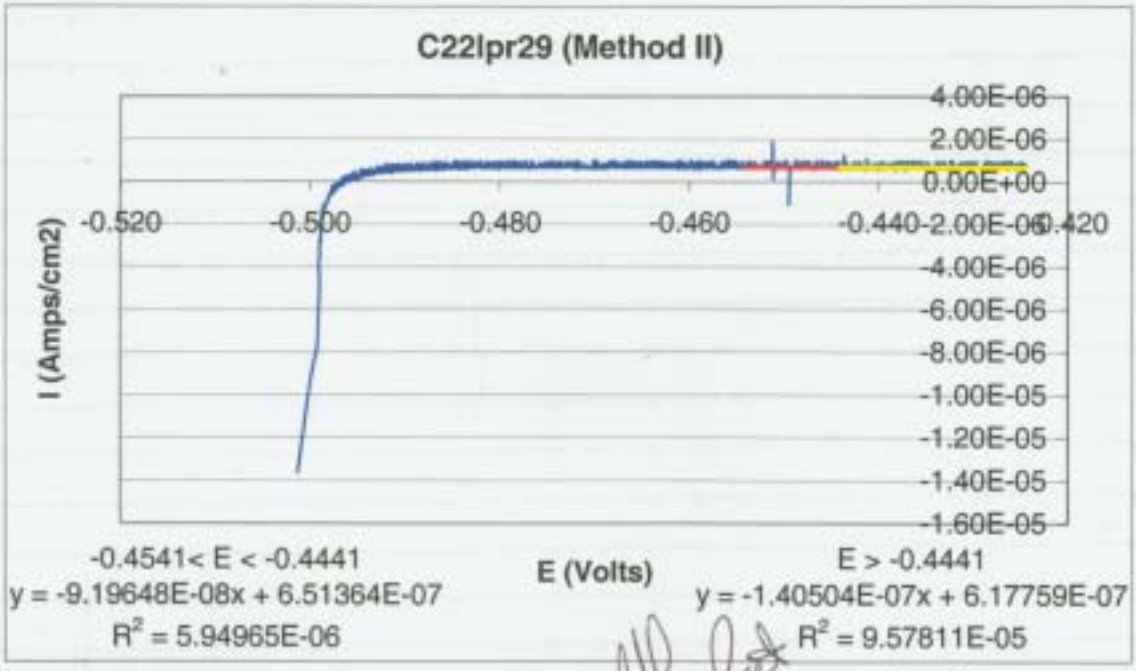

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		Recorded by 6/13/02	6/13/02

Project No._____

Book No._____ TITLE _____

From Page No.____ Polarization Resistance Tests for Alloy C-22 (continued from pg. 37)

Test: C22 lpr 30

Scan: -0.015V to ~~+0.060~~ 0.060 V vs. Open Circuit Potential JB 6/13/02

Scan Rate: 1 mV/s

E_{corr} = -0.4648 V vs. SCE

Results: Method I: R_p = 15281.1 Ω·cm² JB 6/14/02

I_{corr} ~~3.408 μA/cm²~~ JB 6/17/02 3.408 μA/cm²

C.R. = ~~33.4 mm/yr~~ 0.0334 mm/yr JB 6/17/02

Method II (A) for Data: -0.4398 < E < -0.4298 vs. SCE

~~Open Circuit~~ JB 6/14/02

b = -5.43546 x 10⁻⁷

m = -5.88388 x 10⁻⁶

I_{corr} = 2.191 μA/cm²

C.R. = 0.0215 mm/yr

(B) for Data: E > -0.4298 V vs ~~Open Circuit~~ SCE JB 6/14/02

b = ~~2.474 μA/cm²~~ JB 6/13/02 -1.73403 x 10⁻⁶

m = -9.05344 x 10⁻⁶

I_{corr} = 2.474 μA/cm²

C.R. = 0.0242 mm/yr

Data: C22 lpr 30 (Method I) pg. 34

C22 lpr 30 (Method II) pg. 33

(continued on pg. 39

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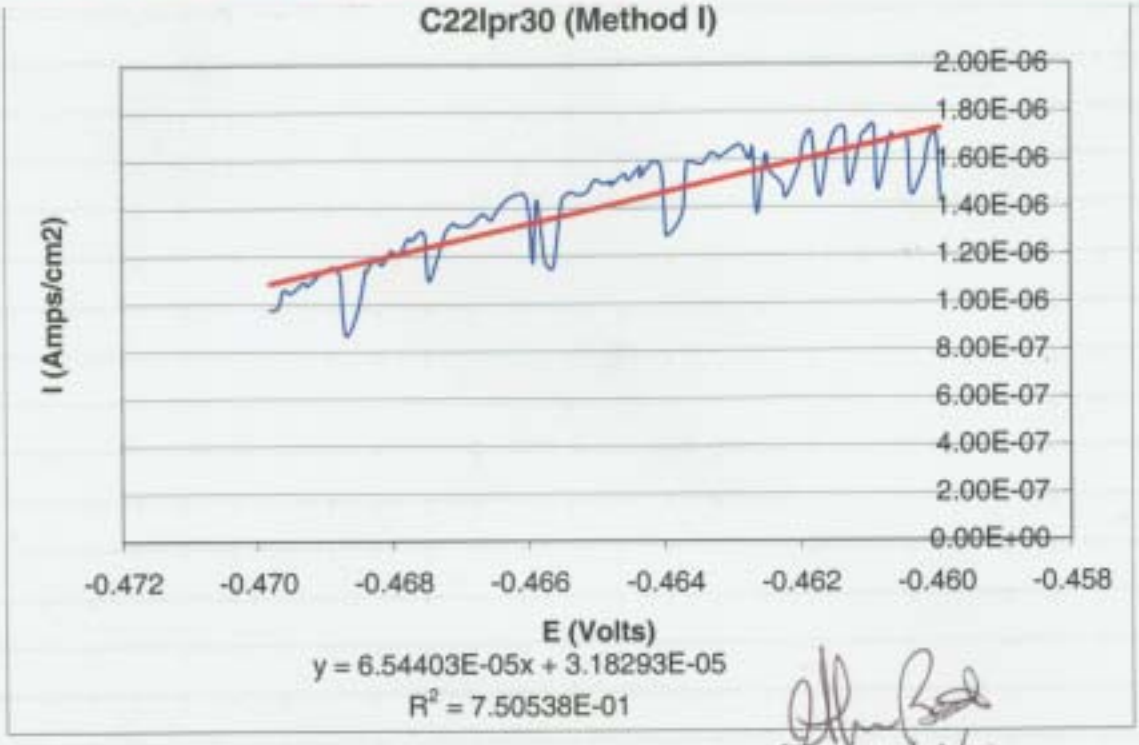
		Recorded by	6/13/02

From Page No. Polarization Resistance Test for Alloy C-22 (continued from pg. 38)



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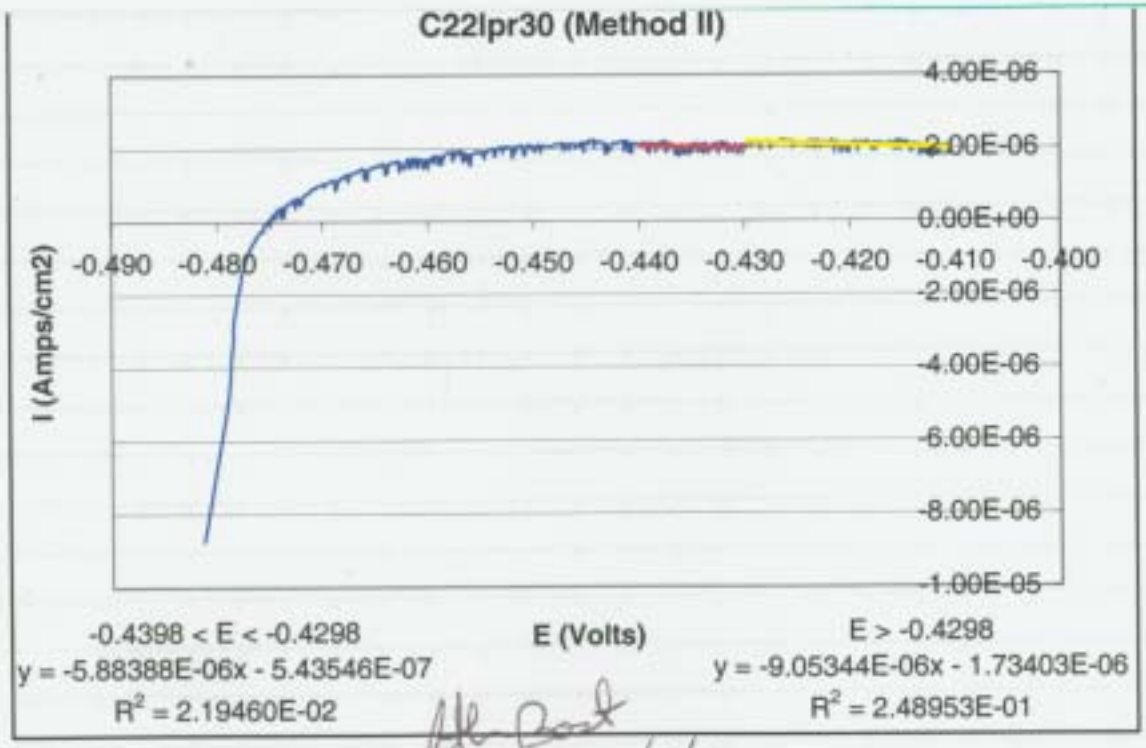

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Witnessed & Understood by me.	Date	Invented by	Date
		Recorded by	6/13/02

Project No._____
Book No._____ TITLE _____

From Page No.___ | Polarization Resistance Test for Alloy C-22

objective: same as pg. 6

specimen: C-22 Heat: 2277-8-3175 Polished to a 600 grit finish

start wt: 12.44580 g Sartorius Genius S/N 17809099 cal: 6/4/02
End wt: 12.44530 g
same test specimens pg. 8

Solution: 0.028M NaCl
3.296 g NaCl Lot: 020814
+DI H_2O to 2000ml

pH start: 5.659 Fisher Accumet 950 meter S/N 3340 cal 7/21/01
pH End: 7.023 pH probe # 13-620-296 S/N 1100208

Potentiostat: Solartron 1287

Counter Electrode: Pt flag

Reference: Fisher 13-620-52 S/N 00 52132

Temperature: 80°C Hg Thermometer S/N H98-162 cal: 4/22/02

E_{corr} = -524.4mV Keithley Model 614 S/N 704936 cal: 5/26/02
E_{pt} = -40.3mV

Solution Deaerated with 99.999% N_2

Specimen Examination: No staining or localized corrosion visible

Continued on pg. 41

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Witnessed & Understood by me, | Date | Invented by | Date

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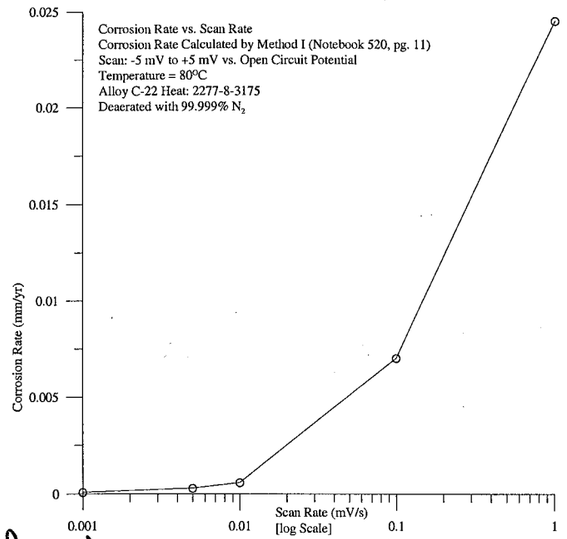
TITLE _____ Project No._____
Book No._____

From Page No.___ | Polarization Resistance Test for Alloy C-22 (continued from pg. 41)

Data:



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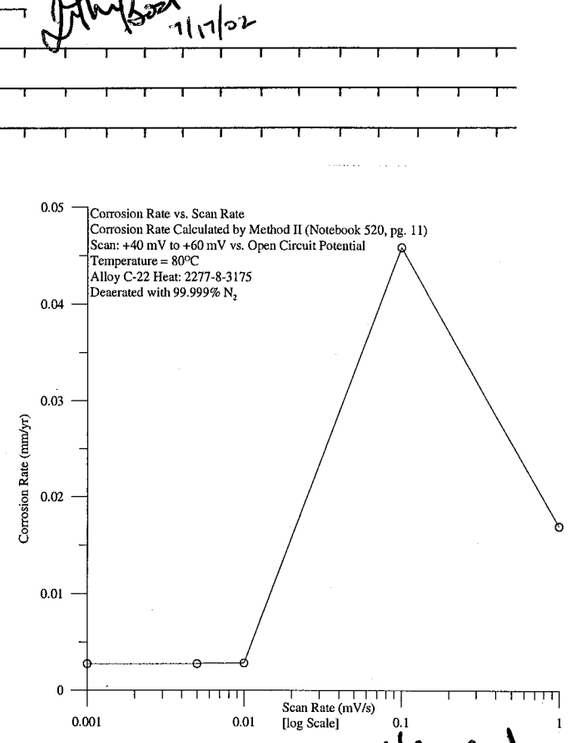

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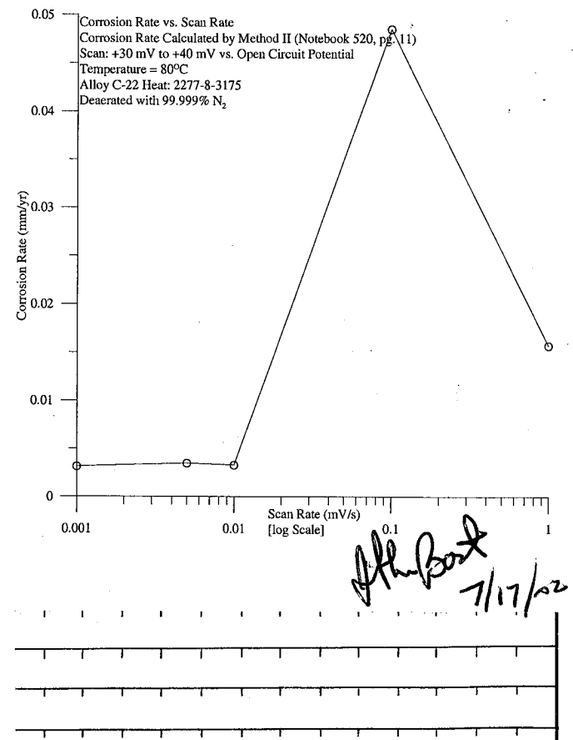

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Continued on pg. 42

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Witnessed & Understood by me, | Date | Invented by | Date

Recorded by [signature] 7/17/02

From Page No. | Polarization Resistance Test for Alloy C-22 (Continued from pg. 41)

Test: C22 lpr 31

scan: ~~-0.15V~~ -0.016V vs. open circuit potential to +0.060 V vs. open circuit potential JB 6/14/02

scan rate: 1mV/s

E_{corr} = -0.4619 V vs. SCE

Results: Method I (see formulas, ~~calculations~~ pg. 11) JB 6/14/02

R_p = 20797.0 $\Omega \cdot cm^2$

I_{corr} = ~~2504 $\mu A/cm^2$~~ JB 6/17/02 2.5042 $\mu A/cm^2$

C.R. = ~~24.5 mm/yr~~ JB 6/17/02 0.0245 mm/yr

Method II (see formulas, pg. 11)

A. from Data: +30mV vs. open circuit to +40mV vs. open circuit

b = 97.2010 x 10^{-7}

m = -1.36632 x 10^{-6}

I_{corr} = 1.603 $\mu A/cm^2$

C.R. = 0.0157 mm/yr

B. from Data: +40mV vs. open circuit to +60mV vs. open circuit (E > -0.4219)

b = -8.40451 x 10^{-8}

m = -3.94887 x 10^{-6}

I_{corr} = 1.740 $\mu A/cm^2$

C.R. = 0.0170 mm/yr

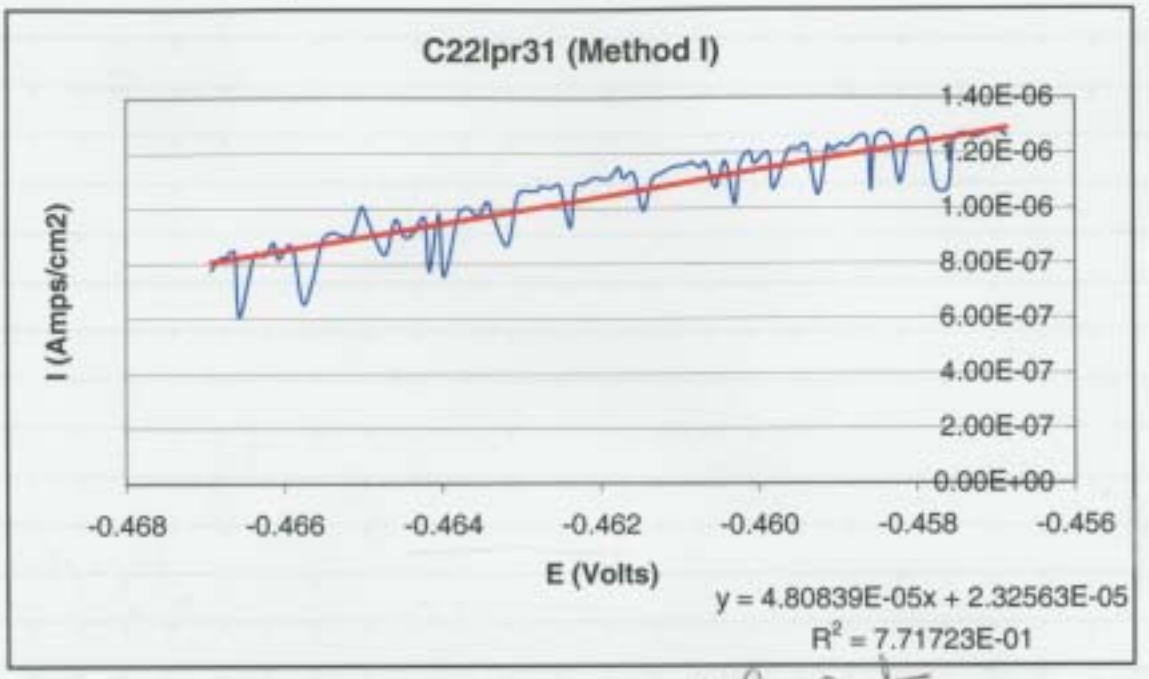
Data: C22 lpr 31 (Method I) pg. 43

C22 lpr 31 (Method II) pg. 43

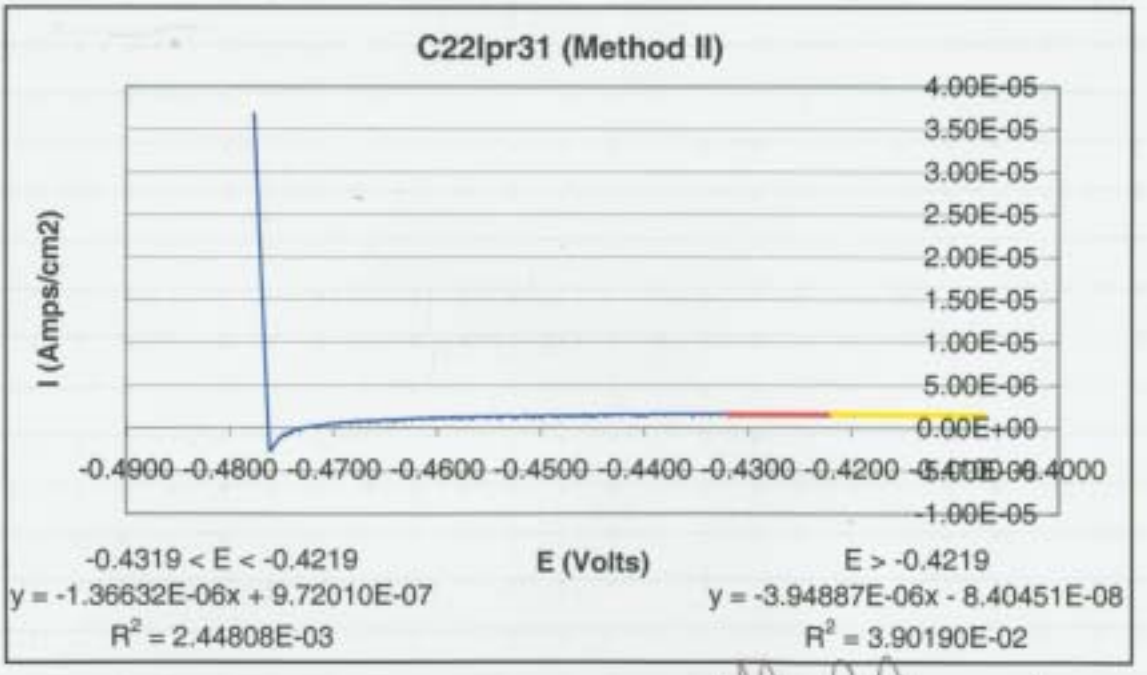
Continued on pg. 43

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/14/02

From Page No. Polarization Resistance Test for Alloy C-22 (continued from pg. 42)



