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Hanford Tanks 241-AN-107 and 241-AN-102: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking

CC Technologies, Inc., Dublin, Ohio 43017 for ARES Corporation for
CH2M HILL Hanford Group, Inc.
Richland, WA 99352
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Abstract: CC Technologies, Inc. of Dublin, Ohio (contracted by ARES Corporation of Richland, WA) performed a series of cyclic potentiodynamic polarization, potentionstatic polarization, slow strain rate, and constant load crack growth rate tests. The key findings of these test are included in this report.

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HANFORD TANKS 241-AN-107 AND 241-AN-102: EFFECT OF CHEMISTRY AND OTHER VARIABLES ON CORROSION AND STRESS CORROSION CRACKING

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EXECUTIVE SUMMARY

The Hanford tank reservation contains approximately 50 million gallons of liquid legacy radioactive waste from cold war weapons production which is stored in 177 underground storage tanks. Current plans call for eventual vitrification processing and ultimate disposal of the resulting waste glass logs at the Yucca Mountain Repository. The double shelled carbon steel storage tanks presently used for storage will continue in operation until the vitrification plant construction is finalized and waste processing operations are completed. Due to various chemical reactions taking place inside Tank 241-AN-107, the waste chemistry will tend to change over time, especially given the currently estimated 2023 time horizon anticipated for tank operations to continue. In addition, the present chemistries for some of the tank waste types are no longer in specification with respect to corrosion mitigation (e.g., maintaining pH levels above 13). Thus, there is concern within DOE and regulatory bodies that tank integrity will be compromised given these changes in chemistry. Furthermore, if tank integrity is potentially compromised, there is a need to define mitigation procedures. Thus, the objective of this work is to determine the range of conditions where the tank steel is susceptible to localized corrosion and SCC to define possible corrosion mitigation strategies for the supernatant and sludge regions.

To accomplish this objective, a series of cyclic potentiodynamic polarization, potentiostatic polarization, slow strain rate, and constant load crack growth rate tests were performed. Based on the work conducted, the key findings of the research are:

- No SCC was observed under open circuit conditions in any of the Tank 241-AN-107 simulants; additionally, the corrosion potentials measured in actual tank waste tended to be at least 60 mV more negative than those measured in the waste simulants under similar conditions (quiescent, non-deaerated conditions)

- Nitrite has been found to be a strong inhibitor for both SCC and pitting
  - Nitrite/nitrate concentration ratios between 0.5 and 1.0 were found to impart substantial resistance to pitting (near 0.5) and SCC (near 1.0)
  - Though nitrite/nitrate ratios between 0.5 and 1.0 were found to be beneficial, it is uncertain based on the data obtained thus far if the concentration ratio or the absolute concentration of nitrite controls inhibition

- pH appears to act as an inhibitor for both pitting and SCC
  - With respect to SCC, increasing the pH over the range from 7 – 11 in standard Tank 241-AN-107 solutions resulted in a decrease in the estimated crack growth rate in SSR tests; above pH 11 there did not appear to be an influence of pH on the SCC crack growth rate
    - In the simulated endpoint Tank 241-AN-107 chemistry, pH values as low as 9.5 showed estimated crack growth rates comparable to those observed in standard Tank 241-AN-107 simulant at pH 11

(this appears to be due to the greater nitrite/nitrate ratio in the endpoint chemistry compared to the standard simulant chemistry)

- For pitting, the difference between the repassivation potential and the corrosion potential was greater than 200 mV at pH values above 10, indicating that pitting corrosion is not likely to occur in the standard Tank 241-AN-107 simulant; below pH 10, the difference was negative when measured using cyclic potentiodynamic polarization, indicating a much higher likelihood of localized corrosion (note, potentiostatic polarization showed that the values obtained from cyclic polarization tended to be conservative and thus the propensity for localized corrosion at pH values near 10 in standard Tank 241-AN-107 simulant appears to be minimal)
  - In the simulated endpoint Tank 241-AN-107 chemistry at pH 10, pitting corrosion was also found to be unlikely

- TOC appears to provide some inhibition of SCC under some circumstances but otherwise has a negligible influence on SCC and pitting
  - In the standard Tank 241-AN-107 solutions, increases in the TOC levels did not appear to influence either pitting or SCC
  - In Tank 241-AN-107 solutions without nitrite, TOC was observed to act as an inhibitor for SCC but tended to exacerbate pitting

- Applied potential is an important factor in establishing regions of SCC susceptibility
  - At potentials more negative than -100 mV vs. SCE, SCC was not observed in Tank 241-AN-107 solutions
  - More positive applied potentials (than -100 mV) not only induces SCC but the estimated crack growth rate increased with increasing potential
  - No SCC was observed in any of the AN 107 solutions at the free corrosion potential

- Chloride concentration has an effect on SCC behavior in some situations and only a minimal influence on pitting
  - Increasing the chloride concentration over the range of 0.05 to 0.2M resulted in a slight increase in the estimated SCC crack growth rate from SSR tests at an applied potential of 0 mV vs. SCE, but did not influence the crack growth rate measured in constant load tests
  - SCC was not observed in tests with 0.2M chloride when the applied potential was more negative than -100 mV vs. SCE
  - Tests at 0.2M chloride were used to bound the likely behavior of Tank 241-AN-102

- SCC was observed in simulated Tank 241-AN-107 standard and endpoint solutions with a maximum crack growth rate of ~ 2×10^{-9} in/s in constant load tests
  - The crack growth rate in the constant load tests was relatively independent of applied K above 20 ksi$\sqrt{\text{in}}$

- Based on the testing conducted, K_{ISCC} is estimated to be between 10 and 30 ksi√in (most likely near 20 ksi√in)
- Current testing enables resolving crack growth rates as low as 10^{-10} in/s; historically, due to sensitivity limits crack growth rates less than 10^{-8} in/s were generally below the detection limit and thus the applied K for these rates was assumed to be below K_{ISCC}

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INTRODUCTION AND BACKGROUND

The Hanford tank reservation contains approximately 50 million gallons of liquid legacy radioactive waste from cold war weapons production, which is stored in 177 underground storage tanks. Current plans call for eventual vitrification processing and ultimate disposal of the resulting waste glass logs at the Yucca Mountain Repository. The double shelled carbon steel storage tanks presently used for storage will continue in operation until the vitrification plant construction is finalized and waste processing operations completed.

Though there are several different waste chemistry types that have been grouped according to their main constituents, all of the wastes tend to be highly alkaline in nature, typically with pH values greater than 10 and to hydroxide concentrations in excess of 6M. Under alkaline conditions, carbon steels will tend to be passive and undergo relatively slow, uniform corrosion. Under these passive conditions, however, carbon steels also can become susceptible to localized corrosion (e.g., pitting) and stress corrosion cracking (SCC) in the presence of certain aggressive constituents, such as chloride and nitrate. The original single shell storage tanks experienced stress corrosion cracking failures as a result of the presence of high concentrations of nitrate in the waste. Research at Hanford and SRL demonstrated that cracking could be prevented by maintaining a high pH of the waste (>13) and post-weld heat treatment of the tanks to 1100 °F. Accordingly, all of the double shelled storage tanks were fabricated with stress relieved welds and chemistry controls were instituted to maintain the pH of the waste above 13-13.5 (as reflected as a minimum hydroxide concentration) in combination with a minimum nitrite concentration. At lower pH values, it was unclear if the relationships developed for higher alkaline conditions would still apply.

Due to various chemical reactions taking place inside the tanks, the waste chemistry will tend to change over time, especially given the currently estimated 2023 time horizon anticipated for tank operations to continue. In addition, the present chemistries for some of the tank waste types are no longer in specification with respect to corrosion (e.g., maintaining pH levels above 13-13.5). Thus, there is concern within DOE and regulatory bodies that tank integrity will be compromised given these changes in chemistry. Furthermore, if tank integrity is potentially compromised, there is a need to define mitigation procedures.

With reference to Tank 241-AN-107, for example, the present pH is between 11 and 12 in comparison to the operational specification of greater than 13. Caustic additions, though capable of returning the supernatant into specification, cannot easily return the salt cake waste chemistry to specification based on porous media convection. Thus, the possible installation of a mixing pump to facilitate homogenization and more effectively return the tank chemistry to specification was being considered. Over and above the immediate issue of installation of a mixing pump, caustic additions will be required to maintain a pH of 13 due to the consumption of hydroxide ions by the slow oxidation of organic constituents as well as the presence of carbon dioxide. These additions will

increase the waste volume, which greatly increases the cost of vitrifying and ultimately disposing of the waste.

The interim findings from Tank 241-AN-107 testing[1] showed that localized corrosion and SCC were unlikely in the existing and expected composition of the waste. However, since these wastes are a complex mixture of nitrate, nitrite, organic compounds (e.g., acetate, oxalate, ethylenediaminetetraacetate, and glycolate), hydroxide, chloride, and other species the influence of each of these on possible tank performance is unclear. For example, it has been argued that Tank 241-AN-107, though out of pH specification, is not likely to suffer from corrosion-related failure due to the inhibitive properties and concentrations of the organic compounds (total organic carbon level). Thus, the objective of this work is to determine the range of conditions where the tank steel is susceptible to localized corrosion and SCC to define possible corrosion mitigation strategies the supernatant and sludge regions. No work has been performed that examines possible integrity risks associated with the vapor phase region.

[1] Michiel P. Brongers, C. Sean Brossia, ARES Tank 241-AN-107 Final Interim Report, "Investigation of Chemistry Factors Influencing Stress Corrosion Cracking Susceptibility of High-Level Waste in Double Shell Tank 241-AN-107".

SUMMARY OF KEY FINDINGS

Based on the work conducted, the key findings of the research are:

- No SCC was observed under open circuit conditions in any of the Tank 241-AN-107 simulants; additionally, the corrosion potentials measured in actual tank waste tended to be at least 60 mV more negative than those measured in the waste simulants under similar conditions (quiescent, non-deaerated conditions)

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  - Increasing the chloride concentration over the range of 0.05 to 0.2M resulted in a slight increase in the estimated SCC crack growth rate from SSR tests at an applied potential of 0 mV vs. SCE, but did not influence the crack growth rate measured in constant load tests
  - SCC was not observed in tests with 0.2M chloride when the applied potential was more negative than -100 mV vs. SCE
  - Tests at 0.2M chloride were used to bound the likely behavior of Tank 241-AN-102

- SCC was observed in simulated Tank 241-AN-107 standard and endpoint solutions with a maximum crack growth rate of ~ 2×10^{-9} in/s in constant load tests
  - The crack growth rate in the constant load tests was relatively independent of applied K above 20 ksi√in
  - Based on the testing conducted, K_{ISCC} is estimated to be between 10 and 30 ksi√in (most likely near 20 ksi√in)
  - Current testing enables resolving crack growth rates as low as 10^{-10} in/s; historically, due to sensitivity limits crack growth rates less than 10^{-8} in/s were generally below the detection limit and thus the applied K for these rates was assumed to be below K_{ISCC}

EXPERIMENTAL APPROACH

Materials and Specimens

All test specimens were fabricated from three 3'×2'×1" as-supplied plates of ASTM A537 Class 2 carbon steel material that had been heat-treated to obtain material properties similar to those of the Class 1 carbon steel used for construction of the double shell storage tanks. Three main specimen geometries were utilized in this work, as shown in FIGURES 1 – 3. Specimens were fabricated by Metal Samples Company in Munford, AL or Metcut Research, Inc. in Cincinnati, OH. Material close to the flame cuts at the edges of the plates was avoided for specimen fabrication to ensure consistent microstructures. The slow strain rate test (SSRT) specimens were fabricated such that the longitudinal axis was in the plate rolling direction (i.e., longitudinal orientation). Compact tension specimens were fabricated such that the precrack was in the plate rolling direction (i.e., transverse-longitudinal orientation).

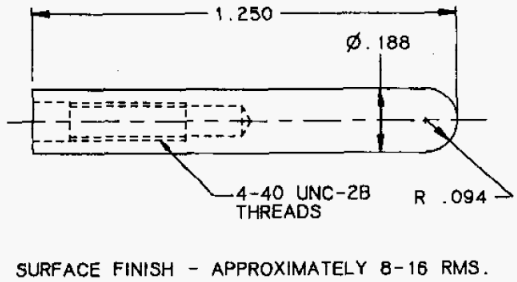

Figure 1. Engineering drawing of the specimen for cyclic potentiodynamic polarization tests (units in inches)

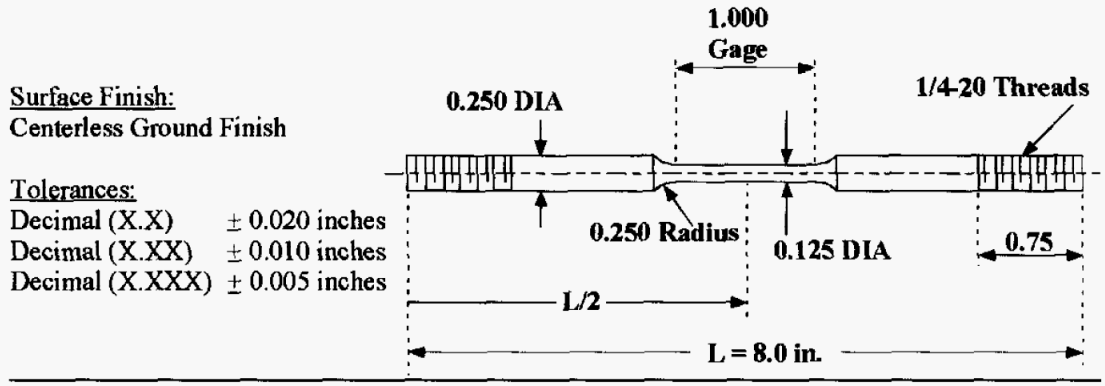

Figure 2. Engineering drawing of the specimen for slow strain rate tests (units in inches)

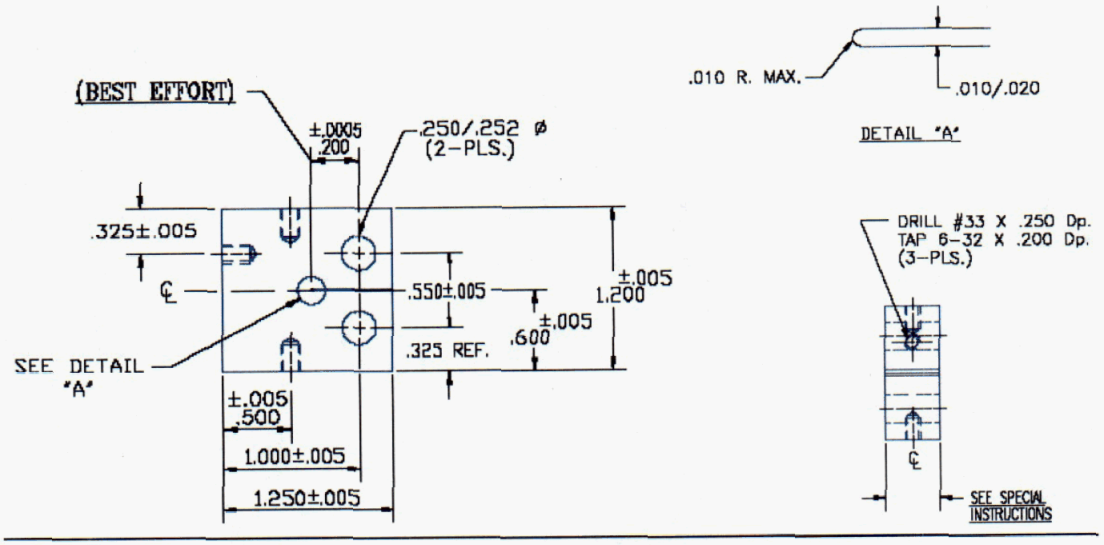

Figure 3. Engineering drawing of the compact tension specimen (unit in inches)

Chemicals and Solutions

TABLE 1 is a list of the chemicals that were used to mix the standard base Tank 241-AN-107 solution. For each test, the solution was mixed 24 hours before starting the test so that the chemicals would dissolve completely. During this time period, the solution was kept on a constantly vibrating shaker to avoid any possible precipitation. The pH of the solution was adjusted shortly before the use of the solution with either sodium hydroxide or sulfuric acid depending on the desired final pH (the initial pH was between 10 and 11 before adjusting).

Four main solution chemistries were examined:

- standard Tank 241-AN-107 (with variations in pH, nitrite concentration, total organic carbon (TOC) concentration, and nitrite/nitrate concentration ratio). The standard AN 107 simulant contains 1.2M nitrite, 3.7M nitrate, 20g/L TOC and 0.1M chloride. Note that the chloride concentration in the standard Tank 241-AN-107 is about double that in the tank
- endpoint Tank 241-AN-107 intended to simulate the Tank 241-AN-107 chemistry in 2023 (composition identical to standard Tank 241-AN-107 with changes in the nitrite [2.3M] and nitrate [2.4M] concentrations and a pH of 10)
- double chloride Tank 241-AN-107 intended to bound the present condition AN102 tank chemistry (composition identical to standard Tank 241-AN-107 with a change in the chloride concentration [0.2M])
- double chloride endpoint Tank 241-AN-107 intended to bound the AN102 chemistry in 2023 (composition identical to Tank 241-AN-107 endpoint with a change in the chloride concentration [0.2M])

These chemistries are summarized in Table 2.

Table 1: THE LIST OF CHEMICALS USED IN THE STANDARD TANK 241-AN-107 SOLUTION*

Compound	Formula	Mass Required (g)
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	13.92
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.64
Cesium Nitrate	$CsNO_3$	0.108
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.44
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	48.92
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.56
Lead Nitrate	$Pb(NO_3)_2$	2.48
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	1.04
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	8.12
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	1.16
Nickel Nitrate, 6-Hydrate	Ni(NO3)2.6H_2O	10.52
Potassium Nitrate	KNO_3	18.40
Strontium Nitrate	$Sr(NO_3)_2$	0.064
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.84
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$**	0.76
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	29.04
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	8.64
Sodium Gluconate	$C_6H_{11}NaO_7$	15.72
Glycolic Acid	$C_2H_4O_3$	107.72***
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	37.76
Nitrilotriacetic Acid	$C_6H_9NO_6$	2.28
Iminodiacetic Acid	$HN(CH_2COOH)_2$	24.16
Boric Acid	H_3BO_3	0.80
Sodium Chloride	NaCl	23.36
Sodium Fluoride	NaF	1.16
Sodium Chromate	Na_2CrO_4	2.20
Sodium Sulfate	Na_2SO_4	48.80
Potassium Molybdate	K_2MoO_4	0.36
Sodium Hydroxide	NaOH	61.04
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	21.48
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	17.76
Sodium Formate	NaHCOO	62.84
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	9.48
Sodium Oxalate	$Na_2C_2O_4$	5.04
Sodium Carbonate	Na_2CO_3	593.00
Sodium Nitrate	$NaNO_3$	1189.16
Sodium Nitrite	$NaNO_2$	331.16

* The chemical weight in the table is for preparing of 4L Tank 241-AN-107 solution;
** x is approximately equal to 1;
*** The weight of 70% aqueous solution;

TABLE 2: SUMMARY OF MAIN CONSTITUENTS IN THE WASTE SIMULANTS INVESTIGATED IN THE PRESENT WORK

	Main Constituents			
Solution Designation	**Nitrate (M)**	**Nitrite (M)**	**Chloride (M)**	**pH**
Standard Tank 241-AN-107	**3.7**	**1.2**	**0.1**	**11**
Endpoint Tank 241-AN-107	**2.4**	**2.3**	**0.1**	**10**
Double Chloride Tank 241-AN-107/Present AN102	**3.7**	**1.2**	**0.2**	**11**
Double Chloride Endpoint 107/Endpoint AN102	**2.4**	**2.3**	**0.2**	**10**

Open Circuit Potential and Cyclic Potentiodynamic Polarization Testing

The cyclic potentiodynamic polarization (CPP) testing was performed according to ASTM G61.[2]

Prior to CPP testing, the specimens were ultrasonically cleaned with isopropanol for five minutes, rinsed with deionized (DI) water, and then dried with nitrogen. For each test, the solution was purged with nitrogen for one hour while waiting for the temperature to reach 50°C (122°F) before the specimen was placed in the test solution. Prior to CPP testing, the open circuit potential (OCP) was monitored for 18 hours. Then the potential scan was started from -500 mV vs. saturated calomel reference electrode (SCE) with a scan rate of 0.17mV/s. A platinum wire loop was used as the counter electrode. The solution was continuously purged with nitrogen throughout the test to maintain a deaerated condition such that the oxygen reduction reaction was minimized or eliminated. Thus, the cathodic reactions could only be from other oxidizing agents in the solution (i.e., nitrite, nitrate) or through water reduction (if the potential was negative enough).

In the original scope of this work, the scans were planned to be reversed at +1000 mV vs. SCE or when the current reached 1mA/cm^2, whichever occurred first. However, it was found that in the environment of interest, such a reversal potential was high enough to oxidize electro-active species in the solution and hence complicate interpretation of the polarization behavior. Therefore, for most of the tests that were performed, the scan was reversed at +400 mV vs. SCE or when the current reached 1mA/cm^2, whichever occurred first.

When a CPP test was completed, the specimen was removed from the test solution, rinsed with DI water, and then dried with nitrogen. If excessive corrosion products were present on the specimen surface, the specimen was then ultrasonically cleaned in acetone for five minutes to remove the corrosion product. It was then rinsed with DI

[2] "Standard Test Method for Conducting Cyclic Potentiodynamic Polarization Measurements for Localized Corrosion Susceptibility of Iron-, Nickel-, or Cobalt-Based Alloys", ASTM G61

water and dried with nitrogen. The post-test appearance of the specimen was photographically documented to show the evidence of corrosion attack. Some specimens were also cross sectioned to evaluate pit depth. Finally, the tested specimens were stored in separate specimen bags in a desiccator for any other further possible analysis.

Potentiostatic Tests

The pitting and repassivation potentials can usually be determined by either CPP tests or potentiostatic tests. For the present work, the CPP test was performed first. In most cases, the pitting potentials were obtained directly from the CPP curve at the potential where current increased dramatically. If the CPP curve showed two slope changes on the forward scan in the transpassive region (e.g., FIGURE 4), then the potential where the second slope change occurred was selected as the pitting potential. Similarly, the repassivation potentials were obtained directly from the CPP curve at the zero current potential on the reversal scan. However, some CPP curves showed an inflection point on the reversal scan at a potential higher than the zero current potential, as shown at location (1) in FIGURE 4. Therefore, questions were raised regarding at what potential repassivation really occurs. To address these questions, potentiostatic tests were performed for the solutions in which a definitive repassivation potential could not be determined directly from the CPP curve due to either the presence of the inflection point or a very negative zero current potential. In the former cases, the potentiostatic tests were performed at potentials selected to bracket the potential at the inflection point (i.e., at potentials lower and higher than point (1) in FIGURE 4). In the later cases, the potentiostatic tests were performed at potentials more positive than the zero current potential. For each potentiostatic test, the CPP test was first performed and the potential was scanned to the reversal potential, and then stopped on the back scan at the potential where the potentiostatic test would be performed. The test was such arranged that pits with depths comparable to those observed in the standard CPP tests would be initiated on the forward scan. Immediately after the CPP test, the potentiostatic test was started at the potential of interest and the current change as a function of time was monitored for a period of usually 24 hours or longer. Other testing conditions remained the same as used in the CPP tests. If the current was observed to increase with time, the interpretation was that the applied potential was more noble than repassivation potential. Conversely, if the current decreased with time or remained small, the interpretation was that the applied potential was below the repassivation potential. Each of these cases is illustrated in FIGURE 5.

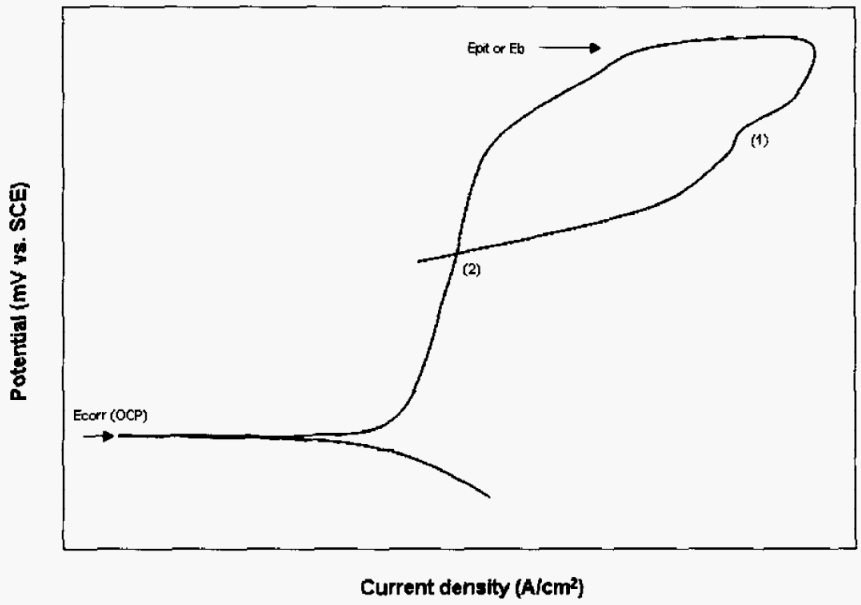

Figure 4. Schematic drawing of typical CPP curve showing pitting potential and two possible repassivation potentials (location (1) and (2)).

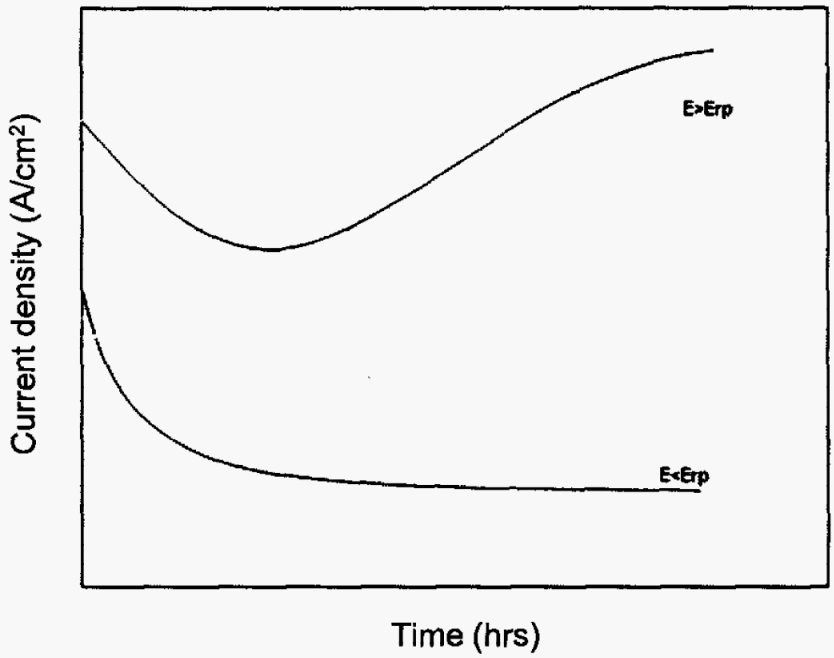

Figure 5: Schematic drawing showing the change of current density as a function of time at potentials higher and lower than E_{rp}, respectively.

Slow Strain Rate Testing

SSR testing was performed according to the guidelines provided in ASTM G129 [3] using cylindrical tensile specimens (FIGURE 2) at a constant extension rate of 10^{-6} in/in-s (unless otherwise noted). To perform the tests, a specimen was placed into a Teflon test cell and the load applied using pull rods that entered the cell through sliding seals. After insertion of the specimen and pull rods into the load frame, the solution of interest was introduced and heated to 50 °C. Tests were either conducted at open circuit or at an applied potential using SCE maintained at room temperature using a Luggin probe/salt bridge that was filled with the test environment solution. A platinum flag was used as a counter electrode. All SSRT experiments were performed under quiescent (no gas purging) conditions.

Post-test analysis consisted of stereographic optical examination at 20 – 40x. Additional analyses using higher magnification optical microscopy, metallographic cross sectional analysis, and scanning electron microscopy (SEM) were also used on an as-needed basis. In cases where evidence of SCC was present, metallographic cross sectional analysis was utilized to estimate a crack growth rate by dividing the maximum crack length observed by the time to failure (total test time). For the purposes of semi-quantitatively comparing the SSRT results, the estimated crack growth rate (CGR) was divided into the following classifications:

Degree of SCC	Estimated CGR (mm/s)	Estimated CGR (in/s)
Major	$\geq 3 \times 10^{-6}$	$\geq 1.2 \times 10^{-7}$
Moderate	$3 \times 10^{-6} - 5 \times 10^{-7}$	$1.2 \times 10^{-7} - 2 \times 10^{-9}$
Minor	$\leq 5 \times 10^{-7}$	$\leq 2 \times 10^{-9}$
None	**No indications of SCC**	

Note that the crack growth rates determined from the SSR tests should be used with caution and only for comparative purposes. Furthermore, the crack growth rates estimated from the SSR test results should not be compared with the rates determined in the constant load crack growth rate tests using compact tension specimens. The SSRT CGRs tend to be higher because of the imposed continued straining of the specimens; a condition unrealistic for storage tanks. On the other hand, the cracks were assumed to initiate at the beginning of the test and continue to propagate at a constant rate throughout which will tend to underestimate the cracking rate in the SSR tests. This underestimation will tend to be exacerbated by the uncertainties associated with low probability of finding the longest crack in the specimen using metallographic cross-sectioning.

[3] "Standard Practice for Slow Strain Rate Testing to Evaluate the Susceptibility of Metallic Materials to Environmentally Assisted Cracking", ASTM International (2005).

The time-to-failure and the strain at failure of the specimens did not always reflect clearly if SCC was present. Also, the degree of SCC was not easily established from these parameters. Therefore, the occurrence of SCC was always confirmed by visual inspection, and the severity of SCC was determined from the estimated crack growth rate. It was found from inspection of metallographic cross-sections of specimens that all cases where SCC was observed, intergranular features were also associated with the cracks.

Constant Load Crack Growth Rate Testing

Crack growth rate tests were performed using pre-cracked ½-T (0.5-inch wide) compact tension (CT) specimens subjected to a constant tensile load. In the CGR tests, crack extension as a function of time was measured using the DC potential drop (DCPD) technique. In this technique, a high electrical current (20 A) is sent through the specimen and the electrical potential between the two sides of the crack is recorded. As a crack propagates the cross sectional area will decrease thereby increasing the resistance which is then measured as an increase in the potential drop across the specimen. Because the current passes through the specimen only, and not through the solution, this current does not affect the polarized potential of the specimen. The resistance increase causes an increase in the DCPD which can be related to the crack extension using the Johnson Equation.[4]

All tests were conducted in Teflon cells to which the environment was added and heated to the test temperature of 50 °C prior to applying the desired load. Tests were conducted either at open circuit or at an applied potential. For the tests at the open circuit potential, the potential was monitored with a high impedance voltmeter and a reference electrode (SCE). The electrode was maintained at room temperature and communicated with the test cell by means of a Luggin probe/salt bridge that was filled with the test environment. For the tests at applied potential, an additional platinum flag counter electrode was included in the cell and a potentiostat was used to control the potential to the desired value. All CGR experiments were performed under quiescent (no gas purging) conditions.

Post-test analysis was performed by initially sectioning the specimens longitudinally using a slow speed diamond saw. That is, the specimens were sectioned approximately at the center line of the thickness dimension creating two specimen halves. The face of one specimen half was then metallographically prepared to evaluate the microstructure of the steel and the SCC crack morphology (i.e., intergranular or transgranular). The other specimen half was mechanically overloaded in air to failure to expose the fracture surface for subsequent examination and analysis.

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[4] Johnson, H. H. "Calibrating the Electric Potential Method for Studying Slow Crack Growth," *Materials Research and Standards*, Vol 5, No 9, September 1965, pp. 442-445.

RESULTS AND DISCUSSION

Electrochemical Polarization Behavior

This section summarizes the results and key findings from the electrochemical tests (i.e., CPP and potentiostatic tests). The effects of pH, nitrite concentration, nitrite/nitrate ratio, total organic carbon (TOC) concentration and chloride concentration on the open circuit potential, pitting potential (E_{pit}) and repassivation potential (E_{rp}) are discussed. In this work, OCP was directly obtained from the CPP curve at the zero current potential on the forward scan. For most cases, the pitting potential was selected directly from the CPP curve. In the case that the CPP curve only exhibited one slope change, the potential at the slope change then was selected as the pitting potential. If two slope changes were present, however, the higher value was selected as the pitting potential. Similarly, if the CPP curve did not show other repassivation characteristics (i.e., an inflection point) except the zero current potential on the reversal scan, the zero current potential was selected as the repassivation potential. Otherwise, the potential at the inflection point or the potential that was determined from the potentiostatic testing was selected as the repassivation potential.

Although the absolute values of E_{pit} and E_{rp} are used many times in the present work to evaluate the corrosion resistance of carbon steel in Tank 241-AN-107 simulant solutions, it is also important to consider the magnitude of the potential difference between the repassivation potential and the OCP. This difference is the safety margin when E_{rp} is used as a design parameter. In the environment of interest, this safety margin is extremely important since larger margins usually imply that the propensity and risk for localized corrosion is lower. The importance of this potential difference is further highlighted by the frequent observation that the OCP of many materials in different environments will tend to asymptotically increase (become more noble) with time until a nominally steady state value is reached.

In this section, the repassivation potentials determined from both the CPP curves (i.e., the zero current potential) and the potentiostatic tests are included in the tables and figures. In the figures, the repassivation potentials from potentiostatic tests are plotted as scattered points whereas the repassivation potentials from CPP curves are plotted as a continuous line. Generally, the repassivation potential determined directly from the CPP curves at the zero current potential are more negative than that from the potentiostatic tests. Thus, the former values reflect a conservative evaluation of the repassivation, which will provide a relatively larger safety margin compared to that using more positive repassivation values when the repassivation potential is used as a design parameter, as discussed above. Because potentiostatic tests were not performed for every solution conditions, the discussions are based on the repassivation potentials determined from the CPP curve unless otherwise noted.

Effect of Solution pH

The effect of pH on OCP, E_{pit} and E_{rp} is summarized in TABLE 3 and FIGURE 6. Note that the results at pH 7, 9.5 and 10 are from Year 1[5]. In each of the tables hereafter, the parameters of interest (i.e., pH, nitrite concentration, etc) will be listed in the first column. The sample ID for every test is also included so that the detailed information can be found in the appendices where a test matrix will be included. The CPP curves are also included in the appendices.

Table 3: The electrochemical parameters (OCP, E_{pit} and E_{rp}) in Tank 241-AN-107 solution at different pH values with the same nitrite, nitrate and TOC concentrations ($[NO_2^-]$ =1.2 M; $[NO_3^-]$ =3.7 M; TOC=20 g/L; T=50°C)

pH	OCP (mV)	E_{pit} (mV)	E_{rp} (mV)[a]	E_{rp} (mV)[b]	Sample ID
7	-204	91		-189	#D9019-3
9.5	-258	-16	-70 (E_{rp}>-70)	-409	#D9019-12
10	-283	117	-100 (E_{rp}>-100)	-370	#D9019-8
11	-381	175	50 (0<E_{rp}<100)	-111	#D9019-37
12	-371	73		-95	#D9019-21
13	-435	-6		-133	#D9019-22
13.5	-538	-204		-262	#D9019-35

a. Repassivation potential determined from potentiostatic test;
b. Repassivation potential determined directly CPP curve;

The data in FIGURE 6 show that pH affected all three electrochemical parameters. The OCP decreased (move in the negative direction) from about -200 mV at pH 7 to -538 mV at pH 13.5. It is generally expected that the OCP will decrease with an increase of pH because the equilibrium potentials of the chemicals that have dominated cathodic reactions shift in the negative direction with an increase in pH. Thus, OCP will shift towards the negative direction according to mixed potential theory, assuming the pH shift did not have a significant impact on the anodic reaction. FIGURE 6 also shows that E_{pit} generally decreased with increasing pH whereas E_{rp} decreased from pH 7 to pH 9.5, but then dramatically increased from pH 9.5 to 11. With further increases in pH, E_{rp} again decreased.

The most important parameter from the standpoint of pit initiation is the difference between the repassivation potential (E_{rp}) and OCP, as well as the difference between the pitting potential (E_{pit}) and the repassivation potential (E_{rp}). FIGURE 7 shows that the difference between E_{pit} and E_{rp}, E_{rp} and OCP as a function of pH. Clearly, the differences between E_{rp} and OCP were positive and relatively large for pH values above 11 (positive for pH values above 9.5 when using the repassivation potentials from the potentiostatic tests), indicating that pit initiation is relatively unlikely to occur at these

[5] Michiel P. Brongers, C. Sean Brossia, ARES Tank 241-AN-107 Final Interim Report, "Investigation of Chemistry Factors Influencing Stress Corrosion Cracking Susceptibility of High-Level Waste in Double Shell Tank 241-AN-107".

elevated pHs. On the other hand, this value was extremely close to OCP at pH 7, indicating that pit initiation is much more likely to occur.

FIGURE 7 also shows that the difference between E_{rp} and OCP did not change significantly above pH 11 with further increases in pH. The difference between E_{pit} and E_{rp} decreased from pH 11 to pH 13 although this difference remained relatively constant when using the repassivation potentials from the potentiostatic tests. From the perspective of pitting corrosion, this could imply that although the current chemistry in Tank 241-AN-107 is out of specification with respect to pH (pH 11 rather than specified pH 13), the environment of interest appears to have no significant difference on corrosivity to carbon steel at pH 11 to pH 13 or higher. Thus, pH adjustment towards more alkaline conditions might not provide further benefits in terms of optimizing the tank operation conditions.

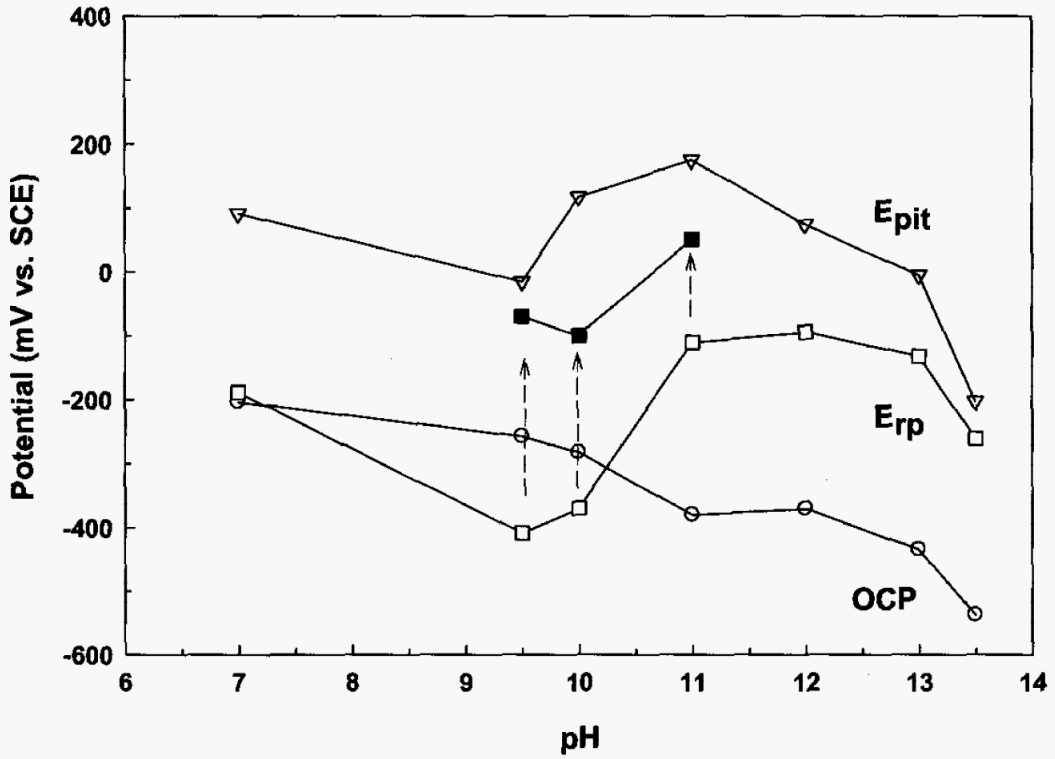

Figure 6: The effect of pH on OCP, E_{pit} and E_{rp} in Tank 241-AN-107 solution at different pH values with the same nitrite, nitrate and TOC concentrations ([NO_2^-] =1.2 M; [NO_3^-] =3.7 M; TOC=20 g/L). The filled symbols represent the potential obtained from potentiostatic tests.

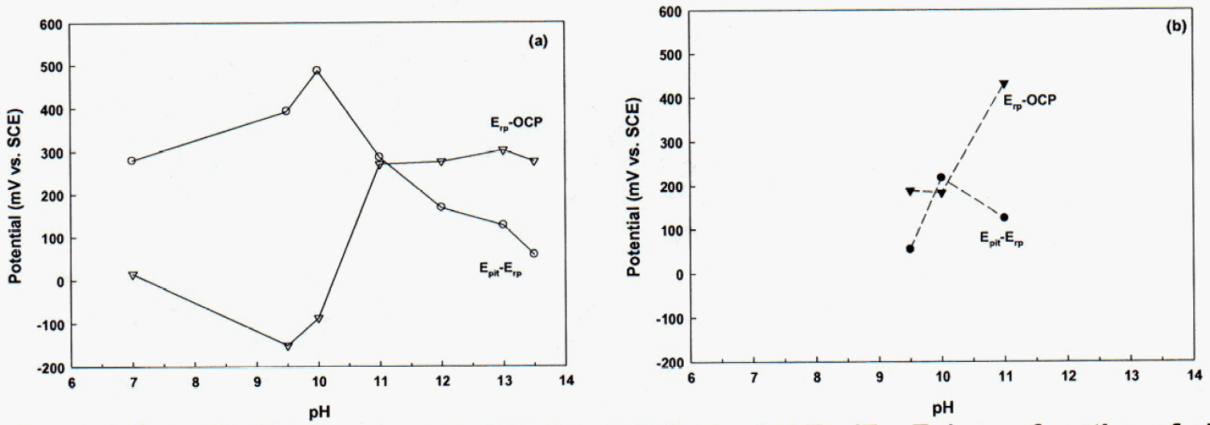

Figure 7: The difference of E_{rp} and OCP (E_{rp}-OCP), E_{pit} and E_{rp} (E_{pit}-E_{rp}) as a function of pH in Tank 241-AN-107 solution. Figure (a) shows data from cyclic polarization testing and Figure (b) shows data from potentiostatic testing.

Effect of Nitrite and Nitrite/Nitrate Ratio

Nitrite was found to have a significant effect on the CPP curves, as shown in FIGURE 8. Basically, the CPP curves in Tank 241-AN-107 solution with higher nitrite concentrations exhibited higher (more positive) pitting and repassivation potentials.

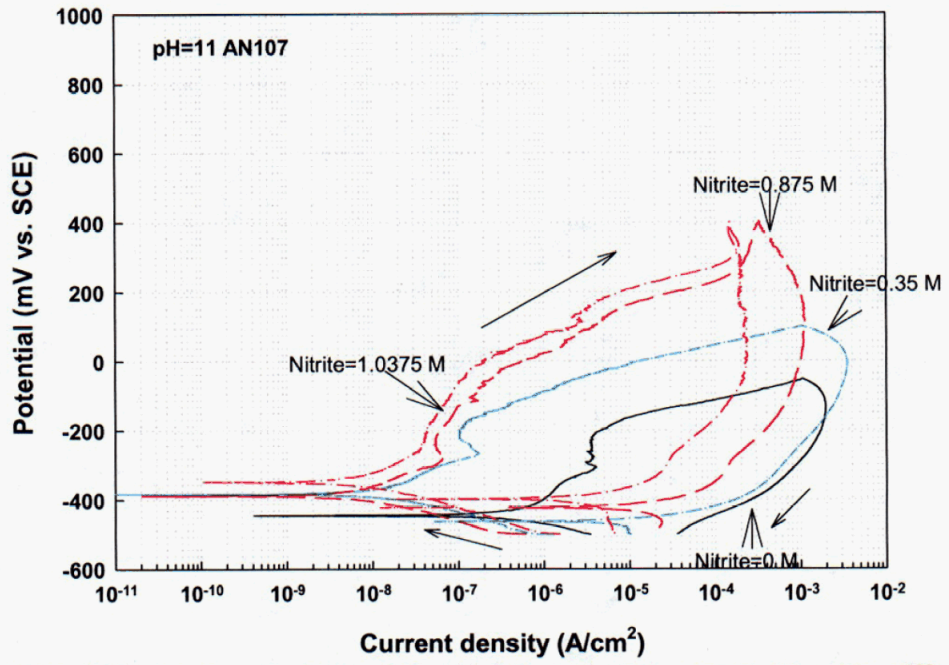

Figure 8: The CPP curves in Tank 241-AN-107 solution at pH 11 with different nitrite concentrations

TABLE 4 summarizes the electrochemical parameters obtained from CPP curves and potentiostatic tests (for repassivation potentials) and FIGURE 9 shows the effect of nitrite concentration on OCP, E_{pit} and E_{rp}. Note that the values at 2.3M nitrite were obtained from Tank 241-AN-107 endpoint solution at pH 10, which also had a lower nitrate concentration of 2.4M compared to other solutions (3.7M). When the nitrite concentration was zero, there was no real repassivation potential as the CPP curve did not close at any potential tested (i.e., no zero current potential was observed). In these cases, the final potential (-500 mV) was used as the repassivation potential.

Table 4: The electrochemical parameters (OCP, E_{pit} and E_{rp}) in Tank 241-AN-107 solution at different nitrite concentrations (TOC=20 g/L; T=50°C)

Nitrite (M)	Nitrate (M)	pH	OCP (mV)	E_{pit} (mV)	E_{rp}		Sample ID
					(mV)[b]	(mV)[c]	
0	3.7	11	-445	-166		-500	#D9019-25
0.35	3.7	11	-380	-143		-462	#D9019-46
0.875	3.7	11	-388	144		-415	#D9019-49
1.0375	3.7	11	-349	152		-397	#D9019-48
1.2	3.7	11	-381	175	50 ($0<E_{rp}<100$)	-111	#D9019-37
2.3[a]	2.4	10	-267	253	215	-17	#D9019-26
3.5	3.7	11	-369	177	233[d]	-90	#D9019-44
7	3.7	11	-397	151	100 ($E_{rp}>100$)	-65	#D9019-45

a. pH 10 endpoint solution;
b. Repassivation potentials determined from potentiostatic test;
c. Repassivation potentials determined directly from CPP curves;
d. Potential at the inflection point on the backward scan of the CPP curve;

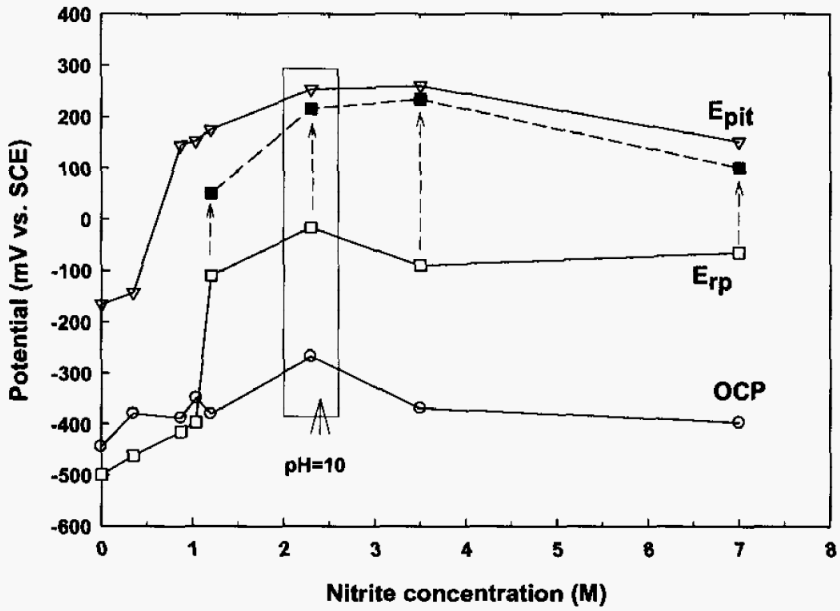

Figure 9. The effect of nitrite concentration on E_{rp}, E_{pit} and OCP. The potentials at 2.3M nitrite are from the CPP test in the endpoint solution at pH 10. All others are from CPP

tests in solutions with pH 11. The filled symbols correspond to the values determined from potentiostatic tests.

FIGURE 9 shows that nitrite concentration appeared to have very little effect on the OCP. The more positive OCP value at 2.3M nitrite was likely due to the pH difference of that solution (i.e., endpoint solution). However, the effect of nitrite concentrations on E_{pit} and E_{rp} is evident. The values of E_{pit} and E_{rp} generally were more positive at higher nitrite concentrations. There appears to be a critical nitrite concentration (~ 1.2M) below which the repassivation potentials were more negative than OCP. Therefore, pitting corrosion could initiate at OCP under such conditions. It can also be seen from FIGURE 9 that the repassivation potentials were closer to the pitting potentials at higher nitrite concentrations. This further demonstrates that nitrite appears to be a potent inhibitor for carbon steel in Tank 241-AN-107 solutions since the smaller difference between E_{rp} and E_{pit} indicates better pitting corrosion resistance of A537. However, no extra benefit with respect to improving the pitting and repassivation potentials was gained with further increases in the nitrite concentration above 3.5M. Based on the effect of nitrite on the repassivation potential, a critical nitrite concentration above 1.2M might be beneficial since the repassivation potential is significantly above OCP at this concentration. Note that the repassivation potentials determined from the potentiostatic tests were even closer to the pitting potentials. Since the E_{rp} shifted in the positive direction when determined using potentiostatic testing, the E_{rp} values at nitrite concentrations lower than 1.2M determined using cyclic polarization testing are likely conservative and might move towards more positive potentials if potentiostatic testing was performed. Therefore, although the critical nitrite concentration might appear to be approximately 1.2M, this apparent critical concentration could very well be lower and thus also represents a conservative value. With further investigations through SSRT, a link between the repassivation potential and hence the critical nitrite concentration and the occurrence of the SCC on carbon steel might be established, as is discussed further in later sections.

As shown previously in the list of the chemicals that were used for Tank 241-AN-107 solutions, both nitrite and nitrate are present in the solution. The standard Tank 241-AN-107 simulant contains 1.2M nitrite and 3.7M nitrate. In the endpoint solution the nitrite was increased to 2.3M whereas nitrate was reduced to 2.4M. Therefore, the concentration ratio as well as the absolute concentrations of nitrite and nitrate are predicted to change with time. As discussed above, nitrite generally is beneficial to carbon steel in terms of improving the resistance to pitting corrosion in nitrate solutions. However, it was not clear whether the positive movements in the pitting potential and the repassivation potential are a function of the absolute nitrite concentration or the ratio of nitrite to nitrate.

In order to address this question, CPP tests were performed in Tank 241-AN-107 solutions with different nitrite/nitrate ratios as well as with approximately the same nitrite to nitrate ratio but with different absolute nitrite and nitrate concentrations. The test results are summarized in TABLE 5 with nitrite to nitrate concentration ratio changed from zero to 1.89. Note that the nitrate concentration was 1.5 M when the nitrite/nitrate

ratio was 0.5 and 1. The changes of OCP, E_{pit} and E_{rp} at different nitrite/nitrate ratios are plotted in FIGURE 10.

Table 5: The electrochemical parameters (OCP, E_{pit} and E_{rp}) in Tank 241-AN-107 solution at different nitrite to nitrate ratios (TOC=20 g/L; T=50°C)

Nitrite/Nitrate	Nitrite (M)	Nitrate (M)	pH	OCP (mV)	E_{pit} (mV)	E_{rp} (mV)[a]	E_{rp} (mV)[b]	Sample ID
0.00	0	3.7	11	-445	-166		-500	#D9019-25
0.09	0.35	3.7	11	-380	-143		-462	#D9019-46
0.24	0.875	3.7	11	-388	144		-415	#D9019-49
0.28	1.0375	3.7	11	-349	152		-397	#D9019-48
0.32	1.2	3.7	11	-359	179	50 ($0<E_{rp}<100$)	-108	#D9019-38
0.50	0.75	1.5	11	-337	194		183	#D9019-58
0.95	3.5	3.7	11	-369	177	233[c]	-90	#D9019-44
1.00	1.5	1.5	11	-326	249		213	#D9019-59
1.89	7	3.7	11	-397	151	100 ($E_{rp}>100$)	-65	#D9019-45

a. Repassivation potentials determined from potentiostatic tests;
b. Repassivation potentials determined directly CPP curves;
c. Potential at the inflection point on the reversal scan of the CPP curve;

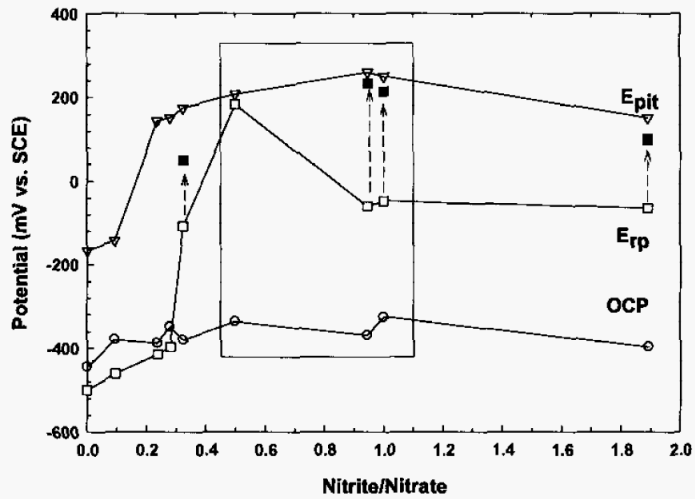

Figure 10: The effect of Nitrite/Nitrate ratio on OCP, Epit and Erp at different nitrite to nitrate ratios (TOC=20 g/L). The filled symbols correspond to the repassivation potentials determined from potentiostatic tests.

The trend of OCP, E_{pit} and E_{rp} as a function of nitrite/nitrate ratio is very similar to that was shown in FIGURE 10, except when the ratio was 0.5 since the solution at this nitrite/nitrate ratio also had a different nitrate concentration (1.5M). This is reasonable because for most tests shown in
Table 5 the nitrate concentration was maintained at 3.7M and thus nitrite concentration was the only variable.

FIGURE 11 shows the change of E_{pit}, E_{rp} and OCP as a function of nitrite concentration when the ratio of nitrite to nitrate concentration was approximately one. When increasing the nitrite concentration from 1.5M to 3.5M, the values of E_{rp} and E_{pit} remained relatively constant and no significant change in any of the three electrochemical parameters was observed independent of the repassivation potential determination method (i.e., CPP vs. potentiostatic test).

Therefore, when the nitrate concentration is fixed, it is beneficial to increase the absolute nitrite concentration. When both nitrite and nitrate concentrations are variable, as is the case for Tank 241-AN-107, maintaining a ratio of nitrite to nitrate concentration above 0.5 could be beneficial from a localized corrosion perspective (as will be discussed later, for SCC this minimum ratio is dependent on the applied potential and could be greater than 0.5 depending on the potential).

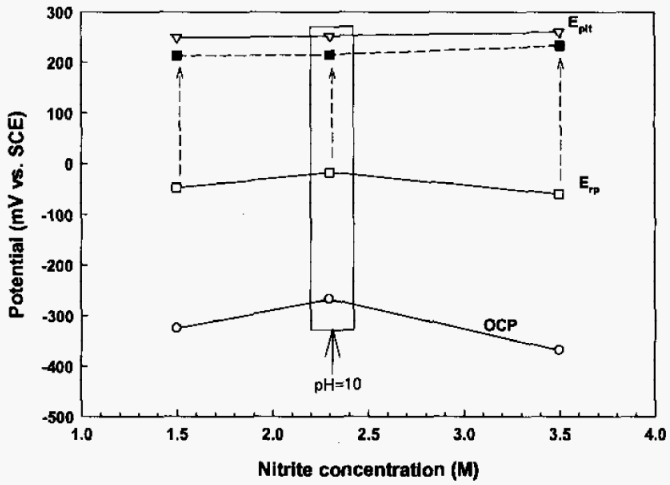

Figure 11: The change of E_{pit}, E_{rp} and OCP as a function of nitrite concentration in Tank 241-AN-107 solution when the ratio of nitrite to nitrate is approximately one. The potentials at nitrite concentration of 2.3 M were obtained for Tank 241-AN-107 endpoint solution at pH 10. Other values were for Tank 241-AN-107 standard solution at pH 11. The filled symbols correspond to the repassivation potentials determined from potentiostatic tests.

The mechanism of nitrite inhibition for carbon steel localized corrosion in alkaline nitrate solutions is not clear at the present point mainly due to the complexity of the solution chemistry in the Tank 241-AN-107 simulant. In the Tank 241-AN-107 simulant, the high nitrate and nitrite concentrations allow for a range of possible cathodic reactions involving nitrogen-containing species:[6,7]

[6] Encyclopedia of Electrochemistry of the Elements, Volume 8, "Nitrogen", p. 321-479, Marcel-Dekker (1978).

$$NO_3^- + H_2O + 2e^- \rightarrow NO_2^- + 2OH^- \quad [1]$$

$$E^{rev}_{NO_3^-/NO_2^-} = 0.835 - 0.059pH + 0.0295\log(NO_3^- / NO_2^-) \quad [1a]$$

$$NO_2^- + 5H_2O + 6e^- \rightarrow NH_3 + 7OH^- \quad [2]$$

$$E^{rev}_{NO_2^-/NH_3} = 0.785 - 0.069pH + 0.0098\log[NO_2^-] - 0.0098\log\alpha_{NH_3} \quad [2a]$$

$$2NO_2^- + 3H_2O + 4e^- \rightarrow N_2O + 6OH^- \quad [3]$$

$$E^{rev}_{NO_2^-/N_2O} = 1.396 - 0.0866pH + 0.0148\log([NO_2^-]^2 / p_{N_2O}) \quad [3a]$$

Though these reactions in the tank are likely more complex than shown here and have several intermediary steps, they illustrate what several potential cathodic reactions involving nitrogen may be possible. FIGURE 12 shows a comparison between the reversal potential for the reduction reactions listed above and the OCP as a function of nitrite concentration. The activity of NH_3 and the partial pressure of N_2O were assumed as unity. It can be seen that nitrite concentration had no significant effect on all three reversal potentials. More importantly, the OCP measured in Tank 241-AN-107 simulant solutions was more negative than any of the reversal potentials at any given nitrite concentration. This indicates that all three reactions could contribute to the cathodic reaction at open circuit potential. Therefore, the role of nitrite might be its pH buffer ability by the form of reaction (2) and reaction (3) and thus reduces the corrosivity in the pits. Though no direct measurement or confirmation of these reactions has been performed, they do represent thermodynamically plausible reaction pathways that might explain the beneficial influence of nitrite. The possibility of additional work to determine the mechanism(s) of nitrite inhibition in these environments has been discussed.[8]

[7] G.S. Frankel, "Cathodic Reactions, Analysis of Polarization Curves, and Inhibition Mechanism", Memo to Tank 241-AN-107 Review Panel (2004).

[8] G.S. Frankel and C.S. Brossia, "Inhibition of Steel Pitting and Cracking in Nitrate Solutions by Nitrite Ions", White Paper Proposal to K. Boomer at CH2M Hill (July 2006).

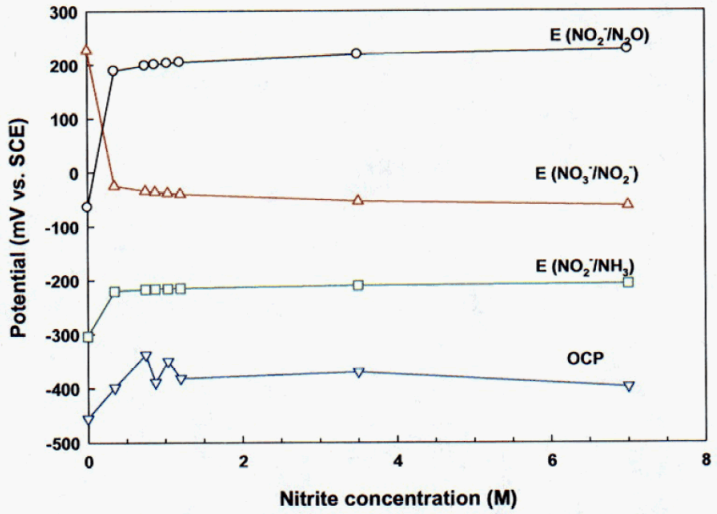

Figure 12: A comparison of reversal potential for different reduction reactions and the OCP in Tank 241-AN-107 at pH 11. The reversal potentials were calculated with pH 11 and nitrate concentration of 3.7 M.

Effect of Total Organic Carbon

To investigate whether the organic carbon compounds function as inhibitors like nitrite, tests were performed in Tank 241-AN-107 solutions with different total organic carbon concentrations with and without nitrite.

TOC was found to be a minor inhibitor in the absence of nitrite. The effect of TOC on OCP, E_{pit} and E_{rp} in the absence of nitrite is summarized in TABLE 6 and FIGURE 13. The values of the three parameters increased slightly with increasing TOC concentration. However, the magnitude of the change was minor. As a matter of fact, E_{rp} remained to be more negative than OCP, indicating that pit initiation is possible. This is a typical behavior in the absence of nitrite and further demonstrated that TOC is not a dominant inhibitor.

Table 6: The electrochemical parameters (OCP, E_{pit} and E_{rp}) in Tank 241-AN-107 solution at different TOC concentrations with no added nitrite (T=50°C).

TOC (g/L)	Nitrite (M)	pH	Nitrate (M)	OCP (mV)	E_{pit} (mV)	E_{rp}[a] (mV)	Sample ID
20	0	11	3.7	-445	-166	-500	#D9019-25
40	0	11	3.7	-397	-173	-500	#D9019-29
80	0	11	3.7	-349	-115	-464	#D9019-32

a. Repassivation potentials determined directly from CPP curves;

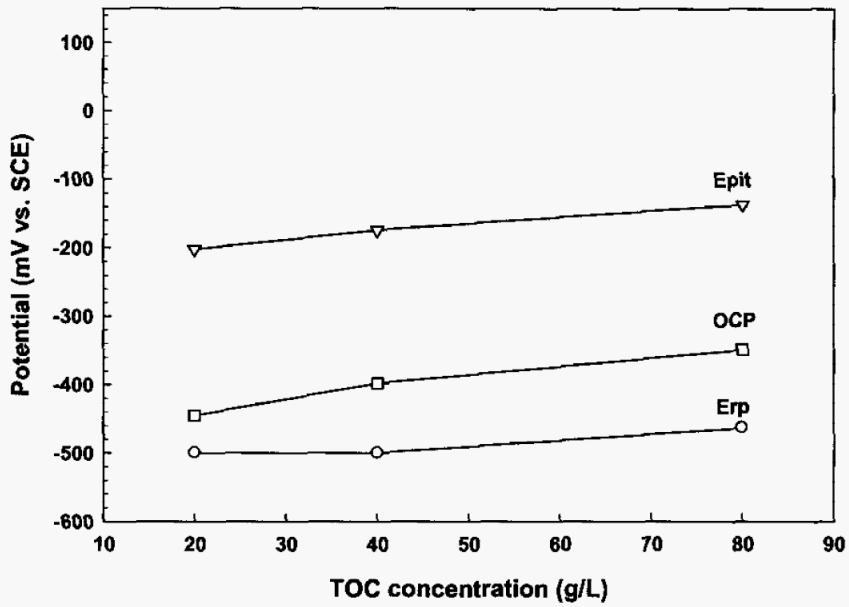

Figure 13: The effect of TOC concentration on OCP, E_{pit} and E_{rp} in Tank 241-AN-107 solution in the absence of nitrite.

In the presence of nitrite, increasing the TOC concentration had a mixed influence on localized corrosion. The effect of TOC on the electrochemical polarization behavior in the presence of nitrite in the Tank 241-AN-107 solution is summarized in Table 7 and Figure 14. These data show that TOC had no significant effect on OCP, but did result in some increase in E_{pit} which would generally be considered beneficial. However, an increase in TOC also generally resulted in a decrease in the repassivation potential and tended to move the repassivation potential closer to OCP which is detrimental for localized corrosion resistance. Although a less strong effect of TOC on the repassivation potentials might be observed if the potentiostatic tests were performed under other three TOC concentrations and caused the E_{rp} to shift in the positive direction. Based on the present repassivation potential data from CPP curves, however, it may not be beneficial to include a high concentration of TOC and nitrite at the same time as these two might compete against each other and hence reduce the inhibition effect that can be obtained otherwise from either TOC—albeit minor—or nitrite. Additionally, although the pitting potential in Tank 241-AN-107 solution at higher TOC concentration was more positive, the change was not significant and thus it appears that TOC is a weak inhibitor, at best, in Tank 241-AN-107 solutions.

Table 7: The electrochemical parameters (OCP, E_{pit} and E_{rp}) in Tank 241-AN-107 solution at different TOC concentrations with 1.2M nitrite (T=50°C).

TOC (g/L)	Nitrite (M)	Nitrate (M)	Chloride (M)	pH	OCP (mV)	E_{pit} (mV)	E_{rp}		Sample ID
							(mV)[a]	(mV)[b]	
10	1.2	3.7	0.1	11	-213	4		4	#D9019-28
20	1.2	3.7	0.1	11	-359	179	50	-108	#D9019-38

							($0<E_{rp}<100$)		
40	1.2	3.7	0.1	11	-326	202		-318	#D9019-27
80	1.2	3.7	0.1	11	-320	120		-175	#D9019-43

a. Repassivation potential determined from potentiostatic test;
b. Repassivation potential determined directly from CPP curves;

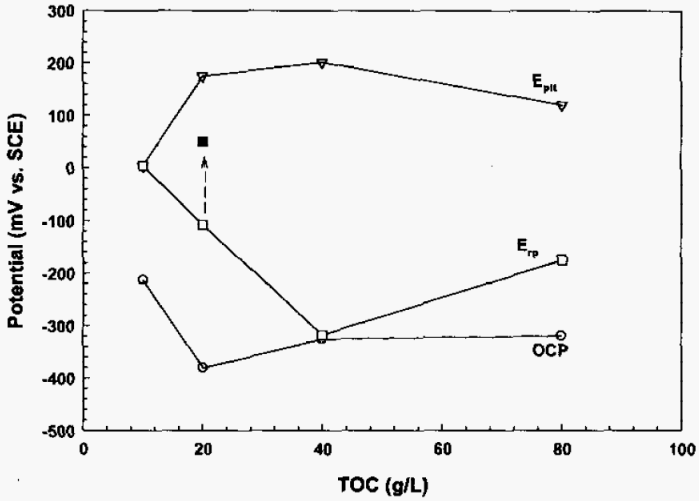

Figure 14: The effect of TOC concentration on OCP, E_{pit} and E_{rp} when nitrite concentration is 1.2M in Tank 241-AN-107 solution. The filled symbol at 20 g/L TOC corresponds to the potential value determined from potentiostatic test.

Effect of Chloride

It is generally accepted that chloride is detrimental to passive materials and promotes pitting corrosion. Since Tank 241-AN-107 solution contains a number of chloride containing species and because carbon steel will tend to be passive in alkaline environments, tests were performed to investigate the effect of chloride on the polarization behavior of carbon steel in Tank 241-AN-107 solution. Furthermore, present and endpoint chemistries for Tank 241-AN-107 that contained additional chloride than the standard simulants (0.2M compared to 0.1M) were used to bound the present and endpoint chemistries for Tank 241-AN-102. Three different chloride concentrations, 0.05M, 0.1M and 0.2M, were tested, with 0.05 M representing the present chloride concentration in Tank 241-AN-107 and 0.1M being the concentration in the standard Tank 241-AN-107 simulant.

In general, chloride only had minor effect on E_{pit} and OCP. The effect of chloride concentration on OCP, E_{pit} and E_{rp} are summarized in TABLE 8 and FIGURE 15. There were only minor changes in OCP, E_{pit} with the increase in chloride concentration. The effect of chloride on the repassivation potential was a little complicated. The data show that the increase in the chloride concentration had no significant impact on the repassivation potentials when using the values from potentiostatic tests whereas it caused the repassivation potentials determined from CPP curves to decrease. It is generally agreed that the increase in chloride concentration would decrease the pitting

potential but usually has no effect on repassivation potential[9]. The data in the present work supported the same conclusion when using the repassivation potential values determined from the potentiostatic tests. This further highlighted that although the zero current potential on the backward scan of the CPP curve might be a conservative repassivation potential, the repassivation potentials determined from the potentiostatic tests more closely reflected the potentials where the repassivation really occurred.

Table 8: The electrochemical parameters (OCP, E_{pit} and E_{rp}) in Tank 241-AN-107 solution with different chloride concentrations (T=50°C).

Chloride (M)	pH	TOC (g/L)	Nitrite (M)	Nitrate (M)	OCP (mV)	E_{pit} (mV)	E_{rp} (mV)[a]	E_{rp} (mV)[b]	Sample ID
0.05	11	20	1.2	3.7	-366.	90	50 (E_{rp}>50)	-70	#D9019-65
0.1	11	20	1.2	3.7	-381	175	50 (0<E_{rp}<100)	-111	#D9019-37
0.1	11	20	1.2	3.7	-359	179	50 (0<E_{rp}<100)	-108	#D9019-38
0.2	11	20	1.2	3.7	-364	152	-25 (-50<E_{rp}<0)	-369	#D9019-51
0.2	11	20	1.2	3.7	-369	172	-25 (-50<E_{rp}<0)	-387	#D9019-57
0.2	11	20	1.2	3.7	-391	-36	-25 (-50<E_{rp}<0)	-392.6	#D9019-60

a. Repassivation potential determined from potentiostatic test;
b. Repassivation potential determined directly from CPP curve;

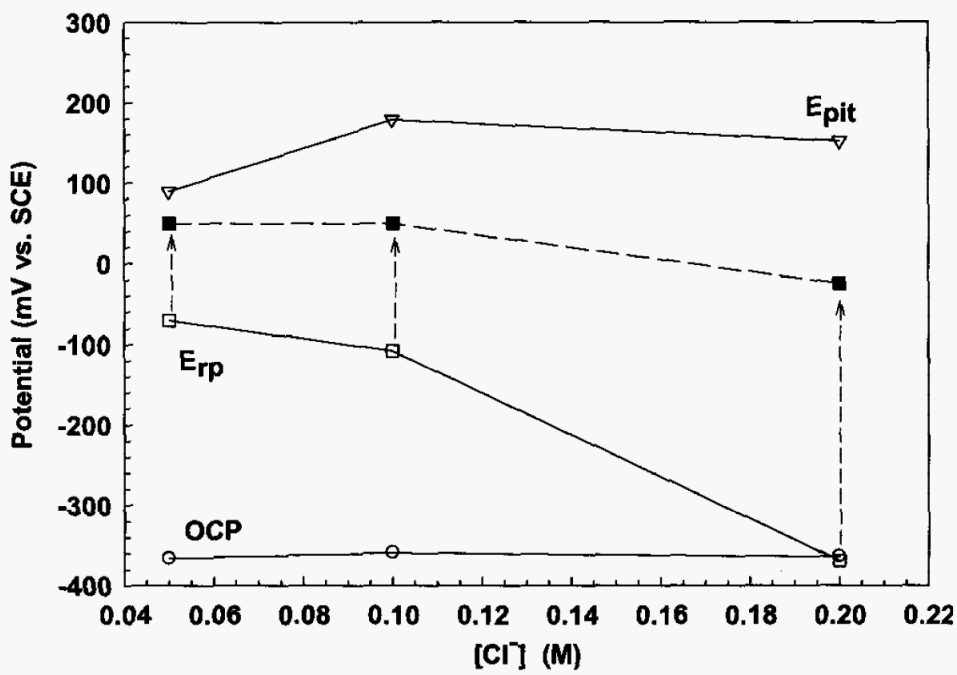

Figure 15: The effect of chloride concentration on OCP, E_{pit} and E_{rp}. The filled symbols correspond to values determined from potentiostatic test.

[9] G. Sussek, M. Kesten, "Effect of Cl^- Concentration on the Characteristic Pitting Potential", Corrosion Science, 15 (1975):225

Slow Strain Rate Testing

This section summarizes the results and key findings from the SSR tests that were performed to explore the susceptibility of A537 Class 2 material to SCC, primarily as a function of solution chemistry and potential. The effects of applied potential, pH, nitrite concentration, nitrite/nitrate concentration ratio, TOC level, and chloride concentration on SCC behavior were examined.

A summary of the SSRT results is shown in TABLE 9. This table includes results from both the present year and last year[10] for comparison. The table is organized based first on the main chemistry variable (e.g., standard Tank 241-AN-107 solution, endpoint Tank 241-AN-107 solution, effect of nitrite, etc.) and is then further organized in order of increasing pH value and then decreasing applied potential. The data presented in TABLE 9 includes the time to failure, the strain at failure, the maximum observed crack length found during metallographic cross sectioning and the resultant estimated crack growth rate, the degree of SCC classification, and the test and specimen identifications.

In some limited cases, the propensity for SCC could be determined directly from the SSRT stress-strain plot though a more reliable approach was to perform metallographic cross sections and utilize the crack lengths observed to estimate a crack growth rate. For example, FIGURE 16 shows the stress-strain data for the Tank 241-AN-107 standard solution at pH 11 without nitrite which clearly exhibits a different response than the other four data sets presented. As will be discussed later, severe SCC and corrosion were often noted in the absence of nitrite. Furthermore, in the case of Tank 241-AN-107 endpoint solution at pH 10 and an applied potential of -50 mV, no SCC was noted and the stress-strain response was very similar to that of air. Though it would appear that general conclusions could be drawn from the stress-strain behavior (or parameters derived therewith), the other two stress-strain curves present in FIGURE 16 (standard Tank 241-AN-107 at pH 11 at applied potentials of 0 and +100 mV) illustrate why caution must be exercised. Though SCC did occur in both cases, it could be interpreted that increasing the potential from 0 to +100 mV was beneficial as both the time to failure and failure strain increased. However, as will be discussed later, higher applied potentials result in higher crack growth rates, indicating a more severe condition.

Table 9: Summary of SSRT results. Note that the Test ID format indicates the project year in which the test was performed (i.e., Y1-3 is the 3rd test conducted in Year 1 and Y2-1 is the 1st test conducted in Year 2).

Chemistry	pH	Applied Potential (mV vs. SCE)	Failure Time (hrs)	Failure Strain (%)	Maximum observed crack (μm)	Estimated CGR (mm/sec)	Degree of SCC	Test ID	Specimen
Air									

[10] Michiel P. Brongers, C. Sean Brossia, ARES Tank 241-AN-107 Final Interim Report, "Investigation of Chemistry Factors Influencing Stress Corrosion Cracking Susceptibility of High-Level Waste in Double Shell Tank 241-AN-107".

Air@100°C			55.5	27.1					
Standard Tank 241-AN-107									
Standard	7	+100	33.7	8.5	483	4×10^{-8}	Major	Y1-3	D9019-46
Standard	7	+100	29.8	11.2	639	6×10^{-8}	Major	Y1-23	D9019-10
Standard	7	-100	73.8	26.1	n/a	0	None	Y1-9	D9019-44
Standard	7	OCP (-225)	77.3	26.6	n/a	0	None	Y1-1	D9019-47
Standard	7	OCP (-200)	77.2	26.7	n/a	0	None	Y1-24	D9019-11
Standard	9.5	0	80.2	24.4	221	8×10^{-7}	Moderate	Y1-27	D9019-15
Standard	9.5	0	43.1	14.8	290	2×10^{-8}	Moderate	Y1-33	D9019-20
Standard	9.5	0	37.9	13.4	445	3×10^{-8}	Moderate	Y1-34	D9019-34
Standard	9.5	-100	74.3	26.7	n/a	0	None	Y1-29	D9019-29
Standard	9.5	OCP (-150)	75.7	25.4	n/a	0	None	Y1-28	D9019-14
Standard	10	+100	32.3	12.6	233	2×10^{-8}	Moderate	Y1-19	D9019-03
Standard	10	0	73.8	26.4	317	1×10^{-8}	Moderate	Y1-17	D9019-02
Standard	10	-100	74.0	26.0	n/a	0	None	Y1-18	D9019-06
Standard	10	OCP (-160)	83.2	28.1	n/a	0	None	Y1-20	D9019-20
Standard	11	+100	73.7	24.9	326	1×10^{-8}	Moderate	Y1-4	D9019-50
Standard	11	+100	70.5	24.7	186	7×10^{-7}	Moderate	Y1-22	D9019-08
Standard	11	+50	69.4	24.5	203	8×10^{-7}	Moderate	Y1-11	D9019-52
Standard	11	0	65.2	23.7	138	6×10^{-7}	Moderate	Y1-12	D9019-51
Standard	11	0	80.4	27.5	425	2×10^{-8}	Moderate	Y2-13	D9019-61
Standard	11	-50	76.9	27.0	56	2×10^{-7}	Minor	Y1-13	D9019-53
Standard	11	-100	72.9	25.4	n/a	0	None	Y1-14	D9019-01
Standard	11	-100	75.4	26.6	n/a	0	None	Y1-10	D9019-45
Standard	11	OCP (-150)	73.4	25.8	n/a	0	None	Y1-21	D9019-07
Standard	11	OCP (-180)	76.3	28	n/a	0	None	Y1-2	D9019-48
Standard	11	-200	79.6	27.9	0	0	None	Y2-25	A537CL2-3
Standard	12	+100	72.2	27.3	257	1×10^{-8}	Moderate	Y2-3	D9019-36
Standard	12	0	100.1	25.9	219	6×10^{-7}	Moderate	Y2-2	D9019-34
Standard	13.5	0	73.9	27.2	250	9×10^{-7}	Moderate	Y2-10	D9019-56
End Point									
End point	10	0	74.7	26.6	171	6×10^{-7}	Moderate	Y2-4	D9019-37
End point	10	-50	78.3	26.7	n/a	0	None	Y2-22	D9019-70
End point	9.5	0	72.8	26.2	140	5×10^{-7}	Moderate	Y2-28	A537CL2-6
Effect of TOC									
TOC 10 g/L	11	0	78.1	26.6	180	6×10^{-7}	Moderate	Y2-6	D9019-39
TOC 40 g/L	11	0	73.5	27.6	180	7×10^{-7}	Moderate	Y2-5	D9019-38
TOC 80 g/L	11	0	75.8	27.0	115	4×10^{-7}	Minor	Y2-11	D9019-57
No nitrite TOC 40 g/L	11	0	27.1	10.7	Not. Meas.	N/A	Major	Y2-7	D9019-40
No nitrite TOC 80 g/L	11	0	30.4	12.7	Not. Meas.	N/A	Major	Y2-9	D9019-55
Effect of Nitrite and Nitrite/Nitrate Ratio									
No nitrite	11	0	21.4	7.9	Not. Meas.	N/A	Major	Y2-1	D9019-33
No nitrite	11	0	25.0	8.6	Not. Meas.	N/A	Major	Y2-8	D9019-54
No nitrite	11	0	26.4	9.2	Not. Meas.	N/A	Major	Y2-12	D9019-58
No nitrite	11	-50	28.1	9.5	Not. Meas.	N/A	Major	Y2-20	D9019-68
No nitrite	11	-100	27.7	8.7	Not. Meas.	N/A	Major	Y2-21	D9019-69
No nitrite	11	OCP (-342)	71.6	26.1	n/a	0	None	Y2-14	D9019-63
No nitrite	13.5	0	27.8	10.6	330	3×10^{-8}	Major	Y2-15	D9019-62
0.35M nitrite	11	0	37.0	14.6	Not. Meas.	N/A	Major	Y2-19	D9019-67
0.875M nitrite	11	0	74.6	25.5	175	7×10^{-7}	Moderate	Y2-18	D9019-66
1.0375M nitrite	11	0	77.7	27.3	125	5×10^{-7}	Moderate	Y2-23	A537CL2-1
3.5M nitrite	11	0	75.7	25.7	n/a	0	None	Y2-16	D9019-64
7M nitrite	11	0	71.5	23.8	n/a	0	None	Y2-17	D9019-65
0.75M nitrite,1.5M nitrate	11	0	73.8	26.7	175	7×10^{-7}	Moderate	Y2-26	A537CL2-5
1.5M nitrite, 1.5M nitrate	11	0	65.1	25.4	190	8×10^{-7}	Moderate	Y2-27	A537CL2-4
Effect of Chloride									
Standard w/	11	0	67.2	22.7	Not. Meas.	N/A	Major	Y2-24	A537CL2-2

0.2M chloride									
Standard w/ 0.2M chloride	11	0	71.5	25.7	260	1×10^{-10}	Moderate	Y2-34	A537CL-12
Standard w/ 0.2M chloride	11	-100	69.4	24.9	n/a	0	None	Y2-30	A537CL2-8
Standard w/ 0.05M chloride	11	0	68.8	25.7	180	7×10^{-7}	Moderate	Y2-29	A537CL2-7
Endpoint w/ 0.2M chloride	10	0	74.6	25.1	n/a	0	None	Y2-31	A537CL-11
Endpoint w/ 0.2M chloride	10	0	75.3	27.0	n/a	0	None	Y2-32	A537CL-9

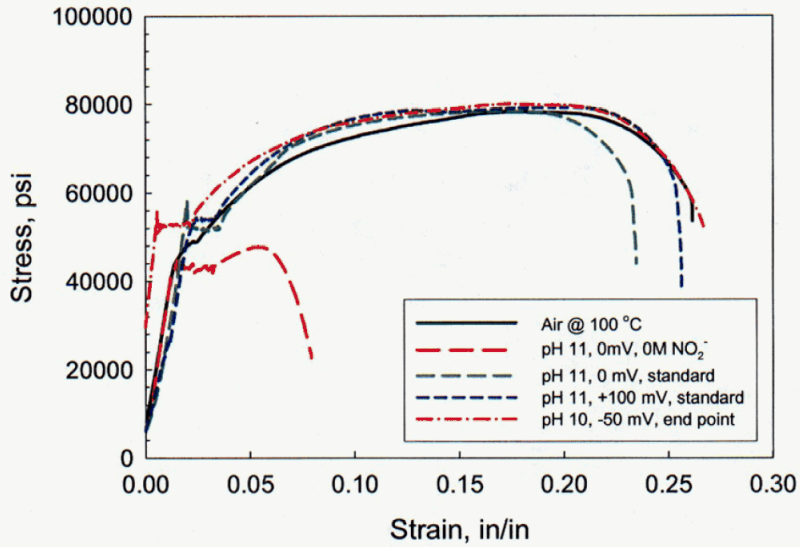

Figure 16: Selected stress-strain SSRT data.

Effect of Applied Potential

The applied potential was found to significantly influence the susceptibility of A537 to SCC. The estimated crack growth rate in standard Tank 241-AN-107 at pH 11 as a function of applied potential is shown in FIGURE 17. For comparison purposes, the corrosion potentials typically measured in Tank 241-AN-107 simulant solutions was between -150 and -225 mV vs. SCE (note that these corrosion potentials are higher than those reported in the localized corrosion discussion since these are measured under quiescent conditions and the electrochemical polarization tests were conducted under deaerated conditions). At potentials at or more negative than -100 mV vs. SCE, no SCC was observed in any test in the standard Tank 241-AN-107 solutions. The only instances where SCC has been noted at potentials more negative than -100 mV have been in solutions with no or very low nitrite concentrations, as will be discussed later. From FIGURE 17 it is also evident that the estimated CGR tends to increase with increasing (more noble) applied potential once the apparent cracking threshold potential of -100 mV is exceeded. Based on linear regression of the data, the estimated crack growth rate will generally increase by about 4.4×10^{-7} mm/s for every 100 mV increase in potential ($r^2 = 0.899$). Though it appears that the crack growth rate increases with increasing potential, it must be cautioned that this trend might not continue at higher potentials. Furthermore, the engineering relevance of these higher potentials from a

tank integrity perspective is diminished when the typical potentials measured in the tank are considerably lower.

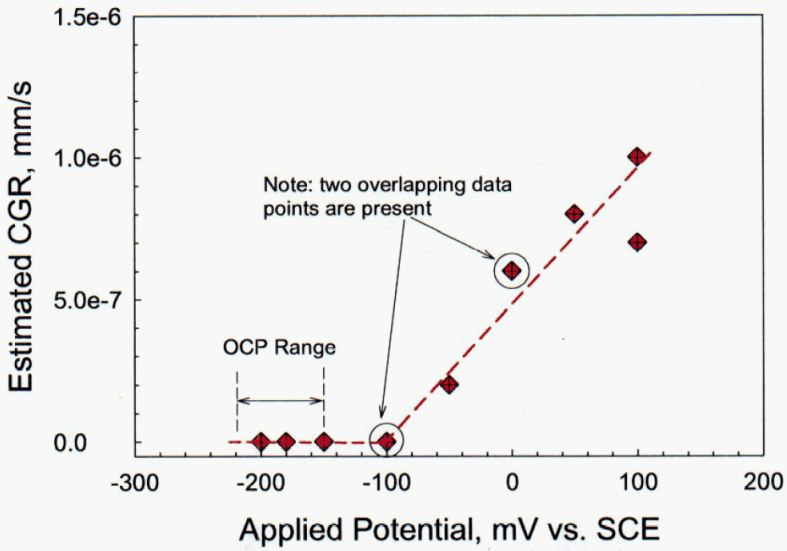

Figure 17: Effect of applied potential on the estimated CGR from SSRT tests in Tank 241-AN-107 at pH 11.

Effect of Solution pH

The effect of pH on the estimated crack growth rate from SSR tests in the standard Tank 241-AN-107 solution is shown in FIGURE 18 which shows the influence of pH in standard Tank 241-AN-107 solutions on the estimated CGR. If the effect of applied potential is neglected and the data examined as an aggregate set, pH can be seen to have an inhibitive effect on SCC over the range of 7 to 11. For example, at an applied potential of +100 mV increasing the pH from 7 to 11 resulted in a decrease in the average estimated CGR from 5×10^{-6} to 8.5×10^{-7} mm/s. Additional increases in pH beyond 11 to values as high as 13.5, however, had no appreciable effect. Thus, the estimated CGR at an applied potential of 0 mV at pH 10 and 13.5 were nearly identical at 1×10^{-6} and 9×10^{-7} mm/s. Thus, one possible explanation why no significant SCC has been observed in Tank 241-AN-107 though the pH level is below the specification might be because over the range that the pH has changed (13.5 vs. 11) there is little influence on SCC susceptibility especially when coupled with the low corrosion potential measurements that have been observed in the tank waste.

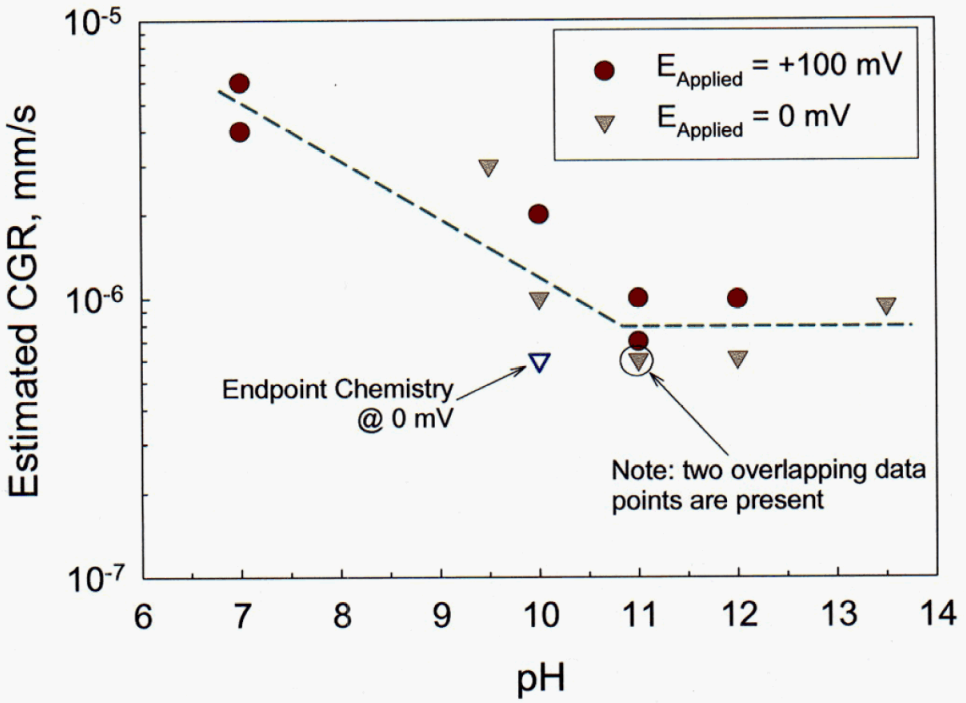

Figure 18: Effect of pH on the estimated CGR in Tank 241-AN-107 standard solution. Also shown is the estimated crack growth rate determined in the Tank 241-AN-107 endpoint simulant at pH 10 and an applied potential of 0 mV.

Effect of Nitrite and Nitrite/Nitrate Ratio

Nitrite concentration and the nitrite/nitrate concentration ratio were found to have a pronounced influence on SCC susceptibility. FIGURE 19 shows the effects of the nitrite/nitrate concentration ratio as a function of applied potential on SCC susceptibility. These data show that at very low nitrite/nitrate ratios, the potential where SCC is observed extends to lower values. Conversely, as this ratio increases the SCC threshold potential increases. Thus, at any given potential, SCC can be mitigated by increasing the nitrite/nitrate ratio and at a constant nitrite/nitrate ratio the propensity for SCC decreases with decreasing potential. As the nitrite/nitrate ratio increases the difference between open circuit and the cracking potential widens thereby decreasing the risk for SCC. This is particularly the case since the open circuit potential has been observed to be essentially independent of the nitrite/nitrate ratio (FIGURE 10).

When examined strictly from a nitrite concentration perspective, the inhibition provided by increased nitrite concentrations becomes evident (FIGURE 20 and FIGURE 21). At low nitrite concentrations, severe SCC is observed based on the stress-strain behavior (as shown in FIGURE 16) along with significant degradation of the sample (FIGURE 22). As a

result, the estimated CGR was assumed to be 10^{-5} mm/s in FIGURE 21. The beneficial effects of nitrite are immediately apparent even at concentrations as low as 0.35M (which equates to a nitrite/nitrate concentration ratio of approximately 0.095) when examining the stress-strain behavior though, it is unclear what influence nitrite has on CGR at these levels. Additional increases in the nitrite concentration to 0.875M and higher resulted in the stress-strain behavior becoming similar to that observed in air along with decreases in the estimated CGR. Eventually, complete inhibition of SCC was achieved at nitrite concentrations that approached the nitrate concentration (near a nitrite/nitrate ratio of 1).

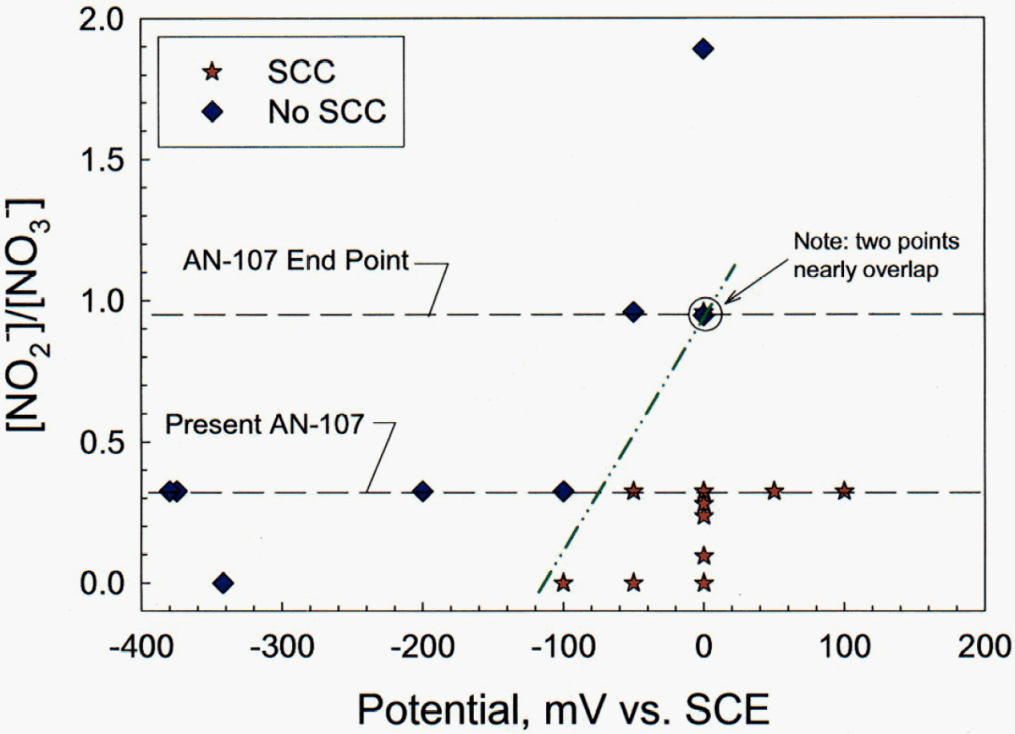

Figure 19: Effect of nitrite/nitrate concentration ratio on the propensity for SCC in Tank 241-AN-107 solution as a function of applied potential (both standard Tank 241-AN-107 and endpoint Tank 241-AN-107 are included).

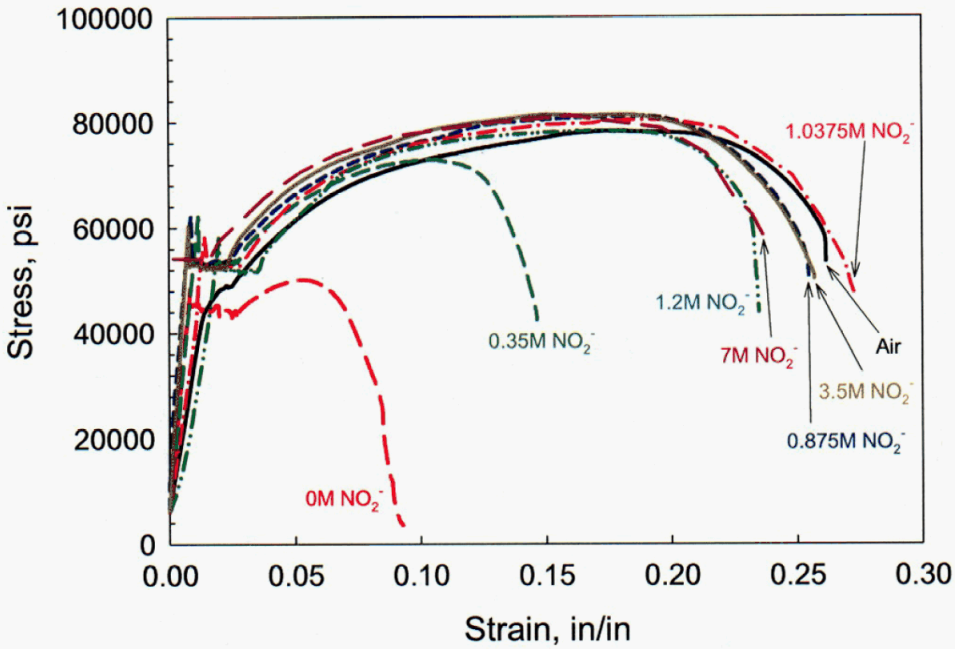

Figure 20: Stress-strain results from SSR tests in standard Tank 241-AN-107, pH 11 solutions with different nitrite concentrations at 0 mV.

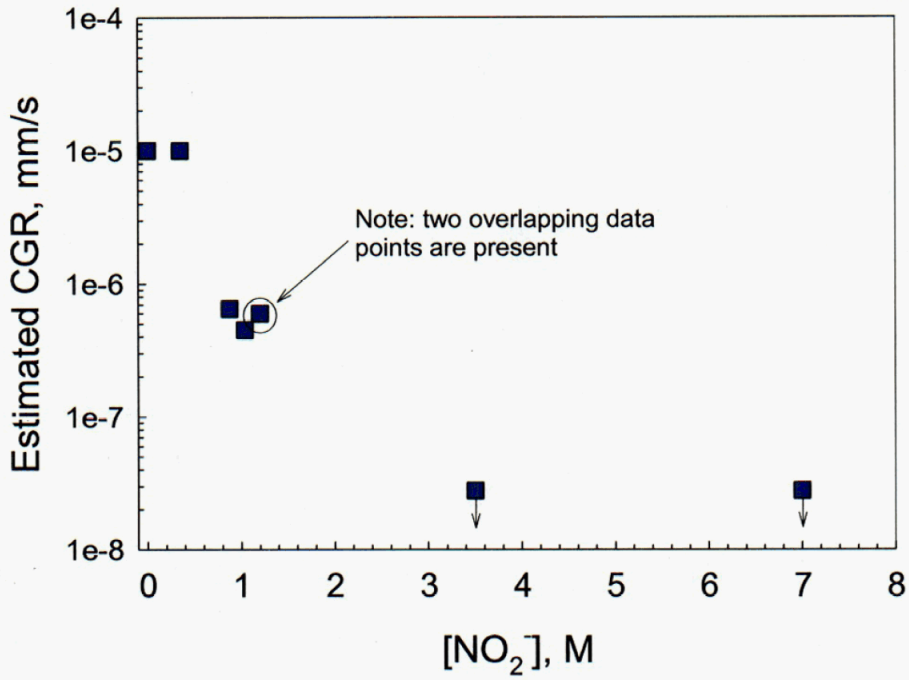

Figure 21: Effect of nitrite concentration on estimated CGR from SSR tests in standard Tank 241-AN-107 at pH 11 and an applied potential of 0 mV. Note that the CGR could not be estimated for the tests at 0 and 0.35M nitrite due to excessive degradation of the specimens and thus a value of 10^{-5} mm/s was assumed. Furthermore, no SCC was found at nitrite concentrations of 3.5 and 7M as denoted by the downward arrows.

Figure 22: Post-test stereo micrograph of an SSR test in Tank 241-AN-107, pH 11, no nitrite solution at 0 mV vs. SCE.

Effect of Total Organic Carbon

Because high organic carbon levels were thought to inhibit SCC sufficiently to allow the Tank 241-AN-107 tank chemistry to fall out of pH specification, the effects of TOC levels on SCC were investigated. Based on the results obtained and shown in FIGURE 23 and FIGURE 24, there appears to be little influence of TOC levels on SCC in standard Tank 241-AN-107 solution, pH 11 solutions at 0 mV vs. SCE with estimated CGRs between $4 - 7 \times 10^{-7}$ mm/s. When the effect of TOC level was investigated to determine if increased TOC levels could counteract the negative effects of removing the nitrite, essentially no differences were observable in terms of the estimated CGRs. However, some possible improvements in SCC resistance were noted in the stress-strain behavior. In any event, the TOC level does not appear to be a strong inhibitor for SCC.

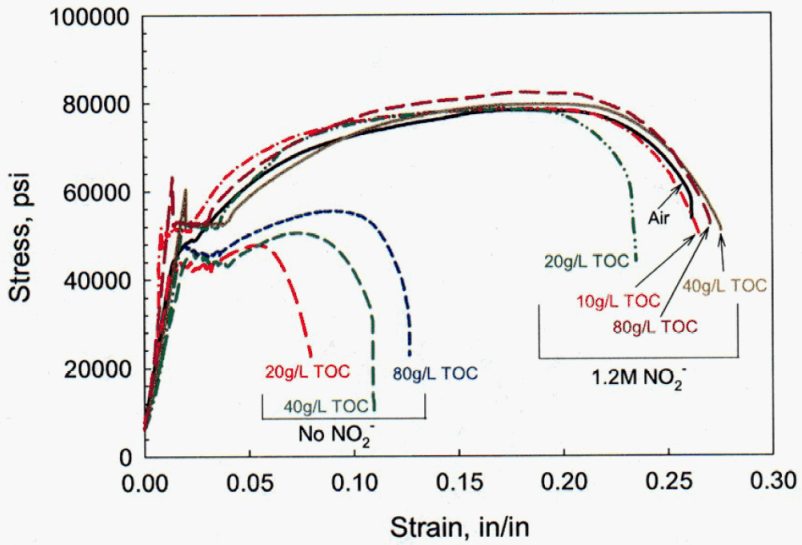

Figure 23: Effect of TOC level on stress-strain behavior in standard Tank 241-AN-107 solution, pH 11 solutions at 0 mV vs. SCE with 0 and 1.2M nitrite.

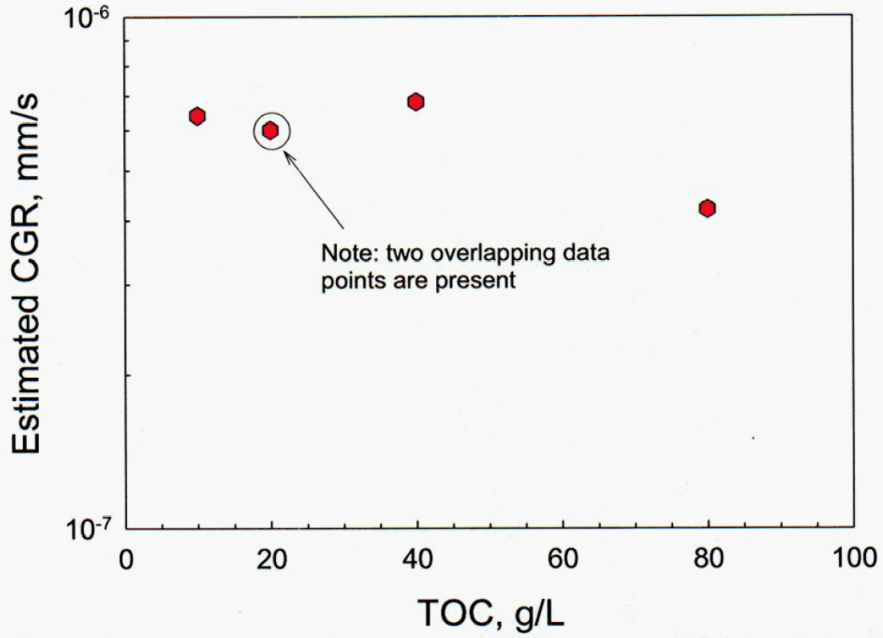

Figure 24: Effect of TOC level on the estimated CGR from SSR tests in standard Tank 241-AN-107, pH 11 solutions at 0 mV vs. SCE.

Effect of Chloride

As with the CPP testing, the effect of chloride concentration on SCC was evaluated at 0.05M (present Tank 241-AN-107 concentration), 0.1M (standard Tank 241-AN-107

simulant concentration), and 0.2M (to simulate Tank 241-AN-102) using SSR tests. Cracking propensity in both standard and endpoint solutions was studied. In addition, one test was run with higher chloride and an applied potential of -100mV to evaluate which of the two parameters had a greater effect on SCC susceptibility.

Changing the chloride concentration over the range of 0.05 to 0.2M did not have an appreciable effect on SCC behavior, as measured through changes in the estimated crack growth rate (FIGURE 25). Reducing the chloride concentration from 0.1M to 0.05M did not have a significant effect on the estimated crack growth rate, and the degree of SCC remained moderate. Increasing the chloride concentration from 0.1M to 0.2M had mixed results with one specimen exhibiting major SCC (the specimen was severely corroded after testing and an estimated crack growth rate could not be determined from cross sectional analysis and a value of 10^{-5} mm/s was assumed). In a duplicate test at 0.2M chloride and 0 mV vs. SCE, moderate SCC was observed with an estimated crack growth rate comparable to the other chloride concentrations evaluated. However, the SCC in the higher chloride solution appeared to be eliminated by reducing the applied potential to -100mV vs. SCE. This observation is consistent with other tests conducted at -100 mV.

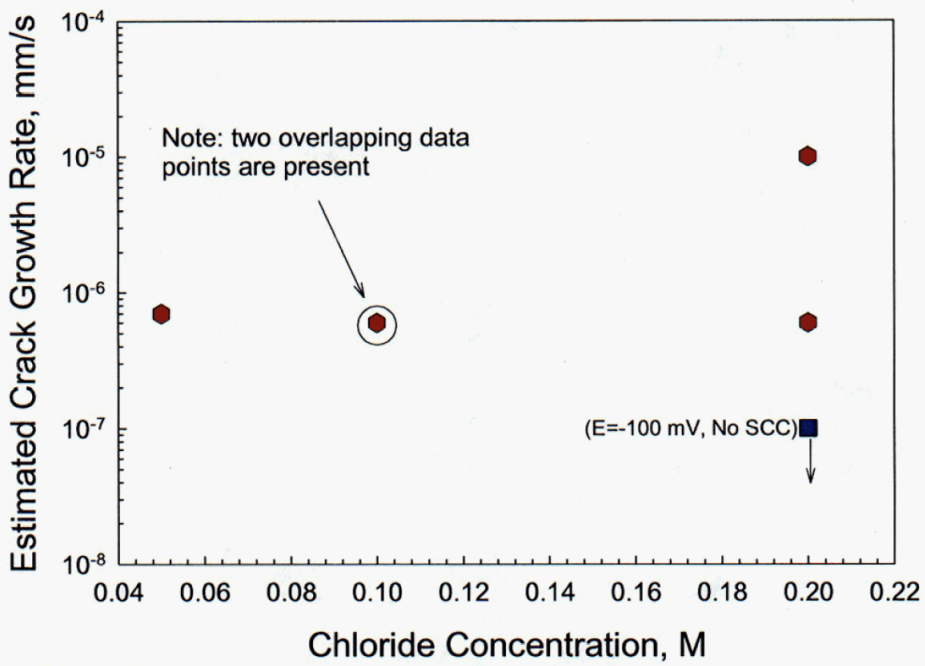

Figure 25: Effect of chloride concentration on the estimated crack growth rate in pH 11 Tank 241-AN-107 solutions at 50 °C. All tests (except one) were performed at an applied potential of 0 mV vs. SCE.

The observation that SCC occurs above a critical potential and is absent below this potential is consistent with the reported observations of Cragnolino et al.[11,12] In Cragnolino's work, a clear link between the repassivation potential for localized corrosion and the critical potential for SCC was established for stainless steels and Ni-Cr alloys in chloride environments. Though some similarities between the present work and that of Cragnolino's exist (e.g., carbon steel is passive in alkaline environments and stainless steels and Ni-Cr alloys are also passive, chloride is present in both cases), this relationship between pitting and SCC from a repassivation potential does not seem to hold under all conditions for the present work. For example, in standard pH 11 Tank 241-AN-107 simulant the repassivation potential and the critical potential for cracking are within 50 mV of each other (E_{rp}=~+50 mV vs. E_{SCC}=~0 mV). However, in other cases (e.g., Tank 241-AN-107 endpoint solution) the difference between E_{rp} and E_{SCC} was quite large (+215 vs. 0 mV respectively). Thus, even though there is a clear threshold potential for SCC, it may not be intimately tied to repassivation.

Constant Load Crack Growth Rate Tests

The SCC crack growth rate was determined using pre-cracked compact tension specimens exposed to different environmental conditions and stress intensities (applied K). The results are summarized in TABLE 10 where they are organized in terms of overall chemistry (e.g., standard vs. endpoint Tank 241-AN-107), then by solution pH and then applied K. Most tests were conducted at an applied potential of 0 mV vs. SCE but a few were also run at open circuit.

The crack growth rate was determined using four methods: DCPD, metallographic cross section using the total crack length, metallographic cross section using only the crack length along the through sample vector direction, and by examination of the fracture surface plan view. For the DCPD measurements, the first five days of the data were ignored to discount any initial crack tip creep effects. In some cases the DCPD measurements indicated a negative crack growth rate, and in these cases a zero crack growth was reported. The three approaches to determine the crack growth rate based on metallographic examination are illustrated in FIGURE 26. A comparison of the rates determined using these four methods is shown in FIGURE 27 which illustrates that as the measured CGR decreased there was a slight difference in the methods. DCPD tended to overestimate the rates that were on the order of 10^{-9} to 10^{-8} in/s. Note that current tests can measure crack growth rates on the order of 10^{-10} in/s. Historically, crack growth rates of these low levels were not measurable, and rates below 10^{-8} in/s

[11] G. Cragnolino, D.S. Dunn, and N. Sridhar, 1996. Environmental factors in the stress corrosion cracking of type 316L stainless steel and alloy 825 in chloride solutions. Corrosion, 52(3): 194-203

[12] G.A. Cragnolino, D.S. Dunn, Y.-M. Pan, and N. Sridhar, 2001. The critical potential for the stress corrosion cracking of Fe-Ni-Cr Alloys and its mechanistic implications, Chemistry and Electrochemistry of Corrosion and Stress Corrosion Cracking: A Symposium Honoring the Contributions of R.W. Staehle. R.H. Jones (ed.), TMS Annual Meeting, New Orleans. 83-104.

were assumed to be below K_{ISCC}. Previous work[13] has shown crack growth rates in aggressive environments as high as 3.8×10^{-7} in/s.