6/14/02



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Continued on pg. 44

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/14/02

From Page No. | Polarization Resistance test for Alloy C-22 (continued from pg. 43)

Test: C22 lpr 32

scan: -0.015 V vs. open circuit potential to +0.060V vs. open circuit potential

scan rate: 0.1 mV/s

E_{corr} = -0.4383 V vs. SCE

Results: Method I (see formulas pg. 11)

R_p = 72658.6 Ω·cm²

I_{corr} = ~~716.8 μA/cm²~~ JB 6/17/02 0.71678 μA/cm²

C.R. = ~~7.02 mm/yr~~ JB 6/17/02 0.00702 mm/yr

Method II

A. From Data: +30mV vs. open circuit to +40mV vs. open circ (-0.4083 < E < 0.3483 V)

b = 4.06386 x10⁻⁷

m = -2.02493 x10⁻⁷

I_{corr} = 0.4951 μA/cm²

C.R. = 0.004852 ~~μA/cm²~~ mm/yr JB 6/14/02

B. From Data: +40mV vs. open circuit to +60mV vs. open circuit (E7 - 0.3983)

b = 7.41497 x10⁻⁷

m = 6.23176 x10⁻⁷ JB 6/14/2

I_{corr} = ~~0.1332 μA/cm²~~ 0.4683 μA/cm²

C.R. = ~~0.00131 mm/yr~~ JB 6/14/02 0.00459 mm/yr

Data: C22 lpr 32 (Method I) pg 45

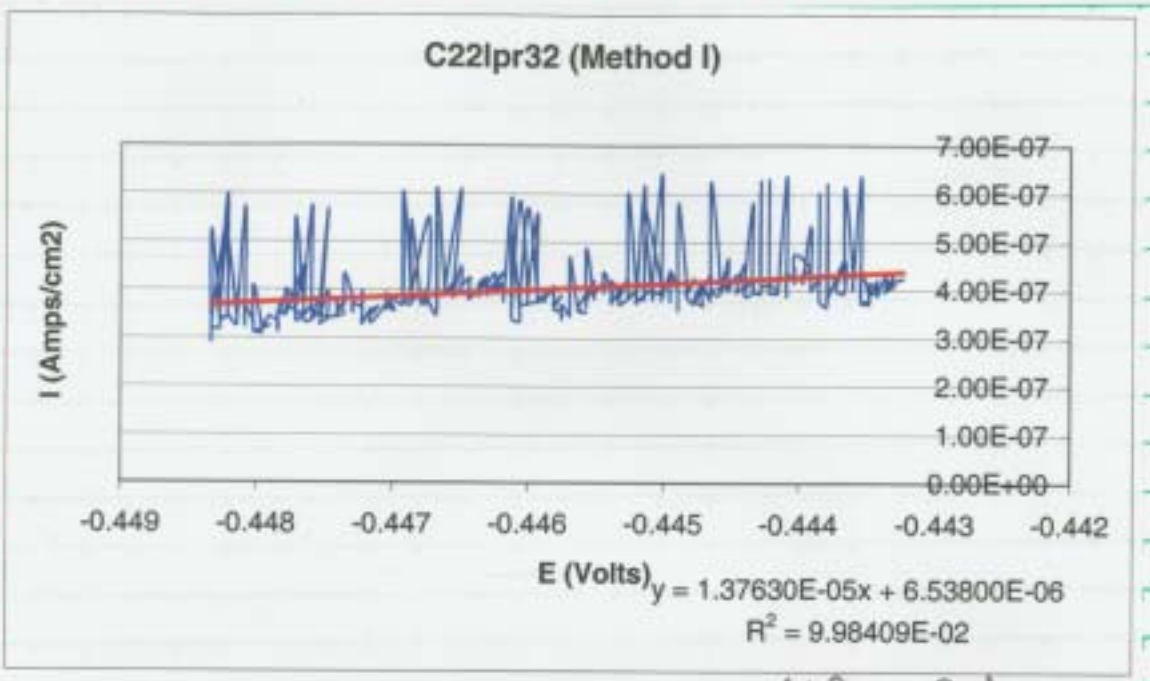
C22 lpr 32 (Method II) pg. 45

continued on pg 45

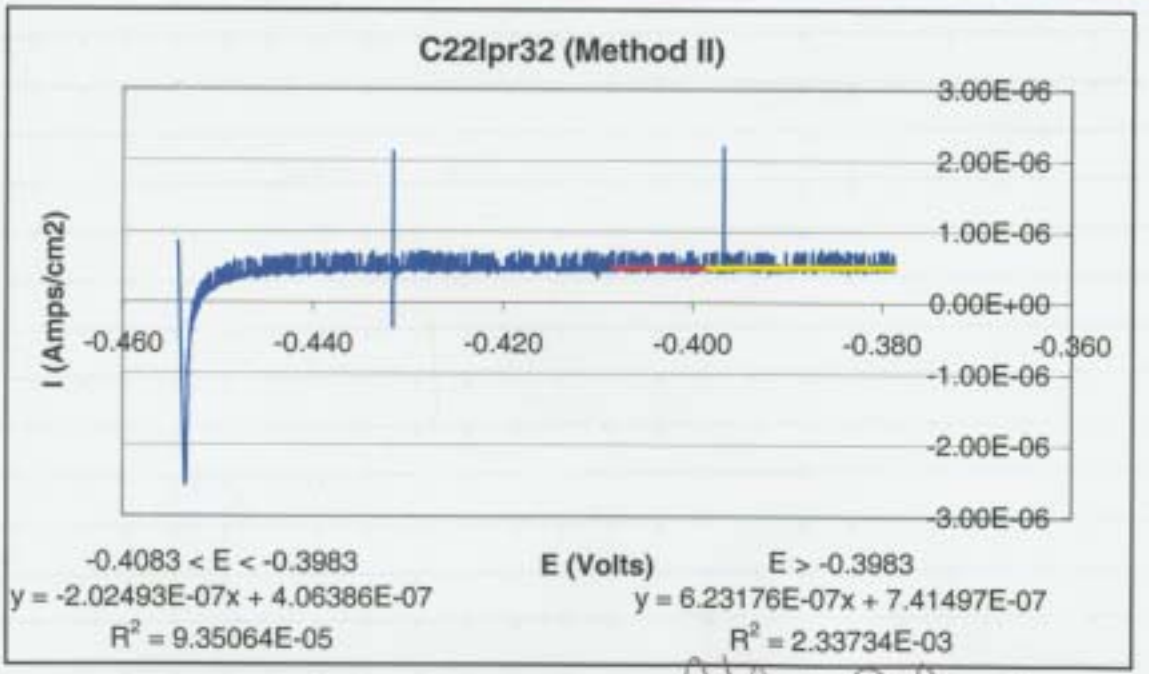
To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/14/02

From Page No. Polarization Resistance test for Alloy C-22 (continued from pg 44)



6/14/12



6/14/12

(Continued on pg 46)

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/14/12

From Page No.___ | Polarization Resistance Test for alloy C-22 (continued from pg. 45)

Test: C22 lpr 33

scan: -0.015V vs. open circuit potential to +0.060V vs. open circuit potential
Scan rate: 0.01 mV/s

E_{corr} = -0.4189 V vs. SCE

Results: Method I (see formulas pg. 11)

R_p = 878781 $\Omega \cdot cm^2$
I_{corr} = ~~5.926 μA/cm²~~ JB 6/17/02 0.059264 $\mu A/cm^2$
C.R. = ~~0.581 mm/yr~~ JB 6/17/02 0.000581 mm/yr

Method II (see formulas pg. 11)

A. From Data: +30mV vs. open circuit to +40mV vs. open circuit
(-0.3884 < E < -0.3789 V)
b = 5.65975 x10⁻⁷
m = 5.53878 x10⁻⁷
I_{corr} = ~~0.0~~ JB 6/14/02 0.3340 $\mu A/cm^2$
C.R. = ~~0.00327 mm/yr~~ 0.00327 mm/yr
JB 6/14/02

B. From Data: +40mV vs. open circuit to +60mV vs. open circuit
b = 9.72202 x10⁻⁷
m = 1.63108 x10⁻⁶
I_{corr} = 0.2889 $\mu A/cm^2$
C.R. = 0.00283 ~~μA/cm²~~ mm/yr
JB 6/14/02

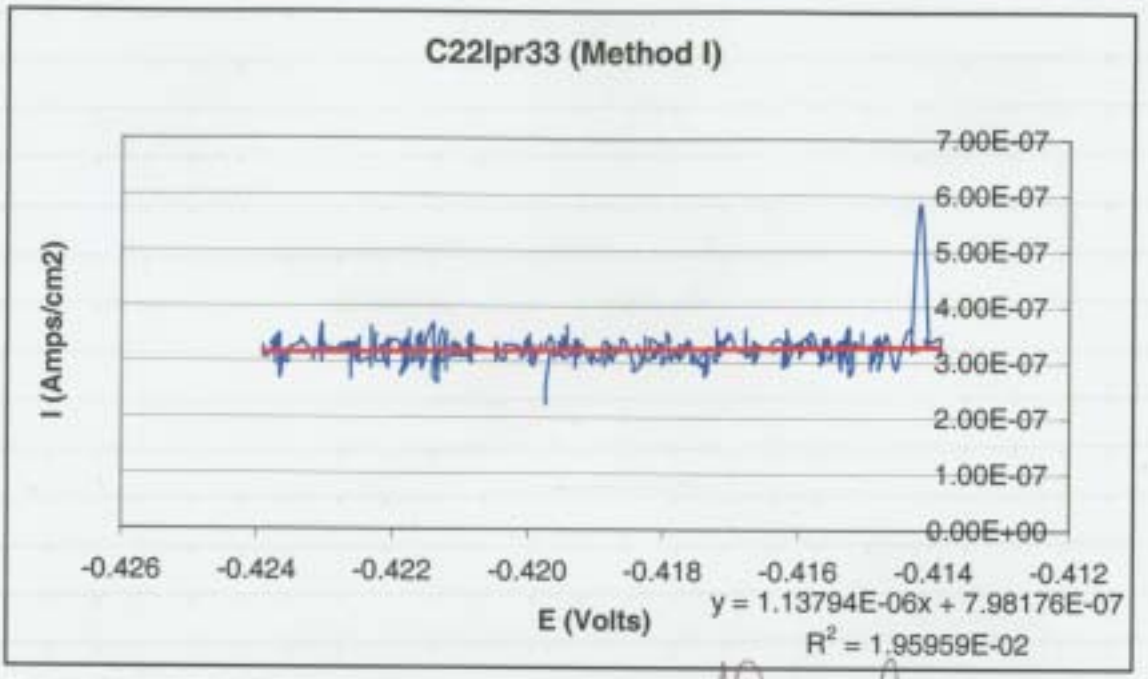
JB 6/14/02 C22 lpr 33
Data: ~~C22 lpr 33~~ (Method I) pg. 47
C22 lpr 33 (Method II) pg. 47

continued on pg. 47

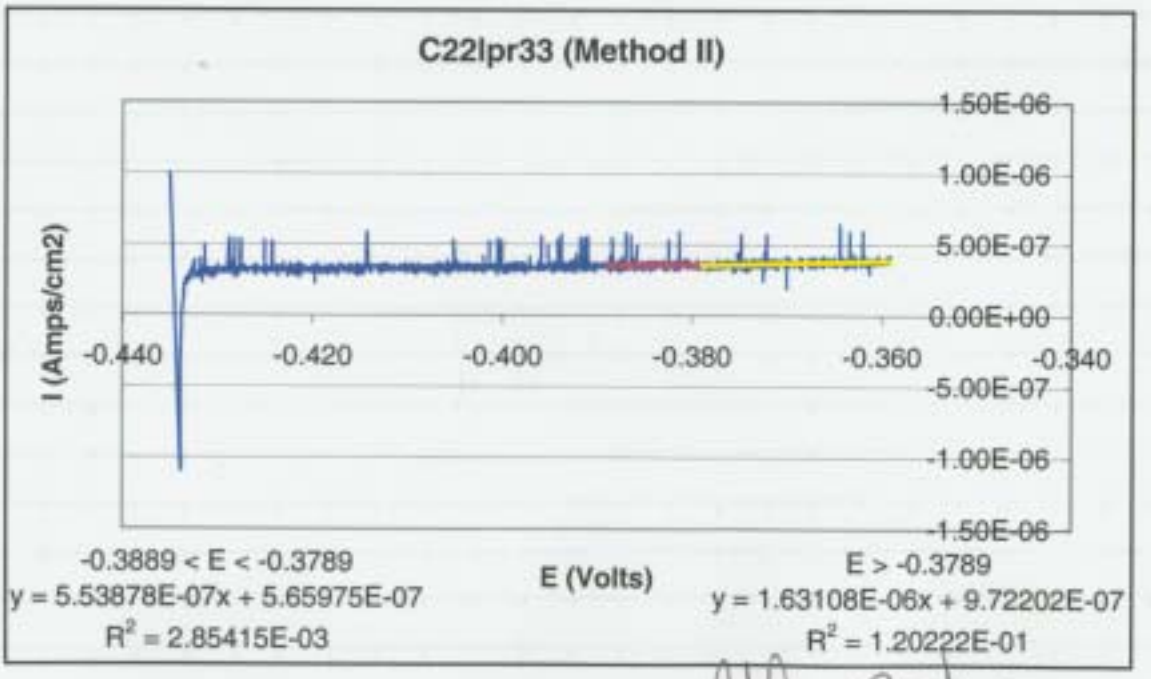
To Page No._____

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/14/02

From Page No. Polarization Resistance Test for Alloy C-22 (continued from pg. 46)



6/14/02



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continued on pg. 48

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/14/02

From Page No.___ | Polarization Resistance Test for Alloy C-22 (continued from pg. 47)

Test: C22 spot 34

Scan: -0.015V vs. Open circuit potential to +0.060 V vs. open circuit potential
Scan rate: 0.005 mV/s

E_{corr} = -0.4057 V vs. SCE

Results: Method I (see formulas pg. 11)

R_p = 1800008 Ω·cm²
I_{corr}: ~~28.93 μA/cm²~~ JB 6/17/02 0.028933 μA/cm²
C.R.: ~~0.284 mm/yr~~ JB 6/17/02 0.000284 mm/yr

Method II (see formulas pg. 11)

A. From Data: +30mV vs. open circuit to +40mV vs. open circuit
(-0.3757 < E < -0.3657)
b = 2.13248×10^{-7}
m = -3.43659×10^{-7}
I_{corr} = 0.3527 μA/cm²
C.R.: 0.00346 mm/yr

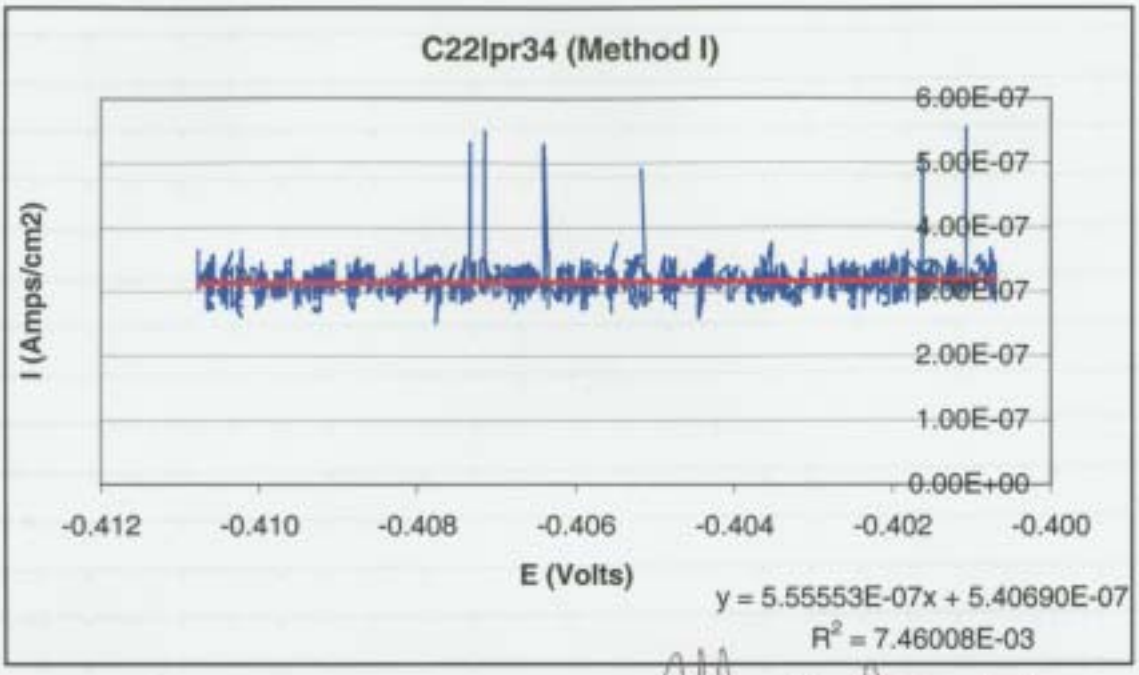
B. From Data: +40mV vs. open circuit potential to +60mV vs. open circuit (E7-0365-7)
b = 9.11651×10^{-7}
m = 1.54433×10^{-6}
I_{corr} = 0.2831 μA/cm²
C.R.: 0.00277 mm/yr

Data: C22 spot 34 (Method I) pg. 49
C22 spot 34 (Method II) pg. 49

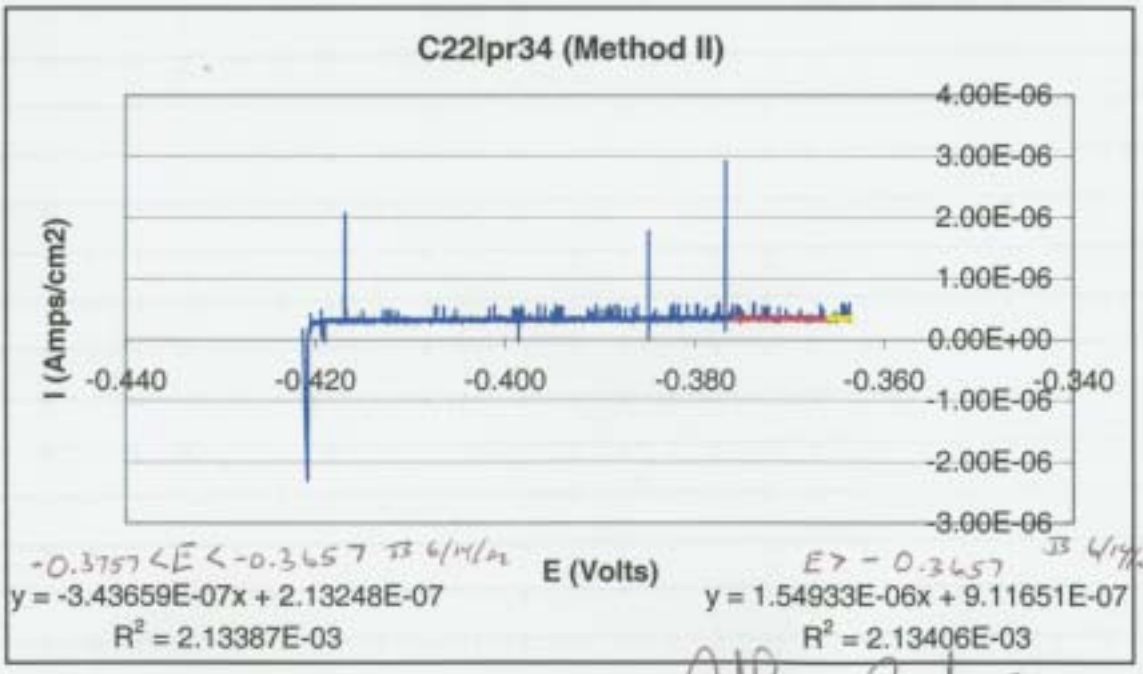
continued on pg. 49

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by [signature]	6/17/02

From Page No. ___ Polarization Resistance Test for Alloy C-22 (continued from pg 48)



JB 6/14/02



JB 6/14/02

~~Polarization Resistance Test~~ JB 6/14/02 continued on pg. 50

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Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by JB 6/14/02	

Project No._____ Book No._____ TITLE _____

From Page No.____ Polarization Resistance Test for Alloy C22 (Continued from pg 49)

Test: C22 lpm 35

scan: -0.015 V vs. open circuit potential to +0.060 V vs. open circuit potential

scan Rate: 0.001 mV/s

E_{corr} = -0.4277 V vs. SCE

Results: Method I (see formula pg. 11)

R_p = 7.0082 x 10^6 Ω·cm²

I_{corr} = 7.4313 x 10^{-3} μA/cm²

C.R. = 0.0000728 mm/yr

Method II (see formulas pg 11)

A. From Data: +30mV vs. ~~OCP~~ open circuit JB 6/17/02 to +40mV vs. ~~SCE~~ open circuit JB 6/17/02 (-0.3977 < E < -0.3871)

b = -2.30067 x 10^{-8}

m = -7.95848 x 10^{-7}

I_{corr} = 0.317377 μA/cm²

C.R. = 0.00311

B. From Data: +40mV vs. open circuit to +60mV vs. open circuit (E > -0.3877)

b = 3.94891 x 10^{-7}

m = 2.65090 x 10^{-7}

JB 6/14/02 ~~I_{corr}~~ I_{corr} = 0.281612 μA/cm²

C.R. = 0.00276 mm/yr

Data: C22 lpm 35 (Method I) pg. 51

C22 lpm 35 (Method II) pg. 51

JB 6/14/02

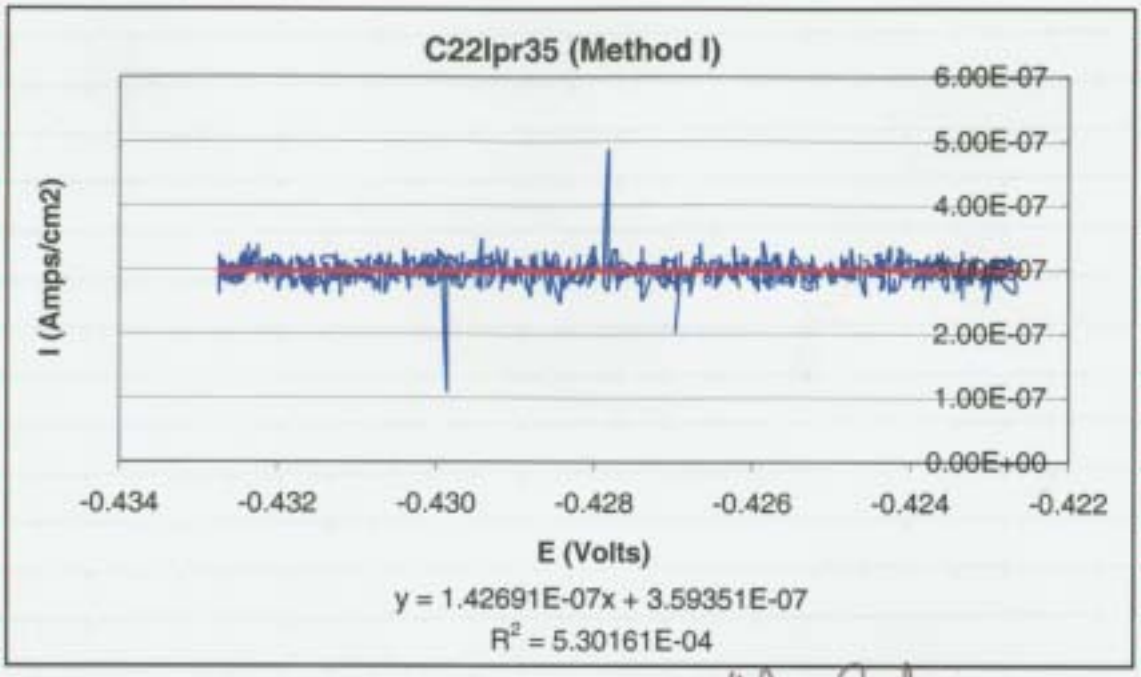
~~Data:~~ continued on pg. 51

To Page No.____

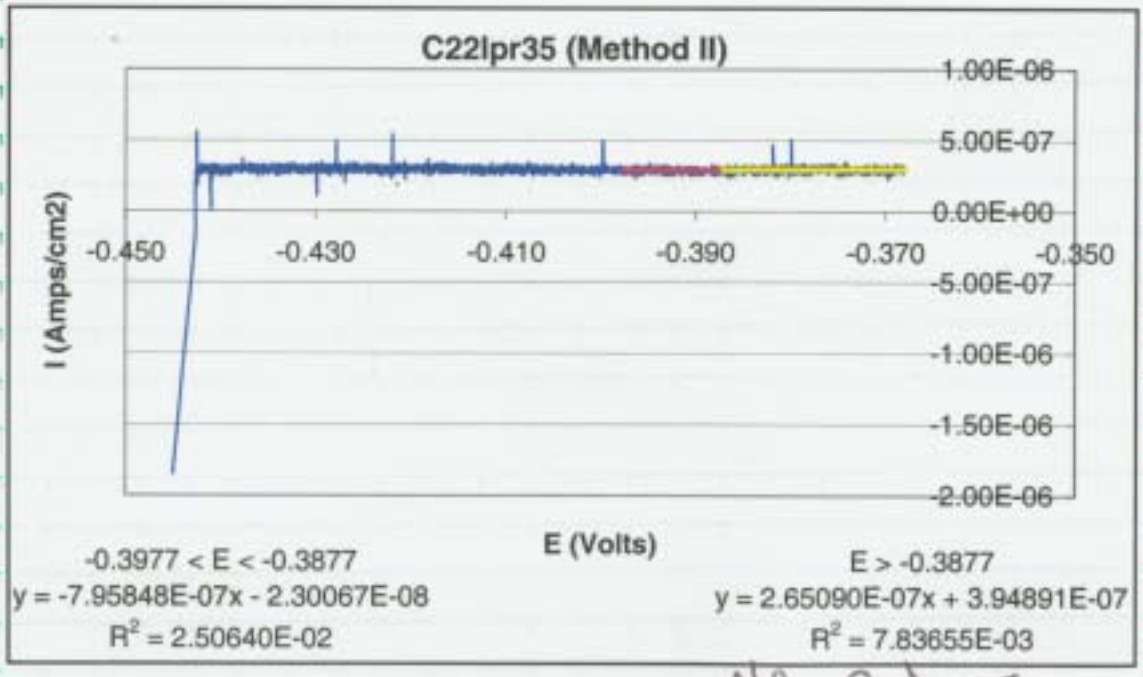
Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/14/02

From Page No. | Polarization Resistance Test for Alloy C-22 (continued from pg. 50)

Data:



Allen Bott 6/17/02



Allen Bott 6/17/02

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by Allen Bott	6/17/02

From Page No.

Passive Film Chemistry C-22 Block Specimen

Cell Dimensions And set up See pg# 34-35 Notebook #485

Solution : 1000 ppm Cl⁻ As KCl
2.09 g KCl Lot #005573
+ DI water To 1000 mls

Temperature : 60°C Thermocouple # 329 Cal 1/11/02

Reference : Fisher 13-620-52 SN# 006619

Potentiostat : EG+G Versastat SN# 20104

Test Procedure : 2 wks 336 hrs. @ 60°C - Glove Box
Deaerate solution for 2hrs Before Placed In cell
with 99.999% N_2 : will continue To Purge N_2 In Glove Box
throughout Testing Procedure

Thermocouple Meter : Monogram Box with Omega DP465
SN# 3130900 Cal 11/21/01

Ecorr = -363mV Keithley 614 SN# 0704934 Cal 5/26/02

Ept = Not taken

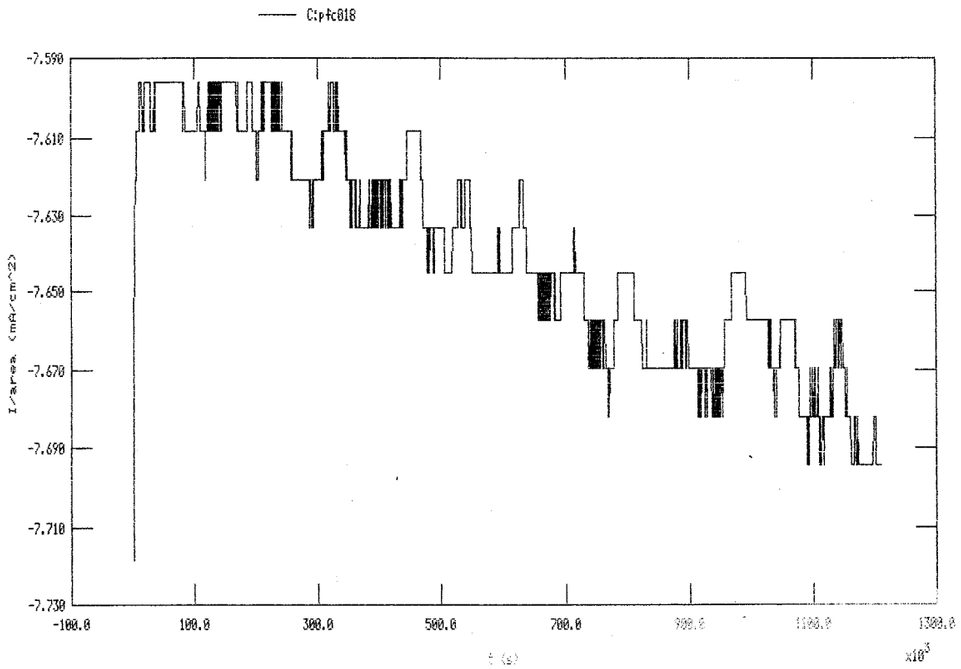
Data C22 018

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/18/02

From Page No.

Model 352/252 Corrosion Analysis Software, v. 2.30 Filename: C:pfc018 Pstat: VStat[] Ver 2 PS POTENTIOSTATIC
File Status: NORMAL Date Run: 12-08-01 Time Run: 10:36:11
CP PASS vs. R CT PASS IP 0.100 vs. R ID 5 S TP 4.033E+02 T1 1.210E+06
CR AUTO MP 3000 SO Pass IR NONE FL I 5.3Hz RT HIGH STABILITY
REF 0.24150 SCE WRK SOLID AR 8.162E+00 LS YES EW 2.604E+01 DEN 8.690E+00 AU NO
OC 0.393
Comment: Alloy 22 passive film chemistry 1000 ppm Cl as KCl 60C



Model 352/252 Corrosion Analysis Software, v. 2.30
Filename: C:pfc018
Pstat: VStat[] Ver 2
PS POTENTIOSTATIC
Date Run: 12-08-01
File Status: NORMAL
Time Run: 10:36:11

Cond. Time	CT	pass	s	Initial Pot.	IP	100.0E-3	V
Cond. Pot.	CP	pass	V	Time Step 1	T1	1.210E6	s
Initial Delay	ID	5	s	Stop On	SO	Pass	
Time/Pt.	TP	403.3	s	Curr. Range	CR	Auto	
No. of Points	NP	3000					
Line Sync.	LS	yes		IR Mode	IR	none	
Rise Time	RT	high stability		Filter	FL	I 5.3Hz	
Working Elec.	WE	Solid		Ref. Elec.	RE	SCE 241.5E-3V	
Sample Area	AR	8.162	cm^2	Equiv. Wt.	EW	26.04	g
Density	DE	8.690	g/ml	AUX A/D	AU	no	
Open Circuit	OC	393.0E-3	V				

Comment: Alloy 22 passive film chemistry 1000 ppm Cl as KCl 60C

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/18/02

Project No._____
Book No._____ TITLE _____

From Page No.____ Electrochemical Impedance Test for Alloy C-22

Objective: same as pg. 7

Specimen: C-22 heat: 2277-8-3175 polished to a 600 grit finish

start wt: 12.44580 g Sartorius Genius s/N 12801099 cal 6/4/02
End wt: 12.44530 g
Same test specimen as pg. 8

Solution: 0.028 M NaCl
3.296 g NaCl Lot: 020814
+ DI H_2O to 2000 ml

pH start: 5.65 Fisher Accumet 950 meter s/N 3340 cal 7/24/01
pH End: 7.02 pH probe # 13-620-296 s/N 1100208

Impedance Analyzer: Solartron 1260

Counter Electrode: Pt Flag

Reference: Fisher 13-620-52 s/N 0052132

Temperature: 80°C Hg Thermometer s/N H98-162 cal 1/22/02

E_{corr}: -529.4 mV Keithley Model 614 s/N 701931 cal 5/26/02
E_{Pt}: -703 mV

Solution Deaerated with 99.999% N_2

Specimen Examination: No staining or localized corrosion visible

continued on pg. 55

To Page No.____

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by John Bart	6/14/02

TITLE _____ Book No._____ Project No._____

From Page No.____ Electrical Impedance Test for Alloy C-22 (continued from pg. 54)

Test: C22 eis1 JB 6/17/02

Initial Frequency = 20000 Hz
Final Frequency = 0.001 Hz

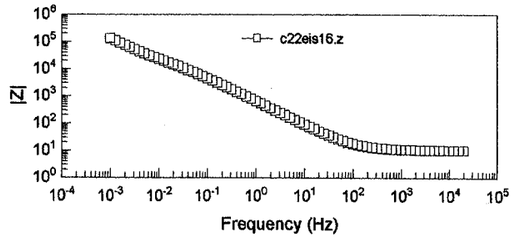
10 steps per decade

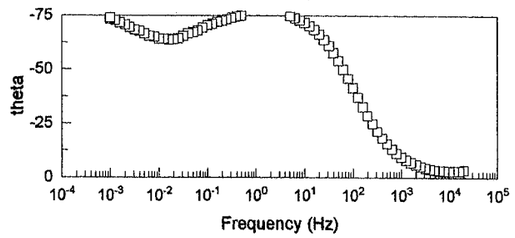
Integration time: 5 seconds
Delay: 2 seconds

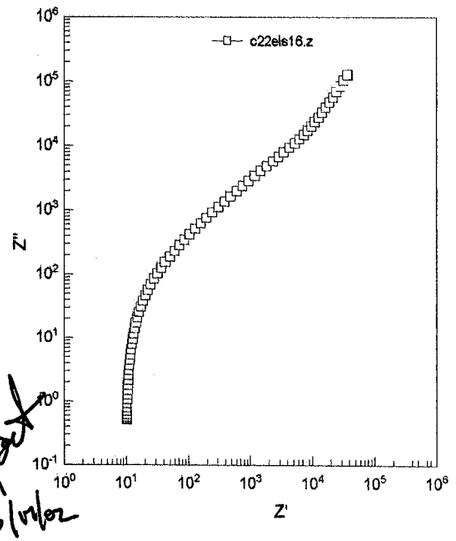
Cell info: Area: 8 cm^2
Density: 8.69 g/cm^3
Equivalent wt: 26.04

Data: C22 eis

C22eis16







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continued on pg. 57

To Page No.____

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by John Bart	6/14/02

Project No._____
Book No._____ TITLE_____

From Page No.___ | Electrochemical Impedance Test for Alloy C-22 (continued from pg. 55)

Test: C22 eis 17

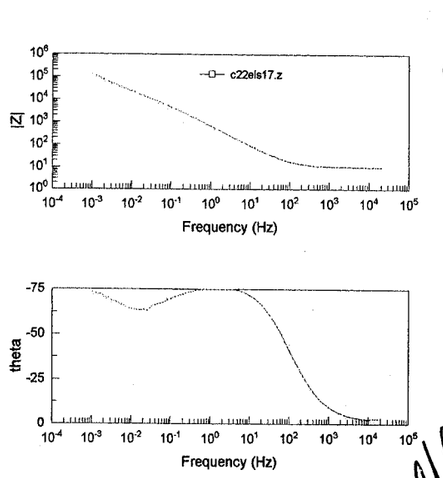
Initial Frequency: 20000 Hz
Final Freqency: 0.001 Hz

10 steps per decade

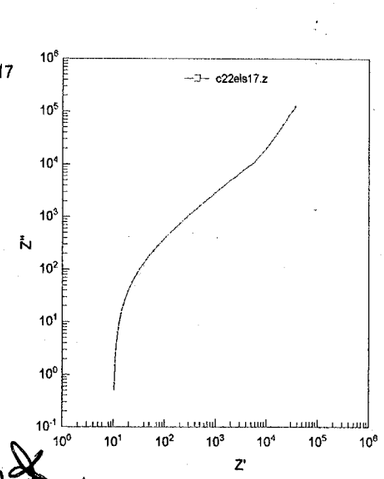
Integration Time: 5 seconds
Delay: 2 seconds

Cell info: Area: 8 cm^2
Density: 8.69 g/cm^3
Equivalent wt: 26.04

Data: C22 eis 17



C22eis17



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continued on pg. 57

To Page No._____

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/17/02

Project No._____
TITLE_____ Book No._____

From Page No.___ | Electrochemical Impedance Test for Alloy C-22 (continued from pg. 56)

Test: C22 eis 18

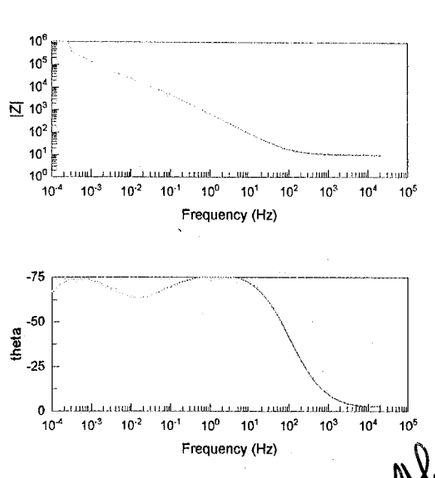
Initial Frequency: 20000 Hz
Final Freqency: 0.0001 Hz

10 steps per Decade

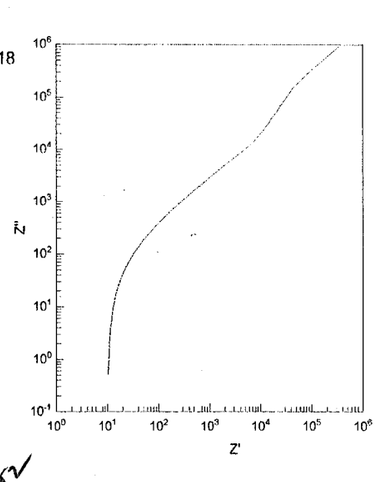
Integration time: 5 seconds
Delay 2 seconds