Several conditions were evaluated in duplicate and/or triplicate tests. These replicates provide some indication of the reproducibility of the results and are shown in FIGURE 28. The average CGR from the four measurement approaches was used for each of the triplicate tests conducted in standard Tank 241-AN-107 solutions at pH 10 and 0 mV which was then combined to determine a mean and standard deviation for the three identical tests. When SCC was observed it was found to be intergranular.

Table 10: Summary of SCC CGR results using PD data beginning on day 5 to discount initial crack mechanical creep effects.

Chemistry	pH	Applied Stress Intensity (ksi√in)	Applied Potential (mV vs. SCE)	CGR by PD (in/sec)	CGR by Metallographic Total Length (in/sec)	CGR by Metallographic Thru' Sample (in/sec)	CGR by Fracture Plan View (in/sec)	Test ID
Standard Tank 241-AN-107								
Standard	10	5	0	0	0	0	0	Y2-CT-1
Standard	10	10	0	9.9×10^{-11}	1.6×10^{-10}	1.1×10^{-10}	0	Y2 -CT-2
Standard	10	20	0	1.8×10^{-9}	0	0	0	Y2-CT-3
Standard	10	20	0	2.9×10^{-9}	0	0	0	Y2-CT-10
Standard	10	20	0	6.0×10^{-10}	0	0	0	Y2-CT-11
Standard	10	30	0	0	6.8×10^{-10}	2.9×10^{-10}	2.9×10^{-10}	Y2-CT-4
Standard	10	30	0	2.7×10^{-10}	0	0	0	Y2-CT-12
Standard	10	30	0	9.7×10^{-10}	0	0	0	Y2-CT-13
Standard	10	40	0	2.6×10^{-9}	3.0×10^{-9}	2.1×10^{-9}	1.8×10^{-9}	Y2-CT-5
Standard	10	20	-100	1.8×10^{-9}	0	0	0	Y2-CT-18
Standard	10	20	-100	7.1×10^{-10}	0	0	0	Y2-CT-20
Standard	11	20	0	3.5×10^{-10}	0	0	0	Y2-CT-21
Standard	11	20	0	0	1.7×10^{-9}	1.5×10^{-9}	0	Y2-CT-22
Standard 0.2M Chloride	11	20	0	0	4.4×10^{-10}	3.1×10^{-10}	1.1×10^{-9}	Y2-CT-19

[13] L. D. Blackburn, 1995a. Recommended Test Program to Determine Crack Growth Rate in Double-Shell Tank Materials. WHC-SD-WM-ETP-137 Rev 0, prepared by ICF Kaiser Hanford Company for Westinghouse Hanford Company, Richland, Washington.

Endpoint Tank 241-AN-107								
Endpoint	10	20	0	0	0	0	0	Y2-CT-16
Endpoint	10	20	0	0	0	0	0	Y2-CT-23
Endpoint	10	40	0	9.4×10^{-10}	0	0	0	Y2-CT-9
Endpoint	10	40	0	0	0	0	0	Y2-CT-14
Endpoint	10	40	OCP	0	0	0	0	Y2-CT-7
Endpoint 0.2M chloride	10	20	0	6.9×10^{-10}	0	0	0	Y2-CT-17
Endpoint 0.2M chloride	10	40	0	~ 0	0	0	0	Y2-CT-15
5M $NaNO_3$								
5M $NaNO_3$	-	40	0	2.9×10^{-8}	3.2×10^{-8}	3.1×10^{-8}	3.3×10^{-8}	Y2-CT-8
5M $NaNO_3$	-	40	OCP	5.1×10^{-8}	4.5×10^{-8}	4.1×10^{-8}	4.2×10^{-8}	Y2-CT-6

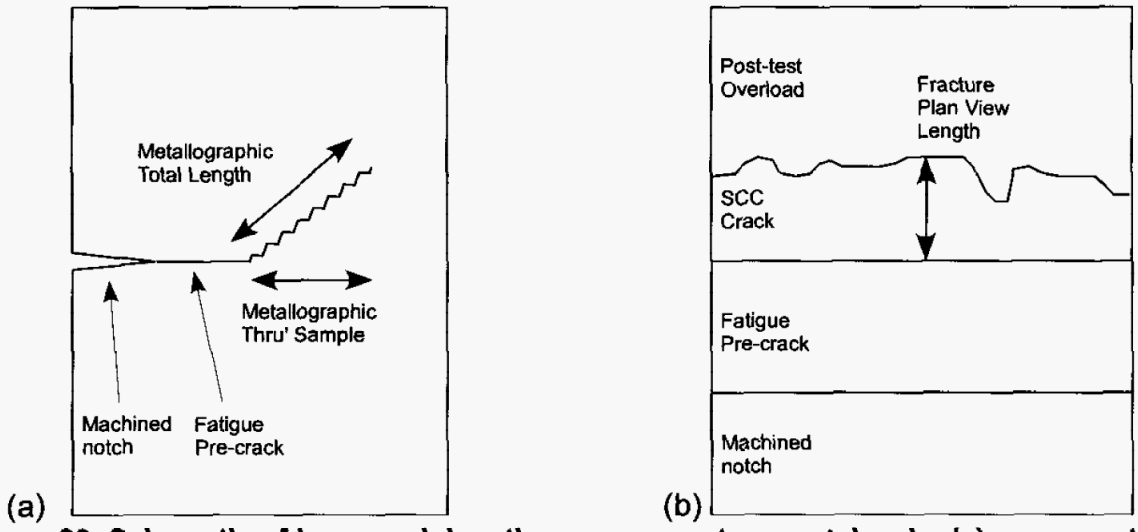

Figure 26: Schematic of how crack length measurements were taken by (a) cross-section metallography and (b) stereo microscopy of the fracture surface.

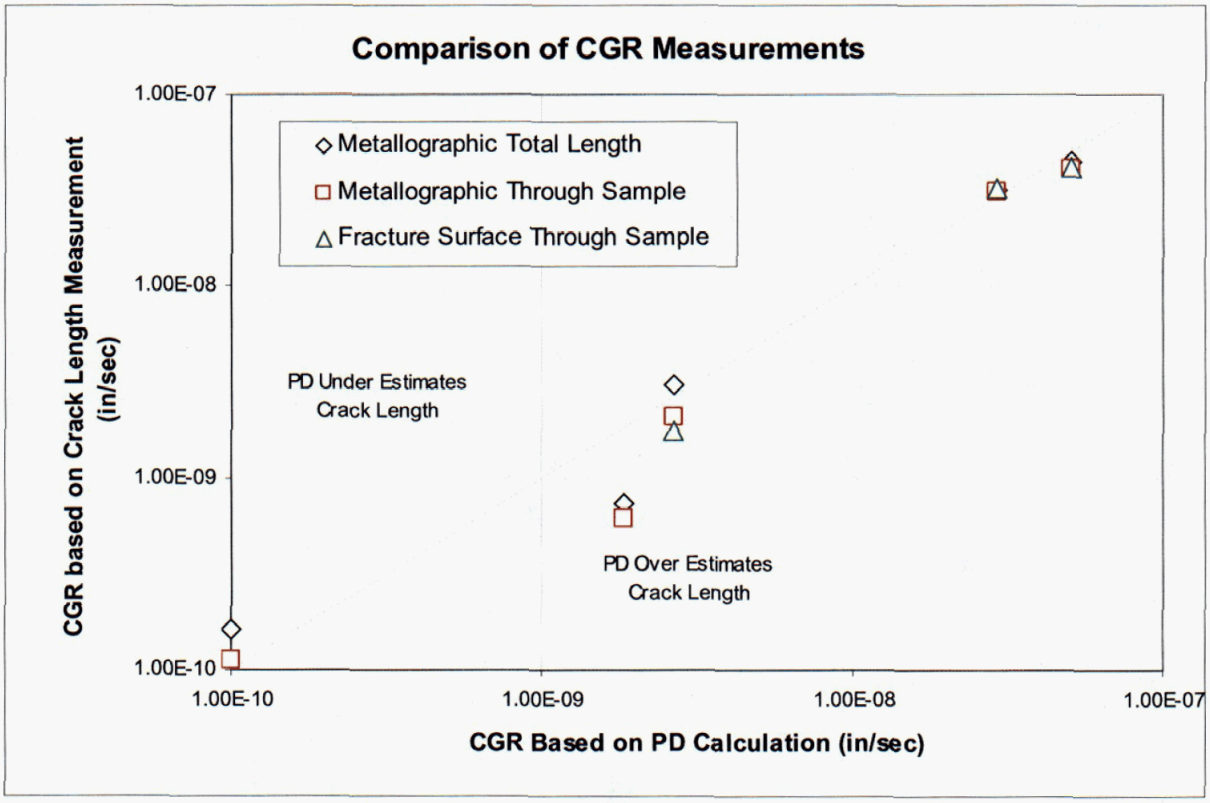

Figure 27: A comparison of crack growth rates as determined by PD and three different metallographic approaches.

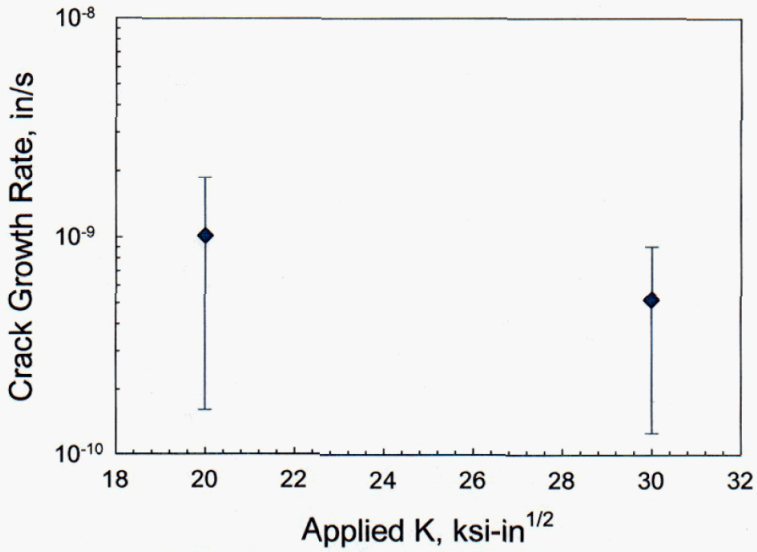

Figure 28: Test-to-test variability in measured CGRs from triplicate tests using the mean CGR results from each test measurement method.

Effect of Chemistry and Potential

The effect of chemistry on crack growth rate was limited to evaluations of the effects of pH, chloride concentration, nitrite concentration, and nitrate concentration (and the nitrite/nitrate ratio). The effect of potential has been limited to an examination of conditions at 0 mV and -100 mV vs. SCE, and open circuit potential, for the various chemistries.

Based on SSR tests, the effect of pH over the range of 10 to 11 is not expected to be significant. Several tests were run in standard Tank 241-AN-107 simulant solutions at applied potential of 0 mV and applied K of 20 ksi√in. Those tests run at pH 11 (Tests Y2-CT-21 and Y2-CT-22) showed slightly lower crack growth rates than those run at pH 10 (Tests Y2-CT-3, Y2-CT-10 and Y2-CT-11), based on DCPD measurement. The differences are not considered significant due to test to test variability. Crack length measurement by metallography showed that crack growth was negligible under these conditions. Furthermore, it was difficult to visually differentiate between the tip of the fatigue pre-crack and a small SCC crack demonstrating that these environments are on the borderline between susceptible and non-susceptible despite the observation of SCC in the SSR tests of comparable chemistries.

The effect of chloride concentration on crack growth was also found to be insignificant. Comparing the crack growth rate at 0.1 M and 0.2 M chloride determined using DCPD in Tank 241-AN-107 endpoint solution with applied K of 40 ksi√in (Tests Y2-CT-9 and Y2-CT-14 compared to Y2-CT-15), or with applied K of 20 ksi√in (Tests Y2-CT-16 and Y2-CT-23 compared to Y2-CT-17), shows no significant effects of higher chloride concentrations.

Thus far the largest chemistry contributor to crack growth is nitrite (or the lack thereof). In the standard Tank 241-AN-107 solution at pH 10 (1.2M nitrite, 3.7M nitrate), sustained crack growth was observed at applied Ks as low as 20-30 ksi√in, perhaps even as low as 10 ksi√in. In contrast, in Tank 241-AN-107 endpoint solutions at pH 10 (2.3M nitrite, 2.4M nitrate), essentially no crack growth was observed at 40 ksi√in (though one test did show growth based on DCPD monitoring but post-test metallographic examination failed to provide any supporting evidence that crack growth had taken place). The beneficial influence of nitrite is further illustrated when the results from the 5M $NaNO_3$ tests are examined where crack growth rates 10 – 100x greater than those measured in standard Tank 241-AN-107 solutions were measured.

The effect of potential has been limited to an examination of conditions at 0 mV and -100 mV vs. SCE in standard Tank 241-AN-107 pH 10 solutions and 0 mV vs. SCE and open circuit conditions in Tank 241-AN-107 endpoint pH 10 solutions and 5M $NaNO_3$. The crack growth rates measured by DCPD in standard AN 107 solution with an applied potential of 0 mV vs. SCE (Tests Y2-CT-3, Y2-CT-10 and Y2-CT-11) were slightly higher than those with applied potential of -100 mV vs. SCE (Tests Y2-CT-18 and

Y2-CT-20). This is consistent with expectations from the SSR tests. Though some crack growth was detected at an applied potential of -100 mV using DCPD, no conclusive evidence was seen during metallographic examination. At open circuit, only the 5M $NaNO_3$ was observed to still experience crack growth with rates being comparable at both OCP and 0 mV. In Tank 241-AN-107 endpoint solutions at pH 10, no crack growth was noted at OCP even at an applied K of 40 ksi√in.

Effect of Stress Intensity

The effect of applied K was explored in an attempt to define the critical threshold intensity factor for SCC (K_{ISCC}). Based on the results obtained (FIGURE 29), no crack growth was detected at 5 ksi√in. At higher applied Ks, the crack growth became detectable at 10 ksi√in but still at slow rates. Additional increases in K above 10 ksi√in did result in an increase in the crack growth rate but essentially there were no additional rate increases with higher K values above 20 ksi√in. It is unclear from these data precisely what the value of K_{ISCC} is in either standard or endpoint Tank 241-AN-107 solutions but it appears to be between 10 – 20 ksi√in, though it could also lie between 20 – 30 ksi√in.

The conclusion that K_{ISCC} lies between 10 and 20 ksi√in is based solely on DCPD measurements. FIGURE 27, above, demonstrated the relation between DCPD measurements and metallographic crack length measurements. The crack growth rate determined using the different approaches were equivalent for longer crack lengths, but there is a discrepancy between values for the smaller crack lengths. Given that the DCPD measurement technique tends to overestimate the rate at lower values and there is some difficulty in distinguishing SCC (if present) from the fatigue pre-crack metallographically in some cases, it could be argued that crack growth rates are negligible below an applied K of 20 ksi√in (and perhaps even 30 ksi√in). Only one SSC crack was clearly distinguishable and easily measurable metallographically from the thirteen tests conducted with an applied K of less than 30 ksi√in.

These estimates of K_{ISCC} can be used in conjunction with stress analyses and fracture mechanics to calculate the critical flaw size necessary for SCC[14]. If K_{ISCC} is assumed to be between 20 and 30 ksi√in, and a residual stress of 10 ksi and a 0.5 inch wall thickness in the lower knuckle region of the tank were also assumed, a crack would have to be between 0.15 and 0.25 inches (respectively) for SCC to occur. The upper limit on crack growth rate measured in the recent tests is approximately 2×10^{-9} in/s. If a crack of the critical size were present it would propagate and result in through wall penetration in approximately 4 to 5.5 years. Note that these estimates are subject to the assumptions made in stress and fracture mechanics analyses which were not performed during the course of this work or by CC Technologies.

[14] M. W. Rinker, J. E. Deibler, K. I. Johnson and S. P. Pilli, 2005. Evaluation and Recommendation of Stress Criteria for Stress Corrosion Cracking of Hanford Double Shell Tanks (draft report, Rev 0) Fig 5.4.

It is possible that crack tip blunting effects will influence the measured crack growth rates. Intuitively, it would be expected that a higher applied K would provide a greater driving force for crack propagation. However, a high stress near the crack tip can lead to blunting of the crack tip and a reduction in the effective localized applied K. This may explain why the crack growth rates for applied Ks between 20 and 40 ksi√in are essentially the same. To minimize any effects of blunting all CT specimens were immersed in test solution before application of load, and the first five days of DCPD data were ignored, however crack blunting has not been actively investigated.

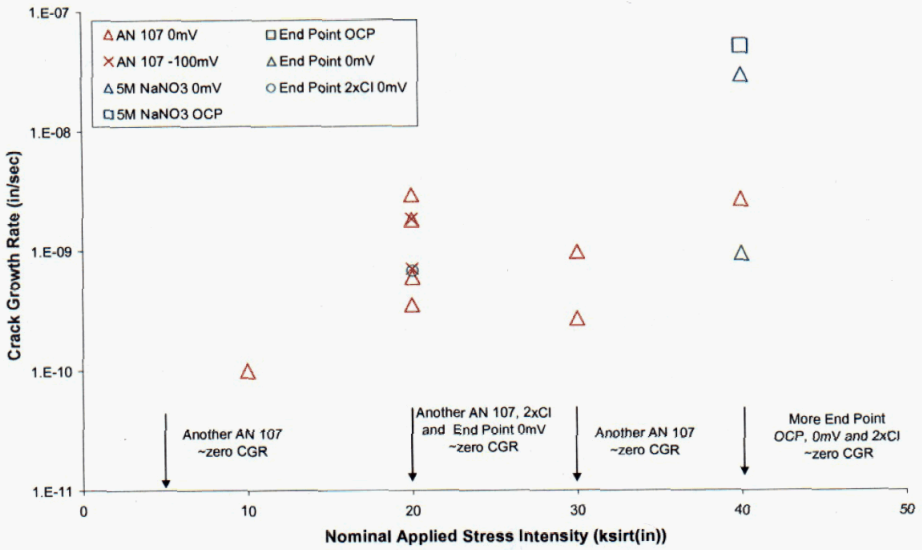

Figure 29: Effect of applied K on the crack growth rate determined using DCPD (using DCPD data after the initial 5 days of testing).

Appendix A: AN107 Supernate Simulant Recipe

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

Balance Device ID No: 0020 NIST Weight (10 g): 10.0000
Balance Device ID No: 0016 NIST Weight (150 g): 150.0
Prepared By: Thomas M Date Prepared: 12-13-05

Flask 384.39

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	401
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.96	6.953
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	0.34
Cesium Nitrate	$CsNO_3$	0.054	0.055
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	0.23
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.46	24.50
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	.30
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.25
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	0.52	0.528
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.070
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.56	0.563
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.261
Potassium Nitrate	KNO_3	9.20	9.21
Strontium Nitrate	$Sr(NO_3)_2$	0.032	0.37
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	0.43
Zirconyl Nitrate	$ZrO(NO_3)_2xH_2O$	0.38	0.387
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.513
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.328
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.863
Glycolic Acid	$C_2H_4O_3$	53.86	54.0
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.88	18.850
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.14
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.037
Boric Acid	H_3BO_3	0.40	.404
Sodium Chloride	NaCl	11.68	11.69
Sodium Fluoride	NaF	0.58	0.59
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.12
Sodium Sulfate	Na_2SO_4	24.40	24.37
Potassium Molibdate	K_2MoO_4	0.18	0.183
	SUM	604.9860	

986.1 / Flask

QA APPROVED
NAME: CLQuinn
DATE: 12-13-05

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.77
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.889
Sodium Formate	NaHCOO	31.42	31.49
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.734
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.55
Deionized Water	H_2O	400.00	400.01
	SUM	458.30	

Flask/ 414.2g
872.3 / Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1747.2/Flask
1362.9 chem only

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	593.8
Sodium Nitrite	$NaNO_2$	165.58	165.8
Water	H_2O	200.00	200.1
Add and Mix thoroughly.	Sum	960.16	

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM OF ALL	2359.94

3129.0g / Flask
- 384.39
2744.7g

Record the Final Weight: 2744.7

Density: 1.37

Measure the pH

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Mixed test stir overnight Adjust pH wed to 12.0 Remove 1 and Adjust to 5 pH. After stirring 10:46 12-14-05 added sulfuric Acid to bring down pH to 12.5

(pH was 10.4 After setting over night)

Flask 414.2 g

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

Balance Device ID No: 0020 NIST Weight (10 g): 10.0001
Balance Device ID No: 0015 NIST Weight (150 g): 150.0

Prepared By: Joe Gerst & Thomas McCohn Date Prepared: 12-7-05

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.2
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.96	6.986
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	.326
Cesium Nitrate	$CsNO_3$	0.054	.054
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	0.221
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.46	24.485
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	0.279
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.246
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	0.52	0.527
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.060
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	0.584
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.29
Potassium Nitrate	KNO_3	9.20	9.25
Strontium Nitrate	$Sr(NO_3)_2$	0.032	0.039
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	0.426
Zirconyl Nitrate	$ZrO(NO_3)_2.xH_2O$	0.38	0.385
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.527
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.319
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.871
Glycolic Acid	$C_2H_4O_3$	53.86	53.854
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.88	19.895
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.149
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.075
Boric Acid	H_3BO_3	0.40	0.41
Sodium Chloride	NaCl	11.68	11.685
Sodium Fluoride	NaF	0.58	0.576
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.110
Sodium Sulfate	Na_2SO_4	24.40	24.38
Potassium Molibdate	K_2MoO_4	0.18	.182
	SUM	604.9869	

1014.2 / Flask
- Flask
600.00

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	40.00	40.3
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.743
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.881
Sodium Formate	NaHCOO	31.42	31.433
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.735
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.520
Deionized Water	H_2O	400.00	400.000
	SUM	498.30	

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

1509.0 / Flask
- Flask = 1094.81

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.6

Mix Thoroughly

1804.9 / Flask
- Flask = 1390.71

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.6
Sodium Nitrite	$NaNO_2$	165.58	165.6
Water	H_2O	200.00	201.7
Add and Mix thoroughly.	Sum	960.16	

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM OF ALL	2359.04

Record the Final Weight: 2779.1

Density: 1.39 g / [illegible] ml

3193.3 / Flask
- Flask
2779.1

Measure the pH

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: mixed let stir overnight - pH 10.40 adjusted to 12.0 removed ½ and adjusted it to pH 12.98

QA APPROVED
NAME: Cldum
DATE: 12-8-05

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

Balance Device ID No: 0020 NIST Weight (10 g): 9.9999
Balance Device ID No: 0018 NIST Weight (150 g): 150.1
Prepared By: Joe Gerst Date Prepared: 11-30-05

Flask Wt 414.2 g

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.1
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.966
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	0.321
Cesium Nitrate	$CsNO_3$	0.054	0.055
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	0.224
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.463
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	0.287
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.242
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	0.522
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.061
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	0.581
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.258
Potassium Nitrate	KNO_3	9.20	9.200
Strontium Nitrate	$Sr(NO_3)_2$	0.032	0.031
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	0.418
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	0.380
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	14.52	14.520
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.319
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.862
Glycolic Acid	$C_2H_4O_3$	53.86	53.863
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.882
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.140
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.081
Boric Acid	H_3BO_3	0.40	0.402
Sodium Chloride	NaCl	11.68	11.679
Sodium Fluoride	NaF	0.58	0.579
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.102
Sodium Sulfate	Na_2SO_4	24.40	24.400
Potassium Molibdate	K_2MoO_4	0.18	0.180
	SUM	604.9860	

Flask + Part 1 = 1016.8 g
− Flask = 414.2 g
Part 1 chem = 602.6 g

In a SEPARATE Container, Mix the Following:

Beaker: 51.0

[illegible]	[illegible]	[illegible]	30.570
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.736
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.884
Sodium Formate	NaHCOO	31.42	31.422
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.741
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.519
Deionized Water	H_2O	400.00	401.700
	SUM	488.82	541.7 − 51.0 = 490.7

Flask + Part 1 1016.8 g
+ Part 2 chem
= 1506.7 g
+ Part 3 chem
= 1789.0 g
+ Part 4 chem
2749.3 g
+ DI To Top OFF
Total 3191.4 g
− Flask 414.2 g
2777.2 g

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.6
Sodium Nitrite	$NaNO_2$	165.58	165.6
Water	H_2O	200.00	200.1
Add and Mix thoroughly.	Sum	960.16	960.3

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM OF ALL	2350.46

Record the Final Weight

Density: 2777.2 g

Measure the pH

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let ~~stir~~ MIX over night in shaker

~~pH = 10.43~~ adjusted To 12.00

QA APPROVED
NAME: Cldum
DATE: 12-6-05

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

Flask 384.3g

Balance Device ID No: 0020 NIST Weight (10 g): 10.0000
Balance Device ID No: 0018 NIST Weight (150 g): 149.9997

Prepared By: Thomas McCohn Date Prepared: 1-10-2006

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	401.00
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.950
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.360
Cesium Nitrate	$CsNO_3$	0.054	.0591
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.250
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.49	24.491
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.289
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.264
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.560
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.093
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.587
Nickel Nitrate, 6-Hydrate	$Ni(NO_3)2.6H_2O$	5.26	5.286
Potassium Nitrate	KNO_3	9.20	9.265
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.036
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.427
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.384
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.550
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.333
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.874
Glycolic Acid	$C_2H_4O_3$	53.86	53.881
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.86	18.896
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.142
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.106
Boric Acid	H_3BO_3	0.40	.408
Sodium Chloride	NaCl	11.68	11.700
Sodium Fluoride	NaF	0.56	.580
Sodium Chromate	Na_2CrO_4	1.10	1.102
Sodium Sulfate	Na_2SO_4	24.40	24.403
Potassium Molibdate	K_2MoO_4	0.18	.178
	SUM	604.9880	603.1000

987.4/Flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	39.969
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.760
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.900
Sodium Formate	NaHCOO	31.42	31.426
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.747
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.530
Deionized Water	H_2O	400.00	400.00
	SUM	496.30	496.3

Flask/408.1g

904.4g with Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask. = 1514.8g/Flask

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.43

1781.6g/Flask
1781.6g − 408.1 = 1373.5g

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.600
Sodium Nitrite	$NaNO_2$	165.58	165.601
Water	H_2O	200.00	200.00
Add and Mix thoroughly.	Sum	960.16	960.201

1370.3g/Flask

410.8=Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM OF ALL	2359.94

2571.01

1787.5g/Flask
1370.3g/Flask

QA APPROVED
NAME: Oldum
DATE: 1-11-06

750ml
1 liter 12
1 liter 13

Record the Final Weight 3158.8g/Flask

	2748
Density:	1.374

Measure the pH

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Mixed complete and let stir overnight 1-10-06 to 1-11-06 pH was [illegible] after setting over night. will adjust pH to 12 & 13 but and half.

(pH 10.43 after mix over s.m was recheck)

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 10
BASE SOLUTION: April 2005 Version

Balance Device ID No: 0070 NIST Weight (10 g): 9.9999
Balance Device ID No: 0018 NIST Weight (150 g): 150.0

Prepared By: Thomas Date Prepared: 1-18-06

END POINT SOLUTION

386.9/Flask

Colin

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.3
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.98	9.950
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.335
Cesium Nitrate	$CsNO_3$	0.054	.059
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.231
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.425
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.289
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.250
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.520
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.082
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.593
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	5.28	5.235
Potassium Nitrate	KNO_3	9.20	9.175
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.037
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.417
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.376
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.539
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.324
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.871
Glycolic Acid	$C_2H_4O_3$	53.86	53.860
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.934
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.141
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.071
Boric Acid	H_3BO_3	0.40	.439
Sodium Chloride	NaCl	11.68	11.651
Sodium Fluoride	NaF	0.58	.584
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.113
Sodium Sulfate	Na_2SO_4	24.40	24.414
Potassium Molibdate	K_2MoO_4	0.18	.175
	SUM		609.4

QA APPROVED
NAME: Colin
DATE: 1-19-06

9963g/Flask

In a SEPARATE Container, Mix the Following:

508.2/Stop

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.74
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.89
Sodium Formate	NaHCOO	31.42	31.4
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.75
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.52
Deionized Water	H_2O	400.00	400.0
			458.3

1452.4/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	298.50	296.6

1730.4/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	407.59	407.6
Sodium Nitrite	$NaNO_2$	317.37	317.4
Water	H_2O	200.00	200.2
Add and Mix thoroughly.			925.2

2655.5/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM	2284.75	2268.4

Record the Final Weight 3091.2g/Flask

	2704.3
Density:	1.35

3091.2-386.9=
2704.3g

Measure the pH

Adjust the Final Solution to pH = 10 by titrating back with sulfuric acid (as necessary).

Comments: Let sit over night pH 10.08 Adjust pH down 10.02
used Sulfuric Acid

2.4263

Triple Batch Recipe (Colin)

AN-107 Supernate Simulant Recipe for a 6-Liter Batch, pH = 10
BASE SOLUTION: April 2005 Version

Balance Device ID No: 0020 NIST Weight (10 g): 9.9999
Balance Device ID No: 0018 NIST Weight (150 g): 130.08

Prepared By: Thomas M. Date Prepared: 1-18-2006

Tare a 12 L Carboy and then Add the Following, in Order:

~~Flask 385.6g~~

carboy = 731.4g

Compound	Formula	grams	Actual Mass Used,
Deionized Water	H_2O	1200.00	1200.2
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	20.88	20.855
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.98	.966
Cesium Nitrate	$CsNO_3$	0.162	.165
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.68	.683
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	73.38	73.389
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.64	.633
Lead Nitrate	$Pb(NO_3)_2$	3.72	3.772
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	1.56	1.598
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	12.18	12.189
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	1.74	1.757
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	15.78	15.786
Potassium Nitrate	KNO_3	27.60	27.616
Strontium Nitrate	$Sr(NO_3)_2$	0.098	.0940
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	1.26	1.260
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	1.14	1.149
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	43.58	43.560
HEDTA, n-Hydroxyethylenediamine	HEDTA	12.96	12.958
Sodium Gluconate	$C_6H_{11}NaO_7$	23.58	23.596
Glycolic Acid	$C_2H_4O_3$	161.58	161.000
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	58.64	56.657
Nitrilotriacetic Acid	$C_6H_9NO_6$	3.42	3.420
Iminodiacetic Acid	$HN(CH_2COOH)_2$	36.24	36.254
Boric Acid	H_3BO_3	1.20	1.220
Sodium Chloride	NaCl	35.04	34.974
Sodium Fluoride	NaF	1.74	1.762
Sodium Chromate	$Na_2Cr_2O_4$	3.30	3.306
Sodium Sulfate	Na_2SO_4	73.20	74.050
Potassium Molibdate	K_2MoO_4	0.54	.550
	Sum	1814.98	1822.9

~~1931.2~~

2554.2/carboy

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	32.22	32.2
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	26.64	26.6
Sodium Formate	NaHCOO	94.28	94.5
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	14.22	14.4
Sodium Oxalate	$Na_2C_2O_4$	7.58	7.6
Deionized Water	H_2O	1200.00	1200.1
	Sum	1374.90	1375.4

~~1954.5g/flask~~ 3917.9/carboy

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.
After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	889.50	889.49

~~3911.79/carboy~~

Mix Thoroughly

~~4756.3/carboy~~

4756.3 /carboy

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	1783.74	1783.7
Sodium Nitrite	$NaNO_2$	496.74	496.4
Water	H_2O	600.00	600.1
	Sum	2880.48	2880.7

~~3468.3g/flask~~

7700/carboy

Add and Mix thoroughly.

Mix thoroughly and dilute to the 7-Liter mark in the Volumetric Flask.

~~Add D.I water 1205.7~~ 6959.54 | 6968.7

~~7700/carboy~~

total = 8905.4g/carboy

Record the Final Weight ~~8174g~~ | 8174.0

Density: 1.32

— carboy

8174

Measure the pH

Adjust the Final Solution to pH = 10 by titrating back with sulfuric acid (as necessary).

Comments: Let stir over night PH 10.0, Adjust to 10.0 used sulfic Acid for adjustment 1-19-06.

QA APPROVED

NAME: CR Dunn

DATE: 1-19-06

342.1
330.9

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = ~~10~~ 11
BASE SOLUTION: April 2005 Version

No nitrite.
Thurs AM.

Balance Device ID No: 0020 **NIST Weight (10 g):** 10.0000
Balance Device ID No: 0018 **NIST Weight (150 g):** 150.0

Prepared By: Thomas M. **Date Prepared:** 1-19-06

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

386.9/Flask

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.3
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.982
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.321
Cesium Nitrate	$CsNO_3$	0.054	.0547
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.241
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.442
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.283
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.260
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.540
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.100
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.594
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	5.26	5.300
Potassium Nitrate	KNO_3	9.20	9.244
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.036
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.421
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.400
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	14.52	14.579
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.307
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.864
Glycolic Acid	$C_2H_4O_3$	53.86	53.89
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.878
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.168
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.110
Boric Acid	H_3BO_3	0.40	.417
Sodium Chloride	NaCl	11.68	11.682
Sodium Fluoride	NaF	0.58	.567
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.120
Sodium Sulfate	Na_2SO_4	24.40	24.460
Potassium Molibdate	K_2MoO_4	0.18	.20
	Sum		608.5

QA APPROVED
NAME: Clolum
DATE: 1-20-06

995.4g/Flask

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.739
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.901
Sodium Formate	NaHCOO	31.42	31.500
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.746
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.522
Deionized Water	H_2O	400.00	400.3

Cup: 51.0

~~512.9~~/Cup

Mix Thoroughly. Then Add this Solution to the Volumetric Flask. 1456.5/Flask 458.708

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.50

1733.9g/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.90
Sodium Nitrite	$NaNO_2$	XXX	No nitrite !!!
Water	H_2O	200.00	200.90

2530.9g/Flask

Add and Mix thoroughly. 795.80

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

Sum	2154.37	2144.0

2

3049.8 - 386.9 = 2662.9

Record the Final Weight 3049.7/Flask

	2662.9
Density:	1.33

Measure the pH 10.10

Adjust the Final Solution to pH = 10 by titrating back with sulfuric acid (as necessary).

Comments: Let stand over night 1-19-2006 PH 10.10
~~Adjust to PH 11~~ 1-20-2006

A-7

Joe G.

256.9

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 12
BASE SOLUTION: April 2005 Version

Basic pH = 12

PM Thursday SSRT

Balance Device ID No: 0029 NIST Weight (10 g): 9.9998 g
Balance Device ID No: 0014 NIST Weight (150 g): 150.1 g
Prepared By: Thomas McGh Date Prepared: 1-20-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.3
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.98	6.970
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.343
Cesium Nitrate	$CsNO_3$	0.054	.0579
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.243
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.561
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.299
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.245
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.525
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.016
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.160
Nickel Nitrate, 6-Hydrate	$Ni(NO_3)_2 \cdot 6H_2O$	5.26	5.275
Potassium Nitrate	KNO_3	9.20	9.267
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.0311
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.432
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.391
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.515
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.368
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.859
Glycolic Acid	$C_2H_4O_3$	53.88	54.000
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.813
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.140
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.078
Boric Acid	H_3BO_3	0.40	.413
Sodium Chloride	NaCl	11.68	11.641
Sodium Fluoride	NaF	0.58	.599
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.124
Sodium Sulfate	Na_2SO_4	24.40	24.441
Potassium Molibdate	K_2MoO_4	0.18	.174
	SUM	604.9860	613.2

386.9 g/Flask

QA APPROVED
NAME: Claus
DATE: 1-23-06

1000.1/Flask

In a SEPARATE Container, Mix the Following:

Sodium Hydroxide	NaOH	30.52	30.560
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.763
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.890
Sodium Formate	NaHCOO	31.42	31.488
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.744
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.529
Deionized Water	H_2O	400.00	400.1
	SUM	488.82	489.074

1488.0/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.6

1780.5/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.5
Sodium Nitrite	$NaNO_2$	165.58	165.5
Water	H_2O	200.00	200.1
Add and Mix thoroughly.	Sum	960.16	960.1

2739.1/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM OF ALL	2359.46

2352.1 g

Record the Final Weight 3161.0 g/Flask

	2774.1
Density:	1.38

Measure the pH

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let Stir over night 10.48 pH. Adjust to 12 pH next day

pH = 10 'End-point solution'

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 10
BASE SOLUTION: April 2005 Version

Balance Device ID No: 0020 NIST Weight (10 g): 10.0000
Balance Device ID No: 0014 NIST Weight (150 g): 150.0
Prepared By: Thomas M. Date Prepared: 1-24-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

386.9/Flask

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.1
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.987
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.337
Cesium Nitrate	$CsNO_3$	0.054	.059
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.231
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.506
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.305
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.261
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.554
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.067
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.596
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.237
Potassium Nitrate	KNO_3	9.20	9.263
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.0379
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.422
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.375
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.62	14.527
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.330
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.856
Glycolic Acid	$C_2H_4O_3$	53.86	53.868
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.841
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.149
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.054
Boric Acid	H_3BO_3	0.40	.420
Sodium Chloride	NaCl	11.68	11.640
Sodium Fluoride	NaF	0.58	.581
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.095
Sodium Sulfate	Na_2SO_4	24.40	24.428
Potassium Molybdate	K_2MoO_4	0.18	.180
	SUM		612

998.9/Flask

QA APPROVED
NAME: [illegible]
DATE: 1-25-06

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.722
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.874
Sodium Formate	NaHCOO	31.42	31.441
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.735
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.534
Deionized Water	H_2O	400.00	400.00

1455.7/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask. 458.31

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	298.50	296.5

1737.9/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	407.59	407.70
Sodium Nitrite	$NaNO_2$	317.37	317.32
Water	H_2O	200.00	200.1

cup: 51.9

Add and Mix thoroughly. 925.12 977.3/cup 2667.0/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM 2284.75 2280.1

2667.0 − 386.9 = 2280.1

Record the Final Weight 3111.6 − 386.9 = Flask 2724.7

3111.6/Flask

Density: 1.36

Measure the pH 10.35

Adjust to 10.09 1-25-06

Adjust the Final Solution to pH = 10 by titrating back with sulfuric acid (as necessary).

Comments: Let Stir Over Night - PH 10.35 Adjust to 10.09 pH. 1-25-06

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH ≈ 10
BASE SOLUTION: April 2005 Version

End · Point Solution.

Balance Device ID No: 0020 **NIST Weight (10 g):** 9.9999
Balance Device ID No: 0019 **NIST Weight (150 g):** 150.0

Prepared By: Thomas McCol **Date Prepared:** 2-1-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Flask/387.5

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.1
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.967
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.335
Cesium Nitrate	$CsNO_3$	0.054	.055
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.238
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.480
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.279
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.261
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.527
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.044
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.585
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	5.28	5.263
Potassium Nitrate	KNO_3	9.20	9.209
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.036
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.427
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.395
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	14.52	14.542
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.312
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.864
Glycolic Acid	$C_2H_4O_3$	53.88	53.864
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.897
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.145
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.067
Boric Acid	H_3BO_3	0.40	.429
Sodium Chloride	NaCl	11.68	11.700
Sodium Fluoride	NaF	0.58	.572
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.125
Sodium Sulfate	Na_2SO_4	24.40	24.379
Potassium Molibdate	K_2MoO_4	0.18	.187
	Sum		603.8

QA APPROVED
NAME: Cldun
DATE: 2-2-06

991.3g/Flask

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.742
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.86	8.861
Sodium Formate	NaHCOO	31.42	31.408
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.755
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.539
Deionized Water	H_2O	400.00	400.1

58.2g

Mix Thoroughly. Then Add this Solution to the Volumetric Flask. 458.465

1448.4g/Flask

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1726.7g/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	407.69	406.7
Sodium Nitrite	$NaNO_2$	317.37	317.3
Water	H_2O	200.00	201.5

Add and Mix thoroughly. 925.5

2650.2g/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM 2284.75 | 2262.7

2650.2 - 387.5 Flask = 2262.7g

Record the Final Weight 3110.1g/Flask | 2722.6g

3110.1 - 387.5 = 2722.6g

Density: 1.36

Measure the pH 10.43 Adjust to 9.99 2-2-06

Adjust the Final Solution to pH = 10 by titrating back with sulfuric acid (as necessary).

Comments: Let stir over night. PH 10.43 adjust to pH 9.99 2-2-2006

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

TOC 40g/L

Balance Device ID No: 0020 NIST Weight (10 g): 10.0000
Balance Device ID No: 0019 NIST Weight (150 g): 150.0

Prepared By: Thomas McLaho Date Prepared: 2-6-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.2
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.961
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.326
Cesium Nitrate	$CsNO_3$	0.054	.055
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.233
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.483
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.263
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.254
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.561
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.071
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.587
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.289
Potassium Nitrate	KNO_3	9.20	9.205
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.031
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.432
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.378
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	29.04	29.045
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	8.66	8.640
Sodium Gluconate	$C_6H_{11}NaO_7$	15.71	15.689
Glycolic Acid	$C_2H_4O_3$	107.71	107.700
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	37.76	37.765
Nitrilotriacetic Acid	$C_6H_9NO_6$	2.28	2.24
Iminodiacetic Acid	$HN(CH_2COOH)_2$	24.15	24.149
Boric Acid	H_3BO_3	0.40	.43
Sodium Chloride	NaCl	11.68	11.649
Sodium Fluoride	NaF	0.58	.581
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.138
Sodium Sulfate	Na_2SO_4	24.40	24.409
Potassium Molibdate	K_2MoO_4	0.18	.206
	SUM	717.6360	721.6

386.4/Flask

1108/Flask

QA APPROVED
NAME: Carolyn L Dunn
DATE: 2-7-06

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.54
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.80
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.845
Sodium Formate	NaHCOO	62.85	62.800
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	9.48	9.459
Sodium Oxalate	$Na_2C_2O_4$	5.03	5.084
Deionized Water	H_2O	400.00	400.1
	SUM	527.50	527.708

1633.9/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.70

1909.4/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.5
Sodium Nitrite	$NaNO_2$	165.58	165.6
Water	H_2O	200.00	200.3
Add and Mix thoroughly.	Sum	960.16	960.4

2866.8/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

	SUM OF ALL	2501.79

2480.4

Record the Final Weight 3187.6/Flask

3187.6/Flask
3187.6-386.4=2801.2g

	2801.2
Density:	1.40

Measure the pH 10.68 pH Adjust to 11.00

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let Stir overnight to Tues-Day-Feb-7-2006. PH 10.68 Adjusted to 11.00 11:30 a.m.

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

TOC 10g/L

Tuesday

Balance Device ID No: 0020 NIST Weight (10 g): 9.9998
Balance Device ID No: 0019 NIST Weight (150 g): 150.0

Prepared By: Thomas McCoy Date Prepared: 2-7-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.1
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.98	6.986
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.370
Cesium Nitrate	$CsNO_3$	0.054	.056
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.260
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.50
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.288
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.255
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.527
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.028
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.594
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.290
Potassium Nitrate	KNO_3	9.20	9.260
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.035
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.419
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.382
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	7.26	7.270
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	2.16	2.139
Sodium Gluconate	$C_6H_{11}NaO_7$	3.93	3.916
Glycolic Acid	$C_2H_4O_3$	26.93	27.000
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	9.44	9.454
Nitrilotriacetic Acid	$C_6H_9NO_6$	0.57	.576
Iminodiacetic Acid	$HN(CH_2COOH)_2$	6.04	6.049
Boric Acid	H_3BO_3	0.40	.438
Sodium Chloride	NaCl	11.68	11.701
Sodium Fluoride	NaF	0.58	.591
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.102
Sodium Sulfate	Na_2SO_4	24.40	24.410
Potassium Molibdate	K_2MoO_4	0.16	.170
	SUM	548.5560	545.8

386.8/Flask

932.8/Flask

QA APPROVED
NAME: Cldunn
DATE: 2-8-06

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.518
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.736
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.878
Sodium Formate	NaHCOO	15.71	15.718
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	2.37	2.371
Sodium Oxalate	$Na_2C_2O_4$	1.26	1.263
Deionized Water	H_2O	400.00	400.0
	SUM	469.48	469.477

Guy Todd

1398.1/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

Guy Todd

1694.2/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	584.58	594.6
Sodium Nitrite	$NaNO_2$	185.58	165.6
Water	H_2O	200.00	200.1
Add and Mix thoroughly.	Sum	990.16	960.3

Guy Todd

2652.2g/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM OF ALL	2274.79

2265.5

Record the Final Weight 3132.8g/Flask

3132.8 - 386.8 = 2746g

	2746
Density:	1.37

Measure the pH 10.58

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let stir overnight. Measure pH 10.58, Adjust to pH 11.00 2-8-2006

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

TOC 46g/L
no nitrite

Wednesday.

Balance Device ID No: 0020 NIST Weight (10 g): 9.9999
Balance Device ID No: 0019 NIST Weight (150 g): 150.0

Prepared By: Thomas M. Date Prepared: 2-8-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.7
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.939
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	0.37
Cesium Nitrate	$CsNO_3$	0.054	.053
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.241
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.431
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.279
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.255
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.544
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.042
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.599
Nickel Nitrate, 6-Hydrate	$Ni(NO_3)_2 \cdot 6H_2O$	5.26	5.260
Potassium Nitrate	KNO_3	9.20	9.190
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.033
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.460
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.376
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	29.04	29.050
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	8.66	8.684
Sodium Gluconate	$C_6H_{11}NaO_7$	15.71	15.700
Glycolic Acid	$C_2H_4O_3$	107.71	107.40
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	37.76	37.792
Nitrilotriacetic Acid	$C_6H_9NO_6$	2.28	2.300
Iminodiacetic Acid	$HN(CH_2COOH)_2$	24.15	24.161
Boric Acid	H_3BO_3	0.40	.410
Sodium Chloride	NaCl	11.68	11.681
Sodium Fluoride	NaF	0.58	.592
Sodium Chromate	Na_2CrO_4	1.10	1.107
Sodium Sulfate	Na_2SO_4	24.40	24.390
Potassium Molibdate	K_2MoO_4	0.18	.20
	SUM	717.6360	723.5

387.4/Flask

1110.9/Flask

QA APPROVED
NAME: Cldun
DATE: 2-9-06

In a SEPARATE Container, Mix the Following:

Gary	[redacted]	[redacted]	30.52
	Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74
	Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88
	Sodium Formate	NaHCOO	62.85
	Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	9.48
	Sodium Oxalate	$Na_2C_2O_4$	5.03
	Deionized Water	H_2O	400.00
	SUM	527.58	527.8

1633.3/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Gary	Sodium Carbonate	Na_2CO_3	296.50	296.5

1929.4/Flask

Mix Thoroughly

Next, Mix the Following:

Gary	Sodium Nitrate	$NaNO_3$	594.58	594.6
	~~Sodium Nitrite~~	~~$NaNO_2$ - T.M.~~	XXX	No nitrite.
	Water	H_2O	200.00	200.0
	Add and Mix thoroughly.	Sum	794.58	794.6

2701.0/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM OF ALL	2336.22

2313.6g

Record the Final Weight 3105.4/Flask

	2719
Density:	1.35

3105.4 - 387.4

Measure the pH 10.12

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let Stir overnight. measure pH 10.12 Adjusted to 11.00 pH 2-9-2006

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 10
BASE SOLUTION: April 2005 Version

END POINT

Balance Device ID No: 0020 NIST Weight (10 g): 9.9999
Balance Device ID No: 0019 NIST Weight (150 g): 150.0

Prepared By: Thomas McCoha Date Prepared: 2-20-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.1
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.9805
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.325
Cesium Nitrate	$CsNO_3$	0.054	.055
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.227
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.474
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.297
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.256
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.530
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.05	4.061
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.583
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	5.26	5.266
Potassium Nitrate	KNO_3	9.20	9.202
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.033
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.428
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.386
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	14.52	14.499
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.335
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.873
Glycolic Acid	$C_2H_4O_3$	53.86	53.855
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.885
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.150
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.092
Boric Acid	H_3BO_3	0.40	.409
Sodium Chloride	NaCl	11.68	11.685
Sodium Fluoride	NaF	0.58	.582
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.107
Sodium Sulfate	Na_2SO_4	24.40	24.396
Potassium Molibdate	K_2MoO_4	0.18	.20
In a SEPARATE Container, Mix the Following:			
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.771
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.900
Sodium Formate	NaHCOO	31.42	31.417
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.748
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.539
Deionized Water	H_2O	400.00	400.00
			458.325

386.1 / Flask

989.4 / Flask

1446.8 / Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.50

1725.2 / Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	407.59	407.70
Sodium Nitrite	$NaNO_2$	317.37	317.40
Water	H_2O	200.00	200.30
			925.4

2667.2 ~~2646.8~~ / Flask

Add and Mix thoroughly.

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM 2284.75 2281.10

Record the Final Weight 3104.49 / Flask

2718.3

Density: 1.359

Measure the pH

Adjust the Final Solution to pH = 10 by titrating back with sulfuric acid (as necessary).

Comments: Let stir overnight 2-20-2006 to 2-21-06
Measured pH at 10.55 Adjusted to 10.00

QA APPROVED
NAME: C Odum
DATE: 2-21-06

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

No nitrite → do early in week

Balance Device ID No: 0020 NIST Weight (10 g): 9.9998
Balance Device ID No: 0018 NIST Weight (150 g): 150.0

Prepared By: Thomas McCoin Date Prepared: 2-21-06

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

2-21-06 387.4/Flask

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.9
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	.945
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.341
Cesium Nitrate	$CsNO_3$	0.054	.055
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.235
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.447
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.299
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.237
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.526
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.050
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.584
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	5.26	5.281
Potassium Nitrate	KNO_3	9.20	9.205
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.035
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.422
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.391
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	14.52	14.561
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.338
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.863
Glycolic Acid	$C_2H_4O_3$	53.86	53.853
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.868
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.140
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.084
Boric Acid	H_3BO_3	0.40	.396
Sodium Chloride	NaCl	11.68	11.660
Sodium Fluoride	NaF	0.58	.578
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.129
Sodium Sulfate	Na_2SO_4	24.40	24.380
Potassium Molibdate	K_2MoO_4	0.18	.200
In a SEPARATE Container, Mix the Following:			
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.73
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.89
Sodium Formate	NaHCOO	31.42	31.42
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.75
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.52
Deionized Water	H_2O	400.00	400.00

990.2/Flask

6 any

442.5/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask. 458.3

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1590.6/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.7
Sodium Nitrite	$NaNO_2$	XXX	No nitrite
Water	H_2O	200.00	200.0

2543.9/Flask

Add and Mix thoroughly.

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

Sum 2154.37 2156.5

Record the Final Weight 3632.7/Flask

2645.3

Density: 1.32

Measure the pH

Adjust the Final Solution to pH = 11 (as necessary).

Comments: Let stir overnight. measured PH 10.95 Adjusted to PH 10.98

QA APPROVED
NAME: [illegible]
DATE: 2-22-06

Thurs Feb 23

AN-107 Supernate Simulant Recipe for a 4-Liter Batch, pH = 10
BASE SOLUTION: April 2005 Version

END POINT DOUBLE BATCH

Balance Device ID No: 0020 NIST Weight (10 g): 9.9998
Balance Device ID No: 0018 NIST Weight (150 g): 150.1

Prepared By: Thomas M. Date Prepared: 2-23-2006

Tare a large Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	800.00	800.3
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	13.92	13.938
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.64	.638
Cesium Nitrate	$CsNO_3$	0.108	.107
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.44	.445
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	48.92	48.945
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.56	.560
Lead Nitrate	$Pb(NO_3)_2$	2.48	2.477
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	1.04	1.051
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	8.12	8.119
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	1.16	1.157
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	10.52	10.547
Potassium Nitrate	KNO_3	18.40	18.405
Strontium Nitrate	$Sr(NO_3)_2$	0.064	.0638
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.84	.844
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.76	.761
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	29.04	29.040
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	8.64	8.639
Sodium Gluconate	$C_6H_{11}NaO_7$	15.72	15.729
Glycolic Acid	$C_2H_4O_3$	107.72	107.709
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	37.76	37.754
Nitrilotriacetic Acid	$C_6H_9NO_6$	2.28	2.284
Iminodiacetic Acid	$HN(CH_2COOH)_2$	24.16	24.162
Boric Acid	H_3BO_3	0.80	.810
Sodium Chloride	NaCl	23.36	23.365
Sodium Fluoride	NaF	1.16	1.160
Sodium Chromate	$Na_2Cr_2O_4$	2.20	2.206
Sodium Sulfate	Na_2SO_4	48.80	48.790
Potassium Molibdate	K_2MoO_4	0.36	.360

387.5/Flask
574.5g/carboy

QA APPROVED
NAME: Oldum
DATE: 2-24-06

1599.4g/Flask
-OR-
1212.5g/carboy

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	21.48	21.497
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	17.76	17.764
Sodium Formate	NaHCOO	62.84	62.863
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	9.48	9.494
Sodium Oxalate	$Na_2C_2O_4$	5.04	5.067
Deionized Water	H_2O	800.00	800.1
			916.785

51.0 cal/917.99

2127.3g/carboy

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	593.00	593.4

3256.9g/carboy

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	815.18	815.1
Sodium Nitrite	$NaNO_2$	634.74	634.3
Water	H_2O	400.00	400.4
			1849.8

5099.1g/carboy

Add and Mix thoroughly.

Mix thoroughly and dilute to the 4-Liter mark in the Volumetric Flask.

SUM 4569.50 4524.5g

Record the Final Weight 6017.7g/carboy

Density: 5443.2 / 1.36

Measure the pH 10.27 to 10.02 pH 2-24-06 J.M

Adjust the Final Solution to pH = 10 by titrating back with sulfuric acid (as necessary).

Comments: Let stir overnight in Shacker 2-23-06 to 2-24-06
Measure PH 10.27 Adjusted to 10.02 Adjusted with Sulfuric Acid = H_2SO_4

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

TOC 80g/L
no nitrite

do early in week.

Balance Device ID No: 0020 NIST Weight (10 g): 10.0000
Balance Device ID No: 0018 NIST Weight (150 g): 149.9

Prepared By: Thomas McCoha Date Prepared: 2-27-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.0
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.941
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.330
Cesium Nitrate	$CsNO_3$	0.054	.056
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.229
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.48	24.490
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.289
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.237
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.530
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.057
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.580
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	5.26	5.240
Potassium Nitrate	KNO_3	9.20	9.204
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.035
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.418
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.385
* EDTA, Ethylenediaminetetraacetate	Na_4EDTA	58.08	58.076
* HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	17.32	17.329
Sodium Gluconate	$C_6H_{11}NaO_7$	31.42	31.425
* Glycolic Acid	$C_2H_4O_3$	215.42	215.430
* Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	75.52	75.516
Nitrilotriacetic Acid	$C_6H_9NO_6$	4.58	4.550
Iminodiacetic Acid	$HN(CH_2COOH)_2$	48.30	48.302
Boric Acid	H_3BO_3	0.40	.402
Sodium Chloride	NaCl	11.68	11.681
Sodium Fluoride	NaF	0.58	.583
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.092
Sodium Sulfate	Na_2SO_4	24.40	24.401
Potassium Molibdate	K_2MoO_4	0.18	.179
	SUM	942.9460	

386.8/Flask

987.8/Flask

QA APPROVED
NAME: Oldum
DATE: 2-28-06

In a SEPARATE Container, Mix the Following:

Sodium Hydroxide	NaOH	30.62	30.590
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.743
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.873
50% Sodium Formate 619	NaHCOO	125.70	126.909
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	18.96	18.961
Sodium Oxalate	$Na_2C_2O_4$	10.06	10.058
Deionized Water	H_2O	400.00	403.00
	SUM	604.86	600.261

1833.9/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.50

2086.0/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.5
Sodium Nitrite	$NaNO_2$	XXX	No nitrite
Water	H_2O	200.00	200.1
Add and Mix thoroughly.	Sum	794.58	794.6

2924.1/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM OF ALL	2638.89

2537.3g

Record the Final Weight 3153.9g

	2767.1
Density:	1.38

3153.9g/Flask

Measure the pH 9.89

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: let stir overnight in shaker. Measured pH 9.89
Adjusted pH = 10.99 by using NaOH to increase pH.

PH 10.99
2-28-06

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH > 13.5
BASE SOLUTION: April 2005 Version

Standard

Balance Device ID No: 0020 NIST Weight (10 g): 9.9996
Balance Device ID No: 0018 NIST Weight (150 g): 150.0

Prepared By: Thomas M. Date Prepared: 3-1-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.6
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.963
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.336
Cesium Nitrate	$CsNO_3$	0.054	.0544
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.240
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.446
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.26	.272
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.239
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.529
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.042
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.581
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	5.26	5.229
Potassium Nitrate	KNO_3	9.20	9.198
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.033
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.410
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.390
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.510
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.315
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.857
Glycolic Acid	$C_2H_4O_3$	53.88	54.001
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.822
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.143
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.031
Boric Acid	H_3BO_3	0.40	.403
Sodium Chloride	NaCl	11.68	11.672
Sodium Fluoride	NaF	0.58	.602
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.111
Sodium Sulfate	Na_2SO_4	24.40	24.396
Potassium Molibdate	K_2MoO_4	0.18	.200
	SUM	604.9960	606.4

386.6/Flask

QA APPROVED
NAME: CO'dwa
DATE: 3-2-06

993.1/Flask

In a SEPARATE Container, Mix the Following:

Sodium Hydroxide	NaOH	30.52	30.52
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.74
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.87
Sodium Formate	NaHCOO	31.42	31.42
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.74
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.52
Deionized Water	H_2O	400.00	400.0
	SUM	488.82	488.81

1473.5g/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1767.8g/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.7
Sodium Nitrite	$NaNO_2$	165.58	165.6
Water	H_2O	200.00	200
Add and Mix thoroughly.	Sum	960.16	960.3

2724.3g/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM OF ALL	2350.46

2337.7

Record the Final Weight 3156.6/Flask

	2770.2
Density:	1.38

Measure the pH

Adjust the Final Solution to pH over 13.5 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let stir overnight in shaker. Measured pH 10.34 on 3-2-2006
Adjust to 13.49 using NaOH 3-2-2006

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

TOC 80g/L

Balance Device ID No: 0020 NIST Weight (10 g): 9.9998
Balance Device ID No: 0018 NIST Weight (150 g): 150.0

Prepared By: Thomas M. Date Prepared: 3-6-2006

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.1
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.952
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.347
Cesium Nitrate	$CsNO_3$	0.054	.0538
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.216
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.490
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.282
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.231
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.533
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.062
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.575
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	5.26	5.239
Potassium Nitrate	KNO_3	9.20	9.224
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.033
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.420
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.381
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	58.08	58.016
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	17.32	17.358
Sodium Gluconate	$C_6H_{11}NaO_7$	31.42	31.422
Glycolic Acid	$C_2H_4O_3$	215.42	215.460
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	75.52	75.513
Nitrilotriacetic Acid	$C_6H_9NO_6$	4.56	4.574
Iminodiacetic Acid	$HN(CH_2COOH)_2$	48.30	48.282
Boric Acid	H_3BO_3	0.40	.399
Sodium Chloride	NaCl	11.68	11.681
Sodium Fluoride	NaF	0.58	0.575
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.091
Sodium Sulfate	Na_2SO_4	24.40	24.430
Potassium Molibdate	K_2MoO_4	0.18	.190
	SUM	942.9460	943.30

387.3/Flask

1330.6g/Flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.51
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.75
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.88
Sodium Formate	NaHCOO	125.70	125.70
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	18.98	18.97
Sodium Oxalate	$Na_2C_2O_4$	10.06	10.06
Deionized Water	H_2O	400.00	400.0
	SUM	604.86	604.87

1928.2/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

2157.2/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.6
Sodium Nitrite	$NaNO_2$	165.58	165.6
Water	H_2O	200.00	200.0
Add and Mix thoroughly.	Sum	960.16	960.2

3177.0g/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM OF ALL	2884.46

2789.9

Record the Final Weight 3241.9/Flask

	2854.6
Density:	1.62

3241.9/Flask

Measure the pH

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let stir overnight pH 9.64 adjusted to 11.0

QA APPROVED
NAME: Oldum
DATE: 3-8-06

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH > 13.5
BASE SOLUTION: April 2006 Version

Standard

Balance Device ID No: 0020 NIST Weight (10 g): 9.9999
Balance Device ID No: 0014 NIST Weight (150 g): 149.9

Prepared By: Thomas McC Date Prepared: 3-8-2006

Tare a 2-liter Volumetric Flask, and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.7
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.956
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.329
Cesium Nitrate	$CsNO_3$	0.054	.056
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.240
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.479
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.26	.271
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.242
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.535
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.086
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.592
Nickel Nitrate, 6-Hydrate	$Ni(NO_3)_2 \cdot 6H_2O$	5.28	5.261
Potassium Nitrate	KNO_3	9.20	9.231
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.034
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.429
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.385
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.534
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.316
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.882
Glycolic Acid	$C_2H_4O_3$	53.86	53.846
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.896
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.141
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.080
Boric Acid	H_3BO_3	0.40	.410
Sodium Chloride	NaCl	11.68	11.681
Sodium Fluoride	NaF	0.58	.590
Sodium Chromate	Na_2CrO_4	1.10	1.099
Sodium Sulfate	Na_2SO_4	24.40	24.390
Potassium Molibdate	K_2MoO_4	0.18	.189
	SUM	604.9860	603.8

387.2/Flask

QA APPROVED
NAME: Oldum
DATE: 3-9-06

Note: use Na_2SO_4: sodium sulfate, anhydrous Lot No: L34517L 3.03

991.0/Flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.52
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.74
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.888
Sodium Formate	NaHCOO	31.42	31.42
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.74
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.51
Deionized Water	H_2O	400.00	400.0
	SUM	488.82	484.078

1460.3g/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1753.4g/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.6
Sodium Nitrite	$NaNO_2$	165.58	165.6
Water	H_2O	200.00	200.0
Add and Mix thoroughly.	Sum	960.16	960.20

2707.9g/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM OF ALL	2350.46	2320.7

Added up before, Flask marks ~~2707.9g/Flask~~ 3159.1g/Flask

Record the Final Weight ~~2320.7g~~ T.M. 2771.8g

Density: 1.38

Measure the pH 10.37

Adjust the Final Solution to pH over 13.5 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let stir overnight in shaker. Measured pH 10.37 - Adjusted to 13.60 PH using NaOH to increase PH. S.M.O

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version No nitrite

Balance Device ID No: 0020 NIST Weight (10 g): 9.9998
Balance Device ID No: 0018 NIST Weight (150 g): 150.2

Prepared By: Thomas M. Date Prepared: 3-15-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.0
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.96	6.971
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	.346
Cesium Nitrate	$CsNO_3$	0.054	.056
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	.223
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.46	24.479
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	.273
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.244
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	0.52	.528
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.050
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	.600
Nickel Nitrate, 6-Hydrate	$Ni(NO_3)_2.6H_2O$	5.26	5.256
Potassium Nitrate	KNO_3	9.20	9.195
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.033
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	.422
Zirconyl Nitrate	$ZrO(NO_3)_2.xH_2O$	0.38	.388
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.536
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.328
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.856
Glycolic Acid	$C_2H_4O_3$	53.85	53.509
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.88	18.877
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.139
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.081
Boric Acid	H_3BO_3	0.40	.412
Sodium Chloride	NaCl	11.68	11.650
Sodium Fluoride	NaF	0.58	.584
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.111
Anhydrous Sodium Sulfate	Na_2SO_4	24.40	24.434 1.m → used sodium sulfate, Anhydrous Lot L345171 Na2SO4
Potassium Molybdate	K_2MoO_4	0.18	.195
In a SEPARATE Container, Mix the Following:			
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.772
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.870
Sodium Formate	NaHCOO	31.42	31.440
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.751
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.513
Deionized Water	H_2O	400.00	400.1
			458.446

385.7/Flask

988.9/Flask

1394.4/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	298.50	296.6

1078.6/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.6
Sodium Nitrite	$NaNO_2$	XXX	No nitrite
Water	H_2O	200.00	208.0
			802.6

No Nitrite 1.m

1880.0/Flask

Add and Mix thoroughly.

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

Sum 2154.37 2296.7

Record the Final Weight 3056.9g/Flask

	2671.2
Density:	1.33

3056.9/Flask

Measure the pH

Adjust the Final Solution to pH = 11 (as necessary). 3-15-2006 stir overnight 3-16-2006

Comments: pH 10.06 after stirring overnight adjusted to 11.00 J.G

QA APPROVED
NAME: C.D.
DATE: 3-16-06

AN-107 Supernate Simulant Recipe for a 4-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

Standard

* Double batch.

Balance Device ID No: 0020 NIST Weight (10 g): 10.0000
Balance Device ID No: 0018 NIST Weight (150 g): 150.0

Prepared By: Thomas McCohn Date Prepared: 3-20-2006

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	800.00	800.10
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	13.92	13.941
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.64	.660
Cesium Nitrate	$CsNO_3$	0.108	.110
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.44	.435
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	48.92	48.970
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.56	.570
Lead Nitrate	$Pb(NO_3)_2$	2.48	2.476
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	1.04	1.053
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	8.12	8.124
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	1.16	1.179
Nickel Nitrate, 6-Hydrate	$Ni(NO_3)_2 \cdot 6H_2O$	10.52	10.526
Potassium Nitrate	KNO_3	18.40	18.405
Strontium Nitrate	$Sr(NO_3)_2$	0.064	.064
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.84	.851
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.78	.764
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	29.04	29.032
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	8.64	8.651
Sodium Gluconate	$C_6H_{11}NaO_7$	15.72	15.715
Glycolic Acid	$C_2H_4O_3$	107.72	107.729
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	37.78	37.770
Nitrilotriacetic Acid	$C_6H_9NO_6$	2.28	2.276
Iminodiacetic Acid	$HN(CH_2COOH)_2$	24.16	24.188
Boric Acid	H_3BO_3	0.80	.810
Sodium Chloride	NaCl	23.36	23.336
Sodium Fluoride	NaF	1.18	1.160
Sodium Chromate	Na_2CrO_4	2.20	2.195
Sodium Sulfate	Na_2SO_4	48.80	48.750
Potassium Molibdate	K_2MoO_4	0.36	.370
	SUM	1209.9720	1212.7

388.0g/Flask

corboy/575.6

Analyte

sodium sulfate, anhydrous L345171 Na2SO4

1600.7/Flask

QA APPROVED
NAME: [illegible]
DATE: 3-21-06

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	61.000
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	21.48	21.485
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	17.76	17.753
Sodium Formate	NaHCOO	62.84	62.833
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	9.46	9.494
Sodium Oxalate	$Na_2C_2O_4$	5.04	5.070
Deionized Water	H_2O	800.00	800.8
	SUM	977.64	978.435

2577.5/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	593.00	593.1

T.M ~~2168.4~~ 2764.9 corboy (before Adding Sodium Carbonate)

Mix Thoroughly

After = ~~2774.2~~ T.M 3357.1 /corboy

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	1189.16	1188.6
Sodium Nitrite	$NaNO_2$	331.16	331.5
Water	H_2O	400.00	399.6
Add and Mix thoroughly.	Sum	1920.32	1919.9

5277 corboy
~~4025.2~~ T.M / Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM OF ALL	4700.93

4701.4g

~~4929.1~~ T.M 6161.7 / corboy

Record the Final Weight ~~4353.5~~ T.M 5592.1

Density: ~~1.08~~ 1.39

Measure the pH 10.36

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let stir overnight in shaker. Measured pH 10.36 3-21-06
Adjusted to 10.99 using sodium hydroxide T.M

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 10
BASE SOLUTION: April 2005 Version

END POINT

Balance Device ID No: 0020 **NIST Weight (10 g):** 9.9998
Balance Device ID No: 0018 **NIST Weight (150 g):** 150.0

Prepared By: THOMAS M. **Date Prepared:** 3-21-2006

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.7
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.98	6.944
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.326
Cesium Nitrate	$CsNO_3$	0.054	.057
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.221
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.480
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.279
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.243
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.527
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.077
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.586
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.297
Potassium Nitrate	KNO_3	9.20	9.221
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.035
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.450
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.386
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.533
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.342
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.863
Glycolic Acid	$C_2H_4O_3$	53.88	54.000
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.898
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.135
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.089
Boric Acid	H_3BO_3	0.40	.409
Sodium Chloride	NaCl	11.68	11.701
Sodium Fluoride	NaF	0.58	.590
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.109
Sodium Sulfate	Na_2SO_4	24.40	24.403
Potassium Molibdate	K_2MoO_4	0.18	.190
In a SEPARATE Container, Mix the Following:			
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.749
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.862
Sodium Formate	NaHCOO	31.42	31.431
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.747
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.514
Deionized Water	H_2O	400.00	399.4

388.1/Flask

Anhydrous

Lot # L345171 Sodium Sulfate, Anhydrous Na2SO4

992.4/Flask

1448.2/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask. 457.703

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.8

1747.5/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	407.59	406.9
Sodium Nitrite	$NaNO_2$	317.37	317.5
Water	H_2O	200.00	200.5

Add and Mix thoroughly. 924.9

2646.9/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM 2284.75 | 2258.89

Record the Final Weight 3109.49/Flask

	2721.3
Density:	1.36

Measure the pH 10.39

Adjust the Final Solution to pH = 10 by titrating back with sulfuric acid (as necessary).

Comments: Let Stir overnight in shaker 3-21-2006 measured pH 10.39 Adjusted to 9.99 using sulfuric acid 3-22-06

QA APPROVED
NAME: Cldur
DATE: 3/22/06

carboy 576.1

AN-107 Supernate Simulant Recipe for a 4-Liter Batch, pH = ~~11~~ special
BASE SOLUTION: April 2005 Version

No nitrite

Balance Device ID No: 002.0 NIST Weight (10 g): 9.9998
Balance Device ID No: 0018 NIST Weight (150 g): 150.0

Prepared By: Thomas M. Date Prepared: 3-28-2006

Tare a ~~2~~-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	800.00	800.0
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	13.92	13.942
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.64	.640
Cesium Nitrate	$CsNO_3$	0.108	.109
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.44	.455
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	48.92	48.933
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.56	.570
Lead Nitrate	$Pb(NO_3)_2$	2.48	2.475
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	1.04	1.061
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	8.12	8.116
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	1.16	1.159
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	10.52	10.546
Potassium Nitrate	KNO_3	18.40	18.390
Strontium Nitrate	$Sr(NO_3)_2$	0.064	.064
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.84	.846
Zirconyl Nitrate	$ZrO(NO_3)_2.xH_2O$	0.76	.800
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	29.04	29.038
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	8.64	8.664
Sodium Gluconate	$C_6H_{11}NaO_7$	15.72	15.745
Glycolic Acid	$C_2H_4O_3$	107.72	107.80
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	37.76	37.757
Nitrilotriacetic Acid	$C_6H_9NO_6$	2.28	2.300
Iminodiacetic Acid	$HN(CH_2COOH)_2$	24.16	24.150
Boric Acid	H_3BO_3	0.80	.830
Sodium Chloride	NaCl	23.36	23.375
Sodium Fluoride	NaF	1.16	1.162
Sodium Chromate	$Na_2Cr_2O_4$	2.20	2.200
Sodium Sulfate	Na_2SO_4	48.80	48.812
Potassium Molybdate	K_2MoO_4	0.36	.357
In a SEPARATE Container, Mix the Following:			
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	21.48	21.485
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	17.76	17.771
Sodium Formate	NaHCOO	62.84	62.814
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	9.48	9.489
Sodium Oxalate	$Na_2C_2O_4$	5.04	5.080
Deionized Water	H_2O	800.00	808.0

carboy/576.0

1784.3/carboy

580.8=carboy

2701.7/carboy

Mix Thoroughly. Then Add this Solution to the Volumetric Flask. 924.644

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	593.00	592.3

3243.2/carboy

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	1189.16	1189.5
Sodium Nitrite	$NaNO_2$	XXX	No nitrite
Water	H_2O	400.00	395.1

Add and Mix thoroughly. 1584.6

4624.9/Flask

Mix thoroughly and dilute to the ~~2~~-Liter mark in the Volumetric Flask.

4 Sum 4308.73 4248.8

Record the Final Weight 5918.9/Carboy 5342.8

Density: 1.33

Measure the pH 10.85

Adjust the Final Solution to pH = ~~11~~ (as necessary).

QA APPROVED
NAME: Oldum
DATE: 1/30/06

Comments: Let stir overnight in shaker measured pH 10.85 Adjusted to pH 12.5 2 liters 1/2
Adjusted to pH 11 2 liters A-24 ½.

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version TOC 80g/L

Balance Device ID No: 0020 NIST Weight (10 g): 9.9998
Balance Device ID No: 0019 NIST Weight (150 g): 150.0

Prepared By: Thomas McCoy Date Prepared: 4-3-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.7
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.96	6.972
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	.316
Cesium Nitrate	$CsNO_3$	0.054	.056
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	.228
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.46	24.459
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	.300
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.226
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	0.52	.540
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.051
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	.578
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.260
Potassium Nitrate	KNO_3	9.20	9.230
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.034
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	.436
Zirconyl Nitrate	$ZrO(NO_3)_2.xH_2O$	0.38	.381
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	58.08	58.028
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	17.32	17.317
Sodium Gluconate	$C_6H_{11}NaO_7$	31.42	31.406
Glycolic Acid	$C_2H_4O_3$	216.42	215.43
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	75.52	75.600
Nitrilotriacetic Acid	$C_6H_9NO_6$	4.58	4.580
Iminodiacetic Acid	$HN(CH_2COOH)_2$	48.30	48.387
Boric Acid	H_3BO_3	0.40	.403
Sodium Chloride	NaCl	11.68	11.672
Sodium Fluoride	NaF	0.58	.588
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.104
Sodium Sulfate	Na_2SO_4	24.40	24.412
Potassium Molybdate	K_2MoO_4	0.18	.186
	SUM	942.9460	

387.9/Flask

1373.3/Flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.580
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.762
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.860
Sodium Formate	NaHCOO	125.70	125.66
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	18.96	18.971
Sodium Oxalate	$Na_2C_2O_4$	10.06	10.088
Deionized Water	H_2O	400.00	400.3
	SUM	604.86	605.121

1976.2/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.58	296.6

2173.3/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.6
Sodium Nitrite	$NaNO_2$	165.58	165.7
Water	H_2O	200.00	200.2
Add and Mix thoroughly.	Sum	960.16	960.5

3122.5/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

	SUM OF ALL	2894.46

2734.9g

QA APPROVED
NAME: Odum
DATE: 4-10-06

Record the Final Weight 3245.6g/Flask

	2857.7
Density:	1.42

Measure the pH 9.84

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let stir over night in shaker 4-3-06 to 4-4-06
Measured pH 9.84 Adjusted to pH 11.01 using NaOH=Sodium hydroxide
4-4-2006

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version 3.5M nitrite

Balance Device ID No: 0029 NIST Weight (10 g): 10.0000
Balance Device ID No: 0018 NIST Weight (150 g): 150.0

Prepared By: Thomas M. Date Prepared: 4-4-2006

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.5
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.96	6.972
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	.334
Cesium Nitrate	$CsNO_3$	0.054	.060
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	.232
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.48	24.500
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	.301
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.250
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	0.52	.523
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.059
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	.582
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.346
Potassium Nitrate	KNO_3	9.20	9.202
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.0325
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	.432
Zirconyl Nitrate	$ZrO(NO_3)_2.xH_2O$	0.38	.389
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.515
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.320
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.863
Glycolic Acid	$C_2H_4O_3$	53.86	53.863
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.88	18.870
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.147
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.091
Boric Acid	H_3BO_3	0.40	.402
Sodium Chloride	NaCl	11.68	11.684
Sodium Fluoride	NaF	0.58	.590
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.101
Sodium Sulfate	Na_2SO_4	24.40	24.445
Potassium Molybdate	K_2MoO_4	0.18	.196
		total =	605.20

387.9/Flask

992.9/Flask

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.7
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.883
Sodium Formate	NaHCOO	31.42	31.440
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.783
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.506
Deionized Water	H_2O	400.00	400.3

1449.6/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask. total = 468.612

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.6

1127.3/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.5
Sodium Nitrite	$NaNO_2$	482.94	482.99
Water	H_2O	200.00	200.6

* expect high density.

Add and Mix thoroughly. total = 1278.09

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

Sum 2637.31 2608.6

QA APPROVED

NAME: Cldun

DATE: 4-10-06

Record the Final Weight 3300.4g/Flask 2912.5g

Density: 1.45

Measure the pH ~~11.85~~ 11.5

Joe

Adjust the Final Solution to pH = 11 (as necessary). Let stir overnight 4-4-06 to 4-5-06 measured PH 11.5

Comments: Adjusted PH 11.02

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version — **7.0M nitrite**

Balance Device ID No: 0029 **NIST Weight (10 g):** 9999.9
Balance Device ID No: 0018 **NIST Weight (150 g):** 1301

Prepared By: Thomas McCobb **Date Prepared:** 4-5-2006

Tare a 2-liter Volumetric Flask, and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.9
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.96	6.994
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	.317
Cesium Nitrate	$CsNO_3$	0.054	.056
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	.222
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.46	24.426
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	.309
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.251
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	0.52	.550
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.052
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	.600
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.280
Potassium Nitrate	KNO_3	9.20	9.196
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.034
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	.416
Zirconyl Nitrate	$ZrO(NO_3)_2xH_2O$	0.38	.395
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	14.52	14.541
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.320
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.870
Glycolic Acid	$C_2H_4O_3$	53.86	53.900
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.88	18.887
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.151
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.106
Boric Acid	H_3BO_3	0.40	.410
Sodium Chloride	NaCl	11.68	11.701
Sodium Fluoride	NaF	0.58	.595
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.111
Sodium Sulfate	Na_2SO_4	24.40	24.353
Potassium Molybdate	K_2MoO_4	0.18	.183
		total =	603.4

388.6/Flask

991.4/Flask

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.771
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.896
Sodium Formate	NaHCOO	31.42	31.419
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.753
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.518
Deionized Water	H_2O	400.00	400.0

Mix Thoroughly. Then Add this Solution to the Volumetric Flask. total = 458.357

1448.7/Flask

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1734.0/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.6
Sodium Nitrite	$NaNO_2$	965.88	965.9
Water	H_2O	200.00	203.1

Add and Mix thoroughly. total = 1763.6

* expect high density.

3487.6g/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

Sum	3120.25	3099.6

QA APPROVED

NAME: Cldum

Record the Final Weight 3550.5g/Flask

	3162.5
Density:	1.58

DATE: 4-10-06

Measure the pH 11.61 4-6-06

Adjust the Final Solution to pH = 11 (as necessary).

Comments: Let stir over night in shaker. Measured pH 11.61. Adjusted to pH 11.02 using Sulfuric Acid = H_2SO_4 4-6-06

A-27

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version — 0.875M nitrite

Balance Device ID No: 0020 — NIST Weight (10 g): 19.9999 (60g)
Balance Device ID No: 0018 — NIST Weight (150 g): 150.0

Prepared By: Thomas McCole — Date Prepared: 4-18-2006

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.5
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.96	6.976
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	.325
Cesium Nitrate	$CsNO_3$	0.054	.060
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	.227
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.46	24.500
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	.280
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.244
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	0.52	.524
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.054
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	.579
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.282
Potassium Nitrate	KNO_3	9.20	9.221
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.033
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	.422
Zirconyl Nitrate	$ZrO(NO_3)_2.xH_2O$	0.38	.384
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.526
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.339
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.891
Glycolic Acid	$C_2H_4O_3$	53.86	53.999
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.88	18.882
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.146
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.062
Boric Acid	H_3BO_3	0.40	.400
Sodium Chloride	NaCl	11.68	11.671
Sodium Fluoride	NaF	0.58	.584
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.100
Sodium Sulfate	Na_2SO_4	24.40	24.386
Potassium Molybdate	K_2MoO_4	0.18	.183
		total =	

Flask/ 386.3

993.5/Flask

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.760
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.86	8.878
Sodium Formate	NaHCOO	31.42	31.417
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.747
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.554
Deionized Water	H_2O	400.00	400.3

1450.6/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask. 458.656

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.18

1727.9/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.8
Sodium Nitrite	$NaNO_2$	120.74	120.8
Water	H_2O	200.00	199.7

2638.7/Flask

Add and Mix thoroughly. 915.3

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

Sum 2275.10 — 2252.4

QA APPROVED

Record the Final Weight 3111.3/Flask — 2725

Density: 1.36

NAME: Odum

DATE: 4-19-06

Measure the pH 10.22

Adjust the Final Solution to pH = 11 (as necessary).

Joe Comments: Let stir over night in shaker - measured pH 10.22 4-19-2006 Adjusted to PH 11.00 4-19-2006 used 28% NaOH to Adjust up to 11.00

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version **0.35M nitrite**

Balance Device ID No: 5029 **NIST Weight (10 g):** 9.9999
Balance Device ID No: 0018 **NIST Weight (150 g):** 150.1

Prepared By: Thomas McCoy **Date Prepared:** Wed-April-19-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.7
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.96	6.965
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	.333
Cesium Nitrate	$CsNO_3$	0.054	.060
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	.217
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.46	24.452
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	.283
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.251
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	0.52	.519
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.063
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	.581
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.267
Potassium Nitrate	KNO_3	9.20	9.218
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.038
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	.430
Zirconyl Nitrate	$ZrO(NO_3)_2.xH_2O$	0.38	.375
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.535
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.329
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.861
Glycolic Acid	$C_2H_4O_3$	53.86	53.866
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.88	18.888
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.145
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.097
Boric Acid	H_3BO_3	0.40	.412
Sodium Chloride	NaCl	11.68	11.692
Sodium Fluoride	NaF	0.58	.575
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.113
Sodium Sulfate	Na_2SO_4	24.40	24.446
Potassium Molybdate	K_2MoO_4	0.18	.189

Flask/386.7

Flask/989.9/Flask

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.739
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.889
Sodium Formate	NaHCOO	31.42	31.423
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.751
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.539
Deionized Water	H_2O	400.00	402.1

4,864

1449.0/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask. total: 460.341

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1727.6/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.6
Sodium Nitrite	$NaNO_2$	48.29	48.3
Water	H_2O	200.00	203.1

Add and Mix thoroughly. total 846.0

2568.4/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

Sum	2202.66	2181.7

QA APPROVED
NAME: Coleman
DATE: 4/20/06

Record the Final Weight 3078.5/Flask

	2691.8
Density:	1.34

Measure the pH 10.22

Adjust the Final Solution to pH = 11 (as necessary).

Joe G.

Comments: Let stir over night in shaker, measured pH 10.22 Adjusted to 11.00 pH
4-20-06

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

No nitrite

Balance Device ID No: 0020 NIST Weight (10 g): 9.9998
Balance Device ID No: 0018 NIST Weight (150 g): 150.11

Prepared By: Thomas M. Date Prepared: 4-24-06

Tare a 2-Liter Volumetric Flask and then Add the Following, in Order:

Flask/387.6

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.7
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.96	6.961
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	.333
Cesium Nitrate	$CsNO_3$	0.054	.056
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	.236
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.46	24.500
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	.300
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.240
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	0.52	.531
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.072
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	.586
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.295
Potassium Nitrate	KNO_3	9.20	9.216
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.034
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	.427
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.394
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.516
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.336
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.868
Glycolic Acid	$C_2H_4O_3$	53.86	53.868
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.68	18.673
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.142
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.070
Boric Acid	H_3BO_3	0.40	.398
Sodium Chloride	NaCl	11.68	11.700
Sodium Fluoride	NaF	0.58	.593
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.102
Sodium Sulfate	Na_2SO_4	24.40	24.397
Potassium Molybdate	K_2MoO_4	0.18	.179
		total =	605

992.6/Flask

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.746
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.892
Sodium Formate	NaHCOO	31.42	31.417
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.742
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.531
Deionized Water	H_2O	400.00	399.1

1446.7/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask. ~~total~~ total = 457424

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1724.9/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.56	594.6
Sodium Nitrite	$NaNO_2$	XXX	No nitrite
Water	H_2O	200.00	199.2

NO Nitrate

Add and Mix thoroughly. 793.8

2514.1/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

Sum 2154.37 2126.4

QA APPROVED

Record the Final Weight 3055.4/Flask

2668.4

Density: 1.33

NAME: CQdum

DATE: 4/26/06

Measure the pH 10.12

Joe

Adjust the Final Solution to pH = 11 (as necessary).

Comments: Let stir over night in shaker pH was 10.12 adjusted to 11.00

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

0.875M nitrite

Balance Device ID No: 0020 NIST Weight (10 g): 9.9998
Balance Device ID No: 0010 NIST Weight (150 g): 150.0

Prepared By: Thomas McCabe Date Prepared: 4-25-2006

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.0
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.98	6.981
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	.330
Cesium Nitrate	$CsNO_3$	0.054	.055
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	.222
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.46	24.450
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	.283
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.243
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	0.52	.523
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.045
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	.590
Nickel Nitrate, 6-Hydrate	$Ni(NO_3)_2.6H_2O$	5.26	5.267
Potassium Nitrate	KNO_3	9.20	9.203
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.033
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	.420
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.384
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.524
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.323
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.864
Glycolic Acid	$C_2H_4O_3$	53.86	53.900
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.88	18.679
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.138
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.061
Boric Acid	H_3BO_3	0.40	.399
Sodium Chloride	NaCl	11.68	11.679
Sodium Fluoride	NaF	0.58	.583
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.110
Sodium Sulfate	Na_2SO_4	24.40	24.394
Potassium Molybdate	K_2MoO_4	0.18	.175
		total = 604.5	

386.4/Flask

990.9/Flask

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.765
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.887
Sodium Formate	NaHCOO	31.42	31.464
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.750
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.529
Deionized Water	H_2O	400.00	399.1

Mix Thoroughly. Then Add this Solution to the Volumetric Flask. total = 451.495

1445.6/Flask

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.6

1723.8/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.5
Sodium Nitrite	$NaNO_2$	120.74	120.7
Water	H_2O	200.00	199.8

Add and Mix thoroughly. 915.0

2633.2/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

Sum 2275.10 2246.8

QA APPROVED
NAME: Qdum
DATE: 4/27/06

Record the Final Weight 3114.9/Flask 2728.5

Density: 1.36

Measure the pH 10.14

Adjust the Final Solution to pH = 11 (as necessary).

Comments: Let sit overnight in shaker. 4-25-06 to 4-26-06 measured PH 10.14 4-26-06
Adjusted to PH 11.03 used NaOH to Adjust UP. PH 11.03

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 10
BASE SOLUTION: April 2006 Version

END POINT

Balance Device ID No: 0020 NIST Weight (10 g): 9.9999
Balance Device ID No: 0014 NIST Weight (150 g): 150.0

Prepared By: Thomas McCohn Date Prepared: 4-26-2006

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.5
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.98	6.962
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.339
Cesium Nitrate	$CsNO_3$	0.054	.054
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.234
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.472
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.289
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.237
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.519
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.08	4.047
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.591
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	5.26	5.276
Potassium Nitrate	KNO_3	9.20	9.196
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.0318
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.435
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.377
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	14.52	14.525
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.324
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.867
Glycolic Acid	$C_2H_4O_3$	53.86	53.879
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.890
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.136
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.085
Boric Acid	H_3BO_3	0.40	.398
Sodium Chloride	NaCl	11.68	11.683
Sodium Fluoride	NaF	0.58	.581
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.101
Sodium Sulfate	Na_2SO_4	24.40	24.406
Potassium Molibdate	K_2MoO_4	0.18	.187
		total =	606.4

388.5/Flask

994.9/Flask

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.746
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.888
Sodium Formate	NaHCOO	31.42	31.424
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.743
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.521
Deionized Water	H_2O	400.00	400.6

1451.6/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	298.50	296.5

1729.7/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	407.59	407.6
Sodium Nitrite	$NaNO_2$	317.37	317.7
Water	H_2O	200.00	202.8
		total =	928.1

2651.1/Flask

Add and Mix thoroughly.

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM	2284.75	2262.6

QA APPROVED
NAME: Oldum
DATE: 4/27/06

Record the Final Weight 3112.5/Flask

	2724
Density:	1.36

Measure the pH 10.10 4-27-06

Adjust the Final Solution to pH = 10 by titrating back with sulfuric acid (as necessary).

Comments: Let stir over night in shaker. Measured pH 10.10 Adjusted to pH 10.00 using Sulfuric Acid H_2SO_4 to Lower pH, pH 10.00 4-27-06 J.M.

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version 1.0375M nitrite

Balance Device ID No: 0020 **NIST Weight (10 g):** 9.9999
Balance Device ID No: 0019 **NIST Weight (150 g):** 150.0

Prepared By: Thomas McCobb **Date Prepared:** May-1-2006

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.9
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.96	6.962
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	.330
Cesium Nitrate	$CsNO_3$	0.054	.055
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	.228
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.46	24.449
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	.276
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.235
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	0.52	.526
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.089
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	.581
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.242
Potassium Nitrate	KNO_3	9.20	9.212
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.033
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	.429
Zirconyl Nitrate	$ZrO(NO_3)_2.xH_2O$	0.38	.379
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.540
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.324
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.858
Glycolic Acid	$C_2H_4O_3$	53.86	53.821
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.88	18.865
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.142
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.066
Boric Acid	H_3BO_3	0.40	.400
Sodium Chloride	NaCl	11.68	11.699
Sodium Fluoride	NaF	0.58	.579
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.103
Sodium Sulfate	Na_2SO_4	24.40	24.421
Potassium Molybdate	K_2MoO_4	0.18	.186
		total:	611.4

387.1/Flask

998.5/Flask

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.743
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.884
Sodium Formate	NaHCOO	31.42	31.445
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.747
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.538
Deionized Water	H_2O	400.00	399.8
		total:	458.157

1453.7/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1731.3/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.7
Sodium Nitrite	$NaNO_2$	143.16	143.2
Water	H_2O	200.00	200.3
		total:	938.2

2665.1/Flask

Add and Mix thoroughly.

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

Sum 2297.52 2278

QA APPROVED
NAME: Odum
DATE: 5-2-06

Joe **Record the Final Weight** 3124.3/Flask 2737.2

Density: 1.36

Measure the pH 10.22 pH

Adjust the Final Solution to pH = 11 (as necessary).

Comments: Let stir over night in shaker. pH = 10.22 adjusted to 11.01

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version — 0.2M Chloride

Balance Device ID No: 0020 NIST Weight (10 g): 10.0000
Balance Device ID No: 0018 NIST Weight (150 g): 150.1

Prepared By: Thomas McCabe Date Prepared: 5-2-2006

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.5
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.963
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.317
Cesium Nitrate	$CsNO_3$	0.054	.053
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.230
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.457
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.289
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.239
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.532
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.081
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.596
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.258
Potassium Nitrate	KNO_3	9.20	9.202
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.033
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.415
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.379
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.521
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.320
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.863
Glycolic Acid	$C_2H_4O_3$	53.86	53.861
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.886
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.145
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.079
Boric Acid	H_3BO_3	0.40	.396
Sodium Chloride	NaCl	23.36	23.375
Sodium Fluoride	NaF	0.58	.592
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.116
Sodium Sulfate	Na_2SO_4	24.40	24.408
Potassium Molibdate	K_2MoO_4	0.18	.185
	SUM	616.67	622.4

Flask/388.0

1010.4/Flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.546
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.747
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.886
Sodium Formate	NaHCOO	31.42	31.429
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.746
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.522
Deionized Water	H_2O	400.00	405.0
	SUM	488.82	493.878

1501.9/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.6

1794.2/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	584.58	594.6
Sodium Nitrite	$NaNO_2$	165.58	165.7
Water	H_2O	200.00	199.7
Add and Mix thoroughly.	Sum	968.16	960.0

2752.1/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask. total = 2364.1

SUM OF ALL	2362.14

QA APPROVED
NAME: [illegible]
DATE: 5-2-06

Record the Final Weight 3163.9/Flask

Density: 2775.9 / 1.38

Measure the pH 10.51

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let stir over night in shaker 5-2-06 to 5-3-06 Measured 10.51 pH
Joe Adjusted to 11.00 pH.

CPP Tests 2&4 (Task 3) @ pH11

B050905 - pH 11

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

Balance Device ID No: 0020 NIST Weight (10 g):
Balance Device ID No: 0018 NIST Weight (150 g):

Prepared By: S. WATERS Date Prepared: 5/9/2005

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams	1-Liter
Deionized Water	H_2O	400.00	400.0	200.00
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.9577	3.48
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	0.3227	0.16
Cesium Nitrate	$CsNO_3$	0.054	0.0543	0.027
Copper Nitrate, 2½-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	0.2192	0.11
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.4580	12.23
Lanthanum Nitrate Hexahydrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	0.2814	0.14
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.2408	0.62
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	0.5202	0.26
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.0606	2.03
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	0.5795	0.29
Nickel Nitrate, 6-Hydrate	$Ni(NO_3)_2 \cdot 6H_2O$	5.26	5.2594	2.63
Potassium Nitrate	KNO_3	9.20	9.1996	4.60
Strontium Nitrate	$Sr(NO_3)_2$	0.032	0.0320	0.016
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	0.4206	0.21
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	0.3791	0.19
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.5195	7.26
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.3210	2.16
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.9604	3.93
Glycolic Acid	$C_2H_4O_3$	53.86	53.8577	26.93
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.8803	9.44
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.1400	0.57
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.0804	6.04
Boric Acid	H_3BO_3	0.40	0.3997	0.20
Sodium Chloride	NaCl	11.68	11.6804	5.84
Sodium Fluoride	NaF	0.58	0.5801	0.29
Sodium Chromate	Na_2CrO_4	1.10	1.0995	0.55
Sodium Sulfate	Na_2SO_4	24.40	24.4006	12.20
Potassium Molibdate	K_2MoO_4	0.18	0.1808	0.09

In a SEPARATE Container, Mix the Following:

Sodium Hydroxide	NaOH	50.92	50.5193	25.46
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.7247	5.37
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.4994	4.44
Sodium Formate	NaHCOO	31.42	31.4202	15.71
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.7398	2.37
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.5197	1.26
Deionized Water	H_2O	400.00	400.0	200.00

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5006	148.25

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.66	297.29
Sodium Nitrite	$NaNO_2$	165.58	165.5791	82.79
Water	H_2O	200.00	200.0	100.00

Add and Mix thoroughly.

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

1984.89 [ ] 992

Record the Final Weight [2785.3]

Density: [1.393]

Measure the pH

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20 g. Mix thoroughly after any addition of sodium hydroxide and measure pH.

Comments:
After adding Max. Amount NaOH (20g) → Final pH was 10.85

QA APPROVED
NAME: Cldum
DATE: 5-11-05

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version — **No nitrite**

Balance Device ID No: 0020 **NIST Weight (10 g):** 10.0001
Balance Device ID No: 0018 **NIST Weight (150 g):** 150.1

Prepared By: Thomas McLohn **Date Prepared:** 5-10-2006 (Morning mix)

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.6
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.96	6.970
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	.316
Cesium Nitrate	$CsNO_3$	0.054	.054
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	.216
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.46	24.446
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	.288
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.237
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	0.52	.531
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.061
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	.588
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.258
Potassium Nitrate	KNO_3	9.20	9.205
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.034
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	.430
Zirconyl Nitrate	$ZrO(NO_3)_2.xH_2O$	0.38	.375
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.530
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.333
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.880
Glycolic Acid	$C_2H_4O_3$	53.86	53.880
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.88	18.898
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.140
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.100
Boric Acid	H_3BO_3	0.40	.442
Sodium Chloride	NaCl	11.68	11.687
Sodium Fluoride	NaF	0.58	.600
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.100
Sodium Sulfate	Na_2SO_4	24.40	24.420
Potassium Molybdate	K_2MoO_4	0.18	.189
		total =	604.5

Flask/387.4

991.8/Flask

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.755
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.890
Sodium Formate	NaHCOO	31.42	31.419
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.754
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.533
Deionized Water	H_2O	400.00	400.7
		total =	459.051

1449.0/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.4

1726.4/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.5
Sodium Nitrite	$NaNO_2$	XXX	No nitrite
Water	H_2O	200.00	199.3
		total =	793.8

2517.0/Flask

Add and Mix thoroughly.

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

Sum	2154.37	2129.8

QA APPROVED
NAME: CLQum
DATE: 5-11-06

Record the Final Weight 3048.2/Flask

	2660.8
Density:	1.33

Measure the pH 10.19

Adjust the Final Solution to pH = 11 (as necessary).

Comments: Let stir over night in shaker 5-10-06 to 5-11-06. Measured pH = 10.19
Adjusted to pH = 11.00 using NaOH to adjust up. 5-11-2006 AM.

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version 3.5M nitrite

Balance Device ID No: 0020 NIST Weight (10 g): 10.0001
Balance Device ID No: 0018 NIST Weight (150 g): 150.1

Prepared By: Thomas McCohn Date Prepared: 5-10-2006 (Afternoon mix)

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.1
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.96	6.956
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	.327
Cesium Nitrate	$CsNO_3$	0.054	.056
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	.236
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.46	24.479
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	.289
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.247
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	0.52	.516
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.091
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	.589
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.258
Potassium Nitrate	KNO_3	9.20	9.206
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.0329
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	.440
Zirconyl Nitrate	$ZrO(NO_3)_2.xH_2O$	0.38	.398
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.519
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.325
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.851
Glycolic Acid	$C_2H_4O_3$	53.86	53.999
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.86	18.846
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.146
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.092
Boric Acid	H_3BO_3	0.40	.404
Sodium Chloride	NaCl	11.68	11.702
Sodium Fluoride	NaF	0.58	.586
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.100
Sodium Sulfate	Na_2SO_4	24.40	24.428
Potassium Molybdate	K_2MoO_4	0.18	.201
	Sum	604.9860	606.5
In a SEPARATE Container, Mix the Following:			
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.769
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.892
Sodium Formate	NaHCOO	31.42	31.433
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.743
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.524
Deionized Water	H_2O	400.00	410.00
	Sum	458.30	468.361

387.4/Flask

993.9/Flask

1458.6/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.4

1735.7/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.8
Sodium Nitrite	$NaNO_2$	482.94	482.9
Water	H_2O	200.00	200.6
Add and Mix thoroughly.			1278.3

3005.6/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

Sum	2837.31	2618.2

QA APPROVED
NAME: CPDun
DATE: 5-11-06

Record the Final Weight 3301.6/Flask

	2914.2
Density:	1.45

Measure the pH 11.09

Adjust the Final Solution to pH = 11 (as necessary).

After Noon mix on 5-10-06 PM.

Comments: Let sit over night in shaker 5-10-06 to 5-11-06. Measured pH: 11.09 Adjusted to pH = 10.99 Adjust down used sulfuric Acid H_2SO_4

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version 0.2M Chloride

Balance Device ID No: 0020 NIST Weight (10 g): 10.0000
Balance Device ID No: 0018 NIST Weight (150 g): 149.9

Prepared By: Thomas M. Date Prepared: 5-15-2006

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.1
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.980
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.325
Cesium Nitrate	$CsNO_3$	0.054	.058
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.223
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.48	24.488
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.294
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.247
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.550
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.051
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.581
Nickel Nitrate, 6-Hydrate	$Ni(NO_3)2.6H_2O$	5.26	5.284
Potassium Nitrate	KNO_3	9.20	9.195
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.033
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.419
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.392
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.539
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.320
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.872
Glycolic Acid	$C_2H_4O_3$	53.88	53.867
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.874
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.142
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.075
Boric Acid	H_3BO_3	0.40	.415
Sodium Chloride	NaCl	23.36	23.369
Sodium Fluoride	NaF	0.58	.596
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.100
Sodium Sulfate	Na_2SO_4	24.40	24.390
Potassium Molibdate	K_2MoO_4	0.18	.184
	SUM	616.57	614.5

387.9/Flask

1002.2/Flask

In a SEPARATE Container, Mix the Following:

Sodium Hydroxide	NaOH	30.52	30.519
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.768
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.879
Sodium Formate	NaHCOO	31.42	31.451
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.753
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.546
Deionized Water	H_2O	400.00	400.9
	SUM	488.82	489.816

1489.1/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1782.3/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	595.41
Sodium Nitrite	$NaNO_2$	165.58	165.16
Water	H_2O	200.00	200.44
Add and Mix thoroughly.	Sum	960.16	961.4

2739.5/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

	SUM OF ALL	2362.14

2351.1

Record the Final Weight 3162.7/Flask

	2775.7
Density:	1.38

Measure the pH 10.44

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Left stir overnight in shaker - was not working in morning - belt came off. Measured PH 10.44 Adjusted to PH 11.01 5-16-2006 used NaOH to Adjust up.

QA APPROVED
NAME: CPDunn
DATE: 5-16-06

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version 7.0M nitrite

Balance Device ID No: 0020 NIST Weight (10 g): 10.0000
Balance Device ID No: 0018 NIST Weight (150 g): 150.1

Prepared By: Thomas M. Date Prepared: 5-16-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.6
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.96	6.957
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	.338
Cesium Nitrate	$CsNO_3$	0.054	.0558
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	.226
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.48	24.500
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	.296
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.255
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	0.52	.533
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.087
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	.580
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.273
Potassium Nitrate	KNO_3	9.20	9.208
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.0378
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	.431
Zirconyl Nitrate	$ZrO(NO_3)_2.xH_2O$	0.38	.383
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.523
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.323
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.866
Glycolic Acid	$C_2H_4O_3$	53.86	53.910
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.88	18.901
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.148
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.074
Boric Acid	H_3BO_3	0.40	.395
Sodium Chloride	NaCl	11.68	11.693
Sodium Fluoride	NaF	0.58	.587
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.109
Sodium Sulfate	Na_2SO_4	24.40	24.434
Potassium Molybdate	K_2MoO_4	0.18	.180
		total =	604.3
In a SEPARATE Container, Mix the Following:			
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.729
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.886
Sodium Formate	NaHCOO	31.42	31.434
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.775
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.527
Deionized Water	H_2O	400.00	399.4
			457.751

387.9/Flask

992.2/Flask

1447.2/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.4

1725.5/Flask

Mix Thoroughly

Next, Mix the Following:

High nitrite OK!

Sodium Nitrate	$NaNO_3$	594.58	594.4
Sodium Nitrite	$NaNO_2$	965.88	969.0
Water	H_2O	200.00	202.6
		total =	1766

3471.2/Flask

Add and Mix thoroughly.

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

Sum	3120.25	3086.3

QA APPROVED
NAME: C.P. Quinn
DATE: 5-17-06

Record the Final Weight 3548.6/Flask

	3160.7
Density:	1.58

Measure the pH 11.65 5-17-06

Adjust the Final Solution to pH = 11 (as necessary).

Comments: Let stir over night in shaker. Measure pH=11.65 Adjusted to PH 11.01. used sulfric Acid to Adjust down

Standard

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

Balance Device ID No: 0020 NIST Weight (10 g): 10.0000
Balance Device ID No: 0018 NIST Weight (150 g): 150.1

Prepared By: Thomas M. Date Prepared: 5-17-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.8
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.991
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.323
Cesium Nitrate	$CsNO_3$	0.054	.057
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.215
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.511
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.269
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.243
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.529
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.069
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.579
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	5.26	5.280
Potassium Nitrate	KNO_3	9.20	9.187
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.0315
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.415
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.397
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.545
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.325
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.875
Glycolic Acid	$C_2H_4O_3$	53.86	53.97
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.856
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.140
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.090
Boric Acid	H_3BO_3	0.40	.409
Sodium Chloride	NaCl	11.68	11.692
Sodium Fluoride	NaF	0.58	.577
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.106
Sodium Sulfate	Na_2SO_4	24.40	24.408
Potassium Molibdate	K_2MoO_4	0.18	.179
	SUM	604.9860	604.2

387.4/Flask

991.3/Flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.517
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.755
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.895
Sodium Formate	NaHCOO	31.42	31.447
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.743
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.527
Deionized Water	H_2O	400.00	399.2
	SUM	488.82	460.084

1477.2/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1771.3/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.3
Sodium Nitrite	$NaNO_2$	165.58	165.9
Water	H_2O	200.00	201.1
Add and Mix thoroughly.	Sum	960.16	961.0

2720.8/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

	SUM OF ALL	2350.46

2333.4

Record the Final Weight 3156.1/Flask

	2768.7
Density:	1.38

QA APPROVED
NAME: Cadu
DATE: 05/22/06

Measure the pH 10.51

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let stir overnight in shaker Measured pH 10.51 5-18-2006 Adjusted to pH 10.99
Shaker worked until 7:55 A.M. 5-16-06 - belt broke had to put solution on stirer on 5-17-06

Job on Friday

Vacation day

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version 9.2M Chloride

Balance Device ID No: 0020 NIST Weight (10 g): 10.0000
Balance Device ID No: 0018 NIST Weight (150 g): 150.0

Prepared By: Thomas M. Date Prepared: 5-23-2006

Tare a 2-liter Volumetric Flask, and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.9
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.989
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.316
Cesium Nitrate	$CsNO_3$	0.054	.060
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.215
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.446
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.300
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.235
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.537
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.08	4.070
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.582
Nickel Nitrate, 6-Hydrate	$Ni(NO_3)_2 \cdot 6H_2O$	5.26	5.276
Potassium Nitrate	KNO_3	9.20	9.208
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.032
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.460
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.377
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.545
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.320
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.894
Glycolic Acid	$C_2H_4O_3$	53.86	53.844
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.892
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.147
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.068
Boric Acid	H_3BO_3	0.40	.427
Sodium Chloride	NaCl	23.36	23.389
Sodium Fluoride	NaF	0.58	.599
Sodium Chromate	Na_2CrO_4	1.10	1.120
Sodium Sulfate	Na_2SO_4	24.40	24.416
Potassium Molibdate	K_2MoO_4	0.18	.20
	SUM	616.67	621.3

387.9/Flask

1009.4/Flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.534
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.746
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.874
Sodium Formate	NaHCOO	31.42	31.410
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.744
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.566
Deionized Water	H_2O	400.00	405.6
	SUM	488.82	494.514

1501.7/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1795.6/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.5
Sodium Nitrite	$NaNO_2$	165.58	166.3
Water	H_2O	200.00	201.0
Add and Mix thoroughly.	Sum	958.16	

2751.5/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

	SUM OF ALL	2362.14

2363.6

Record the Final Weight 3164.3/Flask

Density: 7.776.4 / 1.388

Measure the pH 34 10.43 5-24-06 9:40 A.m

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

QA APPROVED
NAME: [illegible]
DATE: 5/24/06

Comments: Let Stir over night in Shaker. Measured PH 10.43 5-24-06
Adjusted to PH 11.02 used NaOH to Adjust PH UP.

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

Balance Device ID No: 0020 NIST Weight (10 g): 10.0001
Balance Device ID No: 0016 NIST Weight (150 g): 150.0

Prepared By: Thomas M. Date Prepared: 5-24-2006

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.8
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.970
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.324
Cesium Nitrate	$CsNO_3$	0.054	.0539
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	0.260
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.501
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.284
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.257
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.519
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.062
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.587
Nickel Nitrate, 6-Hydrate	$Ni(NO_3)_2 \cdot 6H_2O$	5.26	5.272
Potassium Nitrate	KNO_3	9.20	9.200
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.033
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.419
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.376
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.520
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.324
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.846
Glycolic Acid	$C_2H_4O_3$	53.86	53.844
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.898
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.139
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.090
Boric Acid	H_3BO_3	0.40	.401
Sodium Chloride	NaCl	11.68	11.688
Sodium Fluoride	NaF	0.58	.568
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.115
Sodium Sulfate	Na_2SO_4	24.40	24.410
Potassium Molybdate	K_2MoO_4	0.18	.185
	SUM	604.9860	604.2

387.2/Flask

991.4/Flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.530
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.761
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.86	8.855
Sodium Formate	NaHCOO	31.42	31.481
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.743
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.522
Deionized Water	H_2O	400.00	399.8
	SUM	488.82	488.692

1478.5/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1771.7/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.56	594.7
Sodium Nitrite	$NaNO_2$	165.58	165.6
Water	H_2O	200.00	201.0
Add and Mix thoroughly.	Sum	960.16	961.3

2728.3/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

172.1.6

	SUM OF ALL	2350.46

2341.1

QA APPROVED
NAME: CLO
DATE: 5/25/06

Record the Final Weight 3156.7/Flask

Density: 2769.5 / 1.38

Measure the pH 10.51

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let stir in shaker over night. Measured pH: 10.51 Adjusted to pH 11.00
5-25-2006 used NaOH to adjusted pH up to 11.00. 5-25-06 [illegible]

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

0.2M Chloride

Balance Device ID No: OD30 NIST Weight (10 g): 9.9999
Balance Device ID No: 0018 NIST Weight (150 g): 150.0

Prepared By: Thomas McCabe Date Prepared: 5-29-2006

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.7
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.965
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.319
Cesium Nitrate	$CsNO_3$	0.064	.056
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.227
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.423
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.299
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.246
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.532
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.076
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.584
Nickel Nitrate, 6-Hydrate	$Ni(NO_3)_2 \cdot 6H_2O$	5.26	5.251
Potassium Nitrate	KNO_3	9.20	9.223
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.035
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.419
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.369
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.543
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.309
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.876
Glycolic Acid	$C_2H_4O_3$	53.86	54.001
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.872
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.145
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.096
Boric Acid	H_3BO_3	0.40	.395
Sodium Chloride	NaCl	23.36	23.368
Sodium Fluoride	NaF	0.58	.597
Sodium Chromate	Na_2CrO_4	1.10	1.097
Sodium Sulfate	Na_2SO_4	24.40	24.385
Potassium Molibdate	K_2MoO_4	0.18	.173
	SUM	616.67	618.9

387.9/Flask

1006.8/Flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.549
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.747
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.898
Sodium Formate	NaHCOO	31.42	31.423
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.743
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.532
Deionized Water	H_2O	400.00	400.8
	SUM	488.82	489.692

1493.5/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1787.8/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.9
Sodium Nitrite	$NaNO_2$	165.58	165.6
Water	H_2O	200.00	200.7
Add and Mix thoroughly.	Sum	960.16	961.2

2744.6/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

	SUM OF ALL	2362.14

2356.7

Record the Final Weight 3181.4

	2795.5
Density:	1.396

Measure the pH 10.53

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

QA APPROVED
NAME: CPOm
DATE: 5-31-06

Comments: Shaker broke down - stir on magnet stirer over night. Measured pH 10.53 (5-31-06)
Adjusted to pH 11.01, used NaOH to adjust up.