Cell info: Area: 8 cm^2
Density: 8.69 g/cm^3
Equivalent wt: 26.04

Data: C22 eis 18



C22eis18



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To Page No._____

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/17/02

Project No._____
Book No._____ TITLE_____

From Page No.____

Repassivation Potential of Alloy C-22

Objective: same as pg. 7

Specimen: C-22 Alloy heat: 2277-8-3175 polished to 600 grit finish with 2 PTFE crevice washers attached at 50 in-oz using Proto 6109 S/N 139072 cal 2/14/02 specimen thermally aged @ 870°C for 5 minutes

Start wt: 31.90151 g Sartorius Genius S/N 12889096 cal 6/4/02
End wt: 31.89606 g

Solution: 1.0 M NaCl
116.89 g NaCl Lot #: 020814
+ DI H_2O to 2000 mL

pH start: 6.707 Fisher Accumet 950 meter S/N 3340 cal 7/24/01
pH End: 7.698 pH probe # 13-620-291

Potentiostat: EG&G Model# 273 S/N 41108

Counter Electrode: Pt Flag

Reference: Fisher 13-620-52 S/N 8210502

Temperature: 60°C Hg Thermometer S/N CG6-377 cal 1/11/02

E_{corr}: -457.3 mV Keithley 617 S/N 0579628 cal 5/10/02
E_{pt}: 47.7 mV

Solution Deaerated with 99.995% N_2

Specimen Examination: Crevice corrosion on 12/24 feet - mild staining on all surfaces of Specimen

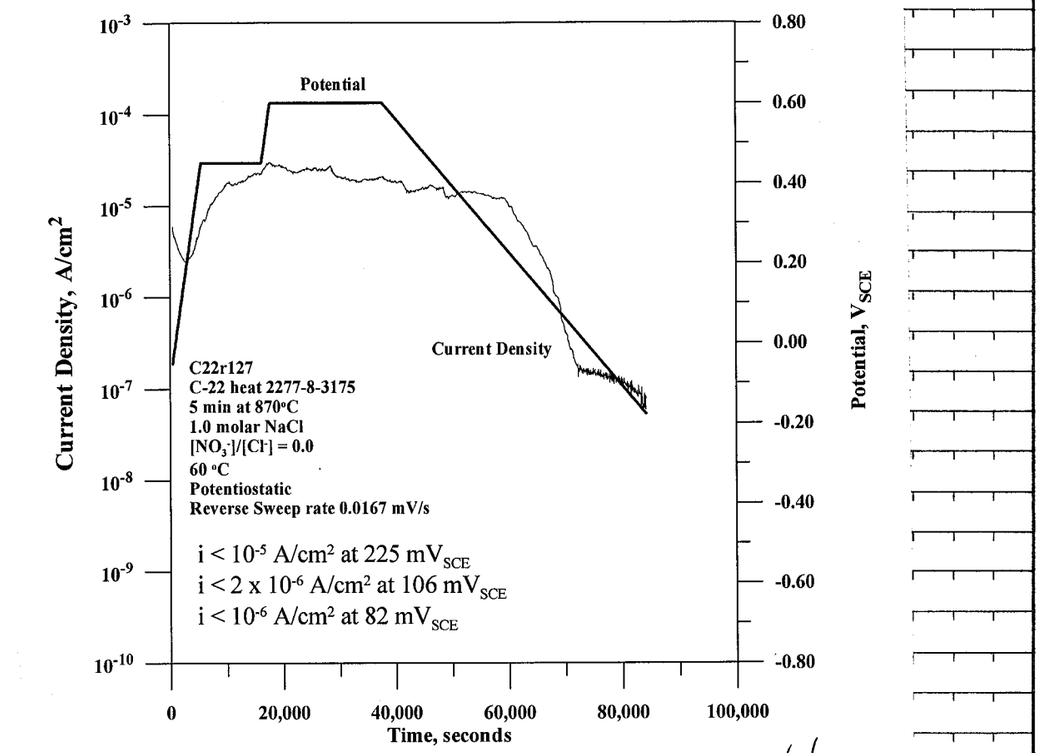
Data C22R127

To Page No._____

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/17/02

Project No._____
TITLE_____ Book No._____

From Page No.____



6/18/02

To Page No._____

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/18/02

From Page No.

Repassivation Potential of Alloy C22

objective: same as pg. 1

specimen: C-22 heat: 2277-8-3175 polished to a 600 grit finish with 2 PTFE crevice washers attached at 50 in-oz using Proto 6104 S/N 139072 cal 2/14/02 specimen thermally aged @ 80°C for 5 min

start wt: 32.08630g Sartorius Genius S/N 12809054 cal 6/4/02

End wt: 32.03171g

Solution: 1.0M NaCl

116.91 g NaCl Lot: 020814

+ DI H_2O to 2000 ml

JB 6/17/02

pH start: 6.362 ~~Kontron~~ Fisher Accumet 950 meter S/N 3340 cal: 7/24/01

pH End 7.914 pH prob #13-622-246 S/N 1100287

potentiostat: EG&G Model #273 S/N 10120

Counter Electrod: Pt fly

Reference: Fisher 13-620-52 S/N D192121

Temperature: 80°C Hg Thermometer S/N C96-833 cal 1/10/02

E_{corr}: -411.4 mV Keithley 617 S/N 0579628 cal 3/10/02

E_{pt}: 47.1 mV

Solution Deaerated with 99.999% N_2

Specimen Examination: Crevice Corrosion on 19/24 feet

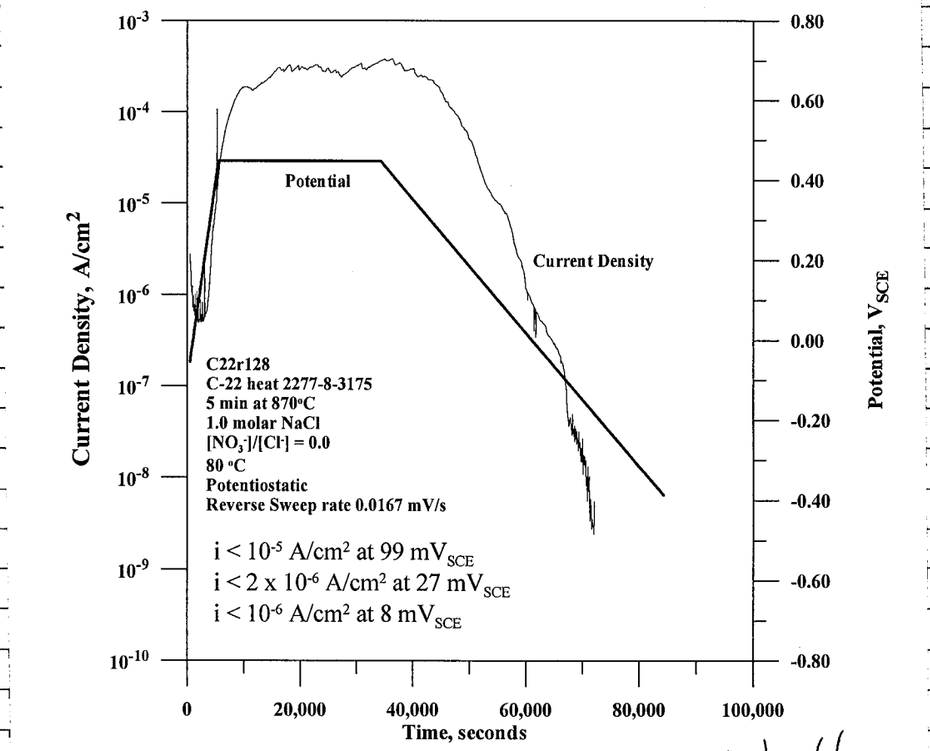
Staining on All Surfaces of Specimen

Data C22r128

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by DA Bell	6/17/02

From Page No.



6/18/02

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/18/02

Project No._____
Book No._____ TITLE _____

From Page No.____ | Polarization Resistance Test for Alloy C-22

objective: same as pg. 6

specimen: C-22 heat: 2277-8-3175 Polished to a 600 grit finish

start wt: 12.44580 g Sartorius Genius s/N 12809099 cal 6/4/02
End wt: 12.44530 g same test specimen as pg. 8

Solution: 0.028M NaCl
3.296 g NaCl Lot 020814
+DI H_2O to 2000 ml

pH start: 5.654 Fisher Accumet 950 meter s/N 3340 cal 7/24/01
pH End: 7.023 pH probe # 13-620-296 s/N 1100208

Potentiostat: Solartron 1287

Counter Electrode: Pt Flag

Reference: Fisher 13-620-52 s/N 0052132

Temperature: 60°C Hg Thermometer s/N HG8-162 cal 4/22/02

E_{corr} = -524 mV Keithley Model 614 s/N 704936 cal 5/26/01
E_{pt} = -40.3 mV

Solution Deaerated with 99.999% N_2

Specimen Examination: No staining or localized corrosion visible

continued on pg. 63

To Page No.____

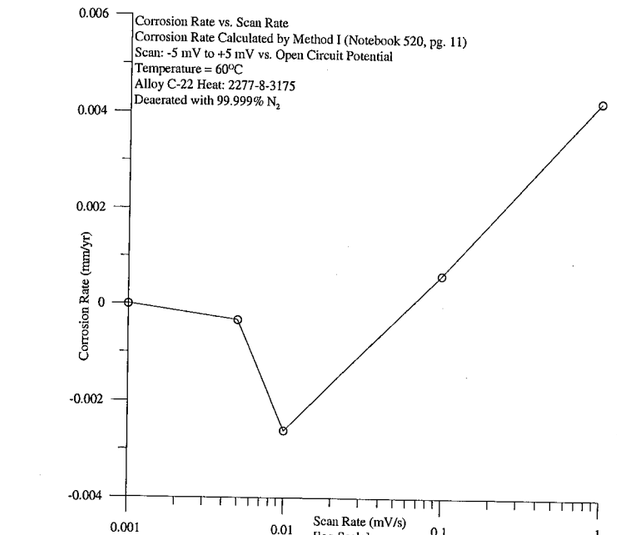
Witnessed & Understood by me, | Date | Invented by | Date

Recorded by Jeffrey Best 6/18/02

Project No._____
TITLE _____ Book No._____

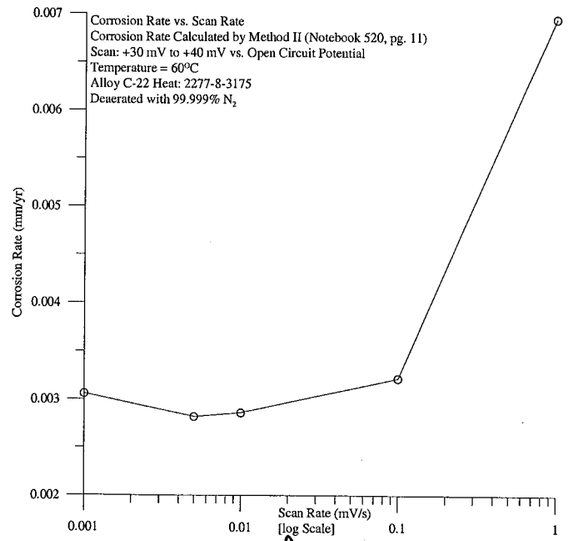
From Page No.____ | Polarization Resistance Test for Alloy C-22 (Continued from pg. 62)

Data: Method I



Jeffrey Best 7/17/02

Method II



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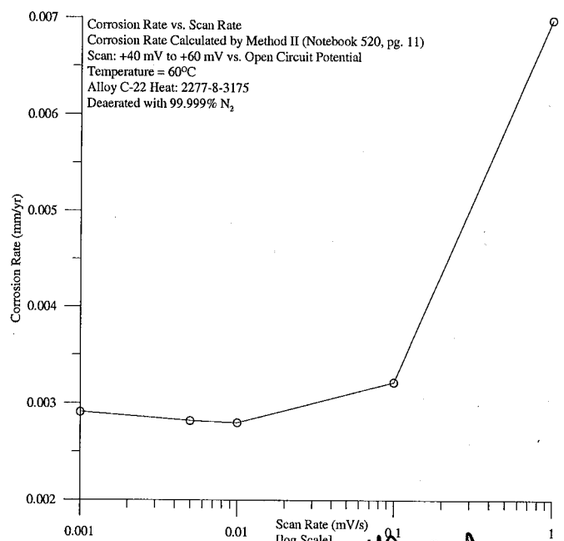

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continued on pg. 64

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Witnessed & Understood by me, | Date | Invented by | Date

Recorded by Jeffrey Best 7/17/02

Project No._____
Book No._____ TITLE _____

From Page No.___ | Polarization Resistance Test for Alloy C-22 (continued from pg. 63)

Test: C22lpr36

scan: -0.015V vs. open circuit to ~~+0.060V~~ 0.060V vs. open circuit potential
JB 6/18/02

scan rate: 1mV/s

E_{corr} = -0.3645V vs. SCE

Results: Method I (see formulas pg. 11)

R_p = 120350 Ω·cm²
I_{corr} = 4.3275 X 10^{-7} A/cm²
C.R. = 0.00424 mm/yr

Method II (see formulas pg. 11)

A. from Data +30mV vs. open circuit to +40mV vs. open circuit (-0.3285 E < -0.3215)

b = 1.02702 X 10^{-6}
m = 8.71649 X 10^{-7}
I_{corr} = 7.09 X 10^{-7} A/cm²
C.R. = 0.00695 mm/yr

B. from Data: +40mV vs. open circuit to +60mV vs. open circuit (E > -0.3215)

b = 9.92802 X 10^{-7}
m = 7.69658 X 10^{-7}
I_{corr} = 7.12 X 10^{-7} A/cm²
C.R. = 6.98 X 10^{-3} mm/yr = 0.00698 mm/yr

Data: C22 lpr 36 (Method I) pg. 65
C22 lpr 36 (Method II) pg. 65

continued on pg 56

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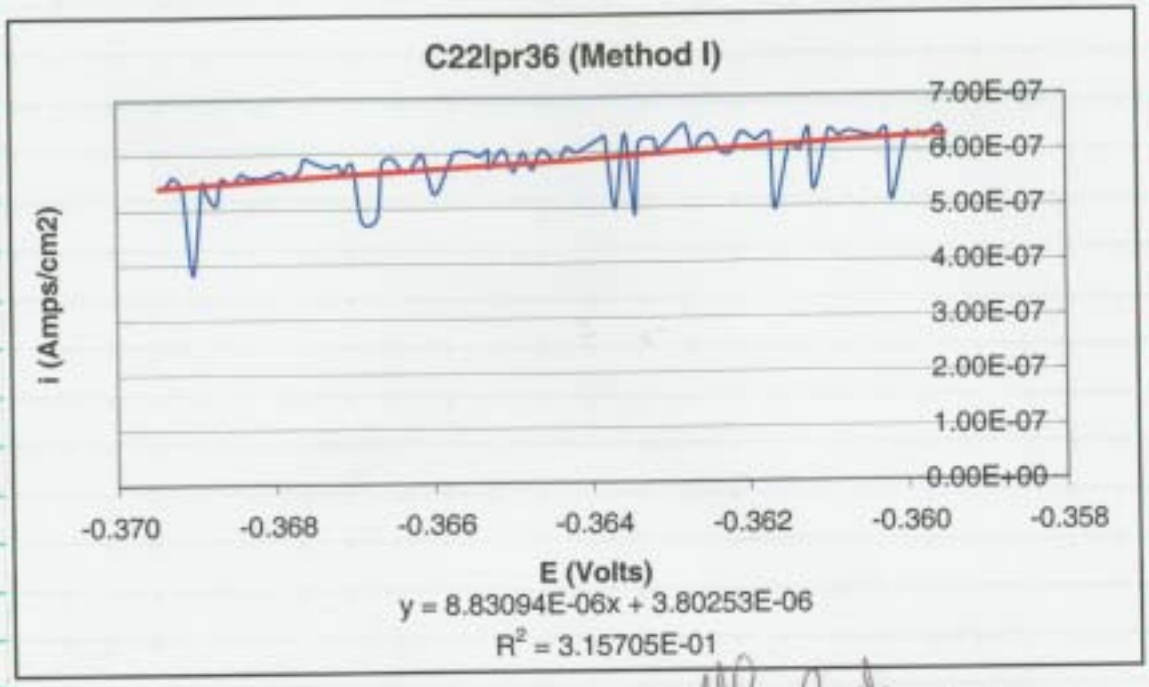
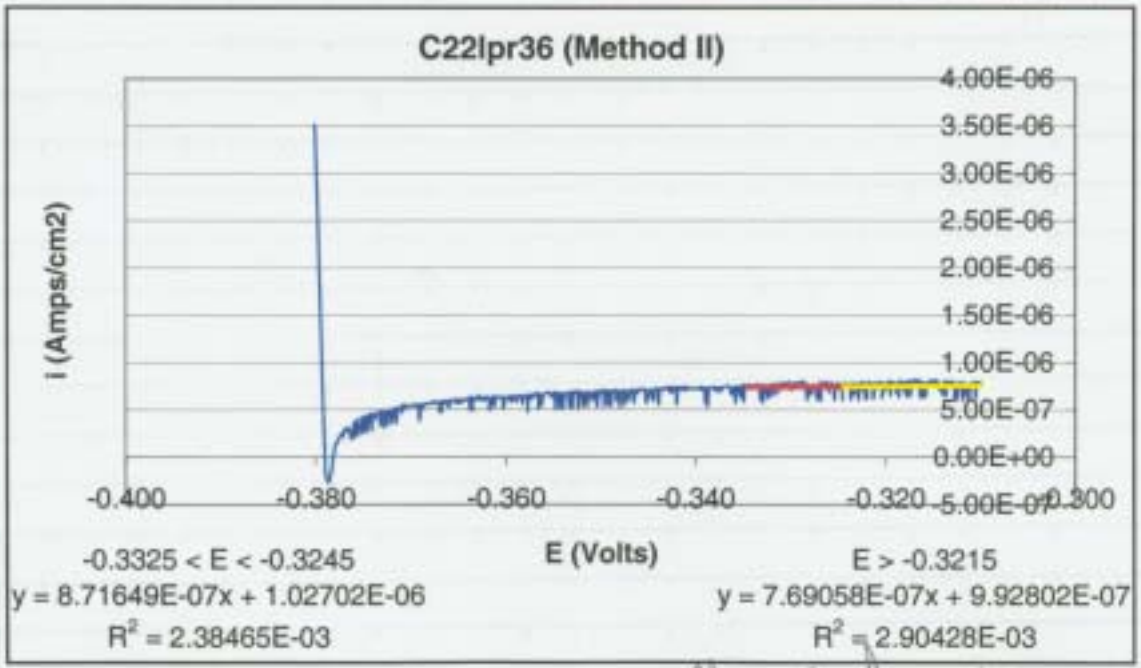
Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/18/02

From Page No. Polarization Resistance Test for Alloy C-22 (continued from pg. 64)

Data:



Alan Back 6/18/02



Alan Back 6/18/02 6/18/02 JJ 6/18/02

continued on pg. 66

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Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by Alan Back	6/18/02

From Page No. Polarization Resistance test for Alloy C-22 (continued from pg. 65)

Test: C22 lpr 37

scan: -0.015 V vs. open circuit potential to +0.060 V vs. open circuit potential

scan rate: ~~0.01~~ JB 6/18/02 0.1 mV/s

E_{corr} = -0.334 V vs. SCE

Results: Method I (see formulas on pg 11.)

R_p = 821500 Ω·cm²

I_{corr} = 6.3396 X10⁻⁸ A/cm²

C.R. = 0.000621 mm/yr

Method II (see formulas pg. 11)

A. from Data: +30mV vs. open circuit to +40 mV vs. open circuit (-0.304 < E < -0.294) JB 6/18/02

b = 6.99519 X10⁻⁷

m = ~~+.7~~ JB 6/18/02 1.10791 X10⁻⁶

I_{corr} = 3.29 X10⁻⁷ A/cm²

C.R. = 0.00322 mm/yr

B. for Data: +40mV vs. open circuit to +60 vs. open circuit (E > -0.294)

b = 7.07979 X10⁻⁷

m = 1.13369 X10⁻⁶

I_{corr} = 3.29 X10⁻⁷ A/cm²

C.R. = 3.22 X10⁻³ mm/yr = 0.00322 mm/yr

Data: C22lpr37 (Method I) pg 67

C22 lpr37 (Method II) pg 67

continued on pg. 67

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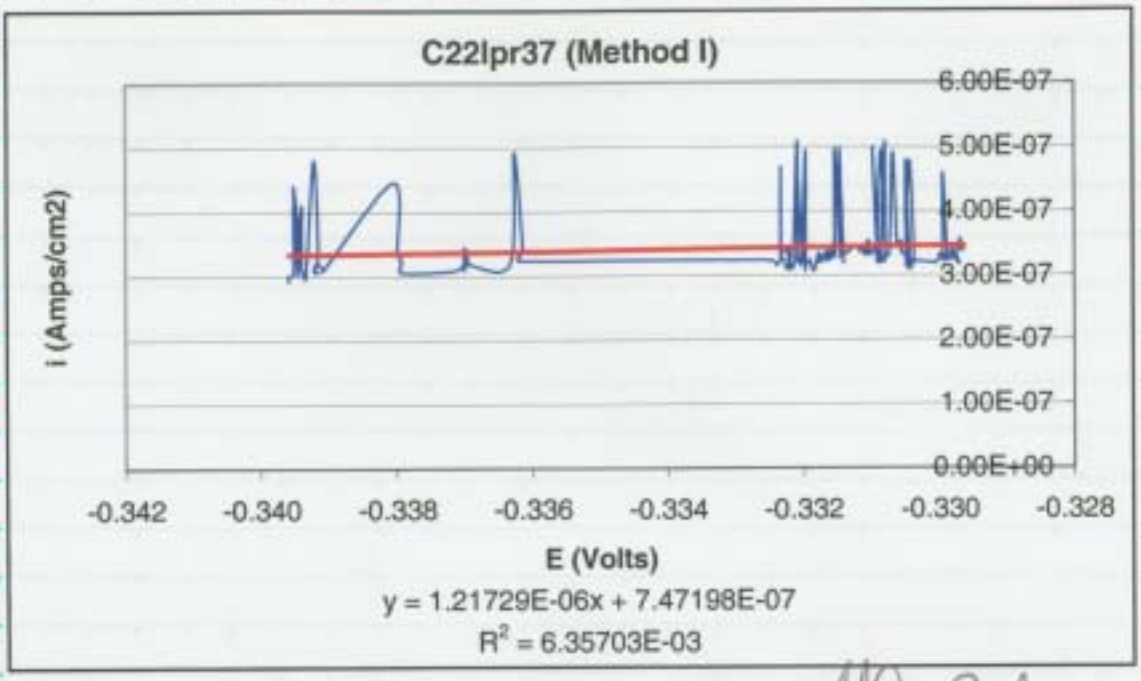
Witnessed & Understood by me, Date

Invented by Date

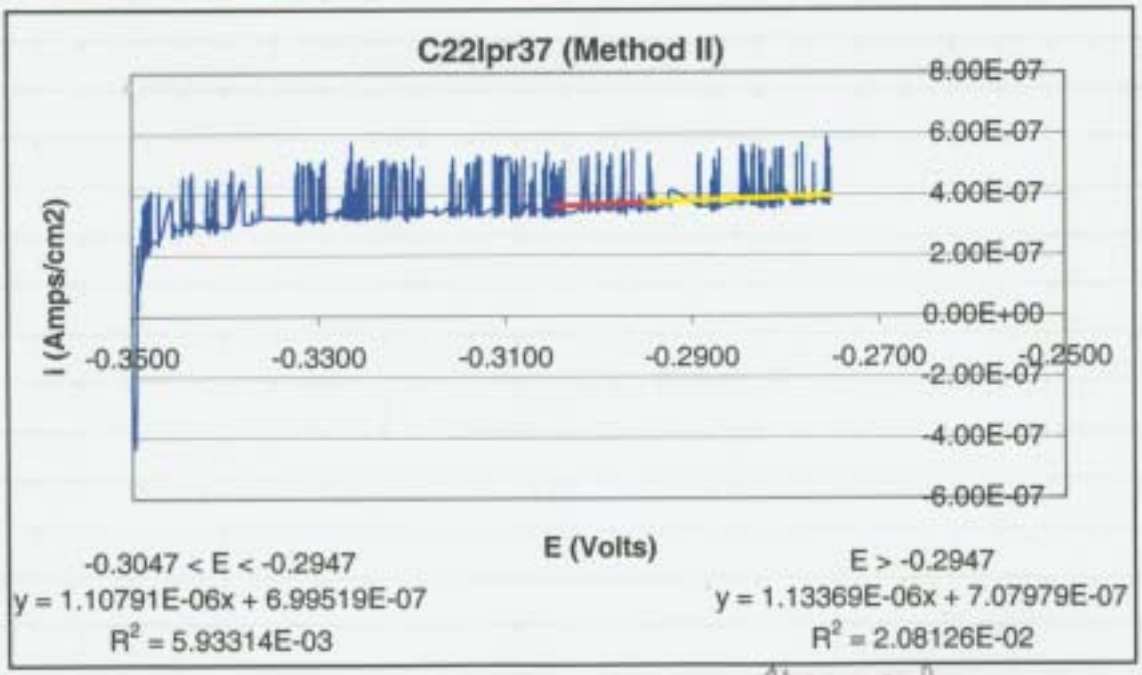
Recorded by 6/18/02

From Page No. Polarization Resistance Test for Alloy C-22 Continued from pg 66

Data:



Alan Bent 6/18/02



Alan Bent 6/18/02

Continued on pg 68

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Witnessed & Understood by me.	Date	Invented by	Date
		Recorded by Alan Bent	6/18/02

From Page No. | Polarization Resistance Test for Alloy C-22 (continued from pg. 67)

Test: C22lpm 38

Scan: +0.015V vs. open circuit potential to +0.060V vs. open circuit potential

Scan Rate: 0.01 mV/s

E_{corr} = -0.3170V vs. SCE

Results: Method I (see formulas pg. 11)

R_p = -1.9533×10^5 $\Omega \cdot cm^2$

I_{corr} = -2.6663×10^{-7} A/cm^2

C.R. = -2.61×10^{-3} = -0.00261 mm/yr

Method II (see formulas pg. 11)

A. For Data: +30mV vs. open circuit to +40mV vs. open circuit ($-0.28 < E < -0.2770$)

b = 4.91809×10^{-7}

m = 6.29964×10^{-7}

E_{corr} = 2.92×10^{-7} Amp/cm^2

C.R. = 0.00286 mm/yr

B. For Data: +40mV vs. open circuit to +60mV vs. open circuit ($E > -0.2770$)

b = 5.24730×10^{-7}

m = 7.54201×10^{-7}

E_{corr} = 2.86×10^{-7} A/cm^2

C.R. = 2.80×10^{-3} mm/yr = 0.00280 mm/yr

Data: C22lpm 38 (Method I) pg. 64
C22lpm 38 (Method II) pg. 64

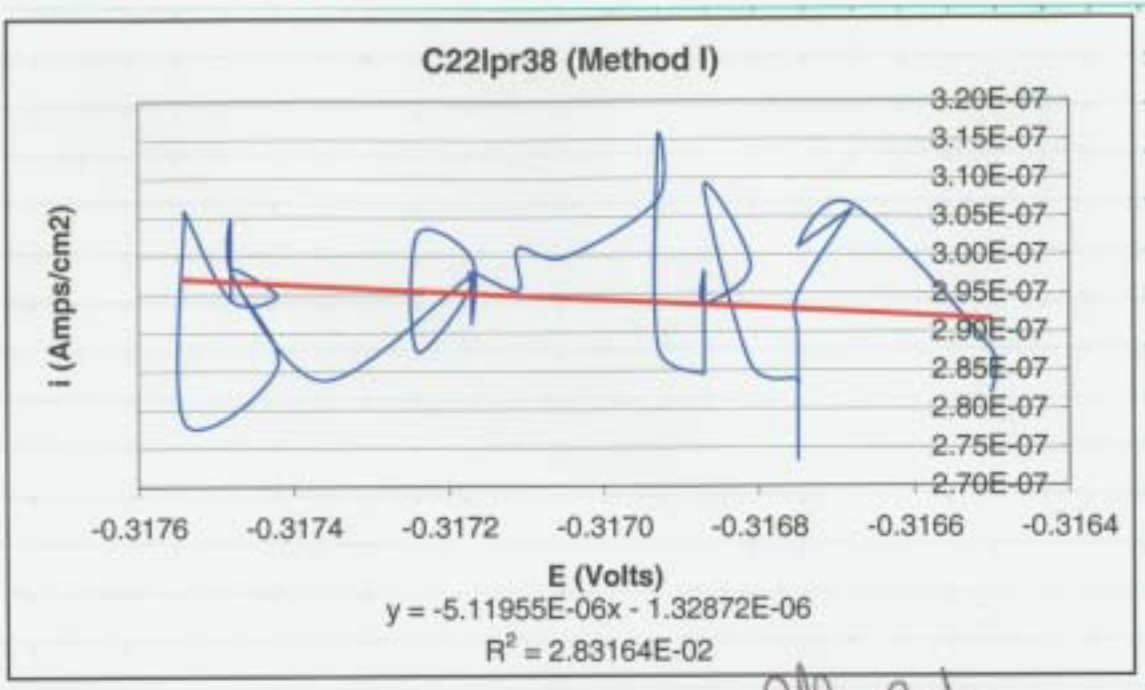
Continued on pg. 69 To Page No.

Witnessed & Understood by me, | Date | Invented by | Date

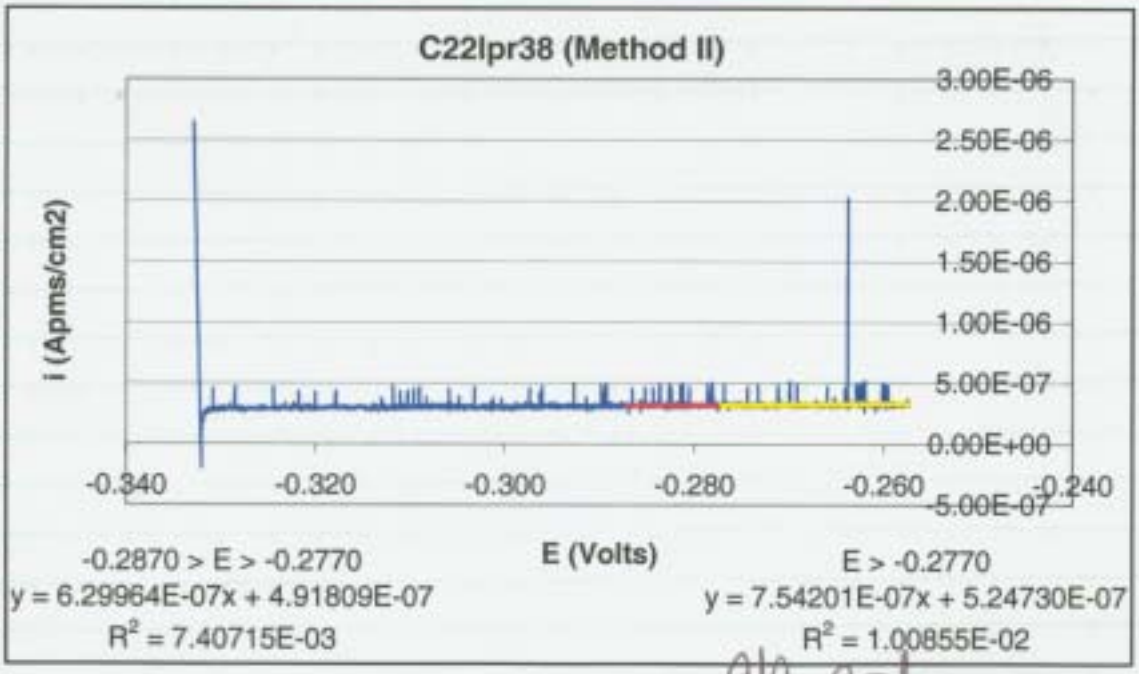
Recorded by [signature] | 6/18/02

From Page No. Polarization Resistance Test for Alloy C-22 (continued from pg. 68)

Date:



6/18/02



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Invented by Date

Recorded by 6/18/02

Project No._____
Book No._____ TITLE_____

From Page No.___ | Polarization Resistance Test for Alloy C-22 (Continued from pg. 64)

Test: C22 lpr 34

Scan: -0.015V vs. open circuit potential to +0.060V vs. open circuit potential

Scan Rate: 0.005 mV/s

E_{corr}: ~~-0.2937V~~ -0.2105V vs. SCE
6/20/02

Results: Method I (See formulas pg. 11)

$R_p = -1.5788 \times 10^{6}\ \Omega \cdot cm^2$
$I_{corr} = -3.3155 \times 10^{-8}\ A/cm^2$
C.R. = -0.000325 mm/yr

Method II (See formulas pg. 11)

A. for Data: +30mV vs. open circuit to +40mV vs. open circuit. ($-0.185 < E < -0.1705$)

$b = 3.42116 \times 10^{-7}$
$m = 2.57812 \times 10^{-7}$
$I_{corr} = 2.88 \times 10^{-7}$
C.R. = 0.00282 mm/yr

B. for Data: +40mV vs. open circuit to +60mV vs. open circuit ($E > -0.1705$)

$b = 3.45660 \times 10^{-7}$
$m = 2.76228 \times 10^{-7}$
$I_{corr} = 2.88 \times 10^{-7}$
C.R. = 0.00282 mm/yr

Data: C22lpr34 (Method I) pg. 71
C22lpr34 (Method II) pg. 71

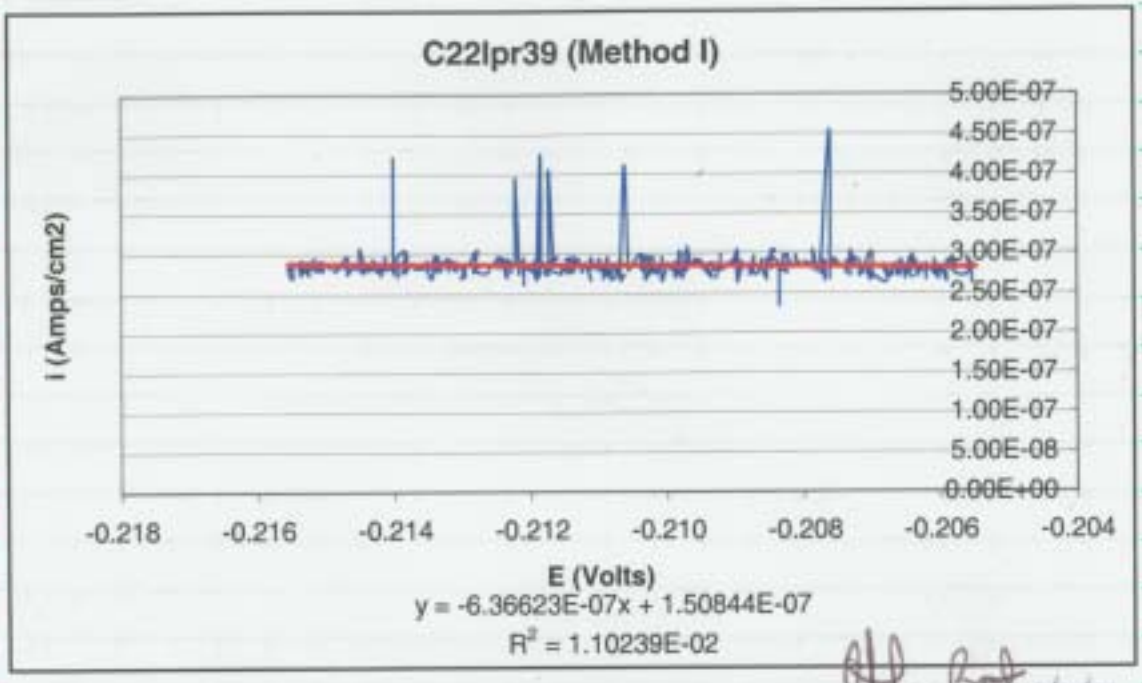
(Continued on pg. 71)

To Page No._____

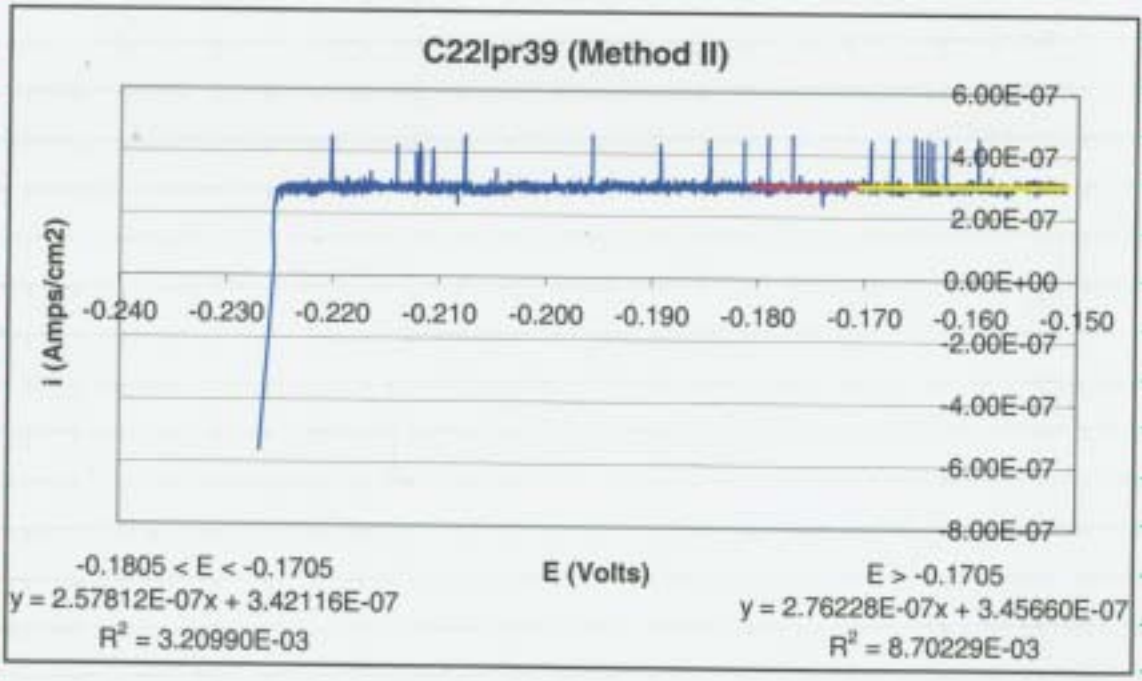
Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/18/02

From Page No. Polarization Resistance Test for Alloy C-22 (continued from pg. 70)

Data:



6/24/02



continued on pg 72

To Page No.

Witnessed & Understood by me.	Date	Invented by	Date
		Recorded by	6/25/02

Project No.