AN-107 Supernate Simulant Recipe for a 5-Liter Batch, pH = 10
BASE SOLUTION: April 2005 Version

Standard

Balance Device ID No: 0029 NIST Weight (10 g): 10.0001
Balance Device ID No: 0018 NIST Weight (150 g): 150.0

Prepared By: Thomas Mitchell Date Prepared: 5-31-2006

Tare a 12 L Carboy and then Add the Following, In Order:

Carboy = 1254.4
-OR-
Flask = 386.9

Compound	Formula	grams	Actual Mass Used,
Deionized Water	H_2O	1200.00	1200.8
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	20.88	20.975
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.96	.961
Cesium Nitrate	$CsNO_3$	0.162	.169
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.66	.658
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	73.38	73.388
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.84	.846
Lead Nitrate	$Pb(NO_3)_2$	3.72	3.718
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	1.56	1.560
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	12.18	12.173
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	1.74	1.741
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	15.78	15.783
Potassium Nitrate	KNO_3	27.60	27.606
Strontium Nitrate	$Sr(NO_3)_2$	0.096	.098
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	1.26	1.260
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	1.14	1.200
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	43.56	43.511
HEDTA, n-Hydroxyethylenediamine	HEDTA	12.96	12.963
Sodium Gluconate	$C_6H_{11}NaO_7$	23.58	23.569
Glycolic Acid	$C_2H_4O_3$	161.58	161.520
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	56.64	56.686
Nitrilotriacetic Acid	$C_6H_9NO_6$	3.42	3.436
Iminodiacetic Acid	$HN(CH_2COOH)_2$	36.24	36.238
Boric Acid	H_3BO_3	1.20	1.209
Sodium Chloride	NaCl	35.04	35.040
Sodium Fluoride	NaF	1.74	1.755
Sodium Chromate	Na_2CrO_4	3.30	3.294
Sodium Sulfate	Na_2SO_4	73.20	73.208
Potassium Molybdate	K_2MoO_4	0.54	.543
	total =		1613.1

3066.8 / carboy
-OR-
2200.0 / Flask

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	32.22	32.220
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	26.64	26.664
Sodium Formate	NaHCOO	94.26	94.259
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	14.22	14.234
Sodium Oxalate	$Na_2C_2O_4$	7.56	7.561
Deionized Water	H_2O	1200.00	1200.6
	total		1375.578

4441.0 / carboy

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.
After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	889.50	889.8

5281.5 / carboy

1.36 x 6000 = 8160

Mix Thoroughly
Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	1783.74	1783.84
Sodium Nitrite	$NaNO_2$	496.74	496.9
Water	H_2O	600.00	601.5
	total =		2882.24

Add and Mix thoroughly.
Mix thoroughly and dilute to the in the Volumetric Flask.

6959.84 ~~6965.10~~ 6906.5

8161.3 / carboy

Record the Final Weight 9491.6 / Carboy

8237.2
Density: 1.37

Measure the pH 10.41
Adjust the Final Solution to pH = 10 by titrating back with sulfuric acid (as necessary).

Comments: Let stir overnight. Measured pH 10.41 on 6-1-2006. Adjusted to pH 10.02 using sulfuric acid to adjust down. Final Measure & Adjustment pH 10.02 6-1-06

QA APPROVED
NAME: CAdum
DATE: 6-1-06

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 10
BASE SOLUTION: April 2005 Version

END POINT

Balance Device ID No: 0020 NIST Weight (10 g): 10.0000
Balance Device ID No: 0046 NIST Weight (150 g): 150.0

Prepared By: Thomas McCabe Date Prepared: 6-6-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams	
Deionized Water	H_2O	400.00	400.4	387.4/Flask
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.968	
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.329	
Cesium Nitrate	$CsNO_3$	0.054	.0537	
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.225	
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.461	
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.277	
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.244	
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.529	
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.051	
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.577	
Nickel Nitrate, 6-Hydrate*	$Ni(NO3)2.6H_2O$	5.26	5.264	
Potassium Nitrate	KNO_3	9.20	9.210	
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.035	
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.423	
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.378	
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.525	
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.325	
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.875	
Glycolic Acid	$C_2H_4O_3$	53.86	53.962	
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.968	
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.140	
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.063	
Boric Acid	H_3BO_3	0.40	.398	
Sodium Chloride	NaCl	11.68	11.689	
Sodium Fluoride	NaF	0.58	.584	
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.103	
Sodium Sulfate	Na_2SO_4	24.40	24.395	994.8/Flask
Potassium Molibdate	K_2MoO_4	0.18	.200	
		total=	607.4	
In a SEPARATE Container, Mix the Following:				
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.785	
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.856	
Sodium Formate	NaHCOO	31.42	31.423	
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.735	
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.513	
Deionized Water	H_2O	400.00	399.9	1451.6/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5	1731.2/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	407.59	408.4	
Sodium Nitrite	$NaNO_2$	317.37	317.4	
Water	H_2O	200.00	202.7	
Add and Mix thoroughly.		total=	928.5	2653.7/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM 2284.75 | 22661.3

Record the Final Weight 3122.5/Flask | 2735.1

Density: 1.36

Measure the pH 10.15

QA APPROVED
NAME: Cedum
DATE: 6-6-06

Adjust the Final Solution to pH = 10 by titrating back with sulfuric acid (as necessary).

Comments: Let stir overnight in shaker. Measured PH 10.15 6-6-06. Adjust to PH 10.00 using Sulfuric Acid. Final PH 10.00 6-6-06 J.m

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 10
BASE SOLUTION: April 2005 Version

END POINT
0.2M Chloride

Balance Device ID No: 0020, NIST Weight (10 g): ~~Recalibration~~ N/A
Balance Device ID No: 0018 NIST Weight (150 g):

Prepared By: Thomas McCohn Date Prepared: 6-6-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.4
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.959
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.315
Cesium Nitrate	$CsNO_3$	0.054	.054
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.222
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.442
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.274
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.245
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.521
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.100
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.588
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.285
Potassium Nitrate	KNO_3	9.20	9.208
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.0317
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.434
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.386
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.513
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.330
Sodium Gluconate	$C_6H_{11}NaO_7$	7.88	7.861
Glycolic Acid	$C_2H_4O_3$	53.86	54.001
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.889
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.136
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.081
Boric Acid	H_3BO_3	0.40	.403
Sodium Chloride	NaCl	23.36	23.365
Sodium Fluoride	NaF	0.58	.586
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.110
Sodium Sulfate	Na_2SO_4	24.40	24.389
Potassium Molibdate	K_2MoO_4	0.18	.198
		total = 616.1	
In a SEPARATE Container, Mix the Following:			
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.756
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.879
Sodium Formate	NaHCOO	31.42	31.480
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.735
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.516
Deionized Water	H_2O	400.00	401.9
		total = ~~616.1~~ 460.268	

387.4/Flask

1003.5/Flask

1461.1/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.7

1741.5/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	407.59	406.6
Sodium Nitrite	$NaNO_2$	317.37	317.8
Water	H_2O	200.00	199.8
		total =	926.2

Add and Mix thoroughly.

2,661.4/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM 2296.43 | 2274

QA APPROVED
NAME: Clem
DATE: 6-7-06

Record the Final Weight 3123.4/Flask

Density: 2736 / 1.36

Measure the pH = 10.35 Adjusted To 10.01

Joe

Adjust the Final Solution to pH = 10 by titrating back with sulfuric acid (as necessary).

Comments: Let stir in shaker overnight. Measured pH 10.35 adjusted to 10.01 6-7-06

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

0.75M nitrite
1.5M nitrate

CPP and SSRT Test 2A

Balance Device ID No: 0020 NIST Weight (10 g): Nist wts out for Recalibration
Balance Device ID No: 0018 NIST Weight (150 g):

Prepared By: Thomas McCabe Date Prepared: 6-7-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.7
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.96	6.953
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	.390
Cesium Nitrate	$CsNO_3$	0.054	.0548
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	.250
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.46	24.462
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	.285
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.242
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	0.52	.530
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.099
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	.586
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.250
Potassium Nitrate	KNO_3	9.20	9.211
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.031
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	.419
Zirconyl Nitrate	$ZrO(NO_3)_2.xH_2O$	0.38	.392
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	14.52	14.533
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.330
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.851
Glycolic Acid	$C_2H_4O_3$	53.86	53.601
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.88	18.875
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.162
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.081
Boric Acid	H_3BO_3	0.40	.395
Sodium Chloride	NaCl	11.68	11.701
Sodium Fluoride	NaF	0.58	.580
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.106
Sodium Sulfate	Na_2SO_4	24.40	24.419
Potassium Molybdate	K_2MoO_4	0.18	.186
		total =	604.4

386.7/Flask

(AM Morning 6-7-2006)

991.1/Flask

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.725
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.874
Sodium Formate	NaHCOO	31.42	31.457
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.762
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.524
Deionized Water	H_2O	400.00	400.1
		total =	458.442

1457.1/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.7

1736.8/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	254.82	254.9
Sodium Nitrite	$NaNO_2$	103.49	103.4
Water	H_2O	200.00	199.2
Add and Mix thoroughly.		total =	557.5

2292.2/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

Sum	1918.09	1905.5

QA APPROVED

NAME: Cldum

DATE: 6-8-06

Record the Final Weight 2922.7/Flask

	2536
Density:	1.26

Measure the pH 10.31

Adjust the Final Solution to pH = 11 (as necessary).

Comments: Let Stir overnight in Shaker. Measured pH = 10.31. Adjusted to pH 11.00 6-8-2006 Now pH 11.00

Joe

A-41

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

1.5M nitrite
1.5M nitrate
Test 2B CCP and SSRT

Balance Device ID No: 0020 NIST Weight (10 g):
Balance Device ID No: 0018 NIST Weight (150 g): Recalibration N/A

Prepared By: Thomas McCobb Date Prepared: 6-7-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.3
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.96	6.950
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	.320
Cesium Nitrate	$CsNO_3$	0.054	.0535
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	.226
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.46	24.502
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	.287
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.243
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	0.52	.525
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.088
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	.586
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.241
Potassium Nitrate	KNO_3	9.20	9.199
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.032
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	.417
Zirconyl Nitrate	$ZrO(NO_3)_2.xH_2O$	0.38	.387
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.530
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.312
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.856
Glycolic Acid	$C_2H_4O_3$	53.86	53.954
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.88	18.888
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.151
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.099
Boric Acid	H_3BO_3	0.40	.395
Sodium Chloride	NaCl	11.68	11.665
Sodium Fluoride	NaF	0.58	.578
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.106
Sodium Sulfate	Na_2SO_4	24.40	24.398
Potassium Molybdate	K_2MoO_4	0.18	.183
		total=	606.5

387.4/Flask
~~388.4~~

(PM Afternoon Solution 6-7-06)

993.8/Flask

In a SEPARATE Container, Mix the Following:

Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.746
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.878
Sodium Formate	NaHCOO	31.42	31.450
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.741
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.523
Deionized Water	H_2O	400.00	400.0

Mix Thoroughly. Then Add this Solution to the Volumetric Flask. total= 458.338

1450.4/Flask

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.7

1730.7/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	254.82	254.8
Sodium Nitrite	$NaNO_2$	206.98	206.9
Water	H_2O	200.00	200.1
Add and Mix thoroughly.			661.8

2392.5/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

Sum 2021.58 2005.1

QA APPROVED
NAME: Cldunn
DATE: 6-8-06

Record the Final Weight 2970.9/Flask 2583.5

Density: 1.29

Measure the pH 10.58

Adjust the Final Solution to pH = 11 (as necessary).

Comments: Let stir overnight in shaken measured pH=10.58 Adjust to pH 11.00
6-8-2006

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

0.2M Chloride

Balance Device ID No: 0020 NIST Weight (10 g):
Balance Device ID No: 0018 NIST Weight (150 g): ~~Being~~ Recalibrated

Prepared By: Thomas McCoy Date Prepared: 6-13-2006

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.3
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.952
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.313
Cesium Nitrate	$CsNO_3$	0.054	.058
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.220
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.465
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.281
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.247
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.525
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.046
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.589
Nickel Nitrate, 6-Hydrate	$Ni(NO_3)_2 \cdot 6H_2O$	5.28	5.253
Potassium Nitrate	KNO_3	9.20	9.217
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.034
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.425
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.391
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	14.52	14.527
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.314
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.862
Glycolic Acid	$C_2H_4O_3$	53.86	53.882
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.879
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.142
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.091
Boric Acid	H_3BO_3	0.40	.408
Sodium Chloride	NaCl	23.36	23.352
Sodium Fluoride	NaF	0.58	.599
Sodium Chromate	Na_2CrO_4	1.10	1.106
Sodium Sulfate	Na_2SO_4	24.40	24.390
Potassium Molibdate	K_2MoO_4	0.18	.184
	SUM	616.67	616.3

387.5/Flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.602
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.790
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.878
Sodium Formate	NaHCOO	31.42	31.416
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.749
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.549
Deionized Water	H_2O	400.00	402.2
	SUM	488.82	491.186

1003.8/Flask

1492.6/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1787.6/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.4
Sodium Nitrite	$NaNO_2$	165.58	165.5
Water	H_2O	200.00	199.0
Add and Mix thoroughly.	Sum	960.16	958.9

2731.7/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

	SUM OF ALL	2362.14

2344.2

QA APPROVED
NAME: CQdum
DATE: 6-16-06

Record the Final Weight 3160.7/Flask

Density: 2773.2 / 1.38

Measure the pH 10.37

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let stir overnight in shaker. measured pH 10.37 6-14-2006 Adjusted to pH 11.00 using NaOH

Final PH 11.00 6-14-2006

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

0.2M Chloride

Balance Device ID No: 0020 NIST Weight (10 g): N/A Recalibration
Balance Device ID No: 0018 NIST Weight (150 g):

Prepared By: Jesse Rhodes Date Prepared: 6/15/06

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.6
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.963
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.329
Cesium Nitrate	$CsNO_3$	0.054	.055
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.228
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.48	24.459
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.287
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.243
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.528
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.06
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.585
Nickel Nitrate, 6-Hydrate	$Ni(NO_3)_2 \cdot 6H_2O$	5.26	5.266
Potassium Nitrate	KNO_3	9.20	9.206
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.034
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.429
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.388
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.529
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.329
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.869
Glycolic Acid	$C_2H_4O_3$	53.86	53.852
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.886
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.142
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.085
Boric Acid	H_3BO_3	0.40	.408
Sodium Chloride	NaCl	23.36	23.368
Sodium Fluoride	NaF	0.58	.589
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.108
Sodium Sulfate	Na_2SO_4	24.40	24.408
Potassium Molibdate	K_2MoO_4	0.18	.184
	SUM	616.67	616.3

389.3g / Flask

1005.6g / Flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.523
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.740
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.884
Sodium Formate	NaHCOO	31.42	31.428
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.741
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.522
Deionized Water	H_2O	400.00	400.7
	SUM	488.82	[illegible] 489.197g

51.203g / Container

540.4g/container

1494.8g / Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.6

1789.9g/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.60
Sodium Nitrite	$NaNO_2$	165.58	165.58
Water	H_2O	200.00	200.7
Add and Mix thoroughly.	Sum	960.16	960.88

2747.2g/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM OF ALL	2362.14	2357.9g

Record the Final Weight [illegible] 3176.9

	2787.6
Density:	1.39

2747.2

Measure the pH 10.43

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let stir overnight in the shaker. Measured pH 10.43 6/16/06
Adjusted pH with NaOH to 11.01

QA APPROVED
NAME: Cldum
DATE: 6-16-06

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

0.2M Chloride

Balance Device ID No: 0020 NIST Weight (10 g): N/A
Balance Device ID No: 0018 NIST Weight (150 g):

Prepared By: Jesse Rhodes Date Prepared: 6/19/06

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.1
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.958
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	0.319
Cesium Nitrate	$CsNO_3$	0.054	0.057
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	0.222
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.470
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	0.278
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.243
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	0.523
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.062
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	0.580
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	5.26	5.259
Potassium Nitrate	KNO_3	9.20	9.205
Strontium Nitrate	$Sr(NO_3)_2$	0.032	0.033
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	0.420
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	0.383
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.524
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.320
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.860
Glycolic Acid	$C_2H_4O_3$	53.86	53.865
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.881
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.141
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.081
Boric Acid	H_3BO_3	0.40	0.402
Sodium Chloride	NaCl	23.36	23.361
Sodium Fluoride	NaF	0.58	0.579
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.105
Sodium Sulfate	Na_2SO_4	24.40	24.408
Potassium Molibdate	K_2MoO_4	0.18	0.180
	SUM	616.67	615.9

387.7 g/flask

1003.1 g/flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	~~30.518~~ 30.523
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.738
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.884
Sodium Formate	NaHCOO	31.42	31.433
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.735
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.519
Deionized Water	H_2O	400.00	400.8
	SUM	488.82	488.9

1491.4 g/ flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.6

1783.9 g/flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.600
Sodium Nitrite	$NaNO_2$	165.58	165.600
Water	H_2O	200.00	200.9
Add and Mix thoroughly.	Sum	960.16	958.2

2742.1 g/ flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

	SUM OF ALL	2362.14

2354.4 g

Record the Final Weight ~~3163.5 g/flask~~ 3164.5 g/flask

~~3163.5 g/flask~~

Density: 1.39

Measure the pH 10.62

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let Stir in shaker overnight. Measured pH 10.62 6/20/06
Adjusted pH with NaOH to 11.01

QA APPROVED
NAME: Cldur
DATE: 6/21/06

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version 0.05M Chloride

Balance Device ID No: 0020 NIST Weight (10 g): N/A
Balance Device ID No: 0018 NIST Weight (150 g):

Prepared By: Jesse Rhodes Date Prepared: 6/20/06

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.9
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.959
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	0.319
Cesium Nitrate	$CsNO_3$	0.054	0.054
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	0.223
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.460
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	0.282
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.242
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	0.522
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.058
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	0.580
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	5.26	5.263
Potassium Nitrate	KNO_3	9.20	9.209
Strontium Nitrate	$Sr(NO_3)_2$	0.032	0.032
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	0.422
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	0.382
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.523
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.321
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.859
Glycolic Acid	$C_2H_4O_3$	53.86	53.855
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.884
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.143
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.082
Boric Acid	H_3BO_3	0.40	0.402
Sodium Chloride	NaCl	5.84	5.841
Sodium Fluoride	NaF	0.58	0.583
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.103
Sodium Sulfate	Na_2SO_4	24.40	24.402
Potassium Molibdate	K_2MoO_4	0.18	0.179
	SUM	599.15	597.7

~~387.6 g/flask~~
385.9 g/flask

983.6 g/flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.530
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.739
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.882
Sodium Formate	NaHCOO	31.42	31.428
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.742
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.518
Deionized Water	H_2O	400.00	400.4
	SUM	468.82	486.3

1469.9 g/flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.50

1763.2 g/flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.6
Sodium Nitrite	$NaNO_2$	165.58	165.6
Water	H_2O	200.00	200.70
Add and Mix thoroughly.	Sum	960.16	957.9

~~2716.6 g/flask~~

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

	SUM OF ALL	2344.52

2335.2

2721.1 g/flask

Record the Final Weight 3148.1 g/flask

Density: 1.38

Measure the pH 10.64

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let stir overnight in Shaker. Measured pH 10.64 6/21/06
Adjusted pH to 10.99 with NaOH

QA APPROVED
NAME: Cldu
DATE: 6/21/06

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version — 0.05M Chloride

Balance Device ID No: 0070 — NIST Weight (10 g): N/A
Balance Device ID No: 0014 — NIST Weight (100 g): N/A

Prepared By: Thomas McCohn — Date Prepared: 6-26-06

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.4
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.991
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.332
Cesium Nitrate	$CsNO_3$	0.054	.057
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.240
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.496
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.276
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.248
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.516
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.052
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.580
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	5.26	5.255
Potassium Nitrate	KNO_3	9.20	9.218
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.032
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.421
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.387
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.552
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.321
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.866
Glycolic Acid	$C_2H_4O_3$	53.86	53.821
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.68	18.690
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.142
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.06	12.064
Boric Acid	H_3BO_3	0.40	.416
Sodium Chloride	NaCl	5.84	5.836
Sodium Fluoride	NaF	0.58	.587
Sodium Chromate	Na_2CrO_4	1.10	1.110
Sodium Sulfate	Na_2SO_4	24.40	24.413
Potassium Molibdate	K_2MoO_4	0.18	.200
	SUM	599.15	597.8

386.4/Flask

984.2/Flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.541
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.770
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.891
Sodium Formate	NaHCOO	31.42	31.440
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.733
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.527
Deionized Water	H_2O	400.00	399.5
	SUM	488.82	488.~~659~~ 392

1470.4/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1764.6/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.5
Sodium Nitrite	$NaNO_2$	165.58	165.5
Water	H_2O	200.00	199.9
Add and Mix thoroughly.	Sum	960.16	959.9

2719.8/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

	SUM OF ALL	2344.62

2333.4

QA APPROVED
NAME: Oldum
DATE: 7-10-06

Record the Final Weight 3155.4/Flask

Density: 2769 / 1.39

Measure the pH 10.45

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let stir over night in Shaker. Measured pH: 10.45 Adjusted to 11.00

JDE

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 11
BASE SOLUTION: April 2005 Version

0.2M Chloride

Balance Device ID No: 0029 NIST Weight (10 g): N/A
Balance Device ID No: 0016 NIST Weight (150 g):

Prepared By: Thomas McCollum Date Prepared: 6-27-2006

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.1
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.96	6.966
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	.329
Cesium Nitrate	$CsNO_3$	0.054	.054
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	.221
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.46	24.432
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	.279
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.237
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3).6H_2O$	0.52	.522
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.050
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	.597
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.274
Potassium Nitrate	KNO_3	9.20	9.229
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.036
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	.425
Zirconyl Nitrate	$ZrO(NO_3)_2xH_2O$	0.38	.398
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.554
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.361
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.860
Glycolic Acid	$C_2H_4O_3$	53.86	53.999
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.88	18.895
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.143
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.077
Boric Acid	H_3BO_3	0.40	.430
Sodium Chloride	NaCl	23.36	23.389
Sodium Fluoride	NaF	0.58	0.593
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.100
Sodium Sulfate	Na_2SO_4	24.40	24.415
Potassium Molybdate	K_2MoO_4	0.18	.184
	SUM	616.67	615.4

387.4/Flask

1002.7/Flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.598
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.765
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.996
Sodium Formate	NaHCOO	31.42	31.426
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.742
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.524
Deionized Water	H_2O	400.00	399.1
	SUM	488.82	488.041

1488.6/Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1783.3/Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	595.0
Sodium Nitrite	$NaNO_2$	165.58	165.6
Water	H_2O	200.00	200.3
Add and Mix thoroughly.	Sum	960.16	960.9

2740.6/Flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM OF ALL	2362.14

2353.2

QA APPROVED
NAME: Cldun
DATE: 7-10-06

Record the Final Weight 3162.5/Flask

	2775.1
Density:	1.384

Measure the pH 10.36

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let stir over night in shaker. Measure pH=10.36 Adjust to 10.99 using Sodium hydroxide NaOH. 6-28-2006 J.M

Final pH=10.99 J.M

measurements are in grams.

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH = 9.5
BASE SOLUTION: April 2006 Version

END POINT

Balance Device ID No: 0020 NIST Weight (10 g): Recalibration
Balance Device ID No: 0019 NIST Weight (150 g):

Prepared By: Thomas McCoh Date Prepared: 6-28-2006

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.8
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.954
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	.322
Cesium Nitrate	$CsNO_3$	0.054	.056
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	.236
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.423
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	.277
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.260
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	.534
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.066
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	.573
Nickel Nitrate, 6-Hydrate	$Ni(NO_3)_2 \cdot 6H_2O$	5.26	5.261
Potassium Nitrate	KNO_3	9.20	9.209
Strontium Nitrate	$Sr(NO_3)_2$	0.032	.033
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	.430
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	.377
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	14.52	14.593
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.318
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.876
Glycolic Acid	$C_2H_4O_3$	53.86	53.868
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.885
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.138
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.081
Boric Acid	H_3BO_3	0.40	.404
Sodium Chloride	NaCl	11.68	11.679
Sodium Fluoride	NaF	0.58	.576
Sodium Chromate	Na_2CrO_4	1.10	1.103
Sodium Sulfate	Na_2SO_4	24.40	24.429
Potassium Molybdate	K_2MoO_4	0.18	.182
			total = 604.3
In a SEPARATE Container, Mix the Following:			
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.7393
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.8797
Sodium Formate	NaHCOO	31.42	31.4261
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.7411
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.5238
Deionized Water	H_2O	400.00	399.9
			total = 458.209

Jess

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

Jess

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	407.59	407.6
Sodium Nitrite	$NaNO_2$	317.37	317.4
Water	H_2O	200.00	200.10
			925.1

Jess

Add and Mix thoroughly.

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM	2284.76	2257.3

383.8/Flask

988.1/Flask

1442.3/Flask

1721.8/Flask

2641.1/Flask

Record the Final Weight 3106.8/Flask

Density: 2723 / 1.36

Measure the pH 10.11

QA APPROVED
NAME: Cldum
DATE: 7-10-06

Adjust the Final Solution to pH = 9.5 by titrating back with sulfuric acid (as necessary).

Comments: Let stir overnight in shaker 6-28-06. Measured PH= 10.11 on 6-29-06
Adjusted to PH 9.50 using Sulfuric Acid 6-29-06

AN-107 Supernate Simulant Recipe for a 4-Liter Batch, pH 11 Standard — RPP-RPT-31680 Rev 0
BASE SOLUTION: April 2005 Version

Balance Device ID No: 0020 NIST Weight (10 g): Recalibration
Balance Device ID No: 0018 NIST Weight (150 g): N/A

Prepared By: Thomas McCabe Date Prepared: 7-5-2006

Tare a Carboy and then Add the Following, In Order:

carboy/ 575.6
Flask/ 383.2

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	800.00	800.0
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	13.92	13.923
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.64	.648
Cesium Nitrate	$CsNO_3$	0.108	.104
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.44	.450
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	48.92	48.929
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.56	.562
Lead Nitrate	$Pb(NO_3)_2$	2.48	2.496
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	1.04	1.072
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	8.12	8.126
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	1.16	1.177
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	10.52	10.587
Potassium Nitrate	KNO_3	18.40	18.359
Strontium Nitrate	$Sr(NO_3)_2$	0.064	.067
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.84	.882
Zirconyl Nitrate	$ZrO(NO_3)_2.xH_2O$	0.76	.770
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	29.04	29.045
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	8.64	8.640
Sodium Gluconate	$C_6H_{11}NaO_7$	15.72	15.729
Glycolic Acid	$C_2H_4O_3$	107.72	107.70
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	37.78	37.787
Nitrilotriacetic Acid	$C_6H_9NO_6$	2.28	2.278
Iminodiacetic Acid	$HN(CH_2COOH)_2$	24.16	24.180
Boric Acid	H_3BO_3	0.80	.814
Sodium Chloride	NaCl	23.36	23.360
Sodium Fluoride	NaF	1.16	1.167
Sodium Chromate	$Na_2Cr_2O_4$	2.20	2.207
Sodium Sulfate	Na_2SO_4	48.80	48.793
Potassium Molybdate	K_2MoO_4	0.36	.390
	SUM	1209.9720	1209.5

15926/Flask

In a SEPARATE Container, Mix the Following:

Sodium Hydroxide	NaOH	61.05	61.090
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	21.48	21.469
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	17.76	17.787
Sodium Formate	NaHCOO	62.84	62.881
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	9.48	9.489
Sodium Oxalate	$Na_2C_2O_4$	5.04	5.039
Deionized Water	H_2O	800.00	800.6
	SUM	977.64	978.355

2568.1/Flask -OR- 2758.4/carboy

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	593.00	593.0

3344.7/carboy

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	1189.16	1189.2
Sodium Nitrite	$NaNO_2$	331.16	331.2
Water	H_2O	400.00	399.3
Add and Mix thoroughly.	Sum	1920.32	1919.7

9.7

Mix thoroughly and dilute to the 4-Liter mark in the Volumetric Flask.

SUM OF ALL	4700.93

5230.5/carboy 4654.9

Record the Final Weight 60969/carboy

Density: 5521.2 / 1.38

Measure the pH 10.55

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let stir over night in shaker Measured pH 10.55 7/6/06
Adjusted pH to 11.00 using NaOH Solution

QA APPROVED
NAME: Cldum
DATE: 7-14-06

AN-107 Supernate Simulant Recipe for a [redacted] Rev 0
BASE SOLUTION: April 2005 Version

END POINT

Balance Device ID No: 0020 NIST Weight (10 g):
Balance Device ID No: 0018 NIST Weight (150 g): N/A

Prepared By: Jesse Rhodes Date Prepared: 7/10/06

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams	
Deionized Water	H_2O	400.00	400.6	389.6 g/flask
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.958	
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	0.319	
Cesium Nitrate	$CsNO_3$	0.054	0.057	
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	0.222	
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.463	
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	0.284	
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.242	
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	0.528	
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.056	
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	0.583	
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	5.26	5.254	
Potassium Nitrate	KNO_3	9.20	9.198	
Strontium Nitrate	$Sr(NO_3)_2$	0.032	0.036	
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	0.419	
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	0.384	
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	14.52	14.518	
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.324	
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.862	
Glycolic Acid	$C_2H_4O_3$	53.86	53.858	
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.889	
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.139	
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.089	
Boric Acid	H_3BO_3	0.40	0.404	
Sodium Chloride	NaCl	11.68	11.680	
Sodium Fluoride	NaF	0.58	0.580	
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.100	
Sodium Sulfate	Na_2SO_4	24.40	24.402	
Potassium Molybdate	K_2MoO_4	0.18	0.179	
			603.0	992.6 g/flask
In a SEPARATE Container, Mix the Following:				
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.738	
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.883	
Sodium Formate	NaHCOO	31.42	31.422	
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.741	
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.521	
Deionized Water	H_2O	400.00	400.2	
Mix Thoroughly. Then Add this Solution to the Volumetric Flask.			454.4	1447.0 g/flask
After the Addition to the Volumetric Flask, Add the Following:				
Sodium Carbonate	Na_2CO_3	296.50	296.50	1737.9 g/flask
Mix Thoroughly				
Next, Mix the Following:				
Sodium Nitrate	$NaNO_3$	407.59	407.60	
Sodium Nitrite	$NaNO_2$	317.37	317.40	
Water	H_2O	200.00	199.40	
Add and Mix thoroughly.			915.30	2653.2 g/flask
Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.				
	SUM	2284.75	2263.6	
				3114.6 g/flask

Record the Final Weight 2725g

Density: 1.363

Measure the pH 10.32

QA APPROVED

NAME: Cldum

DATE: 7-14-06

Adjust the Final Solution to pH = 9.5 by titrating back with sulfuric acid (as necessary).

Comments: Let Stir in shaker overnight. Measured pH 10.32 7/14/06
Adjusted pH to 9.47 w/ sulfuric acid

A-57

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, ~~pH 10~~ RPP-RPT-31680, REV 0
BASE SOLUTION: April 2005 Version

Balance Device ID No: 0020 NIST Weight (10 g): N/A
Balance Device ID No: 0018 NIST Weight (150 g):

Prepared By: Jesse Rhodes Date Prepared: 7/11/06

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.1
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.969
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	0.319
Cesium Nitrate	$CsNO_3$	0.054	0.0542
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	0.222
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.469
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	0.283
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.242
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	0.525
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.063
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	0.581
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.262
Potassium Nitrate	KNO_3	9.20	9.201
Strontium Nitrate	$Sr(NO_3)_2$	0.032	0.0327
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	0.417
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	0.387
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.519
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.321
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.863
Glycolic Acid	$C_2H_4O_3$	53.86	53.862
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.884
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.140
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.084
Boric Acid	H_3BO_3	0.40	0.399
Sodium Chloride	NaCl	11.68	11.683
Sodium Fluoride	NaF	0.58	0.579
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.100
Sodium Sulfate	Na_2SO_4	24.40	24.404
Potassium Molibdate	K_2MoO_4	0.18	0.179
	SUM	604.9860	607.7

389.5 g/flask

992.2 g/flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.524
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.741
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.880
Sodium Formate	NaHCOO	31.42	31.419
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.739
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.521
Deionized Water	H_2O	400.00	400.5
	SUM	488.82	486.2

1478.4 g/flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1770.8 g/flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.6
Sodium Nitrite	$NaNO_2$	165.58	165.6
Water	H_2O	200.00	201.1
Add and Mix thoroughly.	Sum	960.16	955.1

2725.9 g/flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

	SUM OF ALL	2360.46	2336.4

Record the Final Weight 2765.4

Density: 1.383

3154.9 g/flask

Measure the pH 10.34

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let Stir in shaker overnight. Measured pH 10.34 7/12/06
Adjusted pH to 10.98 w/ NaOH.

QA APPROVED
NAME: Cldun
DATE: 7-14-06

AN-107 Supernate Simulant Recipe for a 4-Liter Batch, pH RPP-RPT-31680 Rev 0
BASE SOLUTION: April 2005 Version 0.2M chloride

Balance Device ID No: 0020 NIST Weight (10 g): N/A
Balance Device ID No: 0018 NIST Weight (150 g):

Prepared By: Jesse Rhodes Date Prepared: 7/12/06

Tare a 4-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	800.00	801.0
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	13.92	13.923
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.64	0.642
Cesium Nitrate	$CsNO_3$	0.108	0.107
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.44	0.443
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	48.92	48.923
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.56	0.560
Lead Nitrate	$Pb(NO_3)_2$	2.48	2.479
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	1.04	1.039
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	8.12	8.117
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	1.16	1.159
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	10.52	10.522
Potassium Nitrate	KNO_3	18.40	18.405
Strontium Nitrate	$Sr(NO_3)_2$	0.064	0.065
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.84	0.841
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.76	0.761
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	29.04	29.041
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	8.64	8.642
Sodium Gluconate	$C_6H_{11}NaO_7$	15.72	15.721
Glycolic Acid	$C_2H_4O_3$	107.72	107.714
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	37.76	37.761
Nitrilotriacetic Acid	$C_6H_9NO_6$	2.28	2.284
Iminodiacetic Acid	$HN(CH_2COOH)_2$	24.16	24.165
Boric Acid	H_3BO_3	0.80	0.804
Sodium Chloride	NaCl	46.72	46.720
Sodium Fluoride	NaF	1.16	1.164
Sodium Chromate	$Na_2Cr_2O_4$	2.20	2.199
Sodium Sulfate	Na_2SO_4	48.80	48.803
Potassium Molibdate	K_2MoO_4	0.36	0.360
	SUM	1233.33	1233.10

577.6 g/ carboy

1810.7 g/carboy

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	61.070
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	21.48	21.484
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	17.76	17.762
Sodium Formate	NaHCOO	62.84	62.843
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	9.48	9.484
Sodium Oxalate	$Na_2C_2O_4$	5.04	5.037
Deionized Water	H_2O	800.00	801.7
	SUM	977.64	977.60

2788.3 g/carboy

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	593.00	593.0

3374.4 g/ carboy

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	1189.16	1189.2
Sodium Nitrite	$NaNO_2$	331.16	331.2
Water	H_2O	400.00	399.8
Add and Mix thoroughly.	Sum	1920.32	1908.7

5281.1 g/ carboy

Mix thoroughly and dilute to the 4-Liter mark in the Volumetric Flask.

SUM OF ALL	4724.29

4703.5

Record the Final Weight 5582.6

Density: 1.396

6160.2 g/carboy

Measure the pH 10.37

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let Stir in shaker overnight. Measured pH 10.37 Adjusted pH to 10.98 w/ NaOH.

QA APPROVED

7/13/0 NAME: Cldum

DATE: 7-14-06

AN-107 Supernate Simulant Recipe for a 2-[illegible]680 Rev 0
BASE SOLUTION: April 2005 Version

END POINT
0.2M Chloride

Balance Device ID No: 0020 NIST Weight (10 g):
Balance Device ID No: 0018 NIST Weight (150 g): N/A

Prepared By: Jesse Rhodes Date Prepared: 7/13/06

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams	
Deionized Water	H_2O	400.00	400.0	3881 g/flask
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.959	
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	0.324	
Cesium Nitrate	$CsNO_3$	0.054	0.058	
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	0.219	
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.458	
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	0.277	
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.237	
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	0.517	
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.059	
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	0.583	
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.255	
Potassium Nitrate	KNO_3	9.20	9.200	
Strontium Nitrate	$Sr(NO_3)_2$	0.032	0.036	
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	0.419	
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	0.383	
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	14.52	14.523	
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.320	
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.859	
Glycolic Acid	$C_2H_4O_3$	53.86	53.860	
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.883	
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.140	
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.082	
Boric Acid	H_3BO_3	0.40	0.400	
Sodium Chloride	NaCl	23.36	23.360	
Sodium Fluoride	NaF	0.58	0.575	
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.103	
Sodium Sulfate	Na_2SO_4	24.40	24.404	
Potassium Molibdate	K_2MoO_4	0.18	0.178	
			616.2	1004.3 g/ flask
In a SEPARATE Container, Mix the Following:				
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.742	
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.880	
Sodium Formate	NaHCOO	31.42	31.421	
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.741	
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.520	
Deionized Water	H_2O	400.00	400.0	1459.6 g/ flask
			455.3	

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5	1736.1 g/ flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	407.59	407.6	
Sodium Nitrite	$NaNO_2$	317.37	317.4	
Water	H_2O	200.00	200.0	2655.3 g/flask
Add and Mix thoroughly.			919.2	

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM	2296.43	2267.2	3114.5 g/ flask

Record the Final Weight 2726.4

Density: 1.363

Measure the pH 10.18

Adjust the Final Solution to pH = 10 by titrating back with sulfuric acid (as necessary).

Comments: Let stir in shaker overnight. Measured pH 10.18 7/14/06
Adjusted pH to 9.99 w/ sulfuric acid

A-60

QA APPROVED
NAME: Oldum
DATE: 7-14-06

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH 11 RPP-RPT-31680 Rev 0
BASE SOLUTION: April 2005 Version

Balance Device ID No: 0020 NIST Weight (10 g): ~~N/A~~
Balance Device ID No: 0018 NIST Weight (150 g):

Prepared By: Jesse Rhodes Date Prepared: 7/13/06

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.6
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.961
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	0.317
Cesium Nitrate	$CsNO_3$	0.054	0.056
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	0.228
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.468
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	0.289
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.239
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	0.525
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.08	4.056
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	0.585
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.259
Potassium Nitrate	KNO_3	9.20	9.204
Strontium Nitrate	$Sr(NO_3)_2$	0.032	0.036
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	0.425
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	0.389
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.519
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.322
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.860
Glycolic Acid	$C_2H_4O_3$	53.86	53.857
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.88	18.882
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.141
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.084
Boric Acid	H_3BO_3	0.40	0.398
Sodium Chloride	NaCl	11.68	11.684
Sodium Fluoride	NaF	0.58	0.579
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.104
Sodium Sulfate	Na_2SO_4	24.40	24.399
Potassium Molibdate	K_2MoO_4	0.18	0.184
	SUM	604.9660	602.7

388.4 g/flask

991.1 g/flask

In a SEPARATE Container, Mix the Following:

Sodium Hydroxide	NaOH	30.52	30.529
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.738
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.882
Sodium Formate	NaHCOO	31.42	31.426
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.742
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.526
Deionized Water	H_2O	400.00	399.7
	SUM	488.82	486.8

1477.9 g/ flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5

1770.6 g/ flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.6
Sodium Nitrite	$NaNO_2$	165.58	165.6
Water	H_2O	200.00	204.3
Add and Mix thoroughly.	Sum	960.16	955.6

2726.2 g/ flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM OF ALL	2350.46	2337.8

3159.3 g/ flask

Record the Final Weight 2770.9

Density: 1.385

Measure the pH 10.39

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let Stir in Shaker overnight. Measured pH 10.39 7/14/06
Adjusted pH to 10.99 w/ NaOH

QA APPROVED
NAME: Oldum
DATE: 7-14-06

AN-107 Supernate Simulant Recipe for a 4-Liter Batch pH=10 RPP-RPT-31680 Rev 0
BASE SOLUTION: April 2005 Version

END POINT DOUBLE BATC

Balance Device ID No: 0020 **NIST Weight (10 g):** ~~N/A~~
Balance Device ID No: 0018 **NIST Weight (150 g):**

Prepared By: Jesse Rhodes **Date Prepared:** 7/17/06

Tare a large Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams	
Deionized Water	H_2O	800.00	800.0	581.3g/carboy
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2{\cdot}4H_2O$	13.92	13.921	
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3{\cdot}6H_2O$	0.64	0.637	
Cesium Nitrate	$CsNO_3$	0.108	0.107	
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2{\cdot}2.5H_2O$	0.44	0.441	
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3{\cdot}9H_2O$	48.92	48.921	
Lanthanum Nitrate	$La(NO_3)_3{\cdot}6H_2O$	0.56	0.561	
Lead Nitrate	$Pb(NO_3)_2$	2.48	2.479	
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2{\cdot}6H_2O$	1.04	1.038	
Manganous Chloride, 4-Hydrate	$MnCl_2{\cdot}4H_2O$	8.12	8.123	
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3{\cdot}6H_2O$	1.16	1.159	
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	10.52	10.522	
Potassium Nitrate	KNO_3	18.40	18.399	
Strontium Nitrate	$Sr(NO_3)_2$	0.064	0.0643	
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2{\cdot}6H_2O$	0.84	0.839	
Zirconyl Nitrate	$ZrO(NO_3)_2{\cdot}xH_2O$	0.76	0.760	
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	29.04	29.039	
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	8.64	8.641	
Sodium Gluconate	$C_6H_{11}NaO_7$	15.72	15.721	
Glycolic Acid	$C_2H_4O_3$	107.72	107.717	
Citric Acid Monohydrate	$C_6H_8O_7{\cdot}H_2O$	37.76	37.760	
Nitrilotriacetic Acid	$C_6H_9NO_6$	2.28	2.282	
Iminodiacetic Acid	$HN(CH_2COOH)_2$	24.16	24.162	
Boric Acid	H_3BO_3	0.80	0.800	
Sodium Chloride	NaCl	23.36	23.357	
Sodium Fluoride	NaF	1.16	1.159	
Sodium Chromate	$Na_2Cr_2O_4$	2.20	2.200	
Sodium Sulfate	Na_2SO_4	48.80	48.799	
Potassium Molibdate	K_2MoO_4	0.36	0.361	1788.7g/carboy
			1207.4g	
In a SEPARATE Container, Mix the Following:				
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3{\cdot}9H_2O$	21.48	21.483	
Sodium Phosphate, 12-Hydrate	$Na_3PO_4{\cdot}12H_2O$	17.76	17.759	
Sodium Formate	NaHCOO	62.84	62.840	
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	9.48	9.481	
Sodium Oxalate	$Na_2C_2O_4$	5.04	5.042	
Deionized Water	H_2O	800.00	803.6	2705.7g/carboy
			917.0g	

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	593.00	593.0	3270.5g/carboy

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	815.18	815.2
Sodium Nitrite	$NaNO_2$	634.74	634.7
Water	H_2O	400.00	401.8
			1837.2g

Add and Mix thoroughly. 5107.7g/carboy

Mix thoroughly and dilute to the 4-Liter mark in the Volumetric Flask.

SUM 4569.50 4526.4

Record the Final Weight 5447.2

Density: 1.362

Measure the pH 10.24

Adjust the Final Solution to pH = 10 by titrating back with sulfuric acid (as necessary).

Comments: Let stir in shaker overnight. Measured pH 10.24 7/18/06
Adjusted pH to 9.98 using sulfuric acid

A-62

QA APPROVED
NAME: Cldun
DATE: 7-26-06

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH 9.5 RPP-RPT-31680 Rev 0
BASE SOLUTION: April 2005 Version

END POINT

Balance Device ID No: 0020 NIST Weight (10 g): N/A
Balance Device ID No: 0018 NIST Weight (150 g):

Prepared By: Jesse Rhodes Date Prepared: 7/19/06

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams	
Deionized Water	H_2O	400.00	400.50	388.2g/ flask
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.962	
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	0.319	
Cesium Nitrate	$CsNO_3$	0.054	0.0557	
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	0.218	
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.465	
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	0.281	
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.239	
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	0.518	
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.062	
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	0.581	
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.257	
Potassium Nitrate	KNO_3	9.20	9.199	
Strontium Nitrate	$Sr(NO_3)_2$	0.032	0.0318	
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	0.421	
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	0.382	
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	14.52	14.520	
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.322	
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.858	
Glycolic Acid	$C_2H_4O_3$	53.86	53.859	
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.879	
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.139	
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.081	
Boric Acid	H_3BO_3	0.40	0.400	
Sodium Chloride	NaCl	11.68	11.681	
Sodium Fluoride	NaF	0.58	0.579	
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.102	
Sodium Sulfate	Na_2SO_4	24.40	24.401	
Potassium Molybdate	K_2MoO_4	0.18	0.178	
			603.2g	991.4g/flask
In a SEPARATE Container, Mix the Following:				
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.738	
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.882	
Sodium Formate	NaHCOO	31.42	31.421	
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.738	
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.518	
Deionized Water	H_2O	400.00	399.50	1447.4g/flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask. 456.0g

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.50	1737.1g/flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	407.59	407.60	
Sodium Nitrite	$NaNO_2$	317.37	317.40	
Water	H_2O	200.00	199.70	2656.5g/flask

Add and Mix thoroughly. 919.40g

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM 2284.75 2268.30

Record the Final Weight 2737.4

Density: 1.369

Measure the pH 10.22

Adjust the Final Solution to pH = 9.5 by titrating back with sulfuric acid (as necessary).

Comments: Let Stir in shaker overnight. Measured pH 10.22 7/20/06
Adjusted pH to 9.50 using sulfuric acid

QA APPROVED
NAME: Cldun
DATE: 7-26-06

A-6.3

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH 11 RPP-RPT-31680 Rev 0
BASE SOLUTION: April 2005 Version

Balance Device ID No: 0020 NIST Weight (10 g):
Balance Device ID No: 0018 NIST Weight (150 g): N/A

Prepared By: Jesse Rhodes Date Prepared: 7/20/06

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	399.5
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.961
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	0.319
Cesium Nitrate	$CsNO_3$	0.054	0.057
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	0.221
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.457
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	0.279
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.244
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	0.520
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.063
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	0.581
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	5.26	5.258
Potassium Nitrate	KNO_3	9.20	9.198
Strontium Nitrate	$Sr(NO_3)_2$	0.032	0.034
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	0.418
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	0.382
EDTA, Ethylenediaminetetraacetate	Na_4EDTA	14.52	14.518
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.318
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.859
Glycolic Acid	$C_2H_4O_3$	53.86	53.860
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.880
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.140
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.079
Boric Acid	H_3BO_3	0.40	0.400
Sodium Chloride	NaCl	11.68	11.680
Sodium Fluoride	NaF	0.58	0.578
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.099
Sodium Sulfate	Na_2SO_4	24.40	24.401
Potassium Molibdate	K_2MoO_4	0.18	0.180
	SUM	604.9860	602.90 g

389.7 g/ Flask

992.6 g/ Flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.523
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.738
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.878
Sodium Formate	NaHCOO	31.42	31.421
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.739
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.518
Deionized Water	H_2O	400.00	401.10
	SUM	488.82	488.40 g

1481.0 g/ Flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.50

1774.7 g/ Flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.60
Sodium Nitrite	$NaNO_2$	165.58	165.60
Water	H_2O	200.00	202.40
Add and Mix thoroughly.	Sum	960.16	957.30 g

2732.0 g/flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM OF ALL	2350.46

Record the Final Weight 2773.80

Density: 1.387

3163.5 g/ Flask

Measure the pH 10.36

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let stir in shaker overnight. Measured pH 10.36 7/21/06
Adjusted pH to 11.00 using NaOH

QA APPROVED
NAME: Cadum
DATE: 7-26-06

AN-107 Supernate Simulant Recipe for a 2 [redacted] 680 Rev 0
BASE SOLUTION: April 2005 Version

END POINT

Balance Device ID No: 0020 NIST Weight (10 g): ~~N/A~~
Balance Device ID No: 0018 NIST Weight (150 g):

Prepared By: Jesse Rhodes Date Prepared: 7/21/06

Tare a Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams	
Deionized Water	H_2O	400.00	400.50	388.9 g/ Flask
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.961	
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	0.319	
Cesium Nitrate	$CsNO_3$	0.054	0.0546	
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	0.221	
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.463	
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	0.279	
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.238	
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	0.518	
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.062	
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	0.582	
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.259	
Potassium Nitrate	KNO_3	9.20	9.197	
Strontium Nitrate	$Sr(NO_3)_2$	0.032	0.034	
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	0.417	
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	0.378	
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	14.52	14.518	
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.318	
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.859	
Glycolic Acid	$C_2H_4O_3$	53.88	53.858	
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.88	18.878	
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.141	
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.079	
Boric Acid	H_3BO_3	0.40	0.399	
Sodium Chloride	NaCl	11.68	11.681	
Sodium Fluoride	NaF	0.58	0.580	
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.100	
Sodium Sulfate	Na_2SO_4	24.40	24.401	
Potassium Molibdate	K_2MoO_4	0.18	0.182	992.8 g/ flask
			603.90 g	
In a SEPARATE Container, Mix the Following:				
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.742	
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.801	
Sodium Formate	NaHCOO	31.42	31.417	
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.738	
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.521	
Deionized Water	H_2O	400.00	399.90	1448.9 g/ flask
			456.10 g	

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.50	1731.2 g/flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	407.59	407.60	
Sodium Nitrite	$NaNO_2$	317.37	317.40	
Water	H_2O	200.00	204.00	2654.4 g/flask
			929.20 g	

Add and Mix thoroughly.

Mix thoroughly and dilute to the 4-Liter mark in the Volumetric Flask.

SUM	2284.75	2265.50 g	3114.60/ flask

Record the Final Weight 2725.5 g

Density: 1.363

Measure the pH 10.28

Adjust the Final Solution to pH = 10 by titrating back with sulfuric acid (as necessary).

Comments: Let stir in shaker overnight. Measured pH 10.28 7/22/06
Adjusted pH to 10.01 using sulfuric acid 7-65

QA APPROVED
NAME: Oldum
DATE: 7-26-06

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH 11 RPP-RPT-31680 Rev 0
BASE SOLUTION: April 2006 Version

Balance Device ID No: 0020 NIST Weight (10 g):
Balance Device ID No: 0018 NIST Weight (150 g): N/A

Prepared By: Jesse Rhodes Date Prepared: 7/31/06

Tare a 2-liter Volumetric Flask and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	400.00	400.1
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.963
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	0.320
Cesium Nitrate	$CsNO_3$	0.054	0.056
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	0.219
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.461
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	0.278
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.242
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	0.519
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.059
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	0.578
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2 \cdot 6H_2O$	5.26	5.262
Potassium Nitrate	KNO_3	9.20	9.202
Strontium Nitrate	$Sr(NO_3)_2$	0.032	0.032
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	0.424
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	0.379
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	14.52	14.521
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.320
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.863
Glycolic Acid	$C_2H_4O_3$	53.86	53.860
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.881
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.144
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.079
Boric Acid	H_3BO_3	0.40	0.401
Sodium Chloride	NaCl	11.68	11.679
Sodium Fluoride	NaF	0.58	0.583
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.103
Sodium Sulfate	Na_2SO_4	24.40	24.397
Potassium Molibdate	K_2MoO_4	0.18	0.184
	SUM	604.9860	602.90

384.3g/flask

987.2g/flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	30.525
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.741
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.877
Sodium Formate	NaHCOO	31.42	31.415
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.740
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.516
Deionized Water	H_2O	400.00	399.0
	SUM	488.82	485.60

1472.8g/flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.50

1766.3g/flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.60
Sodium Nitrite	$NaNO_2$	165.58	165.60
Water	H_2O	200.00	202.40
Add and Mix thoroughly.	Sum	960.16	955.80

2722.1g/flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

	SUM OF ALL	2350.46

2337.80

Record the Final Weight 2769.4

Density: 1.385

3153.7g/flask

Measure the pH 10.34

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

QA APPROVED

Comments: Let Stir in shaker overnight. Measured pH 10.34 8/1/06
Adjusted 1L to 11.01 using NaOH. Adjusted 1L to 10.00 using Sulfuric acid.

NAME: Cldum
DATE: 8-15-06

AN-107 Supernate Simulant Recipe for a 4-Liter Batch Recipe 1 RPT-31680 Rev 0
BASE SOLUTION: April 2005 Version Standard

Balance Device ID No: 0020 NIST Weight (10 g):
Balance Device ID No: 0018 NIST Weight (150 g): N/A

Prepared By: Jesse Rhodes Date Prepared: 8/7/06

Tare a Carboy and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	800.00	802.7
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	13.92	13.920
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.64	0.641
Cesium Nitrate	$CsNO_3$	0.108	0.104
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.44	0.455
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	48.92	48.925
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.56	0.561
Lead Nitrate	$Pb(NO_3)_2$	2.48	2.478
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	1.04	1.042
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	8.12	8.123
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	1.16	1.159
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	10.52	10.519
Potassium Nitrate	KNO_3	18.40	18.400
Strontium Nitrate	$Sr(NO_3)_2$	0.064	0.066
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.84	0.841
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.76	0.758
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	29.04	29.039
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	8.64	8.639
Sodium Gluconate	$C_6H_{11}NaO_7$	15.72	15.722
Glycolic Acid	$C_2H_4O_3$	107.72	107.719
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	37.76	37.761
Nitrilotriacetic Acid	$C_6H_9NO_6$	2.28	2.277
Iminodiacetic Acid	$HN(CH_2COOH)_2$	24.16	24.163
Boric Acid	H_3BO_3	0.80	0.800
Sodium Chloride	NaCl	23.36	23.361
Sodium Fluoride	NaF	1.16	1.160
Sodium Chromate	$Na_2Cr_2O_4$	2.20	2.202
Sodium Sulfate	Na_2SO_4	48.80	48.799
Potassium Molybdate	K_2MoO_4	0.36	0.362
	SUM	1209.9720	1210.6

577.8 g/ flask

1788.4 g/ Flask

In a SEPARATE Container, Mix the Following:

[illegible]	[illegible]	[illegible]	61.039
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	21.48	21.478
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	17.76	17.757
Sodium Formate	NaHCOO	62.84	62.843
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	9.48	9.483
Sodium Oxalate	$Na_2C_2O_4$	5.04	5.041
Deionized Water	H_2O	800.00	799.9
	SUM	977.64	975.0

2763.4 g/ flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	593.00	593.0

3347.7 g/ flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	1189.16	1189.2
Sodium Nitrite	$NaNO_2$	331.16	331.2
Water	H_2O	400.00	402.2
Add and Mix thoroughly.	Sum	1920.32	1911.8

5259.5 g/ flask

Mix thoroughly and dilute to the 4-Liter mark in the Volumetric Flask.

SUM OF ALL	4700.93

Record the Final Weight 5569.3

Density: 1.392

6147.[illegible] g/ flask

QA APPROVED
NAME: Cldum
DATE: 8-15-06

Measure the pH 10.51

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let Stir in Shaker overnight. Measured pH 10.51 8/8/06
Adjusted pH to 11.00 using NaOH

A-67

(6)

AN-107 Supernate Simulant Recipe for a ~~4-Liter Batch~~ RPP-RPT-31680 Rev 0
BASE SOLUTION: April 2005 Version Standard

Balance Device ID No: 0020 NIST Weight (10 g):
Balance Device ID No: 0018 NIST Weight (150 g): N/A

Prepared By: Jesse Rhodes Date Prepared: 8/7/06

Tare a Carboy and then Add the Following, In Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams
Deionized Water	H_2O	800.00	801.6
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	13.92	13.919
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.64	0.636
Cesium Nitrate	$CsNO_3$	0.108	0.107
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.44	0.449
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	48.92	48.918
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.56	0.555
Lead Nitrate	$Pb(NO_3)_2$	2.48	2.477
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2.6H_2O$	1.04	1.038
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	8.12	8.116
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	1.16	1.163
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	10.52	10.517
Potassium Nitrate	KNO_3	18.40	18.404
Strontium Nitrate	$Sr(NO_3)_2$	0.064	0.068
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.84	0.839
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.76	0.761
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	29.04	29.043
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	8.64	8.636
Sodium Gluconate	$C_6H_{11}NaO_7$	15.72	15.718
Glycolic Acid	$C_2H_4O_3$	107.72	107.717
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	37.76	37.761
Nitrilotriacetic Acid	$C_6H_9NO_6$	2.28	2.277
Iminodiacetic Acid	$HN(CH_2COOH)_2$	24.16	24.160
Boric Acid	H_3BO_3	0.80	0.799
Sodium Chloride	NaCl	23.36	23.360
Sodium Fluoride	NaF	1.16	1.162
Sodium Chromate	$Na_2Cr_2O_4$	2.20	2.196
Sodium Sulfate	Na_2SO_4	48.80	48.803
Potassium Molybdate	K_2MoO_4	0.36	0.358
	SUM	1209.9720	1209.0

577.7 g/ carboy

1786.7 g/ carboy

In a SEPARATE Container, Mix the Following:

[illegible]			61.041
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	21.48	21.479
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	17.76	17.760
Sodium Formate	NaHCOO	62.84	62.837
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	9.48	9.482
Sodium Oxalate	$Na_2C_2O_4$	5.04	5.036
Deionized Water	H_2O	800.00	800.6
	SUM	977.64	976.0

2762.7 g/ carboy

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	593.00	593.0

3347.9 g/ carboy

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	1189.18	1189.2
Sodium Nitrite	$NaNO_2$	331.16	331.2
Water	H_2O	400.00	401.2
Add and Mix thoroughly.	Sum	1920.32	1908.9

5256.8 g/ carboy

Mix thoroughly and dilute to the 4-Liter mark in the Volumetric Flask.

SUM OF ALL	4700.93

Record the Final Weight 5540.6

Density: 1.385

6118.3 g/ carboy

Measure the pH 10.41

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let Stir in shaker overnight. Measured pH 10.41 8/8/06
Adjusted 2L to 11.01 using NaOH. Adjusted 2L ~~to~~ 10.01 using sulfuric acid

QA APPROVED
NAME: Cldunn
DATE: 8-15-06

A-6.8

AN-107 Supernate Simulant Recipe for a 2-Liter Batch, pH 12 RPP-RPT-31680 Rev 0
BASE SOLUTION: April 2005 Version 0.2M Chloride

Balance Device ID No: 0020 NIST Weight (10 g):
Balance Device ID No: 0018 NIST Weight (150 g): N/A

Prepared By: Jesse Rhodes Date Prepared: 8/8/06

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams	
Deionized Water	H_2O	400.00	399.8	385.0 g/flask
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2.4H_2O$	6.96	6.956	
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3.6H_2O$	0.32	0.319	
Cesium Nitrate	$CsNO_3$	0.054	0.055	
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2.2.5H_2O$	0.22	0.224	
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3.9H_2O$	24.46	24.460	
Lanthanum Nitrate	$La(NO_3)_3.6H_2O$	0.28	0.281	
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.235	
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3).6H_2O$	0.52	0.519	
Manganous Chloride, 4-Hydrate	$MnCl_2.4H_2O$	4.06	4.055	
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3.6H_2O$	0.58	0.577	
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.28	5.261	
Potassium Nitrate	KNO_3	9.20	9.203	
Strontium Nitrate	$Sr(NO_3)_2$	0.032	0.0303	
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2.6H_2O$	0.42	0.421	
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	0.379	
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	14.52	14.520	
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.321	
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.860	
Glycolic Acid	$C_2H_4O_3$	53.86	53.861	
Citric Acid Monohydrate	$C_6H_8O_7.H_2O$	18.88	18.881	
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.140	
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.077	
Boric Acid	H_3BO_3	0.40	0.400	
Sodium Chloride	NaCl	23.36	23.363	
Sodium Fluoride	NaF	0.58	0.582	
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.103	
Sodium Sulfate	Na_2SO_4	24.40	24.398	
Potassium Molybdate	K_2MoO_4	0.18	0.182	
	SUM	616.67	615.4	1000.4 g/flask

In a SEPARATE Container, Mix the Following:

[redacted]	[redacted]	[redacted]	30.527	
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3.9H_2O$	10.74	10.739	
Sodium Phosphate, 12-Hydrate	$Na_3PO_4.12H_2O$	8.88	8.882	
Sodium Formate	NaHCOO	31.42	31.422	
Sodium Acetate Trihydrate	$NaCH_3COO.3H_2O$	4.74	4.739	
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.517	
Deionized Water	H_2O	400.00	401.2	
	SUM	488.82	487.8	1488.2 g/flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5	1781.7 g/flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	594.58	594.6	
Sodium Nitrite	$NaNO_2$	165.58	165.6	
Water	H_2O	200.00	202.4	
Add and Mix thoroughly.	Sum	960.16	962.1	2733.8 g/flask

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM OF ALL	2362.14	2348.8

Record the Final Weight 2779.8

Density: 1.390 3164.8 g/flask

Measure the pH 10.52

Adjust the Final Solution to pH = 11 by progressively adding 2 g of sodium hydroxide (NaOH) up to 20g. MIX THOROUGHLY after any addition of sodium hydroxide and measure pH.

Comments: Let stir in shaker overnight. Measured pH 10.52 8/9/06
Adjusted pH to 11.00 using NaOH

QA APPROVED
NAME: Cldum
DATE: 8-15-06

AN-107 Supernate Simulant Recipe for a [redacted]680 Rev 0
BASE SOLUTION: April 2005 Version

END POINT
0.2M Chloride

Balance Device ID No: 0020 NIST Weight (10 g):
Balance Device ID No: 0018 NIST Weight (150 g): N/A

Prepared By: Jesse Rhodes Date Prepared: 8/10/06

Tare a 2-liter Volumetric Flask and then Add the Following, in Order:

Compound	Formula	Mass Required, grams	Actual Mass Used, grams	
Deionized Water	H_2O	400.00	400.3	379.6 g/flask
Calcium Nitrate, 4-Hydrate	$Ca(NO_3)_2 \cdot 4H_2O$	6.96	6.961	
Cerium Nitrate, 6-Hydrate	$Ce(NO_3)_3 \cdot 6H_2O$	0.32	0.322	
Cesium Nitrate	$CsNO_3$	0.054	0.056	
Copper Nitrate, 2.5-Hydrate	$Cu(NO_3)_2 \cdot 2.5H_2O$	0.22	0.217	
Ferric Nitrate, 9-Hydrate	$Fe(NO_3)_3 \cdot 9H_2O$	24.46	24.456	
Lanthanum Nitrate	$La(NO_3)_3 \cdot 6H_2O$	0.28	0.275	
Lead Nitrate	$Pb(NO_3)_2$	1.24	1.239	
Magnesium Nitrate, 6-Hydrate	$Mg(NO_3)_2 \cdot 6H_2O$	0.52	0.518	
Manganous Chloride, 4-Hydrate	$MnCl_2 \cdot 4H_2O$	4.06	4.057	
Neodymium Nitrate, 6-Hydrate	$Nd(NO_3)_3 \cdot 6H_2O$	0.58	0.580	
Nickel Nitrate, 6-Hydrate	$Ni(NO3)2.6H_2O$	5.26	5.259	
Potassium Nitrate	KNO_3	9.20	9.202	
Strontium Nitrate	$Sr(NO_3)_2$	0.032	0.0328	
Zinc Nitrate, 6-Hydrate	$Zn(NO_3)_2 \cdot 6H_2O$	0.42	0.419	
Zirconyl Nitrate	$ZrO(NO_3)_2 \cdot xH_2O$	0.38	0.382	
EDTA, Ethylenediaminetetraacetate	Na_2EDTA	14.52	14.519	
HEDTA, n-Hydroxyethylenediamine triacetate	HEDTA	4.32	4.320	
Sodium Gluconate	$C_6H_{11}NaO_7$	7.86	7.860	
Glycolic Acid	$C_2H_4O_3$	53.86	53.860	
Citric Acid Monohydrate	$C_6H_8O_7 \cdot H_2O$	18.88	18.876	
Nitrilotriacetic Acid	$C_6H_9NO_6$	1.14	1.143	
Iminodiacetic Acid	$HN(CH_2COOH)_2$	12.08	12.081	
Boric Acid	H_3BO_3	0.40	0.400	
Sodium Chloride	NaCl	23.36	23.360	
Sodium Fluoride	NaF	0.58	0.583	
Sodium Chromate	$Na_2Cr_2O_4$	1.10	1.105	
Sodium Sulfate	Na_2SO_4	24.40	24.397	
Potassium Molibdate	K_2MoO_4	0.18	0.177	994.9 g/flask
In a SEPARATE Container, Mix the Following:				
Aluminum Nitrate, 9-Hydrate	$Al(NO_3)_3 \cdot 9H_2O$	10.74	10.738	
Sodium Phosphate, 12-Hydrate	$Na_3PO_4 \cdot 12H_2O$	8.88	8.880	
Sodium Formate	NaHCOO	31.42	31.419	
Sodium Acetate Trihydrate	$NaCH_3COO \cdot 3H_2O$	4.74	4.740	
Sodium Oxalate	$Na_2C_2O_4$	2.52	2.518	
Deionized Water	H_2O	400.00	400.3	1450.7 g/flask

Mix Thoroughly. Then Add this Solution to the Volumetric Flask.

After the Addition to the Volumetric Flask, Add the Following:

Sodium Carbonate	Na_2CO_3	296.50	296.5	1730.3 g/flask

Mix Thoroughly

Next, Mix the Following:

Sodium Nitrate	$NaNO_3$	407.59	407.6	
Sodium Nitrite	$NaNO_2$	317.37	317.4	
Water	H_2O	200.00	203.4	2658.4 g/flask

Add and Mix thoroughly.

Mix thoroughly and dilute to the 2-Liter mark in the Volumetric Flask.

SUM	2296.43	2278.8	
			3115.6 g/flask

Record the Final Weight 2736 g

Density: 1.368

Measure the pH 10.33

QA APPROVED
NAME: Cldew
DATE: 8-15-06

Adjust the Final Solution to pH = 10 by titrating back with sulfuric acid (as necessary).

Comments: Let Stir in Shaker overnight. Measured pH 10.33 8/11/06
Adjusted pH to 10.01 using sulfuric acid

Appendix B: CPP Testing Information Forms

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

CCT QA-Approval

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		12/01/2005
Material type:	Carbon Steel A537-CL2	Time start:		5:14 pm
Material ID:	1079	Data File:	OCP	#1EDH12 .cor
Specimen ID:	D9019-16		CPP	

Solution:	Modified AN-107 Tank Waste Simulant	Atmosphere::	Naturally aerated
Temperature	50±2 °C 122±4 °F	Reference Electrode:	SCE
Initial pH:	11.92 @ Room temperature	Final pH:	
Starting Potential:	V	Scan Rate:	mV/s
Reverse Current	~~Ecorr test~~ µA mA A		
Reverse Potential	V	Final Potential:	V

Sample Length:	1.250	in	cm
Sample Diameter:	0.186	in	cm
Sample Area:	0.758	in^2 4.89	cm^2

CURVE SINGULARITIES

ID	E vs. Ref (V)	I (A/cm2)	ID	E vs. Ref (V)	I (A/cm2)

COMMENTS:

Solution batch identified as: ARES107
DIN=12
batch = 11-30-2005

QA APPROVED
NAME: C L Quinn
DATE: 12-14-05

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 12/02/2005 Time end: 12:00 pm

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

CCT QA-Approval

Project name:	ARES AN-107	Project #:	R5062-03R (Part 2)
Test Type:	Cyclic Potentiodynamic Polarization	Date start:	12/08/2005
Material type:	Carbon Steel A537-CL2	Time start:	3:40 pm
Material ID:	1079	Data File:	OCP: #18EPH13.COT
Specimen ID:	DQ019 – 18		CPP. #18-pscanph13.COT

Solution:	Modified AN-107 Tank Waste Simulant	Atmosphere::	Naturally aerated
Temperature	50 ± 2 °C 122 ± 3 °F	Reference Electrode:	SCE
Initial pH:	12.98 @ Room temp.	Final pH:	13.23 @ Room temp.
Starting Potential:	-0.5V vs. SCE V	Scan Rate:	0.17 mV/s
Reverse Current	4.86x103 µA 4.86 mA 0.00486 A		
Reverse Potential	+1 V vs. SCE V	Final Potential:	-0.5V vs. SCE V

Sample Length:	1.252	in	cm
Sample Diameter:	0.186	in	cm
Sample Area:	0.759	in^2 4.90	cm^2

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

ARES Solution batch identified as: ARES AN107 pH = 13 12-7-05

Note: initial pH was 12.98.

QA APPROVED
NAME: C. Quinn
DATE: 12-14-05

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 12/09/2005 Time end: 1:30pm.

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

CCT QA-Approval

Project name:	ARES AN-107	Project #:	R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:	12/08/2005
Material type:	Carbon Steel A537-CL2	Time start:	3:49 pm
Material ID:	1079	Data File:	OCP #17 E pH 12. Dat
Specimen ID:	D9019-17		

Solution:	Modified AN-107 Tank Waste Simulant	Atmosphere::	Naturally aerated
Temperature	50 ± 2 °C 122 ± 4 °F	Reference Electrode:	SCE
Initial pH:	12.0 @ room temperature	Final pH:	
Starting Potential:	V	Scan Rate:	mV/s
Reverse Current	~~Ecorr test~~ µA mA A		
Reverse Potential	V	Final Potential:	V

Sample Length:	1.249	in		cm
Sample Diameter:	0.185	in		cm
Sample Area:	0.753	in^2	4.86	cm^2

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

ARES Solution batch identified as: ARES 107 AN107 pH=12 12-7-05

QA APPROVED
NAME: CL Quinn
DATE: 12-14-05

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: ~~12-8-05~~ 12/09/2005 Time end: ~~9:2~~ 10:00 am.

CCT QA-Approval

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		12/14/2005
Material type:	Carbon Steel A537-CL2	Time start:		4:13 pm
Material ID:	1079	Data File:	OCP	#20-Ephl2.cor
Specimen ID:	D9019-20		CPP	

Solution:	Modified AN-107 Tank Waste Simulant	Atmosphere::	Naturally aerated
Temperature	50 ± 2 °C 122 ± 4 °F	Reference Electrode:	SCE
Initial pH:	12 @ room temp.	Final pH:	11.53 @ Room Temp
Starting Potential:	V	Scan Rate:	mV/s
Reverse Current	OCP µA mA A		
Reverse Potential	V	Final Potential:	V

Sample Length:	1.246	in		cm
Sample Diameter:	0.185	in		cm
Sample Area:	0.751	in^2	4.85	cm^2

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

ARES Solution identified as: ARES AN107
pH = 12
12/13/2005

Potentiostat, CCT inventory # 006

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 12/15/2005 Time end: 12:00pm

QA APPROVED
NAME: Cldunn
DATE: 1-19-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

CCT QA-Approval

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		01/11/2006
Material type:	Carbon Steel A537-CL2	Time start:		4:00pm (purging started)
Material ID:	1079	Data File:	OCP	#21-E-PH12.cor
Specimen ID:	#D9019-21		CPP	#21-PscanPH12.cor

Solution:	Modified AN-107 Tank Waste Simulant	Atmosphere::	N_2 Purged
Temperature	50±2 °C 125±4 °F	Reference Electrode:	SCE
Initial pH:	12	Final pH:	11.48 at Room Temp
Starting Potential:	−0.5 V vs. SCE	Scan Rate:	0.17 mV/s
Reverse Current	4890 µA 4.89 mA 0.00489 A		
Reverse Potential	+1 V vs. SCE	Final Potential:	−0.5 V vs. SCE

Sample Length:	1.251	in		cm
Sample Diameter:	0.86	in		cm
Sample Area:	0.758	in²	4.89	cm²

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

ARES solution batch identified as: ARES AN107
PH=12
1-11-06

Potentiostat: CCT inventory # 0006 (blue tag)

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 01/12/2006 Time end: 4:00pm QA APPROVED

NAME: Cldum

DATE: 1-19-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

CCT QA-Approval

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		1/11/2006
Material type:	Carbon Steel A537-CL2	Time start:		5:00 pm / purging started
Material ID:	1079	Data File:	OCP	#22-E-PH 13.wr
Specimen ID:	#D9019-22		CPP	#22-PscanPH13.wr

Solution:	Modified AN-107 Tank Waste Simulant	Atmosphere::	N_2 purged
Temperature	50±2 °C 125±4 °F	Reference Electrode:	SCE
Initial pH:	13 @ Room temp	Final pH:	13.03 @ Room temp
Starting Potential:	-0.5 V vs. SCE	Scan Rate:	0.17 mV/s
Reverse Current	µA mA A		
Reverse Potential	+1 V vs. SCE	Final Potential:	-0.5 V vs. SCE

Sample Length:	1.250	in		cm
Sample Diameter:	0.85	in		cm
Sample Area:	0.753	in^2	4.86	cm^2

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

ARES solution batch identified as: ARES AN107 PH=13 1-11-06

potentiostat: CCT inventory # 2017 (OCP)

CCT inventory # = 0006 (CPP)

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 01/12/2006 Time end: 4:00 pm

QA APPROVED

NAME: CLOwen

DATE: 1-19-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

CCT QA-Approval

PH=10 End Point Solu

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		01/19/2006
Material type:	Carbon Steel A537-CL2	Time start:		10:40 (N2 Purging Started)
Material ID:	1079	Data File:	OCP	#23-EPH10.cor
Specimen ID:	#D9019-23		CPP	#23-pscanpH10.cor

Solution:	Modified AN-107 Tank Waste Simulant (end points)	Atmosphere::	N2 Purged
Temperature	50±2 °C 122±4 °F	Reference Electrode:	SCE
Initial pH:	10.10 @ Room temp	Final pH:	10.18 @ Room temp
Starting Potential:	-0.5 V vs. SCE	Scan Rate:	0.17 mV/s
Reverse Current	890 µA 0.89 mA 0.00089 A		
Reverse Potential	+1 V vs. SCE	Final Potential:	-0.5 V vs. SCE

Sample Length:	1.250	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.758	in²	4.89	cm²

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

ARES solution batch identified as: ARES AN107 End point PH=10 1-18-06

Potentiostat: CCT inventory #: ~~[illegible]~~ 0006

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 01/20/06 Time end: 2:00 pm

QA APPROVED

NAME: [illegible]

DATE: 1-24-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

CCT QA-Approval

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		01/20/06
Material type:	Carbon Steel A537-CL2	Time start:		3:00 N2 purging started
Material ID:	1079	Data File:	OCP	#25-EPH11.CUT
Specimen ID:	#D9019-25		CPP	#25-PScan PH11.CUT

Solution:	Modified AN-107 Tank Waste Simulant pH=11 without NO2	Atmosphere::	N2 purged
Temperature	50 ± 2 °C 122 ± 4 °F	Reference Electrode:	SCE
Initial pH:	10.98 @ Room T	Final pH:	10.99 @ Room T
Starting Potential:	-0.5 V vs. SCE	Scan Rate:	0.17 mV/s
Reverse Current	4880 µA 4.88 mA 0.004888 A		
Reverse Potential	+1 V vs. SCE	Final Potential:	-0.5 V vs. SCE

Sample Length:	1.249	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.757	in^2	4.88	cm^2

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

ARES AN107 Solution batch identified as:
ARES AN107
pH=11 (without Nitrite)
01-19-06
Potentiostat: CCT inventory # 0006

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 01/23/2006 **Time end:** 9:30

QA APPROVED

NAME: Cldm

DATE: 1-24-06

End point second ran

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

CCT QA-Approval

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		02/02/2006
Material type:	Carbon Steel A537-CL2	Time start:		200 pm (N2 purging started)
Material ID:	1079	Data File:	OCP	#26-Ephio.cor
Specimen ID:	#D9019-26		CPP	#26-pscan phio.cor

Solution:	Modified AN-107 Tank Waste Simulant end point	Atmosphere::	N2 purged
Temperature	50 ± 2 °C 122 ± 4 °F	Reference Electrode:	SCE
Initial pH:	10.10	Final pH:	10.18
Starting Potential:	-0.5 V vs. SCE	Scan Rate:	0.17 mV/s
Reverse Current	489 µA 4.89 mA 0.00489 A		
Reverse Potential	+0.4 V vs. SCE	Final Potential:	-0.5 V vs. SCE

Sample Length:	1.250	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.758	in^2	4.89	cm^2

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

ARES AN107 solution batch identified as: ARES AN107
PH=10 end point
02-01-2006

potentiostat ID #: 1408
Gamry 750 system

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 02/03/06 Time end: 4:00 pm

QA APPROVED
NAME: Oldum
DATE: 2-6-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

CCT QA-Approval

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		02/07/06
Material type:	Carbon Steel A537-CL2	Time start:		12:45 pm (N2 Purging Started)
Material ID:	1079	Data File:	OCP	#D9019-27-OCP.DTA
Specimen ID:	#D9019-27		CPP	#D9019-27-CPP.DTA

Solution:	Modified AN-107 Tank Waste Simulant TOC = 40g/L	Atmosphere::	N2 purged
Temperature	50±2 °C 122±4 °F	Reference Electrode:	SCE
Initial pH:	11.0	Final pH:	10.81
Starting Potential:	-0.5 V. vs SCE V	Scan Rate:	0.17 mV/s
Reverse Current	4970 µA 4.97 mA 0.00497 A		
Reverse Potential	+1 V vs. SCE V	Final Potential:	-0.5 V. vs SCE V

Sample Length:	1.249	in		cm
Sample Diameter:	0.189	in		cm
Sample Area:	0.770	in^2	4.97	cm^2

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

ARES AN107 solution batch identified as: ARES AN107
pH=11, TOC=40g/L
02-06-2006

Potentiostat ID: 1408 (Gamry 750)

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 02/08/06 Time end: 1:50 pm

QA APPROVED
NAME: Cldun
DATE: 2-10-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

CCT QA-Approval

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		02/08/06
Material type:	Carbon Steel A537-CL2	Time start:		1:20 pm (N₂ Purging Started)
Material ID:	1079	Data File:	OCP	#D9019-28-OCP.DTA
Specimen ID:	#D9019-28		CPP	#D9019-28-CPP.DTA

Solution:	Modified AN-107 Tank Waste Simulant TOC = 10g/L	Atmosphere::	N_2 Purged
Temperature	50 ± 2 °C 122 ± 4 °F	Reference Electrode:	SCE
Initial pH:	11.0	Final pH:	10.72
Starting Potential:	−0.5 V. vs. SCE V	Scan Rate:	0.17 mV/s
Reverse Current	4890 μA 4.89 mA 0.00489 A		
Reverse Potential	+1 V vs. SCE V	Final Potential:	−0.5 V. vs SCE V

Sample Length:	1.250	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.758	in²	4.89	cm²

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

ARES AN107 solution batch identified as: ARES AN107
pH=11, TOC=10g/L
02-07-06

potentiostat ID: 1408 (Gamry 750)

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 02/09/06 Time end: 1:25 pm

QA APPROVED
NAME: Cldem
DATE: 2-10-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

CCT QA-Approval

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		02/09/06
Material type:	Carbon Steel A537-CL2	Time start:		1:45 pm (N_2 Purging Started)
Material ID:	1079	Data File:	OCP	#D9019-29-OCP. DTA
Specimen ID:	#D9019-29		CPP	#D9019-29-CPP. DTA

Solution:	Modified AN-107 Tank Waste Simulant TOC=40g/L without Nitrite	Atmosphere::	N_2 purged
Temperature	50±2 °C 122±4 °F	Reference Electrode:	SCE
Initial pH:	11.0	Final pH:	10.93
Starting Potential:	−0.5 V vs. Ref V	Scan Rate:	0.17 mV/s
Reverse Current	4930 µA 4.93 mA 0.00493 A		
Reverse Potential	+1 V vs. Ref V	Final Potential:	−0.5 V vs. Ref V

Sample Length:	1.246	in		cm
Sample Diameter:	0.188	in		cm
Sample Area:	0.764	in^2	4.93	cm^2

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

ARES AN107 solution batch identified as: ARES AN107
pH=11, TOC=40g/L
without Nitrite
02-08-2006

potentiostat id: 1408 (Gamry 750)

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 02/10/06 Time end: 11:40

QA APPROVED
NAME: Cldurn
DATE: 2-10-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		02/21/06
Material type:	Carbon Steel A537-CL2	Time start:		2:00 pm (N₂ purging started)
Material ID:	1079	Data File:	OCP	#D9019-30-OCP.DTA
Specimen ID:	#D9019-30		CPP	#D9019-30-CPP.DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=10 end point	Atmosphere::	N₂ purged
Temperature	50±2 °C 122±4 °F	Reference Electrode:	SCE
Initial pH:	10	Final pH:	9.75
Starting Potential:	−0.5 V vs. SCE	Scan Rate:	0.17 mV/s mV/s
Reverse Current	486 µA 4.86 mA 0.00486 A		
Reverse Potential	+0.4 V vs. SCE	Final Potential:	−0.5 V vs. SCE

Sample Length:	1.250	in		cm
Sample Diameter:	0.185	in		cm
Sample Area:	0.753	in²	4.86	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=10 end point 02-20-06
Potantiostat:	Gamry 750
Potentiostat ID:	1408

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

QA APPROVED
NAME: [illegible]
DATE: 3-3-06

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 02/22/06 Time end: 12:30

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		02/21/2006
Material type:	Carbon Steel A537-CL2	Time start:		3:15 pm LN_2 purging started,
Material ID:	1079	Data File:	OCP	#D9019-31-OCP.cor
Specimen ID:	#D9019-31		CPP	#D9019-31-CPP.cor

Solution:	Modified AN-107 Tank Waste Simulant pH=10 end point	Atmosphere::	N_2 purged
Temperature	50±2 °C 122±4 °F	Reference Electrode:	SCE
Initial pH:	10.0	Final pH:	9.70
Starting Potential:	-0.5 V vs. SCE	Scan Rate:	0.17 mV/s
Reverse Current	2890 µA 2.89 mA 0.00289 A		
Reverse Potential	+1 V vs. SCE	Final Potential:	-0.5 V vs. SCE

Sample Length:	~~1.25~~ 1.251	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.758	in^2	4.89	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=10 end point 02-20-2006
Potantiostat:	PAR 273
Potentiostat ID:	0006

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

QA APPROVED
NAME: [illegible]
DATE: 3-3-06

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 02/21/2006 Time end: 4:00 pm

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		02/28/2006
Material type:	Carbon Steel A537-CL2	Time start:		2:05 pm (N_2 purging started)
Material ID:	1079	Data File:	OCP	#D9019-32-OCP.DTA
Specimen ID:	#D9019-32		CPP	#D9019-32-CPP.DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=11, TOC=80g/L without nitrite	Atmosphere::	N_2 - Purged
Temperature	50 ± 2 °C 122 ± 4 °F	Reference Electrode:	SCE
Initial pH:	10.99	Final pH:	10.72
Starting Potential:	-0.15 V vs. SCE	Scan Rate:	0.17 mV/s
Reverse Current	4860 µA 4.86 mA 0.00486 A		
Reverse Potential	+0.4 V vs. SCE	Final Potential:	-0.15 V vs. SCE

Sample Length:	1.250	in		cm
Sample Diameter:	0.185	in		cm
Sample Area:	0.753	in^2	4.86	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 TOC=80g/L Without nitrite, 02-27-06
Potantiostat:	Gamry 750
Potentiostat ID:	1408

CURVE SINGULARITIES

ID	E vs. Ref (V)	I (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

QA APPROVED
NAME: [illegible]
DATE: 3-3-06

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 03/01/06 Time end: 1:10 pm

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		03/02/06
Material type:	Carbon Steel A537-CL2	Time start:		12:45 pm (N2 purging started)
Material ID:	1079	Data File:	OCP	#D9019-33-OCP.DTA
Specimen ID:	#D9019-33		CPP	

Solution:	Modified AN-107 Tank Waste Simulant pH=13.5	Atmosphere::	N2 Purged
Temperature	50±2 °C 122±4 °F	Reference Electrode:	SCE
Initial pH:	13.49	Final pH:	13.71
Starting Potential:	-0.25 V vs. OCP	Scan Rate:	0.17 mV/s
Reverse Current	0.890 µA 0.89 mA 0.00089 A		
Reverse Potential	+0.4 V vs. SCE	Final Potential:	-0.25 V vs. OCP

Sample Length:	1.251	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.758	in^2	4.89	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=13.5 03-01-06
Potantiostat:	Gamry 750
Potentiostat ID:	1408

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:
After CPP test started, temperature went to 90°C due to the problem w/ the thermocouple.

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 03/03/06 Time end: 1:30 pm

QA APPROVED
NAME: Oduro
DATE: 3-21-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		03/07/2006
Material type:	Carbon Steel A537-CL2	Time start:		1:45 pm (N_2 purging started)
Material ID:	1079	Data File:	OCP	#D9019-34-OCP.DTA
Specimen ID:	#D9019-34		CPP	#D9019-34-CPP.DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=11, TOC=80g/L	Atmosphere::	N_2 purged
Temperature	50 ± 2 °C 122 ± 4 °F	Reference Electrode:	SCE
Initial pH:	11	Final pH:	10.97
Starting Potential:	−0.5 V vs. SCE	Scan Rate:	0.17 mV/s
Reverse Current	4880 µA 4.88 mA 0.00488 A		
Reverse Potential	+0.4 V vs. SCE	Final Potential:	−0.5 V vs. SCE

Sample Length:	1.249	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.757	in^2	4.88	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 TOC=80g/L 03-06-2006
Potantiostat:	Gamry 750
Potentiostat ID:	1408

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS: Reverse scan stopped @ +300mV vs SCE, need to be repeated.

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 03/08/2006 Time end: 2:00 pm

QA APPROVED
NAME: Cldum
DATE: 3-21-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		03/09/06
Material type:	Carbon Steel A537-CL2	Time start:		3:30 pm (N_2 purging started)
Material ID:	1079	Data File:	OCP	#D9019-35-OCP.DTA
Specimen ID:	#D9019-35		CPP	#D9019-35-CPP.DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=13.5 2nd run	Atmosphere::	N_2 purged
Temperature	50±2 °C 122±4 °F	Reference Electrode:	SCE
Initial pH:	13.5	Final pH:	13.9
Starting Potential:	-0.6 V vs. SCE	Scan Rate:	0.17 mV/s
Reverse Current	1870 µA 4.87 mA 0.00487 A		
Reverse Potential	0.4 V vs. SCE	Final Potential:	-0.6 V vs. SCE

Sample Length:	1.253	in		cm
Sample Diameter:	0.185	in		cm
Sample Area:	0.755	in^2	4.87	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=13.5 03-08-2006
Potantiostat:	Gamry 750
Potentiostat ID:	1408

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 03/10/06 Time end: 2:00 pm.

QA APPROVED

NAME: Cldum

DATE: 3-21-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		03/16/06
Material type:	Carbon Steel A537-CL2	Time start:		2:00 pm (N_2 purging started)
Material ID:	1079	Data File:	OCP	#D9019-36-OCP.DTA
Specimen ID:	#D9019-36		CPP	#D9019-36-OCP.DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=11 w/o nitrite	Atmosphere::	N_2 purged
Temperature	50±2 °C 122±4 °F	Reference Electrode:	SCE
Initial pH:	11.07	Final pH:	11.05
Starting Potential:	-0.5 V vs. SCE	Scan Rate:	0.17 mV/s
Reverse Current	4950 µA 4.95 mA 0.00495 A		
Reverse Potential	0.4 V vs. SCE	Final Potential:	-0.5 V vs. SCE

Sample Length:	1.252	in		cm
Sample Diameter:	0.188	in		cm
Sample Area:	0.767	in^2	4.95	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 without Nitrite 03-15-06
Potantiostat:	Gamry 750
Potentiostat ID:	1401

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 03/17/06 Time end: 11:30 Am

QA APPROVED

NAME: [illegible]

DATE: 3-21-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		03/21/06
Material type:	Carbon Steel A537-CL2	Time start:		1:10pm (N2 purging Started)
Material ID:	1079	Data File:	OCP	#D9019-37-OCP. DTA
Specimen ID:	#D9019-37		CPP	#D9019-37-CPP. DTA

Solution:	Modified AN-107 Tank Waste Simulant PH=11	Atmosphere::	N_2 purged
Temperature	30±2 °C 122±4 °F	Reference Electrode:	SCE
Initial pH:	11	Final pH:	11.53
Starting Potential:	-0.5 V vs. SCE	Scan Rate:	0.17 mV/s
Reverse Current	4900 µA 4.90 mA 0.00490 A		
Reverse Potential	0.4 V vs. SCE	Final Potential:	-0.5 V vs. SCE

Sample Length:	1.254	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.760	in^2	4.90	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 PH=11 03-20-2006
Potantiostat:	Gamry 750
Potentiostat ID:	1408

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

QA APPROVED
NAME: [illegible]
DATE: 4-11-06

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 03/22/06 Time end: 1:20 pm

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		03/21/06
Material type:	Carbon Steel A537-CL2	Time start:		1:10 pm (N_2 Purging started)
Material ID:	1079	Data File:	OCP	#D9019-38-OCP.cor
Specimen ID:	#D9019-38		CPP	#D9019-38-CPP.cor

Solution:	Modified AN-107 Tank Waste Simulant pH=11	Atmosphere::	N_2 Purged
Temperature	50±2 °C 122±4 °F	Reference Electrode:	SCE
Initial pH:	11	Final pH:	11.51
Starting Potential:	-0.5 V vs. SCE	Scan Rate:	0.17 mV/s
Reverse Current	2910 µA 4.91 mA 0.00491 A		
Reverse Potential	0.4 V vs. SCE	Final Potential:	-0.5 V vs. SCE

Sample Length:	1.249	in		cm
Sample Diameter:	0.187	in		cm
Sample Area:	0.761	in^2	4.91	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 03-20-06
Potantiostat:	PAR 273
Potentiostat ID:	1367

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

QA APPROVED
NAME: [illegible]
DATE: 4-11-06

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 03/22/06 Time end: 1:20 pm

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		03/22/06
Material type:	Carbon Steel A537-CL2	Time start:		04:00 pm (N₂ purging started)
Material ID:	1079	Data File:	OCP	#D9019-39-OCP.DTA
Specimen ID:	#D9019-39.		CPP	#D9019-39-CPP.DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=10 end point	Atmosphere::	N₂ purged
Temperature	50±2 °C 122±4 °F	Reference Electrode:	
Initial pH:	9.99	Final pH:	9.72
Starting Potential:	-0.5 V vs. SCE	Scan Rate:	0.17 mV/s
Reverse Current	4160 µA 4.86 mA 0.00486 A		
Reverse Potential	+0.4 V vs. SCE	Final Potential:	+0.3 V vs. SCE

Sample Length:	1.249	in		cm
Sample Diameter:	0.185	in		cm
Sample Area:	0.753	in²	4.86	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=10 end point 03-21-06
Potantiostat:	Gamry 750
Potentiostat ID:	1408

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS: potentiostatic test at +300 mv vs. SCE for 24 hrs

QA APPROVED
NAME: Cleaver
DATE: 4-11-06

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 03/24/06 Time end: 2:00 pm

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		03/22/06
Material type:	Carbon Steel A537-CL2	Time start:		3:45 pm (N2 purging started)
Material ID:	1079	Data File:	OCP	#D9019-40-OCP.cor
Specimen ID:	#D9019-~~39~~ 40		CPP	#D9019-40-CPP.cor

Solution:	Modified AN-107 Tank Waste Simulant PH=10 end point	Atmosphere::	N2 Purged
Temperature	50±2 °C 122±4 °F	Reference Electrode:	SCE
Initial pH:	9.99	Final pH:	9.63
Starting Potential:	-0.5 V vs. SCE	Scan Rate:	0.17 mV/s
Reverse Current	~~4890~~ µA 4.89 mA 0.00489 A		
Reverse Potential	+0.4 V vs. SCE	Final Potential:	+0.1 V vs. SCE

Sample Length:	1.250	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.758	in²	~~4.26~~ 4.89	cm²

ARES AN107 Solution Batch ID:	ARES AN107 PH=11 end point 03-21-06
Potantiostat:	PAR 273
Potentiostat ID:	1347

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS: Potentiostatic test at +100mv vs. SCE for 24hrs.

QA APPROVED
NAME: [illegible]
DATE: 4-11-06

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 03/24/06 Time end: 1:00 pm

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		03/29/06
Material type:	Carbon Steel A537-CL2	Time start:		11:20 Am (N2 purging Started)
Material ID:	1079	Data File:	OCP	#D9019-41-OCP. DTA
Specimen ID:	#D9019-41		CPP	#D9019-41-CPP. DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=13.5 W/o Nitrite	Atmosphere::	N2 purged.
Temperature	50±2 °C 122±4 °F	Reference Electrode:	SCE
Initial pH:	pH=13.5	Final pH:	13.24
Starting Potential:	-0.05 V vs. OCP	Scan Rate:	0.17 mV/s
Reverse Current	4880 µA 4.88 mA 0.00488 A		
Reverse Potential	+0.4 V vs. SCE	Final Potential:	-0.05 V vs. OCP

Sample Length:	1.248	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.930	in^2	4.88	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=13.5 W/o Nitrite 03-28/06
Potantiostat:	Gamry 750
Potentiostat ID:	1408

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

QA APPROVED
NAME: Cldum
DATE: 4-11-06

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 03/30/06 Time end: 3:00 pm

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		03/29/06
Material type:	Carbon Steel A537-CL2	Time start:		12:10 pm (N2 purging)
Material ID:	1079	Data File:	OCP	#D9019-42-OCP.COR
Specimen ID:	#D9019-42		CPP	#D9019-42-CPP.COR

Solution:	Modified AN-107 Tank Waste Simulant PH=11 W/o Nitrite	Atmosphere::	N2 purged
Temperature	50±2 °C 122±4 °F	Reference Electrode:	SCE
Initial pH:	11.01	Final pH:	10.87
Starting Potential:	-0.5 V vs. SCE	Scan Rate:	0.17 mV/s
Reverse Current	4880 µA 4.88 mA 0.004488 A		
Reverse Potential	~~-0.5~~ +0.4 V vs. SCE	Final Potential:	-0.5 V vs. SCE

Sample Length:	1.249	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.930	in²	4.88	cm²

ARES AN107 Solution Batch ID:	ARES AN107 PH=11.01 without Nitrite. 03-28-06
Potantiostat:	PAR 273
Potentiostat ID:	1347

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	i (A/cm2)

COMMENTS:

QA APPROVED
NAME: Oldum
DATE: 4-11-06

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 03/30/06 Time end: 12:00 pm.

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		04/04/2006
Material type:	Carbon Steel A537-CL2	**Time start:**		2:00pm (N2 purging started)
Material ID:	1079	**Data File:**	**OCP**	#D9019-43-OCP.cor
Specimen ID:	#D9019-43		**CPP**	#D9019-43-CPP.cor

Solution:	Modified AN-107 Tank Waste Simulant pH=11, TOC=80g/L	**Atmosphere::**	N2 purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11	**Final pH:**	10.63
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	9900 µA 4.90 mA 0.0049 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.5 V vs. SCE

Sample Length:	1.252	in		cm
Sample Diameter:	0.96	in		cm
Sample Area:	0.759	in^2	4.90	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 No Nitrite 04-03-2006
Potantiostat:	PAR 273
Potentiostat ID:	347

COMMENTS:

QA APPROVED
NAME: [illegible]
DATE: 4-11-06

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 04/05/06 **Time end:** 11:00 pm

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		04/05/06
Material type:	Carbon Steel A537-CL2	Time start:		1:30pm (N2 purging)
Material ID:	1079	Data File:	OCP	#D9019-44-OCP. DTA
Specimen ID:	#D9019-44		CPP	#D9019-44-CPP. DTA

Solution:	Modified AN-107 Tank Waste Simulant PH=11, Nitrite = 3.5M	Atmosphere::	N2 Purged
Temperature	50±2 °C 122±4 °F	Reference Electrode:	SCE
Initial pH:	11.02	Final pH:	10.64
Starting Potential:	-0.5 V vs. SCE	Scan Rate:	0.17 mV/s
Reverse Current	4900 µA 4.90 mA 0.00049 A		
Reverse Potential	+0.4 V vs. SCE	Final Potential:	-0.5 V vs. SCE

Sample Length:	1.252	in		cm
Sample Diameter:	0.88	in		cm
Sample Area:	0.759	in^2	4.90	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 PH=11 Nitrite = 3.5 M 04-04-06
Potantiostat:	Gamry 750
Potentiostat ID:	1408

CURVE SINGULARITIES

ID	E vs. Ref (V)	i (A/cm2)	ID	E vs. Ref (V)	I (A/cm2)

COMMENTS:

QA APPROVED
NAME: Cldrw
DATE: 4-11-06

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: ~~2:00 pm~~ 04/06/06 Time end: 3:00pm

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		04/06/2006
Material type:	Carbon Steel A537-CL2	**Time start:**		3:45 pm; N_2 purging started
Material ID:	1079	**Data File:**	**OCP**	#D9019-45-OCP.cor
Specimen ID:	#D9019-45		**CPP**	#D9019-45-CPP.cor

Solution:	Modified AN-107 Tank Waste Simulant pH=11, Nitrite = 7 M	**Atmosphere::**	N_2 purged.
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11.02	**Final pH:**	10.67
Starting Potential:	−0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4890 µA 4.89 mA 0.00489 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	−0.5 V vs. SCE

Sample Length:	1.250	in		cm
Sample Diameter:	0.188	in		cm
Sample Area:	0.758	in^2	4.89	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=11, Nitrite=7M 04-05-06
Potentiostat:	PAR 273
Potentiostat ID:	1316

COMMENTS:

QA APPROVED
NAME: [signature]
DATE: 4-11-06

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 12:00 pm **Time end:** 04/07/06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		04/18/06
Material type:	Carbon Steel A537-CL2	**Time start:**		12:00pm (N_2 purging)
Material ID:	1079	**Data File:**	OCP	#D9019-47-ocp. DTA
Specimen ID:	#D9019-47		CPP	#D9019-47-CPP. DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=11, Nitrite=0.875 m	**Atmosphere::**	N_2 purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11	**Final pH:**	10.84
Starting Potential:	-0.15 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	0880 µA 4.88 mA 0.00488 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.5 V vs. SCE

Sample Length:	1.249	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.757	in^2	4.88	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 Solution pH=11, Nitrite=0.875 m 04-18-06
Potantiostat:	Gamry 750
Potentiostat ID:	1408

COMMENTS: Reversal scan stopped after reversal potential
Need to re-run.

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: ~~11:30 am~~ 04/20/06 **Time end:** 11:30 am

QA APPROVED

NAME: Cldw

DATE: 5-2-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		04/20/06
Material type:	Carbon Steel A537-CL2	**Time start:**		1:20pm (N₂ purging)
Material ID:	1079	**Data File:**	**OCP**	#D9019-46-OCP.DTA
Specimen ID:	#D9019-46		**CPP**	#D9019-46-CPP.DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=11, Nitrite=0.35M	**Atmosphere::**	N₂ purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11.0	**Final pH:**	10.80
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	489 µA 4.89 mA 0.00489 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.5 V vs. SCE

Sample Length:	1.250	in		cm
Sample Diameter:	0.88	in		cm
Sample Area:	~~4.89~~ 0.758	in²	4.89	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11, Nitrite=0.35M 04-19-06
Potantiostat:	Gamry 750
Potentiostat ID:	1Kol

COMMENTS:

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: ~~04/20~~ 04/21/06 **Time end:** 11:30 am

QA APPROVED

NAME: Cldu

DATE: 5-8-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		04/26/06
Material type:	Carbon Steel A537-CL2	**Time start:**		1:30 pm (N₂ purging started)
Material ID:	1079	**Data File:**	**OCP**	#D9019-49-OCP.wr
Specimen ID:	#D9019-49		**CPP**	#D9019-49-CPP.wr

Solution:	Modified AN-107 Tank Waste Simulant pH=11, Nitrite=0.875m	**Atmosphere::**	N₂ purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11	**Final pH:**	10.89
Starting Potential:	-0.15 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	0.890 µA 6.89 mA 0.00689 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.15 V vs. SCE

Sample Length:	1.250	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.756	in²	4.89	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11, Nitrite=0.875m 04-25-06
Potantiostat:	PAR 273
Potentiostat ID:	1347

COMMENTS:

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 04/27/06 **Time end:** 12:20 pm

QA APPROVED

NAME: Cldum

DATE: 5-4-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		05/02/06
Material type:	Carbon Steel A537-CL2	**Time start:**		10:00 Am (N2 Purging Started)
Material ID:	1079	**Data File:**	**OCP**	#D9019-48-OCP.Cor
Specimen ID:	#D9019-48		**CPP**	#D9019-48-CPP.Cor

Solution:	Modified AN-107 Tank Waste Simulant pH=11, Nitrite = 1.0375M	**Atmosphere::**	N2 purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11.01	**Final pH:**	10.89
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.167 mV/s
Reverse Current	4880 µA 4.88 mA 0.00488 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.5 V vs. SCE

Sample Length:	1.247	in		cm
Sample Diameter:	0.1186	in		cm
Sample Area:	0.758	in^2	4.88	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=11, Nitrite = 1.0375M 05-01-06
Potantiostat:	PAR 273
Potentiostat ID:	0006

COMMENTS:

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 05/03/06 **Time end:** 12:00pm

QA APPROVED

NAME: Cldm

DATE: 5-8-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	**ARES AN-107**	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		05/03/06
Material type:	Carbon Steel A537-CL2	**Time start:**		1230 pm (N₂ purging)
Material ID:	1079	**Data File:**	OCP	#D9019-50-OCP.Dor
Specimen ID:	#D9019-50		CPP	#D9019-50-CPP.Dor

Solution:	Modified AN-107 Tank Waste Simulant pH=11 [Cl⁻]=0.2M	**Atmosphere::**	N₂ Purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11	**Final pH:**	10.83
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4870 µA 4.87 mA 0.004487 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.5 V vs. SCE

Sample Length:	1.253	in		cm
Sample Diameter:	0.185	in		cm
Sample Area:	0.755	in²	4.87	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 [Cl⁻]=0.2M 05-02-06
Potantiostat:	PAR 273
Potentiostat ID:	0006

COMMENTS:

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 05/06/06 **Time end:** 12:00 pm

QA APPROVED
NAME: Cldum
DATE: 6-2-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		05/16/06
Material type:	Carbon Steel A537-CL2	**Time start:**		640 pm (N2 purging)
Material ID:	1079	**Data File:**	**OCP**	#D9019-51-OCP.COR
Specimen ID:	#D9019-51		**CPP**	#D9019-51-CPP.COR

Solution:	Modified AN-107 Tank Waste Simulant pH=11, [Cl⁻]=0.2 M	**Atmosphere::**	N2 purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11.01	**Final pH:**	11.09
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	8890 µA 8.89 mA 0.00889 A		
Reverse Potential	+0.5 V vs. SCE	**Final Potential:**	-0.15 V vs. SCE

Sample Length:	1.250	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.758	in^2	4.89	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 [Cl⁻]=0.2M 05-15-2006
Potantiostat:	PAR 273
Potentiostat ID:	0006

COMMENTS: Temperature controller malfunction. needs to be rerun.

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 2:30 pm 05/17/06 FG **Time end:** 05/17 2:30 pm FG

QA APPROVED

NAME: Cldun

DATE: 6-2-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107 PT wire	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		05/17/06
Material type:	Carbon ~~Steel A537~~-CL2 PT wire	**Time start:**		3:20 pm (N₂ purging)
Material ID:	1079	**Data File:**	**OCP**	#PT-OCP.COR
Specimen ID:	Pt wire		**CPP**	#PT-CPP.COR

Solution:	Modified AN-107 Tank Waste Simulant pH=11, Nitrite=7 M	**Atmosphere::**	N_2 purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11.01	**Final pH:**	11.47
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	2960 µA 2.96 mA 0.00296 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.5 V vs. SCE

Sample Length:	2.63	in	(9.2) FG 18.4	cm
Sample Diameter:	0.02	in		cm
Sample Area:		in²	2.94	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11, Nitrite=7M 05-16-06
Potentiostat:	PAR 2273
Potentiostat ID:	1410

COMMENTS:

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 05/18/06 **Time end:** 3:30

QA APPROVED

NAME: [illegible]

DATE: 6-2-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		05/17/2006
Material type:	Carbon Steel A537-CL2	**Time start:**		3:20 pm (N2 purging)
Material ID:	1079	**Data File:**	**OCP**	#D9019-52-ocp.cor
Specimen ID:	#D9019-52		**CPP**	#D9019-52-cpp.cor

Solution:	Modified AN-107 Tank Waste Simulant pH=11, Nitrite=7m	**Atmosphere::**	N2 Purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11.01	**Final pH:**	11.20
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4880 µA 4.88 mA 0.00488 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	+0.1 V vs. SCE

Sample Length:	1.248	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.756	in²	4.88	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11, Nitrite=7m 05-16-2006
Potantiostat:	PAR 273
Potentiostat ID:	0006

COMMENTS:
potentiostatic test @ 100mv vs. SCE for 24 hours.

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 05/19/06 **Time end:** 3:00pm

QA APPROVED

NAME: Eldun

DATE: 6-2-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		05/18/06
Material type:	Carbon Steel A537-CL2	**Time start:**		4:30 pm (N₂ Purging)
Material ID:	1079	**Data File:**	**OCP**	#D9019-53-OCP.DTA
Specimen ID:	#D9019-53		**CPP**	#D9019-53-CPP.DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=11 standard	**Atmosphere::**	N₂ purged
Temperature	50±2 °C 122±2 °F	**Reference Electrode:**	SCE
Initial pH:	11.0	**Final pH:**	10.88
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	488.0 µA 4.88 mA 0.00488 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	+0.1 V vs. SCE

Sample Length:	1.249	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.737	in²	4.88.	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 Standard 05-17-06
Potantiostat:	Gamry
Potentiostat ID:	1408

COMMENTS: potentiodynamically scan to 0.4 V vs SCE then reverse to +100 mv. vs. SCE. Hold for 24 hrs.

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 05/22/06 **Time end:** 8:30 pm

QA APPROVED

NAME: Oldum

DATE: 6-2-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		05/24/2006
Material type:	Carbon Steel A537-CL2	**Time start:**		10:30 Am (N2 purging)
Material ID:	1079	**Data File:**	OCP	#D9019-54-OCP.DTA
Specimen ID:	#D9019-54		CPP	#D9019-54-CPP.DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=11 [Cl⁻]=0.2M	**Atmosphere::**	N2 purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11.02	**Final pH:**	11.04
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	1890 µA 4.89 mA 0.00489 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.5 V vs. SCE

Sample Length:	1.281	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.758	in^2	4.89	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 [Cl⁻]=0.2M 05-23-06
Potentiostat:	Gamry 750
Potentiostat ID:	1408

COMMENTS: Reversal scan malfunctioned. Needs rerun.

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 05/25/2006 **Time end:** 6:00 pm

QA APPROVED

NAME: Cloum

DATE: 6-2-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		05/25/2006
Material type:	Carbon Steel A537-CL2	**Time start:**		8:40 am LN2 purging
Material ID:	1079	**Data File:**	OCP	#D9019-55-OCP.DOT
Specimen ID:	#D9019-55		CPP	#D9019-55-CPP.DOT

Solution:	Modified AN-107 Tank Waste Simulant pH=11 standard	**Atmosphere::**	N2 purged
Temperature	50 ± 2 °C 122 ± 4 °F	**Reference Electrode:**	SCE
Initial pH:	10	**Final pH:**	10.70
Starting Potential:	-0.15 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4890 µA 4.89 mA 0.00489 A		
Reverse Potential	0.4 V vs. SCE	**Final Potential:**	0.3 V vs. SCE

Sample Length:	1.251	in		cm
Sample Diameter:	0.187	in		cm
Sample Area:	0.758	in²	4.89	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 standard 05-24-06
Potantiostat:	PAR273
Potentiostat ID:	0006

COMMENTS: Potentio holding @ 300mV vs SCE for 24 hours.