Book No. TITLE

From Page No. Polarization Resistance Test for Alloy C-22 (Continued from pg. 71)

Test: C22 lpn 40

Scan: -0.015V vs. open circuit potential to +0.060 V vs. open circuit potential

Scan Rate: 0.001 mV/s

E_{corr} = -0.2617 V vs SCE

Results: Method I (see formulas pg. 11)

R_p = ~~1.5708 x 10^6~~ -5.8065 x 10^8 Ω/cm² ~~Ω-cm²~~

I_{corr} = ~~3.3165 x 10^-8 A/cm²~~ ~~A/cm²~~ 4/22/02 -8.9693 x 10^-11 A/cm²

C.R. = ~~0.000325 mm/yr~~ ~~mm/yr~~ 4/22/02 -8.79 x 10^-7 mm/yr

Method II (see formulas pg. 11)

A. for Data: +30mV vs. open circuit to +40mV vs. open circuit potential (-0.2317 < E < -0.2217)

b = 1.37124 x 10^-7

m = -6.68238 x 10^-7

I_{corr} = 3.121 x 10^-7 A/cm²

C.R. = 0.00306 mm/yr

B. for Data: +40mV vs. open circuit to +60mV vs. open circuit potential. (E > -0.2217)

b = 2.73379 x 10^-7

m = -9.06755 x 10^-8

I_{corr} = 2.97 x 10^-7

C.R. = 0.0029 mm/yr

Data: C22 lpn 40 (Method I) pg. 73

C22 lpn 40 (Method II) pg. 73

continued pg. 73

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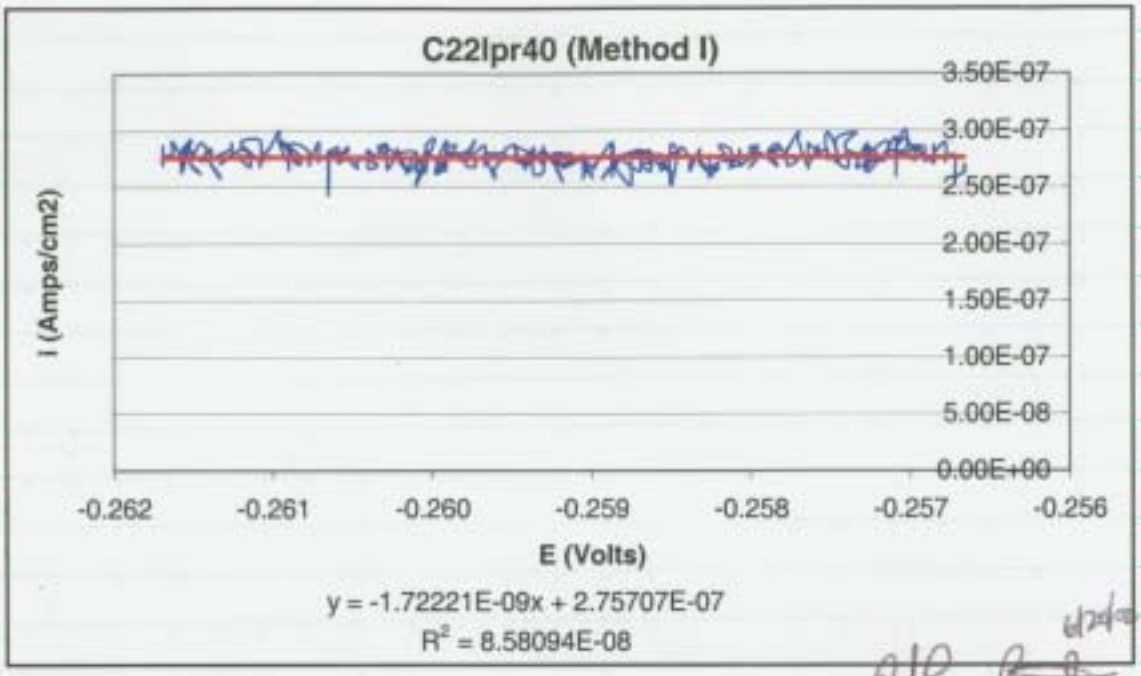
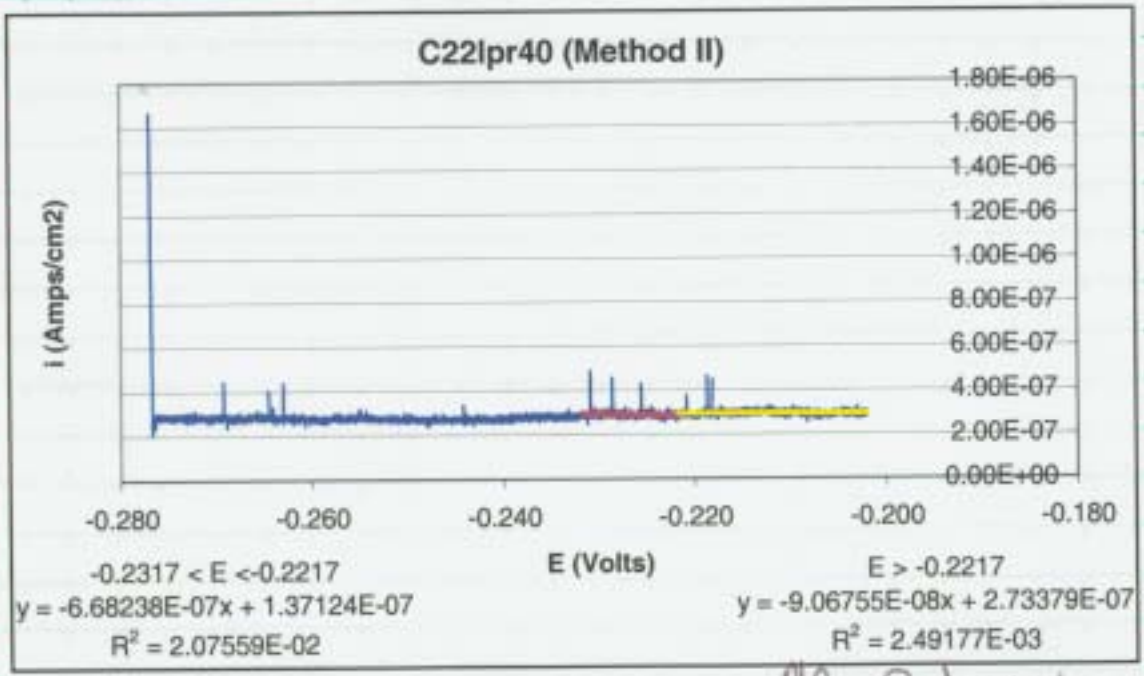
Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by [signature]	6/18/02

From Page No. Polarization Resistance Test for Alloy C-22 (continued from pg. 72)

Data:



6/20/02



6/20/02

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/20/02

Project No._____
Book No._____ TITLE Repassivation Potential of Alloy C-22

From Page No.____

JTB 6/14/02
~~Specimen~~ objective: same as pg 1

specimen: C-22 heat: 2277-8-3175 polished to a 600 grit finish with 2 PTFE crevice washers attached at 50 in-oz using Proto 6104 S/N 139072 cal 2/14/02.
Specimen thermally aged @ 870°C for 5 min.
start wt: 39.15764 g Sartorius balance S/N 12809099 cal 6/4/02
End wt: 39.15752 g

Solution: 4.0 M NaCl
467.54 g NaCl Lot: 020814
+ DI H_2O to 2000 ml

pH start: 7.240 Fisher Accumet 950 meter S/N 3340 cal 7/24/01
pH End: pH probe #13-622-296 S/N 1100258
↳ No pH reading; solution was contaminated with oil when the thermal well broke

Potentiostat: EG&G Model #273 S/N ~~Not 28~~ 81108 JB 6/19/02

Counter Electrode: Pt flag

Reference: Fisher 13-620-52 S/N ~~0612321~~ 82105502 JB 6/14/02

Temperature: 60°C Hg Thermometer S/N <96-377 cal 1/11/02

E_{corr} = -246.9 mV Keithley 617 S/N 0579628 cal 5/10/02
E_{pt} = 140.5 mV

Solution Deaerated with 99.999% N_2

Specimen Examination: no crevice corrosion (0 of 24 feet
mild staining on all surfaces

specimen re polished for further testing.

Data: L22r129 (continued on pg. 74)

To Page No.____

Witnessed & Understood by me, Date

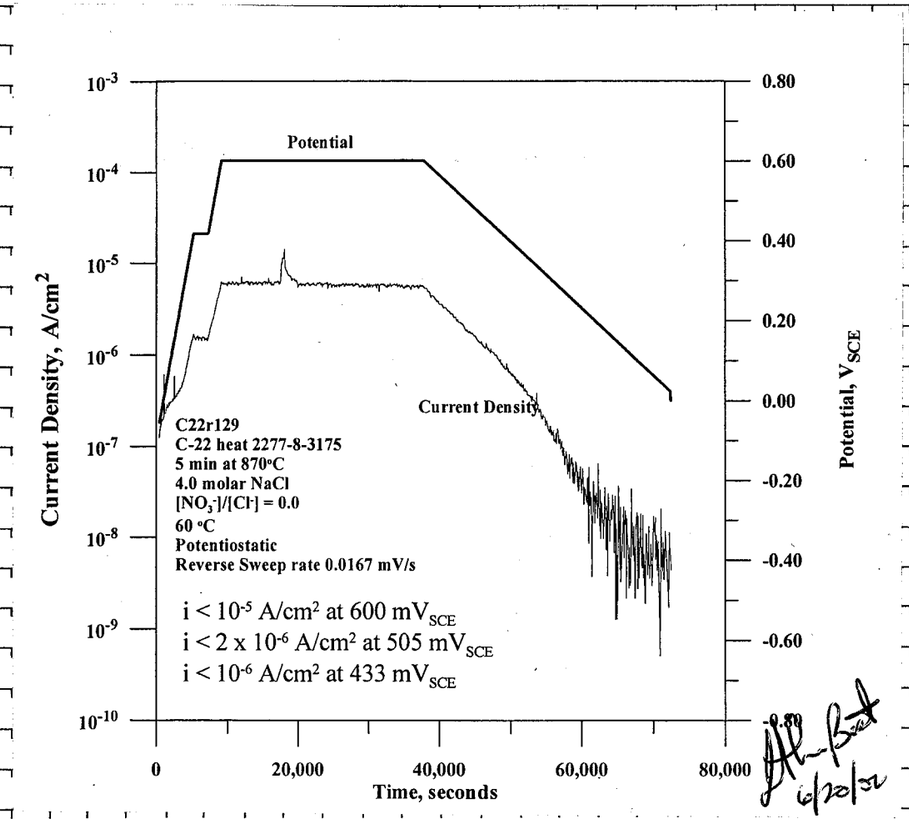
Invented by Date

Recorded by Jeffrey Boot 6/19/02

Project No._____
TITLE_____ Book No._____

From Page No.____ Repassivation Potential of Alloy C-22 (continued from pg. 74)

Data:



Jeffrey Boot 6/20/02

To Page No.____

Witnessed & Understood by me, Date

Invented by Date

Recorded by Jeffrey Boot 6/20/02

From Page No.

Repassivation Potential Alloy C22

objectives: same as pg. 1

Specimen: C-22 heat: 22 77-8-3175 polished to a 600 grit finish with 2 PTFE crevice washers attached at 50 in-oz using Proto 6104 S/N 134072 cal 2/14/02
specimen thermally aged @ 870°C for 5 min
start wt: 34.63025g Sartorious Genius s/N 12809099 cal: 6/4/02
End wt: 34.52199 g

Solution: 4.0 M NaCl
467.54g NaCl Lot 020814
+ DI H_2O up to 2000ml

pH start: 7.437 Fisher Accumet 950 meter S/N 3340 cal: 7/24/01
pH End: 7.579 pH probe #13-620-296 S/N 1100208

Potentiostat: EG&G Model 273 S/N 10120

Counter Electrode: Pt Flag

Reference: Fisher 13-620-52 S/N 0192121

Temperature: 80°C Hg Thermometer S/N C96-833 cal 1/10/02

E_{corr}: -379.8 mV Keithley 617 S/N 0579678 cal 3/10/02
E_{pf}: -81.3 mV

Solution Deaerated with 99.999% N_2

Specimen Examination: Crevice corrosion initiated on 12 of 24 feet
mild staining on all surfaces
Corrosion critical in crevice bolt hole

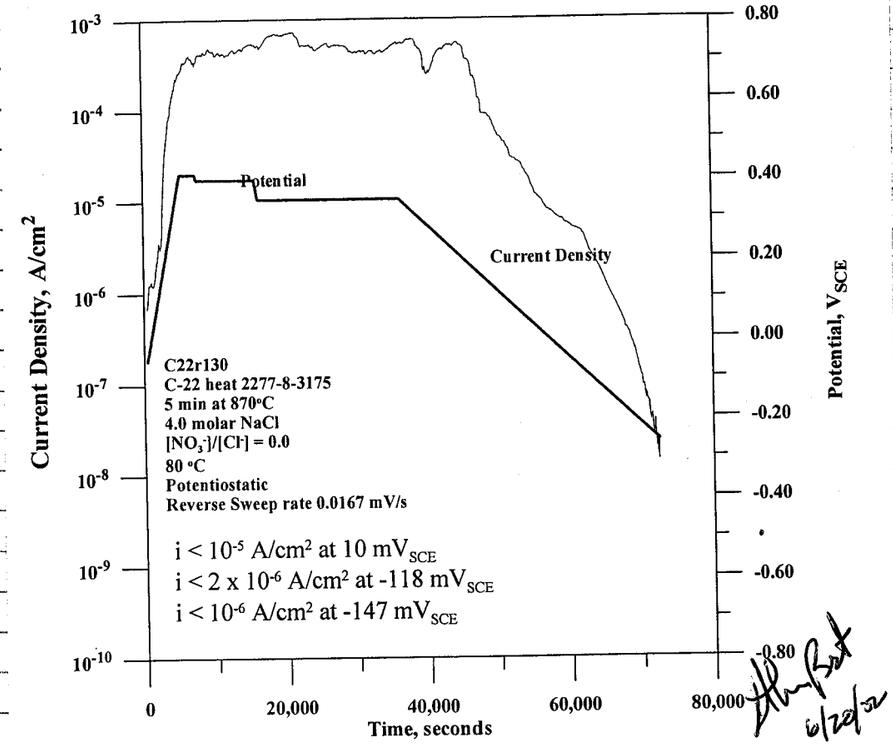
Data: C22r130 continued on pg 77

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by John Bass	6/19/02

From Page No. Repassivation potential of Alloy C-22 (continued from pg. 76)

Data:



John Bass 6/20/02

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by John Bass	6/20/02

From Page No.___ | Electrochemical Impedance Test for Alloy C-22

objective: same as pg.7

Specimen: C-22 heat: 2277-8-3175 Polished to a 600 grit finish

start wt: 12.44580 g Sartorius Genius S/N 12809099 cal: 6/4/02
End wt: 12.44530 g
same test specimen as pg.8

Solution: 0.028M NaCl
3.296g NaCl Lot: 02 0814
+DI H_2O up to 2000ml
pH start: 5.65 Fisher Accumet 950 meter S/N 3340 cal 7/21/01
pH End: 7.023 pH probe, # 13-620-296 S/N 1106208

Impedance Analyzer: Solartron 1260

Counter Electrode: Pt flag

Reference: Fisher 13-62052 S/N 0052132

Temperature: 60°C Hg Thermometer S/N H98-162 cal 4/22/02

$\bar{E}_{corr}$ = -529.4 mV Keithley Model 614 S/N 701931 cal 5/26/02
E_{pt} = -40.3 mV

Solution Deaerated with 99.999% N_2

Specimn examination: No staining or other localized corrosion visible

continued on pg. 79 To Page No._____

Witnessed & Understood by me, | Date | Invented by | Date

Recorded by [signature] 6/14/02

From Page No.___ | Electrochemical Impedance Test for Alloy C-22 (continued from pg 78)

Test: C22eis19

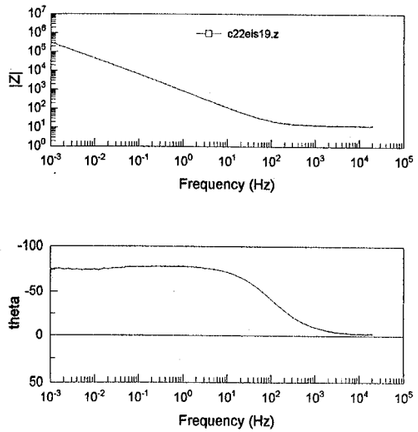
Initial frequency: 20000 Hz.
Final frequency: 0.001 Hz.

10 steps per decade.

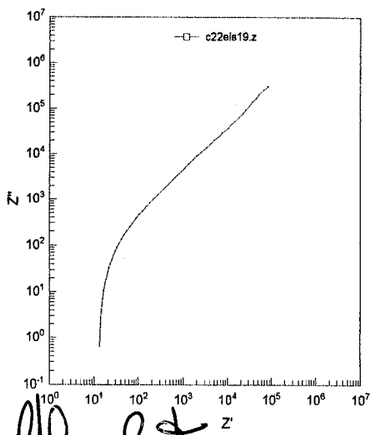
Integration time: 5 seconds
Delay: 2 seconds

Cell info: Area: 8 cm^2
Density: 8.69 g/cm^3
Equivalent weight: 24.04

Data: ~~C22 eis 19~~ 3 6/19/02 C22 eis 19



C22eis19



[signature] 6/20/02

continued on pg. 80 To Page No._____

Witnessed & Understood by me, | Date | Invented by | Date

Recorded by [signature] 6/19/02

Project No.

Book No. TITLE

From Page No. | Electrochemical Impedance Test for Alloy C22 (continued from pg. 74)

~~Objective:~~

Test: C22cis20

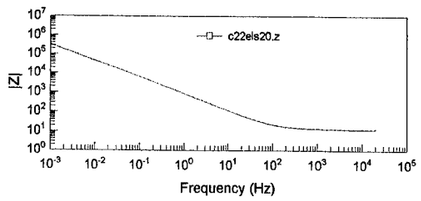
Initial Frequency: 20000 Hz.
Final Frequency: 0.001 Hz

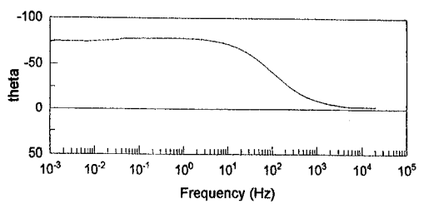
10 steps per Decade

Integration time: 5 seconds
Delay: 2 seconds

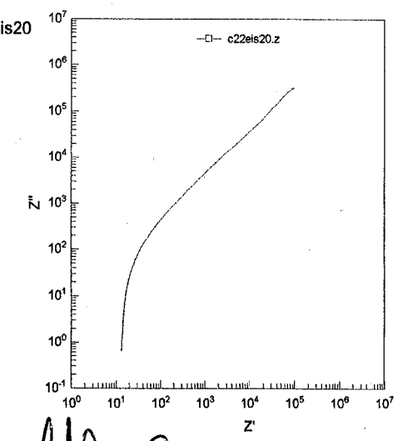
Cell info: Area: 8 cm^2
Density: 8.69 g/cm^3
Equivalent Weight: 26.04

Data: C22 eis 20





C22eis20



Arthur Bart 6/20/02

continued on pg. 81

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Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by Arthur Bart	6/19/02

Project No.

TITLE Book No.

From Page No. | Electrochemical Impedance Test for Alloy C-22 (continued from pg. 80.)

Test: C22 eis 21

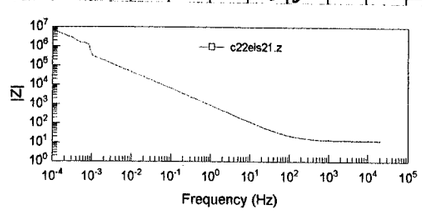
Initial Frequency: 2000 Hz.
Final Frequency: 0.0001 Hz

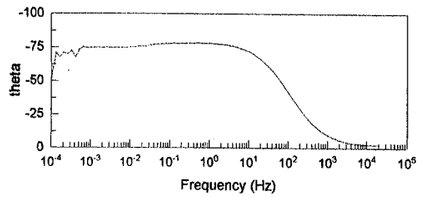
10 steps per Decade

Integration Time: 5 seconds
Delay: 2 seconds

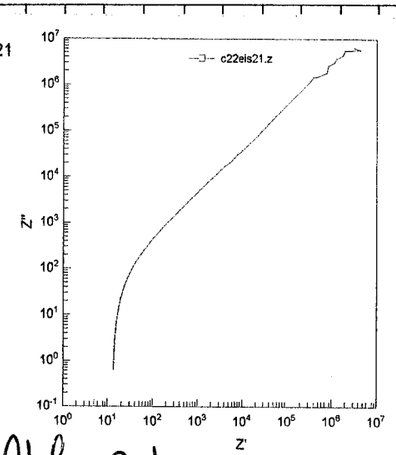
Cell info: Area: 8 cm^2
Density: 8.69 g/cm^3
Equivalent weight: 26.04

Data: C22 eis 21





C22eis21



Arthur Bart 6/21/02

To Page No.

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by Arthur Bart	6/19/02

Project No._____
Book No._____ TITLE repassivation Potential of Alloy C-22

From Page No.____

objective: same as pg. 1

specimen: C22 heat: 2277-8-3175 polished to a 600 grit finish with 2 PTFE crevice washers attached at 50 in-oz using proto 6109 s/N 139072 cal 2/14/02; specimen thermally aged @ 870°C for 5 min

start wt: ~~52.2133g~~ 39.1047g (6/24/02) Sartorius Genius s/N 12809099 cal 6/4/02

End wt: 39.1037g

Solution: 4.0 M NaCl
467.54g NaCl Lot: 020814
+ DI H_2O up to 2000 ml

pH start: 7.625 Fisher Accumet 950 meter s/N 3340 cal 7/24/01

pH End: 6.924 pH probe # 13-620-296 s/N 1100208

potentiostat: EG&G model #273 s/N 41108

Counter Electrode: Pt flag

Reference: Fisher 13-620-52 s/N 82 10 602

Temperature: 60°C Hg Thermometer s/N C96-377 cal 1/11/02

E_{appl} = -331.7 mV Keithley 617 s/N 0579628 cal 5/10/02

E_{pit} = 113.2 mV

Solution Deaerated with 99.999% N_2

Specimen Examination: No crevice corrosion (0 of 24 feet) mild staining

Data: C22r131 continued on pg 83

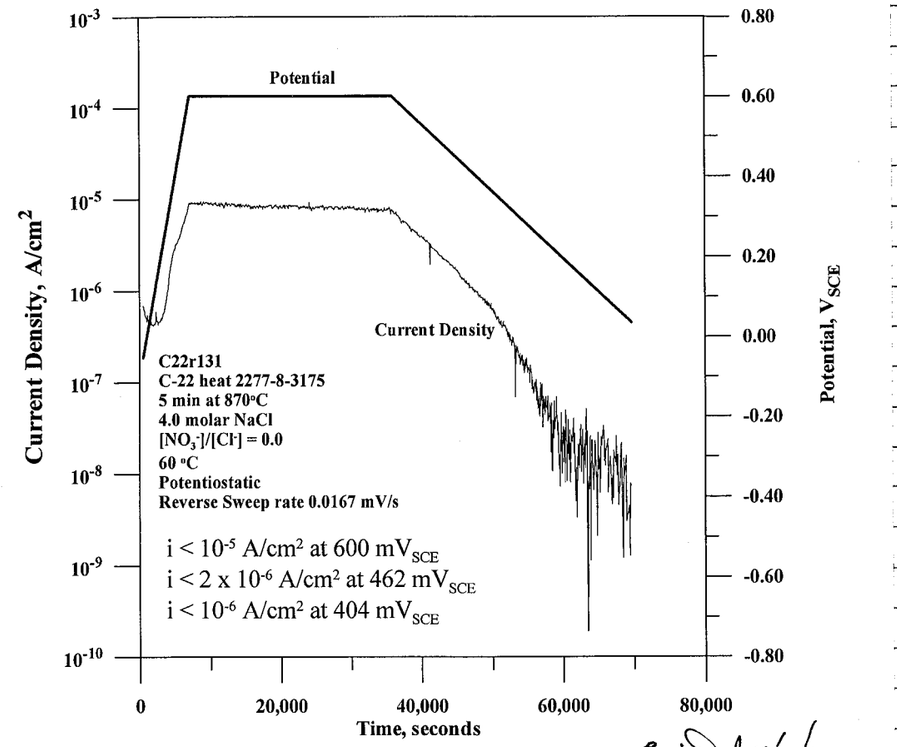
To Page No.____

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/20/02

Project No._____
TITLE _____ Book No._____

From Page No.____ repassivation Potential of Alloy C-22 (continued from pg 82)

Data:



6/24/02

To Page No.____

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/24/02

Project No._____
Book No._____ TITLE Repassivation Potential of Alloy C-22

From Page No.___

Objective: Same as pg. 1

Specimen: C-22 heat: 2277-8-3175 polished to a 600 grit finish with 2 PTFE crevice washers attached at 50 in-oz using Proto 6104 S/N 139672
Specimen thermally aged @ 870°C for 5 min cal 2/14/02
Start wt: 34.48840 g Sartorius Genius S/N 128090966 cal 6/4/02
End wt: 34.47622 g

Solution: 4.0 M NaCl
467.54 g NaCl Lot: 020814
+DI H_2O up to 2000 ml

pH start: 7.593 Fisher Accumet 950 meter S/N 3340 cal 7/24/01
pH End: 7.645 pH probe # 13-620-296 S/N 1100208

Potentiostat: EG&G Model #273 S/N 10120

Counter Electrode: Pt flag

Reference: Fisher 13-620-52 S/N 019,2121

Temperature: 60°C Hg Thermometer S/N C96-833 cal 1/10/02

Eocorr: -294.3 mV Keithley 617 S/N 0577628 cal 3/18/02
E_{pp}: 98.7 mV
E_{pt}: 53 6/20/02
Solution Deaerated with 99.999% N_2

Specimen Examination: Crevice corrosion on 24 of 24 Pcs
~~Need~~ 6/21/02 mild staining on all surfaces

Data: C22r132 continued on pg. 85

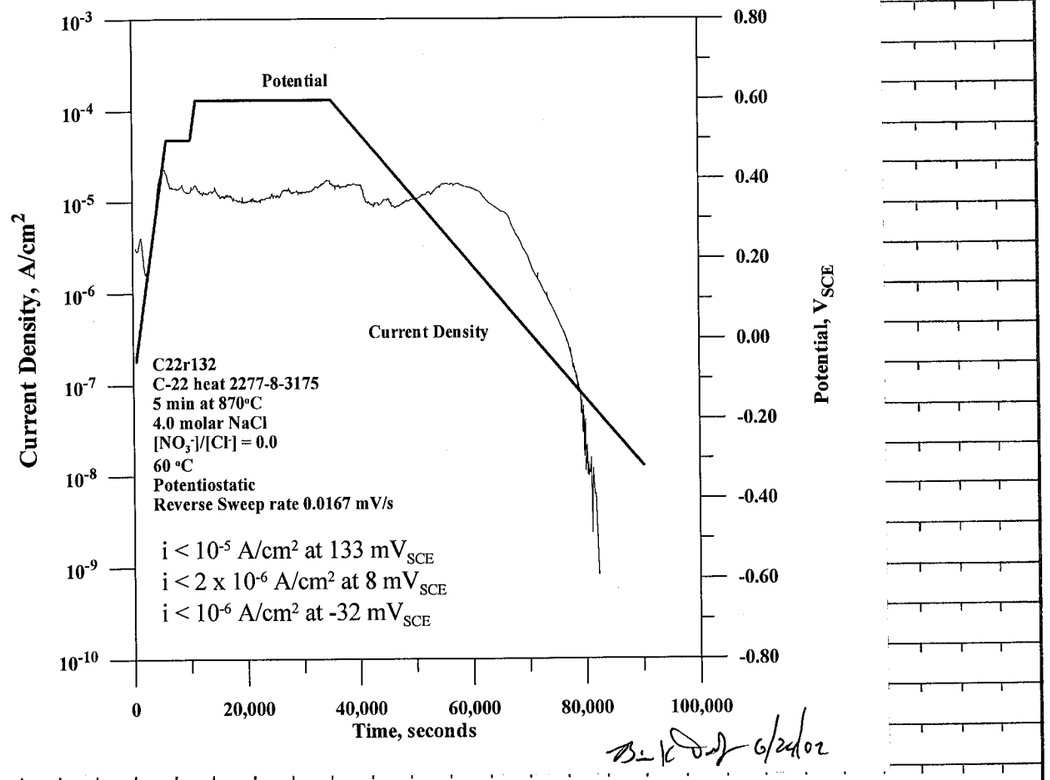
To Page No._____

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by Arlene Rost	6/20/02

Project No._____
TITLE Repassivation Potential of Alloy C-22 (continued from pg. 84)
Book No._____

From Page No.___

Data:



6/24/02

To Page No._____

Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/24/02

Project No._____
Book No._____ TITLE_____

From Page No.____ | Polarization Resistance Test for Alloy C-22

objective: same as pg. 6

specimen: C-22 heat: 2277-8-3175 Polished to a 600 grit finish

start wt: 12.44580 g Sartorius Genius S/N 12809099 cal 6/4/02
End wt: 12.44530 g
same test specimen as pg. 8

Solution: 0.028 M NaCl
3.294 g NaCl Lot: 020814
+ DI H_2O to 2000 ml

pH start: 5.659 Fisher Accumet 950 meter S/N 3340 cal 7/24/01
pH End: 7.023 pH probe #13-620-296 S/N 1100208

Potentiostat: Solartron 1287

Counter Electrode: Pt flag

Reference: Fisher 13-620-52 S/N 6052132

Temperature: 40°C H_2 Thermometer S/N ~~005-2132~~ JB 6/24/02 H46-162 cal 4/22/02

E_{corr}: -524 mV Keithley Model 614 S/N 704 73 6 cal 5/26/02

E_{Pt}: -403 mV

Solution Deaerated with 99.999% N_2

Specimen Examination: No staining or other localized corrosion visible

continued on pg 87

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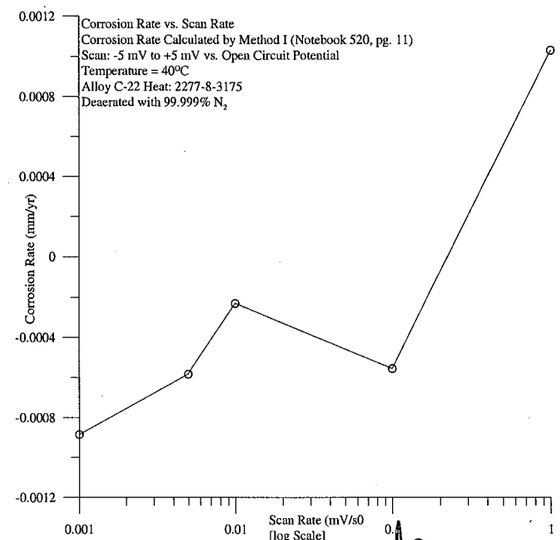
Witnessed & Understood by me, | Date | Invented by | Date
Recorded by Stephen Bates | 6/24/02

Project No._____
TITLE_____ Book No._____

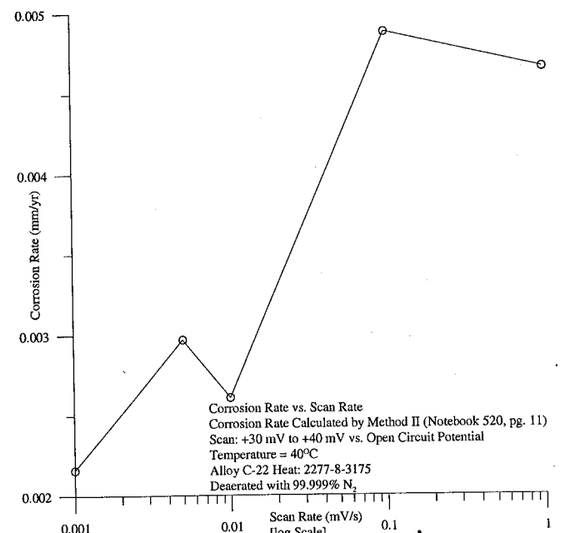
From Page No.____ | Polarization Resistance Test for Alloy C-22 (Continued from pg. 86)

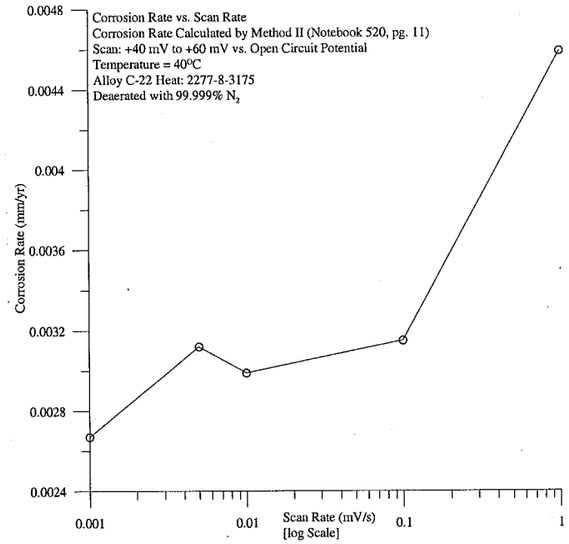
Data: Method I



Stephen Bates 7/17/02

Method II





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continued on pg 88

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Witnessed & Understood by me, | Date | Invented by | Date
Recorded by Stephen Bates | 7/17/02

Project No._____
Book No._____ TITLE_____

From Page No.___ | Polarization Resistance Test for Alloy C-22 (continued from pg. 87)

Test: C22 lpr 41

Scan: -0.015V vs. open circuit potential to +0.060 V vs. open circuit potential JB 6/21/02

Scan Rate: 1 mV/s

E_{corr} = -0.1011 V vs. SCE

Results: Method I (see formulas pg. 11)

$R_p = 4.9541 \times 10^5\ \Omega \cdot cm^2$
$I_{corr} = 1.0513 \times 10^{-7}\ A/cm^2$
C.R. = 0.00102 mm/yr

Method II

A. from Data: +30mV vs. open circuit potential to +40mV vs. open circuit (-0.071 < E < -0.061)

$b = 7.38347 \times 10^{-7}$
$m = 2.60357 \times 10^{-6}$
$I_{corr} = 4.75 \times 10^{-7}\ A/cm^2$
C.R. = 4.66×10^{-3} mm/yr = 0.00466 mm/yr

B. from Data: +40mV vs. open circuit to +60mV vs. open circuit (E > -0.061)

$b = 7.59320 \times 10^{-7}$
$m = 2.87897 \times 10^{-6}$
$I_{corr} = 4.68 \times 10^{-7}\ A/cm^2$
C.R. = 4.59×10^{-3} mm/yr = 0.00459 mm/yr

Data: C22 lpr 41 JB 6/21/02 (Method I) pg. 89
C22 lpr 41 JB 6/21/02 (Method II) pg. 89

Continued on pg. 89

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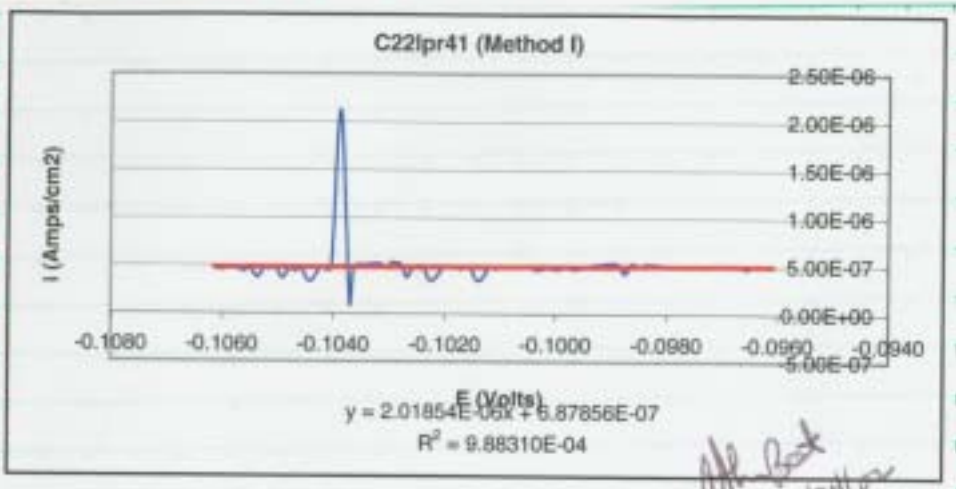
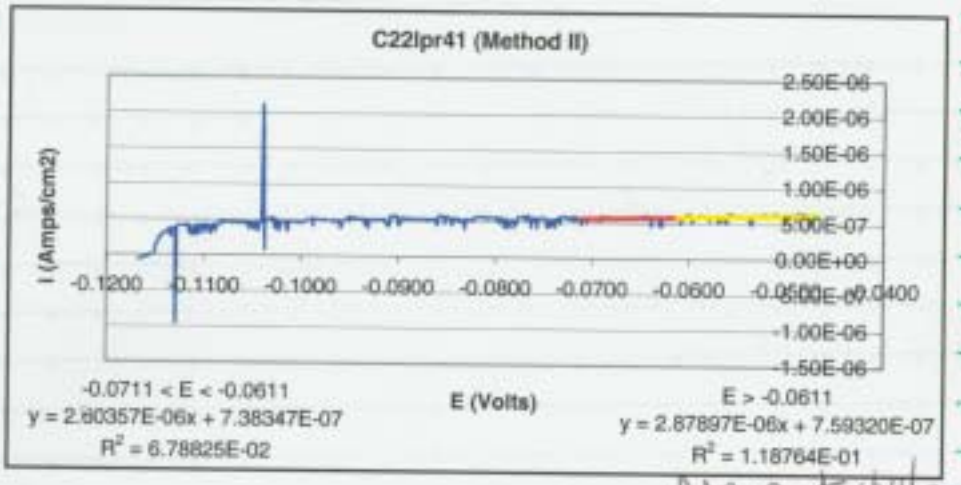
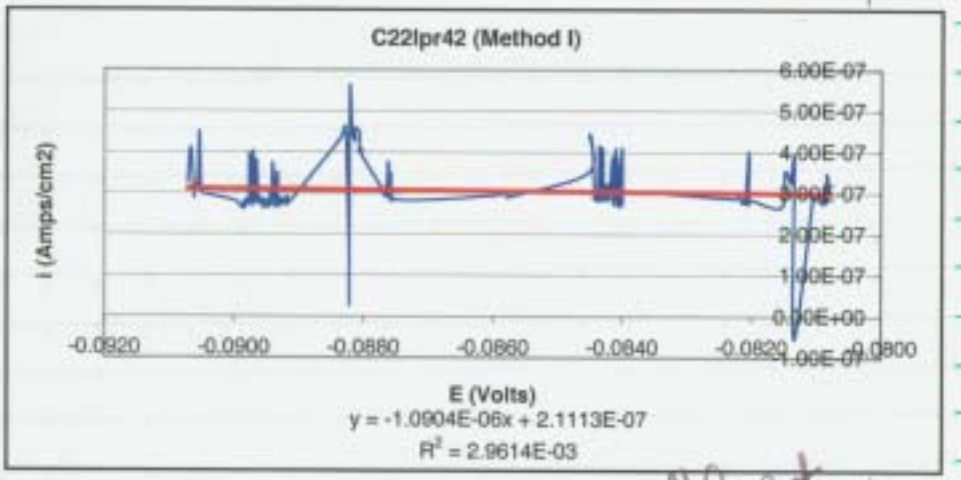
Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by [signature]	6/21/02

From Page No. Polarization Resistance for Alloy C-22 (continued from pg 88)







continued on pg 90

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Witnessed & Understood by me. Date Invented by Date

Recorded by

From Page No. | Polarization Resistance Test for Alloy C-22 (continued from pg. 89)

Test: C22 lpsn 42

scan: -0.015 V vs. open circuit potential to +0.060 V vs. open circuit

scan rate: 0.1 mV/s

E_{corr} = -0.0858 V vs. SCE

Results: Method I (see formulas on pg. 11)

$R_p = -9.1709 \times 10^5\ \Omega \cdot cm^2$
$I_{corr} = -5.6788 \times 10^{-8}\ A/cm^2$
C.R. = -5.56×10^{-4} mm/yr = -0.000556 mm/yr

Method II (see formulas pg. 11)

A. from Data: +30mV vs. open circuit to +40mV vs. open circuit ($-0.0588 < E < -0.0488$)

b = 1.3546×10^{-7}
m = -4.2287×10^{-6}
I_{corr} = 4.98×10^{-7} A/cm²
C.R. = 0.00488 mm/yr

B. from Data: +40mV vs. open circuit to +60mV vs. open circuit ($E > -0.0958$)

b = 3.94347×10^{-7}
m = 8.44299×10^{-7}
I_{corr} = 3.22×10^{-7} A/cm²
C.R. = 0.00315 mm/yr