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 5/31/06 **Time end:** 10:20 Am

QA APPROVED

NAME: Cldum

DATE: 6-2-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		05/25/2006
Material type:	Carbon Steel A537-CL2	**Time start:**		5:00 pm (N2 purging)
Material ID:	1079	**Data File:**	**OCP**	#D9019-56-OCP.DTA
Specimen ID:	#D9019-56		**CPP**	#D9019-56-CPP.DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=11, standard	**Atmosphere::**	N2 purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11.0	**Final pH:**	10.66
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4880 µA 4.88 mA 0.00488 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	+0.1 V vs. SCE

Sample Length:	1.249	in		cm
Sample Diameter:	0.386	in		cm
Sample Area:	0.757	in²	4.88	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 standard 05-26-06
Potantiostat:	Gamry 750
Potentiostat ID:	1408

COMMENTS: Potential holding @ 100 mv vs. SCE for 88 hours

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 05/30/06 **Time end:** 10:10 am

QA APPROVED

NAME: Oldum

DATE: 6-2-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		05/31/06
Material type:	Carbon Steel A537-CL2	**Time start:**		2:50 pm
Material ID:	1079	**Data File:**	OCP	#D9019-57-OCP.cor
Specimen ID:	#D9019-57		CPP	#D9019-57-CPP.cor

Solution:	Modified AN-107 Tank Waste Simulant pH=11, [Cl⁻]=0.2M	**Atmosphere::**	N_2 Purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11	**Final pH:**	10.85
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4900 µA 4.90 mA 0.0049 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.5 V vs. SCE

Sample Length:	1.247	in		cm
Sample Diameter:	0.187	in		cm
Sample Area:	0.760	in^2	4.90	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 [Cl⁻]=0.2M 05-30-06
Potantiostat:	PAR 273
Potentiostat ID:	0006

COMMENTS:

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 06/01/06 **Time end:** 1:30 pm

QA APPROVED

NAME: Cldun

DATE: 6-2-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		06/08/06
Material type:	Carbon Steel A537-CL2	**Time start:**		11:200am (N₂ purging)
Material ID:	1079	**Data File:**	OCP	#D9019-58-OCP.BTA
Specimen ID:	#D9019-58		CPP	#D9019-58-CPP.BTA

Solution:	Modified AN-107 Tank Waste Simulant pH=11, 0.75M Nitrite 1.5M Nitrate	**Atmosphere::**	N₂ Purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11	**Final pH:**	10.6
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4880 µA 4.88 mA 0.00488 A		
Reverse Potential	+0.4 V vs.	**Final Potential:**	-0.5 V vs. SCE

Sample Length:	1.269	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.757	in²	4.88	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11, Nitrite=0.75M Nitrate=1.5M 06-07-06
Potantiostat:	PAR 2273
Potentiostat ID:	1410

COMMENTS:

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 06/09/06 **Time end:** 12:30pm

QA APPROVED

NAME: [illegible]

DATE: 6-22-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		06/08/06
Material type:	Carbon Steel A537-CL2	**Time start:**		11:00 am (N₂ purging)
Material ID:	1079	**Data File:**	OCP	#D9019-59-OCP.Cor
Specimen ID:	#D9019-59		CPP	#D9019-59-CPP.Cor

Solution:	Modified AN-107 Tank Waste Simulant pH=11, 1.5M Nitrite 1.5M Nitrate	**Atmosphere::**	N₂ purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11.0	**Final pH:**	10.40
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4900 µA 4.9 mA 0.0049 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.5 V vs. SCE

Sample Length:	1.252	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.759	in²	4.90	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 06-07-06
Potantiostat:	PAR 273
Potentiostat ID:	0006

COMMENTS:

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 06/09/06 **Time end:** 12:00 pm

~~QA APPROVED~~

NAME: Claw

DATE: 6-22-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		06/14/2006
Material type:	Carbon Steel A537-CL2	**Time start:**		11:30 (N2 purging)
Material ID:	1079	**Data File:**	OCP	#D9019-60-OCP.DTA
Specimen ID:	#D9019-60		CPP	#D9019-60-CPP.DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=11, [Cl⁻]=0.2m	**Atmosphere::**	N2 purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11	**Final pH:**	11.09
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	489 µA 0.489 mA 0.000489 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.5 V vs. SCE

Sample Length:	1.250	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.758	in²	4.89	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 [Cl⁻]=0.2m 06-13-06
Potantiostat:	Gamry 750
Potentiostat ID:	1408

COMMENTS:
reversed @ 0.1 mA/cm².

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 06/15/06 **Time end:** 11:45 am

QA APPROVED
NAME: [illegible]
DATE: 6-22-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		06/14/2006
Material type:	Carbon Steel A537-CL2	**Time start:**		11:30 (N₂ purging)
Material ID:	1079	**Data File:**	OCP	#D9019-61-ocp.cor
Specimen ID:	#D9019-61		CPP	#D9019-61-cpp.cor

Solution:	Modified AN-107 Tank Waste Simulant pH=11 [Cl⁻]=0.2m	**Atmosphere::**	N₂ Purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11	**Final pH:**	11.20
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4980 µA 4.98 mA 0.00498 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.2 V vs. SCE

Sample Length:	1.289	in		cm
Sample Diameter:	0.188	in		cm
Sample Area:	0.765	in²	4.94	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 [Cl⁻]=0.2m 06-13-06
Potantiostat:	PAR 273
Potentiostat ID:	0006

COMMENTS: CPP final potential -0.2 V vs. SCE. Potential hold for ~~24~~ 48 hours @ -200 mV vs. SCE.

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 06/16/06 **Time end:** 2:00pm

QA APPROVED

NAME: Cloun

DATE: 6-22-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		06/15/2006
Material type:	Carbon Steel A537-CL2	**Time start:**		1:15pm (N₂ purging)
Material ID:	1079	**Data File:**	OCP	#D9019-62-OCP.DTA
Specimen ID:	#D9019-62		CPP	#D9019-62-CPP.DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=9.5 end point	**Atmosphere::**	N₂ purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	9.5	**Final pH:**	9.66
Starting Potential:	−0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4890 µA 4.89 mA 0.004889 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	−0.5 V vs. SCE

Sample Length:	1.251	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.758	in^2	4.89	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=9.5 end point 06-14-2006
Potentiostat:	Gamry 750
Potentiostat ID:	1401

COMMENTS:

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 06/16/06 **Time end:** 12:00 pm

QA APPROVED

NAME: Cldum

DATE: 6-2-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		06/16/2006
Material type:	Carbon Steel A537-CL2	**Time start:**		3:00 pm (N₂ Purging)
Material ID:	1079	**Data File:**	OCP	#D9019-63-OCP.DTA
Specimen ID:	#D9019-63		CPP	#D9019-63-CPP.DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=11, [Cl⁻]=0.2m	**Atmosphere::**	N_2 Purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11	**Final pH:**	11.14
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	489 µA 0.489 mA 0.000489 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.1 V vs. SCE

Sample Length:	1.251	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.758	in^2	4.89	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=11, [Cl⁻]=0.2m 06-15-06
Potantiostat:	Gamry 750
Potentiostat ID:	1408

COMMENTS:
Potentiostatic test @ -100 mV vs. SCE for 12 hours
reversed @ 0.1 mA/cm²

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 06/20/06 **Time end:** 11:15am

QA APPROVED
NAME: Cedrin
DATE: 6-22-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	Project #:		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	Date start:		06/16/2006
Material type:	Carbon Steel A537-CL2	Time start:		2:00 pm (N₂ purging)
Material ID:	1079	Data File:	OCP	#D9019-64-ocp.Txt
Specimen ID:	#D9019-64		CPP	#D9019-64-ocp.TXT

Solution:	Modified AN-107 Tank Waste Simulant pH=11, [Cl⁻]=0.2m	Atmosphere::	N₂ purged
Temperature	50±2 °C 122±4 °F	Reference Electrode:	SCE
Initial pH:	11	Final pH:	10.91
Starting Potential:	-0.15 V vs. SCE	Scan Rate:	0.17 mV/s
Reverse Current	488 µA 0.488 mA 0.000488 A		
Reverse Potential	+0.4 V vs. SCE	Final Potential:	+0.1 V vs. SCE

Sample Length:	1.249	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.757	in²	4.88	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 [Cl⁻]=0.2m 06-15-2006
Potantiostat:	PAR 2273
Potentiostat ID:	1410

COMMENTS: potentiostatic test @ +100 mv vs SCE for 72 hours reversed @ 0.1 mA/cm²

Test run by: Feng Gui Home Phone: (614) 777-9599

Project Manager: Sean Brossia

Date end: 06/20/2006 Time end: 11:15am

QA APPROVED

NAME: [illegible]

DATE: 6-22-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	**ARES AN-107**	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		06/21/06
Material type:	Carbon Steel A537-CL2	**Time start:**		1:15 pm (N2 purged)
Material ID:	1079	**Data File:**	**OCP**	#D9019-65-OCP.DTA
Specimen ID:	#D9019-65		**CPP**	#D9019-65-CPP.DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=11, [Cl⁻]=0.05 M	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11	**Final pH:**	10.85
Starting Potential:	−0.5 V vs. SCE	**Scan Rate:**	0.1 mV/s
Reverse Current	8.900 µA 6.90 mA 0.00869 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	−0.5 V vs. SCE

Sample Length:	1.252	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.759	in²	4.90	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11. [Cl⁻]=0.05 M 06-20-06
Potantiostat:	Gamry 350
Potentiostat ID:	1408

COMMENTS:

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 06/22/06 **Time end:** 12:30pm

QA APPROVED

NAME: [illegible]

DATE: 7-13-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		06/28/06
Material type:	Carbon Steel A537-CL2	**Time start:**		12:00 pm (N2 purging)
Material ID:	1079	**Data File:**	OCP	#D9019-66-ocp.cor
Specimen ID:	#D9019-66		CPP	#D9019-66-cpp.DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=11 [Cl⁻]=0.2m	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11	**Final pH:**	11.08
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.1 mV/s
Reverse Current	4950 µA 4.95 mA 0.00495 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.5 V vs. SCE

Sample Length:	1.251	in		cm
Sample Diameter:	0.188	in		cm
Sample Area:	0.767	in^2	4.95	cm^2

ARES AN107 Solution Batch ID:	pH=11 ARES AN(10) [Cl⁻]=0.2m 06-27-06
Potantiostat:	OCP: EAR 273 (0006) CPP: Gamry 750
Potentiostat ID:	

COMMENTS: Reversal scan rate set as 0.03 mV/s

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 06/30/06 **Time end:** 9:20 am

QA APPROVED

NAME: Chan

DATE: 7-13-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		06/29/06
Material type:	Carbon Steel A537-CL2	**Time start:**		1:30 pm (N₂ purging)
Material ID:	1079	**Data File:**	OCP	#D9019-67-OCP.Dor
Specimen ID:	#D9019-67		CPP	#D9019-67-CPP.Dor

Solution:	Modified AN-107 Tank Waste Simulant pH=9.5 end point	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	9.5	**Final pH:**	9.86
Starting Potential:	-0.15 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4886 µA 4.88 mA 0.00488 A		
Reverse Potential	+0.8 V vs. SCE	**Final Potential:**	~~-0.5~~ +0.1 V vs. SCE

Sample Length:	1.267	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.756	in²	4.88	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=9.5 end point 06-28-06
Potantiostat:	PAR 273
Potentiostat ID:	0006

COMMENTS: Potentiostatic test @ +100 mV vs. SCE for 72 hours

Need rerun

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: _____ **Time end:** _____

QA APPROVED

NAME: Cedum

DATE: 7-13-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		06/29/06
Material type:	Carbon Steel A537-CL2	**Time start:**		3:00 (N2 purging)
Material ID:	1079	**Data File:**	OCP	#D9019-68-OCP.cor
Specimen ID:	#D9019-68		CPP	#D9019-68-CPP.cor

Solution:	Modified AN-107 Tank Waste Simulant pH=9.5 end point	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	9.5	**Final pH:**	10.09
Starting Potential:	-0.15 V vs. SCE	**Scan Rate:**	0.167 mV/s
Reverse Current	0.860 µA 0.86 mA 0.000860 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.1 V vs. SCE

Sample Length:	1.269	in		cm
Sample Diameter:	0.185	in		cm
Sample Area:	0.753	in^2	4.86	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=9.5 end point 06-28-06
Potantiostat:	PAR 273
Potentiostat ID:	1410

COMMENTS: potentiostatic test @ -100 mV vs SCE for >2 hrs.

Need rerun

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 07/03/06 **Time end:** 7:00 pm

QA APPROVED

NAME: Clem

DATE: 7-13-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		07/06/06
Material type:	Carbon Steel A537-CL2	**Time start:**		12:00 pm (N₂ purging)
Material ID:	1079	**Data File:**	OCP	#D9019-69-OCP.Cor
Specimen ID:	#D9019-69		CPP	#D9019-69-CPP.Cor

Solution:	Modified AN-107 Tank Waste Simulant pH=11 standard	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11.0	**Final pH:**	10.87
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4900 µA 4.90 mA 0.0049 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	0 V vs. SCE

Sample Length:	1.252	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.759	in²	4.90	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 07-05-06
Potantiostat:	PAR 273
Potentiostat ID:	0006

COMMENTS: Potentiostatic test @ 0 mv vs. SCE for 72 hrs.

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 07/10/06 **Time end:** 11:30 am

QA APPROVED

NAME: [illegible]

DATE: 7-13-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		07/06/06
Material type:	Carbon Steel A537-CL2	**Time start:**		12:00pm (N_2 purging)
Material ID:	1079	**Data File:**	**OCP**	#D9019-70-OCP.Cor
Specimen ID:	#D9019-70		**CPP**	#D9019-70-CPP.Cor

Solution:	Modified AN-107 Tank Waste Simulant pH=11 standard	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11	**Final pH:**	10.86
Starting Potential:	−0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4860 µA 4.86 mA 0.00486 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	−0.05 V vs. SCE

Sample Length:	1.269	in		cm
Sample Diameter:	0.185	in		cm
Sample Area:	0.753	in^2	4.86	cm^2

ARES AN107 Solution Batch ID:	ARES AN(07) pH=11 07-05-06
Potantiostat:	PAR 273
Potentiostat ID:	1347

COMMENTS: potentiostatic @ −50mv for 72 hours

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 07/10/06 **Time end:** 11:30Am

QA APPROVED

NAME: Eldin

DATE: 7-13-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		07/11/06
Material type:	Carbon Steel A537-CL2	**Time start:**		11:40 am (N2 purging)
Material ID:	1079	**Data File:**	**OCP**	#D9019-71-OCP.cor
Specimen ID:	#D9019-71		**CPP**	#D9019-71-CPP.cor

Solution:	Modified AN-107 Tank Waste Simulant pH=9.5 end point	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	9.5	**Final pH:**	9.7
Starting Potential:	-0.15 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4920 µA 4.92 mA 0.00492 A		
Reverse Potential	0.4 V vs. SCE	**Final Potential:**	-0.1 V vs. SCE

Sample Length:	1.251	in		cm
Sample Diameter:	0.187	in		cm
Sample Area:	0.762	in^2	4.92	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=9.5 end point 07-10-06
Potantiostat:	PAR 273
Potentiostat ID:	2006

COMMENTS: Potentiostatic test for 48 hours @ -100mV vs. SCE

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 07/14/06 **Time end:** 12:00 pm

QA APPROVED

NAME: Carol L Dunn

DATE: 8-11-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		07/13/06
Material type:	Carbon Steel A537-CL2	**Time start:**		12:00 pm (N2 purging)
Material ID:	1079	**Data File:**	**OCP**	#D9019-72-OCP.TXT
Specimen ID:	#D9019-72		**CPP**	#D9019-72-CPP.TXT

Solution:	Modified AN-107 Tank Waste Simulant pH=11, [Cl⁻]=0.2 m	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	10.98	**Final pH:**	11.07
Starting Potential:	−0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	6920 µA 6.92 mA 0.00692 A		
Reverse Potential	+0.6 V vs. SCE	**Final Potential:**	0 V vs. SCE

Sample Length:	1.252	in		cm
Sample Diameter:	0.187	in		cm
Sample Area:	0.763	in²	6.92	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11, [Cl⁻]=0.2 m 07-12-06
Potantiostat:	PAR 2273
Potentiostat ID:	N10

COMMENTS: potentiostatic test @ 0 mV vs. SCE for 72 hours

* reverse @ 0.1 mA/cm²

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 07/17/06 **Time end:** 2:00 pm

QA APPROVED
NAME: Cadum
DATE: 8-11-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		07/13/06
Material type:	Carbon Steel A537-CL2	**Time start:**		12:00 pm (N2 purging)
Material ID:	1079	**Data File:**	OCP	#D9019-73-OCP.DTA
Specimen ID:	#D9019-73		CPP	#D9019-73-CPP.DTA

Solution:	Modified AN-107 Tank Waste Simulant pH=11 [Cl⁻]=0.2M	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	10.98	**Final pH:**	11.01
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	900 µA 0.90 mA 0.00069 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.05 V vs. SCE

Sample Length:	1.252	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.759	in²	4.9	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 [Cl⁻]=0.2M 07-12-06
Potantiostat:	Gamry 750 (OCP). PAR 273 (13467) · CPP
Potentiostat ID:	1608

COMMENTS: potentiostatic test @ -50mV vs. SCE for 72 hours

* reverse @ 0.1 mA/cm².

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 07/17/06 **Time end:** 7:00 pm

QA APPROVED

NAME: Cldun

DATE: 8-14-06

B57

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		07/18/06
Material type:	Carbon Steel A537-CL2	**Time start:**		1:45 pm (N2 Purging)
Material ID:	1079	**Data File:**	**OCP**	#D9019-74-OCP.
Specimen ID:	#D9019-74		**CPP**	#D9019-74-CPP.

Solution:	Modified AN-107 Tank Waste Simulant pH=10 end point	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	10	**Final pH:**	10.06
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4950 µA 4.95 mA 0.00495 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.5 V vs. SCE

Sample Length:	1.252	in		cm
Sample Diameter:	0.188	in		cm
Sample Area:	0.767	in^2	4.95	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=10 end point 07-17-06
Potantiostat:	PA273
Potentiostat ID:	1347

COMMENTS: potentiostatic @ 400 mv for 6 hours then scan down to final potential

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 07/20/06 **Time end:** 9:30 am

QA APPROVED

NAME: Clem

DATE: 8-11-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		07/18/06
Material type:	Carbon Steel A537-CL2	**Time start:**		1:45 pm (N₂ purging)
Material ID:	1079	**Data File:**	**OCP**	#D9019-75-OCP
Specimen ID:	#D9019-75		**CPP**	#D9019-75-CPP

Solution:	Modified AN-107 Tank Waste Simulant pH=10 end point	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	10	**Final pH:**	10.08
Starting Potential:	-0.15 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4850 µA 4.85 mA 0.00485 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.5 V vs. SCE

Sample Length:	1.241	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.752	in²	4.85	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=10 end point 07-17-06
Potantiostat:	PAR 273
Potentiostat ID:	0006

COMMENTS: potentiostatic @ 100 mv for 12 hours then scan down to final potential.

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 07/20/06 **Time end:** 9:30 am

QA APPROVED

NAME: Cleden

DATE: 8-11-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		07/20/06
Material type:	Carbon Steel A537-CL2	**Time start:**		1:45 pm (N₂ purging)
Material ID:	1079	**Data File:**	OCP	#D9019-76-OCP.COR
Specimen ID:	#D9019-76		CPP	#D9019-76-CPP.COR

Solution:	Modified AN-107 Tank Waste Simulant pH=9.5 end point	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	9.6	**Final pH:**	9.96
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4880 µA 4.88 mA 0.00488 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	+0.1 V vs. SCE

Sample Length:	1.249	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.757	in²	4.88	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=9.5 end point 07-19-06
Potantiostat:	PAR 273
Potentiostat ID:	1347

COMMENTS: potentiostatic test @ +100 mv for 72 hours

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 07/24/06 **Time end:** 10:30am

QA APPROVED

NAME: [illegible]

DATE: 8-11-06

B-60

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	**ARES AN-107**	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		08/01/06
Material type:	Carbon Steel A537-CL2	**Time start:**		1:30 pm
Material ID:	1081	**Data File:**	**OCP**	#CCT1081-1-OCP.TXT
Specimen ID:	#CCT1081-1		**CPP**	#CCT1081-1-CPP.TXT

Solution:	Modified AN-107 Tank Waste Simulant pH=10 standard	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	10.01	**Final pH:**	9.70
Starting Potential:	-0.15 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4680 µA 4.68 mA 0.004681 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.1 V vs. SCE

Sample Length:	1.288	in		cm
Sample Diameter:	0.185	in		cm
Sample Area:	0.726	in^2	4.68	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=10 07-31-06
Potantiostat:	PAR2273
Potentiostat ID:	1410

COMMENTS: potentiostatic test @ -100 mV vs. SCE for 48 hours

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 08/04/06 **Time end:** 6:00 pm

QA APPROVED

NAME: [illegible]

DATE: 9-5-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		08/01/2006
Material type:	Carbon Steel A537-CL2	**Time start:**		3:30 pm
Material ID:	1079	**Data File:**	**OCP**	#CCT1081-2-OCP.cor
Specimen ID:	#CCT1081-2		**CPP**	#CCT1081-2-CPP.cor

Solution:	Modified AN-107 Tank Waste Simulant pH=11 standard	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11	**Final pH:**	10.87
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4710 µA 4.71 mA 0.004471 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.5 V vs. SCE

Sample Length:	1.249	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.730	in^2	4.71	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 07-31-06
Potantiostat:	PAR 273
Potentiostat ID:	0008

COMMENTS: potentiodynamically scan to 0.4 V vs. SCE then step back to a potential close to final (-0.5 vs) potential

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 08/03/06 **Time end:** 10:00 am

QA APPROVED
NAME: Cldun
DATE: 9-5-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		08/08/06
Material type:	Carbon Steel A537-CL2	**Time start:**		2:00 pm (N_2 purging)
Material ID:	1079	**Data File:**	OCP	#CCT-3-ocp.TXT
Specimen ID:	#CCT1081-3		CPP	#CCT-3-CPP.TXT

Solution:	Modified AN-107 Tank Waste Simulant pH=10, standard	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	10.01	**Final pH:**	9.69
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4720 µA 4.72 mA 0.00472 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.5 V vs. SCE

Sample Length:	1.252	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.732	in^2	4.72	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=10 08-07-06
Potantiostat:	PAR 2273
Potentiostat ID:	1410

COMMENTS: Potentiostatic test @ -300mv vs. SCE for 48 hours.

(Scan problem)

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 08/10/06 **Time end:** 4:00 Pm

QA APPROVED
NAME: Odum
DATE: 9-5-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	**ARES AN-107**	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		08/17/06
Material type:	Carbon Steel A537-CL2	**Time start:**		6:15 pm
Material ID:	1081	**Data File:**	**OCP**	#CCT1081-4 – ocp. cor
Specimen ID:	#CCT1081 – 4		**CPP**	# CCT1081-4 – CPP. cor

Solution:	Modified AN-107 Tank Waste Simulant pH=11, [Cl⁻]=0.05 M	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11	**Final pH:**	10.80
Starting Potential:	−0.15 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4710 µA 4.71 mA 0.004 71 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	+0.03 V vs. SCE

Sample Length:	1.269	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.730	in²	4.71	cm²

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 [Cl⁻]=0.05 M 08-16-06
Potantiostat:	PAR273
Potentiostat ID:	0006

COMMENTS:
Potentiostatic test @ +50 mv for 60 hrs

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 08/21/06 **Time end:** 12:00 pm

QA APPROVED

NAME: Cldun

DATE: 9-5-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	**ARES AN-107**	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		08/17/06
Material type:	Carbon Steel A537-CL2	**Time start:**		6:15 pm
Material ID:	1081	**Data File:**	**OCP**	#CCT1081-5-OCP.TXT
Specimen ID:	#CCT1081-5-		**CPP**	#CCT1081-5-CPP.TXT

Solution:	Modified AN-107 Tank Waste Simulant pH=11. ~~Standard~~ (F6) [Cl⁻]=0.05M	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11	**Final pH:**	10.81
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4720 µA 4.72 mA 0.004472 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	+0.15 V vs. SCE

Sample Length:	1.251	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.731	in^2	4.72	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=11 08-16-06
Potantiostat:	PAR273
Potentiostat ID:	1410

COMMENTS: potentiostatic @ +150mv for 60 hrs

* scan problem *

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 08/21/06 **Time end:** 12:00pm

QA APPROVED

NAME: Cohen

DATE: 9-5-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	**ARES AN-107**	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		08/23/06
Material type:	Carbon Steel A537-CL2	**Time start:**		5:00 pm
Material ID:	1081	**Data File:**	**OCP**	#CCT1081-6-ocp.cor
Specimen ID:	#CCT1081-6		**CPP**	#CCT1081-6-cpp.cor

Solution:	Modified AN-107 Tank Waste Simulant pH=11. [NO2-]=1.6m [NO3-]=3m [Cl-]=0.15m	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11.0	**Final pH:**	10.86
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4720 µA 4.72 mA 0.00472 A		
Reverse Potential	+1 V vs. SCE	**Final Potential:**	-0.5 V vs. SCE

Sample Length:	1.251	in		cm
Sample Diameter:	0.1186	in		cm
Sample Area:	0.731	in^2	4.72	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 [NO2-]=1.6m. [NO3-]=3.0m. [Cl-]=0.15m pH=11 08-22-06
Potantiostat:	PAR 273
Potentiostat ID:	1347

COMMENTS:

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 08/24/06 **Time end:** 12:00 pm

QA APPROVED
NAME: C. Quin
DATE: 9-5-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	**ARES AN-107**	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		08/23/06
Material type:	Carbon Steel A537-CL2	**Time start:**		5:30 pm
Material ID:	1081	**Data File:**	**OCP**	#CCT1081-7-OCP.cor
Specimen ID:	#CCT1081-7		**CPP**	#CCT1081-7-CPP.cor

Solution:	Modified AN-107 Tank Waste Simulant pH=11, $[NO_2^-]$=1.4m, $[NO_3^-]$=3m, $[Cl^-]$=.05m	**Atmosphere::**	Nitrogen purged
Temperature	Room / 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	11	**Final pH:**	10.90
Starting Potential:	~~0.17~~ -0.15 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4710 µA / 4.71 mA / 0.004471 A		
Reverse Potential	+1 V vs. SCE	**Final Potential:**	-0.15 V vs. SCE

Sample Length:	1.25	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.730	in^2	4.71	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=11, $[NO_2^-]$=1.4m, $[NO_3^-]$=3m, $[Cl^-]$=.05m 08-22-06
Potantiostat:	PAR 273
Potentiostat ID:	0006

COMMENTS: Room temperature test.

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 08/24/06 **Time end:** 12:00 pm

QA APPROVED
NAME: CLDun
DATE: 9-5-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	ARES AN-107	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		08/25/06
Material type:	Carbon Steel A537-CL2	**Time start:**		3:30 pm
Material ID:	1081 (FG)	**Data File:**	OCP	#CCT1081-9-OCP.cor
Specimen ID:	#CCT1081-9.8		CPP	#CCT1081-9-CPP.cor

Solution:	Modified AN-107 Tank Waste Simulant pH=9.5 standard	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	9.5	**Final pH:**	9.81
Starting Potential:	-0.5 V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4720 µA 4.72 mA 0.00472 A		
Reverse Potential	+0.4 V vs. SCE	**Final Potential:**	-0.15 V vs. SCE

Sample Length:	1.252	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.730	in^2	4.71	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=9.5 08-24-06
Potantiostat:	PAR 273
Potentiostat ID:	1367

COMMENTS:
Potentiostatic tests @ -150mV vs. SCE for 60 hrs

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 08/28/06 **Time end:** 12:00 pm

QA APPROVED
NAME: CDum
DATE: 9-5-06

Potentiodynamic / Potentiostatic Polarization Work Request/Test Information Form

Project name:	**ARES AN-107**	**Project #:**		R5062-03R
Test Type:	Cyclic Potentiodynamic Polarization	**Date start:**		08/25/06
Material type:	Carbon Steel A537-CL2	**Time start:**		3:45 pm
Material ID:	1081 (FG)	**Data File:**	**OCP**	#CCT1081-8-OCP.cor
Specimen ID:	#CCT1081-8		**CPP**	#CCT1081-8-CPP.cor

Solution:	Modified AN-107 Tank Waste Simulant pH=9.5 standard	**Atmosphere::**	Nitrogen purged
Temperature	50±2 °C 122±4 °F	**Reference Electrode:**	SCE
Initial pH:	9.5	**Final pH:**	10
Starting Potential:	V vs. SCE	**Scan Rate:**	0.17 mV/s
Reverse Current	4710 µA 4.71 mA 0.00471 A		
Reverse Potential	0.4 V vs. SCE	**Final Potential:**	-0.07 V vs. SCE

Sample Length:	1.249	in		cm
Sample Diameter:	0.186	in		cm
Sample Area:	0.732	in^2	4.72	cm^2

ARES AN107 Solution Batch ID:	ARES AN107 pH=9.5 standard 08-24-06
Potantiostat:	PAR273
Potentiostat ID:	0006

COMMENTS: potentiostatic test @ -70 mv vs. SCE

Test run by: Feng Gui **Home Phone:** (614) 777-9599

Project Manager: Sean Brossia

Date end: 08/28/06 **Time end:** 12:00 pm

QA APPROVED
NAME: CQ Quin
DATE: 9-5-06

Appendix C: Slow Strain Rate Testing (SSRT) Information Forms

RPP-RPT-31680 Rev 0

Slow Strain Rate

Work Request/Test Information Form

Person Performing Test: Joe Gerst — Home Phone: 740 548 7747

Special Hazards: Caustic — Project Name: Ares Task 10

Filled 1-25-06 — Start (Date/Time): 1245 p.m. — Finish (Date/Time): TAKE DOWN 1-29-05 2:00 P.M. — Project Number: 80506210

TEST PARAMETERS

Material: A537CL2 — Test #: SSR-4 — SSR System #: 4

Material ID#: 1081 — Extension Rate: 1E-6 in/sec — RPM: 694

Sample #: D9019-37 — Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-4.DAT — Strip Chart Scale: — — Data Acquisition Computer #: 3

Data Channels: 1+2 — Strip Chart Speed: — — LVDT or Dial Gage ID#: 181

Batch 1-24-06

SAMPLE ENVIRONMENT

Test Solution: AN107 End Point — Gas: NONE — Reference Electrode: SCE

Initial pH: 10.09 — Temperature: 50°C — Free Corrosion Potential: -233 mV

Final pH: 10.32 — Pressure: Room — Applied Potential: 0 mV

SPECIMEN DIMENSIONS

Initial		*Final*
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 5.558 in.	Device ID #: 2217	Gage Mark Distance: ~~5.672~~ 5.824 in.
Gage Diameter: 0.1245 in.		Gage Diameter: .063 in.
Cross Sectional Area: .012175 in.^{2}	Machined Gage Length: 1.000 in.	Cross Sectional Area: .003117 in.^{2}

RESULTS & CALCULATIONS

Pre-Load: 75 lbs. — Max. Load 940 lbs. — Time to Failure: 74.658 hrs.

Elongation = 5.824 - 5.558 in. — Reduction in Area: .012175 - .003117 in.^{2} — Time to Failure: 268769 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(266)}{(1.000)} \times 100 = 26.6\ \%$$

$$\%\text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.009057)}{(.012175)} \times 100 = 74.4\ \%$$

QA APPROVED

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(940)}{(.012175)} = 77209 \text{ psi}$$

77209 psi x 6.895x 10^{-3} = 532.36 MPa

NAME: Cledun

DATE: 4-27-06

CRACKING

Visual: None — Crack Mode:

Low Power (30X): yes — Max. Crack Depth: mm

Metallographic: — Crack Velocity: mm/sec

Comments: 100 Ω Resistor

TC 2215 Temp Controller 1236 PSTAT 2064

Project Leader's Signature: [signature] — Date: 4/15/06

C-1

Test Sheet Addendum

Test #	SSR-4
Sample #	D9019-37
Filar Eye Piece	
CCT # 0224	
Magnification	30X
inches/graduation	.001

Readings

63

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
63		.001		.063

Comments

4/10/06

C2

RPP-RPT-31680 Rev 0 Initial setup OK 1/20/06 cdu

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7747
Special Hazards: Caustic
Project Name: Ares Task 10
Start (Date/Time): Filled 1-20-06 1:00 P.M.
Finish (Date/Time): TAKE DOWN 1-23-06 7:40 AM
Project Number: 80506210

TEST PARAMETERS

Material: A537CL2
Test #: SSR 1
SSR System #: 1
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 694
Sample #: D9019-33
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-1
Strip Chart Scale: —
Data Acquisition Computer #: 3
Data Channels: 1 + 2
Strip Chart Speed: —
LVDT or Dial Gage ID#: 181

SAMPLE ENVIRONMENT

Batch 1-19-06
Test Solution: AN107 - Nitrites
Gas: Room
Reference Electrode: SCE
Initial pH: 11.00
Temperature: 50°C
Free Corrosion Potential: -397 mV
Final pH: 11.73
Pressure: Room
Applied Potential: +100 mV mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: To corroded in.
Gage Mark Length: 5.205 in.	Device ID #: 2217	Gage Mark Distance: To Take in.
Gage Diameter: 0.124 in.		Gage Diameter: Final in.
Cross Sectional Area: .012077 $in.^2$	Machined Gage Length: 1.000 in.	Cross Sectional Area: measurements in.

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 577 lbs.
Time to Failure: 21.37 hrs.
Elongation = FROM D/A = .073 in.
Reduction in Area: To corroded To calculate $in.^2$
Time to Failure: 76933 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(.073)}{(1.000)} \times 100 = 7.3\ \%$$

$$\%\text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(\quad)}{(\quad)} \times 100 = ?\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(577)}{(.012077)} = \cancel{76933}\ \text{psi}$$

47776 JR 8-8-06

47776 JR 8-8-06

~~76933~~ psi x 6.895x 10^{-3} = 329.42 MPa

QA APPROVED
NAME: Cldun
DATE: 4/27/06

CRACKING

Visual: NO corrosion to
Crack Mode:
Low Power (30X): ~~YES~~ Heavy to see
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: Resistor 10.1Ω ~~TC 1270~~ Temp Controller 1270 TC 2215 PSTAT 2080 started with 100Ω switched to 10 after 1 minute switched to 1Ω because potential would not hold switched to 0 mV SCE

Project Leader's Signature:
Date: 4/10/06

RPP-RPT-31680 Rev 0

Vertical Configuration OK 1/20/06 CED

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7747
Special Hazards:
Project Name: Ares Task 10
Start (Date/Time): Filled cell 1-21-06 7:40
Finish (Date/Time): Removed 1-25-06 1230 PM
Project Number: 80506210

TEST PARAMETERS

Material: A537CL2
Test #: SSR 2
SSR System #: 2
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 172
Sample #: D9019-34
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-2.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 3
Data Channels:
Strip Chart Speed: —
LVDT or Dial Gage ID#: 434

Batch 1-20-06

SAMPLE ENVIRONMENT

Test Solution: ARESAN107
Gas: NONE
Reference Electrode: SCE
Initial pH: 12.0
Temperature: 50°C
Free Corrosion Potential: -352 mV
Final pH: 12.05
Pressure: Room
Applied Potential: 0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 5.143 in.	Device ID #: 2217	Gage Mark Distance: 5.401 in.
Gage Diameter: 0.124 in.		Gage Diameter: .0698 in.
Cross Sectional Area: .012077 $in.^2$	Machined Gage Length: 1.000 in.	Cross Sectional Area: .003827 $in.^2$

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 953 lbs.
Time to Failure: 100,081 hrs. * RAN 7.13E-07
Elongation = 5.401 - 5.143 in.
Reduction in Area: .012077 - .003827 $in.^2$
Time to Failure: 360292 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(0.258)}{(1.000)} \times 100 = 25.8\ \%$$

$$\%\text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.008250)}{(.012077)} \times 100 = 68.3\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(953)}{(.012077)} = 78910 \text{ psi}$$

78910 psi x 6.895x 10^{-3} = 544.08 MPa

QA APPROVED
NAME: Cedwin
DATE: 4-27-06

CRACKING

Visual: NO
Crack Mode:
Low Power (30X): yes
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: 100.2 Ω Resistor current started out 8.2 went to 2.4 at 1min current Read not valid until Load 65 Lbs
TC 2207 Temp Controller 1361 PSTAT 2068

Project Leader's Signature:
Date: 1/26/06

Test Sheet Addendum

Test #	SSR-2
Sample #	D9019 34
Filar Eye Piece	
CCT # 0224	
Magnification	30x
inches/graduation	.001

Readings

82	88	83	82	71
17	15	12	13	1
65	73	71	69	70

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
69.8		.001		.0698

Comments small crack near heavily strained areas

9/10/02

RPP-RPT-31680 Rev 0

Electrical setup OK 1/20/06 CLD

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7747
Special Hazards: Caustic
Project Name: Ares Task 10
Start (Date/Time): Filled cell 7:40 1-21-06
Finish (Date/Time): Removed 1-24-06 7:30 A.M.
Project Number: 80506210

TEST PARAMETERS

Material: A537CL2
Test #: SSR 3
SSR System #: 4
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 694
Sample #: D9019-36
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-3.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 11
Data Channels: 11 + 12
Strip Chart Speed: —
LVDT or Dial Gage ID#: 1219

Batch 1-20-06

SAMPLE ENVIRONMENT

Test Solution: AN107
Gas: None
Reference Electrode: SCE
Initial pH: 12.0
Temperature: 50°C
Free Corrosion Potential: −330 mV
Final pH: 11.85
Pressure: Room
Applied Potential: +100 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: ~~2217~~ calipers	Overall Length: 8.2 in.
Gage Mark Length: 5.393 in.	Device ID #: 2217	Gage Mark Distance: 5.672 in.
Gage Diameter: 0.124 in.		Gage Diameter: .068 in.
Cross Sectional Area: 0.012077 in.²	Machined Gage Length: 1.000 in.	Cross Sectional Area: .003632 in.²

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 971 lbs.
Time to Failure: 72.227 hrs.
Elongation = 5.672 − 5.393 in.
Reduction in Area: .012077 − .003632 in.²
Time to Failure: 260016 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(0.279)}{(1.000)} \times 100 = 27.9\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} = \frac{(.008445)}{(.012077)} \times 100 = 69.9\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(971)}{(.012077)} = 80400\ \text{psi}$$

80400 psi x 6.895x 10^{-3} = 554.36 MPa

QA APPROVED
NAME: Cldum
DATE: 4-27-06

CRACKING

Visual: NO
Crack Mode:
Low Power (30X): yes
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

1-23-06

Comments: 10.0 Ω Resistor pot + current on D/A incorrect current +16.8mv at .32997" pot = +96.4
pot says +97mv but signal from buffer only says 87
current 28.4mv at .35067" TC 2209 Temp Cont 1236 PSTAT 2064

Project Leader's Signature: [signature]
Date: 4/10/06

Test Sheet Addendum

Test #	SSR-3
Sample #	D9019-36
Filar Eye Piece	
CCT # 0224	
Magnification	30
inches/graduation	.001

Readings

94 95
25 28
69 67

Avg. Reading, graduations	*	inches/ graduation	=	Final Diameter, in.
68		.001		.068

Comments small crack in heavily strained/necked area

4/20/06

RPP-RPT-31680 Rev 0

Slow Strain Rate

Work Request/Test Information Form

Person Performing Test: Joe Gerst — Home Phone: 740 548 7747

Special Hazards: Caustic — Project Name: Ares

Start (Date/Time): Filled cell 2-7-06 11:15 AM — Finish (Date/Time): TAKE DOWN 4:00 2-10-06 — Project Number: 80506210

TEST PARAMETERS

Material: A537CL-2 — Test #: SSR-5 — SSR System #: 4

Material ID#: 1081 — Extension Rate: 1E-6 in/sec — RPM: 694

Sample #: D9019-38 — Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-5.DAT — Strip Chart Scale: — — Data Acquisition Computer #: 11

Data Channels: 11 + 12 — Strip Chart Speed: — — LVDT or Dial Gage ID#: 1219

SAMPLE ENVIRONMENT

Batch 2-6-06

Test Solution: AN107 + 40g TOC — Gas: None — Reference Electrode: SCE

Initial pH: 11.0 — Temperature: 50°C — Free Corrosion Potential: -306 mV

Final pH: 10.82 — Pressure: Room — Applied Potential: 0 mV

SPECIMEN DIMENSIONS

Initial		*Final*
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 1.953 in.	Device ID #: 2217	Gage Mark Distance: 2.236 in.
Gage Diameter: 0.1235 in.		Gage Diameter: 0.065 in.
Cross Sectional Area: 0.011980 $in.^2$	Machined Gage Length: 1.000 in.	Cross Sectional Area: 0.003319 $in.^2$

RESULTS & CALCULATIONS

Pre-Load: 75 lbs. — Max. Load 969 lbs. — Time to Failure: 73.456 hrs.

Elongation = 2.236 - 1.953 in. — Reduction in Area: .011980 - .003319 $in.^2$ — Time to Failure: 264443 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(.283)}{(1.000)} \times 100 = 28.3\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(0.008661)}{(0.011980)} \times 100 = 72.3\%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(969)}{(.011980)} = 80886\ \text{psi}$$

80886 psi x 6.895x 10^{-3} = 557.71 MPa

QA APPROVED

NAME: Cedum

DATE: 4-27-06

CRACKING

Visual: yes — Crack Mode:

Low Power (30X): yes — Max. Crack Depth: mm

Metallographic: — Crack Velocity: mm/sec

Comments: 100.4 Ω Resistor

Project Leader's Signature: [signature] — Date: 4/15/06

Test Sheet Addendum

Test #	SSR-5
Sample #	D901G-38
Filar Eye Piece	
CCT # 0224	
Magnification	30X
inches/graduation	.001

Readings
85
20
65

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
65		.001		.065

Comments

C. 9/15/06

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7247
Special Hazards: CAUSTIC
Project Name: Ares AN107
Start (Date/Time): Filled 2-8-06 11:30 A.M.
Finish (Date/Time): TAKE DOWN 2-12-06 7:00 AM
Project Number: 80506210

TEST PARAMETERS

Material: A537CL-2
Test #: SSR-6
SSR System #: 1
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 694
Sample #: D9019-39
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-6.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 3
Data Channels: 1+2
Strip Chart Speed: —
LVDT or Dial Gage ID#: 0181

SAMPLE ENVIRONMENT

Batch 2-7-06

Test Solution: AN107 + 10g TOC
Gas: None
Reference Electrode: SCE
Initial pH: 11.0
Temperature: 50°C
Free Corrosion Potential: -103 mV
Final pH: 11.10
Pressure: Room
Applied Potential: mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
~~Punched Twice~~ Gage Mark Length: 2.194 in.	Device ID #: 2217	Gage Mark Distance: 2.463 in.
Gage Diameter: ~~0.200~~ 0.123 in.		Gage Diameter: 0.066 in.
Cross Sectional Area: 0.011883 $in.^2$	Machined Gage Length: 1.000 in.	Cross Sectional Area: 0.003421 $in.^2$

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 933 lbs.
Time to Failure: 78.077 hrs.
Elongation = 2.463 − 2.194 in.
Reduction in Area: .011883 − .003421 $in.^2$
Time to Failure: 281078 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(.269)}{(1.000)} \times 100 = 26.9\ \%$$

$$\%\text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.008462)}{(.011883)} \times 100 = 71.21\%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(933)}{(.011883)} = 78515\ \text{psi}$$

78515 psi × 6.895 × 10^{-3} = 541.36 MPa

QA APPROVED
NAME: Cedum
DATE: 4/27/06

CRACKING

Visual: Yes
Crack Mode:
Low Power (30X): Yes
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: 999 SV Resistor Temp Controller #1270 PSTAT 2080 TC 2207

Project Leader's Signature: [signature]
Date: 4/10/06

Test Sheet Addendum

Test #	SSR-6
Sample #	D9019-39
Filar Eye Piece	
CCT # 0224	
Magnification	30X
inches/graduation	.001

Readings

88
22
66

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
66		.001		.066

Comments

4/10/06

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548-7747
Special Hazards: Caustic
Project Name: ACCS AN107
Start (Date/Time): Filled 2-10-05 1:40 P.M
Finish (Date/Time): Took Down 2-12-06 7:00 AM
Project Number: 80506210

TEST PARAMETERS

Material: A537 CL 2
Test #: SSR-7
SSR System #: 4
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 694
Sample #: D9019-40
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR7.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 11
Data Channels: 11 + 12
Strip Chart Speed: —
LVDT or Dial Gage ID#: 1219

SAMPLE ENVIRONMENT

Batch 2-8-06

Test Solution: AN107 + 40 TOC + nitrites
Gas: None
Reference Electrode: SCE
Initial pH: 11.0
Temperature: 50°C
Free Corrosion Potential: -389 mV
Final pH: 11.64
Pressure: Room
Applied Potential: 0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.1 in.
Gage Mark Length: 2.064 in.	Device ID #: 2217	Gage Mark Distance: To corroded
Gage Diameter: 0.1245 in.		Gage Diameter: To measure in.
Cross Sectional Area: 0.012175 in.²	Machined Gage Length: 1.000 in.	Cross Sectional Area: in.²

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 616 lbs.
Time to Failure: 27.129 hrs.
Elongation = From D/A .109 in.
Reduction in Area: in.²
Time to Failure: 97666 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(.109)}{(1.000)} \times 100 = 10.9\ \%$$

$$\%\text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \quad \frac{(\quad)}{(\quad)} \times 100 = ____\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(616)}{(0.012175)} = 50597 \text{ psi}$$

$50597 \text{ psi} \times 6.895 \times 10^{-3} = 348.87$ MPa

QA APPROVED
NAME: Cldur
DATE: 4/27/06

CRACKING

Visual: yes
Low Power (30X):
Metallographic:

Very corroded with lots of corrosion product

Crack Mode:
Max. Crack Depth: mm
Crack Velocity: mm/sec

Comments: 100 Ω Resistor switched to 1 Ω at 500 sec

Project Leader's Signature: [signature]
Date: 4/10/06

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7747
Special Hazards: Caustic
Project Name: Ares AN107
Start (Date/Time): Filled 11:45 A.M 2-22-06
Finish (Date/Time): TAKE DOWN 2-23-06
Project Number: 80506210

TEST PARAMETERS

Material: A537 CL2
Test #: SSR-8
SSR System #: 4
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 694
Sample #: D9019-54
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-8.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 11
Data Channels: 11 + 12
Strip Chart Speed: —
LVDT or Dial Gage ID#: 1219

SAMPLE ENVIRONMENT

Batch 2-21-06

Test Solution: AN107 minus nitrites
Gas: None
Reference Electrode: SCE
Initial pH: 10.98
Temperature: 50°C
Free Corrosion Potential: -396 mV
Final pH: 11.42
Pressure: Room
Applied Potential: 0.0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: in.
Gage Mark Length: 2.167 in.	Device ID #: 2205	Gage Mark Distance: To corroded in.
Gage Diameter: 0.1245 in.		Gage Diameter: To measure in.
Cross Sectional Area: .012175 $in.^2$	Machined Gage Length: 1.000 in.	Cross Sectional Area: $in.^2$

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 620 lbs.
Time to Failure: 24.996 hrs.
Elongation = From D/A .085 in.
Reduction in Area: $in.^2$
Time to Failure: 89984 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(.085)}{(1.000)} \times 100 = 8.5\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(\quad)}{(\quad)} \times 100 = ____\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(620)}{(.012175)} = 50925 \text{ psi}$$

$$50925 \text{ psi} \times 6.895 \times 10^{-3} = 351.13 \text{ MPa}$$

QA APPROVED
NAME: Cldun
DATE: 4-27-06

CRACKING

Visual: YES
Crack Mode:
Low Power (30X):
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: 1Ω Resistor TC 2215 Temp Controller 1236 PStat 2064

Project Leader's Signature: [signature]
Date: 9/10/06

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7747
Special Hazards: Caustic
Project Name: ARES AN107
Start (Date/Time): Filled 1:30 p.m. 2-28-06
Finish (Date/Time): TAKE DOWN 3-2-06 7:26
Project Number: 80506210

TEST PARAMETERS

Material: A537CL-2
Test #: SSR-9
SSR System #: 4
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 694
Sample #: D9019-55
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-9.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 11
Data Channels: 11 + 12
Strip Chart Speed: —
LVDT or Dial Gage ID#: 1219

SAMPLE ENVIRONMENT

Batch 2-27-06 - nitrites

Test Solution: AN107 80TOC
Gas: None
Reference Electrode: SCE
Initial pH: 10.99
Temperature: 50°C
Free Corrosion Potential: -310 mV
Final pH: 11.08
Pressure: Room
Applied Potential: 0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: in.
Gage Mark Length: 2.036 in.	Device ID #: 2205	Gage Mark Distance: To corroded in.
Gage Diameter: 0.1245 in.		Gage Diameter: To measure in.
Cross Sectional Area: .012175 in.²	Machined Gage Length: 1.000 in.	Cross Sectional Area: in.²

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 676 lbs.
Time to Failure: 30.40 hrs.
Elongation = From D/A .126 in.
Reduction in Area: in.²
Time to Failure: 109438 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(.126)}{(1.000)} \times 100 = 12.6\ \%$$

$$\%\text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(\quad)}{(\quad)} \times 100 = ____\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(676)}{(.012175)} = 55525 \text{ psi}$$

$55525 \text{ psi} \times 6.895 \times 10^{-3} = 382.85$ MPa

QA APPROVED
NAME: Cldun
DATE: 4-27-06

CRACKING

Visual: yes
Crack Mode:
Low Power (30X):
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: Resistor 1.0Ω TC-2215 Tcontroller-1236 PSTAT 2064
started with 100Ω switched at 400 sec

Project Leader's Signature: [signature]
Date: 4/10/06

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 7405487747
Special Hazards: Caustic
Project Name: ARES
Start (Date/Time): Filled 3-2-06
Finish (Date/Time): Take Down 3-6-06 7:20
Project Number: 80506210

TEST PARAMETERS

Material: A537CL-2
Test #: SSR-10
SSR System #: 4
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 694
Sample #: D9019-56
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-10.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 11
Data Channels: 11 + 12
Strip Chart Speed: —
LVDT or Dial Gage ID#: 1219

SAMPLE ENVIRONMENT

Batch 3-1-06
Test Solution: AN107
Gas: None
Reference Electrode: SCE
Initial pH: 13.49
Temperature: 50°C
Free Corrosion Potential: -455 mV
Final pH: 13.52
Pressure: Room
Applied Potential: 0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 2.130 in.	Device ID #: 2205	Gage Mark Distance: 2.396 in.
Gage Diameter: 0.125 in.		Gage Diameter: .072 in.
Cross Sectional Area: 0.012273 in.^{2}	Machined Gage Length: 1.000 in.	Cross Sectional Area: .004072 in.^{2}

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 960 lbs.
Time to Failure: 73.877 hrs.
Elongation = 2.396 - 2.130 in.
Reduction in Area: .012273 - .004072 in.^{2}
Time to Failure: 265959 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(.266)}{(1.000)} \times 100 = 26.6\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.008201)}{(.012273)} \times 100 = 66.8\%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(960)}{(.012273)} = 78223\ \text{psi}$$

$$78223\ \text{psi} \times 6.895 \times 10^{-3} = 539.35\ \text{MPa}$$

QA APPROVED
NAME: Cedur
DATE: 4-27-06

CRACKING

Visual:
Crack Mode:
Low Power (30X): yes
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: Resistor 100 Ω TC-2215 Temp Cont. 1236 PSTAT 2064
Cell Fell after specimen broke Lost nearly all solution, recovered about 50 mils

Project Leader's Signature:
Date: 4/10/06

Test Sheet Addendum

Test #	SSR-10
Sample #	D9019-56
Filar Eye Piece	
CCT # 0224	
Magnification	30 X
Inches/graduation	.001

Readings

97
25
72

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
72		.001		.072

Comments

4/16/06

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7747
Special Hazards: caustic
Project Name: Ares AN107
Start (Date/Time): Filled cell 3-7-06
Finish (Date/Time): Take Down 3-11-06 5:30 A.M.
Project Number: 80506210

TEST PARAMETERS

Material: A537 CL-2
Test #: SSR-11
SSR System #: 1
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 694
Sample #: D9019-57
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-11
Strip Chart Scale: —
Data Acquisition Computer #: 3
Data Channels: Filled 3-7-06 12:00 P.M.
Strip Chart Speed: —
LVDT or Dial Gage ID#: 181

SAMPLE ENVIRONMENT

Batch 3-6-06
Test Solution: AN107 + 80 TOC
Gas: None
Reference Electrode: SCE
Initial pH: 11.0
Temperature: 50°C
Free Corrosion Potential: -320 mV
Final pH: 11.06
Pressure: Room
Applied Potential: 0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 3.337 in.	Device ID #: 2205	Gage Mark Distance: 3.611 in.
Gage Diameter: .1248 in.		Gage Diameter: 0.068 in.
Cross Sectional Area: .012175 in.^{2}	Machined Gage Length: 1.000 in.	Cross Sectional Area: ~~.003621~~ .003632 in.^{2}

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 1002 lbs.
Time to Failure: 75.81 hrs.
Elongation = 3.611 - 3.337 in.
Reduction in Area: .012175 - .003632 in.^{2}
Time to Failure: 272926 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(.274)}{(1.000)} \times 100 = 27.4\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} = \frac{(.008543)}{(.012175)} \times 100 = 70.17\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(1002)}{(.012175)} = 82302\ \text{psi}$$

82302 psi x 6.895x 10^{-3} = 567.47 MPa

QA APPROVED
NAME: Cldm
DATE: 4-27-06

CRACKING

Visual:
Crack Mode:
Low Power (30X): yes
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: Resistor - 1000 Ohm

Project Leader's Signature: CSB
Date: 4/6/06

Test Sheet Addendum

Test #	SSR-11
Sample #	D9019-57
Filar Eye Piece	
CCT # 0224	
Magnification	30X
inches/graduation	.001

Readings

79

11

68

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
68		.001		.068

Comments

4/10/06

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7747
Special Hazards: Caustic
Project Name: AREF AN 107
Start (Date/Time): Filled cell 8:45 3-16-06
Finish (Date/Time): Take Down 3-17-06 3:00 P.M.
Project Number: 80506210

TEST PARAMETERS

Material: 1081
Test #: SSR-12
SSR System #: 1
Material ID#: A537 CL-2
Extension Rate: 1E-6 in/sec
RPM: 6.94
Sample #: D9019-58
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-12.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 3
Data Channels: 1+2
Strip Chart Speed: —
LVDT or Dial Gage ID#: 181

SAMPLE ENVIRONMENT

Batch 3-15-06

Test Solution: AN107
Gas: None
Reference Electrode: SCE
Initial pH: 11.0
Temperature: 50°C
Free Corrosion Potential: -395 mV
Final pH: 11.4
Pressure: Room
Applied Potential: 0.0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: specimen in.
Gage Mark Length: 3.035 in.	Device ID #: 2217	Gage Mark Distance: heavily in.
Gage Diameter: 0.125 in.		Gage Diameter: corroded did in.
Cross Sectional Area: 0.012273 in.^{2}	Machined Gage Length: 1.000 in.	Cross Sectional Area: Not measure in.^{2}

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 615 lbs.
Time to Failure: 26.43 hrs.
Elongation = .093 in. From D/A
Reduction in Area: in.^{2}
Time to Failure: 95160 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(.093)}{(1.000)} \times 100 = 9.3\ \%$$

$$\%\text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(\quad)}{(\quad)} \times 100 = ____\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(615)}{(.012273)} = 50111 \text{ psi}$$

50111 psi $\times 6.895 \times 10^{-3} = 345.52$ MPa

QA APPROVED
NAME: Cedum
DATE: 4-27-06

CRACKING

Visual: yes
Crack Mode:
Low Power (30X): yes
Max. Crack Depth: mm
Metallographic: started with 100Ω Resistor
Crack Velocity: mm/sec

Comments: 1.1 Ω Resistor TC 2207 Tcontroller 1270 PSTAT 2080

Project Leader's Signature: [signature]
Date: 4/10/06

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7747
Special Hazards: Caustic
Project Name: ARES AN107
Start (Date/Time): 3-21-06 1:00 (Filled)
Finish (Date/Time): 3-25-06 7:15 A.M (Removed)
Project Number: 80506210

TEST PARAMETERS

Material: A537CL-2
Test #: SSR-13
SSR System #: 1
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 694
Sample #: D9019-61
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-13.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 3
Data Channels: 1 + 2
Strip Chart Speed: —
LVDT or Dial Gage ID#: 181

SAMPLE ENVIRONMENT

Batch 3-20-06
Test Solution: AN107
Gas: None
Reference Electrode: SCE
Initial pH: 11
Temperature: 50°C
Free Corrosion Potential: -380 mV
Final pH: 11.38
Pressure: Room
Applied Potential: 0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 3.731 in.	Device ID #: 2205	Gage Mark Distance: 4.009 in.
Gage Diameter: 0.1245 in.		Gage Diameter: .066 in.
Cross Sectional Area: 0.012175 in.^{2}	Machined Gage Length: 1.000 in.	Cross Sectional Area: .003421 in.^{2}

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 943 lbs.
Time to Failure: 80.36 hrs.
Elongation = 4.009 - 3.731 in.
Reduction in Area: ~~.003421~~ .012175 - .003421 in.^{2}
Time to Failure: 289312 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(0.278)}{(1.000)} \times 100 = 27.8\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.008753)}{(0.012175)} \times 100 = 71.9\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(943)}{(0.012175)} = 77456\ \text{psi}$$

$$77456\ \text{psi} \times 6.895 \times 10^{-3} = 534.06\ \text{MPa}$$

QA APPROVED
NAME: [illegible]
DATE: 4-27-06

CRACKING

Visual: yes
Crack Mode:
Low Power (30X): yes
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: 100 Ω Resistor TC 2215 Temp. Controller #1236 PSTAT 2080

Project Leader's Signature: [signature]
Date: 4/10/06

Test Sheet Addendum

Test #	SSR-13
Sample #	D9019-61
Filar Eye Piece	
CCT # 0224	
Magnification	30X
inches/graduation	.001

Readings

77

11

66

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
66		.001		.066

Comments

CSRee 4/10/06

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740.548-7747
Special Hazards: Caustic
Project Name: ARESAN 107
Start (Date/Time): 3-29-06 11:30 A.M. (Filled) Finish (Date/Time): 4-3-06 7:40 A.M. (Removed)
Project Number: 80506210

TEST PARAMETERS

Material: A537 CL-2
Test #: SSR-14
SSR System #: ~~8~~ 6
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: ~~[illegible]~~ 17.3
Sample #: D9019-~~[illegible]~~ 63
Strain Rate: 1E-6 sec⁻¹

DATA ACQUISITION

Data File Name: SSR-14.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 11
Data Channels: 9 + 15
Strip Chart Speed: —
LVDT or Dial Gage ID#: 530

SAMPLE ENVIRONMENT

Batch 3-28-06
Test Solution: AR107 - Nitrites
Gas: None
Reference Electrode: SCE
Initial pH: ~~[illegible]~~ 11.0
Temperature: 50°
Free Corrosion Potential: -342 mV
Final pH: 10.80
Pressure: Room
Applied Potential: — mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Caliper	Overall Length: 8.25 in.
Incorrect ~~Gage Mark Length: 3.598~~ in.	Device ID #: 2205	Gage Mark Distance: 4.002 in.
No measurement Taken Gage Diameter: 0.125 in.		Gage Diameter: .061 in.
Cross Sectional Area: 0.012273 in.²	Machined Gage Length: 1.000 in.	Cross Sectional Area: .002923 in.²

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 942 lbs.
Time to Failure: 71.59 hrs.
Elongation = 4.002 - 3.598 in.
Reduction in Area: 0.012273 - 0.002923 in.²
Time to Failure: 257709 sec.

% Elongation = $\frac{\text{From D/A Elongation}}{\text{Machined Gage Length}} = \frac{(.261)}{(1.000)} \times 100 = 26.1$ %

%Reduction = $\frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.009350)}{(.012273)} \times 100 = 76.2$ %

UTS = $\frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(942)}{(0.012273)} = 76756$ psi

76756 psi x 6.895x 10⁻³ = 529.23 MPa

QA APPROVED
NAME: Cedum
DATE: 4-27-06

CRACKING

Visual: ~~[illegible] yes~~ NONE
Crack Mode:
Low Power (30X): ~~[illegible] yes~~ NONE
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: TC-2207 Temp Cont-1270

Project Leader's Signature: [signature]
Date: 4/6/06

Test Sheet Addendum

Test #	SSR-14
Sample #	D9019-63
Filar Eye Piece	
CCT # 0224	
Magnification	30X
Inches/graduation	.001

Readings

81

20

61

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
61		.001		.061

Comments

4/10/06

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7747
Special Hazards: Caustic
Project Name: ARES AN107
Start (Date/Time): 3-29-06 11:15 A.M. Filled
Finish (Date/Time): 3.31.06 7:30 A.M. TAKE DOWN
Project Number: 80506210

TEST PARAMETERS

Material: A537CL-2
Test #: 15
SSR System #: ~~#2~~ 1
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: ~~273~~ 694.
Sample #: D9019-62
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-15.DAT
Strip Chart Scale: ——
Data Acquisition Computer #: 3
Data Channels: 1 + 2
Strip Chart Speed: ——
LVDT or Dial Gage ID#: 181

SAMPLE ENVIRONMENT

Batch 3-28-06
Test Solution: AN107 - nitrites
Gas: none
Reference Electrode: SCE
Initial pH: 13.5
Temperature: 50 °C
Free Corrosion Potential: -289 mV
Final pH: 13.37
Pressure: Room
Applied Potential: 0.0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 3.593 in.	Device ID #: 2205	Gage Mark Distance: To corroded in.
Gage Diameter: 0.1245 in.		Gage Diameter: To measure in.
Cross Sectional Area: .012175 $in.^2$	Machined Gage Length: 1.000 in.	Cross Sectional Area: $in.^2$

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 647 lbs.
Time to Failure: 27.85 hrs.
Elongation = From D/A .103 in.
Reduction in Area: $in.^2$
Time to Failure: 100259 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(.103)}{(1.000)} \times 100 = 10.3\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(\quad)}{(\quad)} \times 100 = ____\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(647)}{(.012175)} = 53143\ \text{psi}$$

$$53143\ \text{psi} \times 6.895 \times 10^{-3} = 366.42\ \text{MPa}$$

QA APPRO
NAME: Cedun
DATE: 4-27-06

CRACKING

Visual: yes
Crack Mode:
Low Power (30X): yes
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: 1 Ω Resistor TC #2215 Temp Controller #1236 PSTAT: 2080

Project Leader's Signature: [signature]
Date: 4/10/06

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7747
Special Hazards: Caustic
Project Name: ARES AN107
Start (Date/Time): Filled 4-5-06 12:30
Finish (Date/Time): Take Down 4-10-06 7:15 A.M.
Project Number: 80506210

TEST PARAMETERS

Material: 1081 A537CL-2
Test #: SSR-16
SSR System #: 1
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 694
Sample #: D9019-64
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-16.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 3
Data Channels: 1 + 2
Strip Chart Speed: —
LVDT or Dial Gage ID#: 181

SAMPLE ENVIRONMENT

Batch 4-4-06
Test Solution: AN107 + nitrites
Gas: None
Reference Electrode: SCE
Initial pH: 11.02
Temperature: 50°C
Free Corrosion Potential: -279 mV
Final pH: 10.96
Pressure: Room
Applied Potential: 0.0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: calipers	Overall Length: 8.2 in.
Gage Mark Length: 3.429 in.	Device ID #: 2205	Gage Mark Distance: 3.690 in.
Gage Diameter: 0.1245 in.		Gage Diameter: .061 in.
Cross Sectional Area: .012175 $in.^2$	Machined Gage Length: 1.000 in.	Cross Sectional Area: .002923 $in.^2$

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 991 lbs.
Time to Failure: 75.73 hrs.
Elongation = 3.690 - 3.429 in.
Reduction in Area: .012175 - .002923 $in.^2$
Time to Failure: 272628 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(.261)}{(1.000)} \times 100 = 26.1\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.002923)}{(.012175)} \times 100 = 75.99\%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(991)}{(.012175)} = 81399\ \text{psi}$$

$$81399\ \text{psi} \times 6.895 \times 10^{-3} = 561.24\ \text{MPa}$$

CRACKING

Visual: NONE
Crack Mode:
Low Power (30X): NONE
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: 100.2 Ω Resistor changed To 1K at 1800 sec
TC #2215 Temp Controller 1236 PSTAT 2080

QA APPROVED
NAME: Cldun
DATE: 4/27/06

Project Leader's Signature:
Date:

Test Sheet Addendum

Test #	SSR-16
Sample #	D9019-64
Filar Eye Piece	
CCT # 0224	
Magnification	30X
inches/graduation	.001

Readings

77
16
61

Avg. Reading, graduations	•	inches/ graduation	= Final Diameter, in.
61		.001	.061

Comments

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 5487747
Special Hazards: Caustic
Project Name: ARES AN107
Start (Date/Time): Filled 4-6-06 11 30 A.M. Finish (Date/Time): TAKE DOWN 4-10-07 7:15 A.M.
Project Number: 80506210

TEST PARAMETERS

Material: A537CL-2
Test #: SSR-17
SSR System #: 6
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 173
Sample #: D9019-65
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-17.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 11
Data Channels: 9+15
Strip Chart Speed: —
LVDT or Dial Gage ID#: 530

SAMPLE ENVIRONMENT

Batch 4-5-06
Test Solution: AN107 + 7.0M Nitrite
Gas: None
Reference Electrode: SCE
Initial pH: 11.02
Temperature: 50 °C
Free Corrosion Potential: -321 mV
Final pH: 11.29
Pressure: Room
Applied Potential: 0.0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 1.832 in.	Device ID #: 2205	Gage Mark Distance: 2.098 in.
Gage Diameter: 0.125 in.		Gage Diameter: 0.061 in.
Cross Sectional Area: 0.012175 $in.^2$	Machined Gage Length: 1.000 in.	Cross Sectional Area: .002923 $in.^2$

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 988 lbs.
Time to Failure: 71.5 hrs.
Elongation = 2.098 - 1.832 in.
Reduction in Area: .012175 - .002923 $in.^2$
Time to Failure: 257400 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(0.266)}{(1.000)} \times 100 = 26.6\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \quad \frac{(.009252)}{(.012175)} \times 100 = 75.99\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(988)}{(.012175)} = 81152\ \text{psi}$$

$$81152\ \text{psi} \times 6.895 \times 10^{-3} = 559.54\ \text{MPa}$$

CRACKING

Visual: None
Crack Mode:
Low Power (30X): None
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: 1000 Ω Resistor TC 2208 Temp Cont 1270 PSTAT 2064
D/A Locked up, NO Data Points but Screen [illegible] with Load/Time

QA APPROVED
NAME: Cedrin
DATE: 4/27/06

Project Leader's Signature:
Date:

Test Sheet Addendum

Test #	SSR-17	**Readings**	
Sample #	D9019-65	85	
Filar Eye Piece		24	
CCT # 0224		61	
Magnification	30X		
inches/graduation	.001		

Avg. Reading, graduations	•	inches/ graduation	= Final Diameter, in.
61		.001	.061

Comments

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 7405487747
Special Hazards: Caustic
Project Name: ARES AN107
Start (Date/Time): Filled cell 4-19-06 8:00 AM Finish (Date/Time): Take Down 4-23-06
Project Number: 80506210

TEST PARAMETERS

Material: ~~1081~~ 537CL-2
Test #: SSR 18
SSR System #: 1
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 694
Sample #: D9019-66
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-18.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 3
Data Channels: 1+2
Strip Chart Speed: —
LVDT or Dial Gage ID#: 181

SAMPLE ENVIRONMENT

Batch 4-18-06
Test Solution: AN107 + ~~85~~ .875 g/L Nitrites
Gas: None
Reference Electrode: SCE
Initial pH: 11.0
Temperature: 50°C
Free Corrosion Potential: -339 mV
Final pH: 10.98
Pressure: Room
Applied Potential: 0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 1.949 in.	Device ID #: 2205	Gage Mark Distance: ~~2.126~~ 2.213 in. 5-23-06
Gage Diameter: 0.1245 in.		Gage Diameter: .068 in.
Cross Sectional Area: .012175 $in.^2$	Machined Gage Length: 1.000 in.	Cross Sectional Area: .003632 $in.^2$

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 988 lbs.
Time to Failure: 74.63 hrs.
Elongation = 2.213 - 1.949 in.
Reduction in Area: .012175 - .003632 $in.^2$
Time to Failure: 268661 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(0.264)}{(1.000)} \times 100 = 26.4\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.008543)}{(.012175)} \times 100 = 70.2\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(988)}{(.012175)} = 81152\ \text{psi}$$

81152 psi × 6.895 × 10^{-3} = 559.54 MPa

CRACKING

Visual: yes
Crack Mode:
Low Power (30X): yes
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: 10 Ω Resister
TC-2215 Temp Controller 1238 PSTAT 2065

QA APPROVED
NAME: Cedum Date: 7/31/06

Project Leader's Signature:

DATE: 7/31/06

Test Sheet Addendum

Test #	SSR-18
Sample #	D9019-66
Filar Eye Piece	
CCT # 0224	
Magnification	30X
inches/graduation	.001

Readings

88

20

68

Avg. Reading, graduations	•	inches/ graduation	= Final Diameter, in.
68		.001	.068

Comments

083

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548-7747
Special Hazards: caustic
Project Name: ARES AN107
Start (Date/Time): Filled cell 4-20-06 7:20 A.M
Finish (Date/Time):
Project Number: 80506210

TEST PARAMETERS

Material: A537CL-2
Test #: SSR 19
SSR System #: 6
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 173
Sample #: D9019-67
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-19
Strip Chart Scale: ←
Data Acquisition Computer #: 11
Data Channels: 9+15
Strip Chart Speed: —
LVDT or Dial Gage ID#: 530

SAMPLE ENVIRONMENT

Test Solution: Batch 4-19-06 AN107 + .35 M Nitrate
Gas: None
Reference Electrode: SCE
Initial pH: 11.00
Temperature: 50°C
Free Corrosion Potential: -369 mV
Final pH: 10.91
Pressure: Room
Applied Potential: 0.0mv mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 1.917 in.	Device ID #: 2205	Gage Mark Distance: To corroded in.
Gage Diameter: 0.124 in.		Gage Diameter: To measure in.
Cross Sectional Area: .012077 $in.^2$	Machined Gage Length: 1.000 in.	Cross Sectional Area: $in.^2$

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 887 lbs.
Time to Failure: 37.05 hrs.
Elongation = — in.
Reduction in Area: — $in.^2$
Time to Failure: 133374 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(\quad)}{(\quad)} \times 100 = ____ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(\quad)}{(\quad)} \times 100 = ____ \%$$

$$UTS = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(887)}{(.012077)} = 73445 \text{ psi}$$

$$73445 \text{ psi} \times 6.895 \times 10^{-3} = 506.4 \text{ MPa}$$

CRACKING

Visual: yes
Crack Mode:
Low Power (30X): yes
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: 1.2 Ω Resistor switched to 100 Ω switch back to 1.2 Ω. At 5760 sec
TC-2208 Temp Controller 12-70 PSTAT 2084

QA APPROVED
NAME: Oldum Date: 7/31/06

Project Leader's Signature:

DATE: 7/31/06

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7747
Special Hazards: Caustic
Project Name: ARES AN107
Start (Date/Time): Filled cell 4-25-06 7:30 A.M. Finish (Date/Time): Take Down 4-26-06 3:30 P.M.
Project Number: 80506210

TEST PARAMETERS

Material: A537CL-2
Test #: 20
SSR System #: 1
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 694
Sample #: D9019-68
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-20.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 3
Data Channels: 1+2
Strip Chart Speed: —
LVDT or Dial Gage ID#: 181

SAMPLE ENVIRONMENT

Test Solution: AN107
Gas: None
Reference Electrode: SCE
Initial pH: 11.00
Temperature: 50°C
Free Corrosion Potential: -375 mV
Final pH: 11.27
Pressure: Room
Applied Potential: -50 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 2.127 in.	Device ID #: 2205	Gage Mark Distance: To corroded in.
Gage Diameter: 0.125 in.		Gage Diameter: To measure in.
Cross Sectional Area: .012273 $in.^2$	Machined Gage Length: 1.000 in.	Cross Sectional Area: ____ $in.^2$

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 610 lbs.
Time to Failure: 28.14 hrs.
Elongation = — in.
Reduction in Area: — $in.^2$
Time to Failure: 101307 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(\quad)}{(\quad)} \times 100 = \text{—}\ \%$$

$$\%\text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(\quad)}{(\quad)} \times 100 = \text{—}\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(610)}{(.012273)} = \frac{49704}{\cancel{50104}}\ \text{psi}$$

JR

49704 psi x 6.895x 10^{-3} = 342.71 MPa

CRACKING

Visual: yes
Crack Mode: ____
Low Power (30X): yes
Max. Crack Depth: ____ mm
Metallographic: ____
Crack Velocity: ____ mm/sec

Comments: Resistor 99.9 Ω switched to 1 Ω
TC-2215 Temp Controller 1238 Pstat 2065

QA APPROVED

Project Leader's Signature: [signature] NAME: [signature] Date: 7/27/06

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7747
Special Hazards: Caustic
Project Name: ARES AN107
Start (Date/Time): Filled cell 4-25-06 9:30 AM
Finish (Date/Time): Take Down 4-26-06 3:45 P.M
Project Number: 80506210

TEST PARAMETERS

Material: A537 CL-2
Test #: 21
SSR System #: 6
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 173
Sample #: D9019-69
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-21.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 11
Data Channels: 9 + 15
Strip Chart Speed: —
LVDT or Dial Gage ID#: 530

SAMPLE ENVIRONMENT

Batch 4-24-06
Test Solution: ARES AN107
Gas: None
Reference Electrode: SCE
Initial pH: 11.00
Temperature: 50°C
Free Corrosion Potential: -790 mV
Final pH: ~~11.0~~ 11.17
Pressure: Room
Applied Potential: -100 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 2.174 in.	Device ID #: 2205	Gage Mark Distance: To Corroded in.
Gage Diameter: 0.1245 in.		Gage Diameter: To measure in.
Cross Sectional Area: 0.012175 in.²	Machined Gage Length: 1.000 in.	Cross Sectional Area: in.²

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 670 lbs.
Time to Failure: 27.70 hrs.
Elongation = — in.
Reduction in Area: — in.²
Time to Failure: 99708 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(\quad)}{(\quad)} \times 100 = ____\%$$

$$\%\text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(\quad)}{(\quad)} \times 100 = ____\%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(670)}{(.012175)} = 55032 \text{ psi}$$

$$55032 \text{ psi} \times 6.895 \times 10^{-3} = 379.45 \text{ MPa}$$

CRACKING

Visual: yes
Crack Mode:
Low Power (30X): yes
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: 1.2 Ω Resistor switch to 100 then back to 1.2
TC-2208 Temp Cont 170 PSTAT 2084

QA APPROVED
NAME: Cldun Date: 7/31/06
DATE: 7/31/06

Project Leader's Signature: [signature]

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 7405487747
Special Hazards: Caustic
Project Name: ARES AN107
Start (Date/Time): Filled cell 4-27-06 10:05 A.M. Finish (Date/Time):
Project Number: 80506210

TEST PARAMETERS

Material: A537CL-2
Test #: SSR-22
SSR System #: 1
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 694
Sample #: D9019-70
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-22.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 3
Data Channels: 1+2
Strip Chart Speed: —
LVDT or Dial Gage ID#: 181

SAMPLE ENVIRONMENT

Batch 4-26-06
Test Solution: AN107 Endpoint
Gas: None
Reference Electrode: SCE
Initial pH: 10.00
Temperature: 50 °C
Free Corrosion Potential: -218 mV
Final pH: 10.24
Pressure: Room
Applied Potential: -50 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 2.334 in.	Device ID #: 2205	Gage Mark Distance: 2.618 in.
Gage Diameter: 0.1245 in.		Gage Diameter: .063 in.
Cross Sectional Area: 0.012175 $in.^2$	Machined Gage Length: 1.000 in.	Cross Sectional Area: 0.003117 $in.^2$

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 974 lbs.
Time to Failure: 74.39 hrs.
Elongation = 2.618 - 2.334 in.
Reduction in Area: .012175 - .003117 $in.^2$
Time to Failure: 281989 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(.284)}{(1.000)} \times 100 = 28.4\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.009057)}{(.012175)} \times 100 = 74.4\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(974)}{(.012175)} = 80002 \text{ psi}$$

$$80002 \text{ psi} \times 6.895 \times 10^{-3} = 551.61 \text{ MPa}$$

CRACKING

Visual: NO
Crack Mode:
Low Power (30X): NO
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: Resistor 1000 Ω
TC-2215 Temp Controller 1238 PSTAT 2065

QA APPROVED

Project Leader's Signature: [signature] NAME: Odum Date: 7/31/06

DATE: 7/31/06

Test Sheet Addendum

Test #	SSR-22
Sample #	A537CL2-2
Filar Eye Piece	
CCT # 0224	
Magnification	30X
inches/graduation	.001

Readings

95

32

63

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
63		.001		.063

Comments

Clear

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 7405487747
Special Hazards: CAUSTIC
Project Name: ARES AN107
Start (Date/Time): 5-2-06 7:45 A.M. Filled cell
Finish (Date/Time): 5-6-06 6:30 A.M. TAKE DOWN
Project Number: 80506210

TEST PARAMETERS

Material: A537CL2
Test #: SSR-23
SSR System #: 1
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 694
Sample #: A537CL2-1
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-23.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 3
Data Channels: 1+2
Strip Chart Speed: —
LVDT or Dial Gage ID#: 181

SAMPLE ENVIRONMENT

Batch 5-1-06
Test Solution: AN107/1.0375M Nitrites
Gas: NONE
Reference Electrode: SCE
Initial pH: 11.01
Temperature: 50°C
Free Corrosion Potential: -376 mV
Final pH: 11.00
Pressure: Room
Applied Potential: 0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Callipers	Overall Length: 8.2 in.
Gage Mark Length: 2.056 in.	Device ID #: 2205	Gage Mark Distance: 2.336 in.
Gage Diameter: 0.124 in.		Gage Diameter: .067 in.
Cross Sectional Area: 0.012077 $in.^2$	Machined Gage Length: 1.000 in.	Cross Sectional Area: .003526 $in.^2$

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 979 lbs.
Time to Failure: 79.67 hrs.
Elongation = 2.336 - 2.056 in.
Reduction in Area: .012077 - .003526 $in.^2$
Time to Failure: 279612 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(.280)}{(1.000)} \times 100 = 28.0\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.008551)}{(.012077)} \times 100 = 70.8\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(979)}{(.012077)} = 81063 \text{ psi}$$

$$81063 \text{ psi} \times 6.895 \times 10^{-3} = 558.93 \text{ MPa}$$

CRACKING

Visual: yes
Low Power (30X): yes
Metallographic:

QA APPROVED
NAME: Oldum
DATE: 7/31/06

Crack Mode:
Max. Crack Depth: mm
Crack Velocity: mm/sec

Comments: 1000 Ω Resistor
TC-2215 Temp Controller 1238 PSTAT 2065
D/A Failed Load, Time to Failure, ~~Elongation~~ were estimated from Picture of chart

Project Leader's Signature: [signature]
Date: 7/31/06

Test Sheet Addendum

Test #	SSR-23
Sample #	A537CL2-1
Filar Eye Piece	
CCT # 0224	
Magnification	30X
Inches/graduation	.001

Readings

91
24
67

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
67		.001		.067

Comments

C863

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 7405487747
Special Hazards: Caustic
Project Name: ARES AN107
Start (Date/Time): Filled cell 5-3-06 7:30 AM
Finish (Date/Time): TAKEDOWN 5-6-06 8:00 AM
Project Number: 80506210

TEST PARAMETERS

Material: A537CL2
Test #: SSR-24
SSR System #: 6
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 173
Sample #: A537CL2-2
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-24.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 11
Data Channels:
Strip Chart Speed: —
LVDT or Dial Gage ID#: 530

SAMPLE ENVIRONMENT

Batch 5-2-06
Test Solution: AN107+0.2M Chlorides
Gas: NONE
Reference Electrode: SCE
Initial pH: 11.00
Temperature: 50°C
Free Corrosion Potential: -341 mV
Final pH: 11.03
Pressure: Room
Applied Potential: 0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 2.006 in.	Device ID #: 2205	Gage Mark Distance: 2.241 in.
Gage Diameter: 0.123 in.		Gage Diameter: .079 in.
Cross Sectional Area: 0.011883 $in.^2$	Machined Gage Length: 1.000 in.	Cross Sectional Area: 0.004902 $in.^2$

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 952 lbs.
Time to Failure: 67.22 hrs.
Elongation = 2.241 − 2.006 in.
Reduction in Area: .011883 − .004902 $in.^2$
Time to Failure: 241976 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(0.235)}{(1.000)} \times 100 = 23.5\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.006981)}{(.011883)} \times 100 = \cancel{58.8}\ \% \quad 58.75$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(952)}{(0.011883)} = 80114 \text{ psi}$$

80114 psi x 6.895x 10^{-3} = 552.39 MPa

CRACKING

Visual: yes
Crack Mode:
Low Power (30X): yes
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: 1000 Ω Resistor
TC-2208 Temp Controller 1270 PSTAT 2064

QA APPROVED
NAME: Cldun Date: 7/31/06

Project Leader's Signature: CBR

DATE: 7/31/06

Test Sheet Addendum

Test #	SSR-24
Sample #	A537CL2-2
Filar Eye Piece	
CCT # 0224	
Magnification	30X
inches/graduation	.001

Readings

97

18

79

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
79		.001		.079

Comments

Ofn

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 7405487747
Special Hazards: Caustic
Project Name: 80506210
Start (Date/Time): Filled cell 5-18-06 11:00 AM
Finish (Date/Time): Takedown 5-22-06 7:00 A.M.
Project Number: ARES AN107

TEST PARAMETERS

Material: A537CL2
Test #: SSR 25
SSR System #: 6
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 173
Sample #: A537CL2-3
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR
Strip Chart Scale: —
Data Acquisition Computer #: 11
Data Channels: 9 + 15
Strip Chart Speed: —
LVDT or Dial Gage ID#: 530

SAMPLE ENVIRONMENT

Batch 5-17-06

Test Solution: AN107
Gas: None
Reference Electrode: SCE
Initial pH: 10.99
Temperature: 50°C
Free Corrosion Potential: -365 JR 5-18 = -352 mV
Final pH: 11.10
Pressure: Room
Applied Potential: -200 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 2.102 in.	Device ID #: 2205	Gage Mark Distance: 2.382 in.
Gage Diameter: 0.124 in.		Gage Diameter: .063 in.
Cross Sectional Area: 0.012077 in.^{2}	Machined Gage Length: 1.000 in.	Cross Sectional Area: ~~0.008960~~ 0.003117 in.^{2} JR 5-23-06

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 963 lbs.
Time to Failure: 79.59 hrs.
Elongation = 2.382 - 2.102 in.
Reduction in Area: .012077 - ~~.008960~~ .003117 in.^{2} JR 5-23-06
Time to Failure: 286522 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(.280)}{(1.000)} \times 100 = 28.0\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.008960)}{(.012077)} \times 100 = 74.2\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(963)}{(.012077)} = 79738 \text{ psi}$$

79738 psi x 6.895x 10^{-3} = 549.79 MPa

CRACKING

Visual: None
Crack Mode:
Low Power (30X): None
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: 1000 Ω Resistor
TC 2208 Temp Controller - 1270 PSTAT 2064

QA APPROVED
NAME: Cdum Date: 7/31/06

Project Leader's Signature:

DATE: 7/31/06

Test Sheet Addendum

Test #	SSR-25
Sample #	A537CL2-3
Filar Eye Piece	
CCT # 0224	
Magnification	30X
inches/graduation	.001

Readings
98
35
63

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
63		.001		.063

Comments

CSB

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7747
Special Hazards: Caustic
Project Name: ARES AN107
Start (Date/Time): 6-8-06 8:00 A.M. (Filled cell)
Finish (Date/Time): Take Down 6-12-06 8:00
Project Number: 80506210

TEST PARAMETERS

Material: A537CL2
Test #: SSR-26
SSR System #: 6-7-06 12 ~~8~~ 1
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: ~~12~~ 694
Sample #: A537CL2-5
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-26.DAT
Strip Chart Scale: ——
Data Acquisition Computer #: 3
Data Channels: 1+2
Strip Chart Speed: ——
LVDT or Dial Gage ID#: 141

SAMPLE ENVIRONMENT

Test Solution: Batch 6-7-06 AN107 .75 M Nitrite 1.5 M Nitrate
Gas: None
Reference Electrode: SCE
Initial pH: 11.00
Temperature: 50°C
Free Corrosion Potential: -248 mV
Final pH: 10.61
Pressure: Room
Applied Potential: 0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 1.722 in.	Device ID #: 2218	Gage Mark Distance: 2.000 in.
Gage Diameter: 0.124 in.		Gage Diameter: 0.062 in.
Cross Sectional Area: 0.012077 $in.^2$	Machined Gage Length: 1.000 in.	Cross Sectional Area: 0.003019 $in.^2$

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 947 lbs.
Time to Failure: 73.84 hrs.
Elongation = 2.000 - 1.722 in.
Reduction in Area: .012077 - .003019 $in.^2$
Time to Failure: 265821 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(0.278)}{(1.000)} \times 100 = 27.8\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.009058)}{(.012077)} \times 100 = 75.0\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(947)}{(.012077)} = 78413 \text{ psi}$$

78413 psi x 6.895x 10^{-3} = 540.66 MPa

CRACKING

Visual: None
Crack Mode:
Low Power (30X): yes
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: 1.1 Ω Resistor used 100KΩ Resistor
TC#2208 Tcontroller# 1238 PSTAT 2065

QA APPROVED
NAME: Cldum Date: 7/31/06

Project Leader's Signature: CSR

Test Sheet Addendum

Test #	SSR-26
Sample #	A537CL2-5
Filar Eye Piece	
CCT # 0224	
Magnification	30K
inches/graduation	.001

Readings

84
22
62

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
62		.001		.062

Comments

CBB

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst — Home Phone: 740 548 7747
Special Hazards: CAUSTIC — Project Name: ARES AN107
Start (Date/Time): Filled 6-8-06 9:10 — Finish (Date/Time): Linkedow 6-11-06 8:00 AM — Project Number: 80506210

TEST PARAMETERS

Material: A537CL2 — Test #: SSR-27 — SSR System #: 6
Material ID#: 1081 — Extension Rate: 1E-6 in/sec — RPM: ~~124~~ 173 (6-7-06)
Sample #: A537CL2-4 — Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-27.DAT — Strip Chart Scale: — — Data Acquisition Computer #: 11
Data Channels: 9 4 15 — Strip Chart Speed: — — LVDT or Dial Gage ID#: 530

SAMPLE ENVIRONMENT

Batch 6-7-06 1.5M ~~1.5M~~ nitrite 1.5M nitrate
Test Solution: ARES AN107 — Gas: None — Reference Electrode: SCE
Initial pH: 11.0 — Temperature: 50° — Free Corrosion Potential: -311 mV
Final pH: 10.43 — Pressure: Room — Applied Potential: 0 mV

SPECIMEN DIMENSIONS

Initial		*Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 1.810 in.	Device ID #: 2218	Gage Mark Distance: 2.079 in.
Gage Diameter: 0.124 in.		Gage Diameter: .074 in.
Cross Sectional Area: .012077 in.^{2}	Machined Gage Length: 1.000 in.	Cross Sectional Area: 0.004301 in.^{2}

RESULTS & CALCULATIONS

Pre-Load: 75 lbs. — Max. Load 920 lbs. — Time to Failure: 65.11 hrs.
Elongation = 2.079 - 1.810 in. — Reduction in Area: .012077 - .004301 in.^{2} — Time to Failure: 234411 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(0.269)}{(1.000)} \times 100 = 26.9\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.007776)}{(.012077)} \times 100 = 64.4\%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(920)}{(.012077)} = 76177\ \text{psi}$$

$$76177\ \text{psi} \times 6.895 \times 10^{-3} = 525.24\ \text{MPa}$$

CRACKING

Visual: yes — Crack Mode:
Low Power (30X): yes — Max. Crack Depth: mm
Metallographic: — Crack Velocity: mm/sec

Comments: 1000 Ω Resistor
TC #2215 Tcontroller #1270 PSTAT #2064

QA APPROVED
NAME: Cldur Date: 7/31/06
DATE: 7/31/06

Project Leader's Signature:

Test Sheet Addendum

Test #	SSR-27	**Readings**	
Sample #	A537CL2-4	88	
Filar Eye Piece		14	
CCT # 0224			
Magnification	30X		
inches/graduation	.001		

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
74		.001		.074

Comments

CSB

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7747
Special Hazards: Caustic
Project Name: ARES AN107
Start (Date/Time): 6-13-06 8:00 Filled Cell
Finish (Date/Time): 6-19- 7:30 TAKEDOWN
Project Number: 80506210

TEST PARAMETERS

Material: A537CL2
Test #: SSR-28
SSR System #: 1
Material ID#: 1081
Extension Rate: 1 E-6 in/sec
RPM: 694
Sample #: A537CL2-6
Strain Rate: 1 E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR28.DAT
Strip Chart Scale: ——
Data Acquisition Computer #: 3
Data Channels: 1+2
Strip Chart Speed: ——
LVDT or Dial Gage ID#: 181

SAMPLE ENVIRONMENT

Batch 6-14-06
Test Solution: AN107 End Point
Gas: None
Reference Electrode: SCE
Initial pH: 9.50
Temperature: 50°C
Free Corrosion Potential: -195 mV
Final pH: 9.51
Pressure: Room
Applied Potential: 0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gage Mark Length: 1.734 in.	Device ID #: 2205	Gage Mark Distance: 2.012 in.
Gage Diameter: 0.124 in.		Gage Diameter: 0.062 in.
Cross Sectional Area: .012077 in.²	Machined Gage Length: 1.000 in.	Cross Sectional Area: 0.003019 in.²

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 952 lbs.
Time to Failure: 72.79 hrs.
Elongation = 2.012 - 1.734 in.
Reduction in Area: .012077 - .003019 in.²
Time to Failure: 262055 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(0.278)}{(1.000)} \times 100 = 27.8\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.009058)}{(.012077)} \times 100 = 75.0\%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(952)}{(.012077)} = 78827\ \text{psi}$$

$$78827\ \text{psi} \times 6.895 \times 10^{-3} = 543.51\ \text{MPa}$$

CRACKING

Visual: yes
Crack Mode:
Low Power (30X): yes
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: TC #2208 Tcontroller #1238 PSTAT 2065
1000 Ω Resistor

QA APPROVED

Project Leader's Signature: [signature] NAME: Cldum Date: 7/31/06

DATE: 7/31/06

Test Sheet Addendum

Test #	SSR-28
Sample #	~~A537CL2.Dat~~
Filar Eye Piece	A537CL2.D
CCT # 0224	
Magnification	.01
inches/graduation	.001

Readings

82

20

62

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
62		.001		.062

Comments

CSB

RPP-RPT-31680 Rev 0

Slow Strain Rate

Work Request/Test Information Form

Person Performing Test: Joe Gerst | Home Phone: 7405487747

Special Hazards: Caustic | Project Name: ARES AN107

Start (Date/Time): Filled cell ~~6-15-06~~ 9:00 AM | Finish (Date/Time): TAKE DOWN 6-30-06 3:30 PM | Project Number: 805062 10

JR 6-27-06

TEST PARAMETERS

Material: A537CL2 | Test #: SSR-29 | SSR System #: 6

Material ID#: 1081 | Extension Rate: 1E-6 in/sec | RPM: 173

Sample #: A537CL2-7 | Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-29.DAT | Strip Chart Scale: — | Data Acquisition Computer #: 11

Data Channels: 9 + 15 | Strip Chart Speed: — | LVDT or Dial Gauge ID#: 530

SAMPLE ENVIRONMENT

Batch 6-~~15~~ 26-06 JR 0.05M chlorides

Test Solution: AN 107 | Gas: None | Reference Electrode: SCE

Initial pH: 11.00 | Temperature: 50°C | Free Corrosion Potential: -339 mV

Final pH: 10.80 | Pressure: Room | Applied Potential: JR 6-27 0.0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gauge Mark Length: 1.815 in.	Device ID #: 2205	Gauge Mark Distance: 2.064 in.
Gauge Diameter: 0.124 in.		Gauge Diameter: .071 in.
Cross Sectional Area: .012077 in.^{2}	Machined Gauge Length: 1.000 in.	Cross Sectional Area: .003959 in.^{2}

RESULTS & CALCULATIONS

Pre-Load: 75 lbs. | Max. Load 950 lbs. | Time to Failure: 68.79 hrs.

Elongation = 2.064 - 1.815 in. | Reduction in Area: .012077 - .003959 in.^{2} | Time to Failure: 247630 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(0.249)}{(1.000)} \times 100 = 24.9\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.008118)}{(.003959)} \times 100 = 67.2\%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(950)}{(.012077)} = 78661 \text{ psi}$$

78661 psi × 6.895 10^{-3} = 542.37 MPa

CRACKING

Visual: yes | Crack Mode: _____

Low Power (30X): yes | Max. Crack Depth: _____ mm

Metallographic: _____ | Crack Velocity: _____ mm/sec

Comments: 1000 Ω Resistor

TC 2215 Tcontroller 1270 PSTAT 2064

D/A Reading potential incorrectly meter says -100 mv D/A says -50 mv

Project Leader's Signature: [signature] | Date: 7/31/06

QA APPROVED

NAME: 7/31/06

DATE: [signature]

Test Sheet Addendum

Test #	SSR-29
Sample #	A537CL2
Filar Eye Piece	
CCT # 0224	
Magnification	30X
Inches/graduation	.001

Readings

75
4
71

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
71		.001		.071

Comments

CJB

RPP-RPT-31680 Rev 0

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7747
Special Hazards: Caustic
Project Name: ARES AN107
Start (Date/Time): Filled cell 6-28-06 9:20AM
Finish (Date/Time): TAKE DOWN 7-3-06 6:30 A.M.
Project Number: 80506210

TEST PARAMETERS

Material: A537CL2
Test #: SSR-30
SSR System #: 1
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 694
Sample #: A537CL2-8
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-30.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 3
Data Channels: 1+2
Strip Chart Speed: —
LVDT or Dial Gauge ID#: 181

SAMPLE ENVIRONMENT

Batch 6-27-06
Test Solution: AN107 0.2 clorides
Gas: NONE
Reference Electrode: SCE
Initial pH: 11.0
Temperature: 50°C
Free Corrosion Potential: -352 mV
Final pH: 11.12
Pressure: Room
Applied Potential: -100 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gauge Mark Length: 1.826 in.	Device ID #: 2205	Gauge Mark Distance: 2.083 in.
Gauge Diameter: 0.122 in.		Gauge Diameter: .061 in.
Cross Sectional Area: 0.011691 in.^{2}	Machined Gauge Length: 1.000 in.	Cross Sectional Area: ~~.008768~~ .002923 in.^{2} JR 7-28

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 918 lbs.
Time to Failure: 69.37 hrs.
Elongation = 2.083 - 1.826 in.
Reduction in Area: .011691 - ~~.008768~~ .002923 in.^{2} 1-28 JR
Time to Failure: 249740 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{0.257}{(1.000)} \times 100 = 25.7\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.008768)}{(.011691)} \times 100 = 75.0\%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(918)}{(.011691)} = 78524\ \text{psi}$$

78524 psi × 6.895 10^{-3} = 541.43 MPa

CRACKING

Visual: NO
Crack Mode:
Low Power (30X): NO
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: 1000 Ω Resistor
TC 2208 Tcontroller 1238 PSTAT 2065
D/A Reading Potential incorrectly

QA APPROVED
NAME: Cdeur
DATE: 7/31/06

Project Leader's Signature: [signature]
Date: 7/31/06

Test Sheet Addendum

Test #	SSR-30
Sample #	A537CL2-8
Filar Eye Piece	
CCT # 0224	
Magnification	30X
Inches/graduation	.001

Readings

73
12
61

Avg. Reading, graduations	*	inches/ graduation	=	Final Diameter, in.
61		.001		.061

Comments

CSB

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7747
Special Hazards: Caustic
Project Name: ARES AN107
Start (Date/Time): Filled Cell 8-11-06 10:45
Finish (Date/Time): TAKE DOWN 8-15-06 7:30
Project Number: 80506210

TEST PARAMETERS

Material: A537 CL 2
Test #: SSR-31
SSR System #: 1
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 694
Sample #: A537CL2-11
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-31.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 3
Data Channels: 1 + 2
Strip Chart Speed: —
LVDT or Dial Gauge ID#: 181

SAMPLE ENVIRONMENT

Batch 8-10-06 End Point
Test Solution: AN107 .2M Chloride
Gas: None
Reference Electrode: SCE
Initial pH: 10.0
Temperature: 50°C
Free Corrosion Potential: -245 mV
Final pH: 9.64
Pressure: Room
Applied Potential: 0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gauge Mark Length: 1.918 in.	Device ID #: 2205	Gauge Mark Distance: 2.172 in.
Gauge Diameter: 0.124 in.		Gauge Diameter: 0.064 in.
Cross Sectional Area: 0.012077 in.^{2}	Machined Gauge Length: 1.000 in.	Cross Sectional Area: 0.003217 in.^{2}

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 947 lbs.
Time to Failure: 74.60 hrs.
Elongation = 2.172 - 1.918 in.
Reduction in Area: .012077 in.^{2}
Time to Failure: 268564 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(.254)}{(1.000)} \times 100 = 25.4\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.008860)}{(.012077)} \times 100 = 73.4\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(947)}{(.012077)} = 78413 \text{ psi}$$

78413 psi × 6.895 10^{-3} = 540.66 MPa

CRACKING

Visual: No
Crack Mode:
Low Power (30X): yes very small crack right at fracture
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

QA APPROVED
NAME: Cldum
DATE: 8/17/06

Comments: 1000 Ω Resistor
PStat 2080 TC 2207 Tcontroller 1259

Project Leader's Signature: [signature]
Date: 8/16/06

Test Sheet Addendum

Test #	SSR-31
Sample #	A537CL-11
Filar Eye Piece	
CCT # 0224	
Magnification	30X
inches/graduation	.061

Readings

80

16

64

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
64		.001		.064

Comments

CSR 8/16/06

RPP-RPT-31680 Rev 0
Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 740 548 7747
Special Hazards: Caustic
Project Name: ARES AN107
Start (Date/Time): Filled cell 8-11-06 10:45 Finish (Date/Time): Take Down 8-15-06 7:30
Project Number: 80506210

TEST PARAMETERS

Material: A537CL2
Test #: SSR-32
SSR System #: 6
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: ~~694~~ 173
Sample #: A537CL2-9
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-32.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 11
Data Channels: 9 + 18
Strip Chart Speed: —
LVDT or Dial Gauge ID#: 530

SAMPLE ENVIRONMENT

Batch 8-10-06 Endpoint
Test Solution: AN107 .2M Chlorides
Gas: None
Reference Electrode: SCE
Initial pH: 10.0
Temperature: 50°C
Free Corrosion Potential: -229 mV
Final pH: 9.65
Pressure: Room
Applied Potential: 0 mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gauge Mark Length: 1.654 in.	Device ID #: 2205	Gauge Mark Distance: 1.929 in.
Gauge Diameter: 0.123 in.		Gauge Diameter: 0.065 in.
Cross Sectional Area: 0.011883 $in.^2$	Machined Gauge Length: 1.000 in.	Cross Sectional Area: 0.003319 $in.^2$

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 939 lbs.
Time to Failure: 75.31 hrs.
Elongation = 1.929 - 1.654 in.
Reduction in Area: .011883 - .003319 $in.^2$
Time to Failure: 271101 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(.275)}{(1.000)} \times 100 = 27.5\ \%$$

$$\%\text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(.008565)}{(0.011883)} \times 100 = 72.1\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{939\ \cancel{74020.0}}{(0.011883)} = 79020 \text{ psi}$$

JR 8-15-06

79020 psi × 6.895 10^{-3} = 544.84 MPa

CRACKING

Visual: NO
Crack Mode:
Low Power (30X): yes very small crack right at Fracture
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

QA APPROVED
NAME: Cldum
DATE: 8/17/06

Comments: 1000 Ω Resistor
Pstat 2108 TC 1301 Tcontroller 1270

Project Leader's Signature: [signature]
Date: 8/16/06

Test Sheet Addendum

Test #	SSR-32
Sample #	A537CL2-9
Filar Eye Piece	
CCT # 0224	
Magnification	30X
inches/graduation	.001

Readings

70

5

65

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
65		.001		.065

Comments

8/16/06

Slow Strain Rate
Work Request/Test Information Form

Person Performing Test: Joe Gerst
Home Phone: 7405487747
Special Hazards: Caustic
Project Name: ARES AN107
Start (Date/Time): Filled cell 8-22-06 1035
Finish (Date/Time): Take Down 8-25-06 3:00
Project Number: 80506210

TEST PARAMETERS

Material: A537CL2
Test #: SSR-34
SSR System #: 6
Material ID#: 1081
Extension Rate: 1E-6 in/sec
RPM: 173
Sample #: A537CL2-13
Strain Rate: 1E-6 sec^{-1}

DATA ACQUISITION

Data File Name: SSR-34.DAT
Strip Chart Scale: —
Data Acquisition Computer #: 11
Data Channels: 9 + 15
Strip Chart Speed: —
LVDT or Dial Gauge ID#: 530

SAMPLE ENVIRONMENT

Test Solution: AN107 standard 0.2 M Chlorides
Gas: None
Reference Electrode: SCE
Initial pH: 11.00
Temperature: 50 °C
Free Corrosion Potential: 8-22 JR -~~24~~-314 mV
Final pH: 10.97
Pressure: Room
Applied Potential: mV

SPECIMEN DIMENSIONS

Initial		Final
Overall Length: 8.0 in.	Measurement Device: Calipers	Overall Length: 8.2 in.
Gauge Mark Length: 1.665 in.	Device ID #: 2205	Gauge Mark Distance: 1.931 in.
Gauge Diameter: 0.124 in.		Gauge Diameter: 0.068 in.
Cross Sectional Area: .012077 $in.^2$	Machined Gauge Length: 1.000 in.	Cross Sectional Area: .003632 $in.^2$

RESULTS & CALCULATIONS

Pre-Load: 75 lbs.
Max. Load 935 lbs.
Time to Failure: 72.03 hrs.
Elongation = 1.931 - 1.665 in.
Reduction in Area: .012077 - .003632 $in.^2$
Time to Failure: 259320 sec.

$$\% \text{ Elongation} = \frac{\text{Elongation}}{\text{Machined Gage Length}} = \frac{(0.266)}{(1.000)} \times 100 = 26.6\ \%$$

$$\% \text{Reduction} = \frac{\text{Reduction in Area}}{\text{Initial Cross Section Area}} \frac{(0.008445)}{(0.012077)} \times 100 = 69.9\ \%$$

$$\text{UTS} = \frac{\text{Max. Load}}{\text{Initial Cross Section Area}} = \frac{(935)}{(0.012077)} = 77419\ \text{psi}$$

77419 psi x 6.895 10^{-3} = 533.81 MPa

CRACKING

Visual: yes
Crack Mode:
Low Power (30X): yes
Max. Crack Depth: mm
Metallographic:
Crack Velocity: mm/sec

Comments: 1000 Ω Resistor PSTAT 2068 Tcontroller 1270 TC 2215

Project Leader's Signature: [signature]
QA APPROVED Date: 8/29/06
NAME: Oldum
DATE: 8-29-06

Test Sheet Addendum

Test #	SSR-34
Sample #	A537CL2-13
Filar Eye Piece	
CCT # 0224	
Magnification	30X
inches/graduation	.001

Readings

90
22
68

Avg. Reading, graduations	•	inches/ graduation	=	Final Diameter, in.
68		.001		.068

Comments [illegible] 8/29/06

Appendix D: Constant Load CGR Testing Information Forms

PSTAT-2092 Temp Controller 1264 TC-1302

ARES AN 107 Crack Growth Testing

Specimen CT-1
Frame 5
K = 5
Load = 455 lbs

Load Cell 2163
LVDT 557

Test # CT-1
Lab Computer 16
File Name CT-1.DAT
Setup File CTSETUP.WBB

Test Solution AN107
Batch 1-18-06

Starting pH 10.02 @ 10.20
Ending pH ~~10.20~~ ~~10.73~~

Set pot = 0 mV SCE

Project Name ARES AN107
Project Number 80506210

Material A537CL-2
Material ID # 1081

Filled cell 10:00 A.M 1-19-06

Date	Time	Temp. C	Load, lbs.	Disp. In	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 99.4 ohm Resistor, V	Comments
1-19-06	3:45	50	63	.4186	20.01	0.000283	0.000218		12.2 mV	FCP-321 mV
1-19-06	3:45	50	455	0.4036	20.01	0.000283	0.000218		14.3 mV	
1-20-06	6:45	50	453	0.4022	20.01	0.000284	0.000217		.164 V	
1-23-06	7:00	50	454	0.4020	20.01	0.000283	0.000217	0	.104 V	
1-24-06	655	50	454	0.4021	20.02	0.000284	0.000217		.243	
1-25-06	645	50	454	0.4019	20.02	0.000283	0.000217		.114	
1-26-06	7:00	50	454	0.4019	20.03	0.000283	0.000218		.0668	
1-27-06	7:35	50	454	0.4019	20.01	0.000283	0.000218		.052	
1-31-06	4:00	50	454	.4019	20.01	0.000283	0.000218		.0269	
2-1-06	9:10	50	454	0.4017	20.01	0.000283	0.000218		.024	
2-2-06	650	50	454	0.4019	20.01	0.000282	0.000218		.024	
2-3-06	7:00	50	454	0.4019	20.01	0.000282	0.000218	0	.0198	
2-6-06	6:50	50	454	0.4020	20.01	0.000282	0.000218		.0155	
2-7-06	7:00	50	454	0.4018	20.01	0.000282	0.000219		.0119	
2-8-06	645	50	454	0.4018	20.01	0.000282	0.000218		.0117	
2-10-06	12:20	50	454	0.4018	20.01	0.000283	0.000218		.0087	
2-13-06	705	50	454	0.4019	20.01	0.000283	0.000218		.0077	QA APPROVED
2-14-06	7:05	50	454	0.4019	20.01	0.000282	0.000219		.0090	NAME: Oldum
2-15-06	725	50	454	0.4019	20.02	0.000283	0.000218	0	.0072	
2-16-06	705	50	454	0.4018	20.02	0.000283	0.000218		.0067	DATE: 5-9-06
2-17-06	650	50	454	0.4019	20.03	0.000284	0.000218		.0067	
2-20-06	650	50	454	0.4018	20.02	0.000283	0.000219		.0064	End Test Take Down

Project Manager [signature]

Date 5/8/06

PSTAT 2066 Temp Controller - 1262 TC 2211

ARES AN 107 Crack Growth Testing

Specimen: CT-2 K= 10
Frame: 6 Load = 888 Lbs
Load Cell: 2164
LVDT: Not Working

Test #: CT-2
Lab Computer: 16
File Name: CT-2.DAT
Setup File: CTSETUP.WB13 set pot= 0 mv SCE
Test Solution: AN107
Batch: 1-18-06
Starting pH: 10.02
Ending pH: ~~10.98~~ 10.53

Project Name: ARES
Project Number: 80506210
Material: A537CL-2
Material ID #: 1081

Filled cell 10:00 AM 1-19-06

Date	Time	Temp. C	Load, lbs.	Disp. In	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 99.9 ohm Resistor, V	Comments
1-19-06	345	50	88	·	19.99	0.000325	0.000439	0	.005	FCP -321
1-19-06	345	50	888	1.6390	19.99	0.000326	0.000439		.006	
1-20-06	650	50	888	—	19.99	0.000325	0.000439		.111	
1-23-06	800	50	888	—	19.99	0.000326	0.000440	0	.0497	
1-24-06	655	50	889	—	19.99	0.000327	0.000440		.069	
1-25-06	645	50	888		19.99	0.000327	0.000440		.041	
1-26-06	7:00	50	889		19.99	0.000327	0.000440		.079	
1-27-06	7:35	50	889		19.99	0.000327	0.000440		.046	
1-31-06	4:00	50	888		19.99	0.000327	0.000440		.0157	
2-1-06	9:10	50	888		19.99	0.000327	0.000440		.016	
2-2-06	6:50	50	887		19.99	0.000326	0.000439	0	.014	
2-3-06	7:00	50	887		19.99	0.000327	0.000440		.013	
2-6-06	6:50	50	887		19.99	0.000327	0.000440		.0093	
2-7-06	7:00	50	888		19.99	0.000327	0.000440		.0087	
2-8-06	645	50	888		19.99	0.000327	0.000440		.0074	
2-10-06	1220	50	888		19.99	0.000327	0.000440		.0086	
2-13-06	705	50	888		19.99	0.000327	0.000440		.0077	QA APPROVED
2-14-06	705	50	888		19.99	0.000327	0.000440		.0061	NAME: Clem
2-15-06	725	50	888	19.99	~~20.01~~	0.000327	0.000440	0	.0057	DATE: 5-9-06
2-16-06	705	50	888	-	19.99	0.000327	0.000439		.0046	
2-17-06	650	50	888		19.99	0.000327	0.000440		.0058	
2-20-06	650	50	888		19.99	0.000327	0.000440		.0042	End Test Takedown

Project Manager [signature] D-2 Date 5/8/06

PSTAT-2091 Temp Controller-1205 TC 1301

ARES AN 107 Crack Growth Testing

Specimen: CT-3 K=20 Load = 1810 lbs
Frame: 7
Load Cell: 2225
LVDT: 427

Test #: CT-3
Lab Computer: 2
File Name: CT-3.DAT
Setup File: CTSETUP.WB13
Set Pot = 0 mV SCE

Test Solution: AN 107
Batch: 1-18-06
Starting pH: 10.02
Ending pH: 10.20

Project Name: ARES
Project Number: 80506210
Material: A537CL2
Material ID #: 1081

Filled cell 10:00 A.M 1-19-06

Date	Time	Temp. C	Load, lbs.	Disp. In	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 9.98 ohm Resistor, V	Comments
1-19-06	3:50	50	59	0.4360	20.03	0.000251	0.000391		0.367	FCP -347 mV
1-19-06	3:50	50	1814	0.3332	20.02	0.000255	0.000394		0.305	
1-20-06	6:50	50	1813	0.3300	20.02	0.000248	0.000387		0.340	
1-23-06	7:00	50	1814	.3279	20.01	0.000253	0.000391	0	0.316	
1-24-06	6:55	50	1813	.3274	20.02	0.000251	0.000389		0.326	
1-25-06	6:50	50	1813	.3270	20.02	0.000252	0.000391		0.433	
1-26-06	7:00	50	1814	.3267	20.02	0.000248	0.000386		0.338	
1-27-06	7:45	50	1814	.3264	20.02	0.000257	0.000397		0.752	
1-31-06	4:00	50	1814	.3251	20.02	0.000257	0.000396		0.629	
2-1-06	9:10	50	1814	.3248	20.02	0.000259	0.000398		0.482	
2-2-06	6:50	50	1814	.3245	20.02	0.000257	0.000395		0.376	
2-3-06	7:00	50	1814	.3243	20.02	0.000257	0.000395		0.287	
2-6-06	6:50	50	1814	.3234	20.01	0.000251	0.000391		0.214	
2-7-06	7:00	50	1814	.3233	20.01	0.000257	0.000394		0.163	
2-8-06	645	50	1814	.3232	20.01	0.000255	0.000391		0.1317	
2-10-06	1220	50	1814	.3227	20.01	0.000252	0.000389		0.1360	
2-13-06	705	50	1814	.3218	20.00	0.000253	0.000389		0.100	QA APPROVED
2-14-06	705	50	1814	.3210	20.01	0.000257	0.000393		0.101	NAME: Clem
2-15-06	730	50	1814	.2961	20.01	0.000255	0.000392		0.1285	
2-16-06	7:05	50	1814	.2961	20.02	0.000257	0.000393		0.112	DATE: 5-9-06
2-17-06	650	50	1814	.2960	20.01	0.000254	0.000390		0.0956	
2-20-06	650	50	1815	.2959	20.01	0.000251	0.000387		0.0629	Take Down

Project Manager [signature] Date 5/9/06

PSTAT 2112 Temp Controller-1203 TC-1297

ARES AN 107 Crack Growth Testing

Specimen: CT-4 K=30
Frame: 8 Load=2753
Load Cell: 2224
LVDT: 531

Test #: CT-4
Lab Computer: 2
File Name: CT-4.DAT set Pot = 0 mV SCE
Setup File: CTSETUP.WBB
Test Solution: AN107
Batch: 1-18-06
Starting pH: 10.02
Ending pH: ~~10.12~~ 10.19

Project Name: ARES
Project Number: 80506210
Material: A537CL2
Material ID #: 1081

Date	Time	Temp. C	Load, lbs.	Disp. In	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 99.2 ohm Resistor, V	Filled cell 10:00 A.M. 1-19-06 Comments
1-19-06	3:50	50	76	0.324	20.01	0.000294	0.000480		0.0040	FCP -308 mV
1-19-06	3:50	50	2754	0.257	20.00	0.000298	0.000474		0.0037	
1-20-06	6:50	50	2754	0.2549	20.01	0.000292	0.000480		0.101	
1-23-06	7:00	50	2754	0.2541	20.01	0.000297	0.000476	0	0.0807	
1-24-06	6:55	50	2754	0.2540	20.02	0.000294	0.000479			
1-25-06	650	50	2754	0.2539	20.02	0.000297	0.000476		0.054	
1-26-06	7:00	50	2754	0.2538	20.02	0.000291	0.000483		0.051	
1-27-06	7:45	50	2754	0.2538	20.00	0.000297	0.000478		0.039	
1-31-06	4:00	50	2753	0.2535	20.00	0.000295	0.000478		0.039	
2-1-06	9:10	50	2754	0.2536	20.00	0.000299	0.000473		0.097	
2-2-06	6:50	50	2754	0.2537	20.00	0.000294	0.000482			
2-3-06	7:00	50	2754	0.2533	20.00	0.000300	0.000475		0.026	
2-6-06	6:50	50	2754	0.2532	2	power	supply	Down		
2-6-06	12:45	50	2753	0.2532	20.00	0.000294	0.000479		.0132	
2-7-06	7:00	50	2753	0.2531	20.01	0.000298	0.000475		.0114	current was off again
2-8-06	645	50	2754	0.2534	20.02	0.000297	0.000478		.0113	
2-10-06	12:20	50	2754	0.2533	20.01	0.000295	0.000479		.0163	QA APPROVED
2-13-06	7:05	50	2754	0.2533	20.01	0.000297	0.000478		.0229	NAME: [illegible]
2-14-06	705	50	2754	0.2533	20.01	0.000300	0.000474		.0170	
2-15-06	730	50	2754	0.2533	20.02	0.000298	0.000477		.0113	DATE: 5-9-06
2-16-06	705	50	2754	0.2533	20.02	0.000297	0.000476		.0089	
2-20-06	650	50	2754	0.2532	20.02	0.000294	0.000479		.0084	Take Down

Project Manager [signature] D-4 Date 5/8/06

PSTAT-2087 Temp Controller-~~2087~~ 1266 TC-2213

ARES AN 107 Crack Growth Testing

Specimen: CT-5 K=40
Frame: 9 Load = 3450 lbs
Load Cell: 2223
LVDT: 1208

Test #: CT-5
Lab Computer: 15
File Name: CT-5.DAT
Setup File: CTSETUP.WBB
SCT Pot = 0 mv SCE

Test Solution: AN107
Batch: 1-18-06
Starting pH: 10.02
Ending pH: ~~10.92~~ 10.41

Project Name: ARES
Project Number: 80506210
Material: A537CL-2
Material ID #: 1081

Filled cell 10:00 1-19-06

Date	Time	Temp. C	Load, lbs.	Disp. in	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 98.5 ~~99.7~~ ohm Resistor, V	Comments
1-19-06	405	50	55	.2498	20.00	0.000295	0.000290	0	.0041	FCP - 314 mv
1-19-06	405	50	3448	0.1580	20.00	0.000296	0.000295		.0058	
1-20-06	655	50	3447	0.1558	20.00	0.000300	0.000299		.185	
1-23-06	7:00	50	3448	0.1549	20.00	0.000303	0.000300	0	.080	
1-24-06	655	50	3447	0.1547	20.00	0.000302	0.000298		.049	
1-25-06	655	50	3447	0.1547	20.00	0.000301	0.000297		.044	
1-26-06	7:00	50	3448	0.1547	19.99	0.000301	0.000296		.031	
1-27-06	7:50	50	3448	0.1546	19.99	0.000301	0.000296		.031	
~~1-27-06~~	~~7:50~~	~~50~~							~~.030~~	
1-31-06	4:00	50	3448	0.1544	20.00	0.000304	0.000300		.036	
2-1-06	910	50	3448	0.1544	20.00	0.000301	0.000297	0	.021	
2-2-06	6:50	50	3448	0.1544	20.00	0.000304	0.000299		.021	
2-3-06	7:00	50	3448	0.1543	20.00	0.000304	0.000300		.035	
2-6-06	7:00	50	3448	0.1541	20.00	0.000305	0.000298		.013	
2-7-06	7:00	50	3448	0.1541	20.00	0.000307	0.000300		.0097	
2-8-06	650	50	3447	0.1541	20.00	0.000304	0.000297		.0081	
2-10-06	12:20	50	3448	0.1541	20.00	0.000307	0.000299		.0076	
2-13-06	7:10	50	3448	0.1541	20.00	0.000307	0.000299		.0042	QA APPROVED
2-14-06	7:05	50	3448	0.1541	19.99	0.000306	0.000298		.0045	NAME: [illegible]
2-15-06	725	50	3448	0.1541	19.99	0.000308	0.000300		.0035	
2-16-06	705	50	3448	0.1543	20.00	0.000307	0.000299		.0036	DATE: 5-9-06
2-20-06	650	50	3448	0.1541	19.99	0.000308	0.000299		.0040	

Project Manager [signature]

Date 5/2/06

Page 1

Temp Controller 1235 ~~PSTAT = 2112~~ TC 2212

ARES AN 107 Crack Growth Testing		Test #	CT-6	Project Name	ARES
Specimen	CT-6	Lab Computer	15	Project Number	80506210
Frame	10	File Name	CT-6.DAT		
	K=40 Load=3540 Lbs	Setup File	CTSETUP.WBB		
Load Cell	2222 ~~1206~~	Test Solution	5M $NaNO_3$	Starting pH	6.50
LVDT	1206	Batch	1-19-06	Ending pH	6.5 / pH paper
				Material	A537CL-2
				Material ID #	1081

Date	Time	Temp. C	Load, lbs.	Disp. In	Current Amps	Pot Drop V	Control PD V	~~PSTAT Pot V SCE~~	V Drop across ____ ohm Resistor, V	Filled cell 11:00 A.M. 1-19-06 Comments
1-19-06	405	50	50	.2562	19.99	0.000292	0.000337	—	—	FCP-498
1-19-06	405	50	3536	0.1511	19.99	0.000295	0.000332	—	0	
1-20-06	655	50	3536	0.1487	19.99	0.000293	0.000333	—	—	FCP-464
1-23-06	7:00	50	3535	0.1474	19.98	0.000298	0.000331	—	—	FCP 476
1-24-06	6:55	50	3535	0.1472	19.98	0.000301	0.000332	—	—	
1-25-06	6:55	50	3535	0.1471	19.98	0.000304	0.000333	—	—	
1-26-06	7:00	50	3534	0.1468	19.98	0.000307	0.000333	—	—	
1-27-06	7:50	50	3534	0.1466	19.98	0.000310	0.000333	—	—	
1-31-06	3:00	45	3534	0.1457	19.98	0.000330	0.000330			-345
solution	was	leaking	through	control	port	crack was	still	submerged		
added	more	5M	nitrate	solution						
1-31-06	4:05	45	3533	0.1459	19.98	0.000325	0.000330			-340
2-1-06	7:00	50	3533	0.1455	19.98	0.000333	0.000330			-337
2-2-06	6:50	50	3534	0.1451	19.98	0.000334	0.000334			-335
2-3-06	7:00	50	3533	0.1454	19.98	0.000340	0.000330			-321
2-6-06	7:00	50	3533	0.1447	19.98	0.000351	0.000333			-300
2-7-06	7:00	50	3533	0.1446	19.98	0.000358	0.000332			-312
2-8-06	650	50	3534	0.1443	19.98	0.000363	0.000331			
2-10-06	12:20	50	3534	0.1435	19.99	0.000374	0.000331			
2-13-06	710	50	3531	0.1425	19.98	0.000389	0.000330			
2-14-06	705	50	3534	0.1421	19.98	0.000394	0.000331			
2-15-06	725	50	3534	0.1415	19.98	0.000400	0.000331			-299

QA APPROVED
NAME: Cldun
DATE: 5/9/06

Project Manager [signature]

D.6

Date 5/9/06

Page 2

ARES AN 107 Crack Growth Testing

Specimen: CT-6
Frame: 10

Test #: CT-6
Lab Computer:
File Name:
Setup File:

Project Name: ARES
Project Number: 80506210

Load Cell:
LVDT:
Test Solution:
Batch:
Starting pH:
Ending pH:
Material:
Material ID #:

Date	Time	Temp. C	Load, lbs.	Disp. In	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across ____ ohm Resistor, V	Comments
2-16-06	7:05	50	3535	0.1412	19.99	0.000401	0.000334			-298
2-17-06	655	50	3533	0.1406	19.98	0.000411	0.000333			-292
2-20-06	650	50	3535	0.1384	19.97	0.000433	0.000331			-298

Project Manager: [signature]

D-7

Date 5/9/06

ARES AN 107 Crack Growth Testing

Specimen: CT-7
Frame: 10
40ksi = 3448 Lbs

Load Cell: 2222
LVDT: 1206

Test #: CT-7
Lab Computer: 15
File Name: CT-7.DAT
Setup File: CT SETUP

Test Solution: ~~Sat Nitrate~~ AN107 End Point
Batch: 2-23-06

Starting pH: 10.02
Ending pH: 10.80

Project Name: ARES AN107
Project Number: 80506210

Material: A537CL2
Material ID #: 1081

Specimen was isolated

Date	Time	Temp. C	Load, lbs.	Disp. In	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 99.3 ohm Resistor, V	Comments
2-24-06	925	Room	400	—	20.00	0.000303	0.000194			In Air Filled 11:25
2-24-06	1245	50	400	—	19.99	0.000319	0.000203			FCP = -274 mVSCE
2-24-06	155	50	3443	0.2439	19.99	0.000317	0.000206	0	.0068	
2-27-06	650	51	3444	0.2426	19.99	0.000316	0.000208		.0046	
2-28-06	710	50	3444	0.2425	19.99	0.000318	0.000206		.0059	
3-1-06	710	50	3444	0.2427	19.99	0.000317	0.000207		.0031	
3-2-06	700	50	3444	0.2427	20.00	0.000315	0.000208			
3-6-06	655	50	3444	0.2425	20.00	0.000317	0.000207		.0097	
3-7-06	705	50	3444	0.2425	20.00	0.000317	0.000207		.0035	
3-9-06	1230	50	3444	0.2427	20.00	0.000316	0.000207		.0049	
3-10-06	420	50	3444	0.2425	20.00	0.000317	0.000206		.0054	
3-13-06	700	50	3444	0.2424	20.00	0.000317	0.000206		.004	
3-16-06	7:00	50	3444	0.2424	20.00	0.000318	0.000206		.0033	
3-20-06	1250	50	3444	0.2423	20.00	0.000316	0.000208		.0016	
3-22-06	655	50	3444	0.2424	19.99	0.000318	0.000205		.0017	
3-24-06	705	50	3444	0.2424	19.99	0.000317	0.000206		.0027	
3-27-06	635	50	3444	0.2422	19.99	0.000314	0.000207		.0010	End Test
										QA APPROVED
Temp Controller		#1235								NAME: CRdun
PSTAT		#2069								
TC		#1297								DATE: 5-9-06

Project Manager: [signature]

Date: 5/9/06

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ARES AN 107 Crack Growth Testing

Specimen: CT-8
Frame: CREEP 8
10 Ksi = 3607 Lbs (3988)

Test #: CT-8
Lab Computer: 2
File Name: CT-8.DAT
Setup File: CT SETUP

Project Name: ARES AN107
Project Number: 80506210

Load Cell: 2224
LVDT: 531
Test Solution: 5M $NaNO_3$
Batch: 2-24-06
Starting pH: ___
Ending pH: ~~12.88~~ meter won't read

Material: A537CL-2
Material ID #: 1081

Date	Time	Temp. C	Load, lbs.	Disp. in	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 1.2 ohm Resistor, V	Comments
										specimen was Isolated
2-24-06	9:20	Room	400	–	19.99	0.000274	0.000421			In Air Filled 11:15
2-24-06	12:25	49	404	–	20.01	0.000297	0.000450			FCP -485 mV SCE
PSTAT	won't	reach	0 mv,		overpowered at		-325 mv			
2-24-06	1:50	50	3595	0.1729	20.01	0.000303	0.000439	-286	0.1112	.245 V SCE when I_{AT} left 3:50
2-27-06	645	50	3596	0.1650	20.01	0.000320	0.000441	.002	0.0098	
2-28-06	710	50	3596	0.1643	20.01	0.000324	0.000439	.002	0.0046	
3-1-06	710	50	3596	0.1638	20.01	0.000322	0.000444	.001	0.0027	
3-2-06	655	50	3596	0.1636	20.01	0.000325	0.000442	.002	0.0016	
3-6-06	655	50	3596	0.1632	20.00	0.000331	0.000439	.002	0.0000	
3-7-06	705	50	3590	0.1632	20.01	0.000332	0.000442	.001	-.0004	
3-9-06	1230	50	3596	0.1626	20.01	0.000336	0.000444	.001	-.0003	
3-10-06	920	50	3596	0.1624	20.00	0.000342	0.000441	.001	-.0005	
3-13-06	200	50	3596	0.1622	20.01	0.000346	0.000442	.001	-.0007	
3-16-06	655	50	3596	0.1619	20.01	0.000354	0.000441	.001	-.0006	
3-20-06	1250	50	3596	0.1612	20.01	0.000359	0.000454	.001	-.001	
3-22-06	655	50	3596	0.1612	20.01	0.000368	0.000450	.001	-.0011	
3-24-06	705	50	3596	0.1606	20.01	0.000371	0.000454	.001	-.001	
3-27-06	635	50	3596	0.1600	20.01	0.000390	0.000449	.001	-.001	End Test
										QA APPROVED
Temp Controller		#1203								NAME: Cldwn
PSTAT		2112								DATE: 5-9-06
TC		#1302								

Project Manager: [signature]

Date: 5/9/06

ARES AN 107 Crack Growth Testing

Specimen: CT-9
Frame: 9
40ksi = 3602 Lbs

Test #: CT-9
Lab Computer: 15
File Name: CT-9.DAT
Setup File: CTSETUP

Project Name: ARES AN107
Project Number: 80506210

Load Cell: 2223
LVDT: 1208
Test Solution: AN107 End Point
Batch: 2-23-06
Starting pH: 10.02
Ending pH: 10.66
Material: A537CL-2
Material ID #: 1081

Specimen was Isolated

Date	Time	Temp. C	Load, lbs.	Disp. In	Current Amps	Pot Drop V	Control PD V	~~PSTAT~~ FCP Pot V SCE	V Drop across 9 ohm Resistor, V	Comments
2-24-06	925	Room	400	—	19.99	0.000282	0.000266			Air Filled 11:25
2-24-06	1240	50	400		20.01	0.000301	0.000290	-.317		FCP -317mV SCE
2-24-06	150	50	3611		20.01	0.000303	0.000297	-.318		
2-27-06	650	50	3611	.2999	20.01	0.000304	0.000298	-.252		
2-28-06	710	50	3612	.2995	20.01	0.000305	0.000298	-.239		
3-1-06	710	50	3611	.2994	20.00	0.000305	0.000298	-.227		
3-2-06	700	50	3611	.2993	20.00	0.000304	0.000296	-.219		
3-6-06	655	50	3611	.2991	20.00	0.000305	0.000297	-.248		
3-7-06	705	50	3611	.2992	20.00	0.000307	0.000299	-.266		
3-9-06	1230	50	3611	.2990	20.01	0.000308	0.000300	-.254		
3-10-06	420	50	3611	.2988	20.01	0.000307	0.000298	-.262		
3-13-06	7:00	50	3611	.2988	20.01	0.000307	0.000298	-.273		
3-16-06	655	50	3612	.2986	20.01	0.000309	0.000300	-.273		
3-20-06	1250	50	3612	.2984	20.01	0.000307	0.000297	-.258		
3-22-06	655	50	3612	.2985	20.01	0.000309	0.000299	-.259		
3-24-06	705	50	3612	.2984	20.01	0.000308	0.000298	-.262		
3-27-06	635	50	3612	.2984	20.01	0.000308	0.000298	-.258		End Test
Temp Controller		#1266								QA APPROVED
TC		#1301								NAME: Oldum
										DATE: 5-9-06

Project Manager: [signature]

Date: 5/9/06

ARES AN 107 Crack Growth Testing

Specimen: CT 10 — 20 ksi = 1804 Lbs

Frame: 10

Load Cell: 2222

LVDT: 1206

Test #: CT-10

Lab Computer: 15

File Name: CT-10.DAT

Setup File: CTSETUP

Test Solution: AN 107

Batch: 5-31-06

Starting pH: 10.02

Ending pH: 10.23

PSTAT-2069 Tcontroller-1235 TC-2213

Project Name: ARES AN107

Project Number: 80506210

Material: A537CL2

Material ID #: 1081

Date	Time	Temp. C	Load, lbs.	Disp. In	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 99.3 ohm Resistor, V	Comments (specimen was isolated)
6-1-06	1245	50	402		20.01	0.000309	0.000443			FCP-317 mV SCE
6-1-06	145	50	1803	0.5231	20.01	0.000311	0.000442	0.0	0.0136	
6-2-06	7:15	50	1804	0.5026	20.00	0.000311	0.000441	0	0.141	
6-5-06	715	50	1804	0.5026	20.00	0.000313	0.000442	0	0.0580	
6-6-06	710	50	1803	0.5026	20.00	0.000315	0.000439	0	0.0434	
6-7-06	540	50	1803	0.5024	20.00	0.000316	0.000440	0	0.0313	
6-8-06	400	50	1804	0.5025	20.00	0.000316	0.000441	0	0.0222	
6-9-06	1015	50	1803	0.5023	20.00	0.000316	0.000441	0	0.0200	-current is shifting when
6-12-06	730	50	1803	0.5024	20.00	0.000316	0.000441		0.0150	TC comes on..
6-15-06	715	50	1803	0.5024	20.00	0.000318	0.000439		0.0119	
6-16-06	300	50	1803	0.5024	20.00	0.000316	0.000441		0.0130	
6-19-06	615	50	1803	0.5024	20.00	0.000317	0.000441		0.0191	
6-20-06	315	50	1803	0.5024	20.00	0.000316	0.000441		0.0092	
6-21-06	650	50	1803	0.5023	20.00	0.000316	0.000441		0.0099	
6-22	700	50	1803	0.5023	20.00	0.000317	0.000442		0.0073	
6-23	1250	50	1804	0.5023	20.01	0.000317	0.000441	0	0.0043	
6-26	700	50	1804	0.5027	20.01	0.000317	0.000441		0.0045	Room 81°
6-27	1020	50	1804	0.5025	20.01	0.000323	0.000436		0.0031	
6-30	650	50	1804	0.5024	20.02	0.000316	0.000444	0	0.0040	
7-3-06	725	50	1804	0.5023	19.99	0.000319	0.000439		0.0018	End Test

QA APPROVED

NAME: Cldum

DATE: 7/31/06

Project Manager: [signature]

Date 7/31/06

D-11

ARES AN 107 Crack Growth Testing

Specimen CT-11
Frame 9

KSI = 20
LBS = 1818

Test # CT-11
Lab Computer 15
File Name CT-11.DAT
Setup File CTSETUP

PSTAT-2066 TCon-Troller-1266
TC-2209

Project Name ARES AN107
Project Number 80506210

Load Cell 2223
LVDT 1208

Test Solution AN 107
Batch 5-31-06

Starting pH 10.02
Ending pH 10.20

Material A537CL2
Material ID # 1081

Date	Time	Temp. C	Load, lbs.	Disp. In	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 100.0 ohm Resistor, V	Comments (Specimen was isolated)
6-1-06	1240	50	406		20.01	0.000312	0.000490			FCP -275 mV SCE
6-1-06	1:40	50	1818	0.4340	20.01	0.000312	0.000491	0.0	0.0118	
6-2-06	7:15	50	1819	0.4342	20.01	0.000315	0.000495	0	0.1860	
6-5-06	7:15	50	1818	0.4340	20.01	0.000313	0.000492	0	0.0400	
6-6-06	7:10	50	1819	0.4340	20.00	0.000314	0.000492	0	0.0298	
6-7-06	540	50	1819	0.4340	20.00	0.000314	0.000493	0	0.0239	
6-8-06	400	50	1819	0.4340	20.01	0.000314	0.000493	0	0.0192	
6-9-06	815	50	1819	0.4340	20.01	0.000314	0.000493	0	0.0210	
6-12-06	730	50	1819	0.4340	19.98	0.000313	0.000492		0.0089	
6-15-06	715	50	1819	0.4338	20.00	0.000315	0.000493		0.0042	
6-16-06	300	50	1819	0.4338	20.00	0.000313	0.000492		0.0040	
6-19-06	615	50	1819	0.4338	20.00	0.000313	0.000492		0.0030	
6-20	315	50	1819	0.4337	20.01	0.000312	0.000490		0.0031	
6-21	650	50	1819	0.4338	19.99	0.000314	0.000493		0.0031	
6-22	700	50	1820	0.4336	20.01	0.000313	0.000493		0.0027	
6-23	1250	50	1820	0.4337	20.01	0.000312	0.000491	0	0.0021	
6-26	700	50	1820	0.4335	20.00	0.000312	0.000492		0.0015	Room 81°
6-27	1020	50	1819	0.4338	20.00	0.000319	0.000499		0.0010	
6-30	650	50	1819	0.4337	20.01	0.000312	0.000491	0	0.0011	
7-3	725	50	1819	0.4337	20.01	0.000314	0.000493		0.0011	End Test

QA APPROVED
NAME: Cedum
DATE 7/31/06

Project Manager [signature]

Date 7/31/06

ARES AN 107 Crack Growth Testing

Specimen: CT 12 — KSI = 30
Frame: 8 — Lbs = 2741

Test #: CT-12
Lab Computer: 2
File Name: CT-12.DAT — PSTAT-2112
Setup File: CTSETUP — TC-1299

Project Name: ARES AN107
Project Number: 80506210 — Tcontroller-1203

Load Cell: 2224
LVDT: 531

Test Solution: AN107
Batch: 5-31-06

Starting pH: 10.02
Ending pH: 10.12

Material: A537CL2
Material ID #: 1081

Date	Time	Temp. C	Load, lbs.	Disp. In	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 98.7 ohm Resistor, V	Specimen was Isolated Comments
6-1-06	1230	50	403		20.01	.000313	.000343			FCP -264
6-1-06	135	50	2737	0.5083	20.02	0.000311	0.000346	0.0	0.0043	
6-2-06	715	50	2737	0.5071	20.01	000319	0.000334	0	0.179	
6-5-06	710	50	2739	0.5071	20.01	0.000318	0.000338	0	0.0394	
6-6-06	710	50	2739	0.5069	20.01	0.000316	0.000340	0	0.0293	
6-7-06	540	50	2739	0.5069	20.01	0.000315	0.000341	0	0.0210	
6-8-06	400	50	2741	0.5071	20.01	0.000317	0.000337	0	0.0198	
6-9-06	815	50	2741	0.5071	20.00	0.000317	0.000337	0	0.0162	
6-12-06	730	50	2741	0.5072	20.01	0.000319	0.000341		0.0125	
6-15-06	715	50	2741	0.5071	20.00	0.000317	0.000338		0.0080	
6-16-06	300	50	2741	0.5068	20.01	0.000315	0.000341		0.0066	
6-19-06	615	50	2741	0.5068	20.00	0.000319	0.000335		0.0045	
6-20-06	315	50	2741	0.5068	20.00	0.000319	0.000338		0.0048	
6-21-06	615	50	2741	0.5069	20.00	0.000315	0.000342		0.0038	
6-22-06	700	50	2741	0.5067	20.01	0.000318	0.000340		0.0035	
6-23-06	1250	50	2741	0.5067	20.01	0.000317	0.000339	0	0.0030	
6-26-06	700	50	2741	0.5060	20.00	0.000319	0.000338		0.0032	Room 81°
6-27-06	1020	50	2741	0.5068	20.00	0.000316	0.000339		0.0020	
6-30-06	650	50	2741	0.5068	20.00	0.000313	0.000341	0	0.0022	
7-3-06	725	50	2741	0.5067	19.99	0.000316	0.000339		0.0015	End Test

QA APPROVED
NAME: Cldun
DATE: 7/31/06

Project Manager: [signature]

Date: 7/31/06

ARES AN 107 Crack Growth Testing

Specimen: CT 13
Frame: 7
Load Cell: 2225
LVDT: 427

KSI = 30
Lbs = ~~2726~~ 2737 6-1-06

Test #: CT-13
Lab Computer: 2
File Name: CT-13.DAT
Setup File: CTSETUP
Test Solution: AN107
Batch: 5-31-06
Starting pH: 10.02
Ending pH: 10.18

PSTAT - 2091 TC - 1297
Tcontroller - 1205

Project Name: ARES AN107
Project Number: 80506210
Material: A537CL2
Material ID #: 1081

Specimen was Isolated

Date	Time	Temp. C	Load, lbs.	Disp. in	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across .994 ohm Resistor, V	Comments
6-1-06	1210	50	378		20.01	.000248	.000244			FCP - 233 mV SCE
6-1-06	1 15	50	2728	0.5337	20.01	.000248	.000242	0.0	0.057	
6-2-06	7 10	50	2736	0.4989	20.01	.000257	.000258	0.0	1.631	
6-5-06	710	50	2738	0.4992	20.01	0.000256	0.000254	0.0	.7905	
6-6-06	710	50	2740	0.4992	20.01	0.000254	0.000250	0.0	.3453	
6-7-06	540	50	2739	0.4992	20.01	0.000253	0.000250	0	.3360	
6-8-06	400	50	2739	0.4994	20.01	0.000254	0.000250	0	.2610	
6-9-06	815	50	2739	0.4994	20.01	0.000254	0.000250	0	.3006	
6-12-06	730	50	2739	0.4995	20.01	0.000251	0.000246		.1425	
6-15-06	715	50	2739	0.4993	20.00	0.000251	0.000249		.1016	
6-16-06	300	50	2739	0.4991	20.01	0.000250	0.000245		.0812	
6-19-06	615	50	2739	0.4993	20.00	0.000255	0.000250		.0768	
6-20	315	50	2739	0.4989	20.01	0.000256	0.000250		.0729	
6-21	650	50	2739	0.4993	20.00	0.000251	0.000246		.0600	
6-22	700	50	2739	0.4988	20.02	0.000254	0.000248		.0630	
6-23	1250	50	2739	0.4991	20.00	0.000253	0.000248	0	.0495	
6-26	655	50	2739	0.4984	20.00	0.000249	0.000244		.0571	Room 81°
6-27	1020	50	2739	0.4993	20.00	0.000254	0.000249		.0295	
6-30	650	50	2739	0.4993	19.99	0.000250	0.000245	0	.0241	
7-3-06	725	50	2739	0.4992	20.00	0.000253	0.000247		.0220	End Test

QA APPROVED
NAME: Cdum
DATE: 7/31/06

Project Manager: [signature]

D-14

Date 7/31/06

ARES AN 107 Crack Growth Testing

Specimen: CT-14 KSI = 40
Frame: 6 Load = 3511 lbs
Load Cell: 2164
LVDT: Not Working

Test #: CT-14
Lab Computer: 16
File Name: CT-14.DAT PSTAT-2090 Tcontroller-1237
Setup File: CTSETUP TC-2206
Test Solution: AN107 Endpoint
Batch: 6-5-06
Starting pH:
Ending pH: 10.32

Project Name: ARES AN107
Project Number: 80506210
Material: A537CL2
Material ID #: 1081

Specimen is Isolated

Date	Time	Temp. C	Load, lbs.	Disp. In	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 999 ohm Resistor, V	Comments
6-6-06	1:30	50	386	—	19.99	0.000319	0.000437	0	.0091	FCP -268 mV SCE
6-6-06	2:15	50	3510		19.99	0.000317	0.000437	0	.0025	
6-7-06	540	50	3509		19.99	0.000315	0.000436	0	.0042	
6-8-06	400	50	3509		19.99	0.000314	0.000434	0	.0042	
6-9-06	815	50	3508		19.99	0.000315	0.000434	0	.0095	
6-12-06	730	50	3507		19.99	0.000315	0.000435		.0038	
6-15-06	715	50	3507		20.00	0.000315	0.000435		.0036	
6-16-06	300	50	3508		20.00	0.000315	0.000436		.0040	
6-19-06	615	50	3509		20.00	0.000315	0.000435		.0010	
6-20-06	315	50	3508		20.00	0.000315	0.000435		.0009	
6-21-06	650	50	3508		20.00	0.000315	0.000435		.0008	
6-22-06	700	50	3508		20.00	0.000314	0.000435		.0008	
6-23-06	1250	50	3507		20.00	0.000314	0.000435	0	.0012	
6-26-06	655	50	3506		20.00	0.000317	0.000438		.0014	Room 81°
6-27-06	1020	50	3509		20.00	0.000316	0.000436		.0008	
6-30-06	650	50	3508		19.99	0.000316	0.000436	0	.0010	
7-3-06	725	50	3508		20.00	0.000316	0.000436		.0007	
7-5-06	200	50	3508		19.99	0.000316	0.000439		.0008	
7-7-06	710	50	3508		20.00	0.000316	0.000436	0	.0005	End Test

QA APPROVED
NAME: Cadum
DATE: 7/31/06

Project Manager: [signature]

Date 7/31/06

ARES AN 107 Crack Growth Testing

Specimen CT-15 KSI = 40

Frame 5 Load = 3517

Load Cell 2163

LVDT 557

Test # CT-15

Lab Computer 16

File Name CT-15.DAT PSTAT: 2092

Setup File CTSETUP Tcontroller 1264 TC 2212

Test Solution AWQ End point 2% chloride Starting pH 10.01

Batch 6-6-06 Ending pH 10.10

Project Name ARES AN107

Project Number 80506210

Material A537CL2

Material ID # 1081

Date	Time	Temp. C	Load, lbs.	Disp. In	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 100 ohm Resistor, V	Specimen was Isolated Comments
6-7-06	820	50	391	—	20.00	0.000296	0.000245	0	—	FCP -286 SCE
6-7-06	1030	50	3524	0.3357	19.99	0.000302	0.000240	0.0	.0015	
6-8-06	400	50	3524	0.3333	19.98	0.000295	0.000246	0	.0073	
6-9-06	815	50	3523	0.3324	20.00	0.000295	0.000247	0	.0088	
6-12-06	730	50	3523	0.3322	20.00	0.000294	0.000247		.0103	
6-15-06	715	50	3523	0.3297	20.00	0.000294	0.000248		.0122	
6-16-06	300	50	3524	0.32[illegible]	20.00	0.000294	0.000248		.0110	
6-19-06	615	50	3522	0.3293	20.01	0.000294	0.000247		.0125	
6-20	315	50	3524	0.3290	20.00	0.000294	0.000248		.0123	
6-21	650	50	3523	0.3291	20.01	0.000294	0.000249		.0127	
6-22	700	56	3523	0.3187	20.01	0.000301	0.000250		.0260	TC off 6°C Repaired
6-23	1250	50	3523	0.3196	20.01	0.000297	0.000244	0	.0181	
6-26	655	50	3524	0.3189	20.02	0.000297	0.000245		.0116	Room 81°
6-27	1020	50	3523	0.3192	20.01	0.000294	0.000248		.0069	
6-30	650	50	3522	0.3193	20.01	0.000294	0.000248	0	.0040	
7-3	725	50	3524	0.3191	20.01	0.000294	0.000247		.0029	
7-5	200	50	3524	0.3190	20.01	0.000294	0.000248		.0024	
7-7	710	50	3523	0.3190	20.01	0.000293	0.000249	0	.0019	End Test

QA APPROVED

NAME: [illegible]

DATE: 7/31/06

Project Manager [signature]

Date 2/31/06

ARES AN 107 Crack Growth Testing

Specimen CT-16 PSTAT - 2092
Frame CREEP 5 TController - 1264
TC - 2206

Load Cell 2163
LVDT 557

Test # CT-16
Lab Computer 16
File Name CT-16.DAT
Setup File CTSETUP

Test Solution EndPoint
Batch 7-17-06

Starting pH 9.98
Ending pH 10.17

Project Name ARES AN107
Project Number 80506210
20ksi = 1778 lbs
set Point = 0.0 mV SCE
Material A537CL2
Material ID # 1081

Specimen is Isolated

Date	Time	Temp. C	Load, lbs.	Disp. In	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 1000 ohm Resistor, V	Comments
7-18-06	12:59	50	392	~~0.4408~~	20.01	0.000309	0.000430	—	—	FCP = -.288
7-18-06	340	50	1781	.4234	20.01	0.000303	0.000426	0	.1837	
7-19-06	705	50	1783	0.4224	20.00	0.000302	0.000429		.0254	
7-20-06	845	50	1783	0.4221	20.00	0.000302	0.000428	0	.0240	
7-21-06	840	50	1783	0.4220	20.00	0.000302	0.000428		.0167	
7-24-06	700	50	1783	0.4218	20.01	0.000302	0.000429	0	.0786	
7-25-06	645	50	1782	0.4219	20.01	0.000302	0.000427		.0453	
7-26	400	50	1783	0.4218	20.01	0.000302	0.000428		.0395	
7-27	235	50	1783	0.4218	20.01	0.000302	0.000428	0	.0350	
7-28	1020	50	1783	0.4218	20.01	0.000301	0.000428		.0321	
7-31	700	50	1783	0.4217	20.01	0.000301	0.000429	0	.0098	
8-7	930	50	1783	0.4219	20.02	0.000298	0.000429	0	.0023	
8-9	410	50	1783	.4219	20.01	0.000298	0.000428		.0018	
8-10	350	50	1783	.4217	20.01	0.000298	0.000428		.0018	QA APPROVED
8-11	440	50	1783	.4218	20.00	0.000298	0.000427		.0014	NAME: [illegible]
8-14	745	50	1782	.4218	20.01	0.000297	0.000429	0	.0015	DATE: 8/29/06
8-15	710	50	1782	.4218	20.01	0.000297	0.000428		.0014	
8-17	705	50	1782	.4215	20.01	0.000296	0.000430		.0013	
8-21	700	50	1780	.4216	20.01	0.000295	0.000430	0	.0015	Test Over

Project Manager [signature] Date 8/29/06

ARES AN 107 Crack Growth Testing

Specimen: CT-17 | PSTAT - 2090
Frame: CREEP 6 | TController - 1237
TC - 2212
Load Cell: 2164
LVDT: 529

Test #: CT-17
Lab Computer: LAB 16
File Name: CT-17.DAT
Setup File: CTSETUP
Test Solution: End Point .2M chlorides | Starting pH: 9.99
Batch: 7-13-06 | Ending pH: 10.00

Project Name: ARES AN107
Project Number: 80506210
20 KSI = 1722 lbs
set Point = 0.0 mv SCE
Material: A537CL2
Material ID #: 1081

specimen is Isolated

Date	Time	Temp. C	Load, lbs.	Disp. in	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 100 ohm Resistor, V	Comments
7-14-06	1245	50	386	–	19.99	0.000300	0.000255	–		FCP -254 mVSCE
7-14-06	245	50	1722	0.3725	19.99	0.000301	0.000256	0	0.0180	
7-17-06	700	50	1722	0.3739	19.99	0.000302	0.000256	0	0.0177	
7-18-06	1:20	50	1722	0.3741	20.00	0.000302	0.000257		0.0283	
7-19-06	705	50	1722	0.3743	20.00	0.000303	0.000257		0.0169	
7-20-06	845	50	1721	0.3743	20.00	0.000303	0.000257	0	0.0138	
7-21-06	840	50	1722	0.3742	20.00	0.000303	0.000257		0.0161	
7-24-06	700	50	1722	0.3742	20.00	0.000303	0.000257	0	0.0270	
7-25-06	645	50	1721	0.3745	20.00	0.000304	0.000257		0.0178	
7-26	400	50	1721	0.3745	20.00	0.000304	0.000257		0.0132	QA APPROVED
7-27	235	50	1721	0.3745	20.00	0.000304	0.000257	0	0.0131	NAME: Cldum
7-28	1020	50	1721	0.3745	20.00	0.000304	0.000257		0.0121	DATE: 8-16-06
7-31	700	50	1721	0.3745	20.00	0.000304	0.000257	0	0.0079	
8-7	930	50	1722	0.3748	20.00	0.000304	0.000256	0	0.0297	
8-9	410	50	1722	0.3747	20.00	0.000000	0.000000		0.0240	D/A messed up for PD's
8-10	750	50	1722	0.3748	20.00	0.000304	0.000257		0.1295	
8-10	350	50	1722	0.3748	20.00	0.000304	0.000257		0.0845	
8-11	440	50	1722	0.3748	20.00	0.000304	0.000257		0.1587	
8-14	845	50	1722	0.3748	20.00	0.000305	0.000257	0	0.4669	
8-15	710	50	1722	0.3749	20.00	0.000306	0.000257	0	0.8354	Test Over

Project Manager: [signature] 8/16/06 Date

ARES AN 107 Crack Growth Testing

Specimen CT-18 PSTAT -2091
Frame creep 7 TController -1205
TC -1297

Load Cell 2225
LVDT 427

Test Solution AN107 Standard
Batch 7-13-06

Test # CT-18
Lab Computer LAB 2
File Name CT-18.DAT
Setup File CT SETUP

Starting pH 11.00
Ending pH 11.02

Project Name ARES AN107
Project Number 80506210

20 ksi = 1733 lbs
SET Point = -100 mV SCE
Material A537CL2
Material ID # 1081

Date	Time	Temp. C	Load, lbs.	Disp. in	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 1000 ohm Resistor, V	Specimen is Isolated Comments
7-14-06	1245	50	377	—	20.00	0.000254	0.000293	—		FCP -375 mV SCE
7-14-06	245	50	1735	0.3675	20.00	0.000254	0.000292	-100	0.1665	
7-17-06	700	50	1735	0.3659	20.00	0.000257	0.000294	-100	~~0.2702~~	0.161
7-18-06	1:20	50	1734	0.3658	20.00	0.000256	0.000293		0.0181	
7-19-06	705	50	1734	0.3658	19.99	0.000257	0.000293		0.0192	
7-20-06	845	50	1734	0.3658	19.99	0.000256	0.000292	-100	0.0186	
7-21-06	840	50	1735	0.3657	19.99	0.000256	0.000295		0.0202	
7-24-06	700	50	1734	0.3656	19.99	0.000260	0.000295	+00	0.0845	
7-25	645	50	1735	0.3658	19.99	0.000259	0.000294		0.2242	
7-26	400	50	1735	0.3657	19.99	0.000264	0.000299		0.2701	
7-27	235	50	1735	0.3656	19.99	0.000260	0.000294	-100	0.3687	
7-28	1020	50	1735	0.3656	19.99	0.000262	0.000296		0.3125	
7-31	700	50	1734	0.3657	20.00	0.000262	0.000296	-100	0.1056	
8-7	930	50	1734	0.3656	20.00	0.000263	0.000297	-100	0.0506	QA APPROVED
8-9	410	50	1734	0.3657	20.00	0.000261	0.000295		0.0446	NAME: Oldum
8-10	350	50	1734	0.3656	20.00	0.000262	0.000296		0.0384	DATE: 8-16-06
8-11	440	50	1734	0.3658	20.00	0.000262	0.000295		0.0342	
8-14	745	50	1734	0.3657	20.00	0.000264	0.000297	-100	0.0350	
8-15	700	50	1736	0.3658	20.01	0.000265	0.000297	-100	0.0383	Test over

Project Manager 8/16/06

ARES AN 107 Crack Growth Testing

Specimen CT-19 PSTAT - 2112
Frame CREEP 8 TController - 1203
TC - 2209

Load Cell 2224
LVDT 531

Test # CT-19
Lab Computer 2
File Name CT-19.DAT
Setup File CTSETUP

Test Solution AN107 .2M chlorides
Batch 7-12-06

Starting pH 10.98
Ending pH 10.84

Project Name ARES AN107
Project Number 80506210

20ksi = 1759 lbs
Set Point = 0.0 mv SCE
Material A537 CL2
Material ID # 1081

Date	Time	Temp. C	Load, lbs.	Disp. in	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 100 ohm Resistor, V	Specimen was Isolated Comments
7-13-06	130	50	402	—	20.00	0.000294	0.000284	—	—	FCP - 359
7-13-06	400	50	1769	0.3890	19.99	0.000297	0.000279	0	.1384	
7-14-06	1:00	50	1769	0.3879	19.99	0.000294	0.000280	0	.1594	
7-17-06	7:00	50	1771	0.3876	19.99	0.000294	0.000280	0	.2704	
7-18-06	1:20	50	1769	0.3872	19.99	0.000292	0.000284		.1530	
7-19-06	705	50	1770	0.3871	19.99	0.000293	0.000282		.1426	
7-20-06	845	50	1770	0.3873	19.99	0.000291	0.000283	0	.1481	
7-21-06	845	50	1771	0.3873	19.99	0.000294	0.000281		.2005	
7-24-06	700	50	1770	0.3870	19.99	0.000294	0.000281	0	.2003	
7-25	645	50	1770	0.3869	19.99	0.000295	0.000280		.2165	
7-26	400	50	1770	0.3869	19.99	0.000291	0.000284		.2073	
7-27	240	50	1770	0.3868	19.99	0.000291	0.000285	0	.2124	
7-28	1020	50	1770	0.3868	19.99	0.000293	0.000280		.1970	
7-31	700	50	1770	0.3868	19.99	0.000295	0.000279	0	.1795	
8-7	930	50	1770	0.3868	19.99	0.000283	0.000280	0	.1297	
8-9	410	50	1770	0.3867	19.99	0.000284	0.000277		.0909	
8-10	350	50	1770	0.3867	19.99	0.000280	0.000283		.0917	
8-11	440	50	1770	0.3867	19.99	0.000280	0.000282		.0754	
8-14	745	50	1770	0.3867	19.99	0.000276	0.000285	0	.0676	Test over

DATE: 8-16-06
NAME: [illegible]

QA APPROVED

Project Manager [illegible] 8/16/06

ARES AN 107 Crack Growth Testing

Specimen CT-20 PSTAT - 2066
Frame CREEP 9 Tcontroller - 1266
TC - 2213

Load Cell 2223
LVDT 1208

Test Solution AN107 Standard
Batch 7-11-06

Test # CT-20
Lab Computer 15
File Name CT-20.DAT
Setup File CTSETUP

Starting pH 10.98
Ending pH 10.96

Project Name ARES AN 107
Project Number 80506210
20 KSI = 1705 lbs
SET Point = -100 mV SCE
Material A537CL2
Material ID # 1081

Specimen was Isolated

Date	Time	Temp. C	Load, lbs.	Disp. in	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 1000 ohm Resistor, V	Comments
7-12-06	1:15	50	407	—	20.00	0.000290	0.000490	—	—	FCP = -324 mV SCE
7-12-06	3:30	50	1707	0.2681	20.00	0.000291	0.000494	-100	.1668	
7-13-06	7:10	50	1707	0.2658	20.00	0.000289	0.000490	-100	.0083	
7-14-06	1:45	50	1707	0.2658	20.00	0.000291	0.000495	-100	.3301	
7-17-06	7:00	50	1707	0.2657	19.99	0.000293	0.000497	-100	.1514	
7-18-06	1:20	50	1707	0.2655	20.00	0.000292	0.000495	-100	.1241	
7-19-06	705	50	1708	0.2655	20.00	0.000290	0.000493	-100	.0877	
7-20	845	50	1708	0.2655	20.00	0.000292	0.000495	-100	.0735	
7-21	850	50	1707	0.2656	20.00	0.000295	0.000499		.0520	
7-24	700	50	1707	0.2653	20.00	0.000291	0.000494	-100	.0257	
7-25	645	50	1707	0.2652	20.00	0.000290	0.000494		.0238	
7-26	400	50	1707	0.2652	20.00	0.000292	0.000495		.0267	
7-27	240	50	1707	0.2652	20.00	0.000292	0.000495	-100	.0261	
7-28	1020	50	1707	0.2652	20.00	0.000292	0.000496		.0214	
7-31	700	50	1707	0.2652	20.00	0.000292	0.000496	-100	.0230	
8-7	930	50	1707	0.2652	20.00	0.000292	0.000495	-100	.0120	
8-9	410	50	1707	0.2652	20.00	0.000292	0.000493	-	.0080	
8-10	350	50	1707	0.2651	20.00	0.000293	0.000494		.0087	
8-11	440	50	1707	0.2652	20.00	0.000293	0.000495		.0079	
8-14	745	50	1707	0.2651	20.00	0.000294	0.000497	-100	.0076	Over

QA APPROVED
NAME: [illegible]
DATE: 8-16-06

Project Manager [illegible] 8/16/06

ARES AN 107 Crack Growth Testing

Specimen CT-21 PSTAT - 2069
Frame creep 10 Tcontroller - 1235
TC - 1299

Load Cell 2222
LVDT 1206

Test # CT-21
Lab Computer 15
File Name CT-21.DAT
Setup File CTSETUP

Test Solution AN107 standard
Batch 7-11-06
Starting pH 10.98
Ending pH 10.78

Project Name ARES AN107
Project Number 805062 10
20 KSI = 1665 lbs
Set Point = 0 mV SCE
Material A537CL2
Material ID # 1081

Date	Time	Temp. C	Load, lbs.	Disp. In	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 1000 ohm Resistor, V	Comments
7-12-06	1:15	49	399	—	19.99	0.000309	0.000450	—	—	Specimen was Isolated FCP = -375 mVSCE
7-12-06	3:30	50	1665	.4042	19.99	0.000304	0.000449	0	2396	
7-13-06	7:10	50	1664	.4026	19.99	0.000304	0.000449	0	1.626	
7-14-06	2:00	50	1665	.4022	20.00	0.000307	0.000452	0	0.8820	
7-17-06	7:00	50	1665	.4020	20.01	0.000306	0.000450	0	0.3468	
7-18-06	1:20	50	1665	.4020	20.01	0.000308	0.000453	0	0.3104	
7-19-06	7:05	50	1665	.4019	20.01	0.000308	0.000452		0.3150	
7-20-06	8:45	50	1665	.4018	20.01	0.000306	0.000451	0	0.3583	
7-21-06	8:45	50	1665	.4019	20.01	0.000303	0.000446		.2405	
7-24	7:00	50	1665	.4018	20.01	0.000307	0.000451	0	1.5328	added capacitor to D/A for noise
7-25	6:45	50	1665	.4018	20.01	0.000308	0.000452		.7057	
7-26	4:00	50	1665	.4018	20.01	0.000306	0.000450		.2549	
7-27	2:45	50	1665	0.4018	20.01	0.000306	0.000450	0	.2177	
7-28	1:20	50	1665	0.4018	20.01	0.000308	0.000452		.2019	
7-31	7:00	50	1665	0.4018	20.01	0.000307	0.000451	0	.1313	QA APPROVED
8-7	9:30	50	1665	0.4016	20.01	0.000308	0.000452	0	.1180	NAME: Oldum
8-9	4:10	50	1665	0.4016	20.01	0.000308	0.000452		.1502	
8-10	3:50	50	1665	0.4016	20.01	0.000307	0.000451		.1203	DATE: 8-16-06
8-11	4:40	50	1665	0.4016	20.00	0.000307	0.000451		.1123	
8-14	7:45	50	1665	0.4015	20.00	0.000306	0.000450	0	.0822	Test over

Project Manager [signature] 8/16/06 Date

ARES AN 107 Crack Growth Testing

Specimen: CT-22 | PSTAT 2065
Frame: CREEP 11 | Tcontroller 1238
TC 2210

Load Cell: 433
LVDT: 471

Test #: CT-22.
Lab Computer: 14
File Name: CT-22.DAT
Setup File: CT SETUP

Test Solution: AN107 standard
Batch: 7-20-06

Starting pH: 11.00
Ending pH: 10.96

Project Name: ARES AN107
Project Number: 80506210
20 ksi = 1786 lbs
Set point = 0.0 mV
Material: A537CL2
Material ID #: 1081

Specimen is Isolated

Date	Time	Temp. C	Load, lbs.	Disp. In	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 1000 ohm Resistor, V	Comments
7-21-06	1:10	50	380	—	20.00	0.000300	0.000218	—	—	FCP -352 mV SCE
7-21-06	350	50	1787	0.	20.00	0.000307	0.000224	0	0.1248	
7-22-06	8:50	50	1788	0.3534	19.99	0.000286	0.000203	0	2.5193	
7-24	700	50	1788	0.3533	19.99	0.000285	0.000203		1.3884	
7-25	645	50	1788	0.3532	19.99	0.000285	0.000203		1.8054	
7-26	400	50	1788	0.3531	19.99	0.000286	0.000204		.7135	
7-27	245	50	1788	0.3531	19.99	0.000286	0.000204	0	.4662	
7-28	1020	50	1788	0.3532	19.99	0.000285	0.000203		.3425	
7-31	700	50	1788	0.3531	20.00	0.000285	0.000203	0	.3831	
8-7	930	50	1789	0.3530	20.00	0.000284	0.000202		.1510	
8-9	410	50	1789	0.3533	20.00	0.000283	0.000202		.1227	
8-10	350	50	1789	0.3529	19.99	0.000284	0.000203		.1219	
8-11	440	50	1789	0.3530	19.99	0.000285	0.000202		.1195	
8-14	745	50	1789	0.3528	19.99	0.000283	0.000201	0	.0976	
8-15	1:05	50	1789	0.3526	19.99	0.000284	0.000202		.0987	
8-17	705	50	1789	0.3528	19.99	0.000284	0.000202		.0883	
8-21	700	50	1789	0.3526	19.99	0.000284	0.000202		.0696	
8-22	700	50	1789	0.3529	19.99	0.000284	0.000202	0	.0646	Test Over

QA APPROVED
NAME: Cldum
DATE: 8/29/06

Project Manager: [signature]

Date: 8/29/06

ARES AN 107 Crack Growth Testing

Specimen: CT-23 PSTAT 2064
Frame: CREEP 1 Tcontroller 1265
TC 239
Load Cell: 470
LVDT: 556

Test Solution: AN107 EndPoint
Batch: 7-21-06

Test #: CT-23
Lab Computer: 14
File Name: CT-23.DAT
Setup File: CTSETUP
Starting pH: 10.01
Ending pH: 10.17

Project Name: ARES AN107
Project Number: 80506210
20ksi = 1732 Lbs
set point = 0.0 mv SCE
Material: A537CL2
Material ID #: 1081

Date	Time	Temp. C	Load, lbs.	Disp. In	Current Amps	Pot Drop V	Control PD V	PSTAT Pot V SCE	V Drop across 1000 ohm Resistor, V	Specimen is Isolated Comments
7-22-06	1045	50	417	—	20.00	0.000294	0.000156	—	—	FCP -237 mv SCE
7-22-06	1150	50	1732	.4904	20.00	0.000306	0.000168	0	.1242	
7-24	700	50	1731	.4893	20.04	0.000305	0.000167		.0347	current reading on Display
7-25	645	50	1730	.4891	20.04	0.000305	0.000167		.0517	was incorrect was 20.04 read
7-26	400	50	1731	.4892	20.05	0.000305	0.000167		.0620	400
7-27	245	50	1731	.4892	20.05	0.000304	0.000167		.0678	
2-28	1020	50	1731	.4894	20.05	0.000304	0.000166		.0440	
7-31	700	50	1730	.4895	20.06	0.000305	0.000168	0	.0616	
8-7	930	50	1730	.4898	20.06	0.000303	0.000168		.0066	
8-9	410	50	1731	.4899	20.05	0.000303	0.000167		.0049	
8-10	350	50	1730	.4898	20.05	0.000303	0.000168		.0070	
8-11	440	50	1730	.4898	20.05	0.000303	0.000168		.0043	
8-14	745	50	1730	.4900	20.05	0.000303	0.000169	0	.0060	
8-15	710	50	1730	.4898	20.05	0.000302	0.000167		.0038	
8-17	705	50	1730	.4901	20.05	0.000304	0.000169		.0030	
8-21	700	50	1730	.4901	20.05	0.000302	0.000168		.0021	
8-22	700	50	1730	.4902	20.05	0.000302	0.000168	0	.0021	Test over

QA APPROVED
NAME: Cedum
DATE: 8/29/06

Project Manager: [signature]

Date: 8/29/06

Appendix E: CPP Testing Results

Table E-1: CPP testing results

Sample ID	Tank 241-AN-107 Solution					OCP	E_{pit}	E_{rp}	
	pH	TOC (g/L)	Nitrite (M)	Nitrate (M)	Chloride (M)	(mV)	(mV)	(mV)[a]	(mV)[b]
#D9019-3	7	20	1.2	3.7	0.1	-204.0	91.0		-189[c]
#D9019-8	10	20	1.2	3.7	0.1	-283.0	117.0	-100 (E_{rp}>-100)	-370[c]
#D9019-12	9.5	20	1.2	3.7	0.1	-258.0	-16.0	-70 (E_{rp}>-70)	-409
#D9019-21	12	20	1.2	3.7	0.1	-371.0	73.0		-95
#D9019-22	13	20	1.2	3.7	0.1	-435.0	-6.0		-133
#D9019-25	11	20	0	3.7	0.1	-445.0	-166.0		-500
#D9019-26	10[d]	20	2.3	2.4	0.1	-267.4	252.9		-17
#D9019-27	11	40	1.2	3.7	0.1	-325.6	201.6		-318
#D9019-28	11	10	1.2	3.7	0.1	-213.2	3.8		3.8
#D9019-29	11	40	0	3.7	0.1	-396.9	-173.6		-500
#D9019-30	10[d]	20	2.3	2.4	0.1	-258.7	220.9		-29
#D9019-32	11	80	0	3.7	0.1	-348.8	-114.7		-464
#D9019-35	13.5	20	1.2	3.7	0.1	-537.8	-203.5		-262
#D9019-36	11	20	0	3.7	0.1	-448.8	-169.8		-500
#D9019-37	11	20	1.2	3.7	0.1	-380.8	175.0	50 (0<E_{rp}<100)	-111
#D9019-38	11	20	1.2	3.7	0.1	-359.0	179.0	50 (0<E_{rp}<100)	-108
#D9019-41	13.5	20	0	3.7	0.1	-604.3	-150.8		-605
#D9019-42	11	20	0	3.7	0.1	-405.0	-140.0		-500.0
#D9019-43	11	80	1.2	3.7	0.1	-320.0	120.0		-175
#D9019-44	11	20	3.5	3.7	0.1	-369.2	177.3		-90
#D9019-45	11	20	7	3.7	0.1	-397.0	151.0	100 (E_{rp}>100)	-65
#D9019-46	11	20	0.35	3.7	0.1	-379.8	-142.6		-462
#D9019-48	11	20	1.0375	3.7	0.1	-349.0	152.0		-397
#D9019-49	11	20	0.875	3.7	0.1	-388.0	144.0		-415
#D9019-50	11	20	1.2	3.7	0.2	-354.0	158.0	-25 (-50<E_{rp}<0)	-376
#D9019-51	11	20	1.2	3.7	0.2	-364.0	152.0	-25 (-50<E_{rp}<0)	-369
#D9019-57	11	20	1.2	3.7	0.2	-369.0	172.0	-25 (-50<E_{rp}<0)	-387
#D9019-58	11	20	0.75	1.5	0.1	-337	194		-58
#D9019-59	11	20	1.5	1.5	0.1	-326.0	249.0	213	-48
#D9019-60	11	20	1.2	3.7	0.2	-390.7	-36.1	-25 (-50<E_{rp}<0)	-393
#D9019-62	9.5	20	2.3	3.7	0.1	-276.2	162.8	100 (E_{rp}>100)	-340
#D9019-65	11	20	1.2	3.7	0.05	-366.3	90.1		-70

a. Repassivation potential determined from the potentiostatic tests;
b. Repassivation potential determined directly from CPP curves;
c. Data from 2005 final interim report;
d. Endpoint solution;

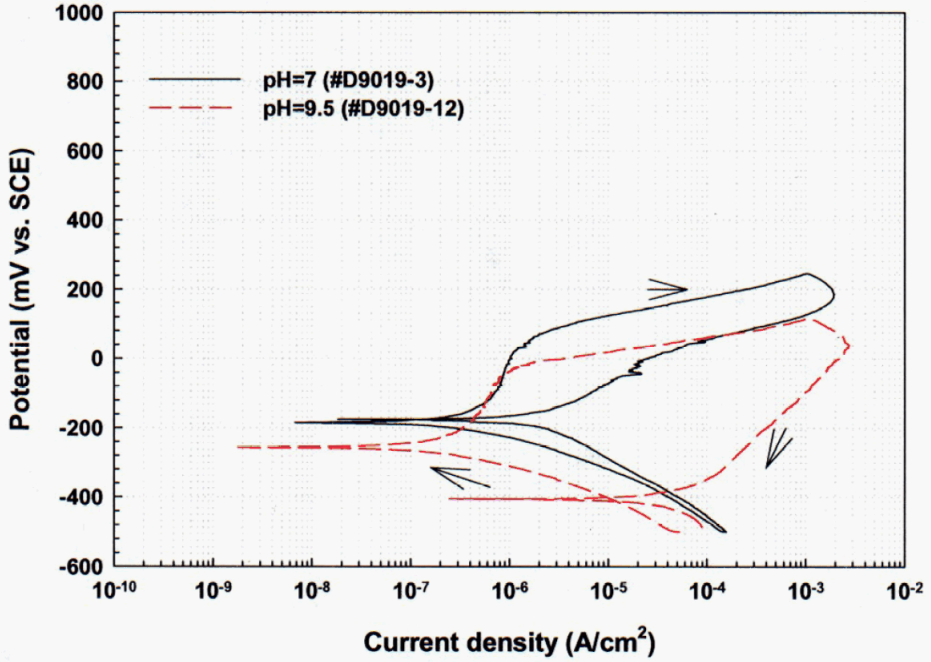


Figure E-1: The CPP curves in Tank 241-AN-107 solution at pH 7 and 9.5.

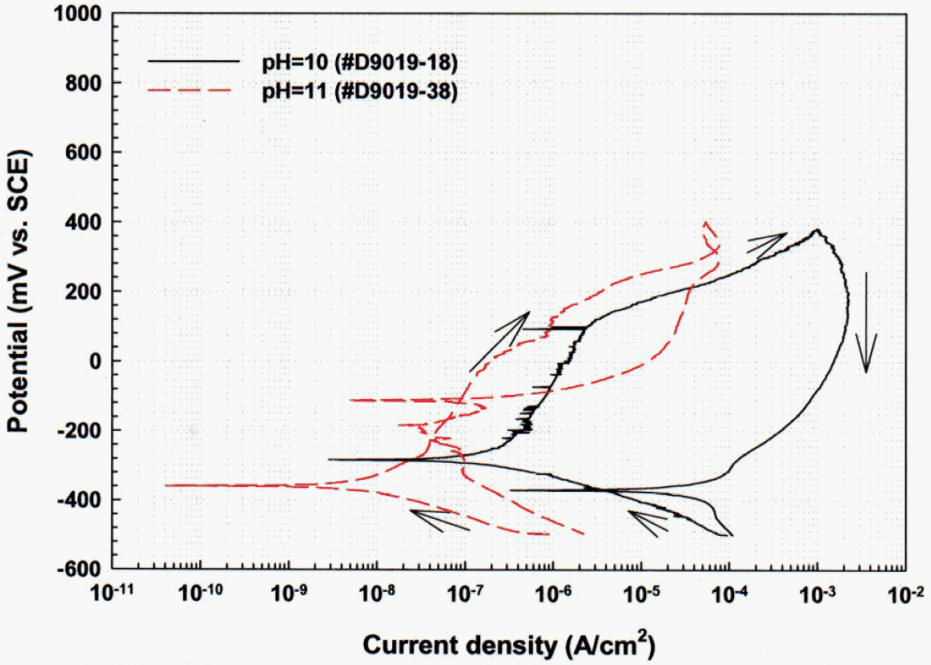


Figure E-2: The CPP curves in Tank 241-AN-107 solution at pH 10 and pH 11.

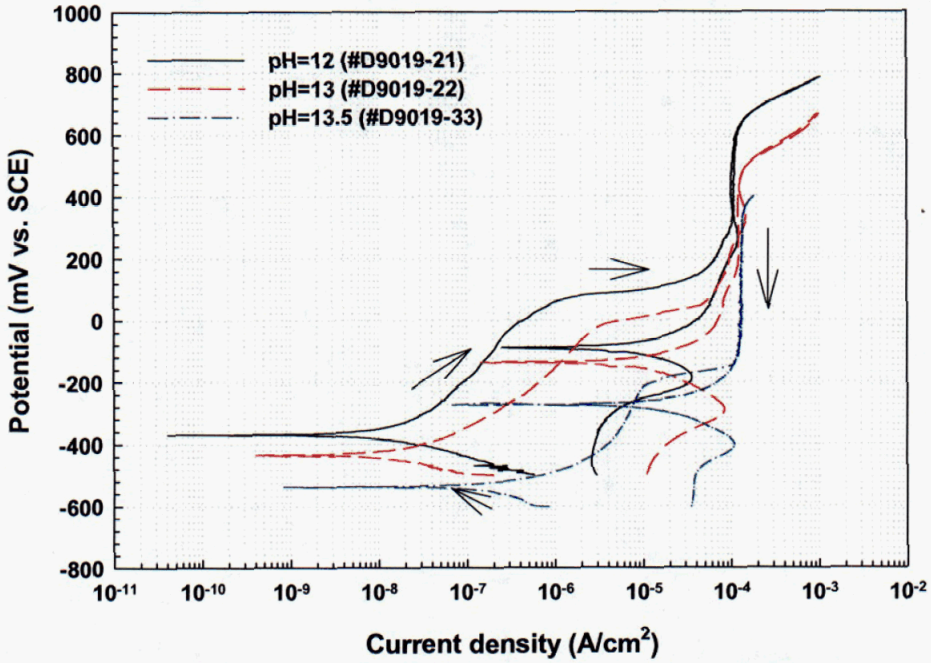
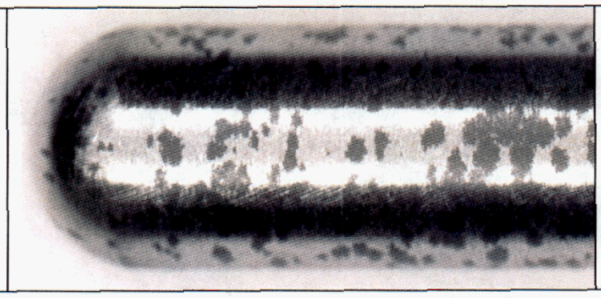
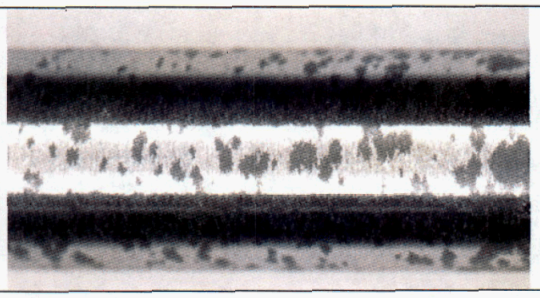
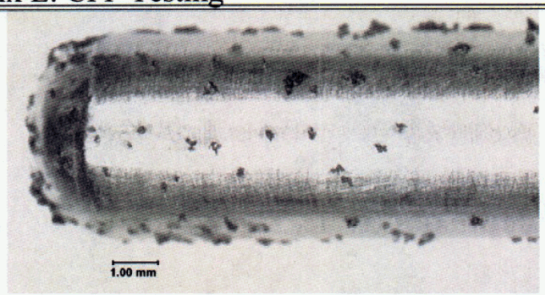
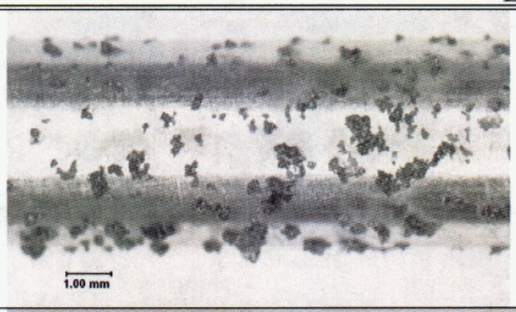
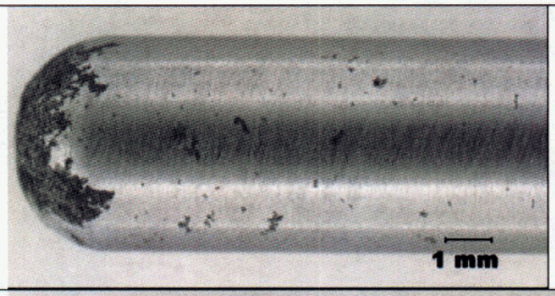
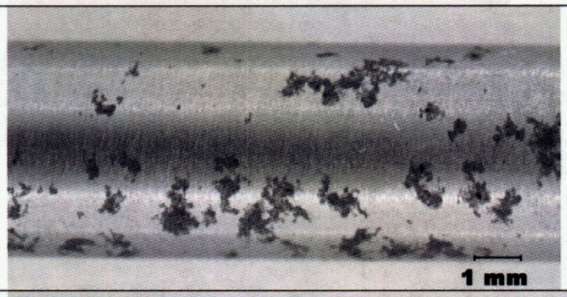
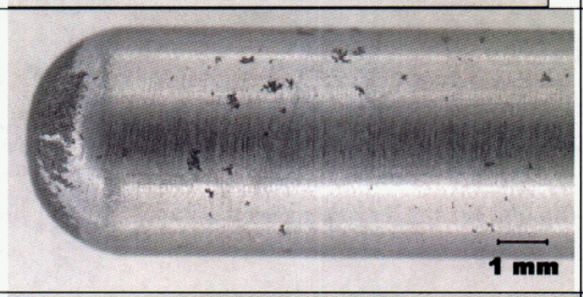
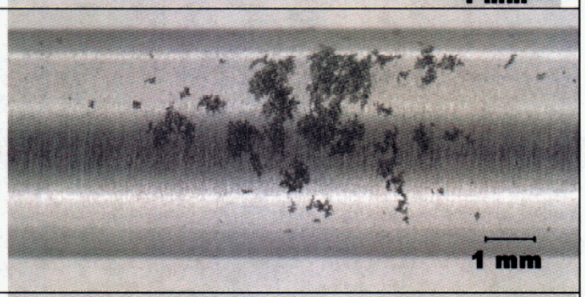
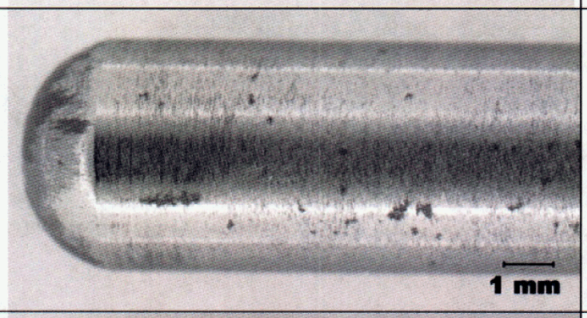
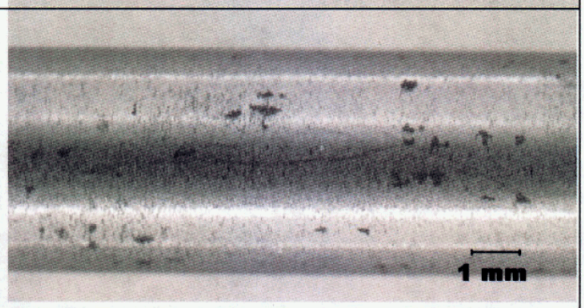
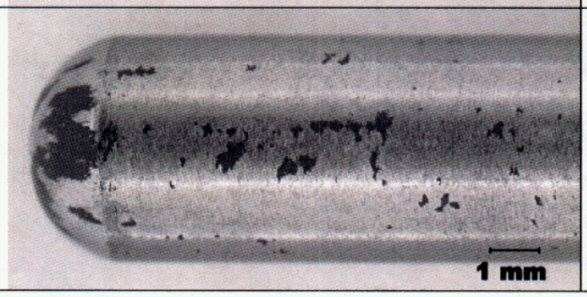
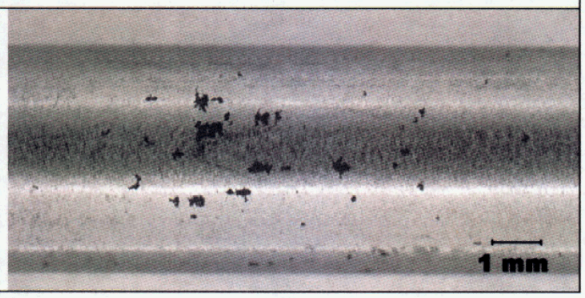
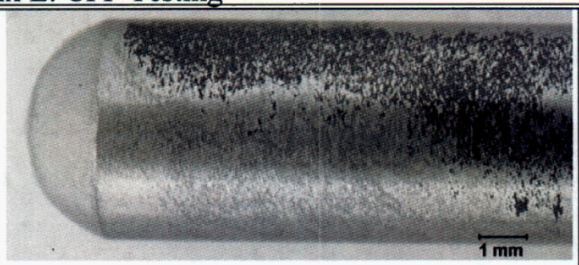
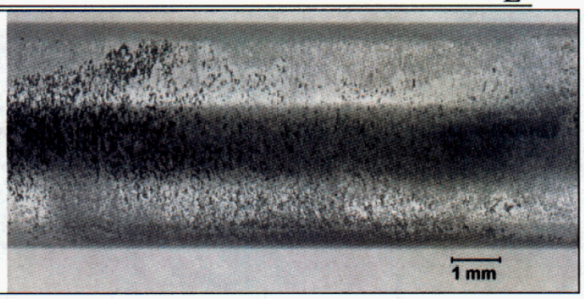


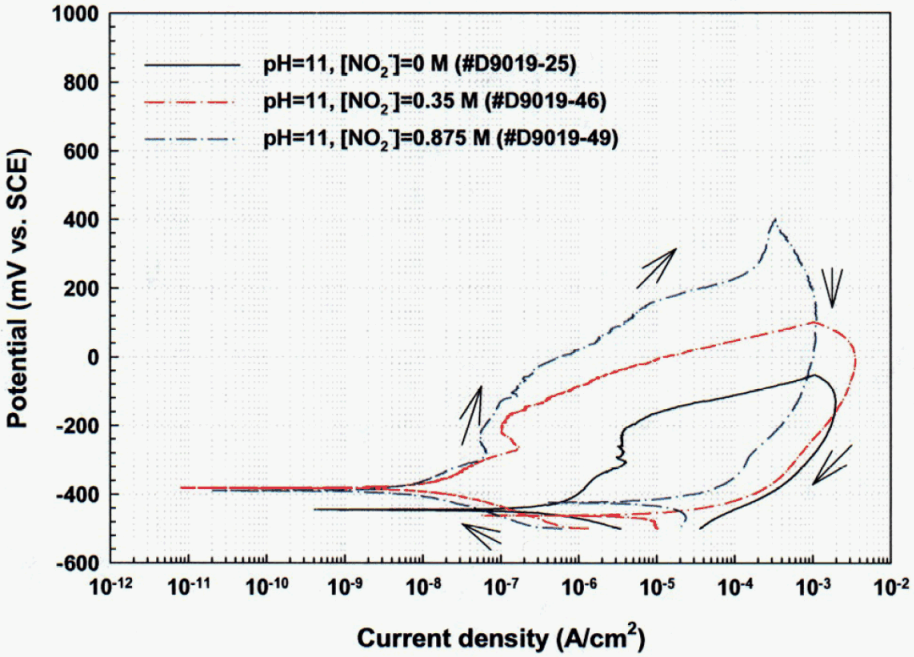
Figure E-3: The CPP curves in Tank 241-AN-107 solution at pH 12, 13 and 13.5.

Table E-2: The specimen appearance after CPP tests in Tank 241-AN-107 solution at different pH values.

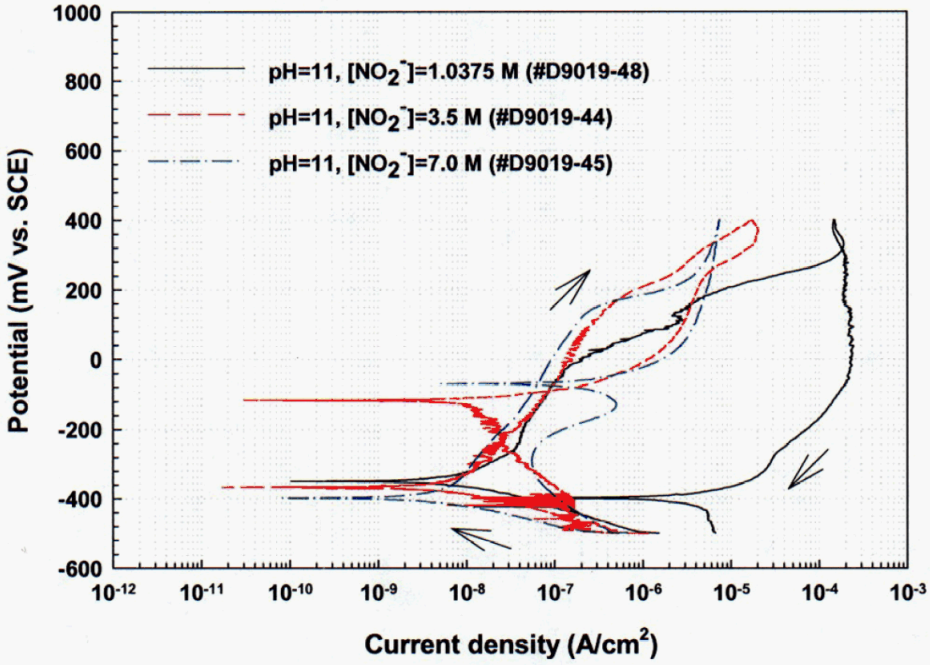
pH=7 standard		

pH=9.5 standard		
pH=10 standard		
pH=11 standard		
pH=12 standard		
pH=13 standard		

pH=13.5 Standard		



(a)



(b)

Figure E-4: The CPP curves in Tank 241-AN-107 solution at pH 11 with different nitrite concentrations.

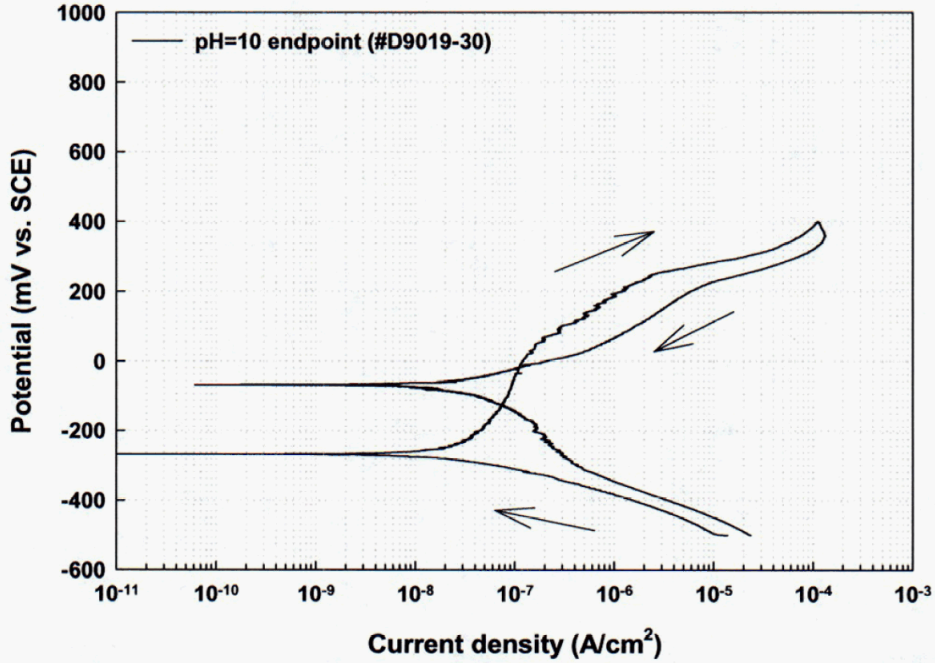
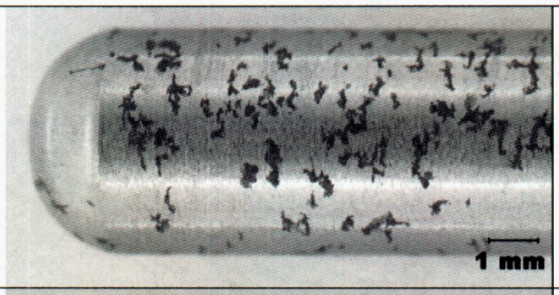
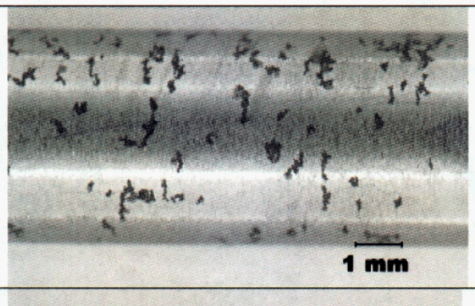
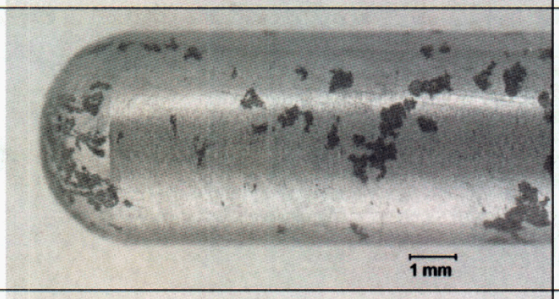
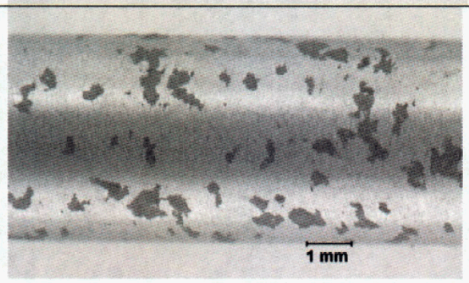
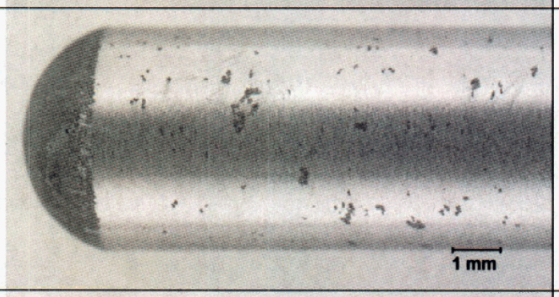
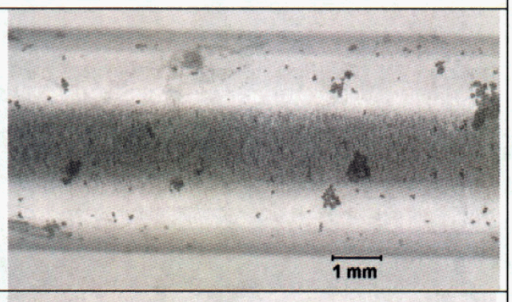
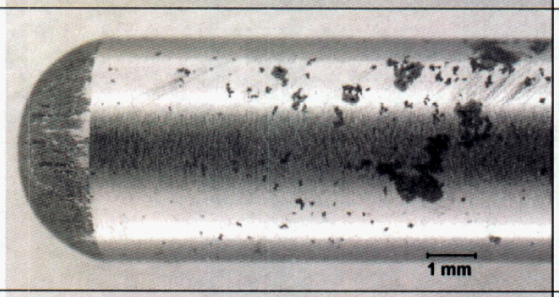
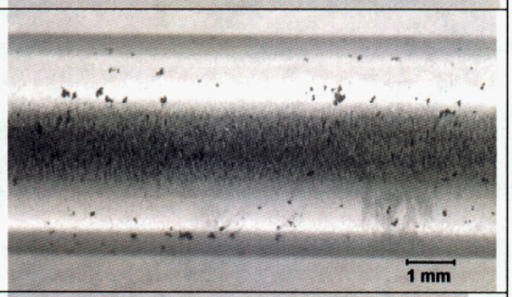
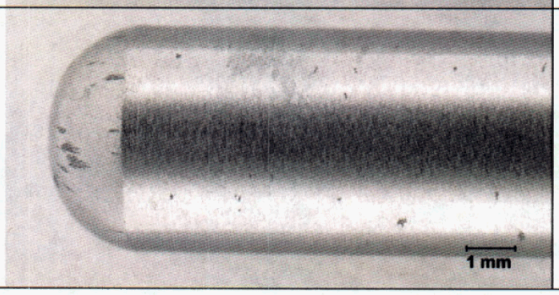
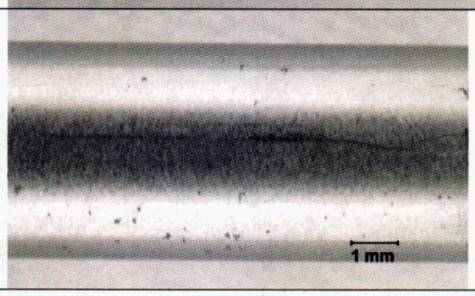
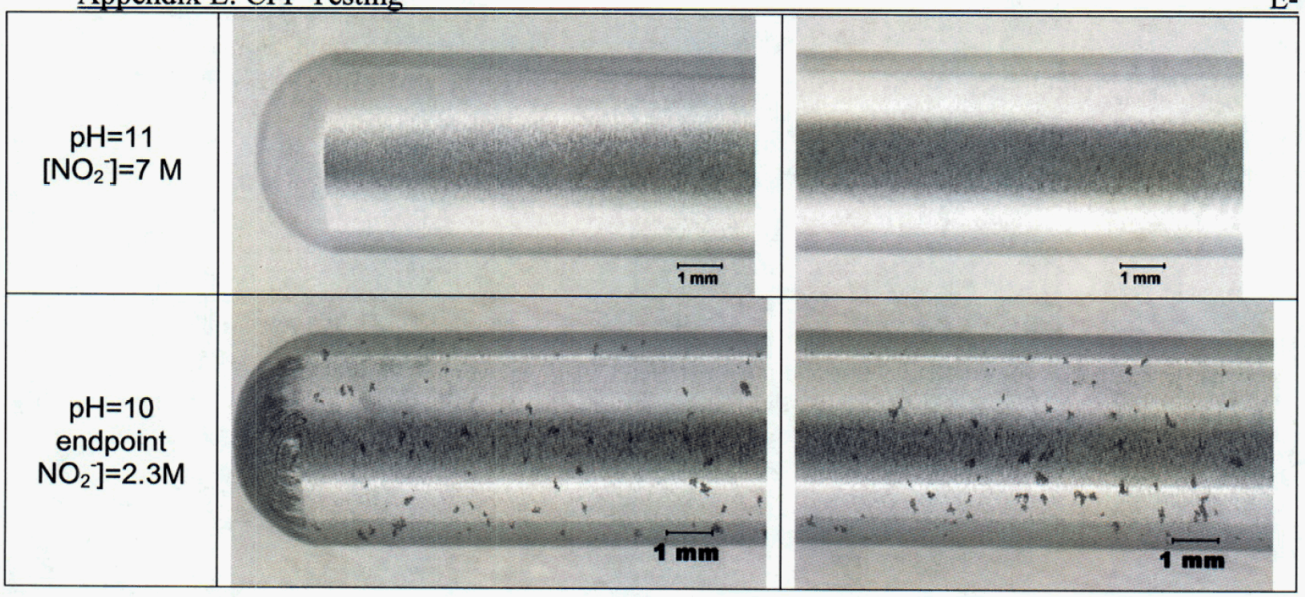


Figure E-5: The CPP curve in Tank 241-AN-107 endpoint solution at pH 10.

Table E-3: The specimen appearance after CPP tests in Tank 241-AN-107 solution with different nitrite concentrations.

pH=11 $[NO_2^-]$=0 M		
pH=11 $[NO_2^-]$=0.35 M		
pH=11 $[NO_2^-]$=0.875 M		
pH=11 $[NO_2^-]$=1.0375 M		
pH=11 $[NO_2^-]$=3.5 M		



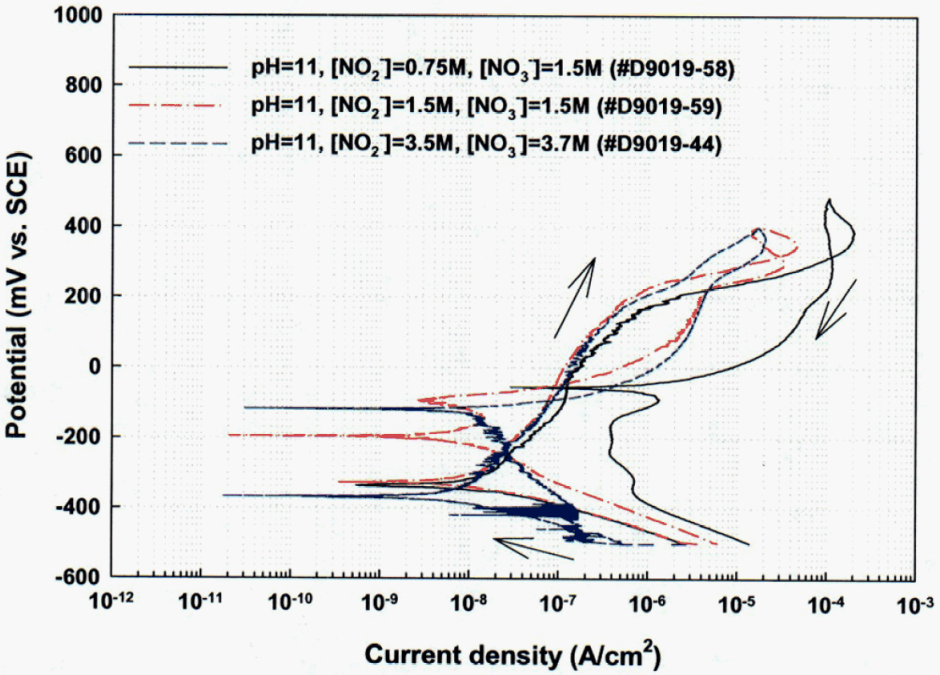
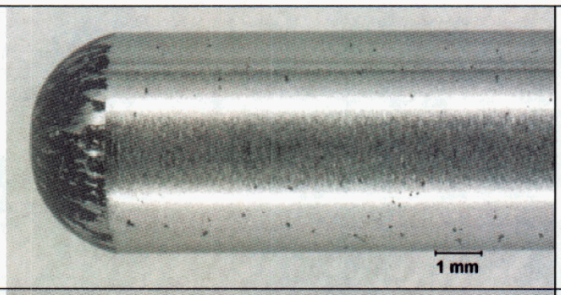
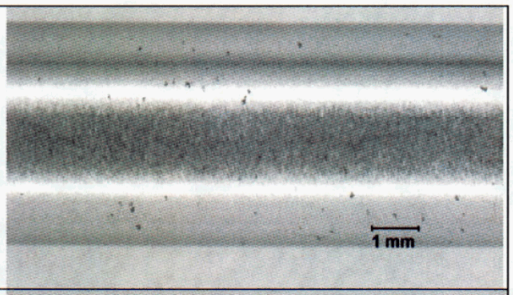
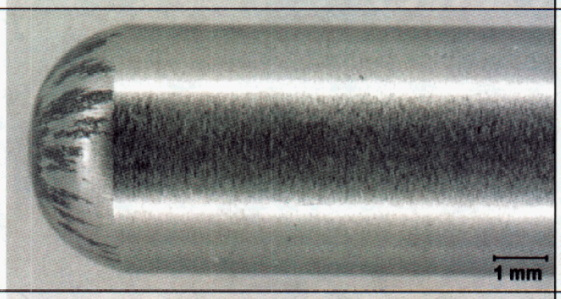
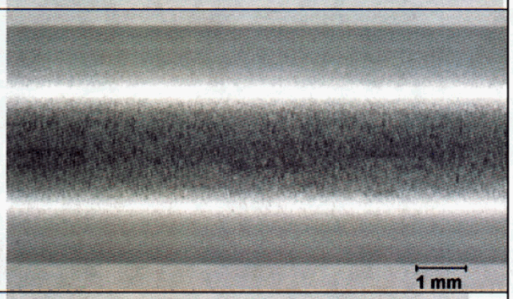
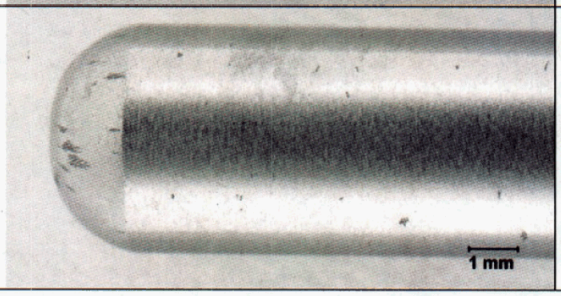
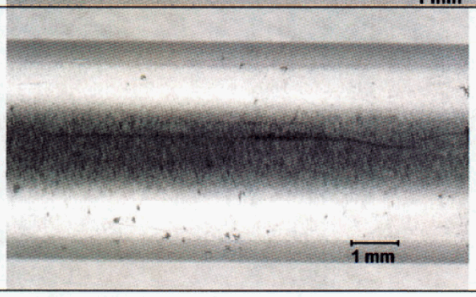


Figure E-6: The CPP curves in Tank 241-AN-107 with different nitrite/nitrate ratios

Table E-4: The specimen appearance after CPP tests in Tank 241-AN-107 solutions with different nitrite/nitrate concentration ratios.

pH=11 $[NO_2^-]$=0.75 M $[NO_3^-]$=1.5M		
pH=11 $[NO_2^-]$=1.5 M $[NO_3^-]$=1.5M		
pH=11 $[NO_2^-]$=3.5 M $[NO_3^-]$=3.7 M		

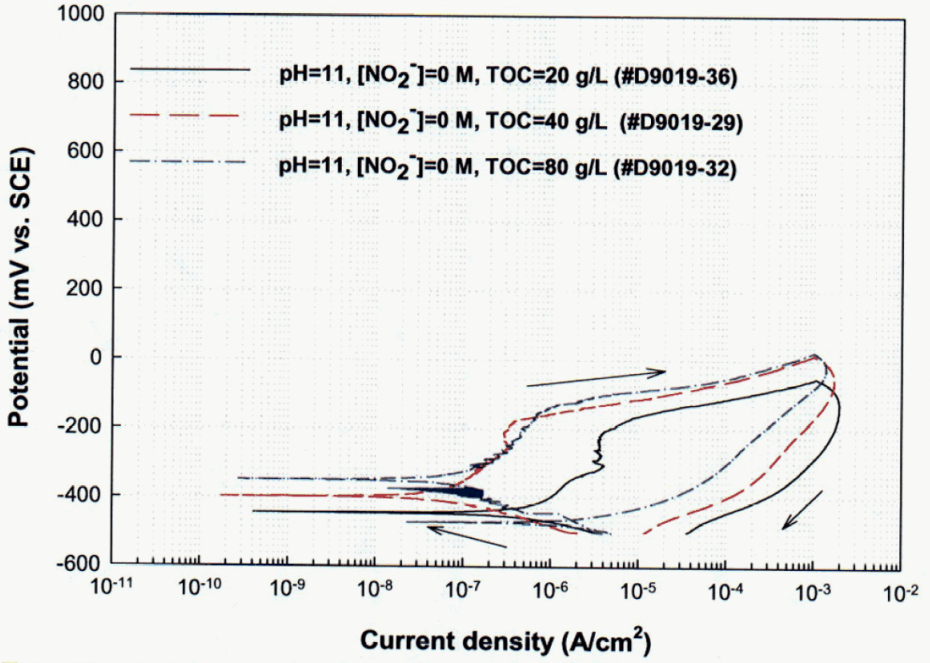
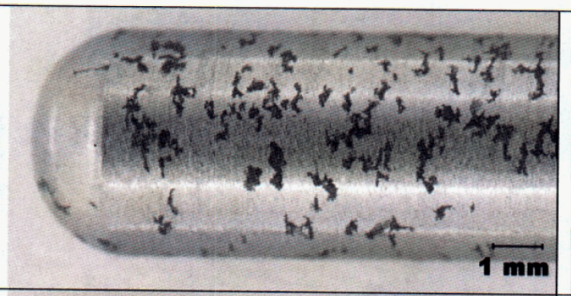
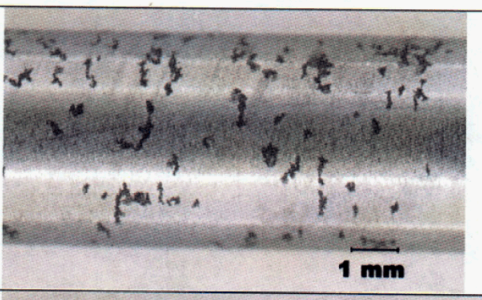
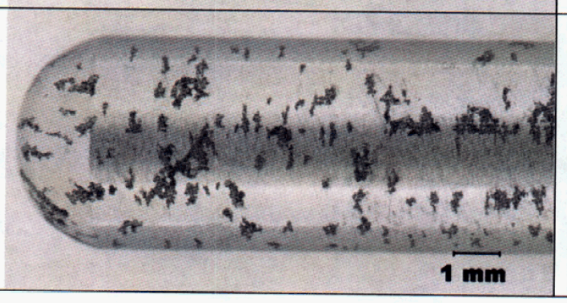
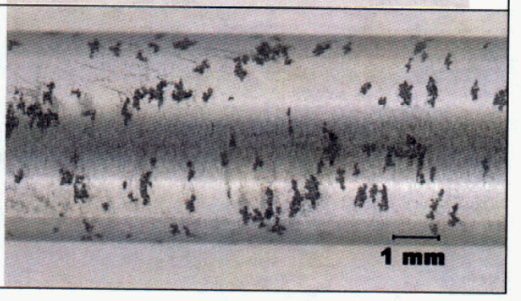
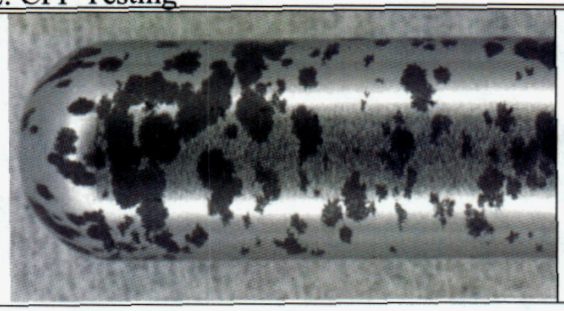
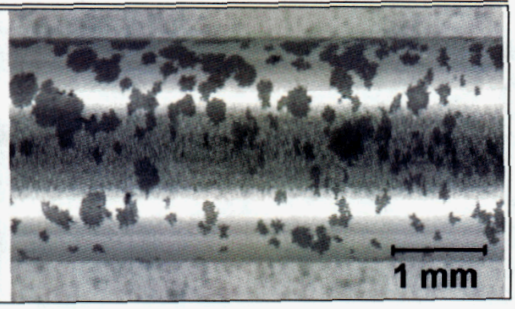
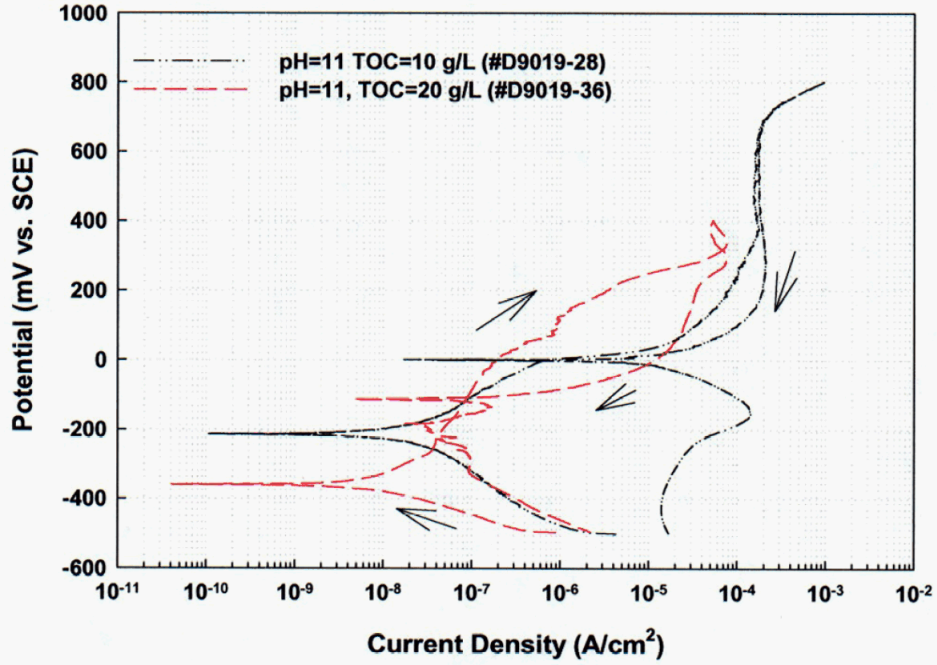


Figure E-7: The CPP curves in Tank 241-AN-107 at pH 11 with different TOC concentration in the absence of nitrite.

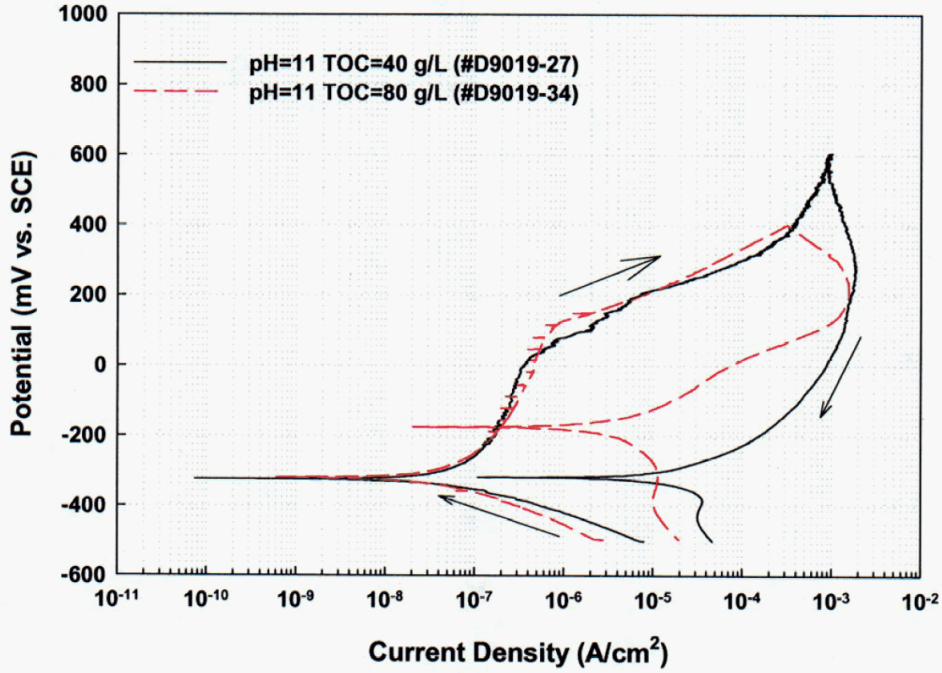
Table E-5: The specimen appearance after CPP tests in Tank 241-AN-107 solutions with different TOC ratios in the absence of nitrite.

pH=11 TOC=20 g/L $[NO_2^-]$=0 M		
pH=11 TOC=40 g/L $[NO_2^-]$=0 M		

pH=11 TOC=80 g/L $[NO_2^-]$=0 M		



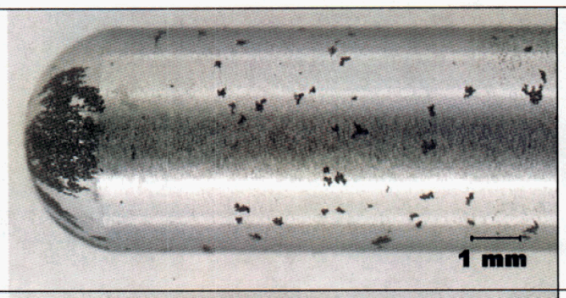
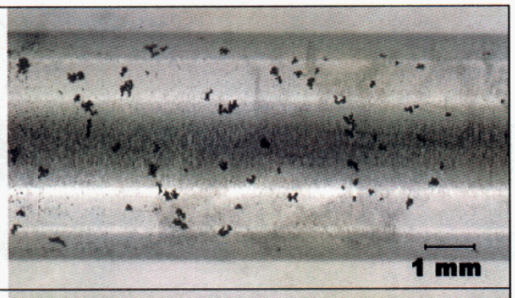
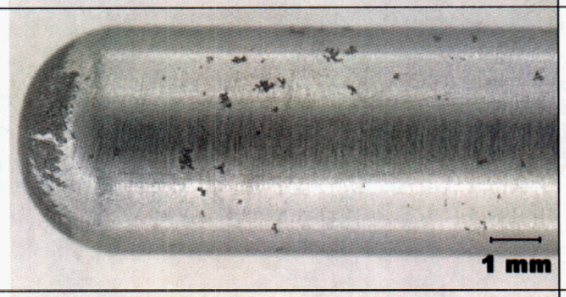
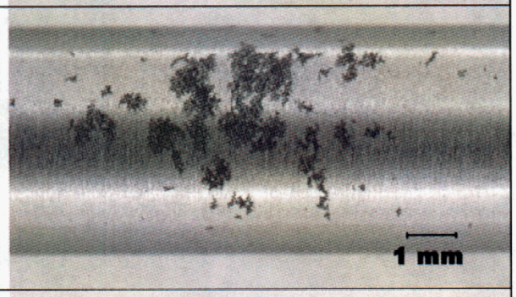
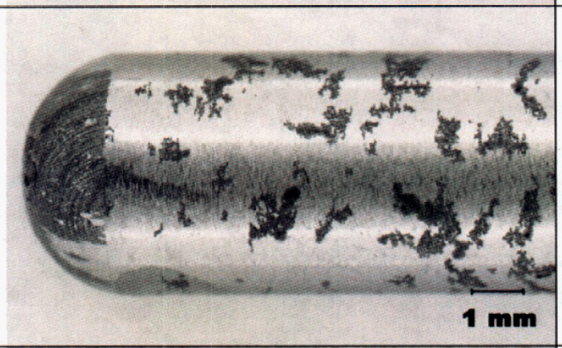
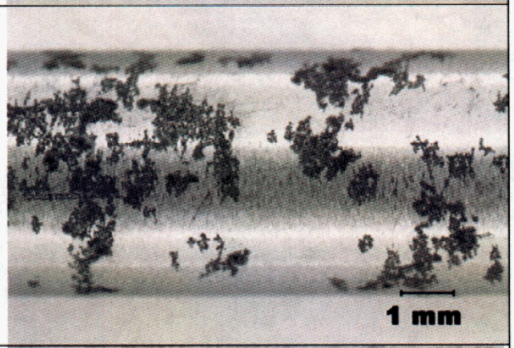
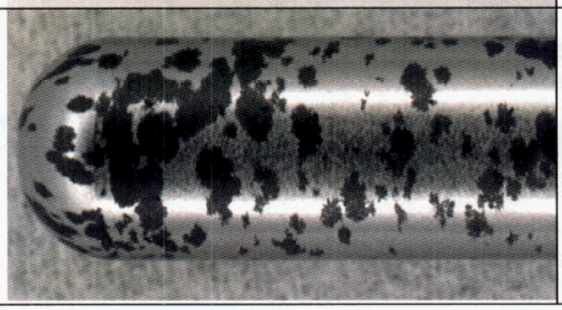
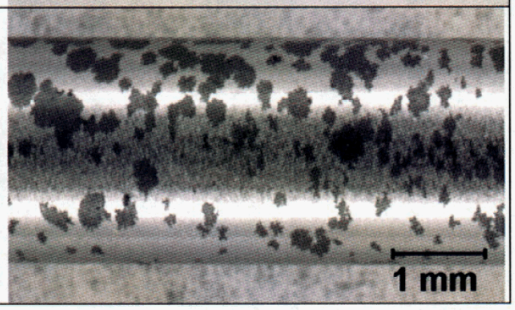
(a)



(b)

Figure E-8: The CPP curves in Tank 241-AN-107 solution with 1.2M nitrite at pH 11 with different TOC concentrations.