Data: C22 lpsn 42 (Method I) pg. 89
C22 lpsn 42 (Method II) pg. 89 JB 6/24/02 92

Continued on pg. 91

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Witnessed & Understood by me, | Date | Invented by | Date
Recorded by JB | 6/21/02

From Page No. | Polarization Resistance Test for Alloy C-22 (continued from pg. 90)

Test: C22 lpsn 43

scan: -0.015 V vs. open-circuit potential to +0.060 V vs. open circuit

scan rate: 0.01 mV/s

E_{corr} = -0.0778 V vs. SCE

Results: Method I (see formulas pg. 11)

$R_p = -2.2069 \times 10^6$
$I_{corr} = -2.3598 \times 10^{-8}$
C.R. = -0.000231 mm/yr

Method II (see formulas pg. 11)

A. from Data: +30mV vs. open circuit to +40mV vs. open circuit ($-0.0478 < E < -0.0378$)

b = 3.57980×10^{-7}
m = 1.18340×10^{-8}
I_{corr} = 2.66×10^{-7} A/cm²
C.R. = 0.00261 mm/yr

B. from Data: +40mV vs. open circuit to +60mV vs. open circuit potential ($E > -0.0378$)

b = 3.19583×10^{-7}
m = -3.13 6/24/02 1.82193×10^{-7}
I_{corr} = 3.05×10^{-7} A/cm²
C.R. = 0.00299 mm/yr

Data: C22 lpsn 43 (Method I) pg. 92
C22 lpsn 43 (Method II) pg. 92

Continued on pg. 92

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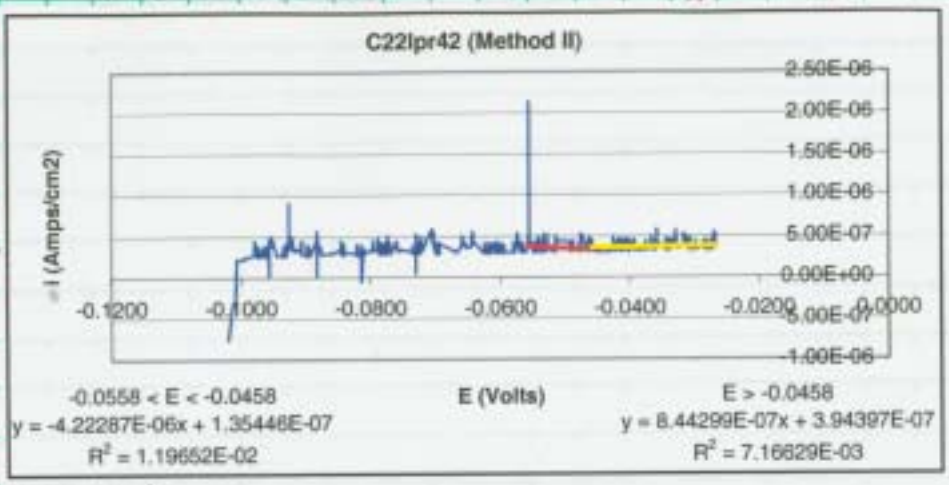
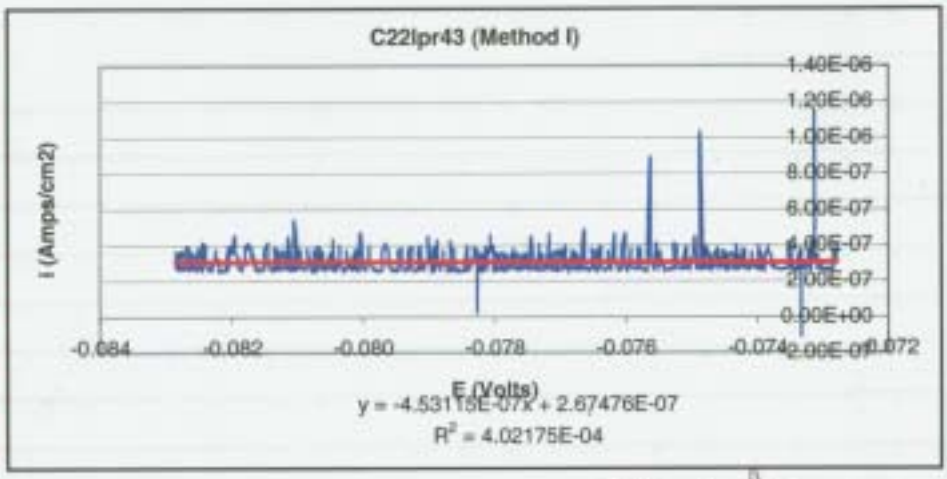
Witnessed & Understood by me, | Date | Invented by | Date
Recorded by JB | 6/21/02

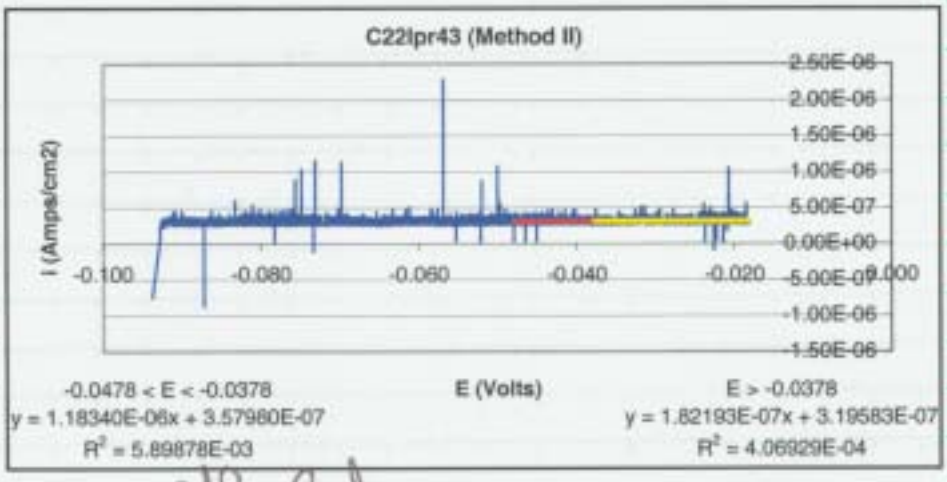
Project No.
Book No. TITLE Polarization Resistance Test for Alloy 22 (continued from pg. 91)

From Page No.

Data:







continued on pg. 93

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Witnessed & Understood by me, Date

Invented by

Recorded by

Date 6/24/02

From Page No. | Polarization Resistance Test ~~for Alloy J3 6/24/02~~ (continue from pg. 92)
for Alloy C-22 6/24/02

Test: C22 lpm 44

Scan: -0.015V vs. open circuit potential to +0.060V vs. open circuit

Scan rate: 0.005 mV/s

E_{corr} = -0.0650 V vs. SCE

Results: Method I (see formula on pg. 11)

R_p = -8.7468×10^{-5} $\Omega \cdot cm^2$
I_{corr} = -5.9542×10^{-8} A/cm^2
C.R. = -0.000583 mm/yr

Method II (see formula on pg. 11)

A. for Data: +30 mV vs. open circuit to +40 mV vs. open circuit ($-0.035 < E < 0.025$)

b = 2.98200×10^{-7}
m = -8.01143×10^{-8}
I_{corr} = 3.03×10^{-7} A/cm^2
C.R. = 2.97×10^{-3} mm/yr = 0.00297 mm/yr

B. for Data: +40 mV vs. open circuit to +60 mV vs. open circuit (~~B 6/21/02~~ $E > -0.025$)

b = 2.83726×10^{-7}
m = 2.08844×10^{-7}
I_{corr} = 2.73×10^{-7} A/cm^2
C.R. = 2.67×10^{-3} mm/yr = 0.00267 mm/yr

Data: C22 lpm 44 (Method I) pg 94
C22 lpm 44 (Method II) pg. 94

Continued on pg. 94 To Page No.

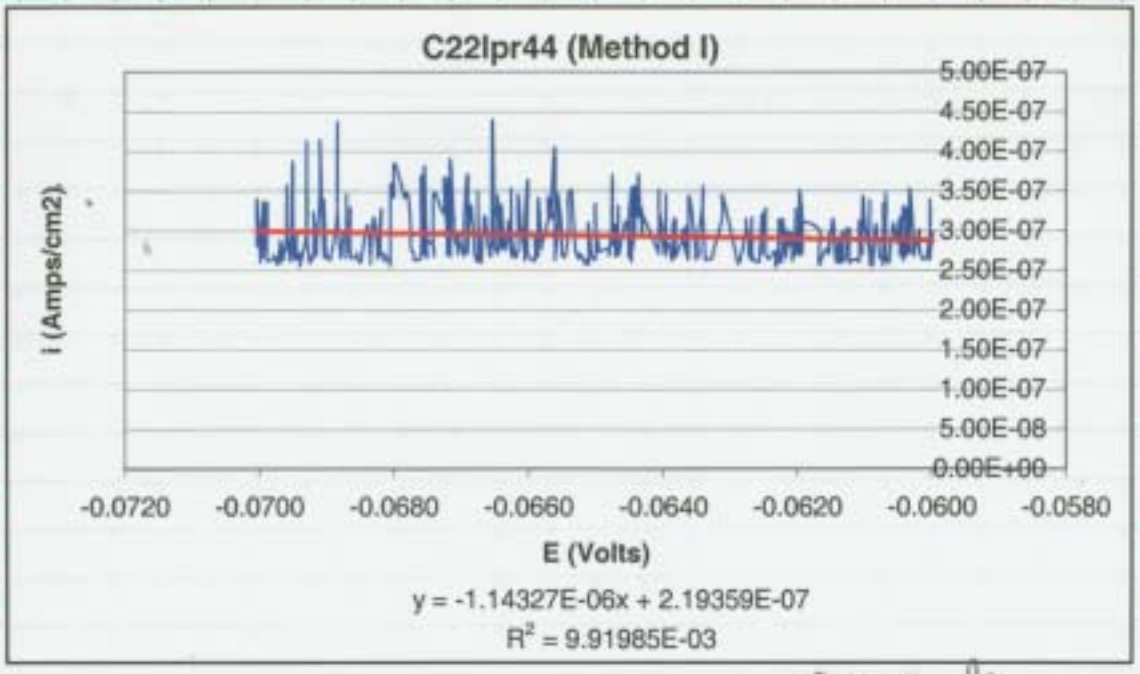
Witnessed & Understood by me, | Date | Invented by | Date
Recorded by [signature] | 6/21/02

Project No.

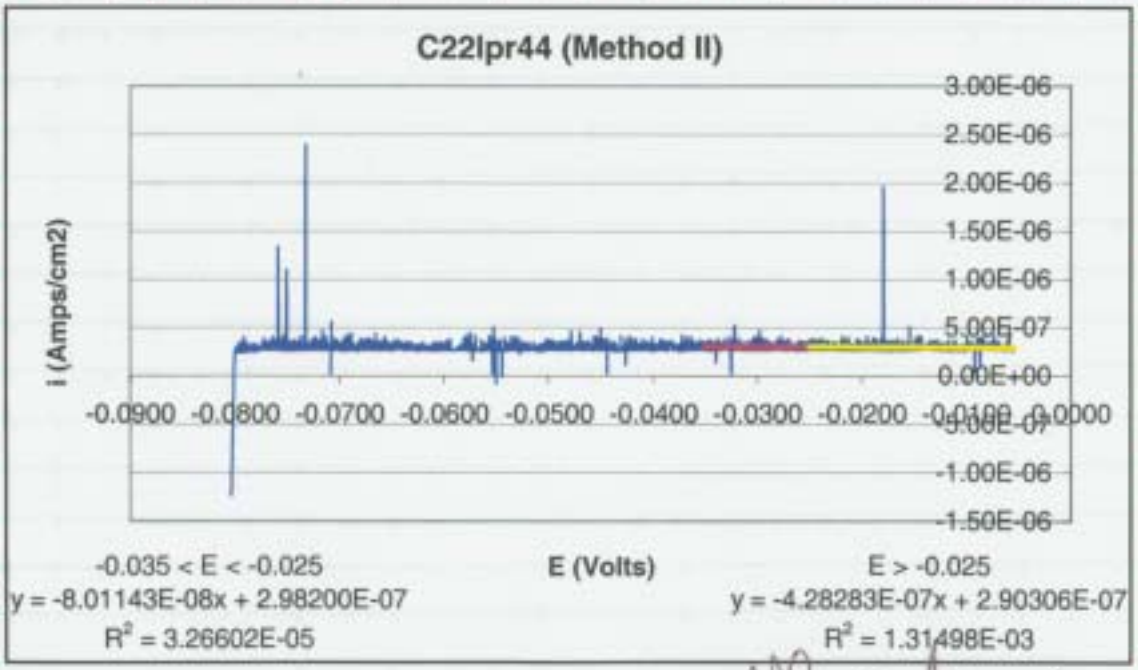
Book No. TITLE

From Page No. Polarization Resistance Test for Alloy C-22 (continued from pg 93)

Data:



4/24/12



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Witnessed & Understood by me, Date

Invented by Date

Recorded by 6/24/12

From Page No. | Polarization Resistance Test for Alloy C-22 (continued from pg. 94)

Test: C22lpr1 45

Scan: ~~0.015~~ 6/21/02 -0.015 V vs. open circuit to +0.060 V vs. open circuit potential

scan rate: 0.001 mV/s

E_{corr} = -0.0525 V vs. SCE

Results: Method I (see formulas on pg. 11)

R_p = -5.7677×10^{5} $\Omega \cdot cm^2$

I_{corr} = -9.0295×10^{-8} A/cm^2

C.R. = -0.000885 mm/yr

Method II (see formulas pg. 11)

A. for Data: +30 mV vs. open circuit to +40 mV vs. open circuit ($-0.0225 < E < 0.0125$)

b = 3.09799×10^{-7}

m = 1.70104×10^{-6}

I_{corr} = 2.20×10^{-7} A/cm^2

C.R. = 2.16×10^{-3} mm/yr = 0.00216 mm/yr

B for Data: +40 mV vs. open circuit to +50 mV vs. open circuit ($E > -0.0125$)

b = 2.83726×10^{-7}

m = 2.08844×10^{-7}

I_{corr} = 2.73×10^{-7}

C.R. = 0.00267 mm/yr

Data: C22 lpr1 45 (Method I) pg. 96

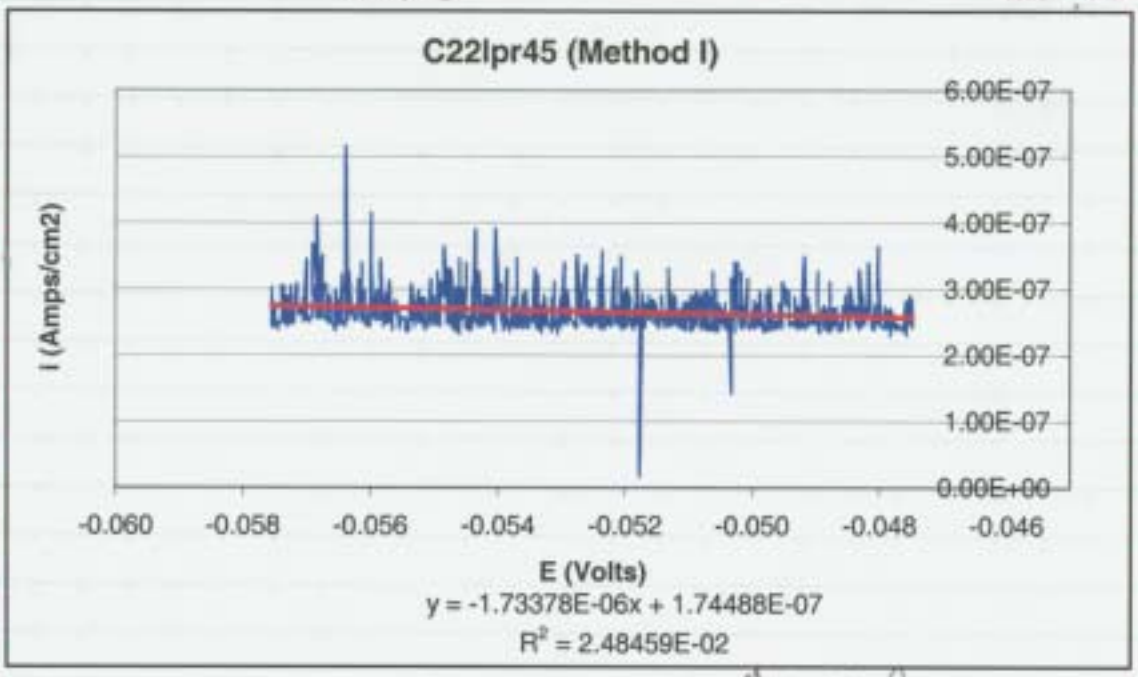
C22 lpr1 45 (Method II) pg. 96

continued on pg. 96 To Page No.

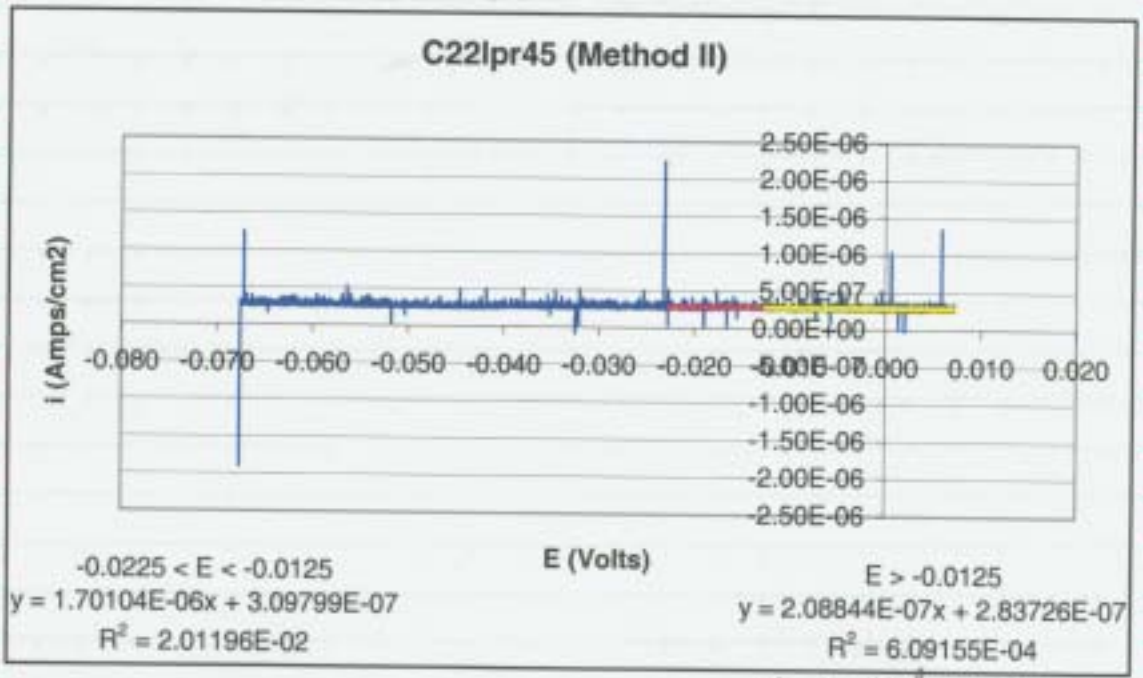
Witnessed & Understood by me,	Date	Invented by	Date
		Recorded by	6/21/02

From Page No. Polarization ~~Test~~ & Resistance Test For Alloy C-22 Continued From on 9.57

Date: 6/21/02



6/24/02



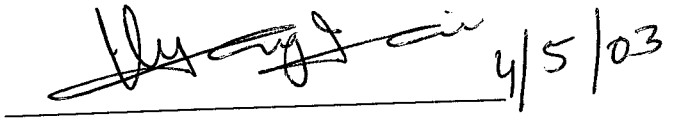
6/24/02

* Continue Testing In NB# 528 * 6/24/02

To Page No.

Witnessed & Understood by me.	Date	Invented by	Date
		Recorded by	6/24/02

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.



4/5/03