Table E- 6: The specimen appearance after CPP tests in Tank 241-AN-107 solution with 1.2M nitrite and different TOC concentrations.

pH=11 TOC=10 g/L $[NO_2^-]$=1.2M		
pH=11 TOC=20 g/L $[NO_2^-]$=1.2M		
pH=11 TOC=40 g/L $[NO_2^-]$=1.2M		
pH=11 TOC=80 g/L $[NO_2^-]$=1.2M		

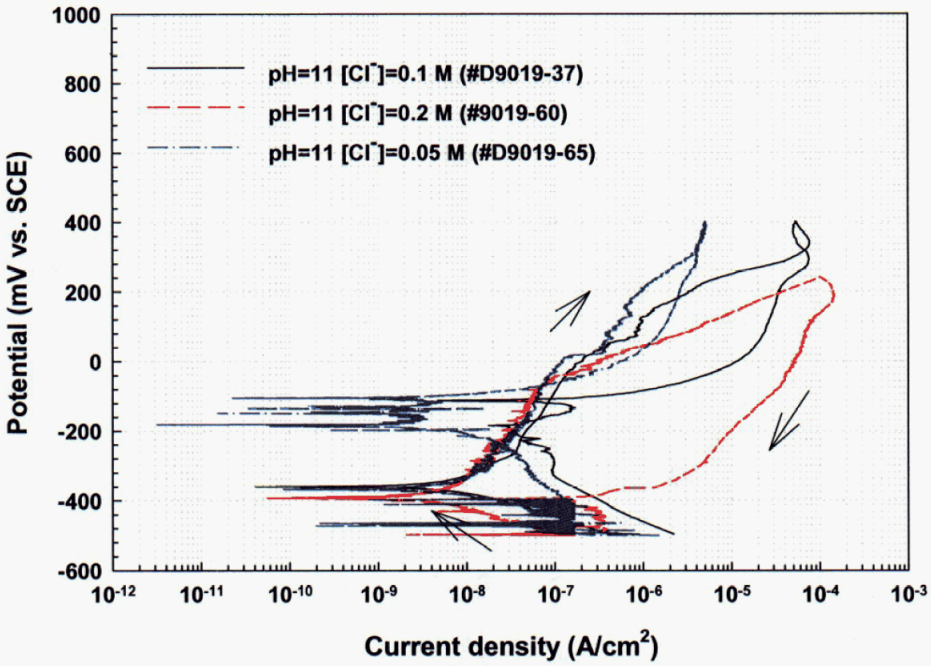
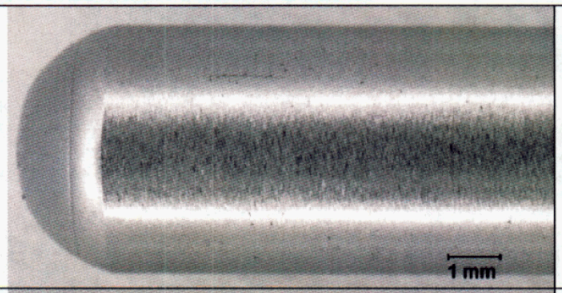
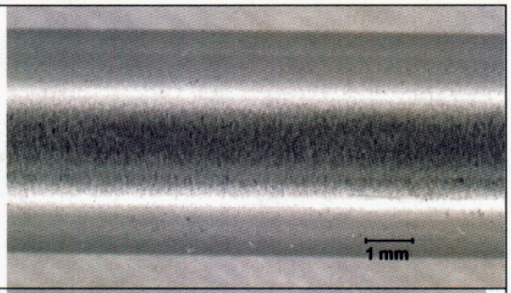
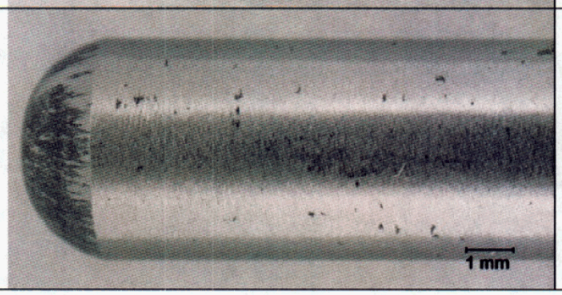
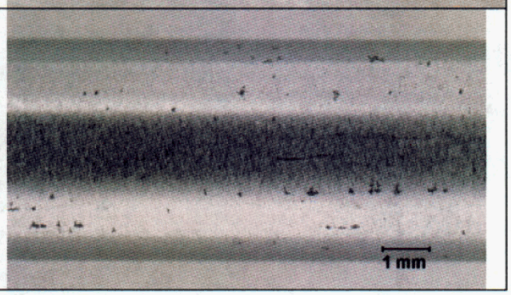
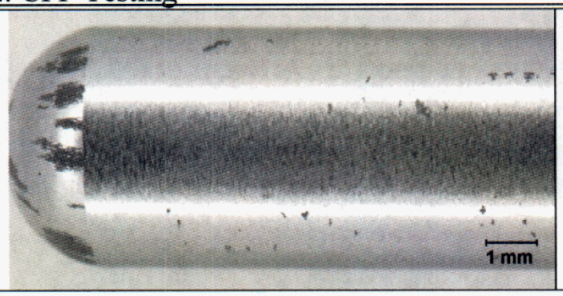
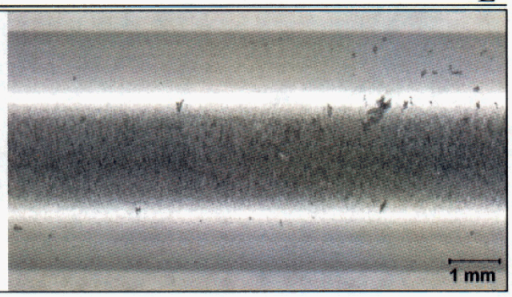


Figure E-9: The CPP curves in Tank 241-AN-107 at pH 11 with different chloride concentrations.

Table E-7: The specimen appearance after CPP tests in Tank 241-AN-107 solution with different chloride concentrations.

pH=11 [Cl⁻]=0.05 M		
pH=11 [Cl⁻]=0.1 M		

pH=11 [Cl^-]=0.2 M		

Appendix F: Potentiostatic Test Results

Table F-1: Potentiostatic tests results summary

pH	Tank-AN-107 Solution				Held Potential (mV vs. SCE)	E_{rp} (mV)	Specimen ID
	TOC (g/L)	Nitrite (M)	Nitrate (M)	Chloride (M)			
9.5[a]	20	2.3	2.4	0.1	-100	>100	#D9019-71
9.5[a]	20	2.3	2.4	0.1	100		#D9019-76
9.5	20	1.2	3.7	0.1	-70	>-70	#CCT1081-9
10	20	1.2	3.7	0.1	-100	>-100	#CCT1081-1
10[a]	20	2.3	2.4	0.1	300	The inflection point at ~220 mV	#D9019-39
10[a]	20	2.3	2.4	0.1	100		#D9019-40
11	20	7	3.7	0.1	100	>100	#D9019-52
11	20	1.2	3.7	0.1	100	0~100	#D9019-53
11	20	1.2	3.7	0.1	300		#D9019-55
11	20	1.2	3.7	0.1	100		#D9019-56
11	20	1.2	3.7	0.1	0		#D9019-69
11	20	1.2	3.7	0.1	-50		#D9019-70
11	20	1.2	3.7	0.2	-200	-50~0	#D9019-61
11	20	1.2	3.7	0.2	-100		#D9019-63
11	20	1.2	3.7	0.2	+100		#D9019-64
11	20	1.2	3.7	0.2	0		#D9019-72
11	20	1.2	3.7	0.2	-50		#D9019-73

a. Endpoint solution;

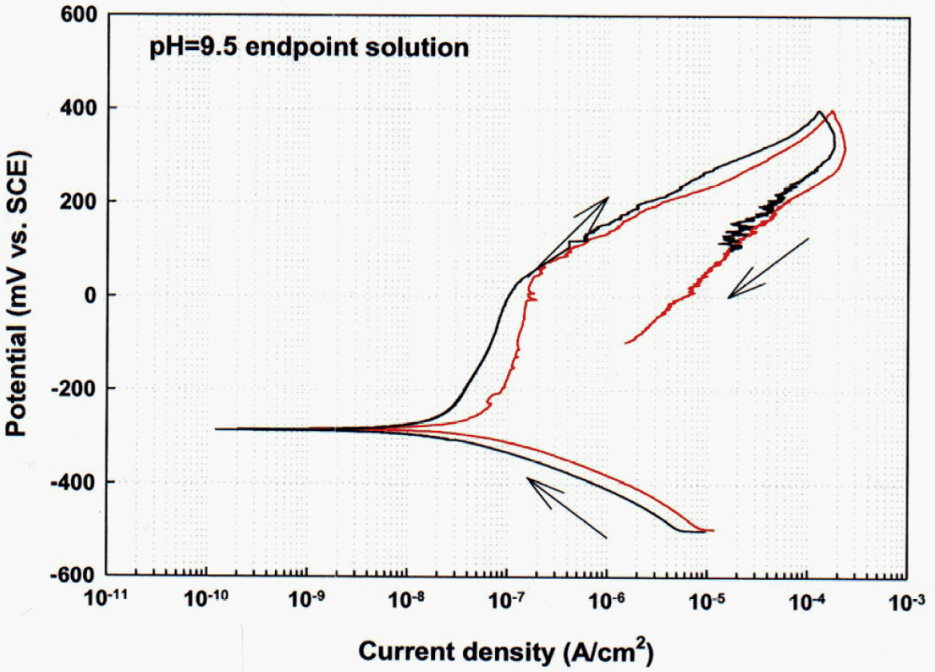


Figure F-1: CPP curves showing the potentials for the potentiostatic tests in Tank 241-AN-107 endpoint solution at pH 9.5 (#D9019-71—Potential held at -100 mV; #D9019-76—Potential held at 100 mV).

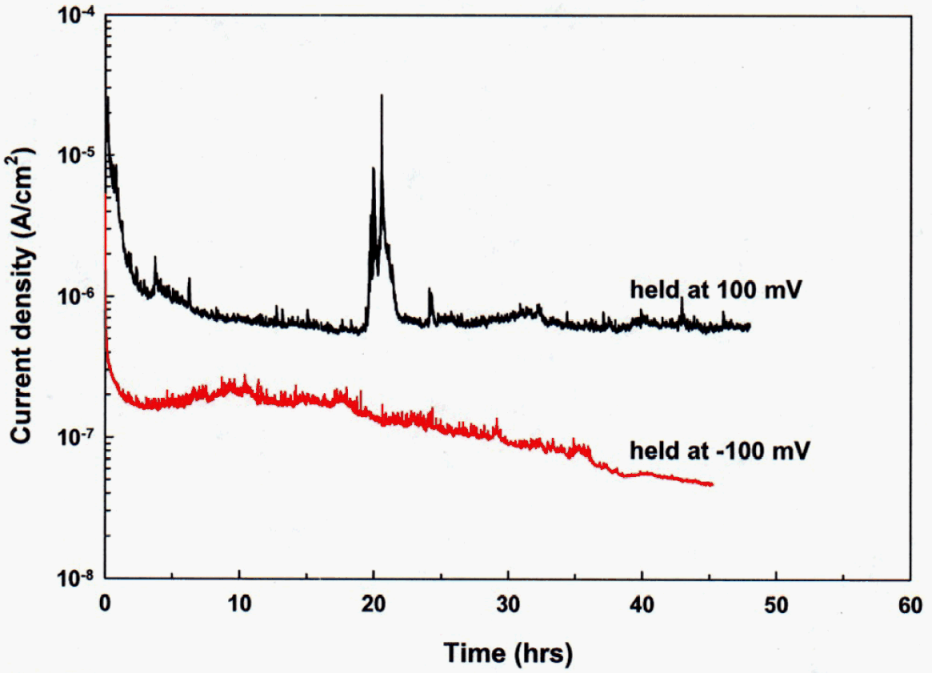


Figure F-2: The current change as a function of time from the potentiostatic tests in Tank 241-AN-107 solution at pH 9.5 (#D9019-71—Potential held at -100 mV; #D9019-76—Potential held at 100 mV).

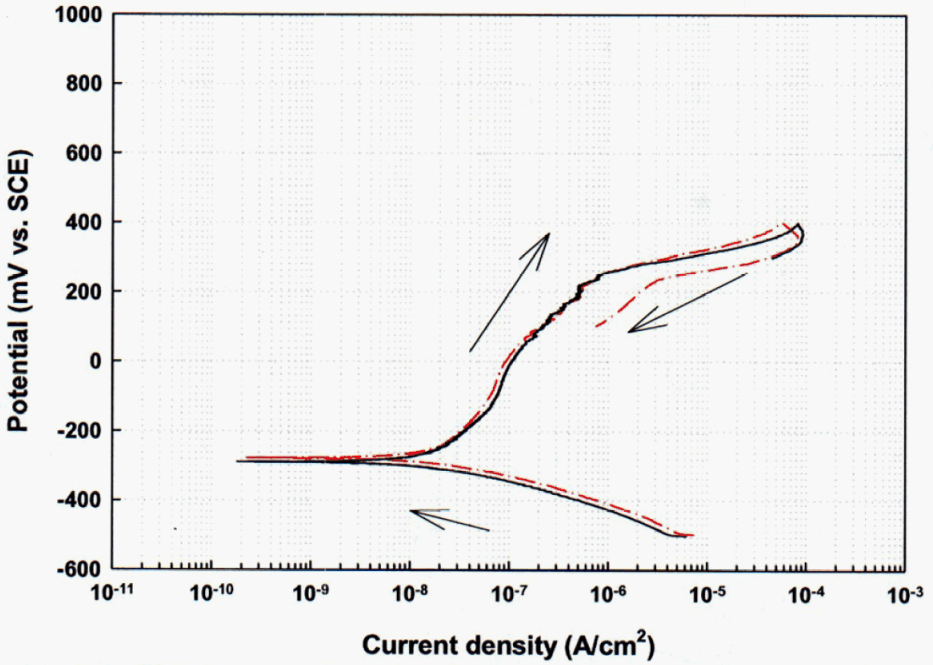


Figure F-3: The CPP curves showing the potentials for the potentiostatic tests in Tank 241-AN-107 endpoint solution at pH 10 (#D9019-39—Potential held at 300 mV; #D9019-40—Potential held at 100 mV).

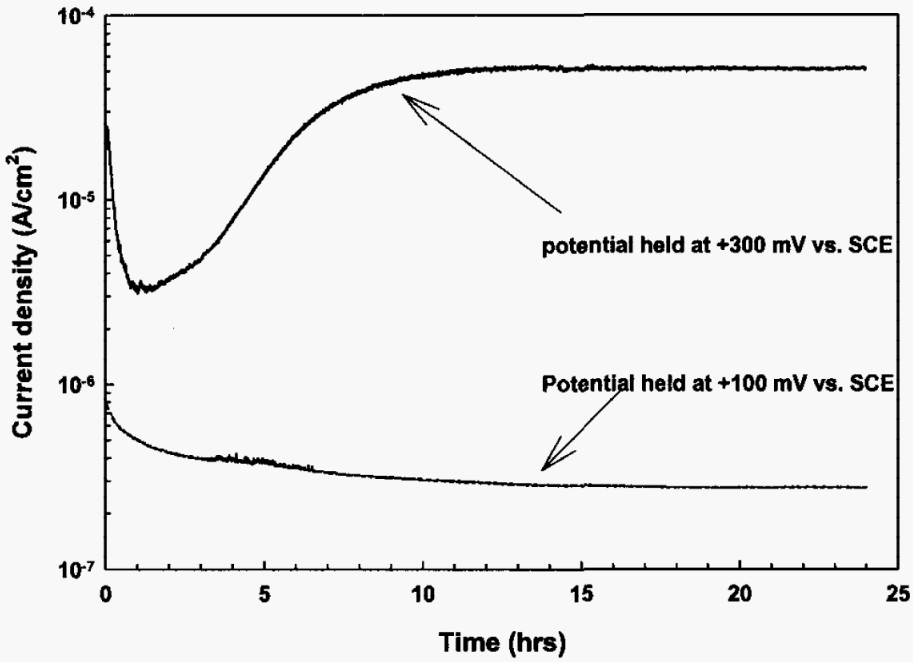


Figure F-4: The current change as a function of time from the potentiostatic tests in Tank 241-AN-107 endpoint solution at pH 10 (#D9019-39—Potential held at 300 mV; #D9019-40—Potential held at 100 mV).

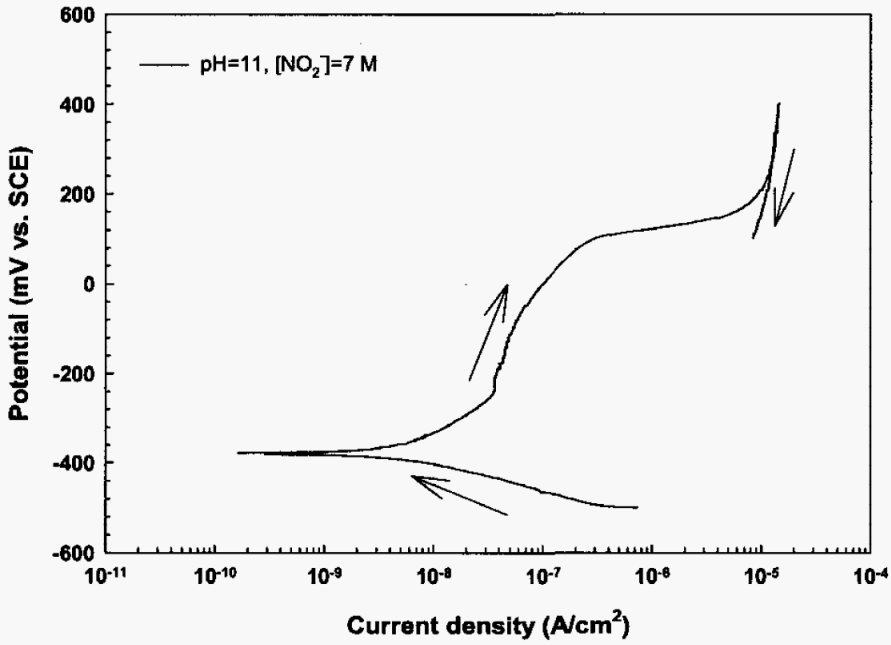


Figure F-5: The CPP curve showing the potential for the potentiostatic test in Tank 241-AN-107 solution at pH 11 with 7 M nitrite (#D9019-52).

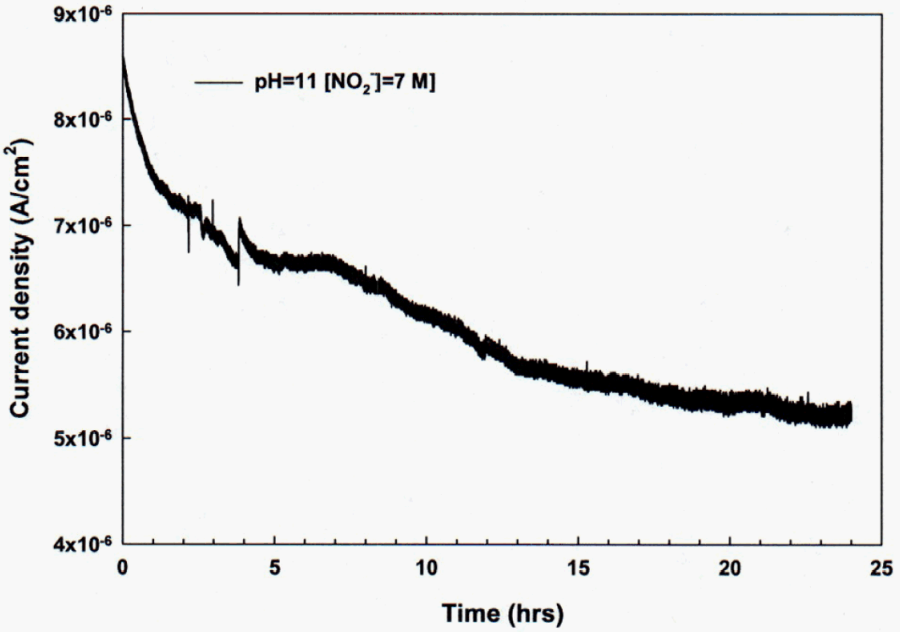


Figure F-6: The current change as a function of time from the potentiostatic tests in Tank 241-AN-107 solution at pH 11 with 7 M nitrite (#D9019-52).

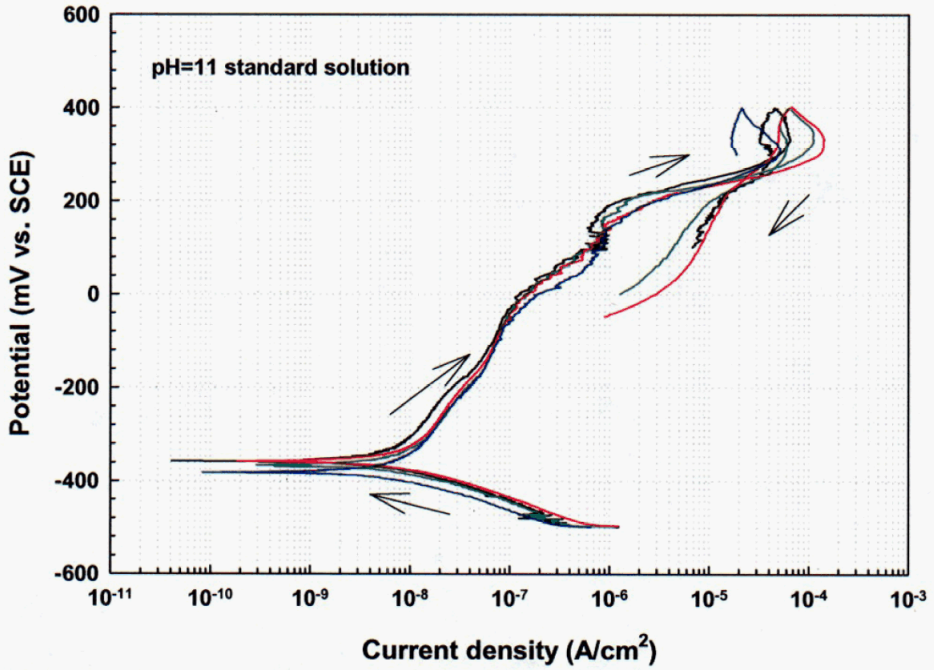


Figure F-7: The CPP curves showing the potentials for the potentiostatic tests in Tank 241-AN-107 solution at pH 11(#D9019-53—Potential held at 100 mV; #D9019-55—Potential held at 300 mV; #D9019-69—Potential held at 0 mV; #D9019-70—Potential held at -50 mV).

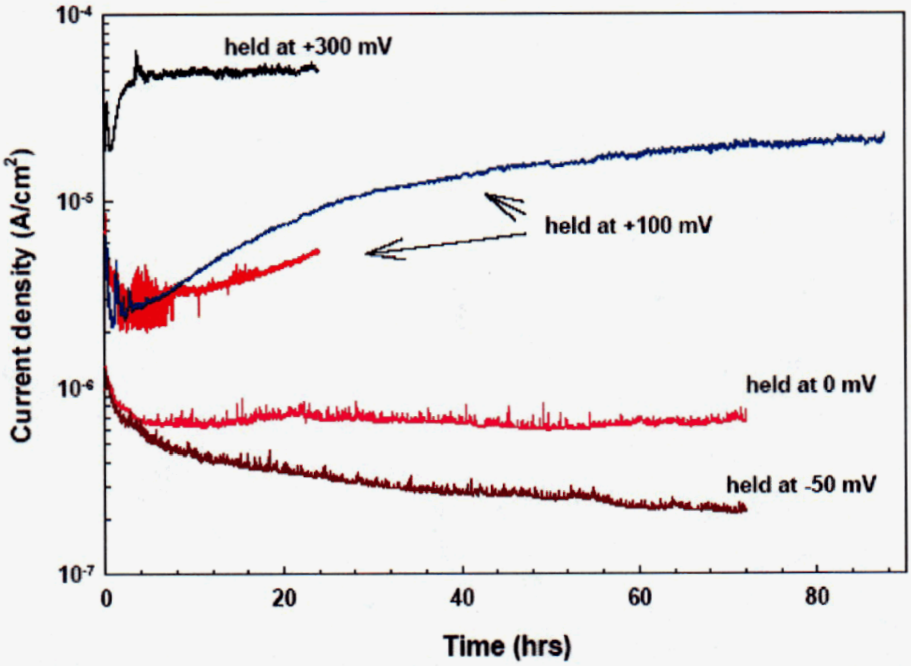


Figure F-8: The current change as a function of time from the potentiostatic tests in Tank 241-AN-107 solution at pH 11 (#D9019-53—Potential held at 100 mV; #D9019-55—Potential held at 300 mV; #D9019-69—Potential held at 0 mV; #D9019-70—Potential held at -50 mV).

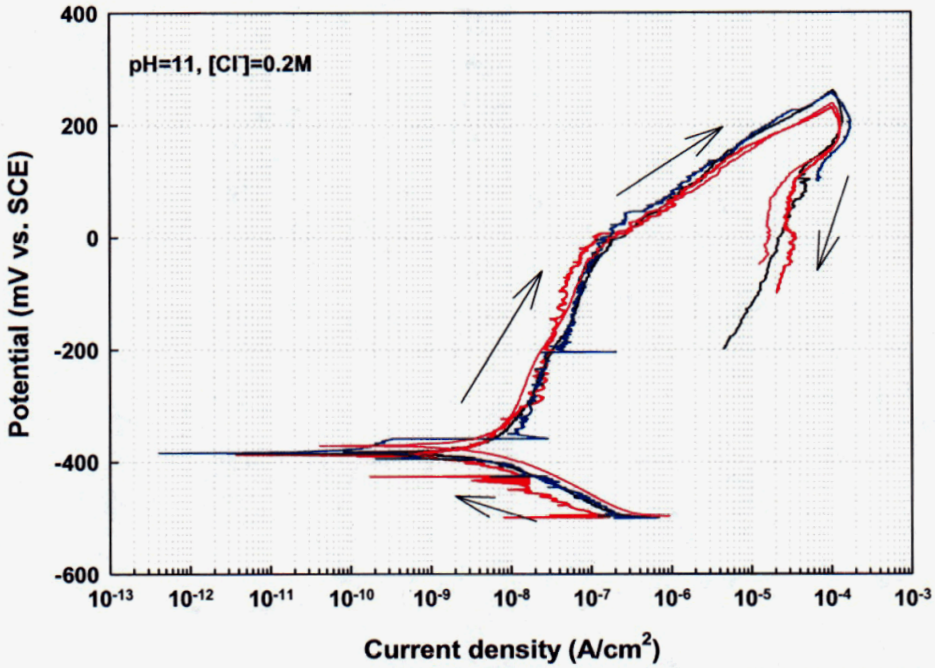


Figure F-9: The CPP curves showing the potentials for the potentiostatic tests in Tank 241-AN-107 solution at pH 11 with 0.2M chloride (#D9019-61—Potential held at -200 mV; #D9019-63—Potential held at -100 mV; #D9019-64—Potential held at 100 mV; #D9019-73—Potential held at -50 mV).

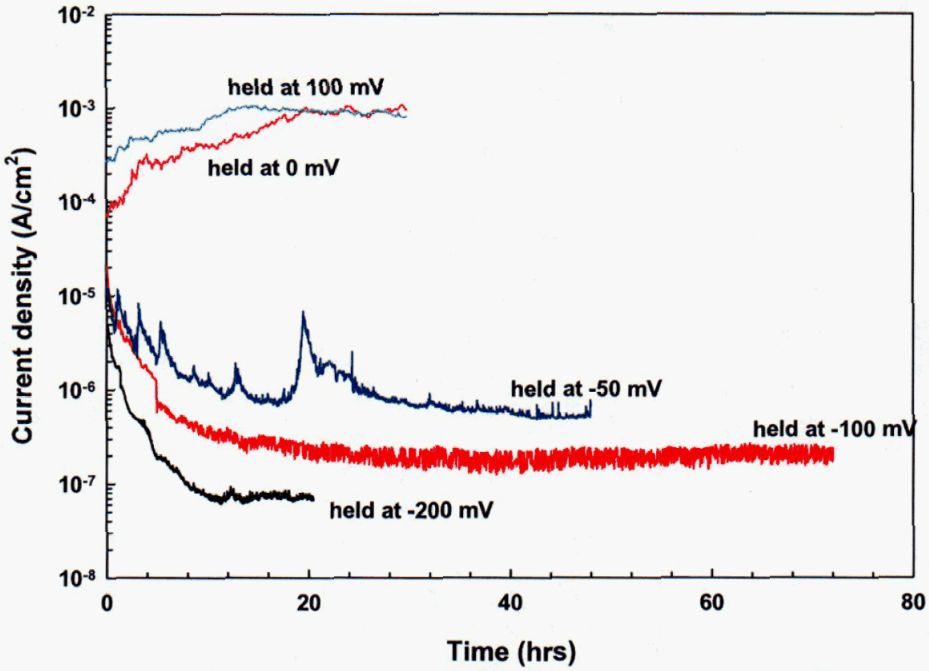


Figure F-10: The current change as a function of time for the potentiostatic tests in Tank 241-AN-107 solution at pH 11 with 0.2M chloride (#D9019-61—Potential held at -200 mV; #D9019-63—Potential held at -100 mV; #D9019-64—Potential held at 100 mV; #D9019-73—Potential held at -50 mV).

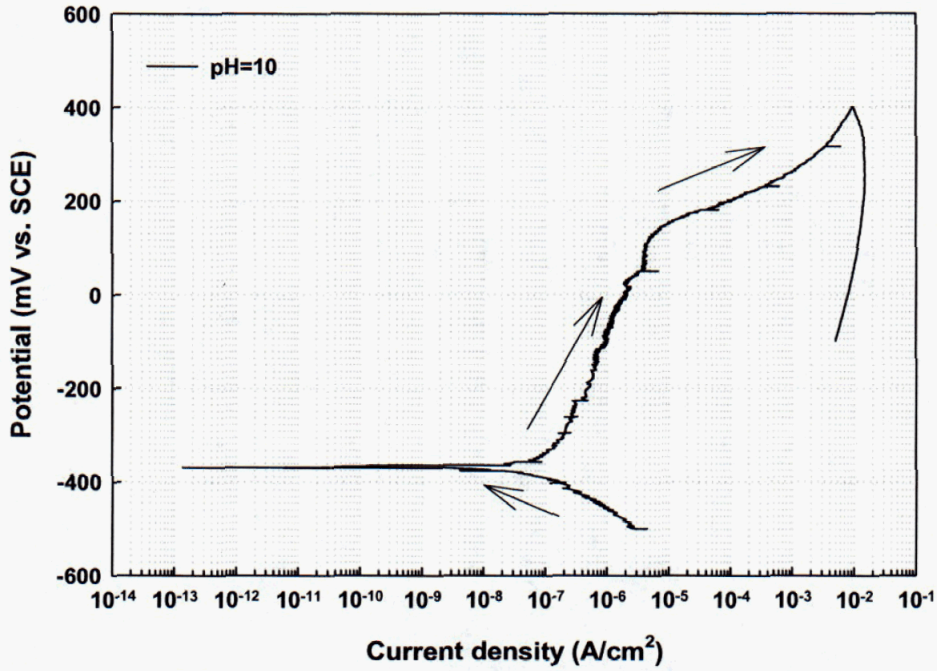


Figure F-11: The CPP curve showing the potential for the potentiostatic test in Tank 241-AN-107 solution at pH 10 (#CCT1081-1—Potential held at -100 mV).

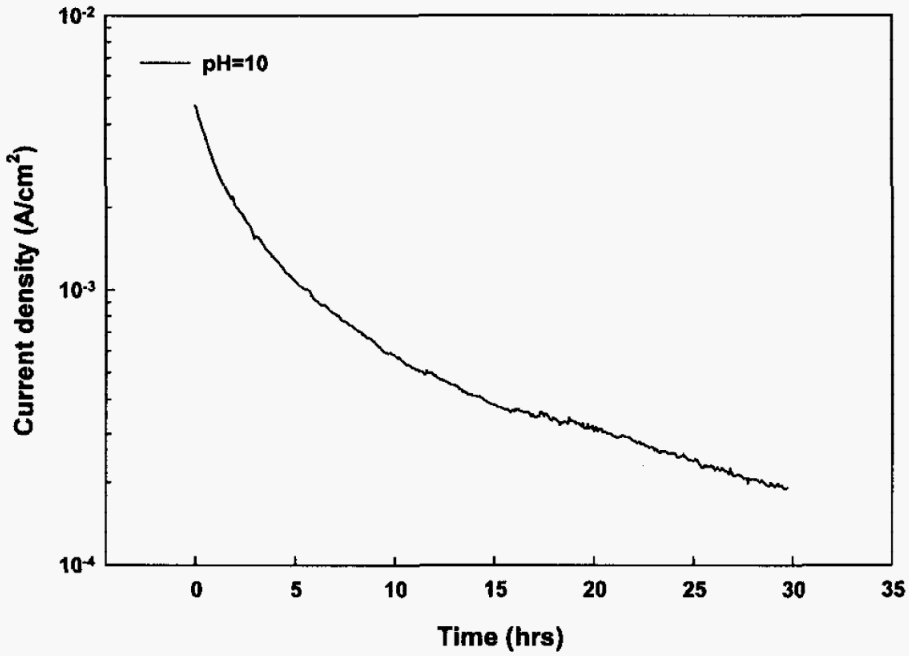


Figure F-12: The current change as a function of time from the potentiostatic test in Tank 241-AN-107 solution at pH 10 (#CCT1081-1—Potential held at -100 mV).

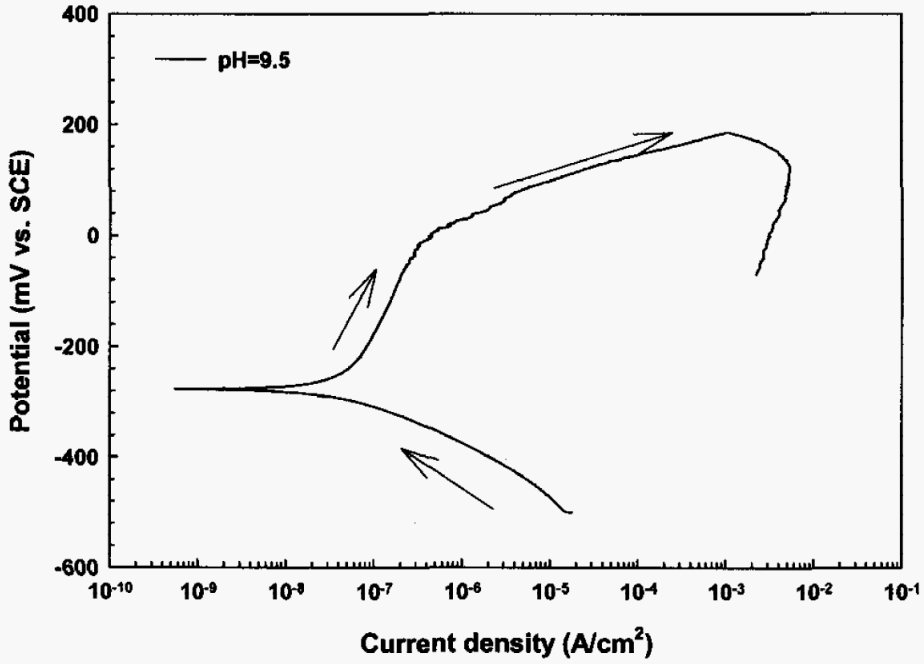


Figure F-13: The CPP curve showing the potential for the potentiostatic test in Tank 241-AN-107 solution at pH 9.5 (#CCT1081-9—Potential held at -70 mV).

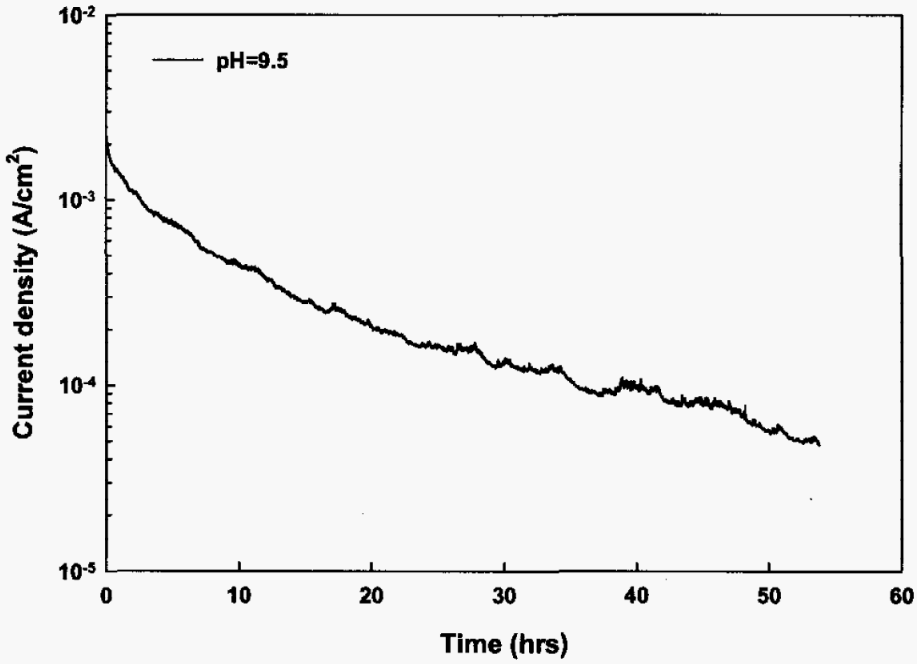


Figure F-14: The current change as a function of time from the potentiostatic test in Tank 241-AN-107 solution at pH 9.5 (#CCT1081-9—Potential held at -70 mV).

APPENDIX G SLOW STRAIN RATE TESTING

Table G 1 Summary of SSRT results. Note that the Test ID format indicates the project year the test was performed (i.e., Y1-3 is the 3rd test conducted in Year 1 and Y2-1 is the 1st test conducted in Year 2).

Chemistry	pH	Applied Potential (mV vs. SCE)	Failure Time (hrs)	Failure Strain (%)	Maximum observed crack (μm)	Estimated CGR (mm/sec)	Degree of SCC	Test ID	Specimen
Air									
Air@100°C			55.5	27.1					
Standard Tank 241-AN-107									
Standard	7	+100	33.7	8.5	483	4×10^{-6}	Major	Y1-3	D9019-46
Standard	7	+100	29.8	11.2	639	6×10^{-6}	Major	Y1-23	D9019-10
Standard	7	-100	73.8	26.1	n/a	0	None	Y1-9	D9019-44
Standard	7	OCP (-225)	77.3	26.6	n/a	0	None	Y1-1	D9019-47
Standard	7	OCP (-200)	77.2	26.7	n/a	0	None	Y1-24	D9019-11
Standard	9.5	0	80.2	24.4	221	8×10^{-7}	Moderate	Y1-27	D9019-15
Standard	9.5	0	43.1	14.8	290	2×10^{-6}	Moderate	Y1-33	D9019-20
Standard	9.5	0	37.9	13.4	445	3×10^{-6}	Moderate	Y1-34	D9019-34
Standard	9.5	-100	74.3	26.7	n/a	0	None	Y1-29	D9019-29
Standard	9.5	OCP (-150)	75.7	25.4	n/a	0	None	Y1-28	D9019-14
Standard	10	+100	32.3	12.6	233	2×10^{-6}	Moderate	Y1-19	D9019-03
Standard	10	0	73.8	26.4	317	1×10^{-6}	Moderate	Y1-17	D9019-02
Standard	10	-100	74.0	26.0	n/a	0	None	Y1-18	D9019-06
Standard	10	OCP (-160)	83.2	28.1	n/a	0	None	Y1-20	D9019-20
Standard	11	+100	73.7	24.9	326	1×10^{-6}	Moderate	Y1-4	D9019-50
Standard	11	+100	70.5	24.7	186	7×10^{-7}	Moderate	Y1-22	D9019-08
Standard	11	+50	69.4	24.5	203	8×10^{-7}	Moderate	Y1-11	D9019-52
Standard	11	0	65.2	23.7	138	6×10^{-7}	Moderate	Y1-12	D9019-51
Standard	11	0	80.4	27.5	425	2×10^{-6}	Moderate	Y2-13	D9019-61
Standard	11	-50	76.9	27.0	56	2×10^{-7}	Minor	Y1-13	D9019-53
Standard	11	-100	72.9	25.4	n/a	0	None	Y1-14	D9019-01
Standard	11	-100	75.4	26.6	n/a	0	None	Y1-10	D9019-45
Standard	11	OCP (-150)	73.4	25.8	n/a	0	None	Y1-21	D9019-07
Standard	11	OCP (-180)	76.3	28	n/a	0	None	Y1-2	D9019-48
Standard	11	-200	79.6	27.9	0	0	None	Y2-25	A537CL2-3
Standard	12	+100	72.2	27.3	257	1×10^{-6}	Moderate	Y2-3	D9019-36
Standard	12	0	100.1	25.9	219	6×10^{-7}	Moderate	Y2-2	D9019-34
Standard	13.5	0	73.9	27.2	250	9×10^{-7}	Moderate	Y2-10	D9019-56
End Point									
End point	10	0	74.7	26.6	171	6×10^{-7}	Moderate	Y2-4	D9019-37
End point	10	-50	78.3	26.7	n/a	0	None	Y2-22	D9019-70
End point	9.5	0	72.8	26.2	140	5×10^{-7}	Moderate	Y2-28	A537CL2-6
Effect of TOC									
TOC 10 g/L	11	0	78.1	26.6	180	6×10^{-7}	Moderate	Y2-6	D9019-39
TOC 40 g/L	11	0	73.5	27.6	180	7×10^{-7}	Moderate	Y2-5	D9019-38
TOC 80 g/L	11	0	75.8	27.0	115	4×10^{-7}	Minor	Y2-11	D9019-57
No nitrite TOC 40 g/L	11	0	27.1	10.7	Not. Meas.	N/A	Major	Y2-7	D9019-40
No nitrite TOC 80 g/L	11	0	30.4	12.7	Not. Meas.	N/A	Major	Y2-9	D9019-55

Effect of Nitrite and Nitrite/Nitrate Ratio									
No nitrite	11	0	21.4	7.9	Not. Meas.	N/A	Major	Y2-1	D9019-33
No nitrite	11	0	25.0	8.6	Not. Meas.	N/A	Major	Y2-8	D9019-54
No nitrite	11	0	26.4	9.2	Not. Meas.	N/A	Major	Y2-12	D9019-58
No nitrite	11	-50	28.1	9.5	Not. Meas.	N/A	Major	Y2-20	D9019-68
No nitrite	11	-100	27.7	8.7	Not. Meas.	N/A	Major	Y2-21	D9019-69
No nitrite	11	OCP (-342)	71.6	26.1	n/a	0	Zero	Y2-14	D9019-63
No nitrite	13.5	0	27.8	10.6	330	3×10^{-8}	Major	Y2-15	D9019-62
0.35M nitrite	11	0	37.0	14.6	Not. Meas.	N/A	Major	Y2-19	D9019-67
0.875M nitrite	11	0	74.6	25.5	175	7×10^{-7}	Moderate	Y2-18	D9019-66
1.0375M nitrite	11	0	77.7	27.3	125	5×10^{-7}	Moderate	Y2-23	A537CL2-1
3.5M nitrite	11	0	75.7	25.7	n/a	0	None	Y2-16	D9019-64
7M nitrite	11	0	71.5	23.8	n/a	0	None	Y2-17	D9019-65
0.75M nitrite,1.5M nitrate	11	0	73.8	26.7	175	7×10^{-7}	Moderate	Y2-26	A537CL2-5
1.5M nitrite, 1.5M nitrate	11	0	65.1	25.4	190	8×10^{-7}	Moderate	Y2-27	A537CL2-4
Effect of Chloride									
Standard w/ 0.2M chloride	11	0	67.2	22.7	Not. Meas.	N/A	Major	Y2-24	A537CL2-2
Standard w/ 0.2M chloride	11	0	71.5	25.7	260	1×10^{-10}	Moderate	Y2-34	A537CL-12
Standard w/ 0.2M chloride	11	-100	69.4	24.9	n/a	0	None	Y2-30	A537CL2-8
Standard w/ 0.05M chloride	11	0	68.8	25.7	180	7×10^{-7}	Moderate	Y2-29	A537CL2-7
End point w/ 0.2M chloride	10	0	74.6	25.1	n/a	0	None	Y2-31	A537CL-11
End point w/ 0.2M chloride	10	0	75.3	27.0	n/a	0	None	Y2-32	A537CL-9

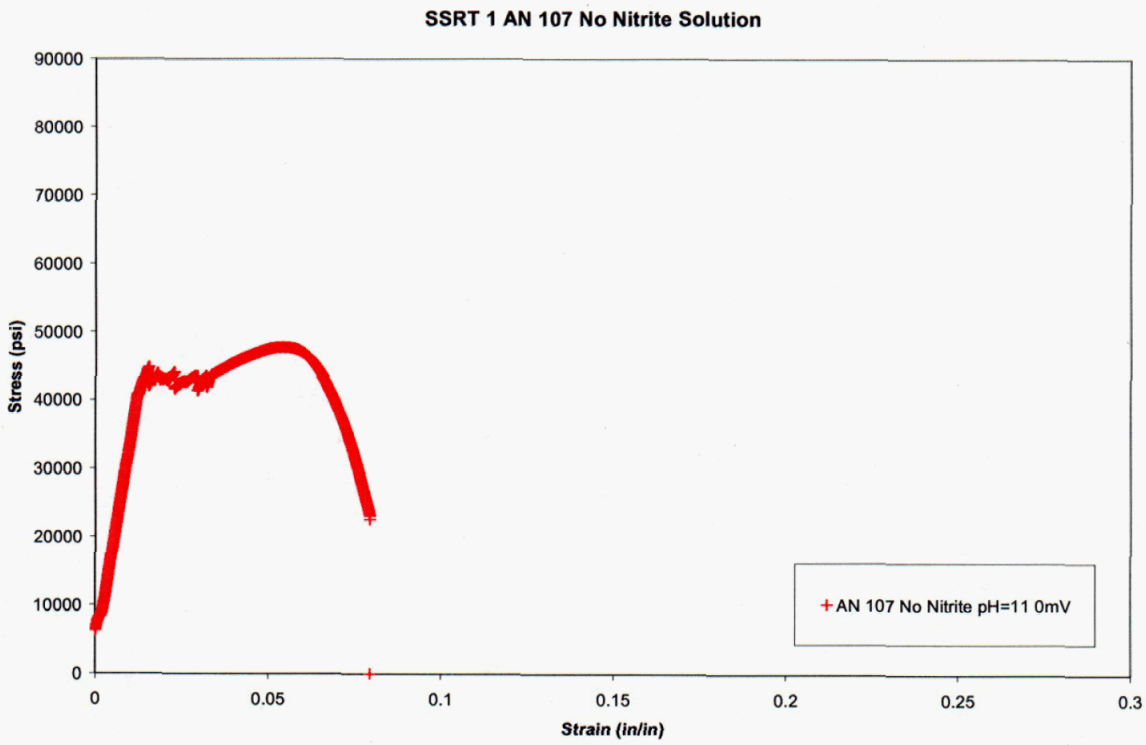


Figure G 1 The stress-strain curve from SSRT 1 performed in Tank 241-AN-107 no nitrite solution, pH 11, with applied potential of 0mV vs SCE.

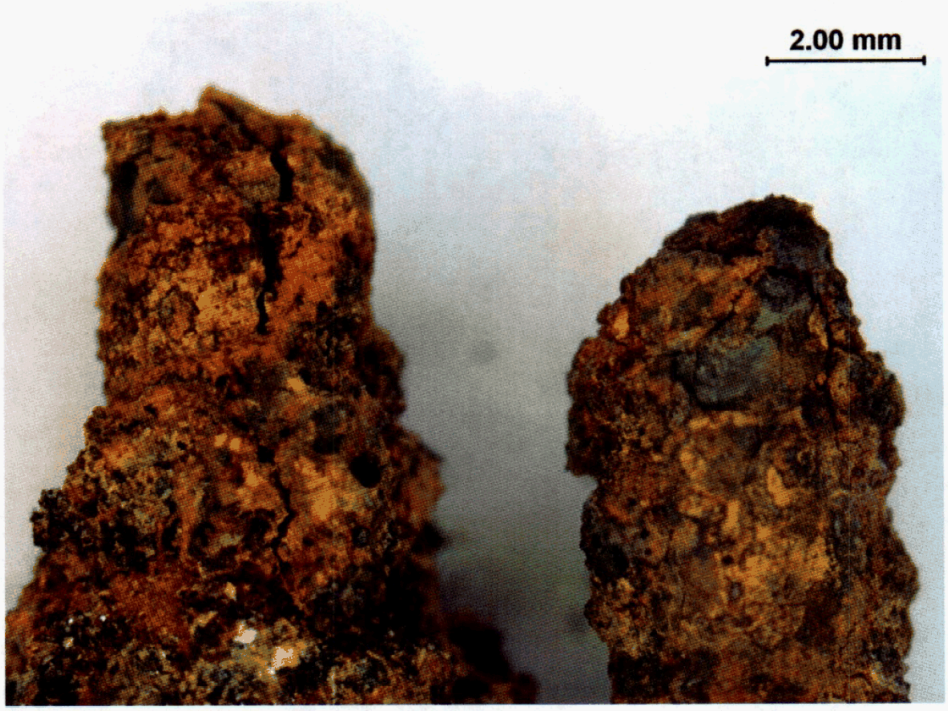


Figure G 2 A post-test photograph of the specimen from SSRT 1 performed in Tank 241-AN-107 no nitrite solution, pH 11, with applied potential of 0mV vs SCE.

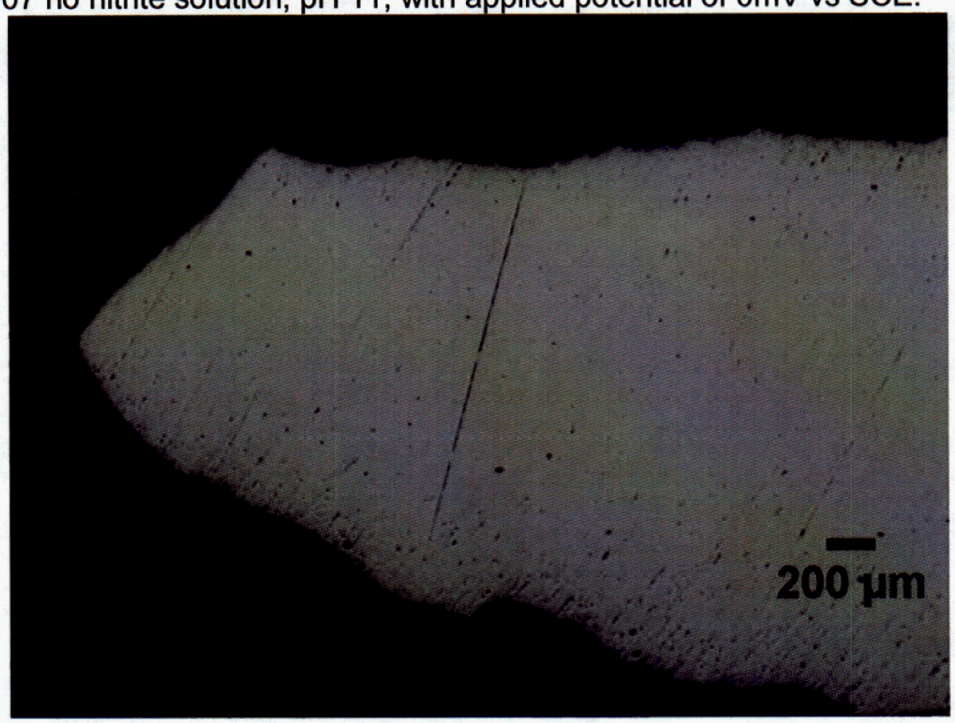


Figure G 3 A post-test micrograph of the cross-section of the specimen from SSRT 11 performed in Tank 241-AN-107 no nitrite solution, pH 11, with applied potential of 0mV vs SCE.

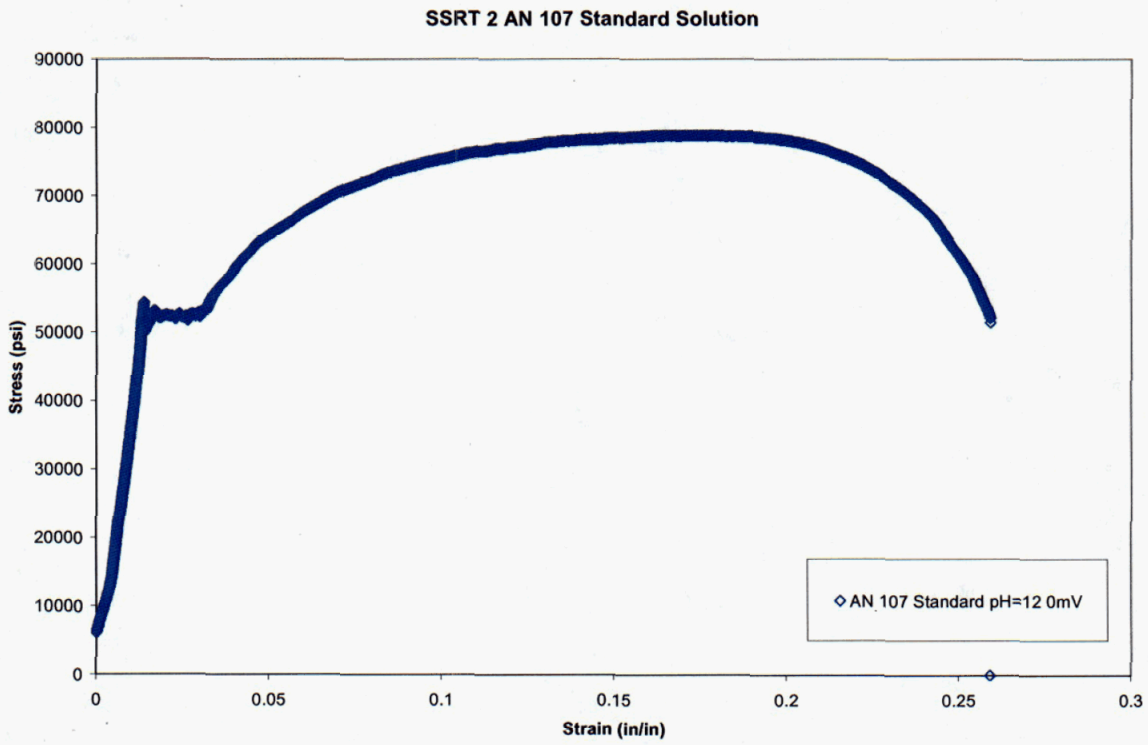


Figure G 4 The stress-strain curve from SSRT 2 performed in Tank 241-AN-107 standard solution, pH 11, with applied potential of 0mV vs SCE.

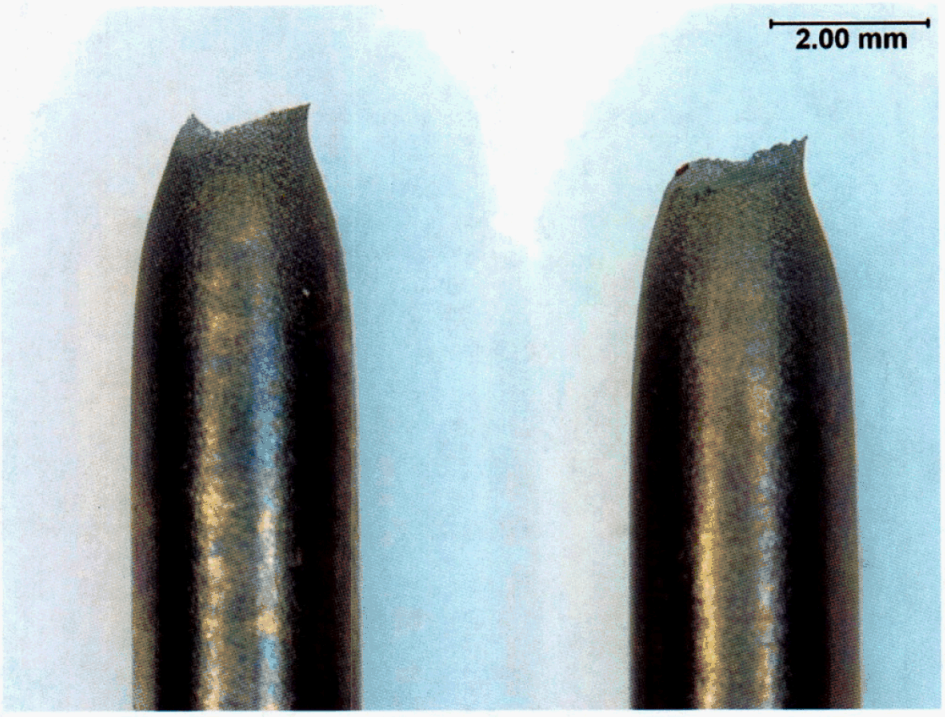


Figure G 5 A post-test photograph of the specimen from SSRT 2 performed in Tank 241-AN-107 standard solution, pH 11, with applied potential of 0mV vs SCE.

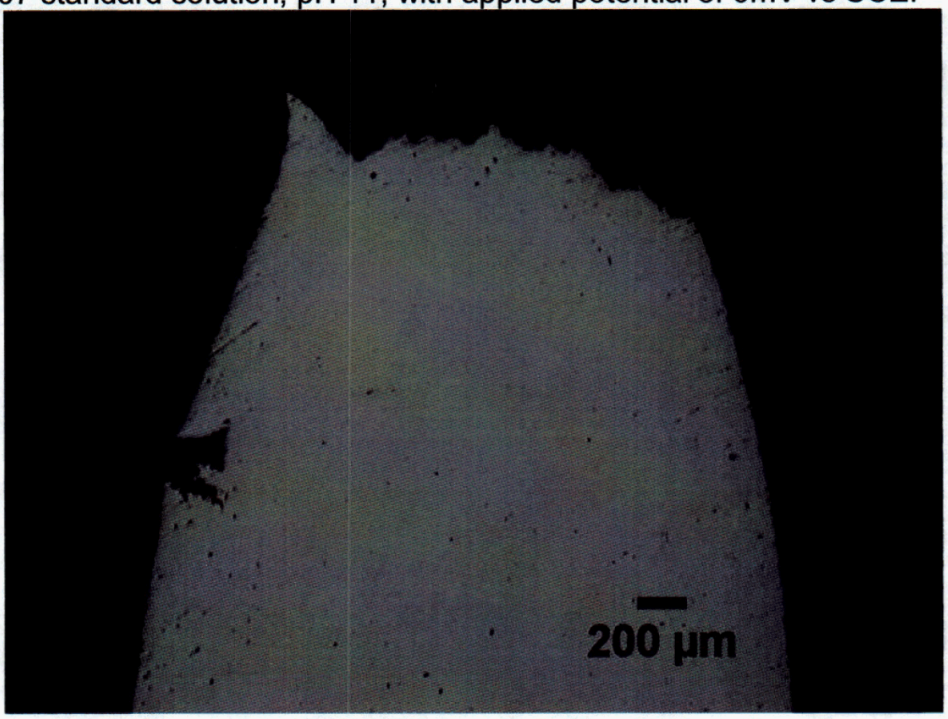


Figure G 6 A post-test micrograph of the cross-section of the specimen from SSRT 2 performed in Tank 241-AN-107 standard solution, pH 12, with applied potential of 0mV vs SCE.

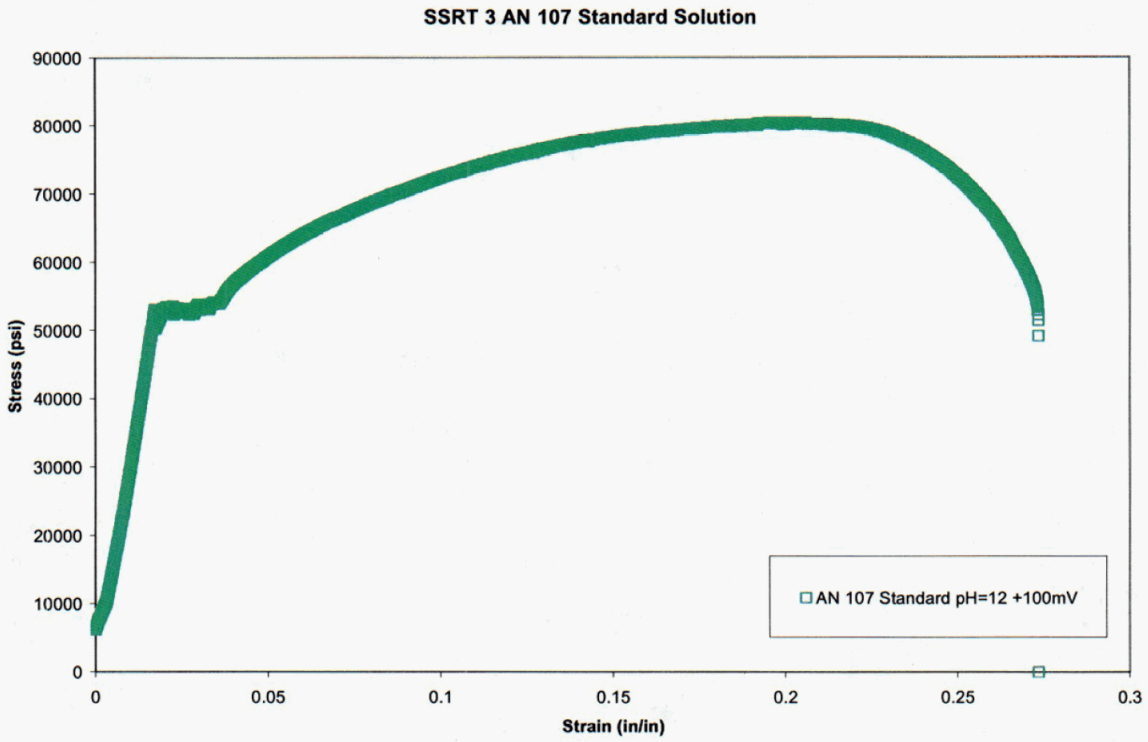


Figure G 7 The stress-strain curve from SSRT 3 performed in Tank 241-AN-107 standard solution, pH 12, with applied potential of +100mV vs SCE.

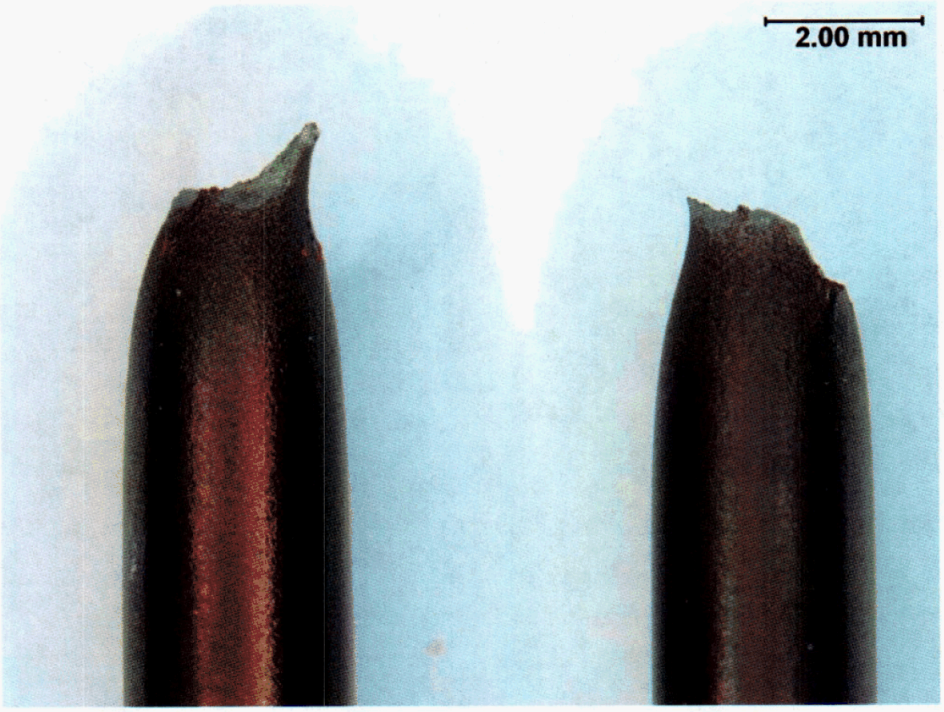


Figure G 8 A post-test photograph of the specimen from SSRT 3 performed in Tank 241-AN-107 standard solution, pH 12, with applied potential of +100mV vs SCE.

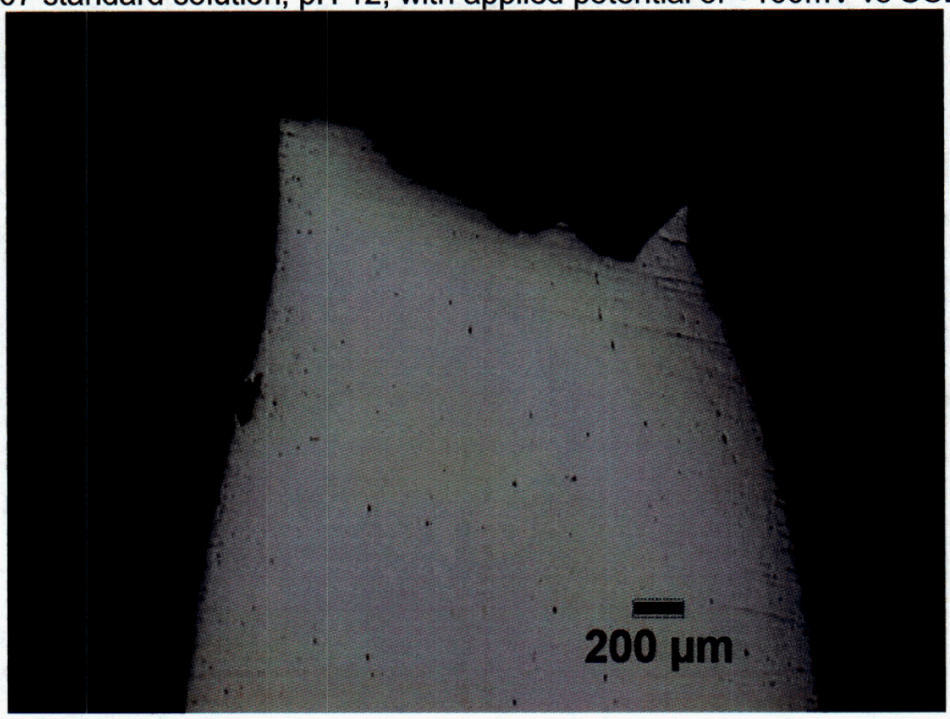


Figure G 9 A post-test micrograph of the cross-section of the specimen from SSRT 3 performed in Tank 241-AN-107 standard solution, pH 12, with applied potential of +100mV vs SCE.

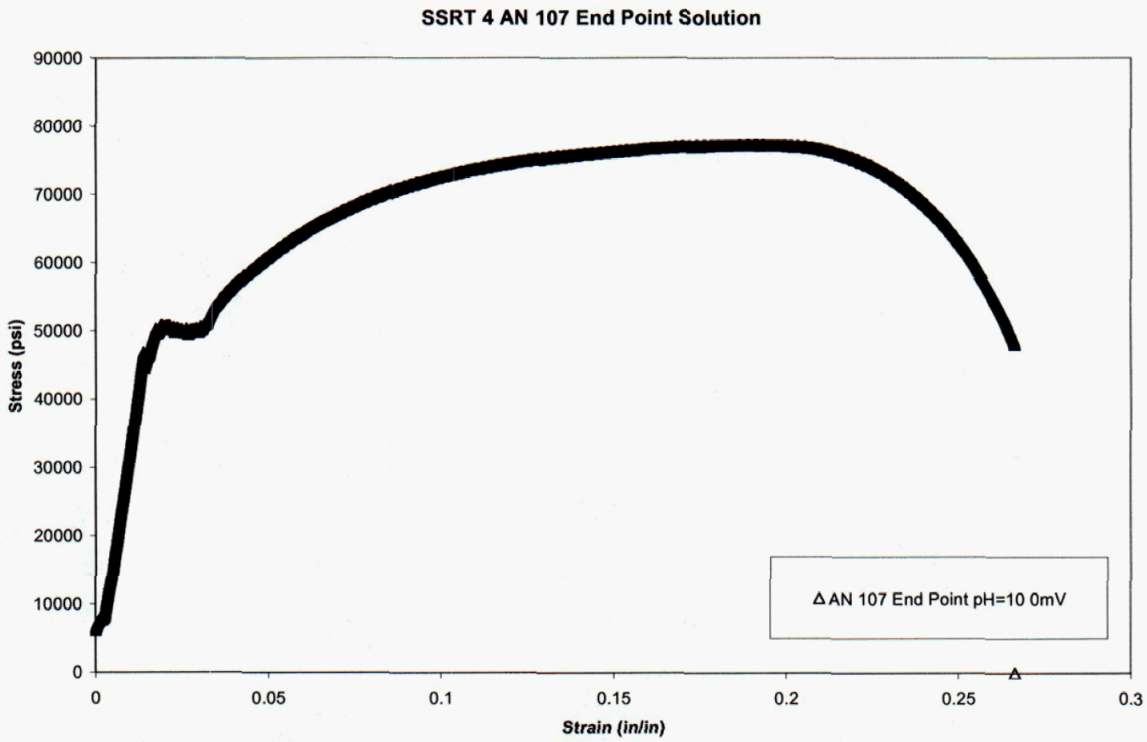


Figure G 10 The stress-strain curve from SSRT 4 performed in Tank 241-AN-107 end point solution, pH 10, with applied potential of 0mV vs SCE.

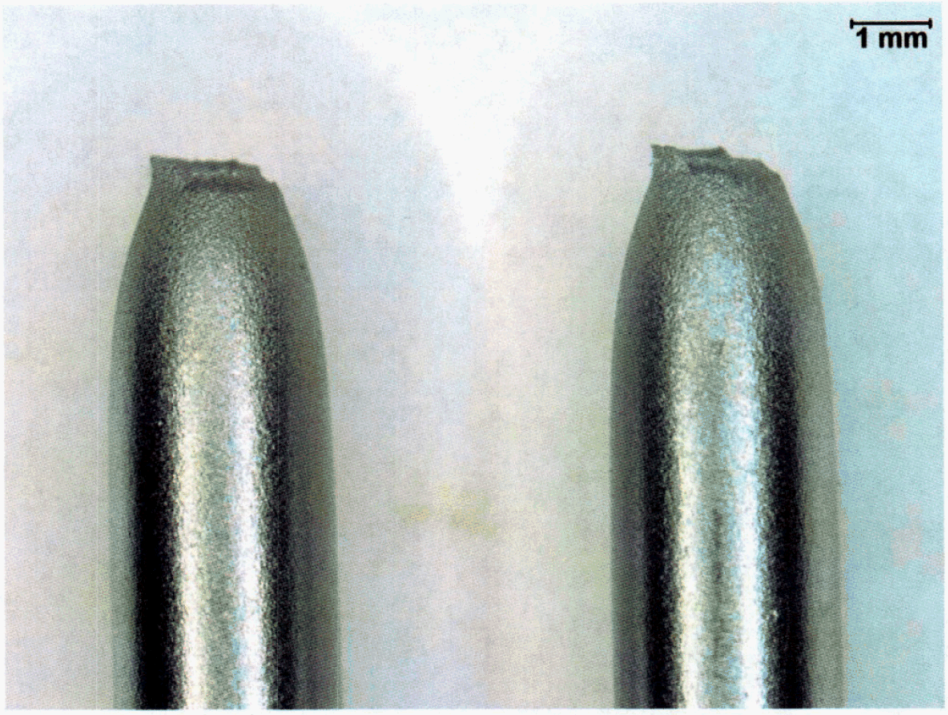


Figure G 11 A post-test photograph of the specimen from SSRT 4 performed in Tank 241-AN-107 end point solution, pH 10, with applied potential of 0mV vs SCE.

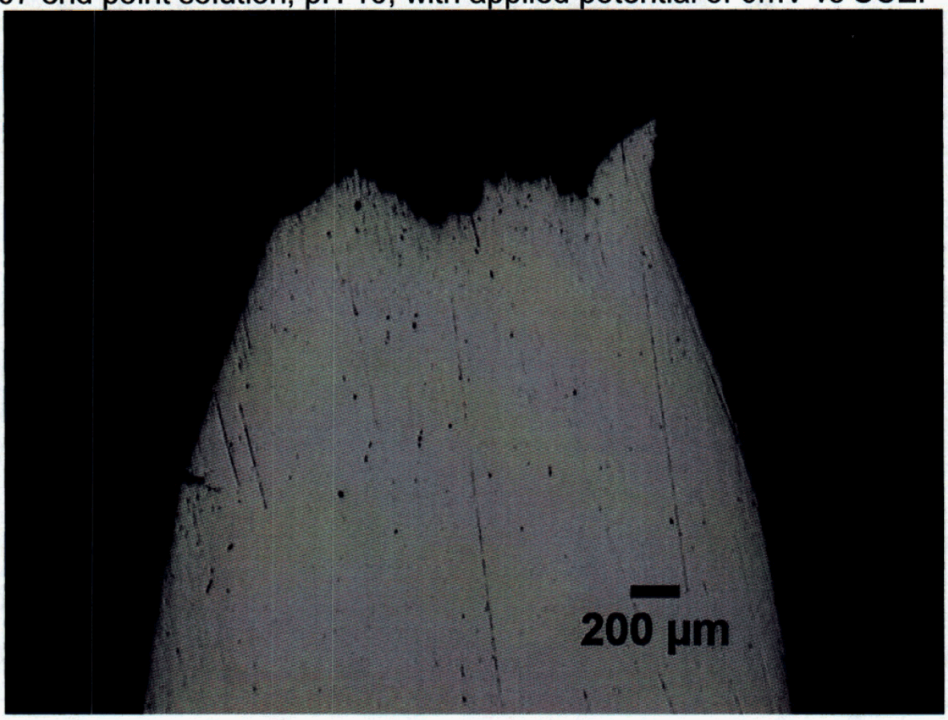


Figure G 12 A post-test micrograph of the cross-section of the specimen from SSRT 4 performed in Tank 241-AN-107 end point solution, pH 10, with applied potential of 0mV vs SCE.

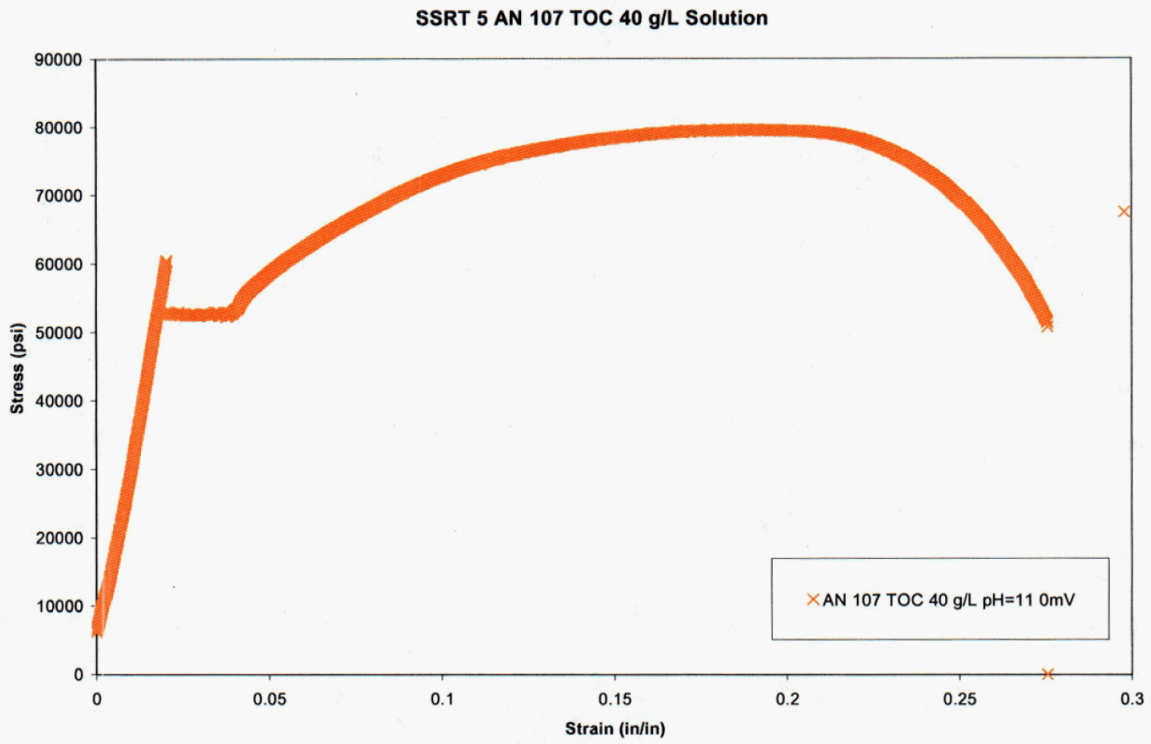


Figure G 13 The stress-strain curve from SSRT 5 performed in Tank 241-AN-107 40 g/L TOC solution, pH 11, with applied potential of 0mV vs SCE.

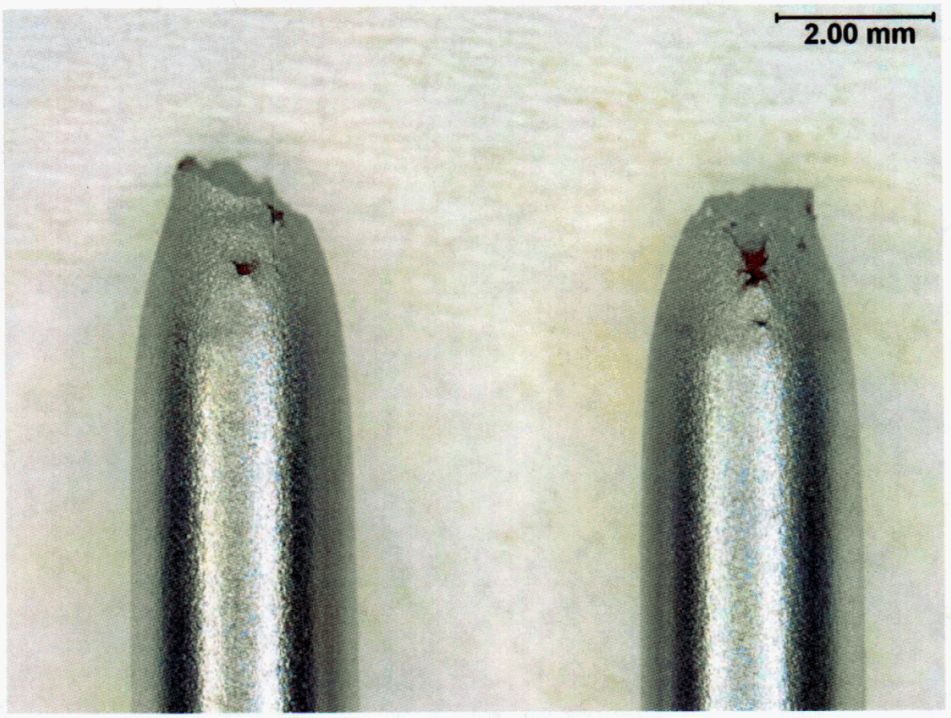


Figure G 14 A post-test photograph of the specimen from SSRT 5 performed in Tank 241-AN-107 40 g/L TOC solution, pH 11, with applied potential of 0mV vs SCE.

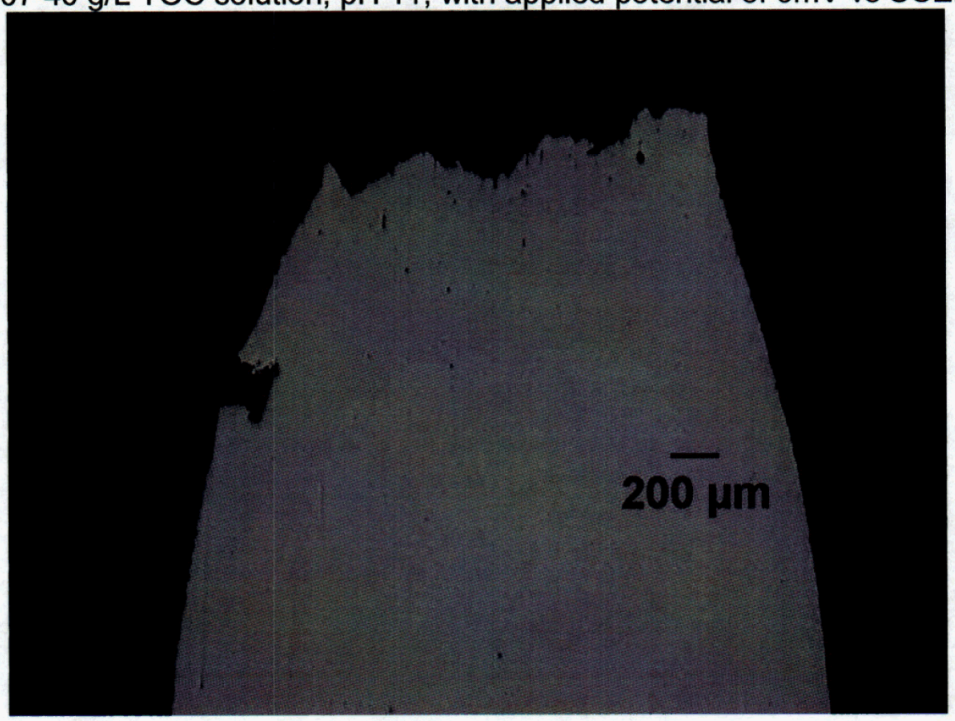


Figure G 15 A post-test micrograph of the cross-section of the specimen from SSRT 5 performed in Tank 241-AN-107 40 g/L TOC solution, pH 11, with applied potential of 0mV vs SCE.

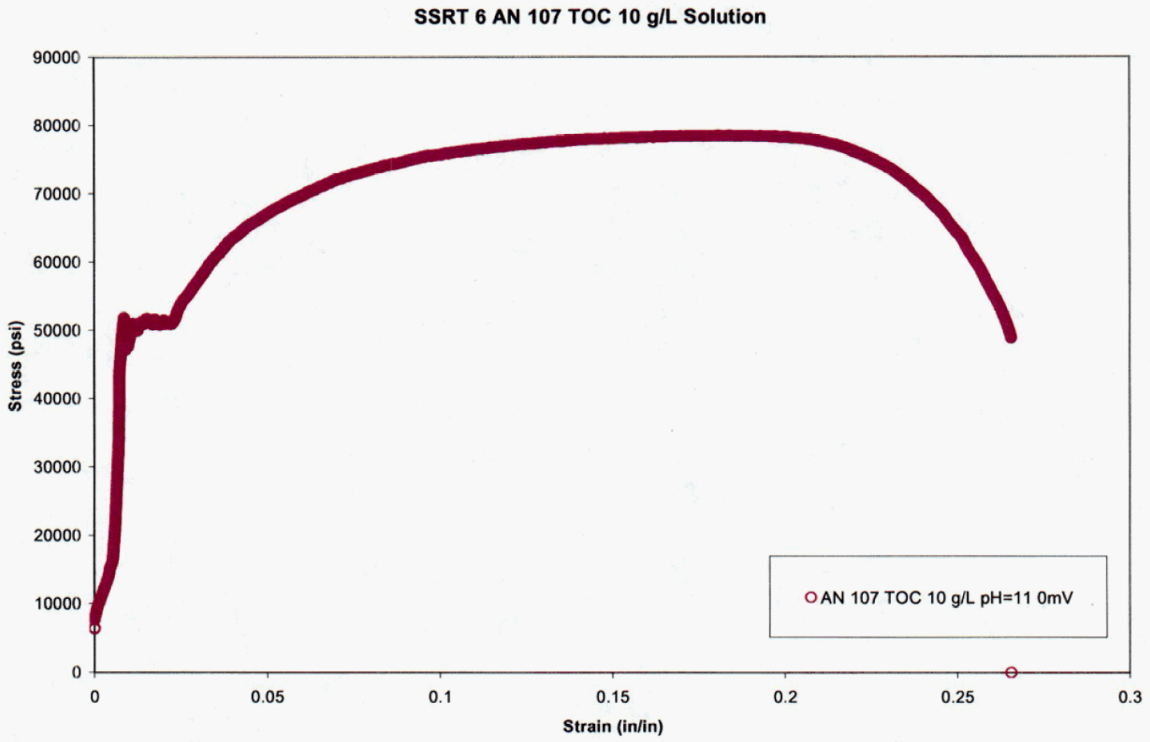


Figure G 16 The stress-strain curve from SSRT 6 performed in Tank 241-AN-107 10 g/L TOC solution, pH 11, with applied potential of 0mV vs SCE.

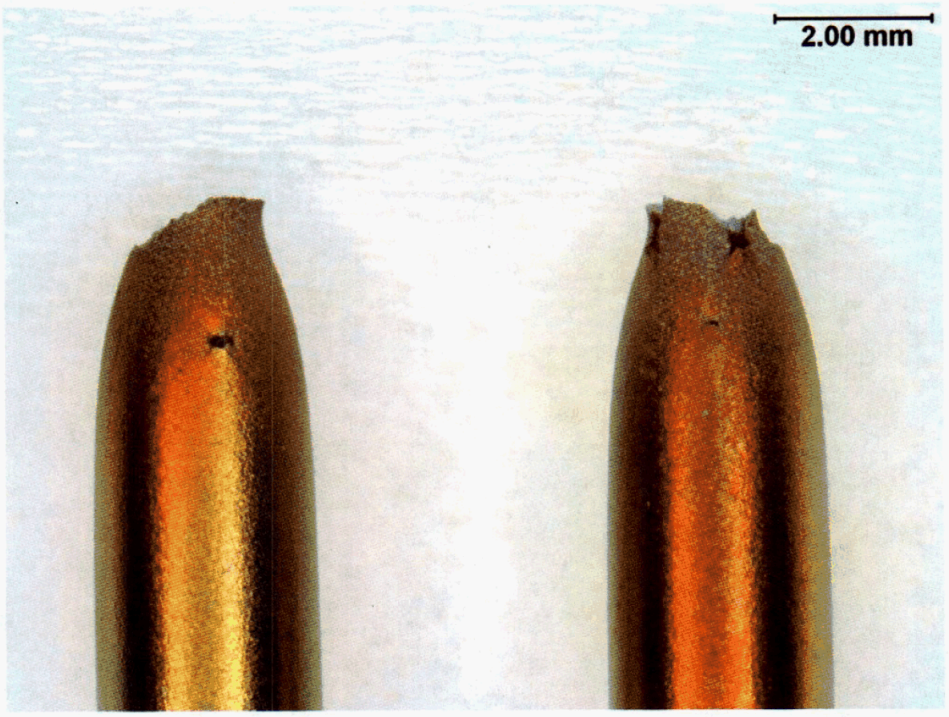


Figure G 17 A post-test photograph of the specimen from SSRT 6 performed in Tank 241-AN-107 10 g/L TOC solution, pH 11, with applied potential of 0mV vs SCE.

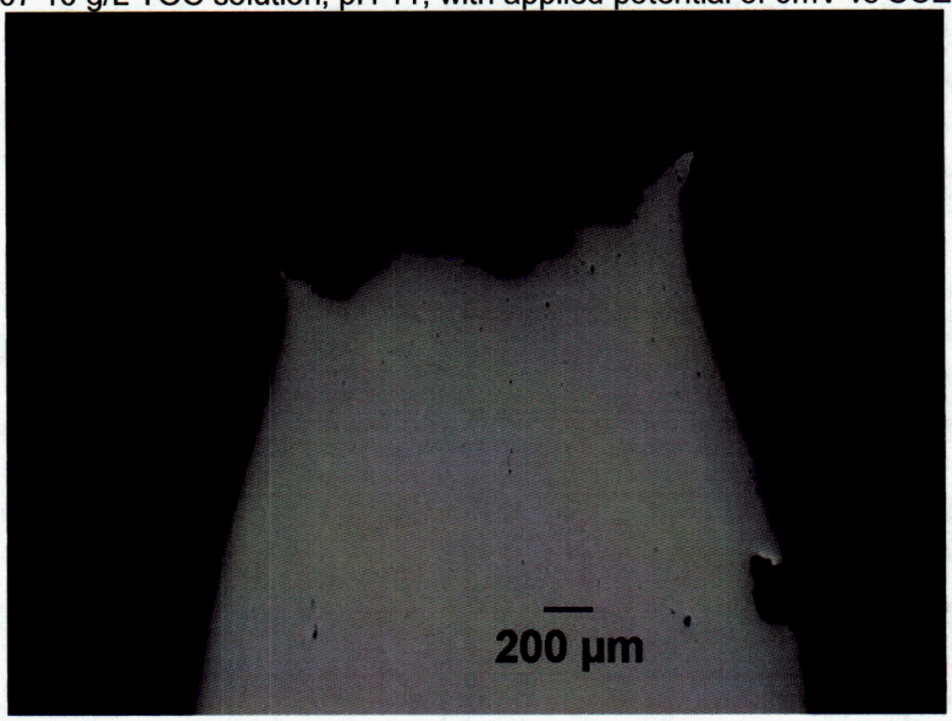


Figure G 18 A post-test micrograph of the cross-section of the specimen from SSRT 6 performed in Tank 241-AN-107 10 g/L solution, pH 11, with applied potential of 0mV vs SCE.

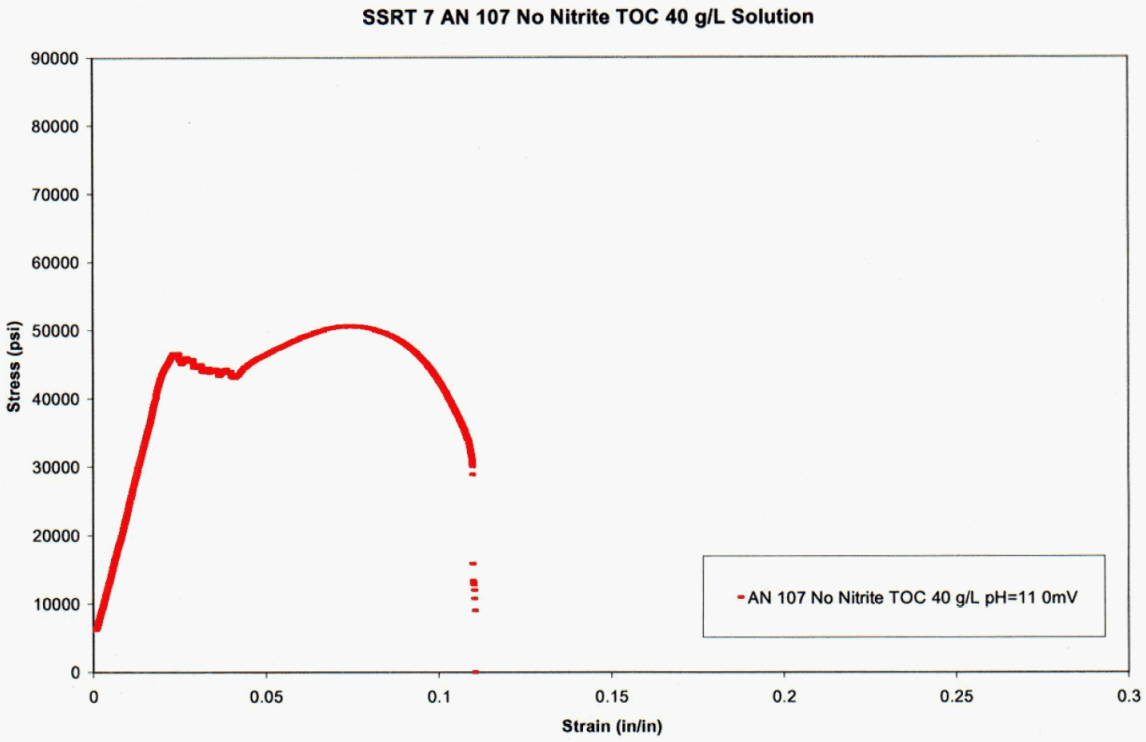


Figure G 19 The stress-strain curve from SSRT 7 performed in Tank 241-AN-107 no nitrite 40 g/L TOC solution, pH 11, with applied potential of 0mV vs SCE.

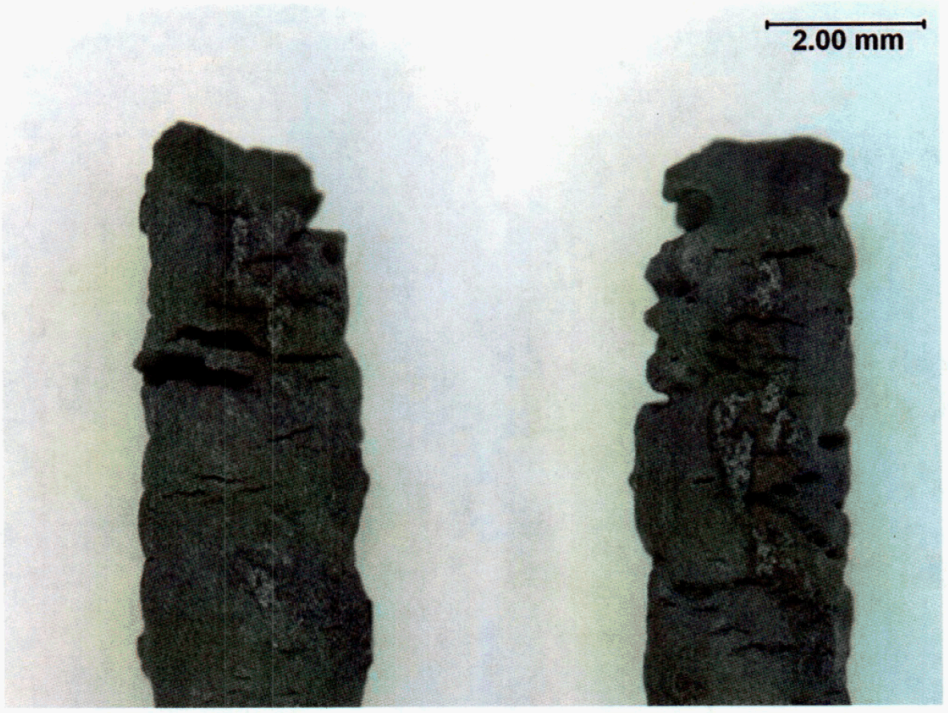


Figure G 20 A post-test photograph of the specimen from SSRT 7 performed in Tank 241-AN-107 no nitrite 40 g/L TOC solution, pH 11, with applied potential of 0mV vs SCE.

Figure G 21 A post-test micrograph of the cross-section of the specimen from SSRT 7 performed in Tank 241-AN-107 no nitrite 40 g/L TOC solution, pH 11, with applied potential of 0mV vs SCE.

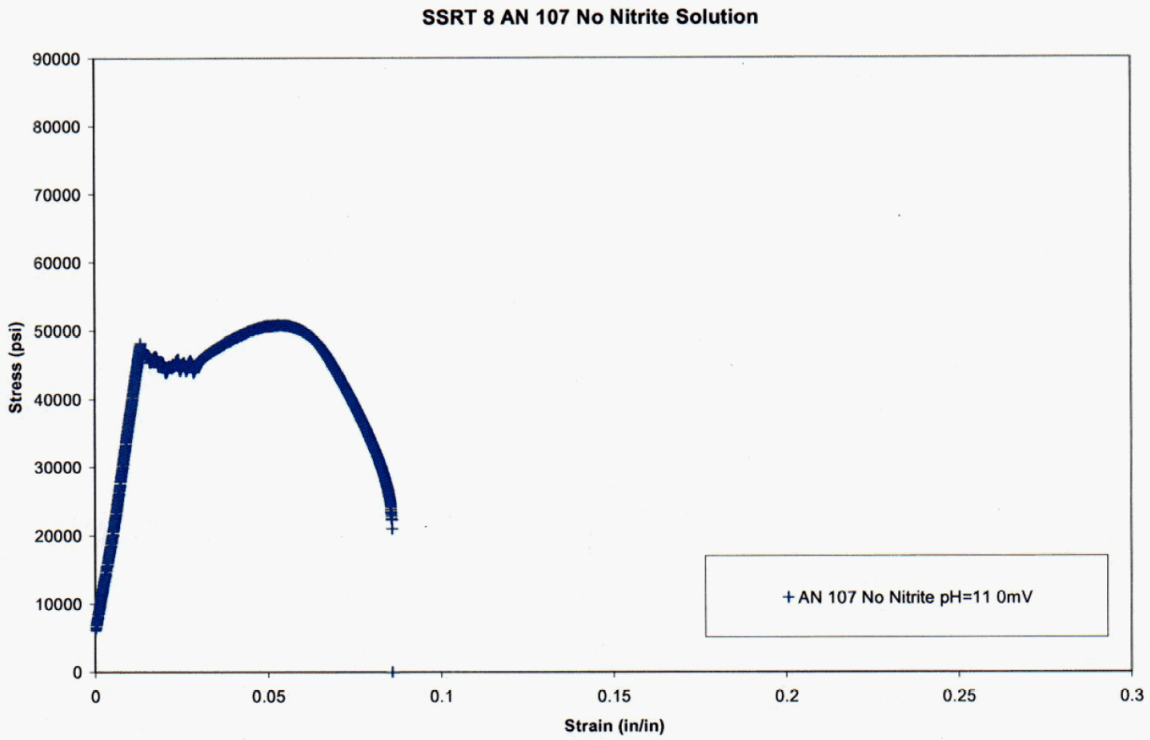


Figure G 22 The stress-strain curve from SSRT 8 performed in Tank 241-AN-107 no nitrite solution, pH 11, with applied potential of 0mV vs SCE.

Figure G 23 A post-test photograph of the specimen from SSRT 8 performed in Tank 241-AN-107 no nitrite solution, pH 11, with applied potential of 0mV vs SCE.

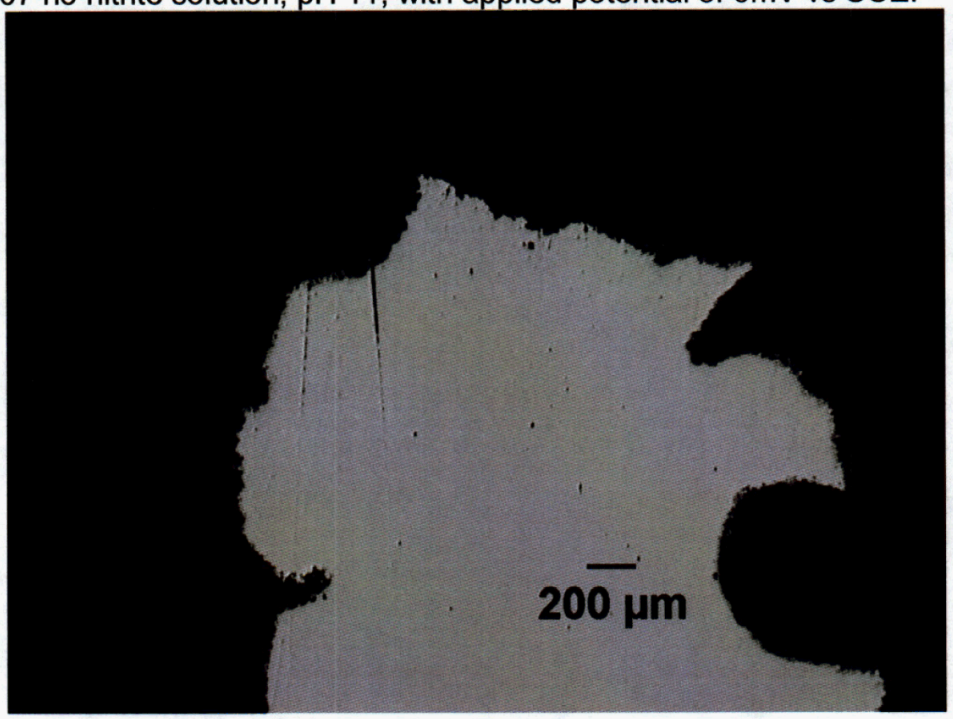


Figure G 24 A post-test micrograph of the cross-section of the specimen from SSRT 8 performed in Tank 241-AN-107 no nitrite solution, pH 11, with applied potential of 0mV vs SCE.

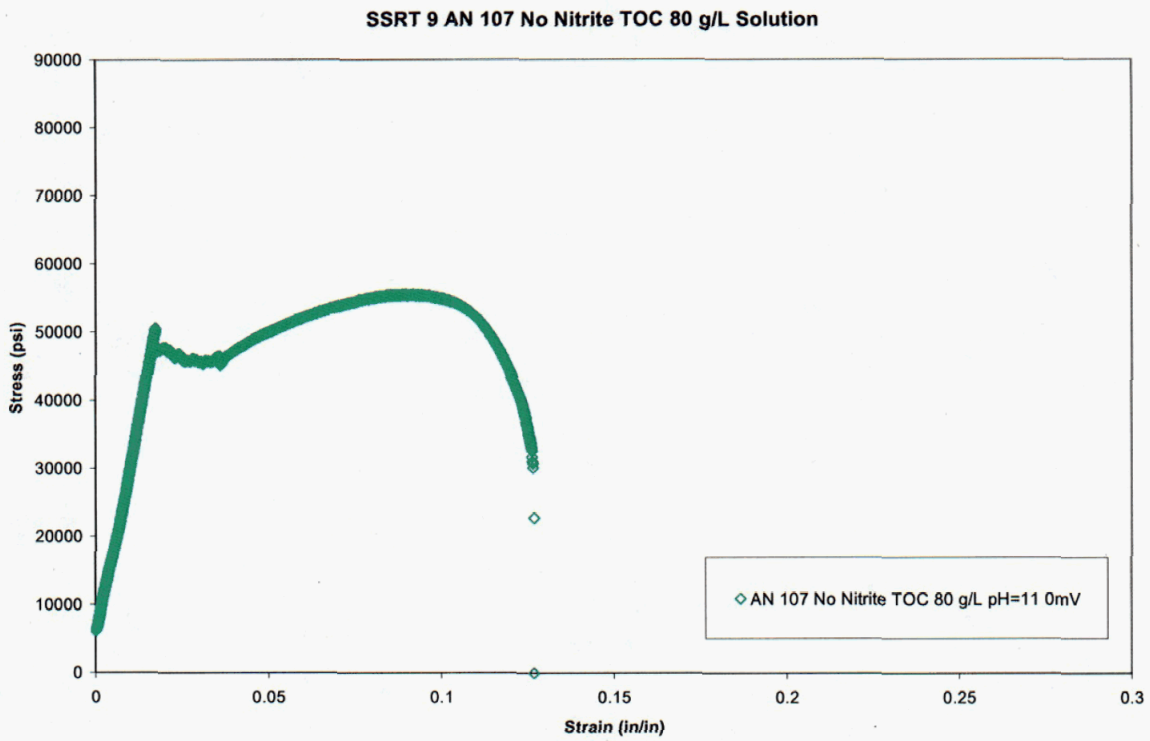


Figure G 25 The stress-strain curve from SSRT 9 performed in Tank 241-AN-107 no nitrite 80 g/L TOC solution, pH 11, with applied potential of 0mV vs SCE.

Figure G 26 A post-test photograph of the specimen from SSRT 9 performed in Tank 241-AN-107 no nitrite 80 g/L TOC solution, pH 11, with applied potential of 0mV vs SCE.

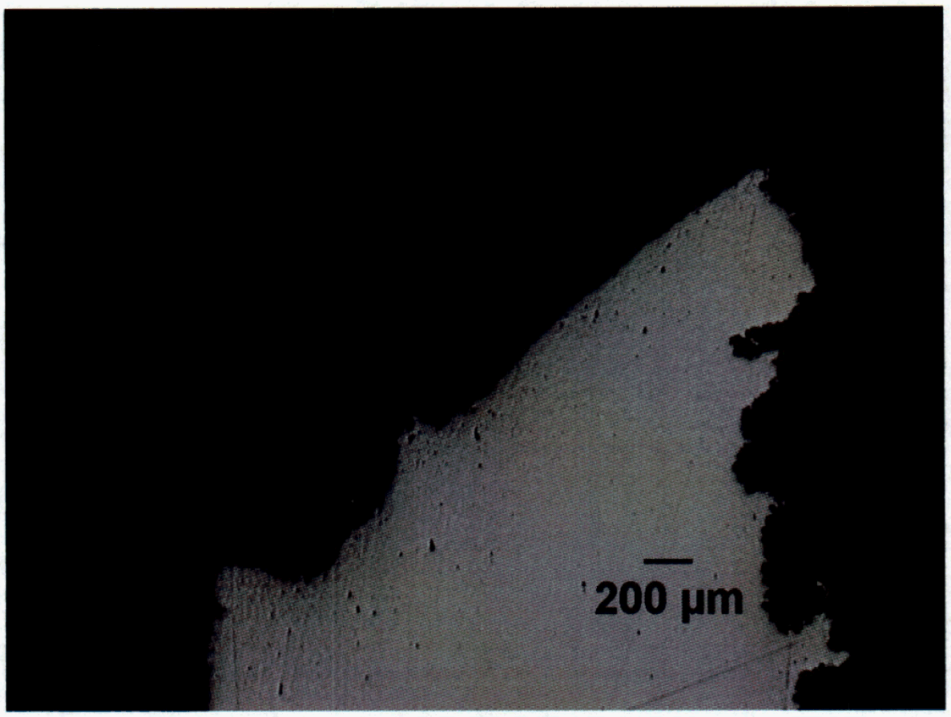


Figure G 27 A post-test micrograph of the cross-section of the specimen from SSRT 9 performed in Tank 241-AN-107 no nitrite 80 g/L TOC solution, pH 11, with applied potential of 0mV vs SCE.

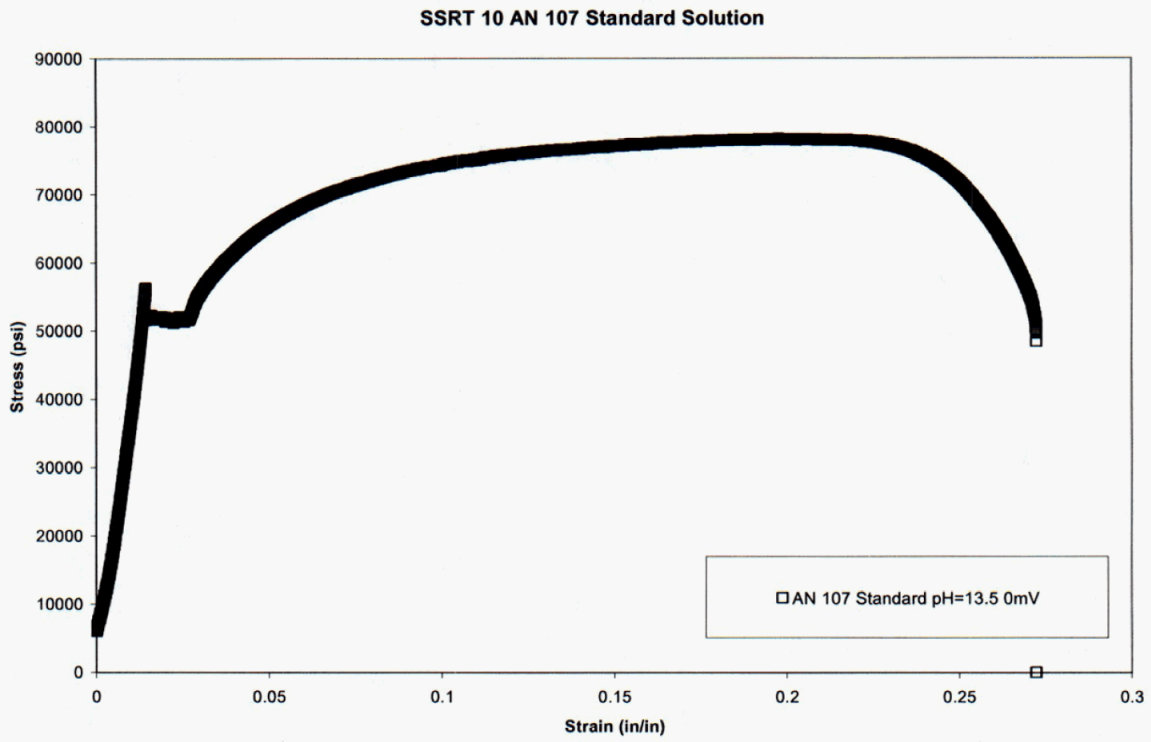


Figure G 28 The stress-strain curve from SSRT 10 performed in Tank 241-AN-107 standard solution, pH 13.5, with applied potential of 0mV vs SCE.

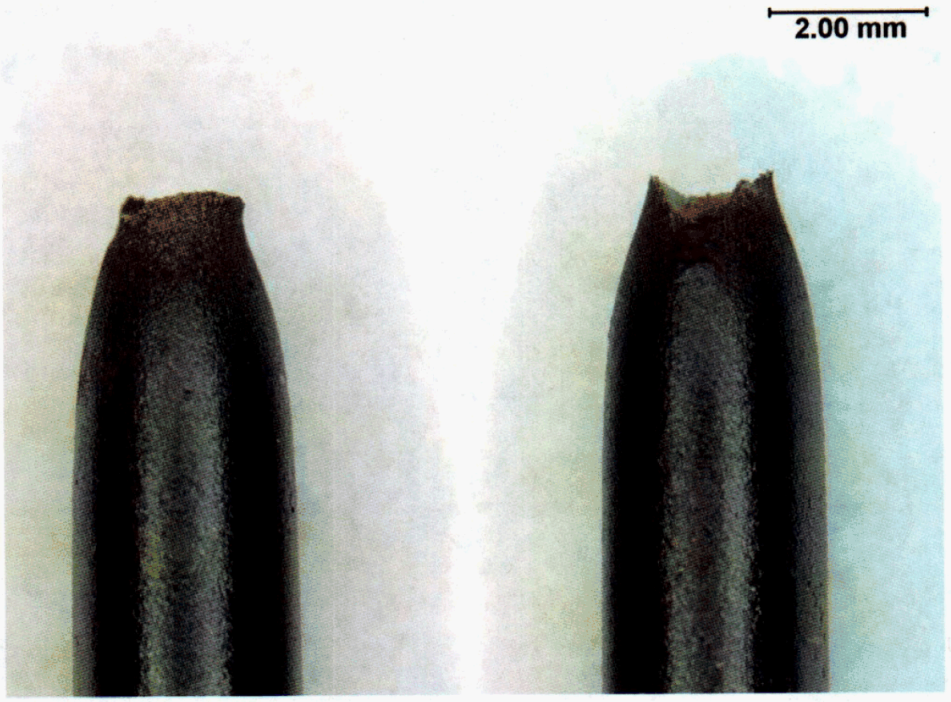


Figure G 29 A post-test photograph of the specimen from SSRT 10 performed in Tank 241-AN-107 standard solution, pH 13.5, with applied potential of 0mV vs SCE.

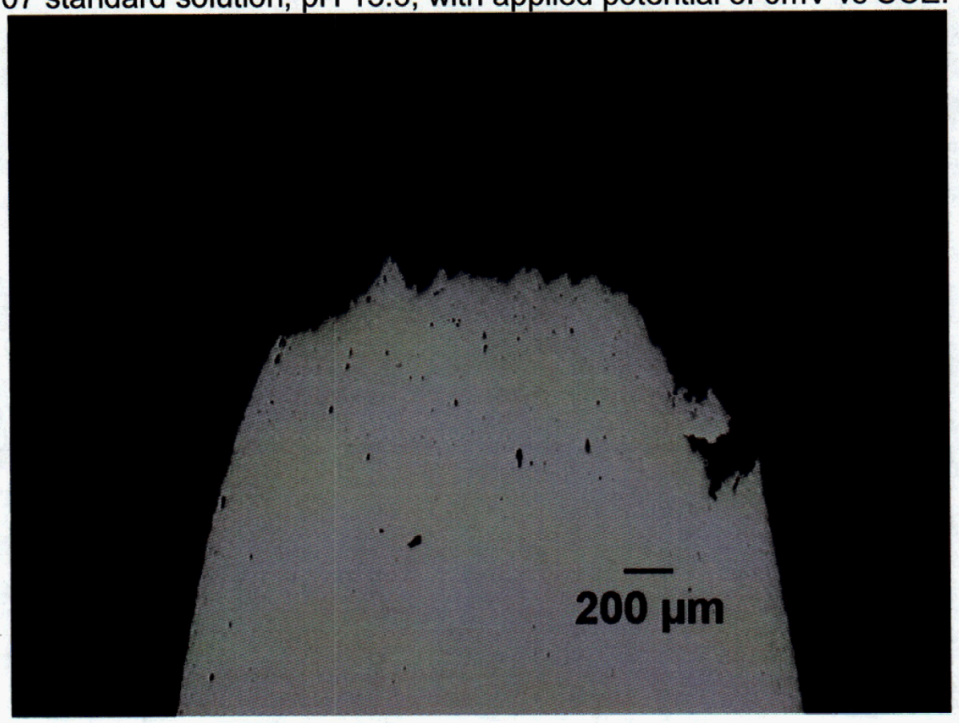


Figure G 30 A post-test micrograph of the cross-section of the specimen from SSRT 10 performed in Tank 241-AN-107 standard solution, pH 13.5, with applied potential of 0mV vs SCE.

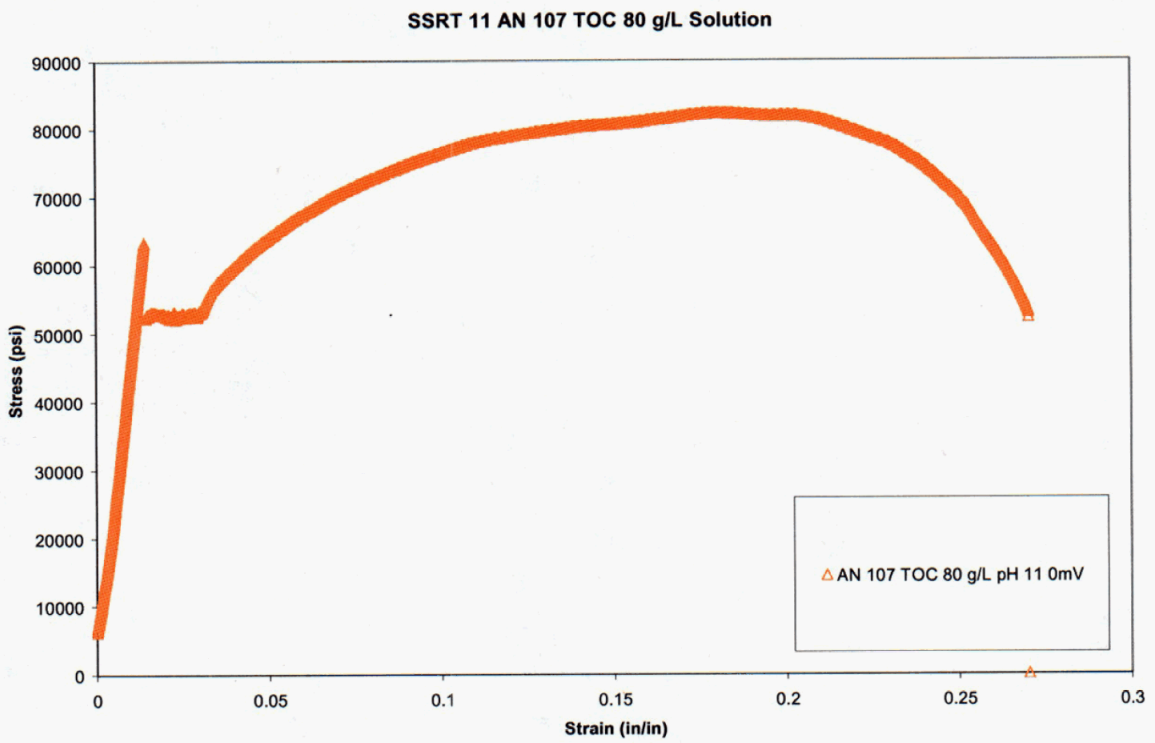


Figure G 31 The stress-strain curve from SSRT 11 performed in Tank 241-AN-107 80 g/L TOC solution, pH 11, with applied potential of 0mV vs SCE.

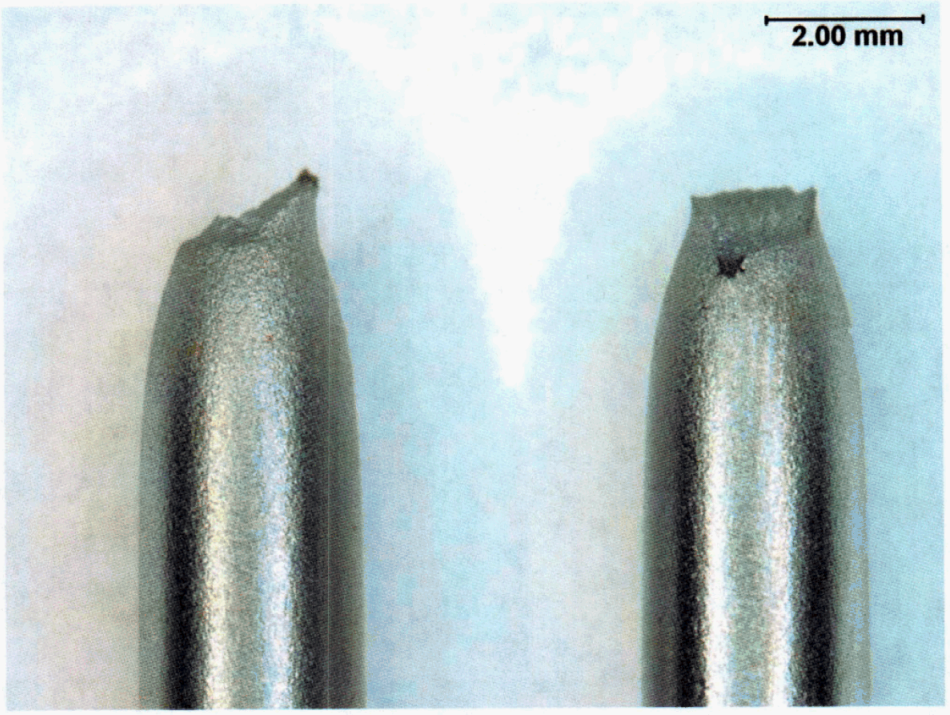


Figure G 32 A post-test photograph of the specimen from SSRT 11 performed in Tank 241-AN-107 80 g/L TOC solution, pH 11, with applied potential of 0mV vs SCE.

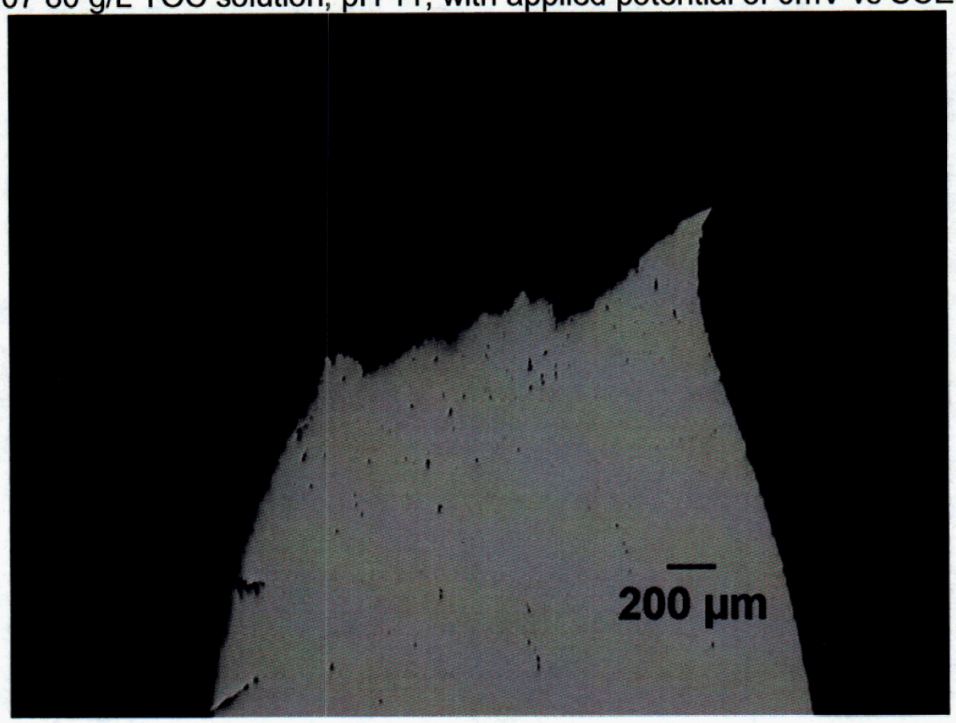


Figure G 33 A post-test micrograph of the cross-section of the specimen from SSRT 11 performed in Tank 241-AN-107 80 g/L TOC solution, pH 11, with applied potential of 0mV vs SCE.

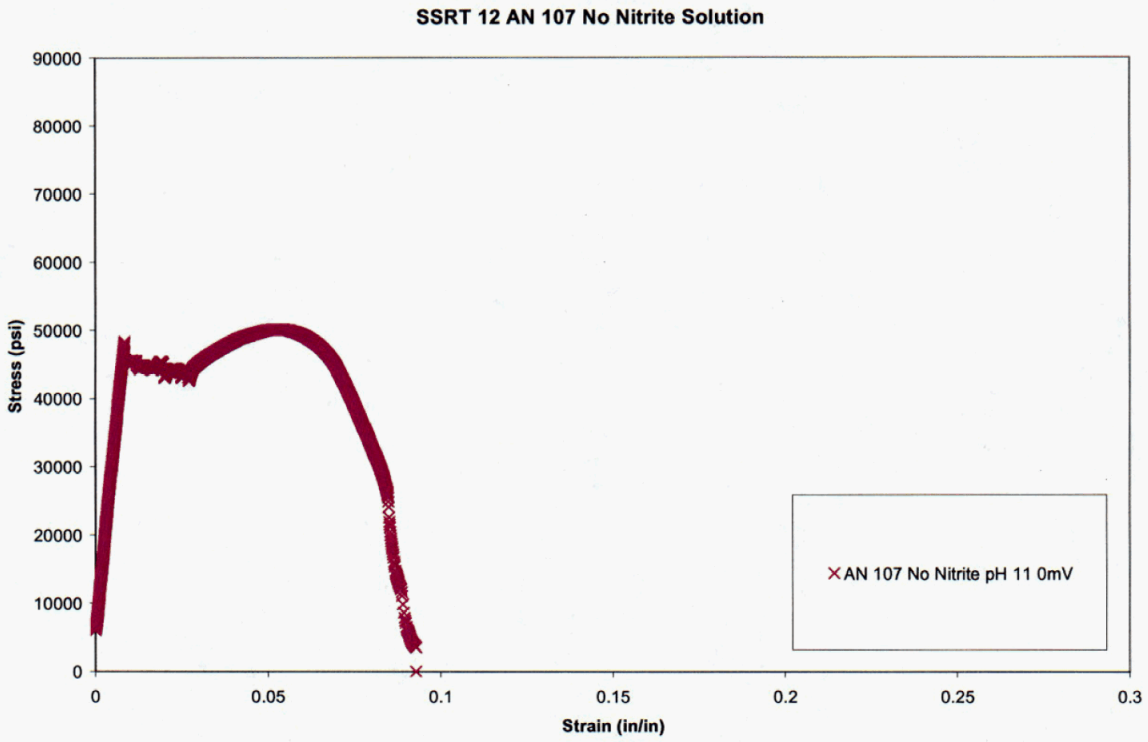


Figure G 34 The stress-strain curve from SSRT 12 performed in Tank 241-AN-107 no nitrite solution, pH 11, with applied potential of 0mV vs SCE.

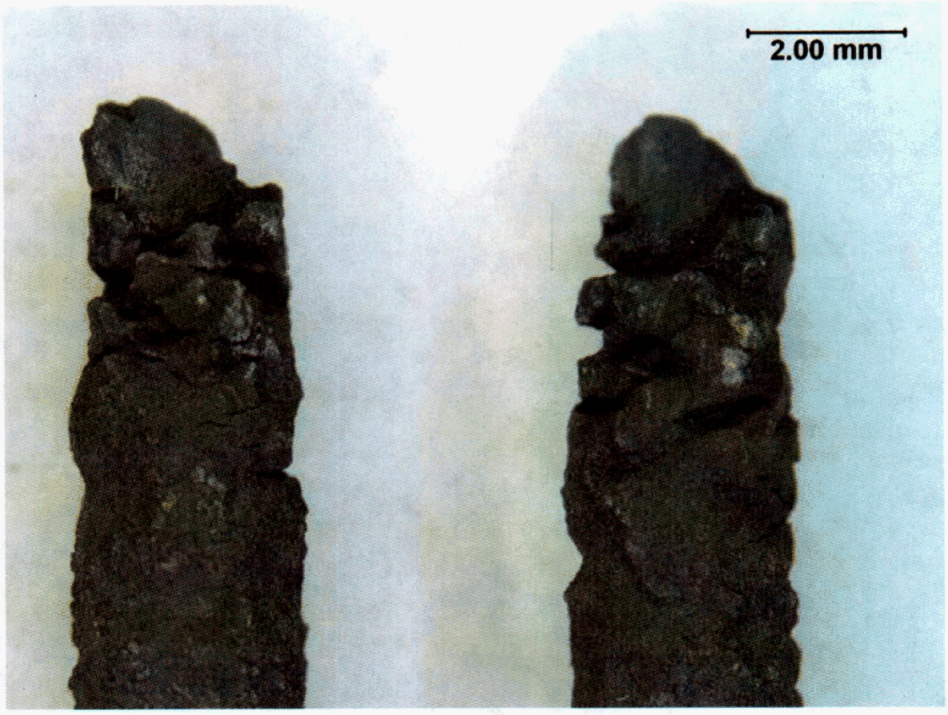


Figure G 35 A post-test photograph of the specimen from SSRT 12 performed in Tank 241-AN-107 no nitrite solution, pH 11, with applied potential of 0mV vs SCE.

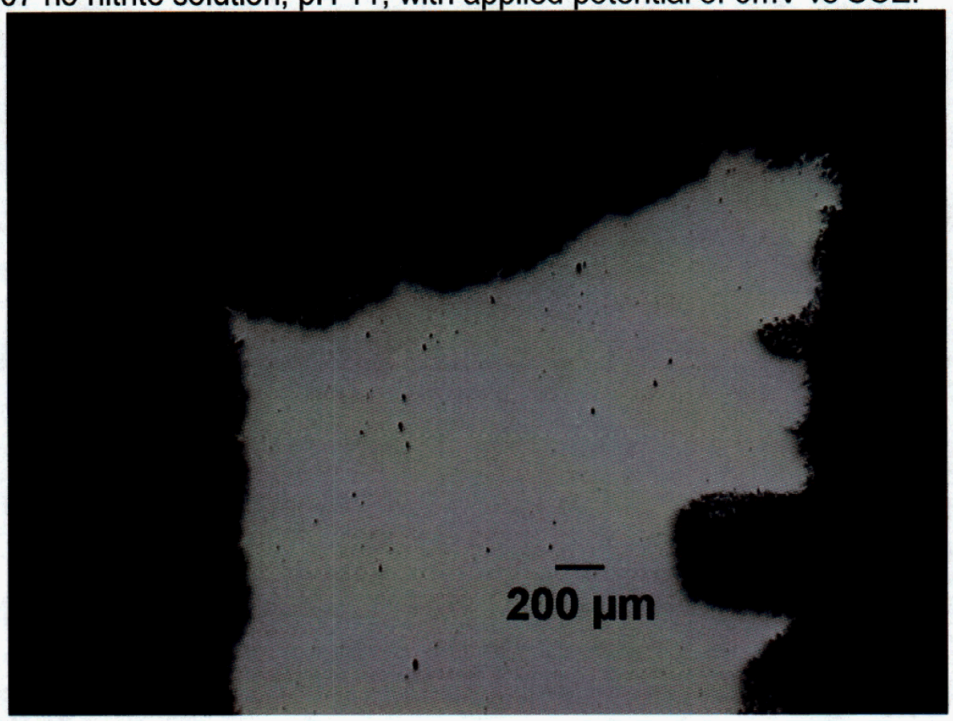


Figure G 36 A post-test micrograph of the cross-section of the specimen from SSRT 12 performed in Tank 241-AN-107 no nitrite solution, pH 11, with applied potential of 0mV vs SCE.

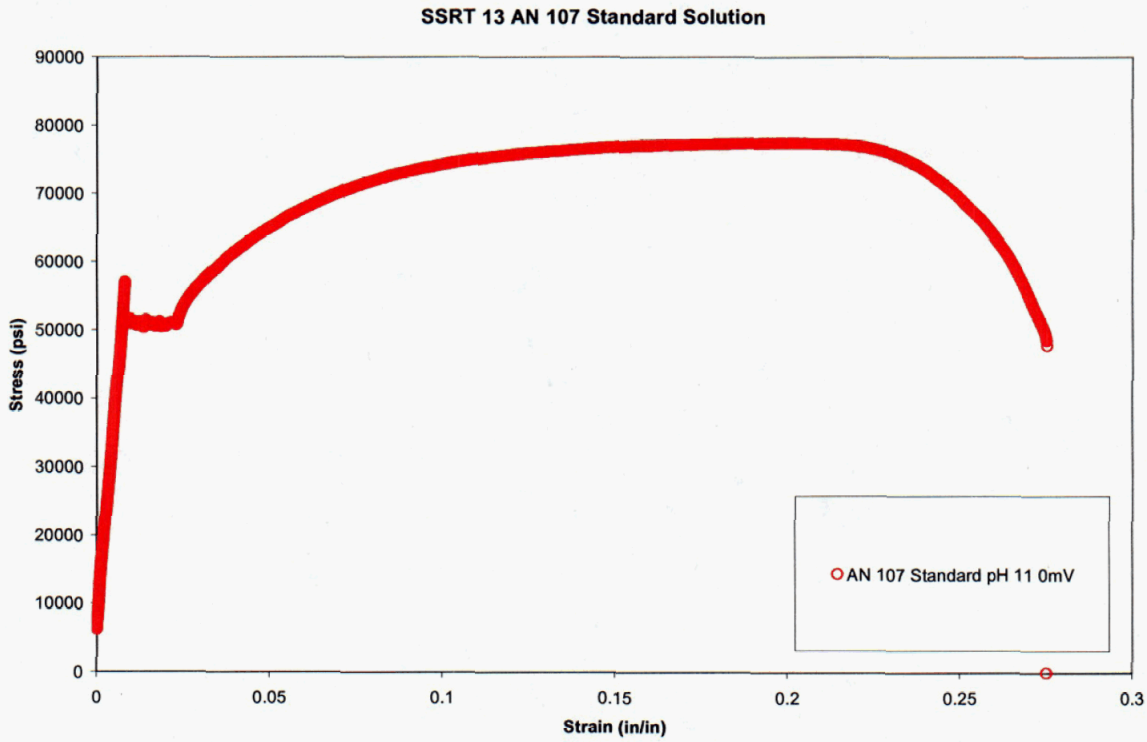


Figure G 37 The stress-strain curve from SSRT 13 performed in Tank 241-AN-107 standard solution, pH 11, with applied potential of 0mV vs SCE.

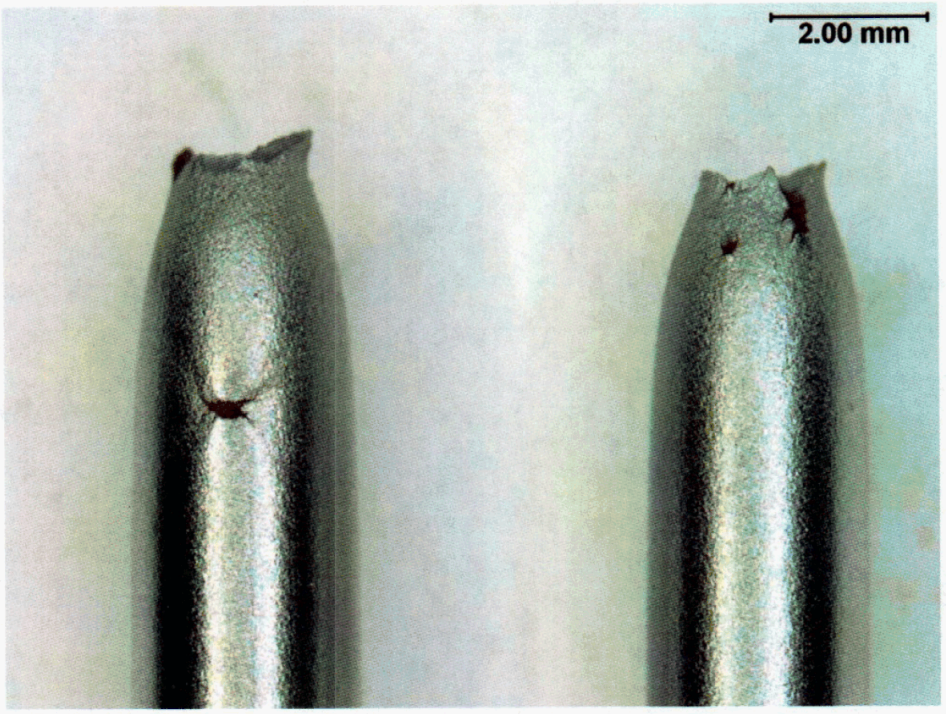


Figure G 38 A post-test photograph of the specimen from SSRT 13 performed in Tank 241-AN-107 standard solution, pH 11, with applied potential of 0mV vs SCE.

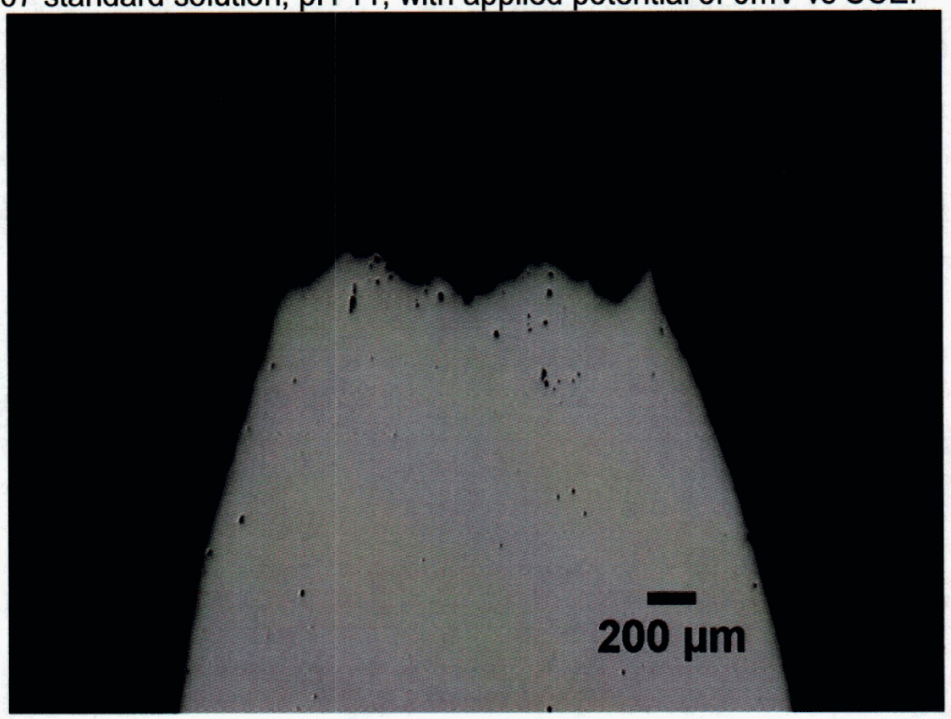


Figure G 39 A post-test micrograph of the cross-section of the specimen from SSRT 13 performed in Tank 241-AN-107 standard solution, pH 11, with applied potential of 0mV vs SCE.

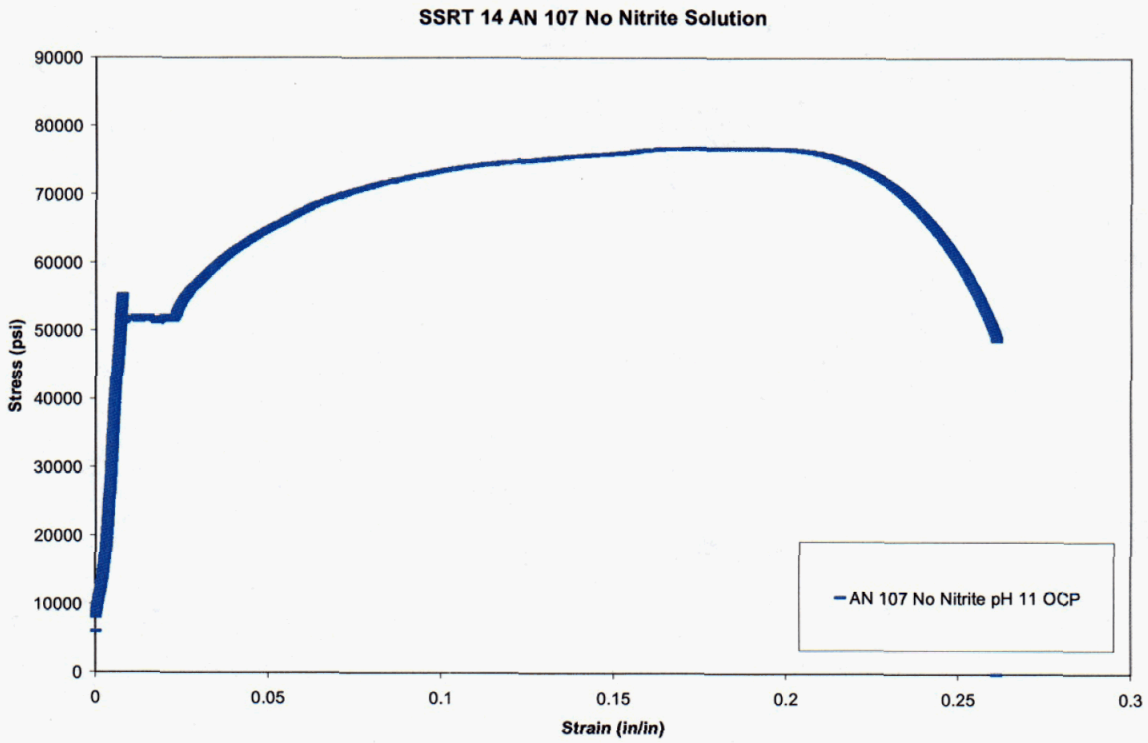


Figure G 40 The stress-strain curve from SSRT 14 performed in Tank 241-AN-107 no nitrite solution, pH 11, at OCP.

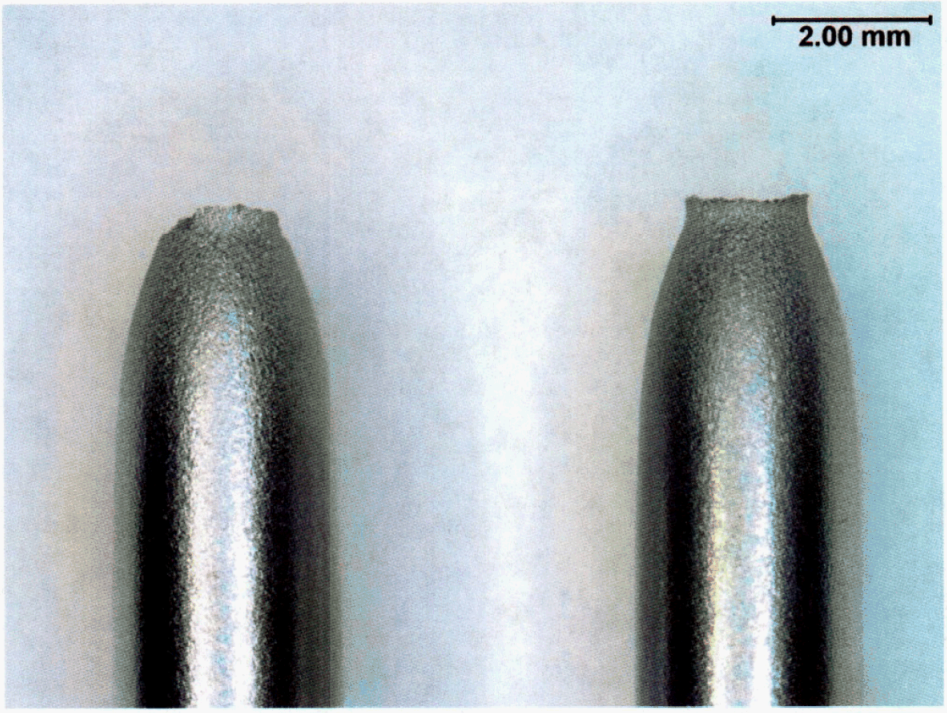


Figure G 41 A post-test photograph of the specimen from SSRT 14 performed in Tank 241-AN-107 no nitrite solution, pH 11, at OCP.

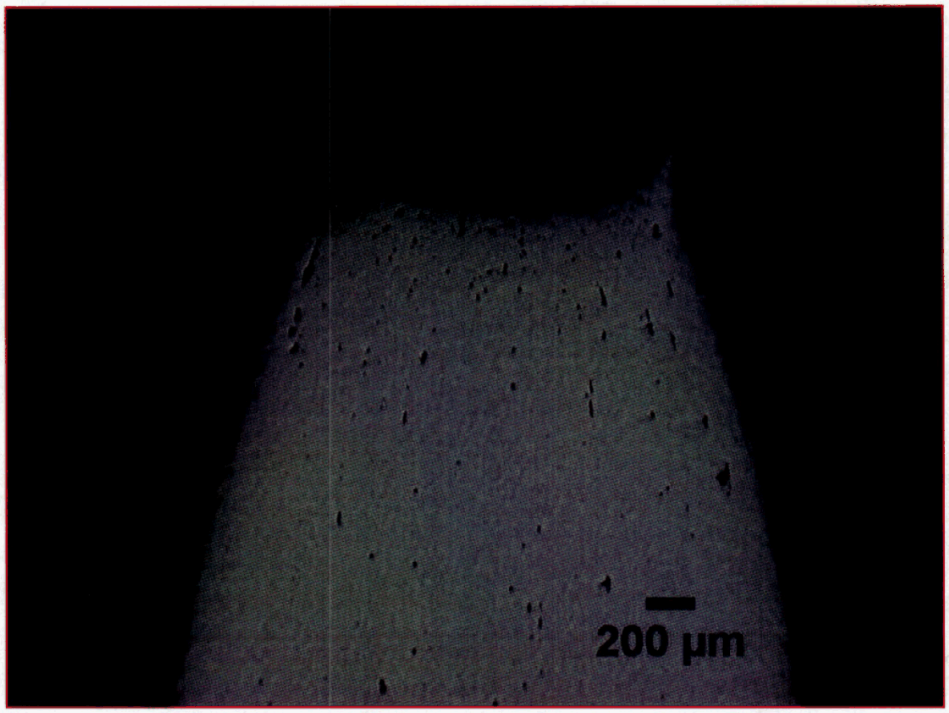


Figure G 42 A post-test micrograph of the cross-section of the specimen from SSRT 14 performed in Tank 241-AN-107 no nitrite solution, pH 11, at OCP.

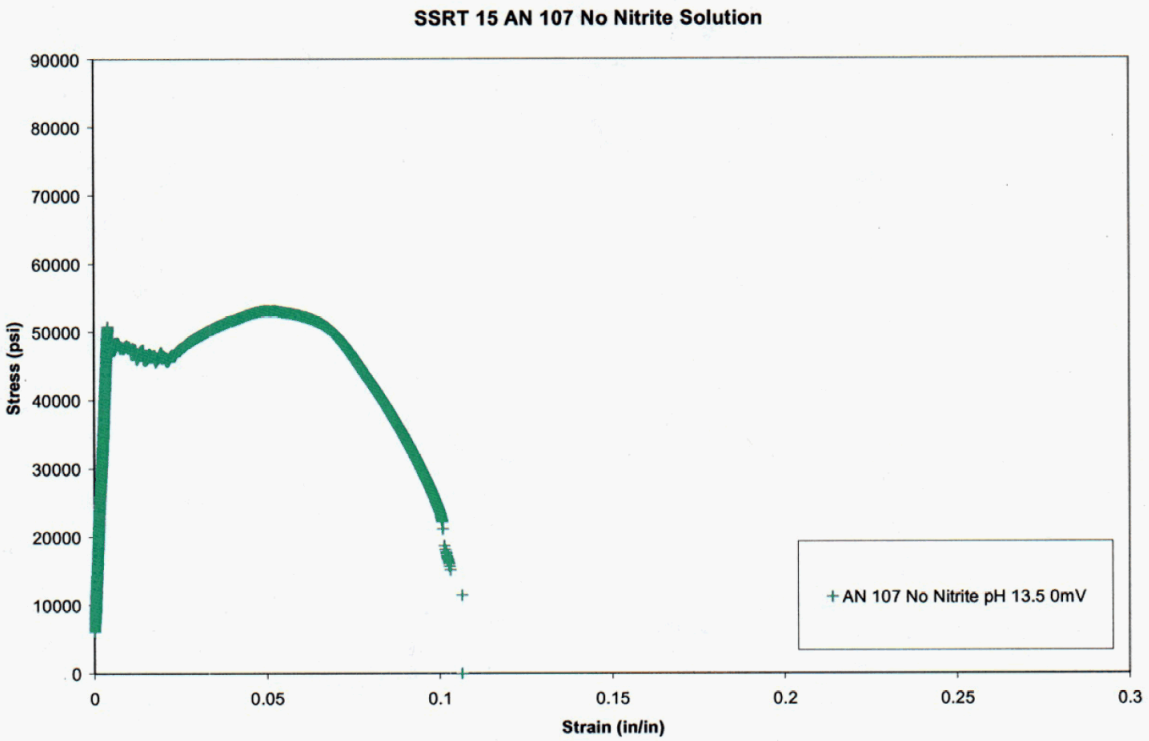


Figure G 43 The stress-strain curve from SSRT 15 performed in Tank 241-AN-107 no nitrite solution, pH 13.5, with applied potential of 0mV vs SCE.

Figure G 44 A post-test photograph of the specimen from SSRT 15 performed in Tank 241-AN-107 no nitrite solution, pH 13.5, with applied potential of 0mV vs SCE.

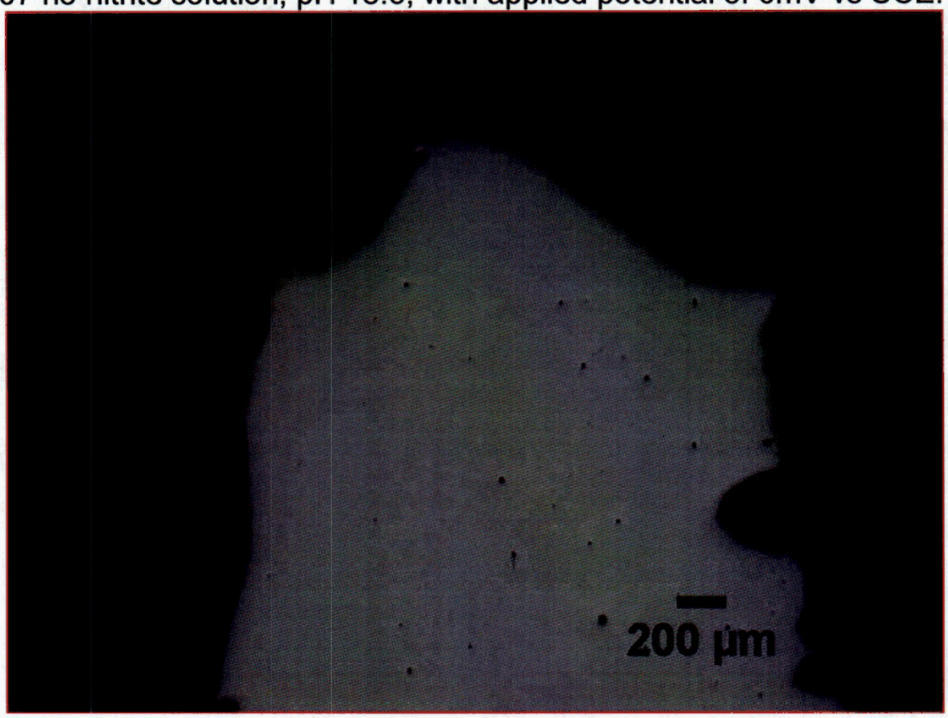


Figure G 45 A post-test micrograph of the cross-section of the specimen from SSRT 15 performed in Tank 241-AN-107 no nitrite solution, pH 13.5, with applied potential of 0mV vs SCE.

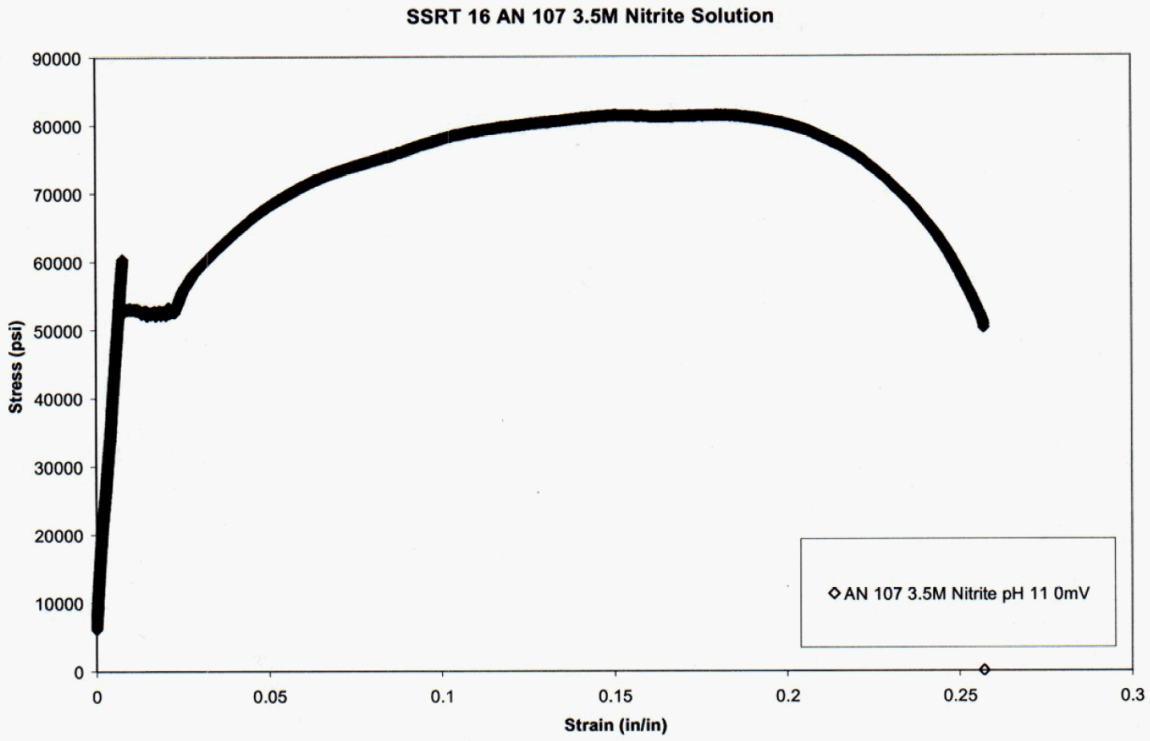


Figure G 46 The stress-strain curve from SSRT 16 performed in Tank 241-AN-107 3.5M nitrite solution, pH 11, with applied potential of 0mV vs SCE.

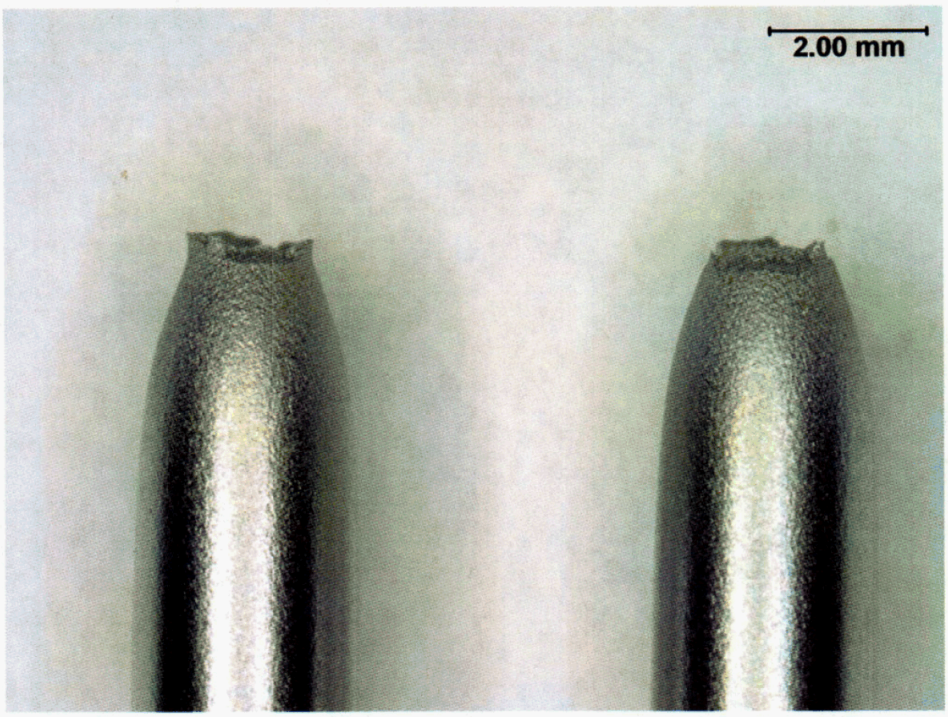


Figure G 47 A post-test photograph of the specimen from SSRT 16 performed in Tank 241-AN-107 3.5M nitrite solution, pH 11, with applied potential of 0mV vs SCE.

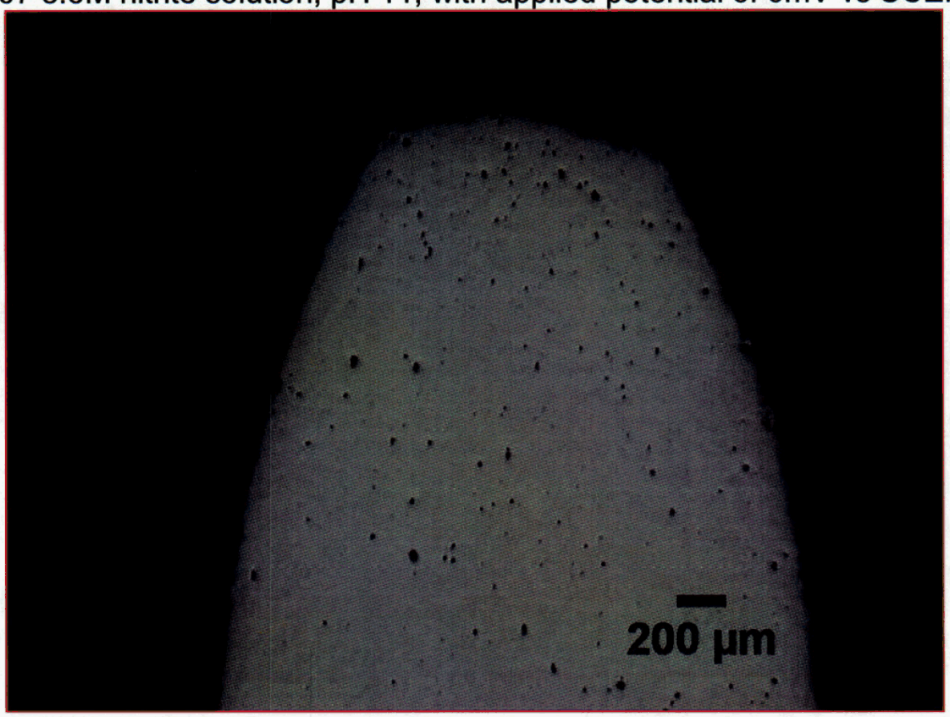


Figure G 48 A post-test micrograph of the cross-section of the specimen from SSRT 16 performed in Tank 241-AN-107 3.5M nitrite solution, pH 11, with applied potential of 0mV vs SCE.

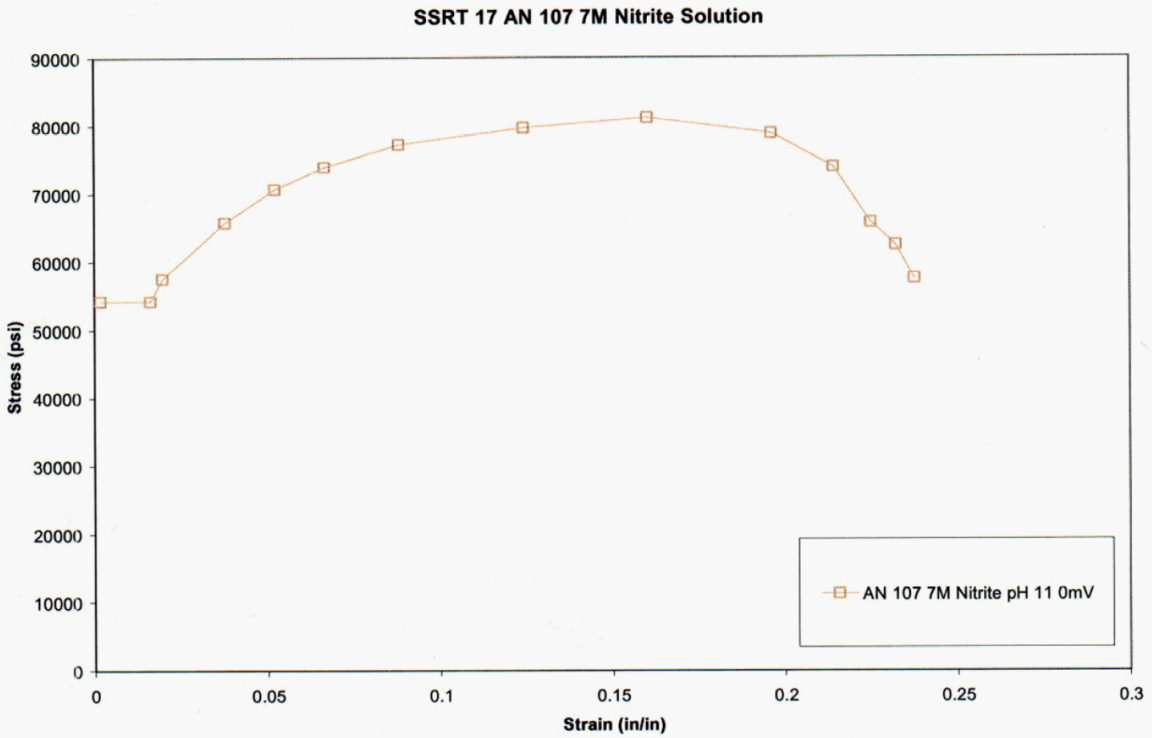


Figure G 49 The stress-strain curve from SSRT 17 performed in Tank 241-AN-107 7M nitrite solution, pH 11, with applied potential of 0mV vs SCE.

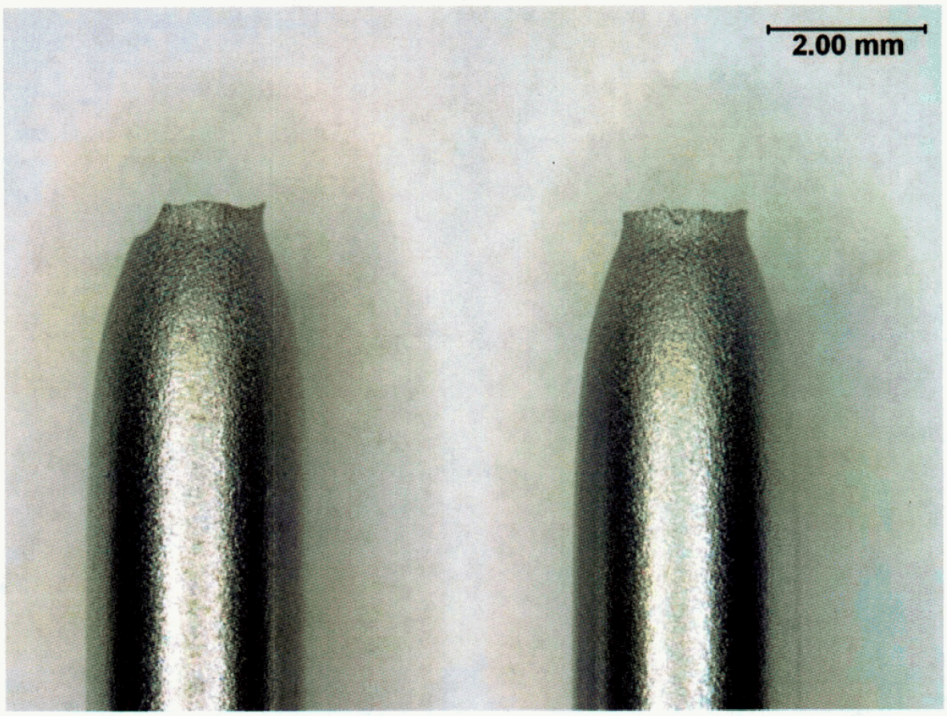


Figure G 50 A post-test photograph of the specimen from SSRT 17 performed in Tank 241-AN-107 7M nitrite solution, pH 11, with applied potential of 0mV vs SCE.

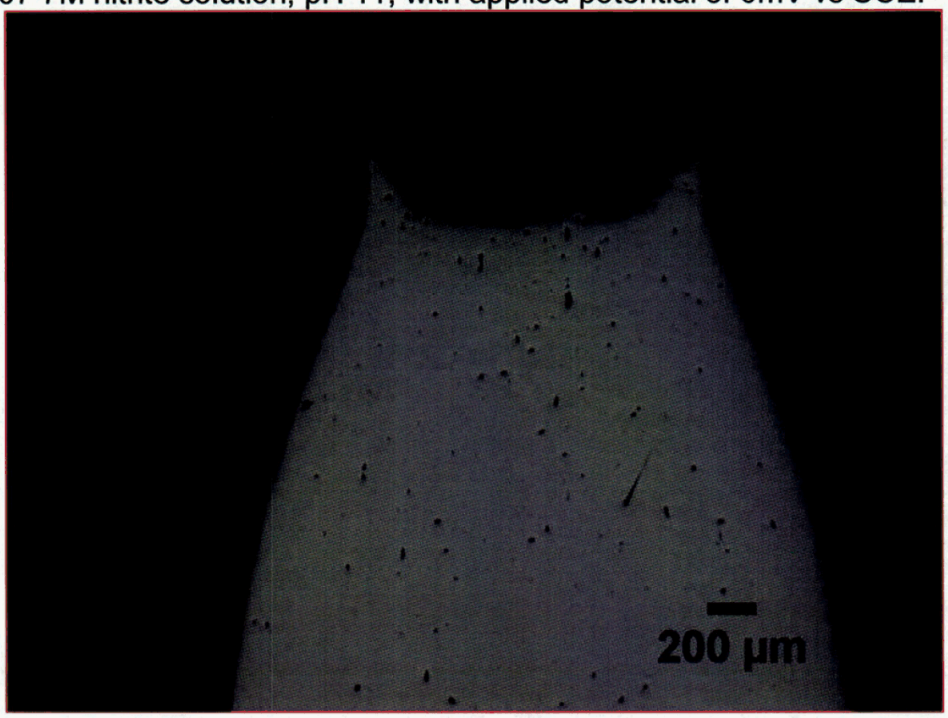


Figure G 51 A post-test micrograph of the cross-section of the specimen from SSRT 17 performed in Tank 241-AN-107 7M nitrite solution, pH 11, with applied potential of 0mV vs SCE.

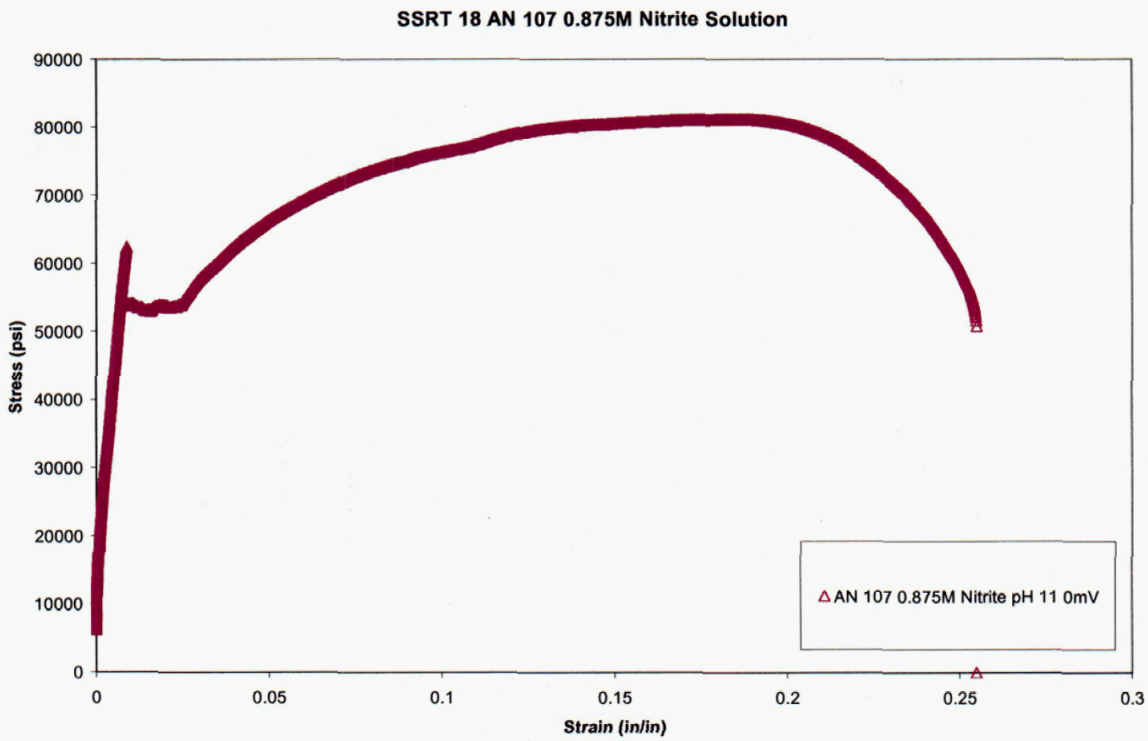


Figure G 52 The stress-strain curve from SSRT 18 performed in Tank 241-AN-107 0.875M nitrite solution, pH 11, with applied potential of 0mV vs SCE.

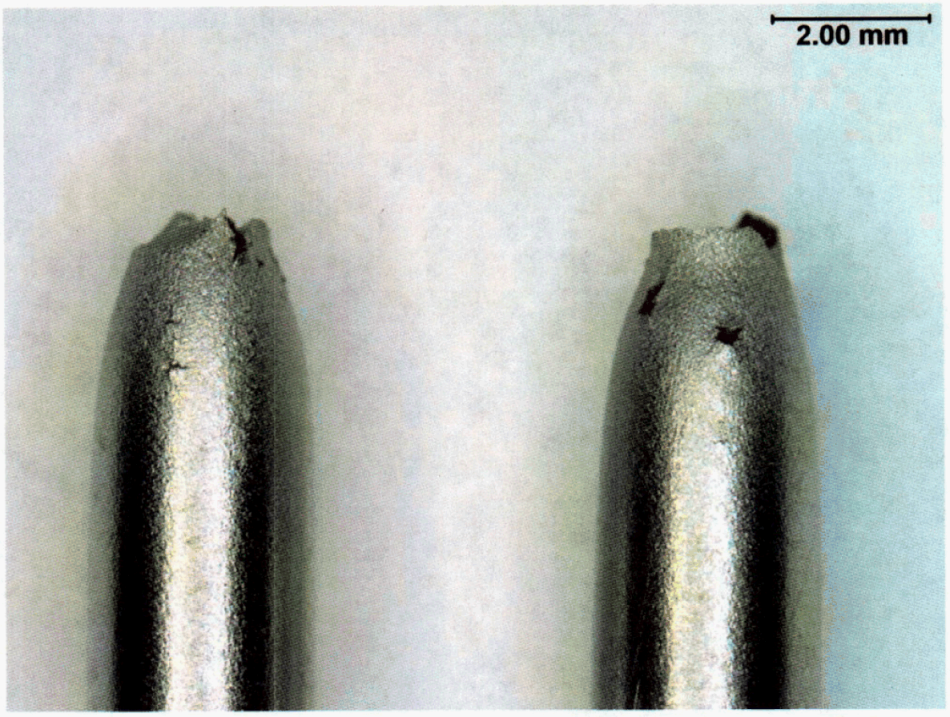


Figure G 53 A post-test photograph of the specimen from SSRT 18 performed in Tank 241-AN-107 0.875M nitrite solution, pH 11, with applied potential of 0mV vs SCE.

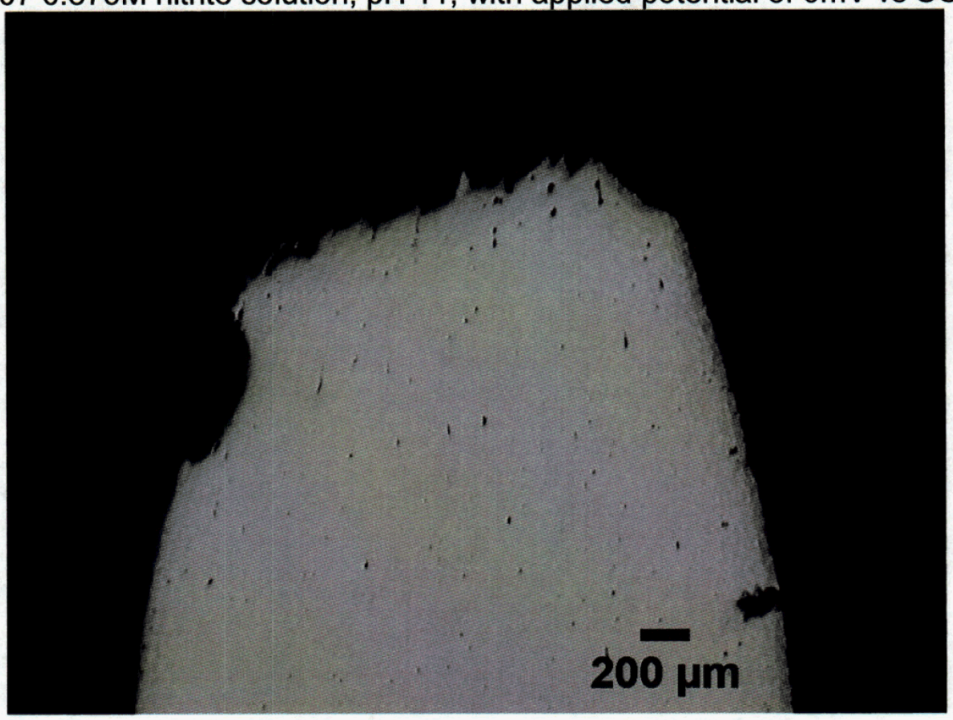


Figure G 54 A post-test micrograph of the cross-section of the specimen from SSRT 18 performed in Tank 241-AN-107 0.875M nitrite solution, pH 11, with applied potential of 0mV vs SCE.

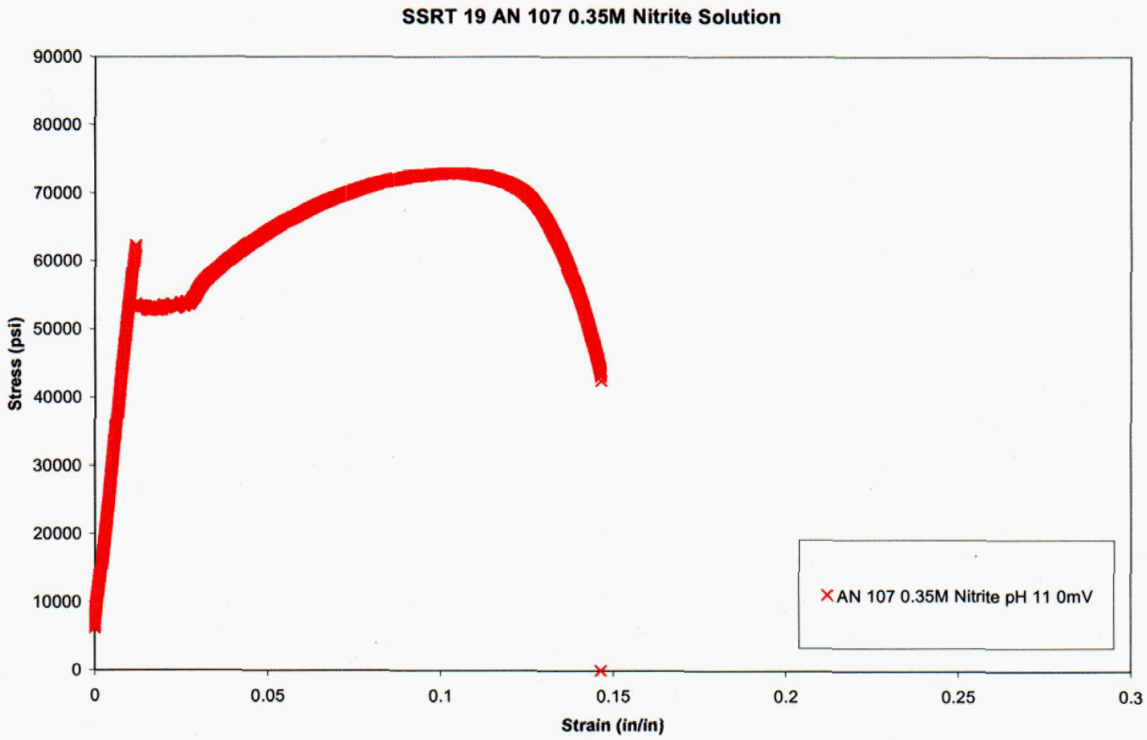


Figure G 55 The stress-strain curve from SSRT 19 performed in Tank 241-AN-107 0.35M nitrite solution, pH 11, with applied potential of 0mV vs SCE.

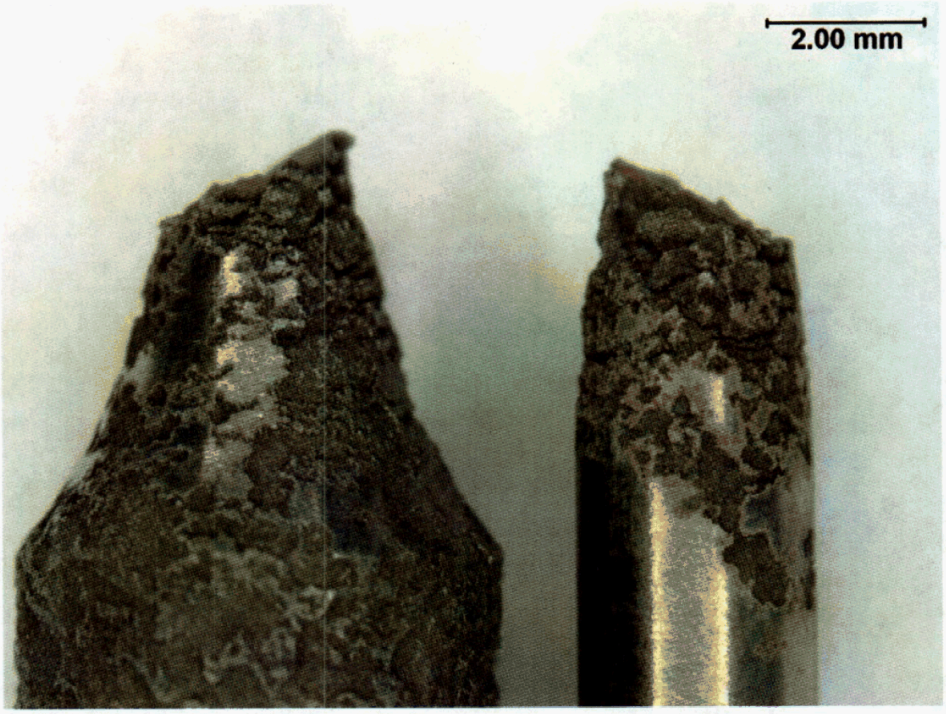


Figure G 56 A post-test photograph of the specimen from SSRT 19 performed in Tank 241-AN-107 0.35M nitrite solution, pH 11, with applied potential of 0mV vs SCE.

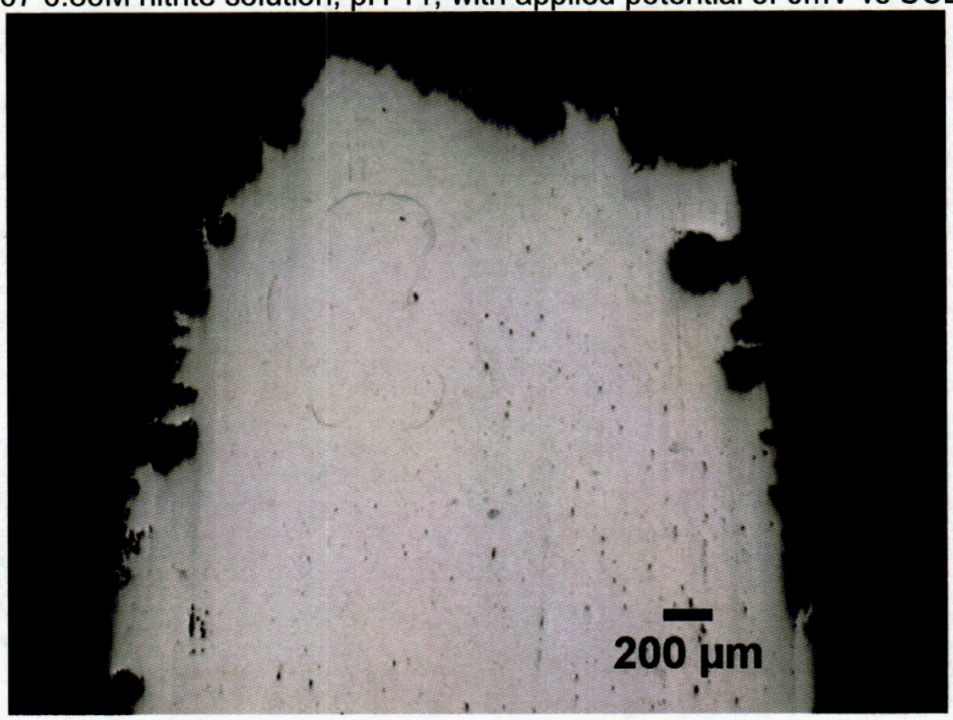


Figure G 57 A post-test micrograph of the cross-section of the specimen from SSRT 19 performed in Tank 241-AN-107 0.35M nitrite solution, pH 11, with applied potential of 0mV vs SCE.

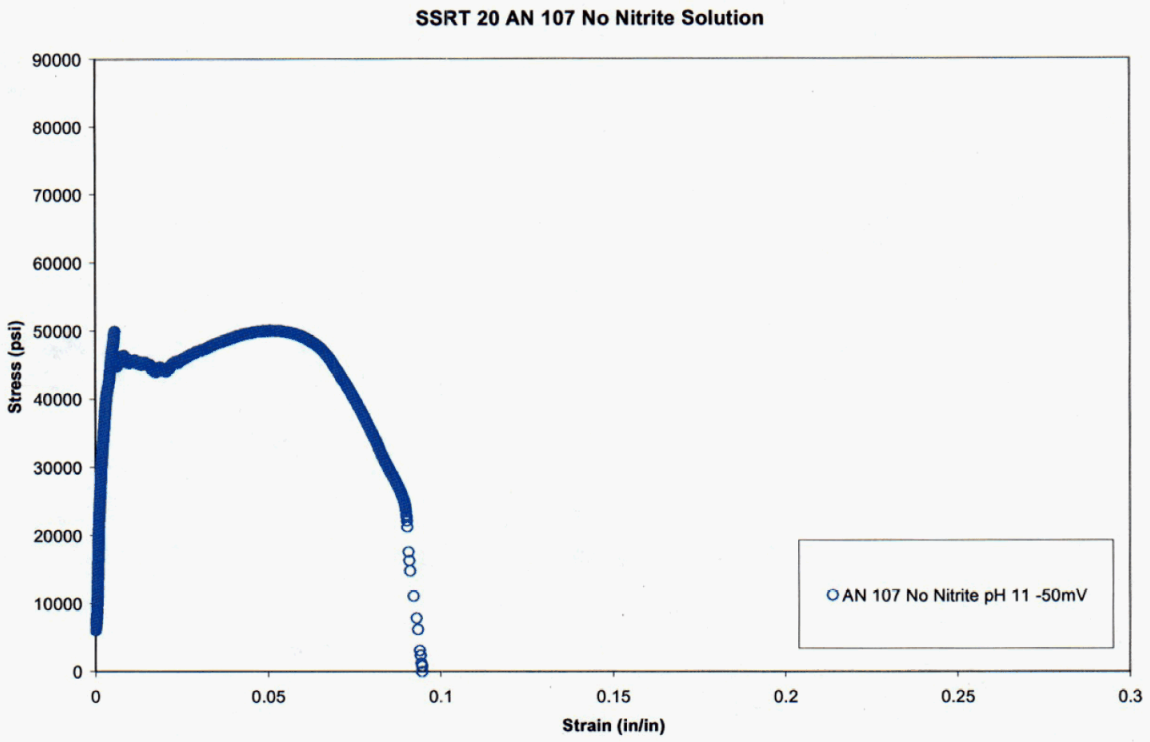


Figure G 58 The stress-strain curve from SSRT 20 performed in Tank 241-AN-107 no nitrite solution, pH 11, with applied potential of -50mV vs SCE.

Figure G 59 A post-test photograph of the specimen from SSRT 20 performed in Tank 241-AN-107 no nitrite solution, pH 11, with applied potential of -50mV vs SCE.

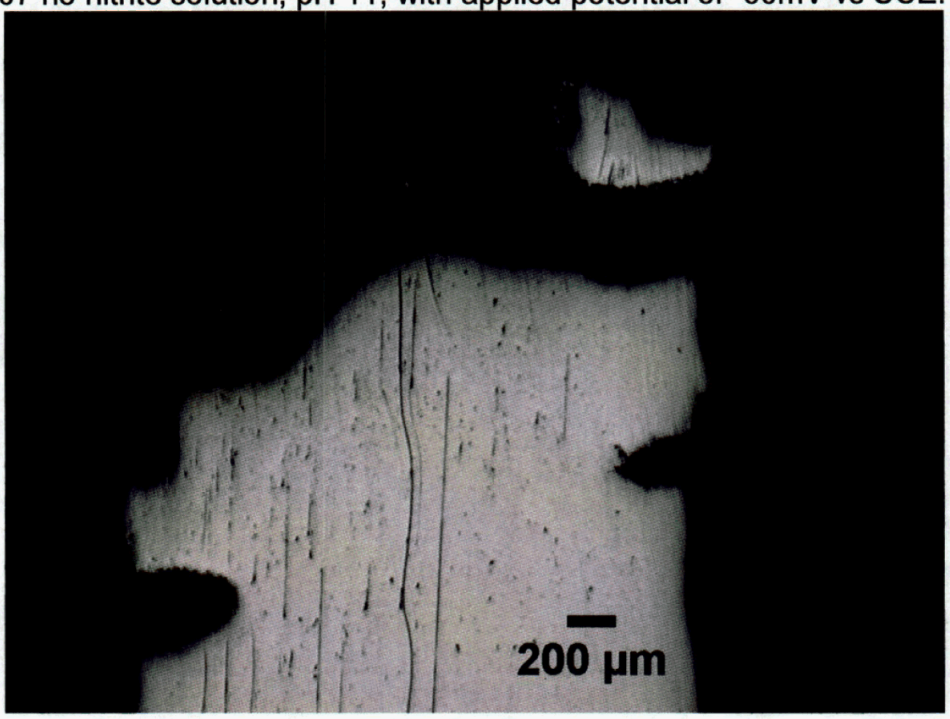


Figure G 60 A post-test micrograph of the cross-section of the specimen from SSRT 20 performed in Tank 241-AN-107 no nitrite solution, pH 11, with applied potential of -50mV vs SCE.

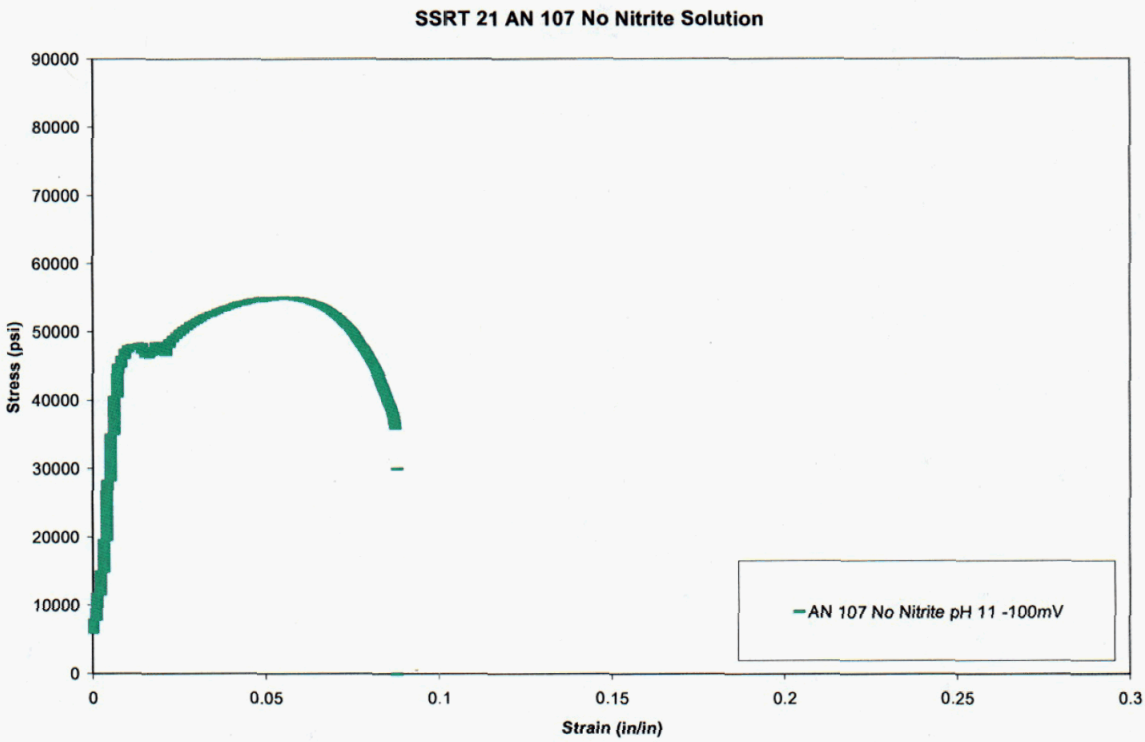


Figure G 61 The stress-strain curve from SSRT 21 performed in Tank 241-AN-107 no nitrite solution, pH 11, with applied potential of -100mV vs SCE.

Figure G 62 A post-test photograph of the specimen from SSRT 21 performed in Tank 241-AN-107 no nitrite solution, pH 11, with applied potential of -100mV vs SCE.

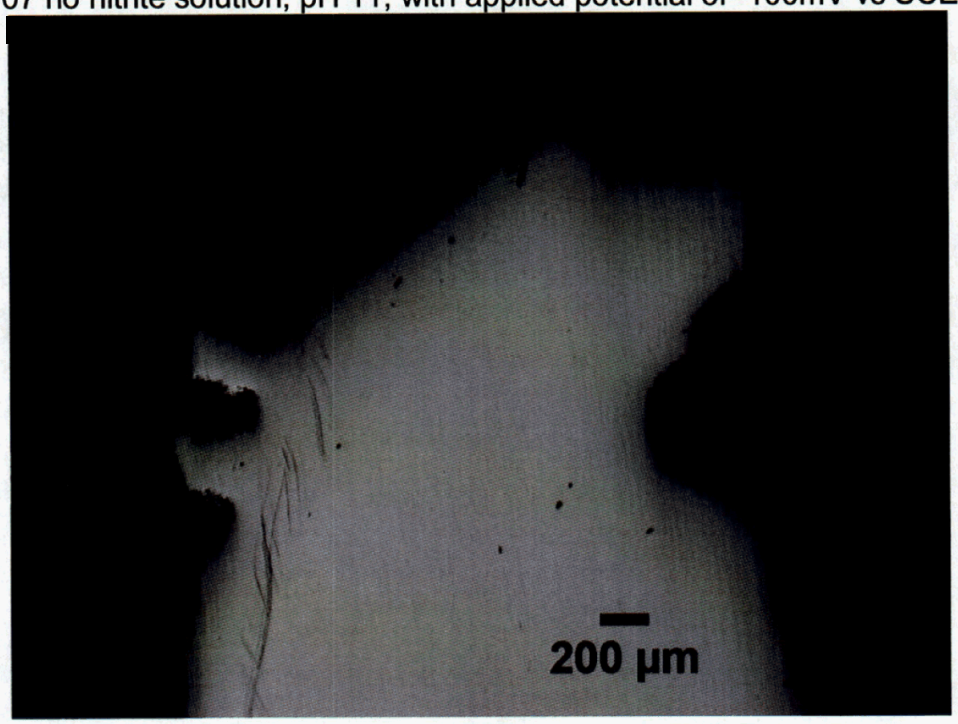


Figure G 63 A post-test micrograph of the cross-section of the specimen from SSRT 21 performed in Tank 241-AN-107 no nitrite solution, pH 11, with applied potential of -100mV vs SCE.

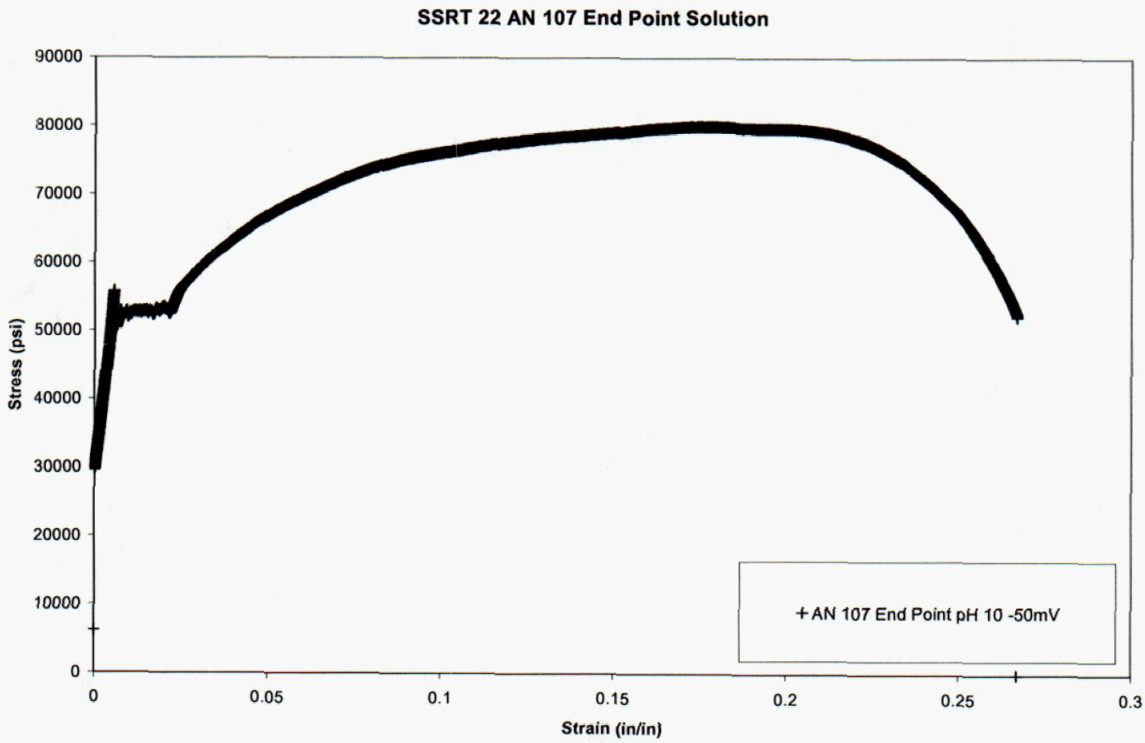


Figure G 64 The stress-strain curve from SSRT 22 performed in Tank 241-AN-107 end point solution, pH 10, with applied potential of -50mV vs SCE.

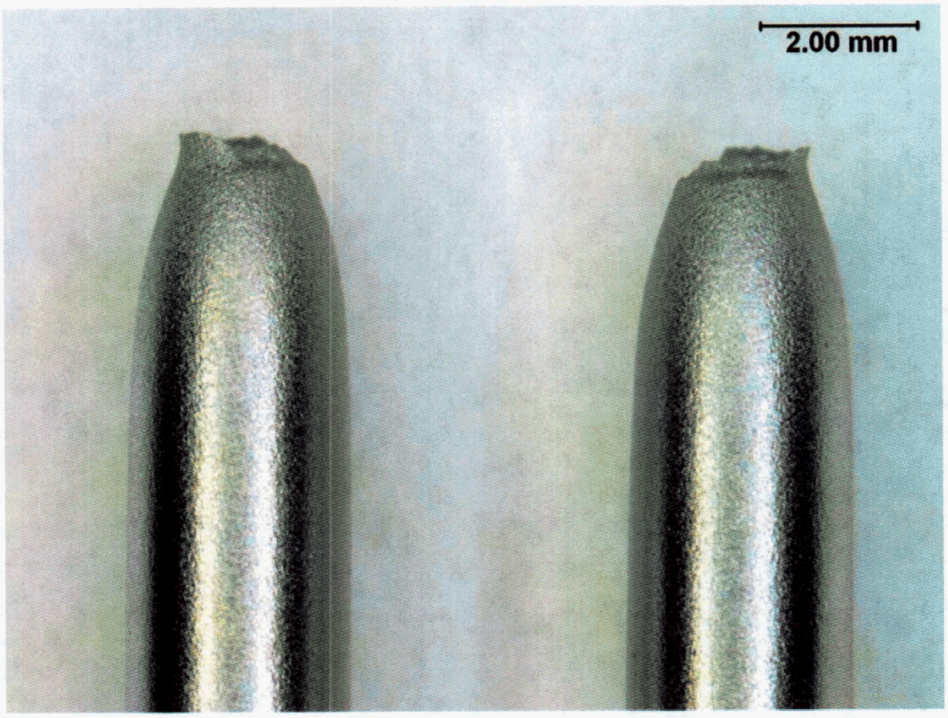


Figure G 65 A post-test photograph of the specimen from SSRT 22 performed in Tank 241-AN-107 end point solution, pH 10, with applied potential of -50mV vs SCE.

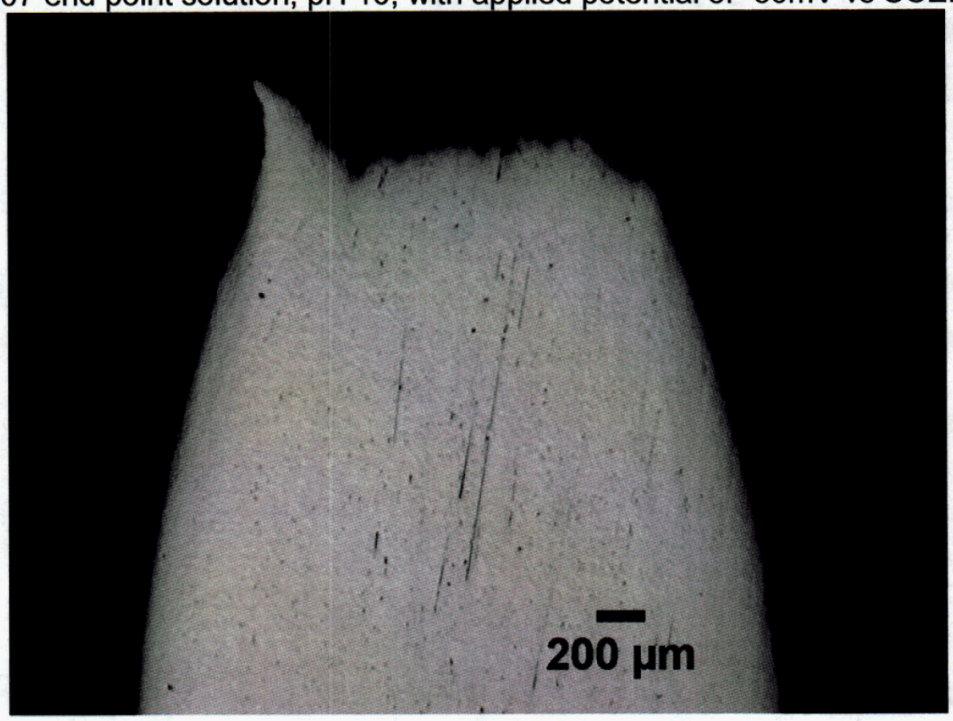


Figure G 66 A post-test micrograph of the cross-section of the specimen from SSRT 22 performed in Tank 241-AN-107 end point solution, pH 10, with applied potential of -50mV vs SCE.

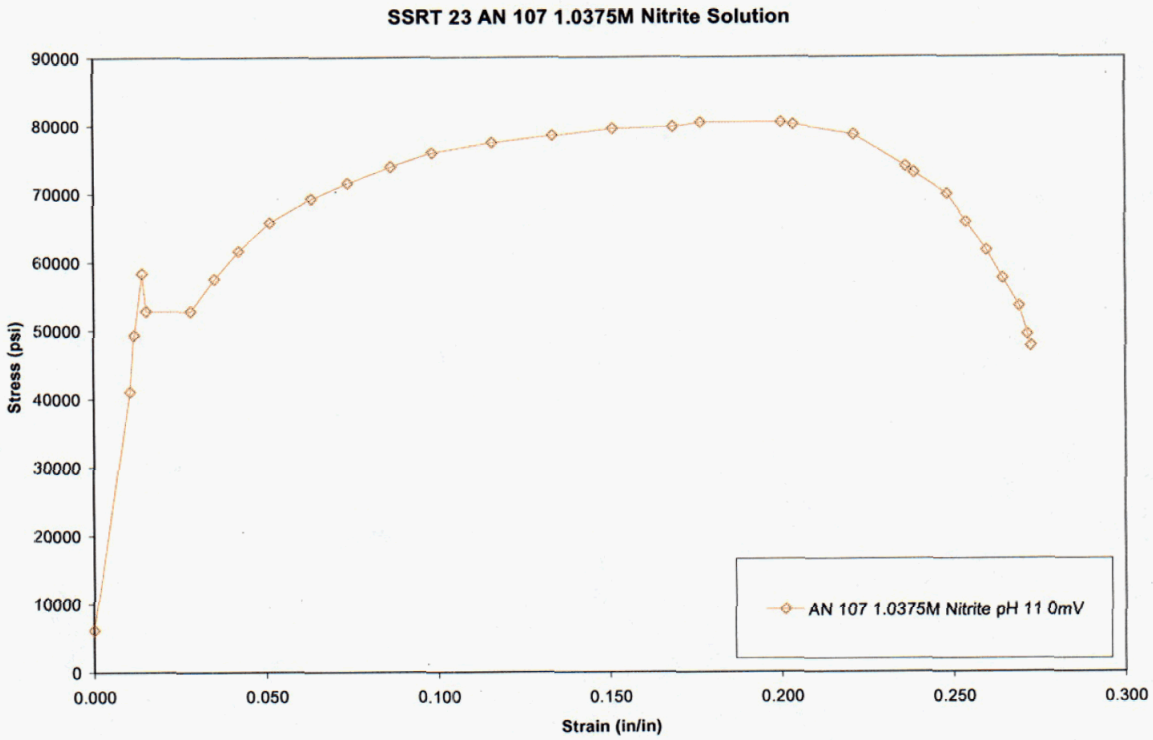


Figure G 67 The stress-strain curve from SSRT 23 performed in Tank 241-AN-107 1.0375M nitrite solution, pH 11, with applied potential of 0mV vs SCE.

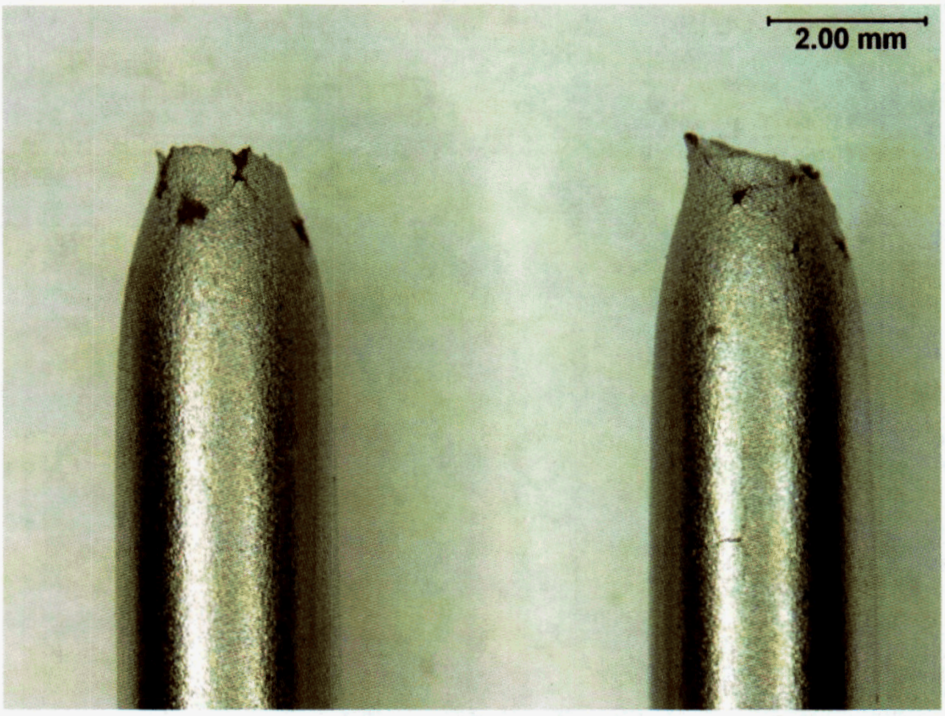


Figure G 68 A post-test photograph of the specimen from SSRT 23 performed in Tank 241-AN-107 1.0375M nitrite solution, pH 11, with applied potential of 0mV vs SCE.

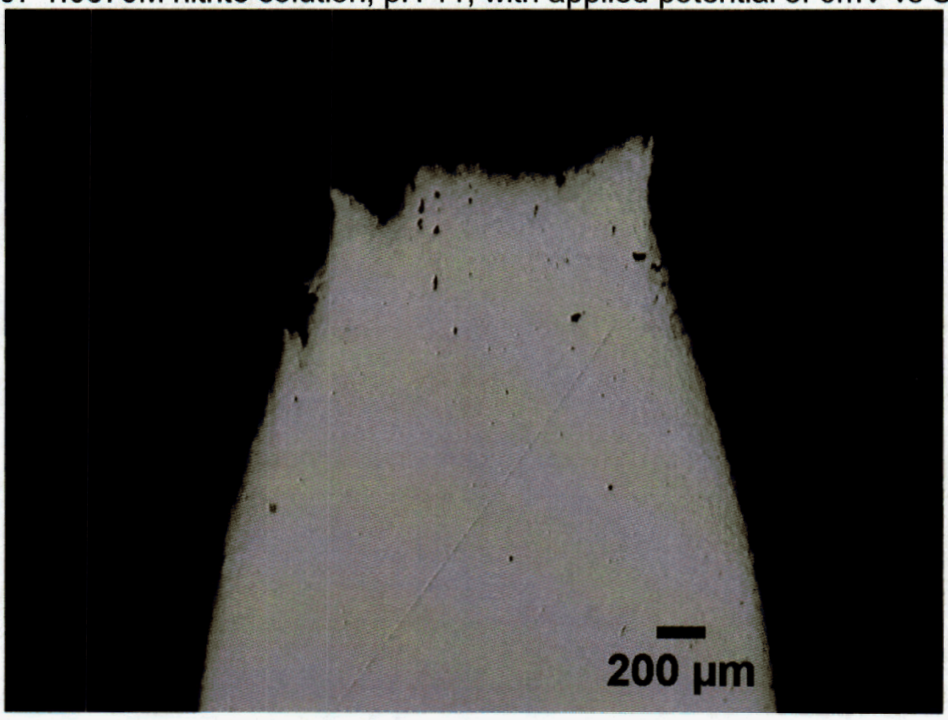


Figure G 69 A post-test micrograph of the cross-section of the specimen from SSRT 23 performed in Tank 241-AN-107 1.0375M nitrite solution, pH 12, with applied potential of 0mV vs SCE.

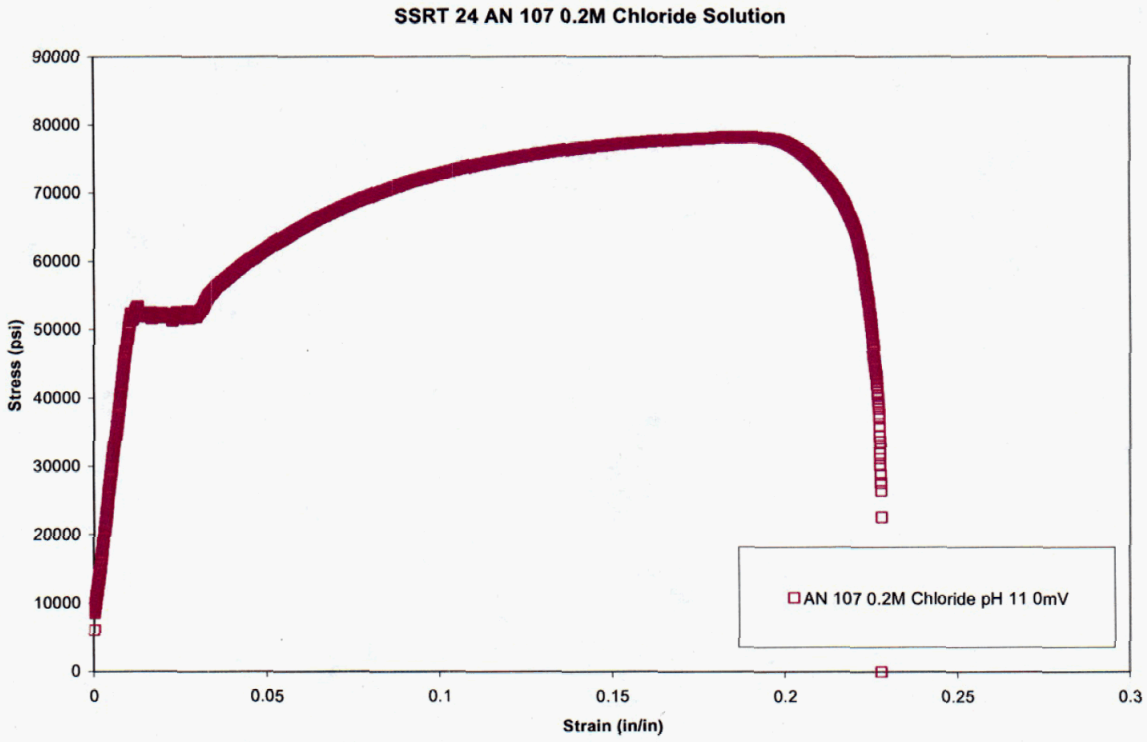


Figure G 70 The stress-strain curve from SSRT 24 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, with applied potential of 0mV vs SCE.

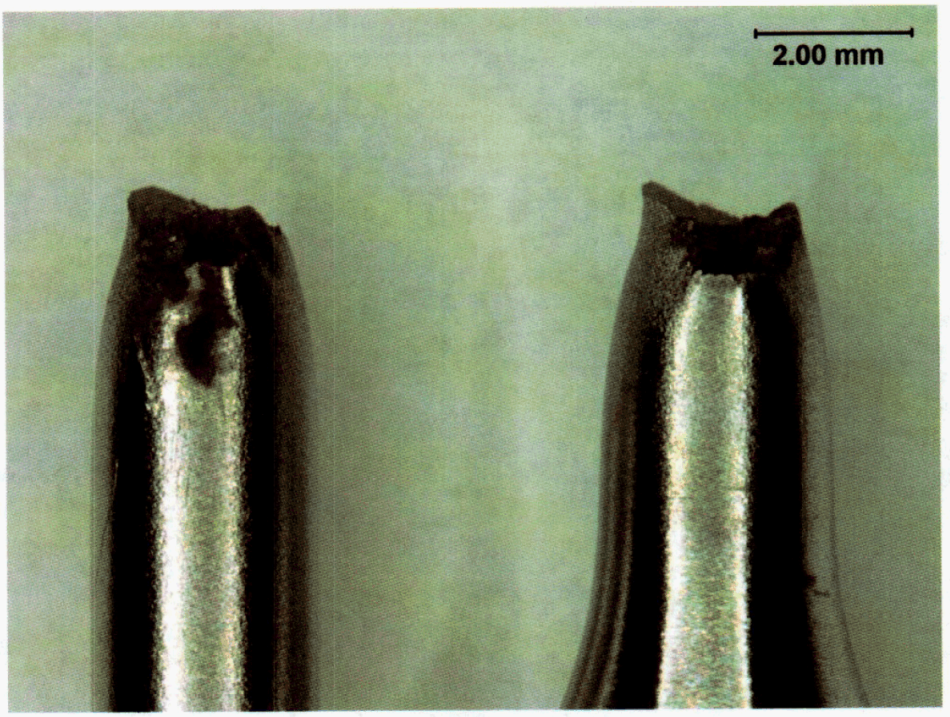


Figure G 71 A post-test photograph of the specimen from SSRT 24 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, with applied potential of 0mV vs SCE.

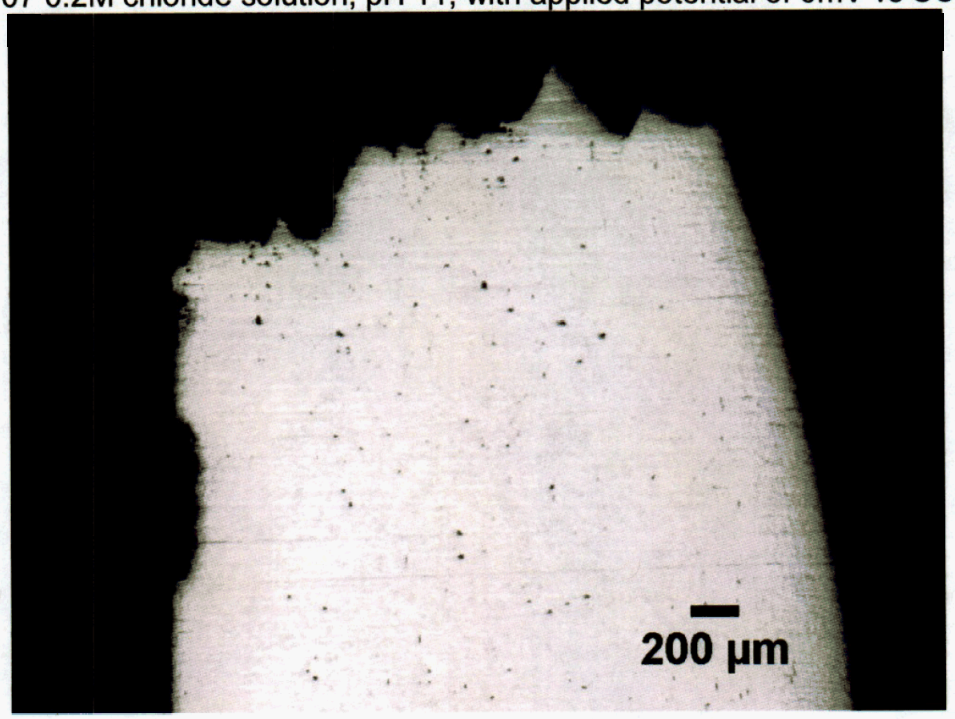


Figure G 72 A post-test micrograph of the cross-section of the specimen from SSRT 24 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, with applied potential of 0mV vs SCE.

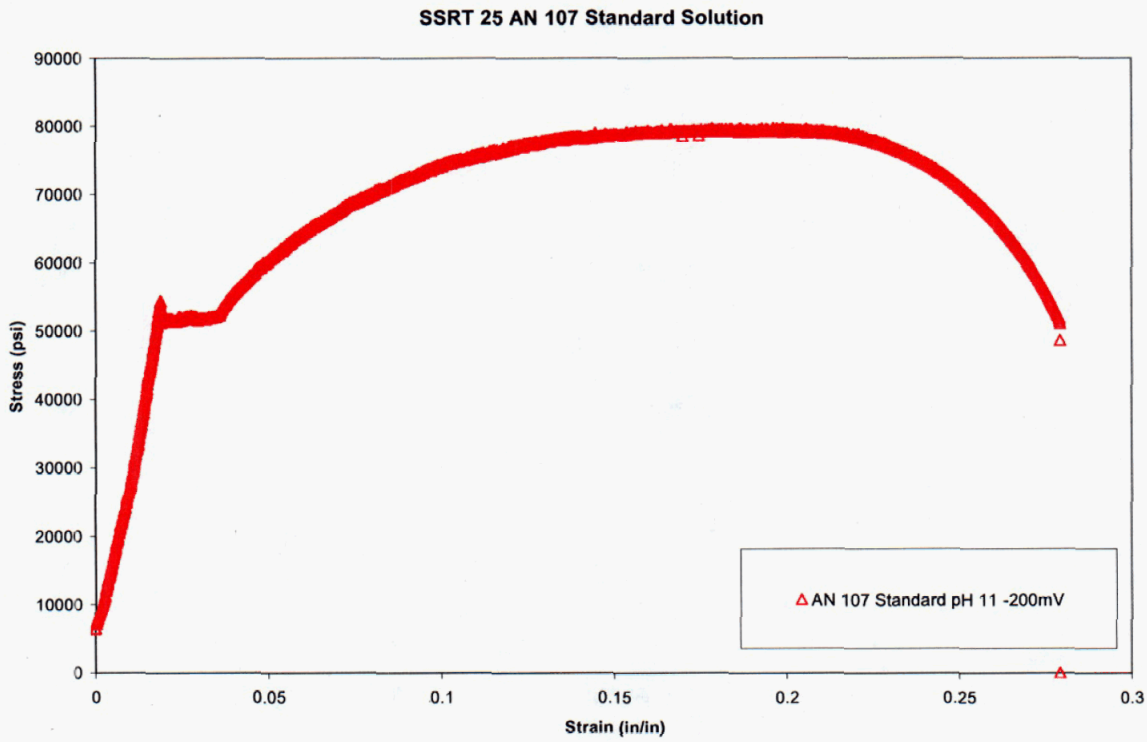


Figure G 73. The stress-strain curve from SSRT 25 performed in Tank 241-AN-107 Standard solution, pH 11, with applied potential of -200mV vs SCE.

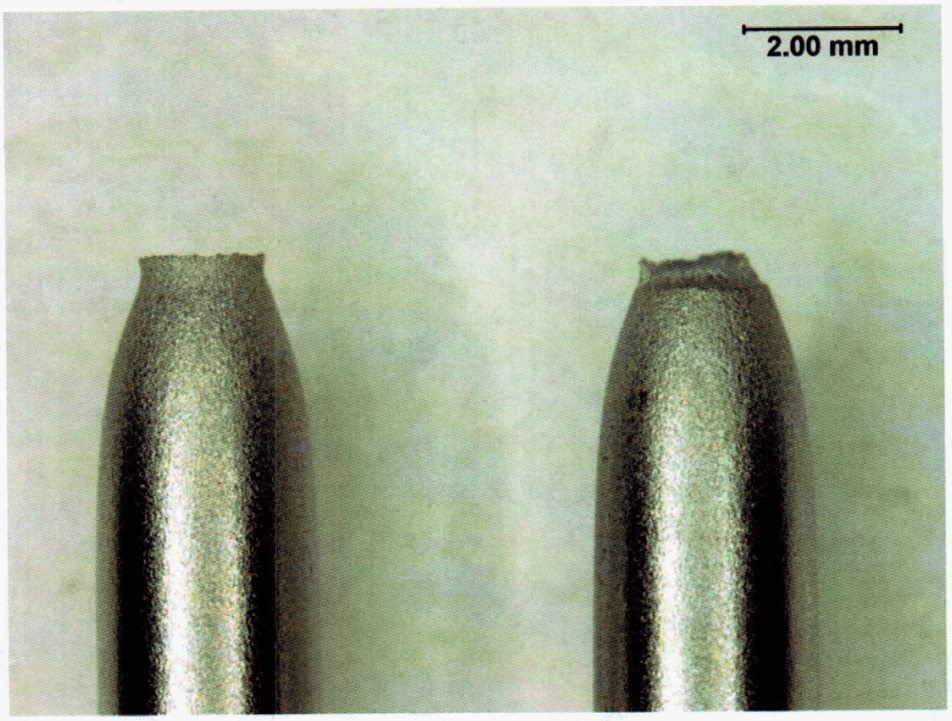


Figure G 74 A post-test photograph of the specimen from SSRT 25 performed in Tank 241-AN-107 Standard solution, pH 11, with applied potential of -200mV vs SCE.

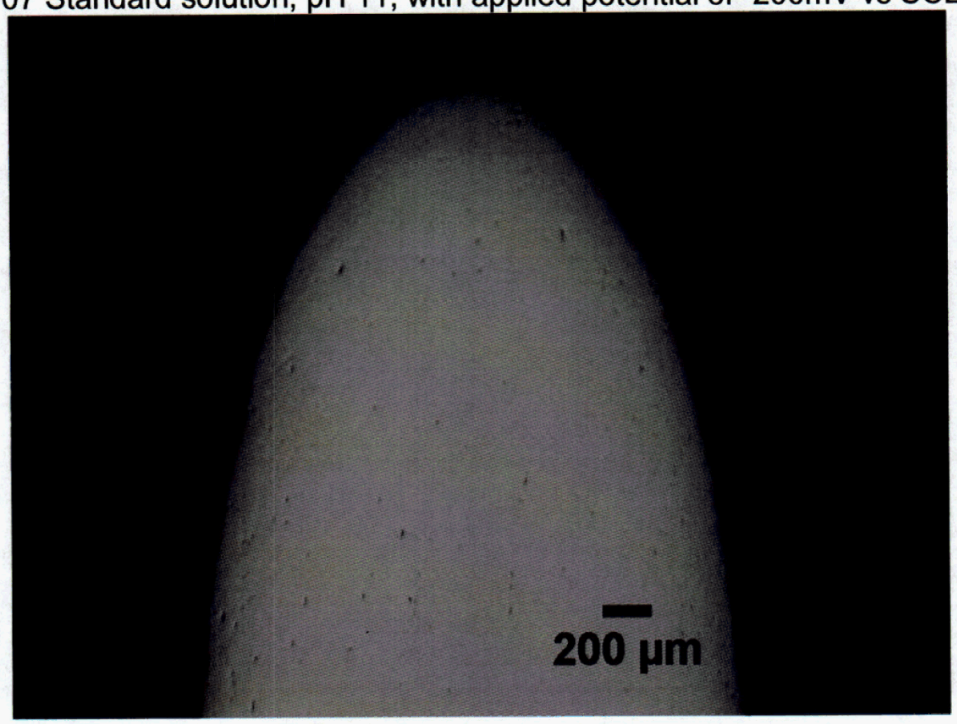


Figure G 75 A post-test micrograph of the cross-section of the specimen from SSRT 25 performed in Tank 241-AN-107 Standard solution, pH 11, with applied potential of -200mV vs SCE.

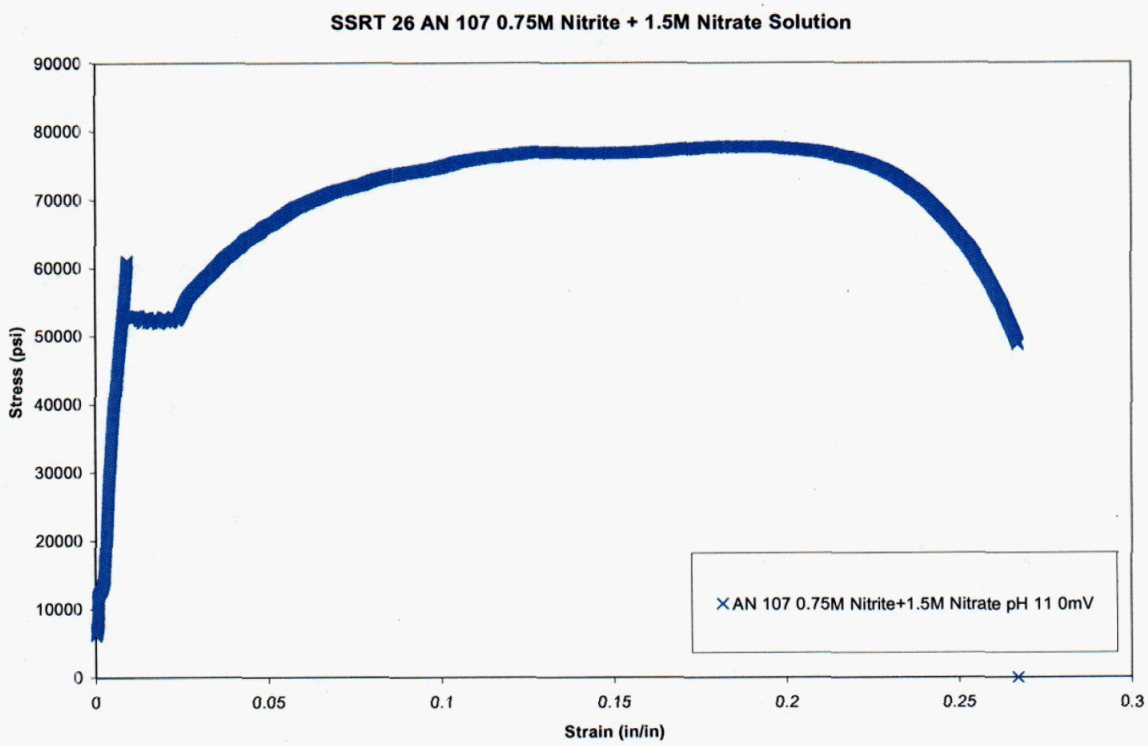


Figure G 76. The stress-strain curve from SSRT 26 performed in Tank 241-AN-107 0.75M nitrite, 1.5M nitrate solution, pH 11, with applied potential of 0mV vs SCE.

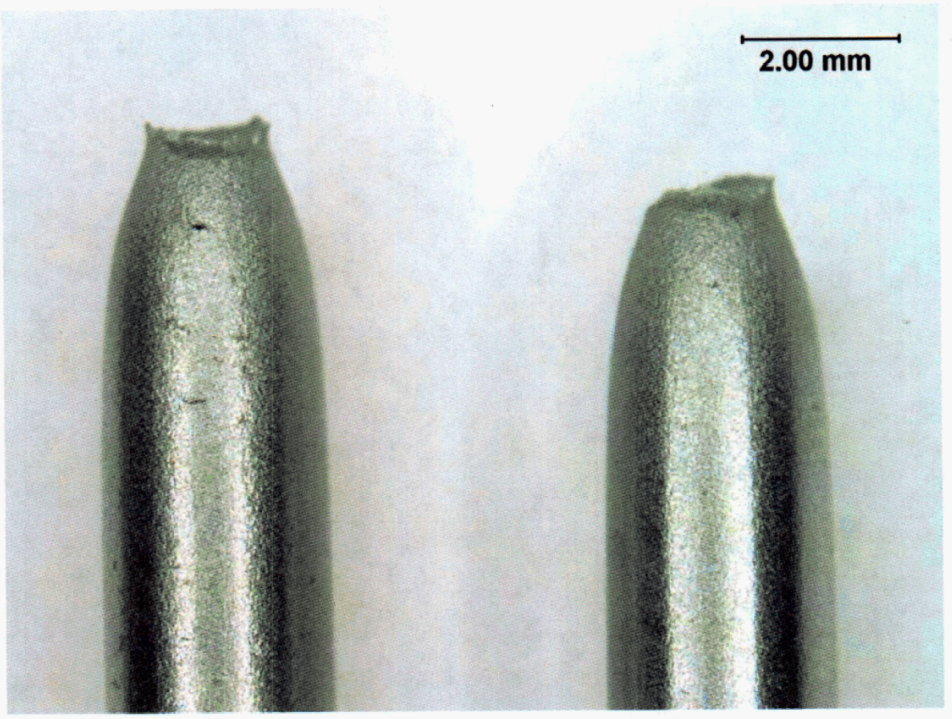


Figure G 77 A post-test photograph of the specimen from SSRT 26 performed in Tank 241-AN-107 0.75M nitrite, 1.5M nitrate solution, pH 11, with applied potential of 0mV vs SCE.

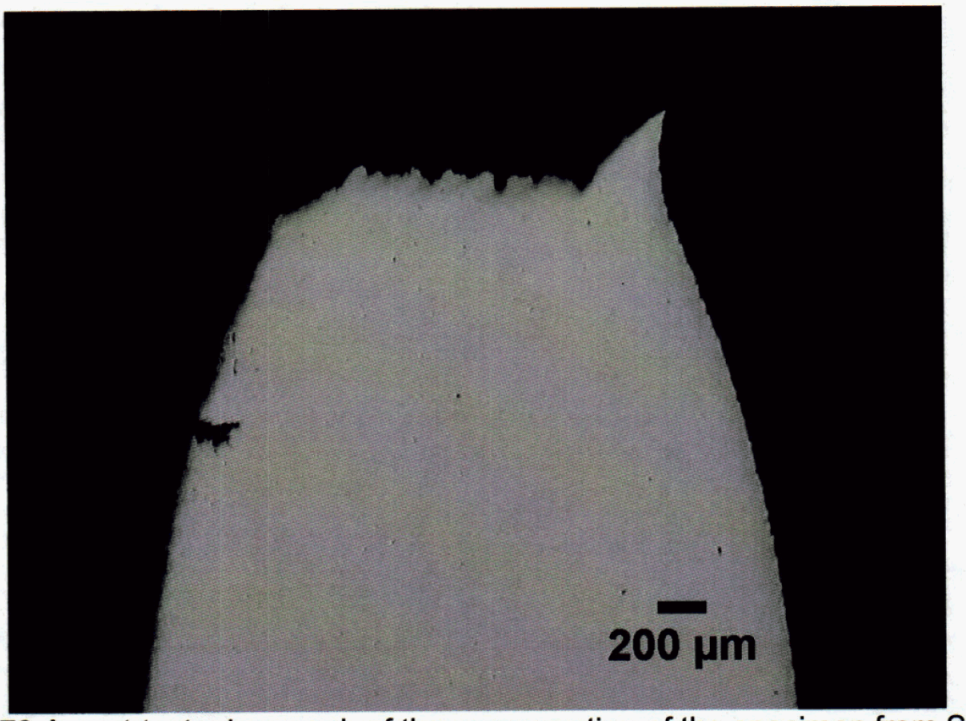


Figure G 78 A post-test micrograph of the cross-section of the specimen from SSRT 26 performed in Tank 241-AN-107 0.75M nitrite, 1.5M nitrate solution, pH 11, with applied potential of 0mV vs SCE.

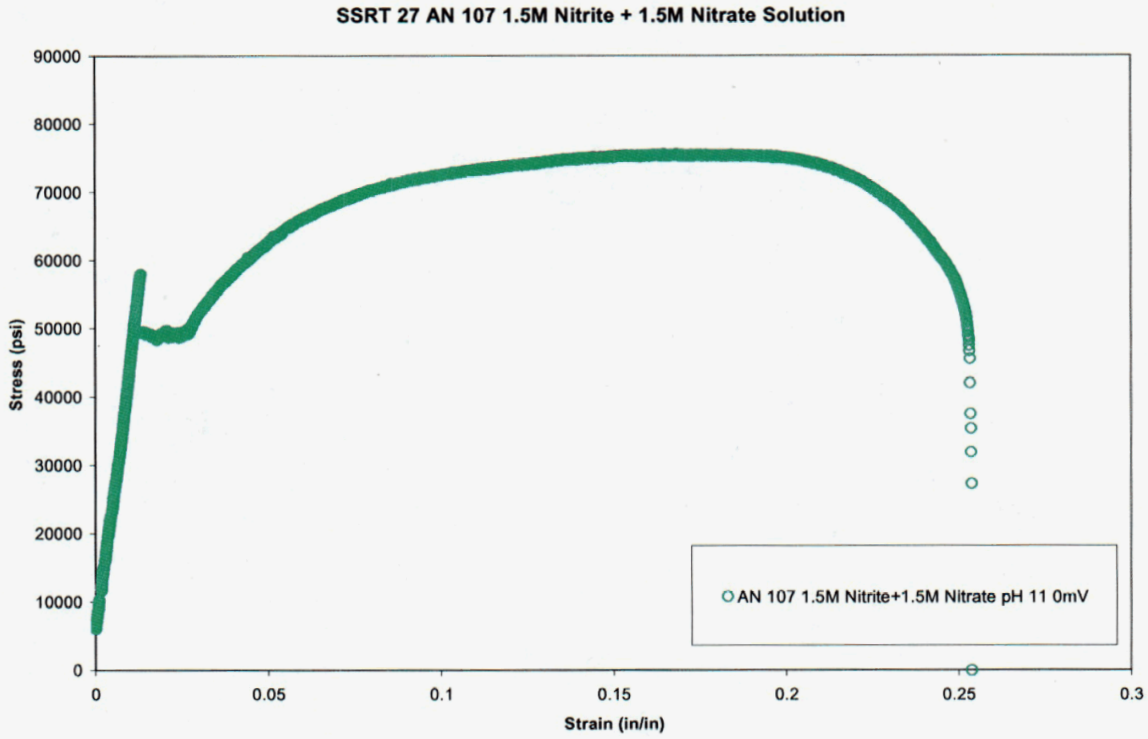


Figure G 79. The stress-strain curve from SSRT 27 performed in Tank 241-AN-107 1.5M nitrite, 1.5M nitrate solution, pH 11, with applied potential of 0mV vs SCE.

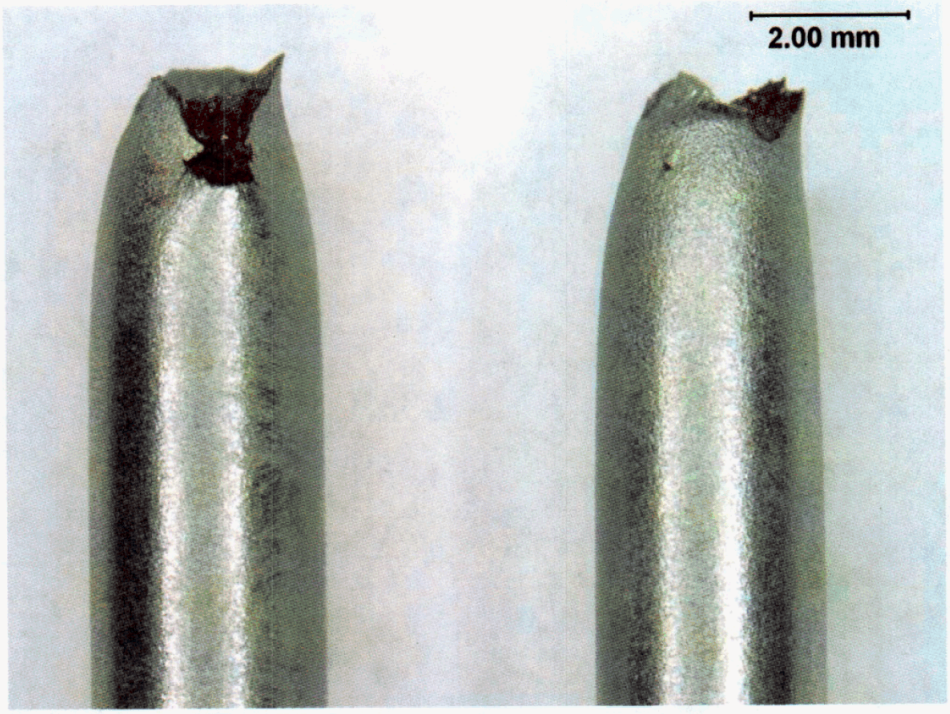


Figure G 80 A post-test photograph of the specimen from SSRT 27 performed in Tank 241-AN-107 1.5M nitrite, 1.5M nitrate solution, pH 11, with applied potential of 0mV vs SCE.

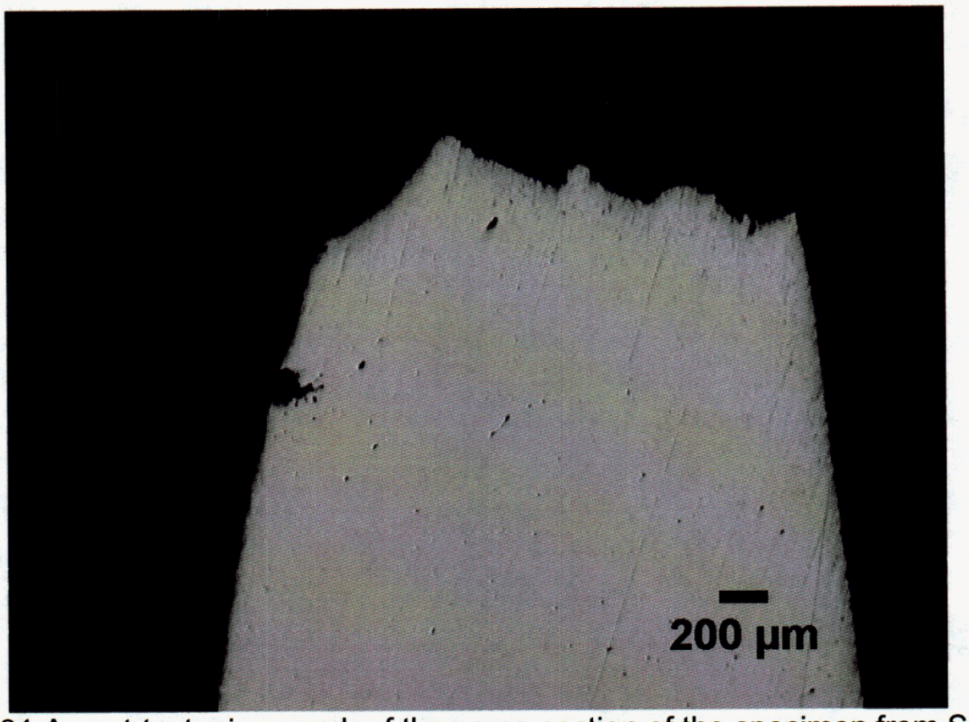


Figure G 81 A post-test micrograph of the cross-section of the specimen from SSRT 27 performed in Tank 241-AN-107 1.5M nitrite, 1.5M nitrate solution, pH 11, with applied potential of 0mV vs SCE.

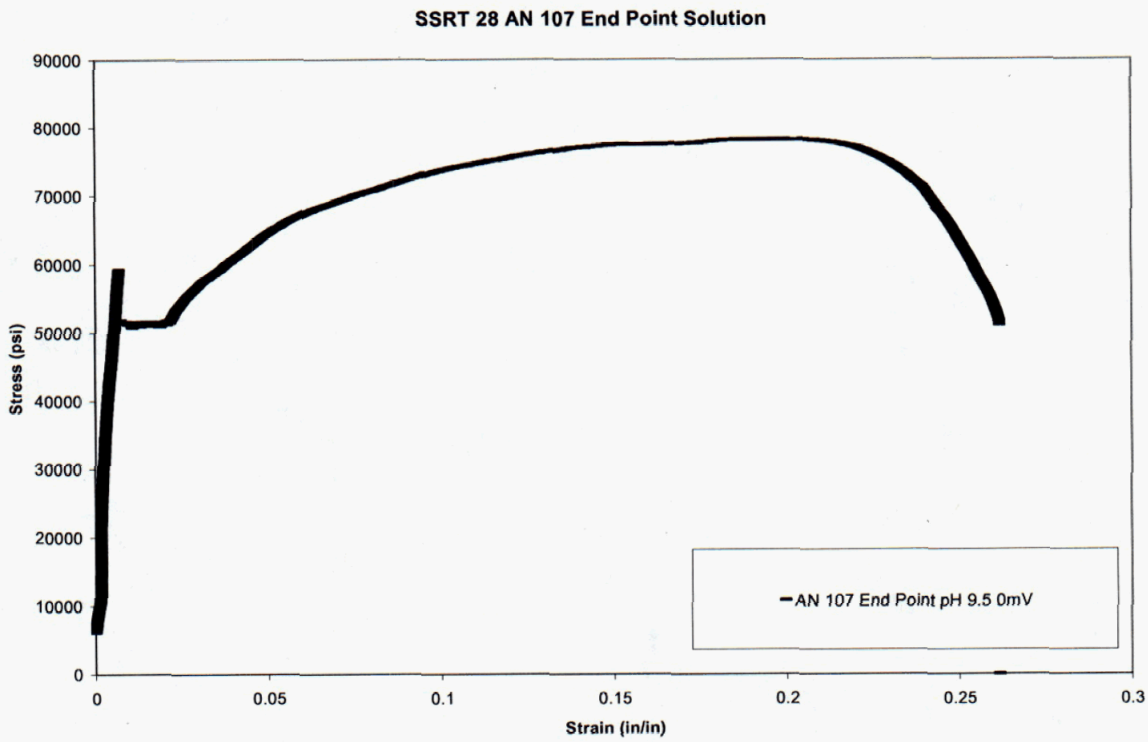


Figure G 82. The stress-strain curve from SSRT 28 performed in Tank 241-AN-107 end point solution, pH 9.5, with applied potential of 0mV vs SCE.

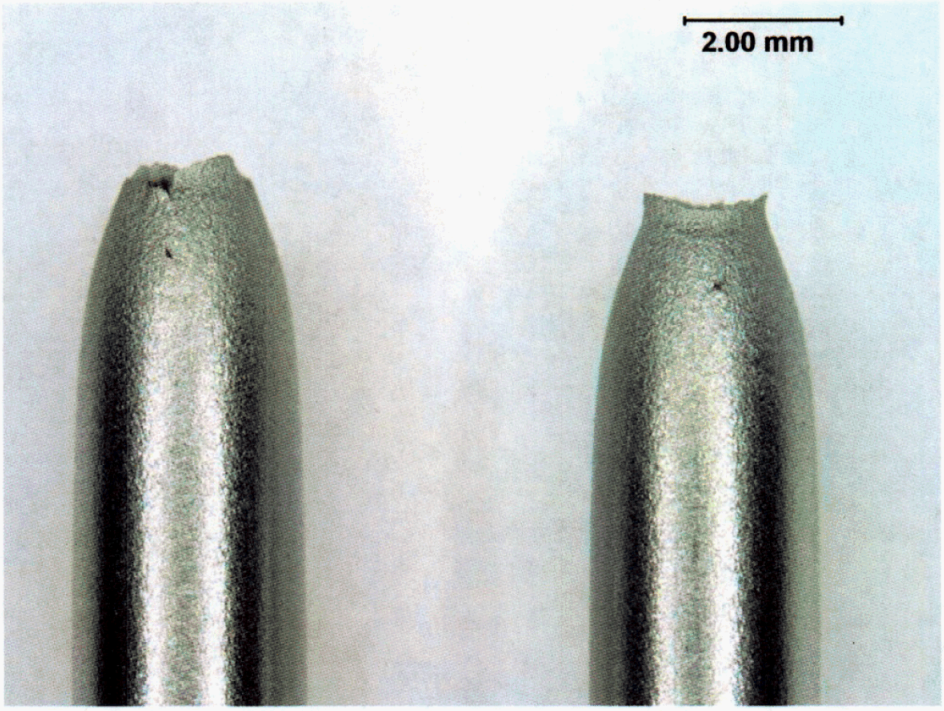


Figure G 83 A post-test photograph of the specimen from SSRT 28 performed in Tank 241-AN-107 end point solution, pH 9.5, with applied potential of 0mV vs SCE.

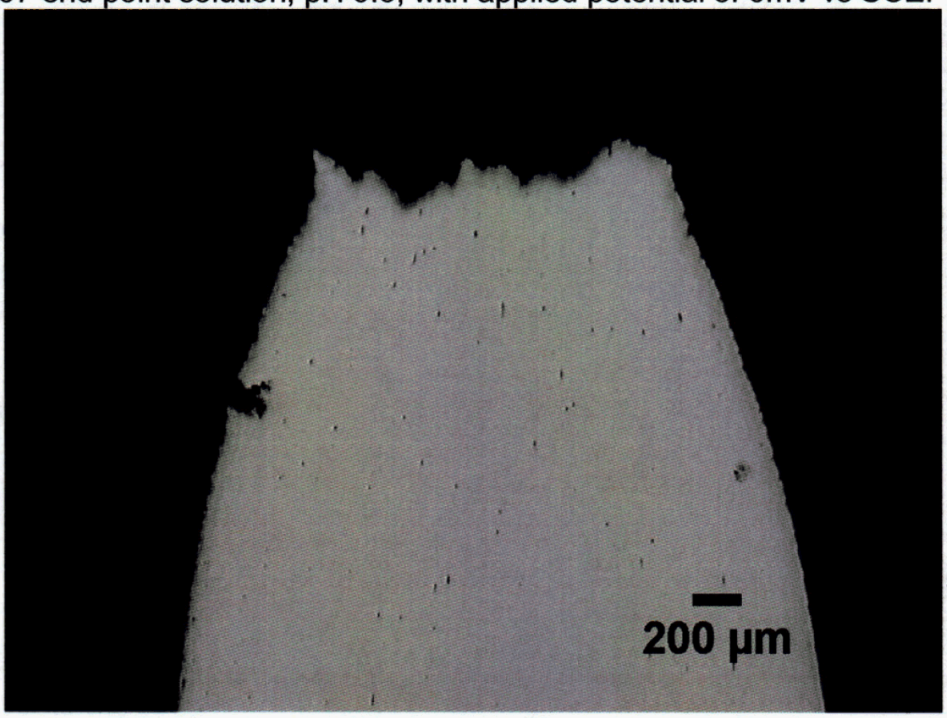


Figure G 84 A post-test micrograph of the cross-section of the specimen from SSRT 28 performed in Tank 241-AN-107 end point solution, pH 9.5, with applied potential of 0mV vs SCE.

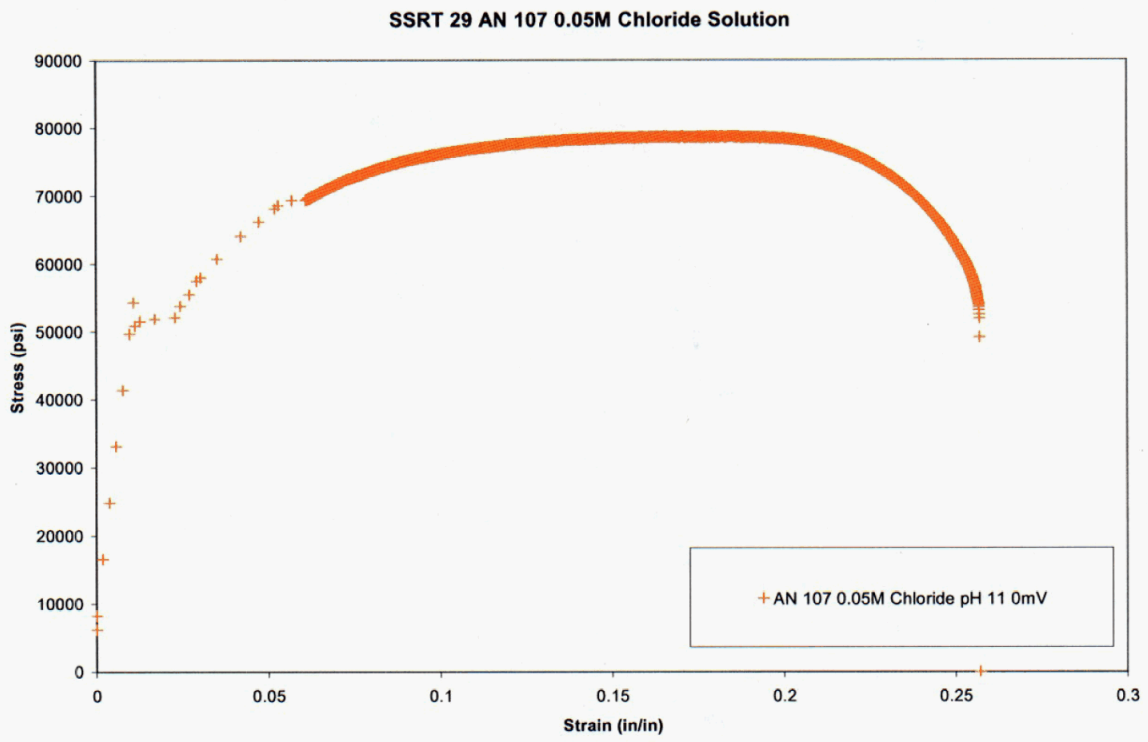


Figure G 85. The stress-strain curve from SSRT 29 performed in Tank 241-AN-107 0.05M chloride solution, pH 11, with applied potential of 0mV vs SCE.

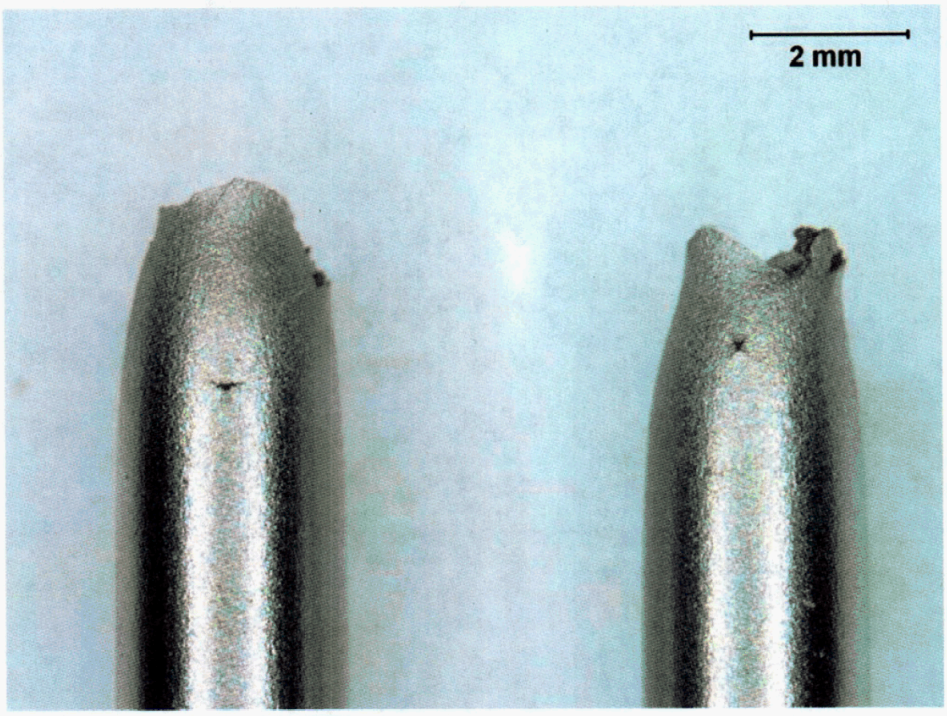


Figure G 86 A post-test photograph of the specimen from SSRT 29 performed in Tank 241-AN-107 0.05M chloride solution, pH 11, with applied potential of 0mV vs SCE.

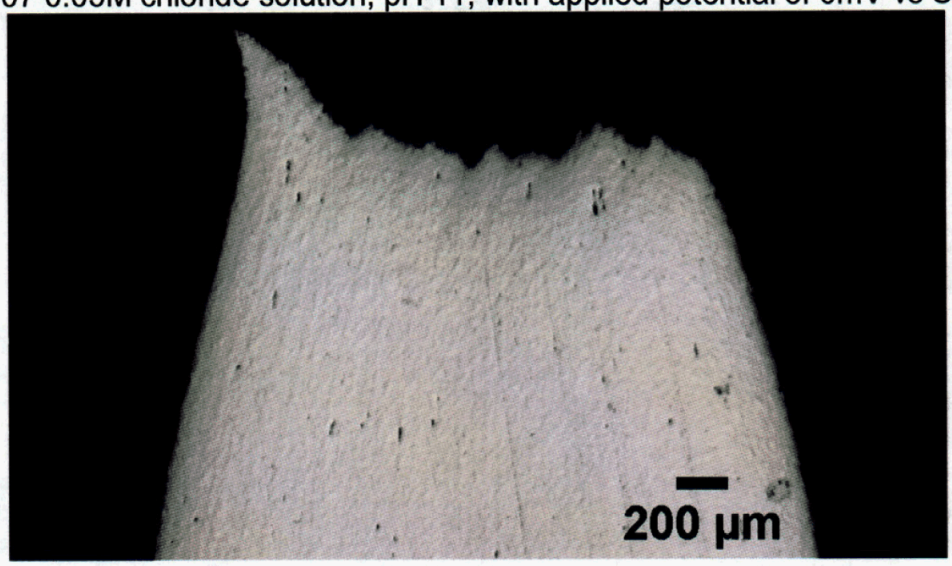


Figure G 87 A post-test micrograph of the cross-section of the specimen from SSRT 29 performed in Tank 241-AN-107 0.05M chloride solution, pH 11, with applied potential of 0mV vs SCE.

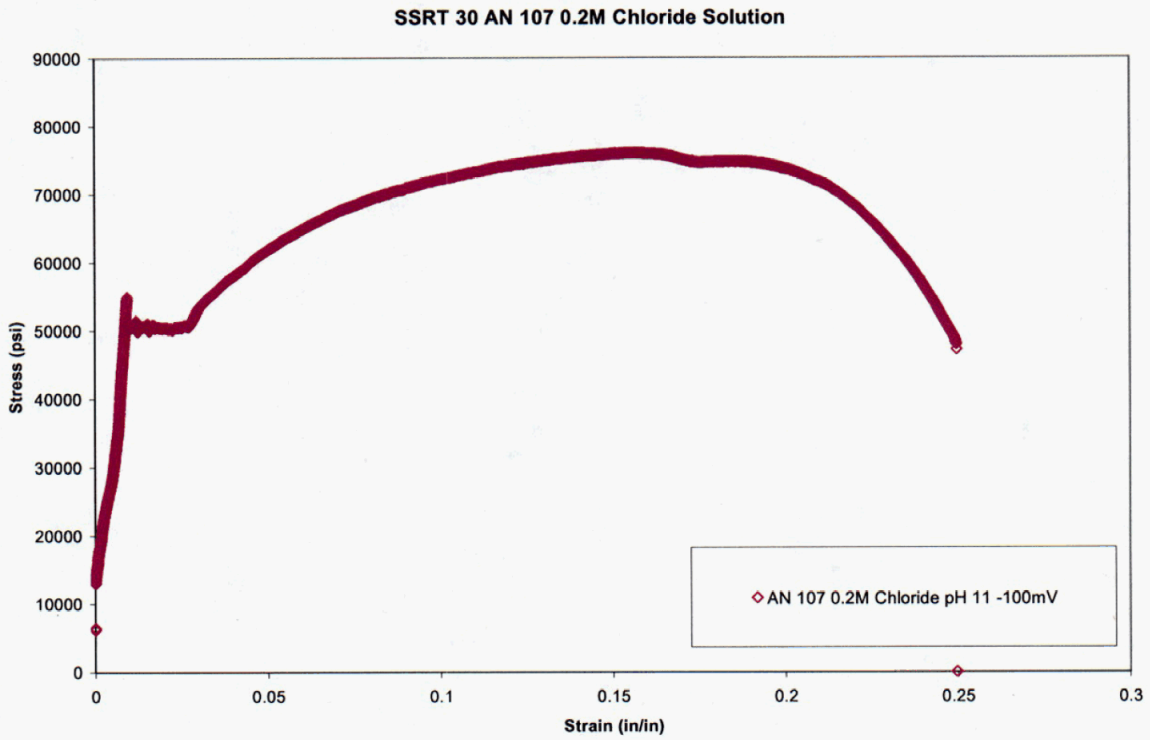


Figure G 88. The stress-strain curve from SSRT 30 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, with applied potential of -100mV vs SCE.

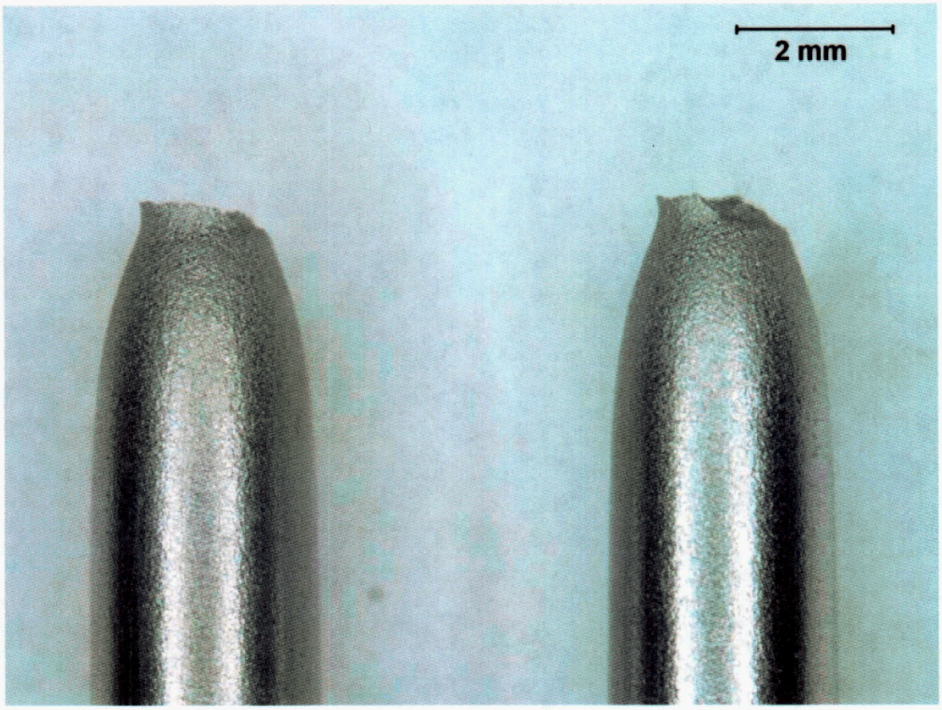


Figure G 89 A post-test photograph of the specimen from SSRT 30 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, with applied potential of -100mV vs SCE.

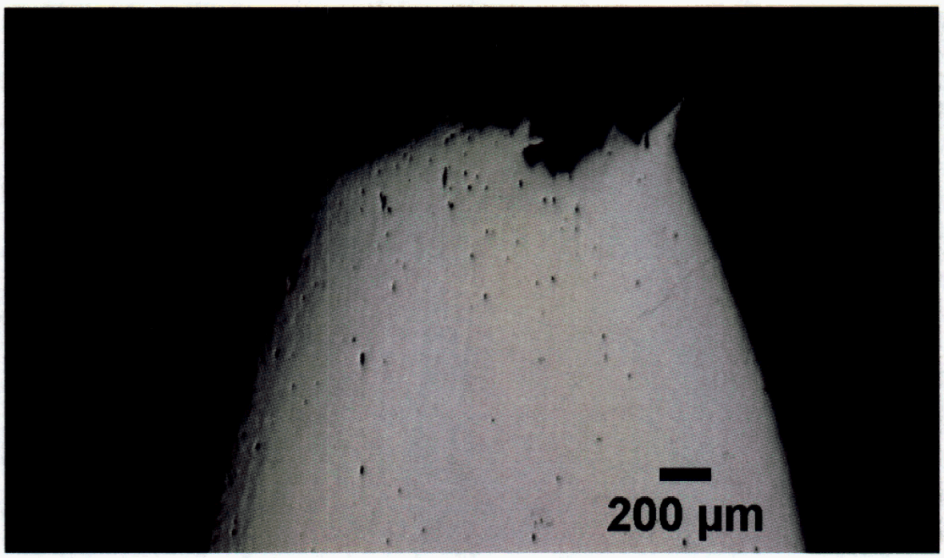


Figure G 90 A post-test micrograph of the cross-section of the specimen from SSRT 30 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, with applied potential of -100mV vs SCE.

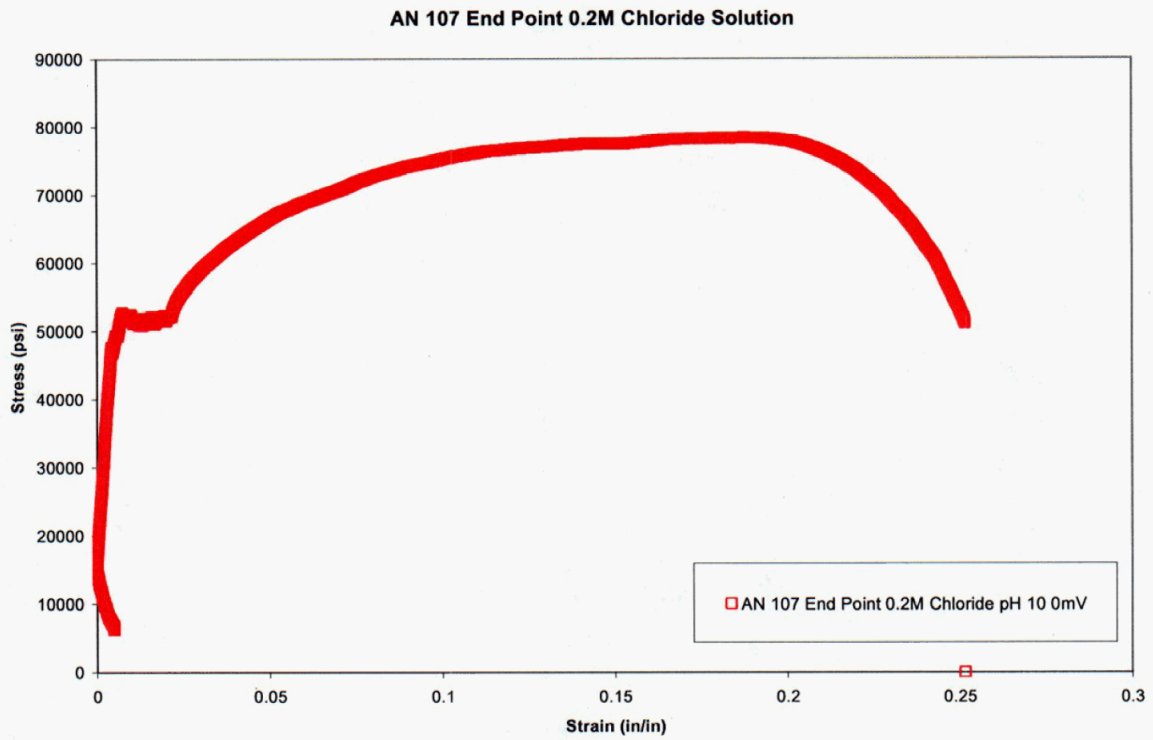


Figure G 91. The stress-strain curve from SSRT 31 performed in Tank 241-AN-107 end point 0.2M chloride solution, pH 10, with applied potential of -100mV vs SCE.

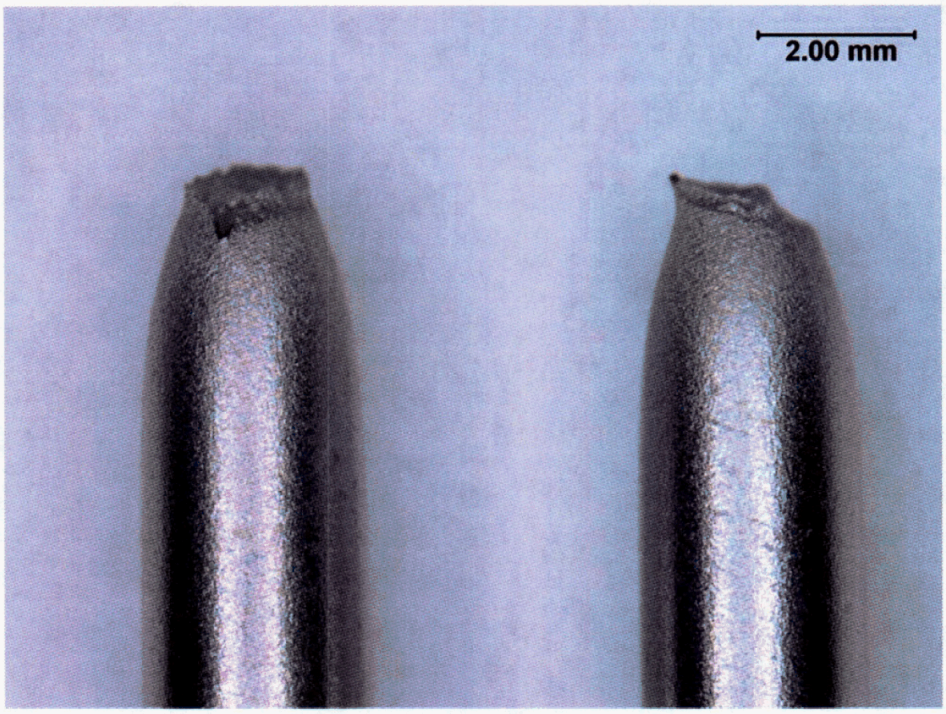


Figure G 92 A post-test photograph of the specimen from SSRT 31 performed in Tank 241-AN-107 end point 0.2M chloride solution, pH 10, with applied potential of -100mV vs SCE.

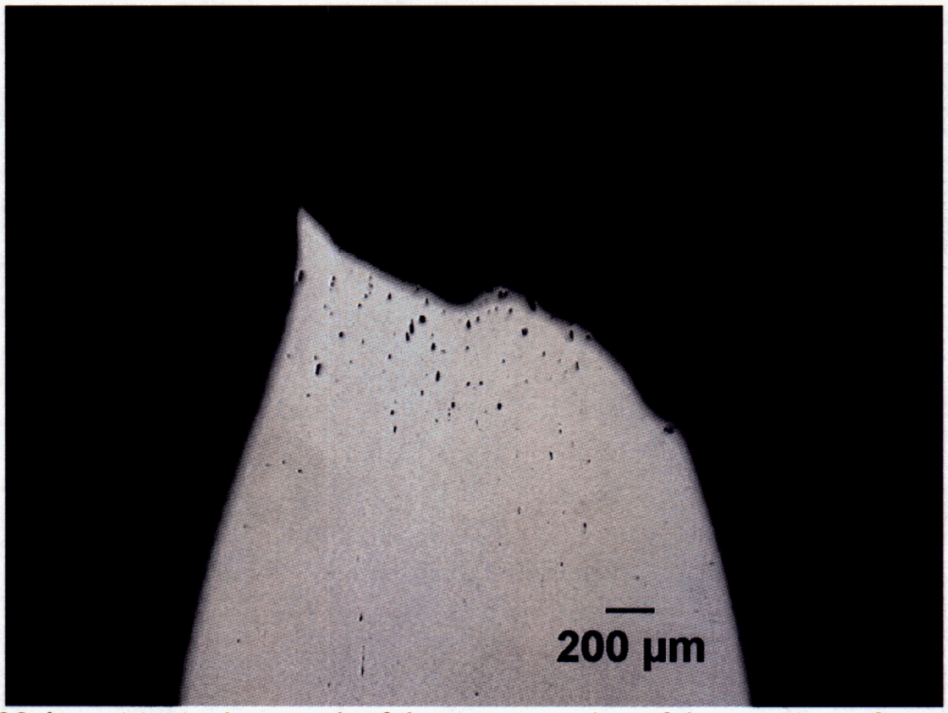


Figure G 93 A post-test micrograph of the cross-section of the specimen from SSRT 31 performed in Tank 241-AN-107 end point 0.2M chloride solution, pH 10, with applied potential of -100mV vs SCE.

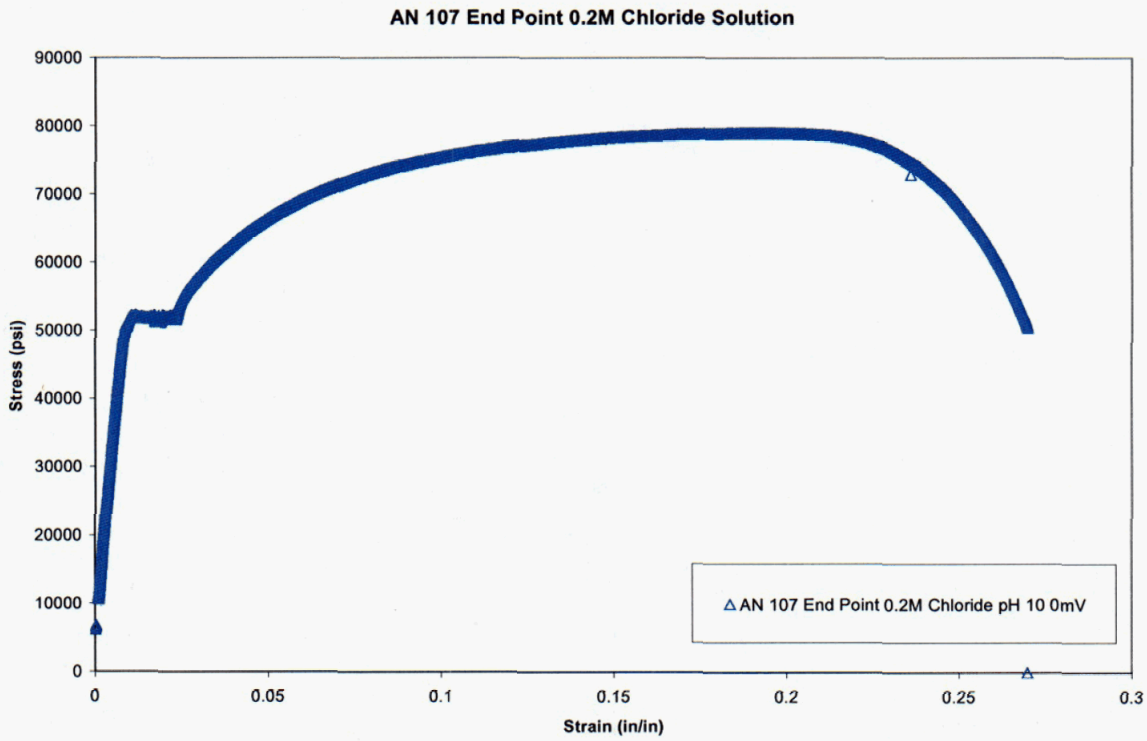


Figure G 94. The stress-strain curve from SSRT 32 performed in Tank 241-AN-107 end point 0.2M chloride solution, pH 10, with applied potential of -100mV vs SCE.

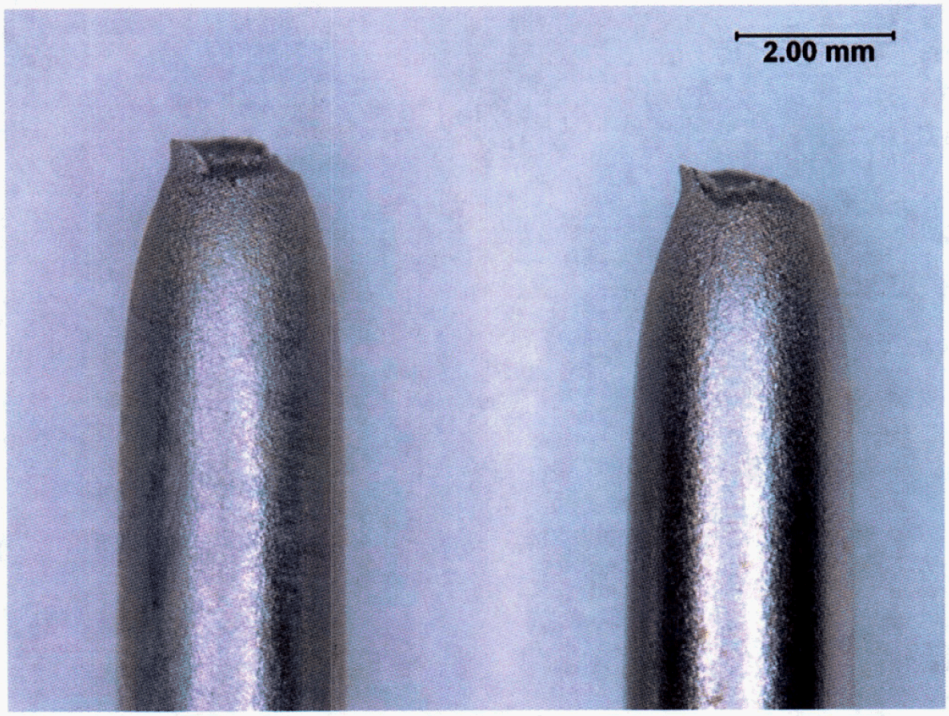


Figure G 95 A post-test photograph of the specimen from SSRT 32 performed in Tank 241-AN-107 end point 0.2M chloride solution, pH 10, with applied potential of -100mV vs SCE.

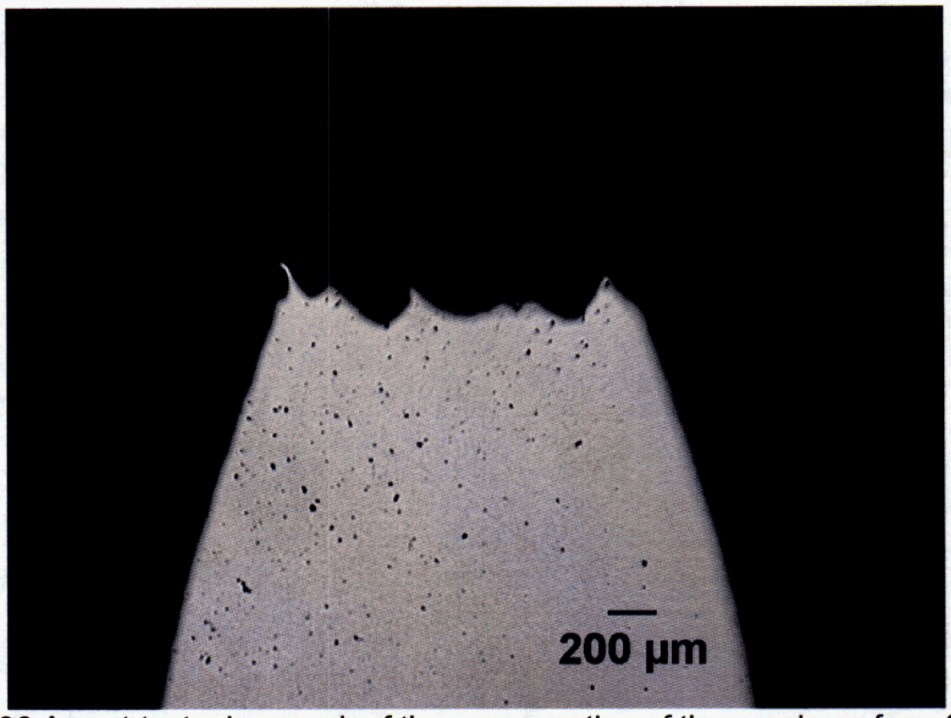


Figure G 96 A post-test micrograph of the cross-section of the specimen from SSRT 32 performed in Tank 241-AN-107 end point 0.2M chloride solution, pH 10, with applied potential of -100mV vs SCE.

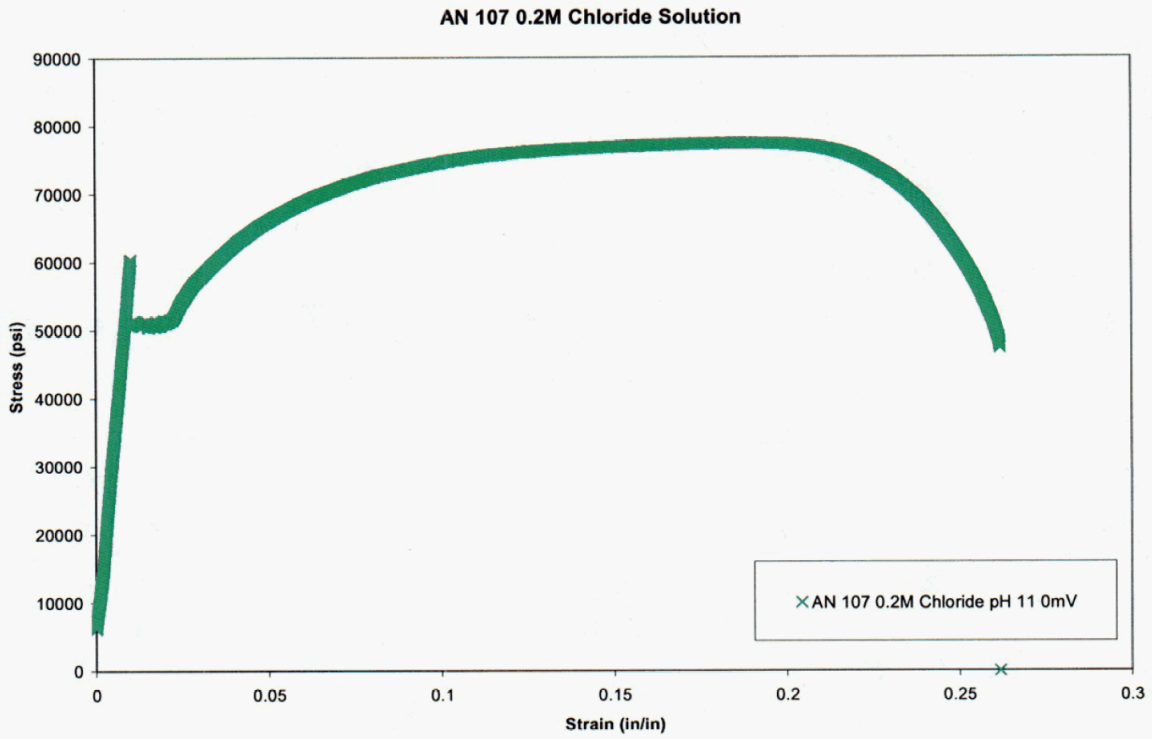


Figure G 97. The stress-strain curve from SSRT 34 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, with applied potential of 0mV vs SCE.

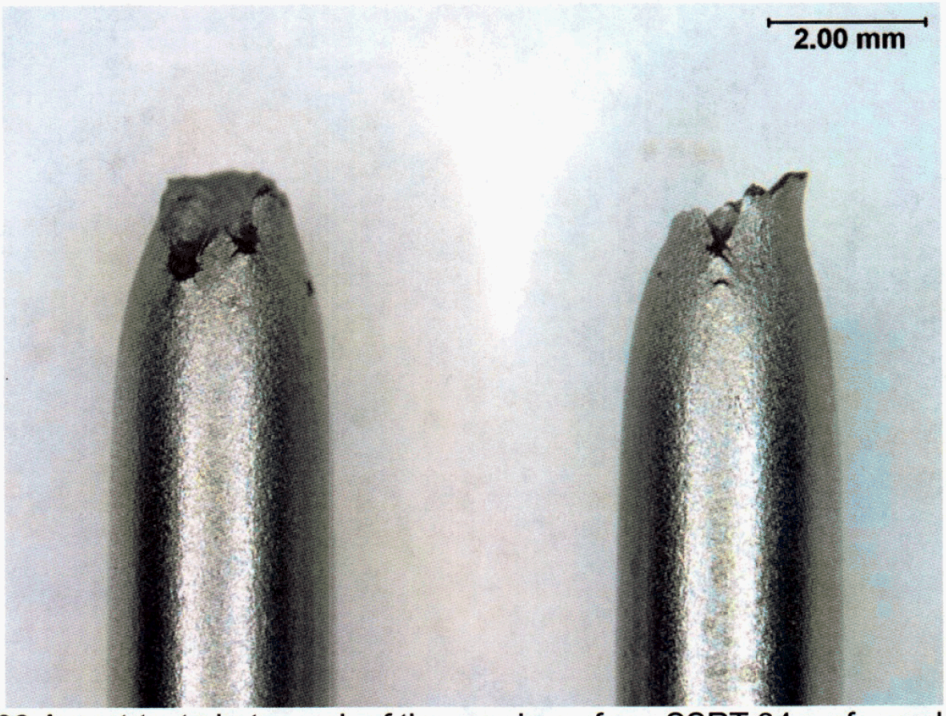


Figure G 98 A post-test photograph of the specimen from SSRT 34 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, with applied potential of 0mV vs SCE.

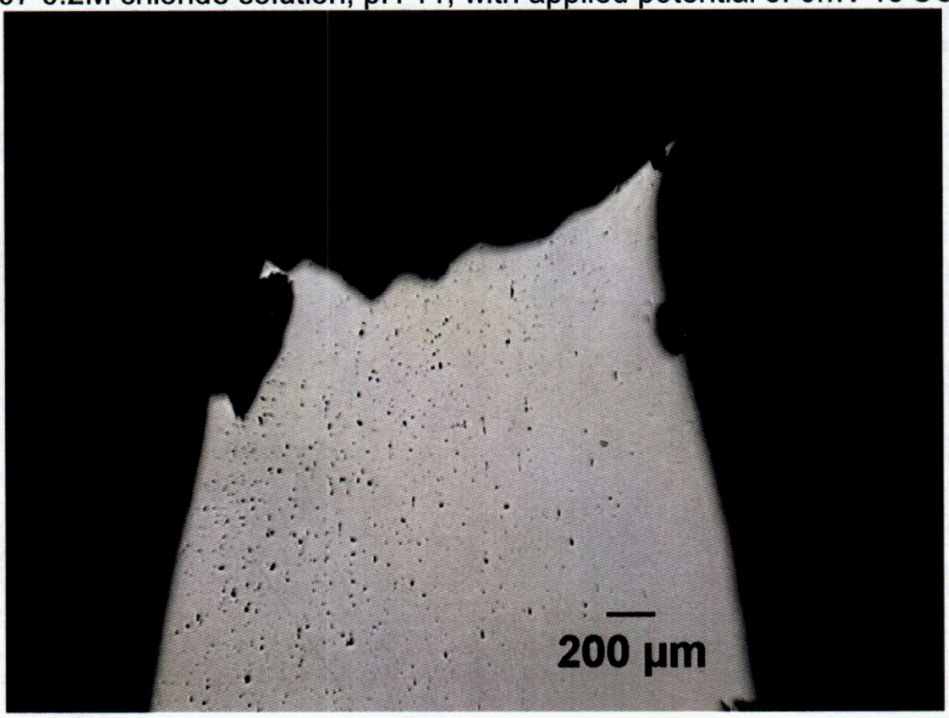


Figure G 99 A post-test micrograph of the cross-section of the specimen from SSRT 34 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, with applied potential of 0mV vs SCE.

Appendix H: Constant Load Crack Growth Rate Testing

Table H 1 Summary of SCC CGR results using PD data beginning on Day 5 to discount initial crack mechanical creep effects.

Chemistry	pH	Applied Stress Intensity (ksi√in)	Applied Potential (mV vs. SCE)	CGR by PD (in/sec)	CGR by Metallographic Total Length (in/sec)	CGR by Metallographic Thru' Sample (in/sec)	CGR by Fracture Plan View (in/sec)	Test ID
Standard Tank 241-AN-107								
Standard	10	5	0	0	0	0	0	Y2-CT-1
Standard	10	10	0	9.9×10^{-11}	1.6×10^{-10}	1.1×10^{-10}	0	Y2 -CT-2
Standard	10	20	0	1.8×10^{-9}	0	0	0	Y2-CT-3
Standard	10	20	0	2.9×10^{-9}	0	0	0	Y2-CT-10
Standard	10	20	0	6.0×10^{-10}	0	0	0	Y2-CT-11
Standard	10	30	0	0	6.8×10^{-10}	2.9×10^{-10}	2.9×10^{-10}	Y2-CT-4
Standard	10	30	0	2.7×10^{-10}	0	0	0	Y2-CT-12
Standard	10	30	0	9.7×10^{-10}	0	0	0	Y2-CT-13
Standard	10	40	0	2.6×10^{-9}	3.0×10^{-9}	2.1×10^{-9}	1.8×10^{-9}	Y2-CT-5
Standard	10	20	-100	1.8×10^{-9}	0	0	0	Y2-CT-18
Standard	10	20	-100	7.1×10^{-10}	0	0	0	Y2-CT-20
Standard	11	20	0	3.5×10^{-10}	0	0	0	Y2-CT-21
Standard	11	20	0	0	1.7×10^{-9}	1.5×10^{-9}	0	Y2-CT-22
Standard 0.2M Chloride	11	20	0	0	4.4×10^{-10}	3.1×10^{-10}	1.1×10^{-9}	Y2-CT-19
End point Tank 241-AN-107								
End Point	10	20	0	0	0	0	0	Y2-CT-16
End Point	10	20	0	0	0	0	0	Y2-CT-23
End Point	10	40	0	9.4×10^{-10}	0	0	0	Y2-CT-9
End Point	10	40	0	0	0	0	0	Y2-CT-14
End Point	10	40	OCP	0	0	0	0	Y2-CT-7
End Point 0.2M chloride	10	20	0	6.9×10^{-10}	0	0	0	Y2-CT-17
End Point 0.2M chloride	10	40	0	~ 0	0	0	0	Y2-CT-15
5M $NaNO_3$								
5M $NaNO_3$	-	40	0	2.9×10^{-8}	3.2×10^{-8}	3.1×10^{-8}	3.3×10^{-8}	Y2-CT-8
5M $NaNO_3$	-	40	OCP	5.1×10^{-8}	4.5×10^{-8}	4.1×10^{-8}	4.2×10^{-8}	Y2-CT-6

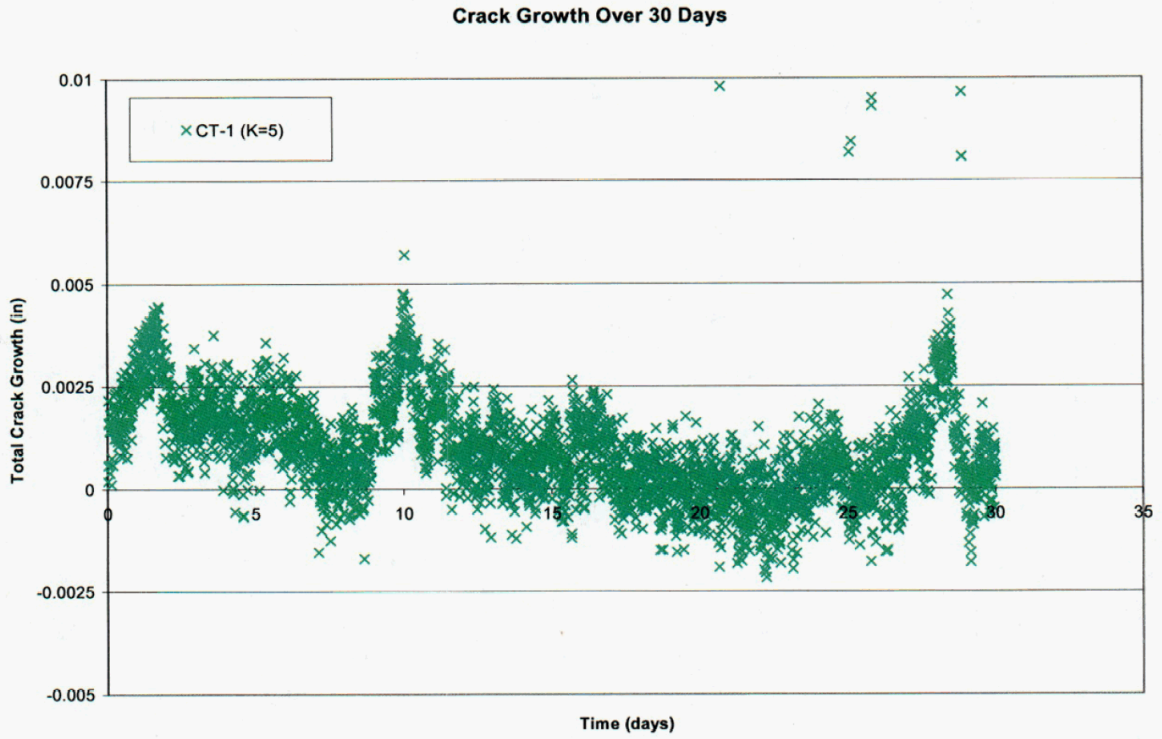


Figure H 1 The crack extension-time curve from CT 1 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 5ksi√in, with applied potential of 0mV vs SCE.

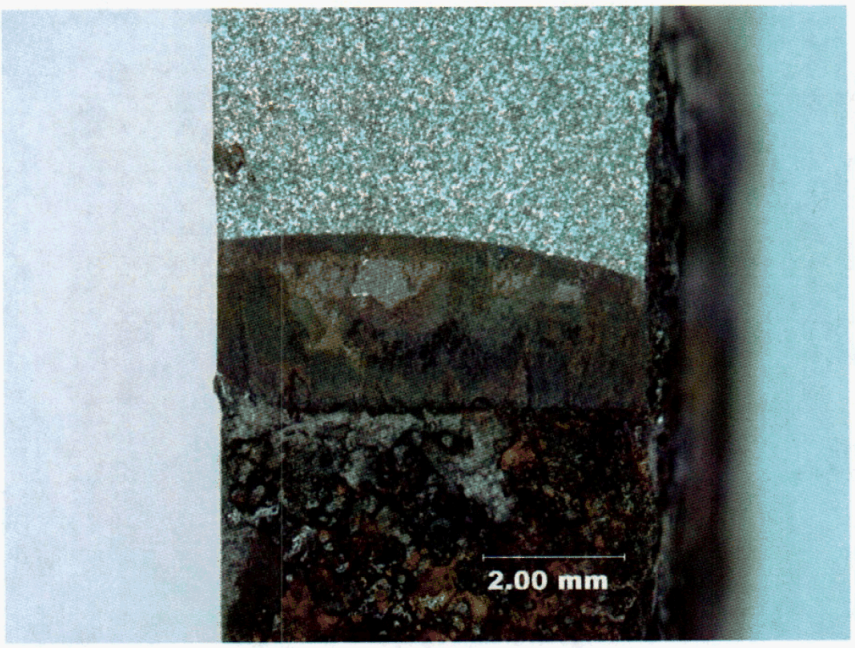


Figure H 2 A post-test photograph of the fracture surface from CT 1 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 5ksi√in, with applied potential of 0mV vs SCE.

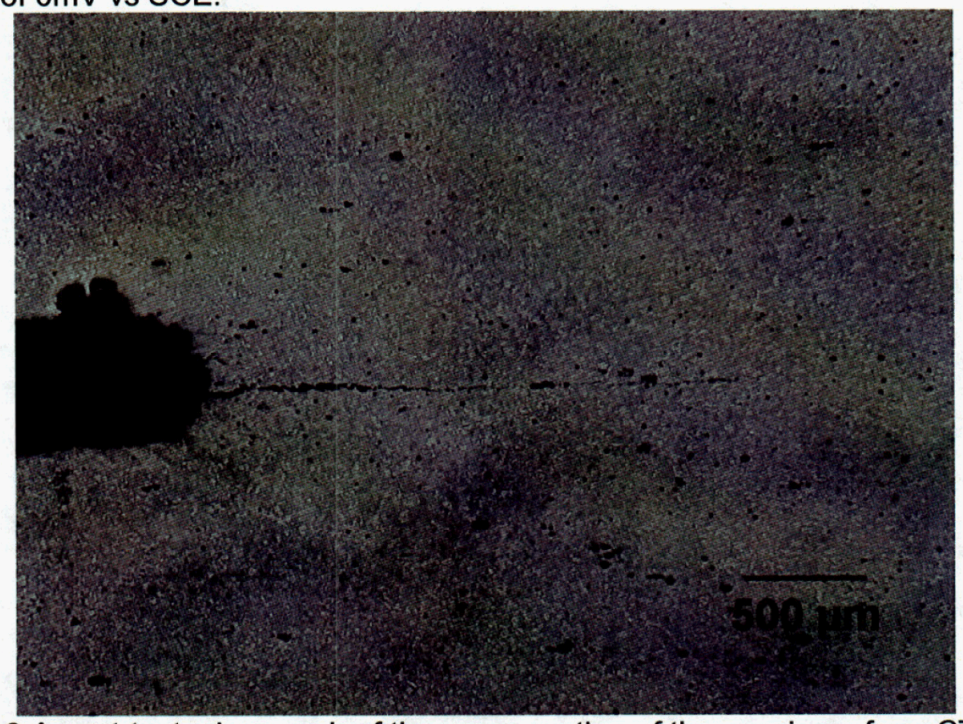


Figure H 3 A post-test micrograph of the cross-section of the specimen from CT 1 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 5ksi√in, with applied potential of 0mV vs SCE.

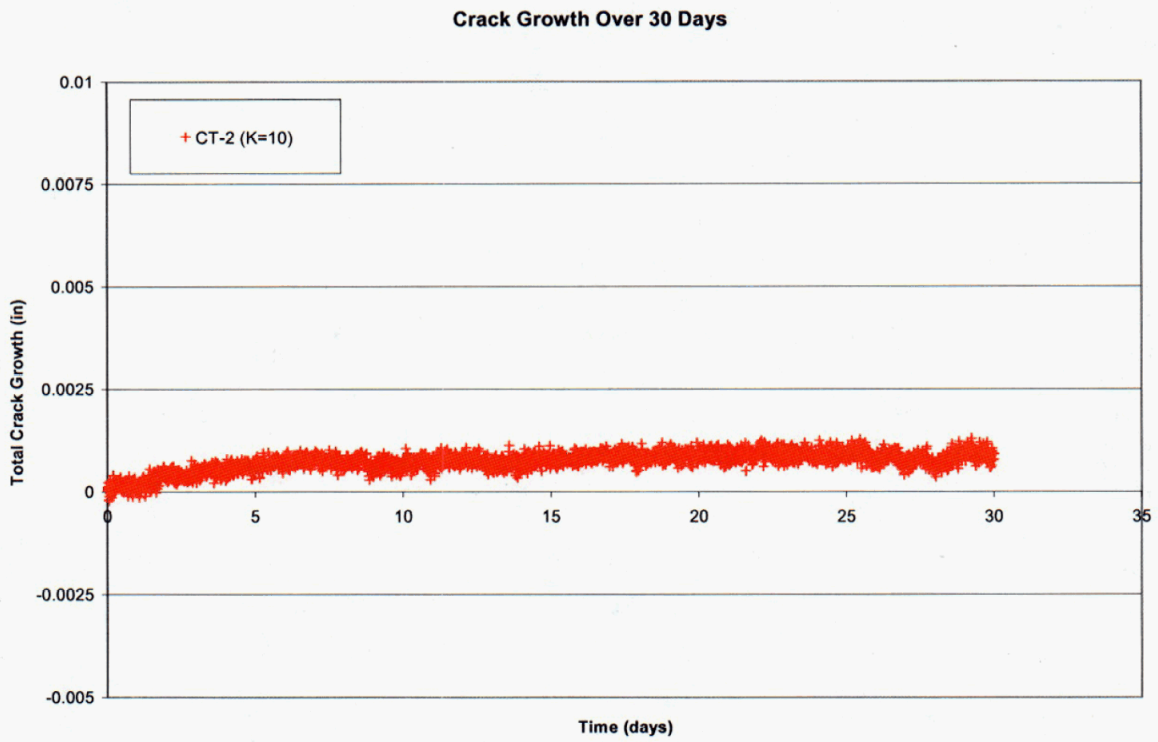


Figure H 4 The crack extension-time curve from CT 2 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 10ksi√in, with applied potential of 0mV vs SCE.

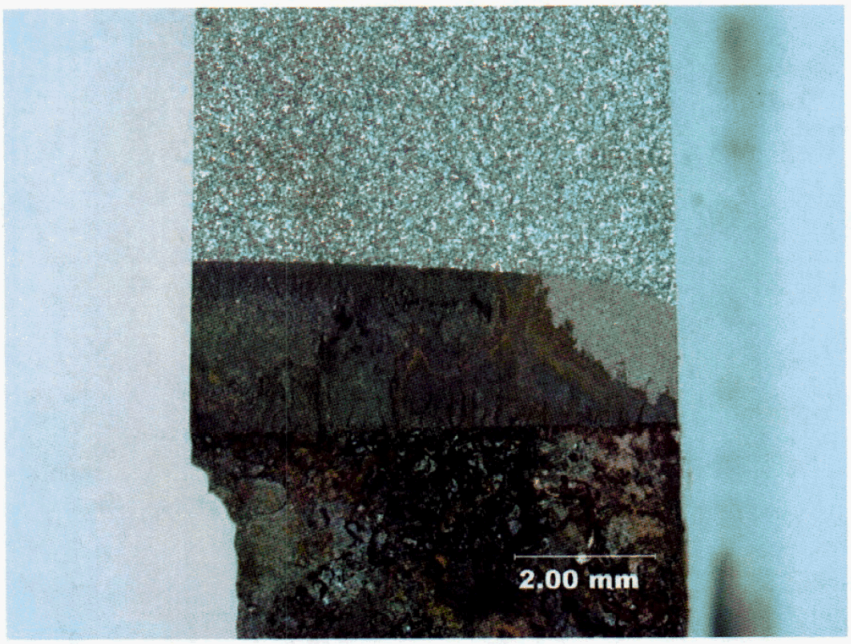


Figure H 5 A post-test photograph of the fracture surface from CT 2 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 10ksi√in, with applied potential of 0mV vs SCE.

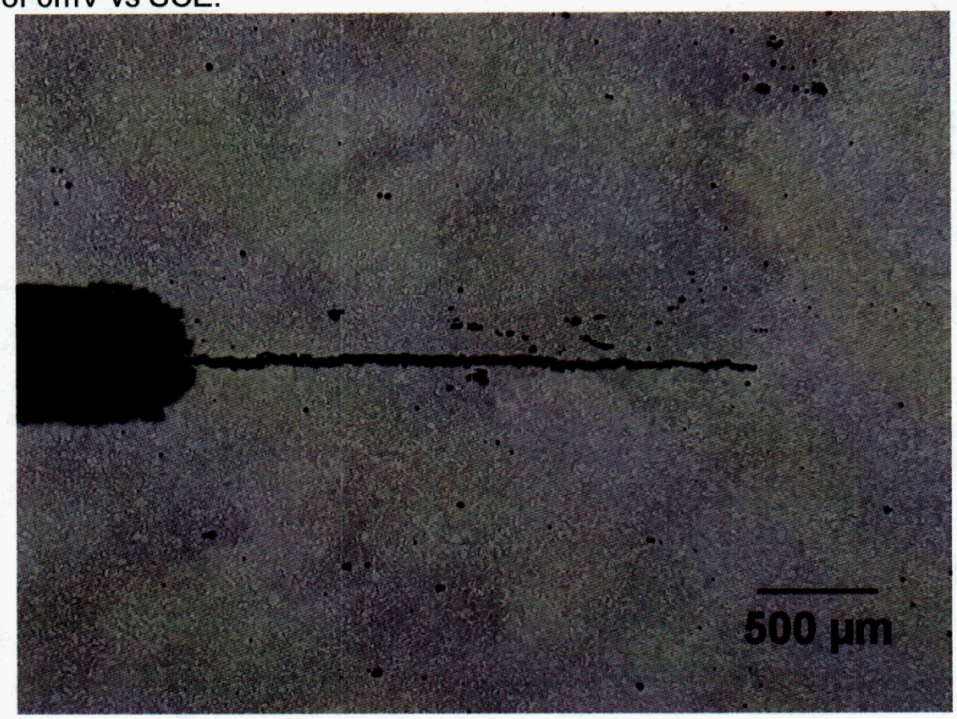


Figure H 6 A post-test micrograph of the cross-section of the specimen from CT 2 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 10ksi√in, with applied potential of 0mV vs SCE.

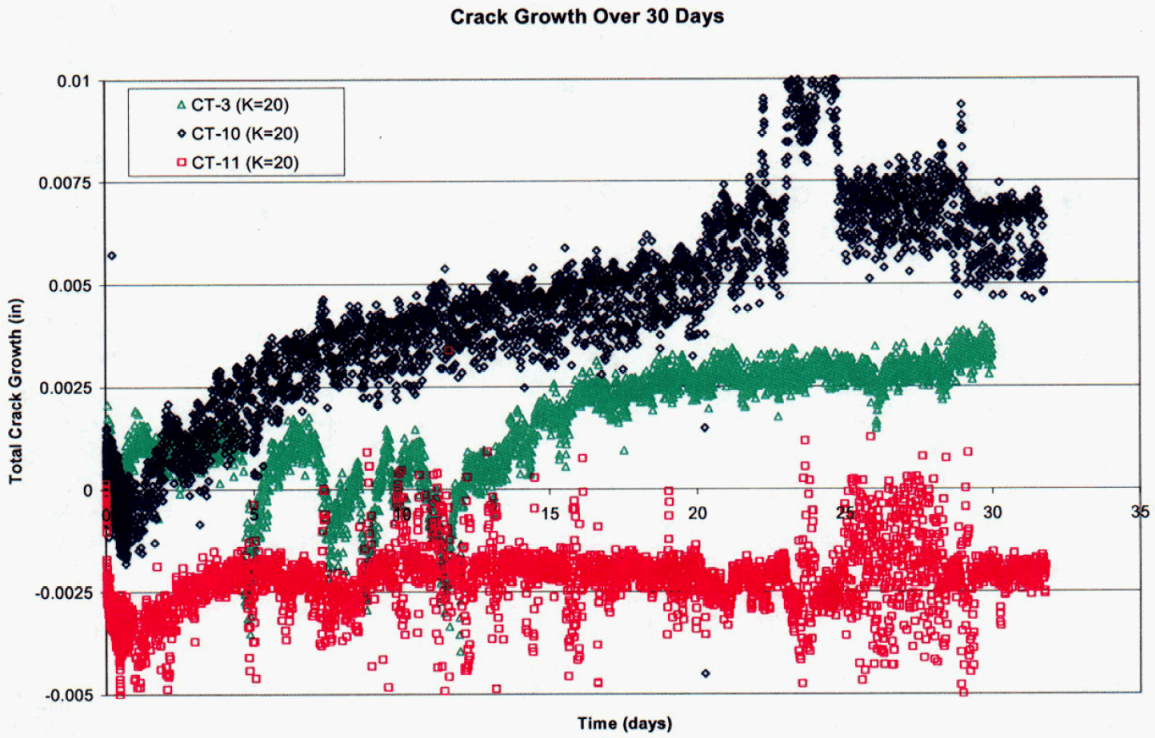


Figure H 7 The crack extension-time curve from CTs 3, 10 and 11 (replicates) performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

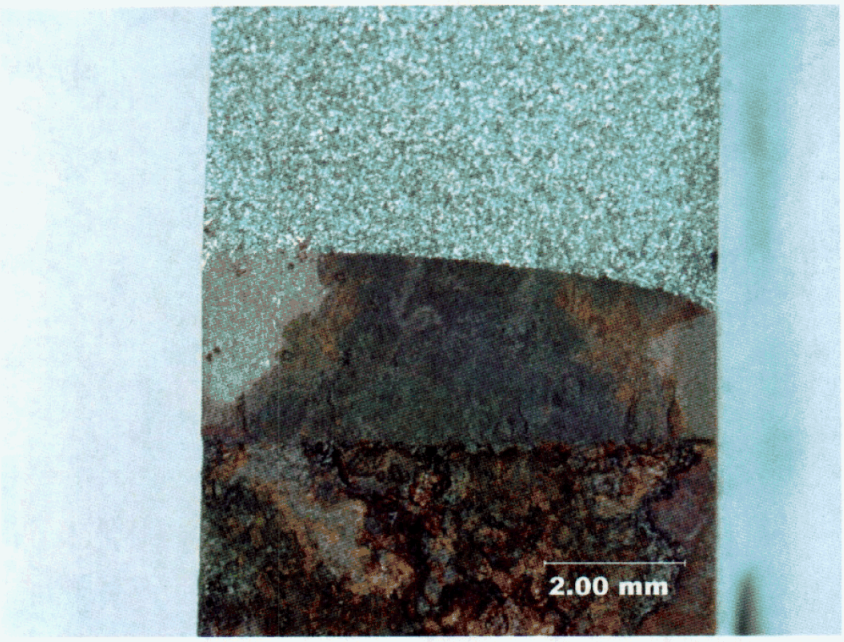


Figure H 8 A post-test photograph of the fracture surface from CT 3 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

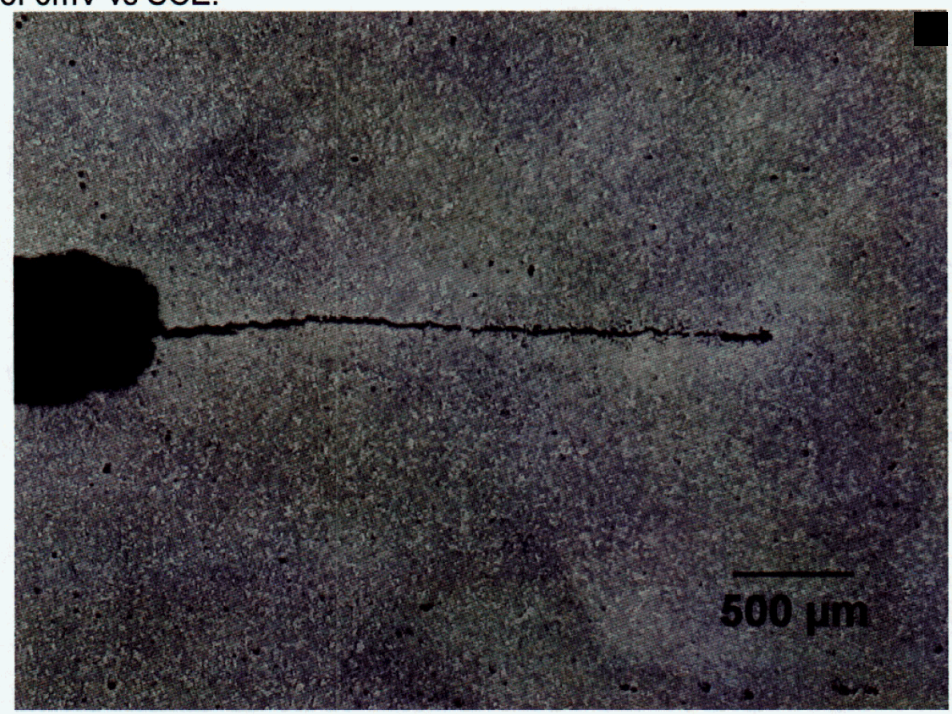


Figure H 9 A post-test micrograph of the cross-section of the specimen from CT 3 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

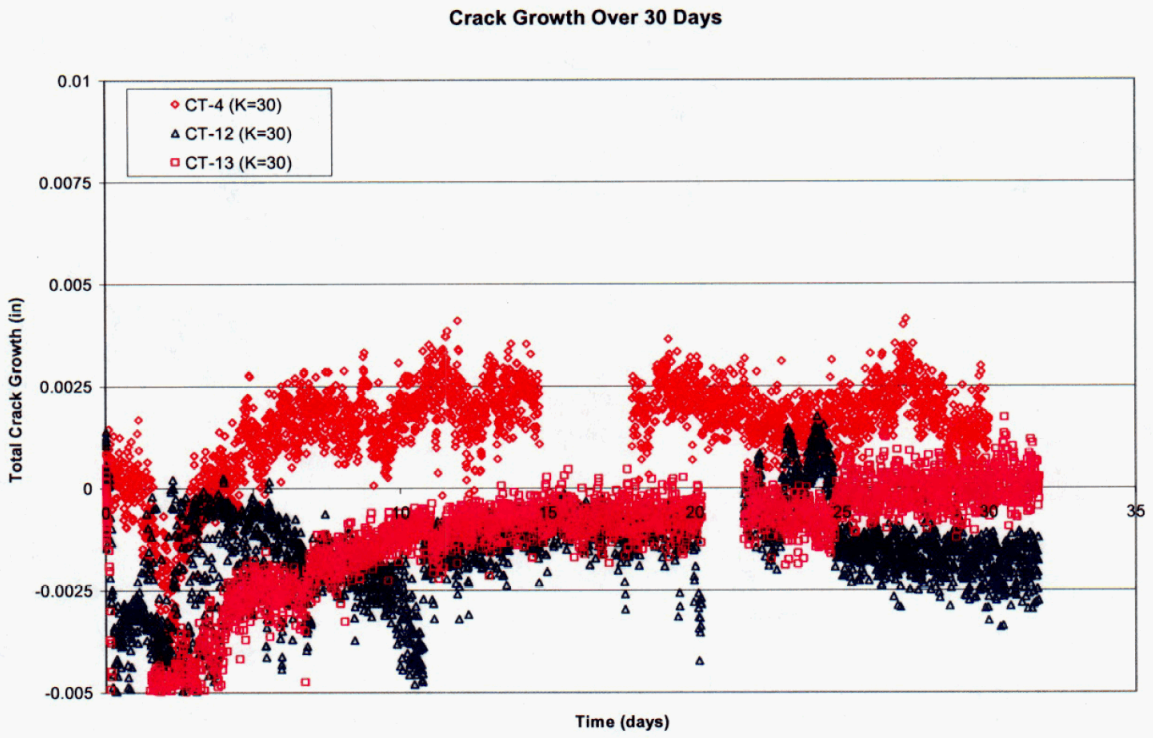


Figure H 10 The crack extension-time curves from CTs 4, 12 and 13 (replicates) performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 30ksi√in, with applied potential of 0mV vs SCE.

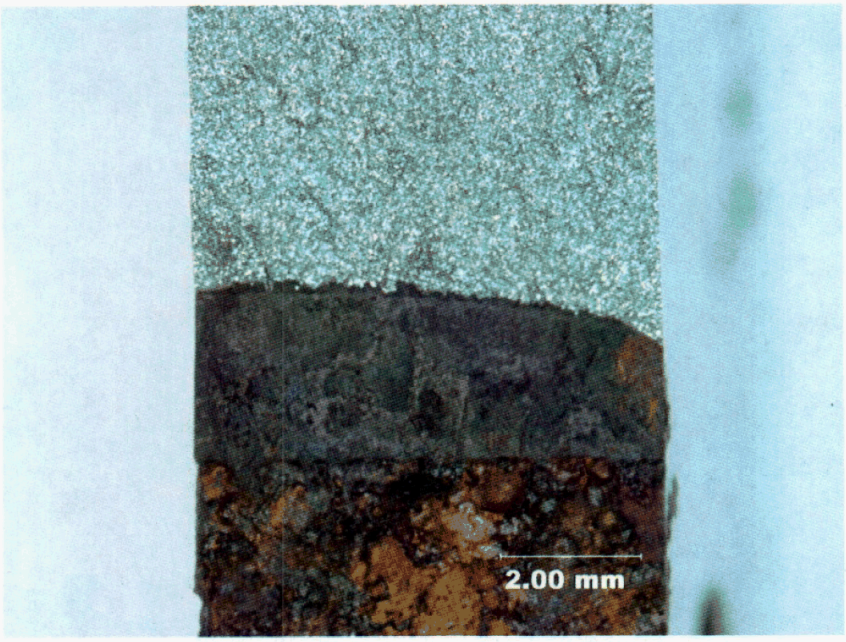


Figure H 11 A post-test photograph of the fracture surface from CT 4 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 30ksi√in, with applied potential of 0mV vs SCE.

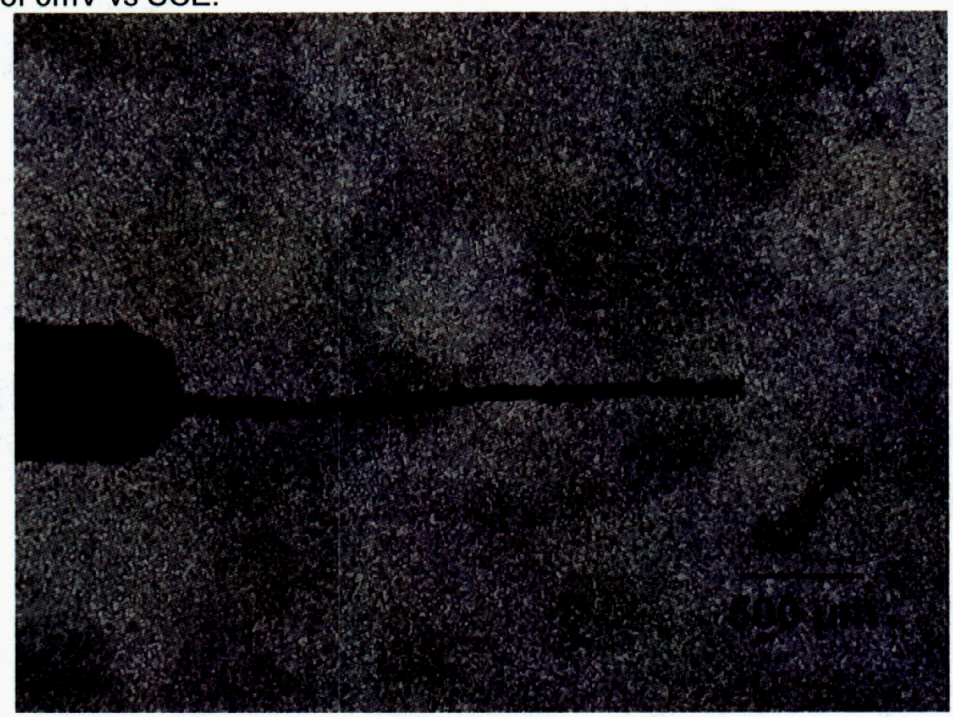


Figure H 12 A post-test micrograph of the cross-section of the specimen from CT4 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 30ksi√in, with applied potential of 0mV vs SCE.

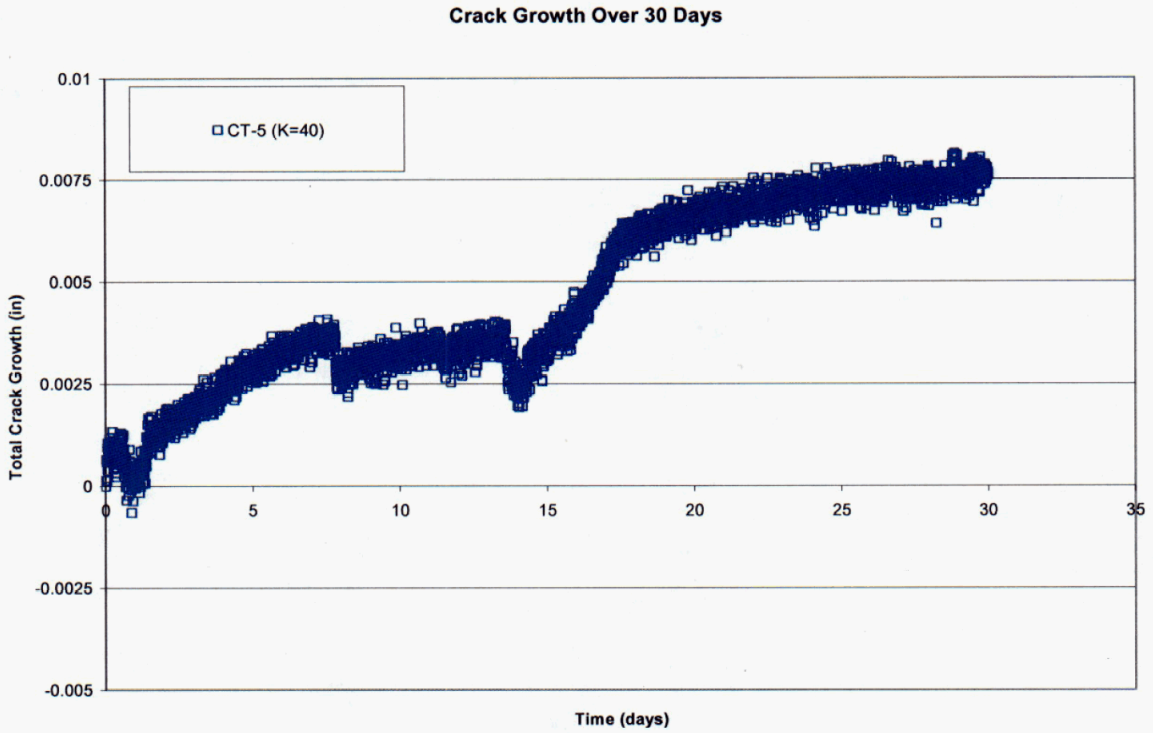


Figure H 13 The crack extension-time curve from CT 5 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 40ksi√in, with applied potential of 0mV vs SCE.

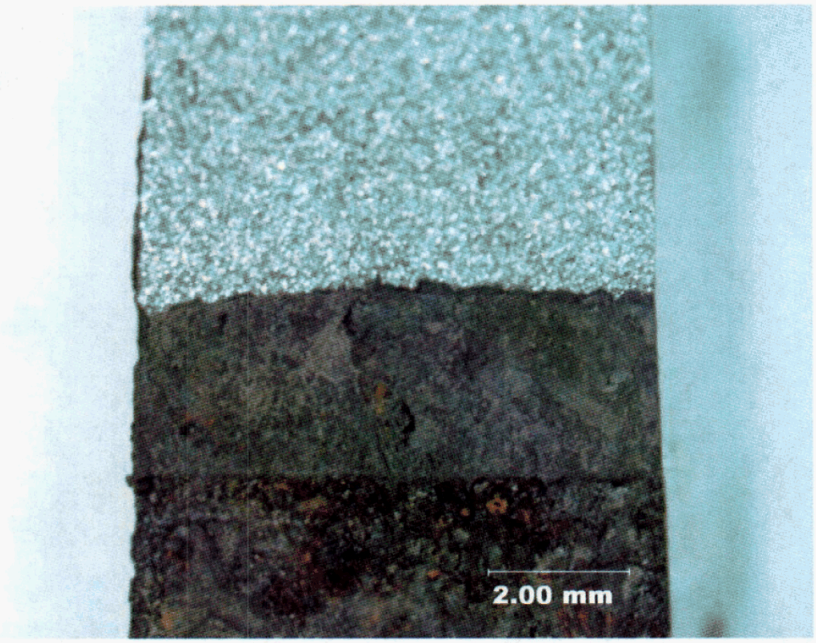


Figure H 14 A post-test photograph of the fracture surface from CT 5 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 40ksi√in, with applied potential of 0mV vs SCE.

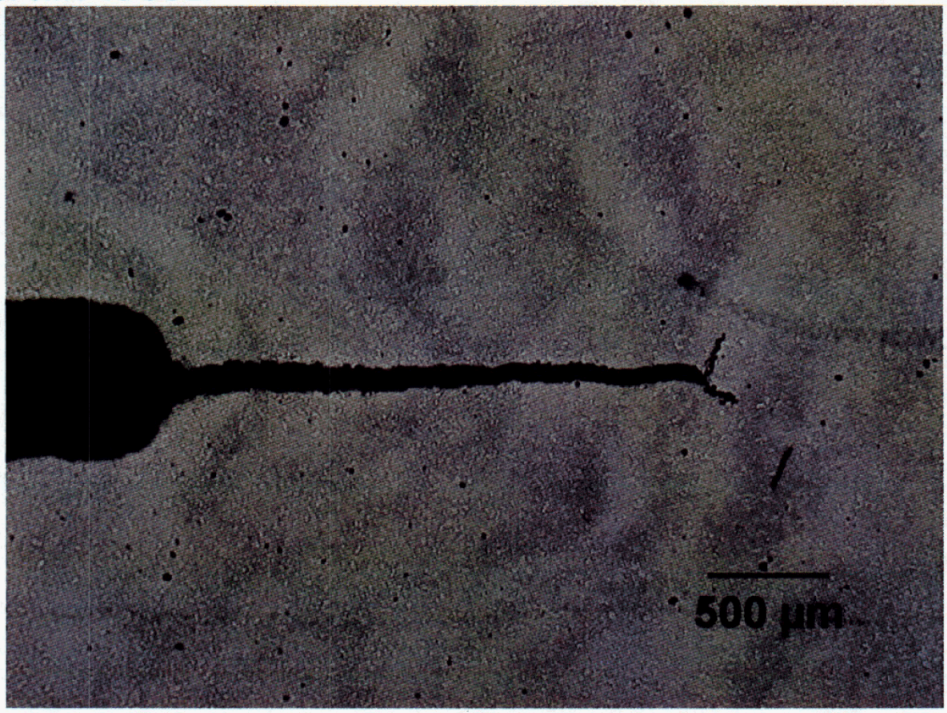


Figure H 15 A post-test micrograph of the cross-section of the specimen from CT 5 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 40ksi√in, with applied potential of 0mV vs SCE.

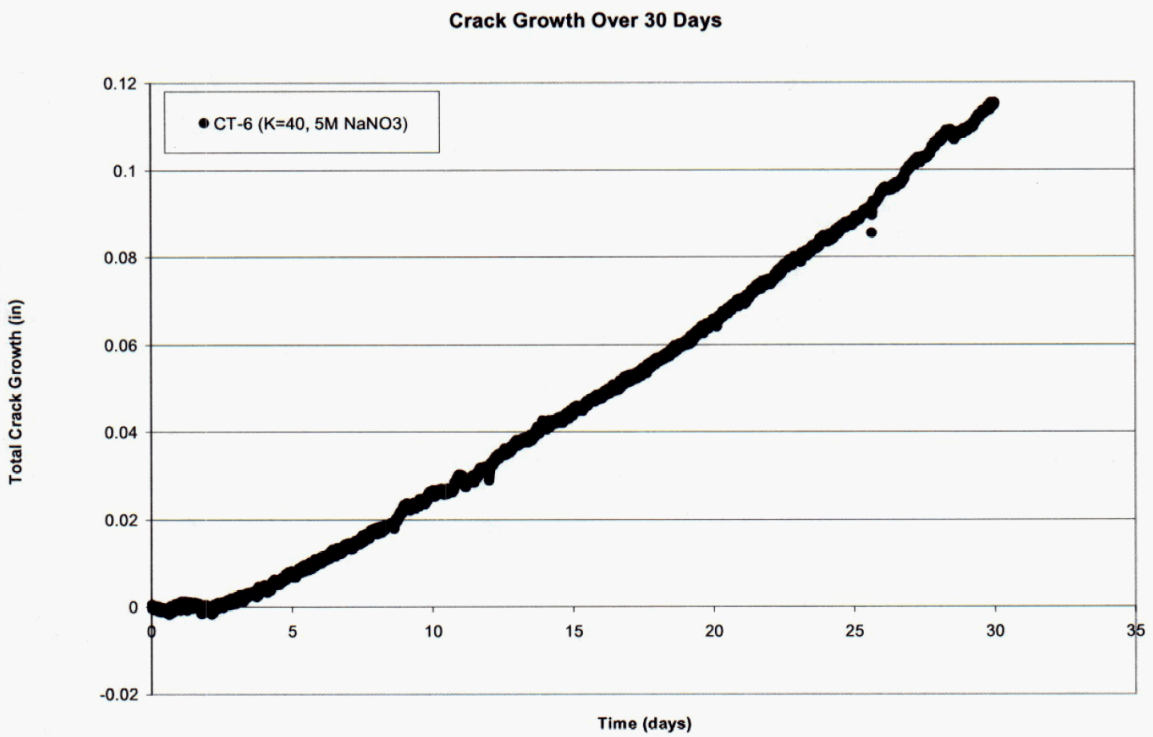


Figure H 16 The crack extension-time curve from CT 6 performed in 5M $NaNO_3$ solution, applied stress intensity of 40ksi$\sqrt{in}$, at OCP.

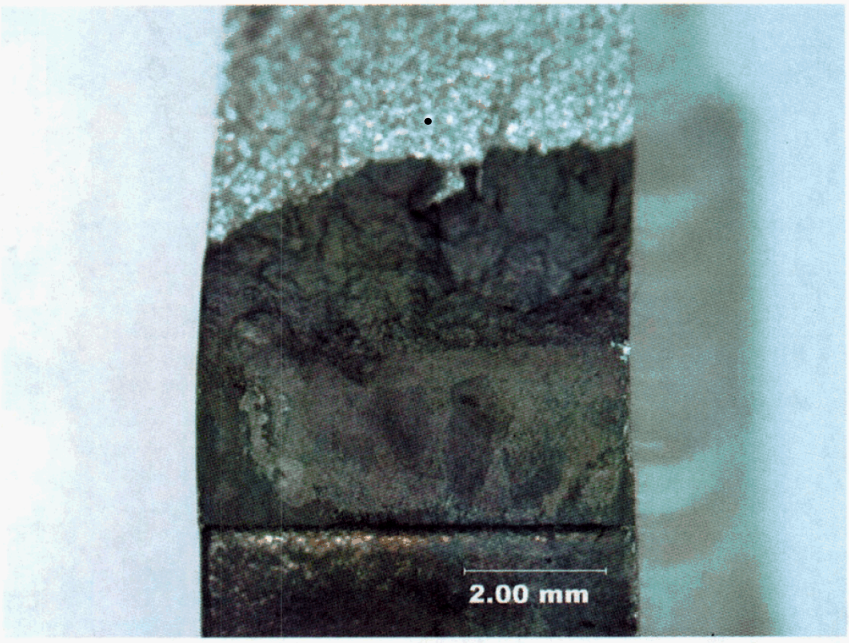


Figure H 17 A post-test photograph of the fracture surface from CT 6 performed in 5M $NaNO_3$ solution, applied stress intensity of 40ksi$\sqrt{in}$, at OCP.

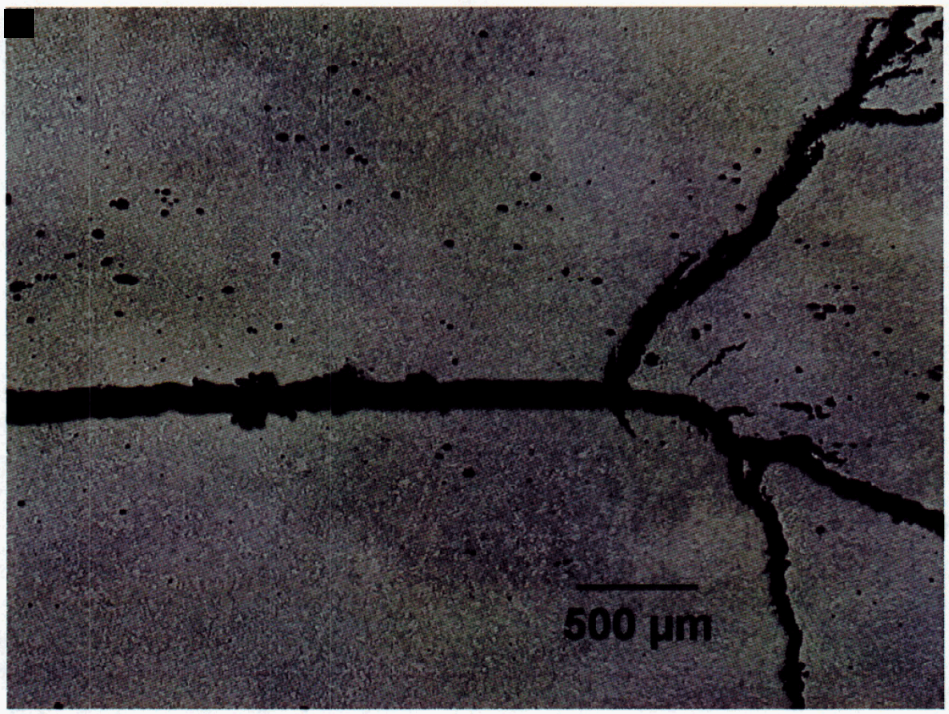


Figure H 18 A post-test micrograph of the cross-section of the specimen from CT 6 performed in 5M $NaNO_3$ solution, applied stress intensity of 40ksi$\sqrt{in}$, at OCP.

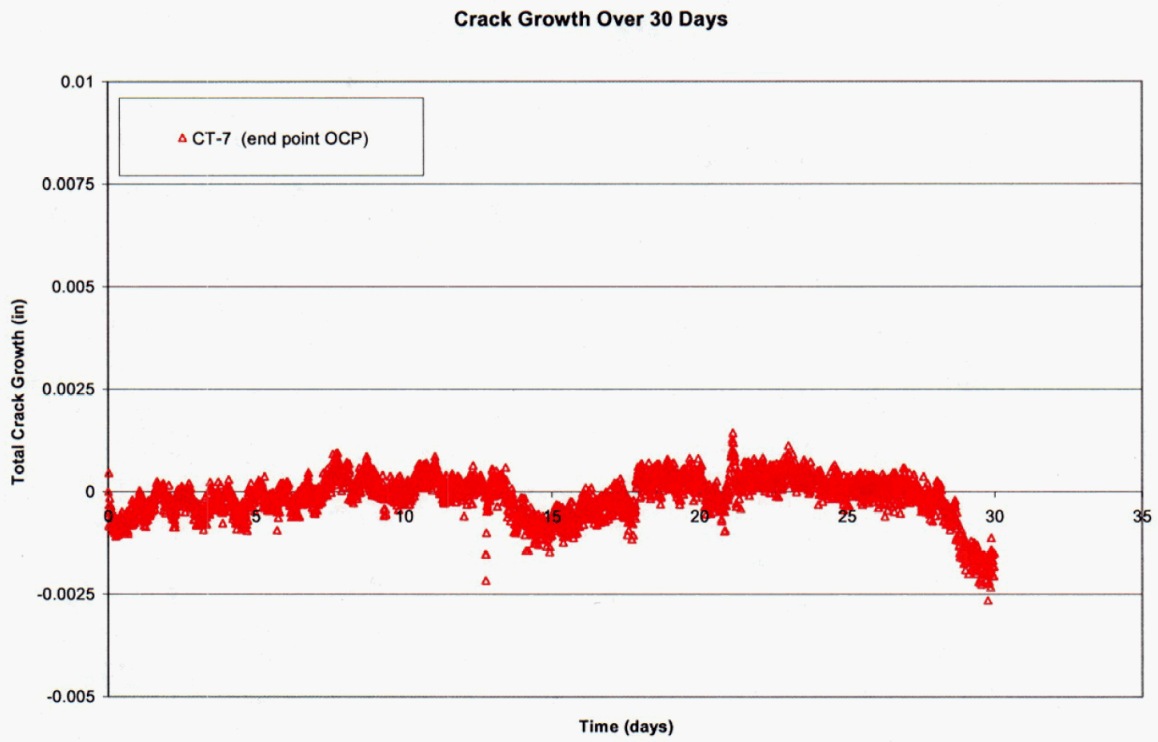


Figure H 19 The crack extension-time curve from CT 7 performed in Tank 241-AN-107 end point solution, pH 10, applied stress intensity of 40ksi√in, at OCP.

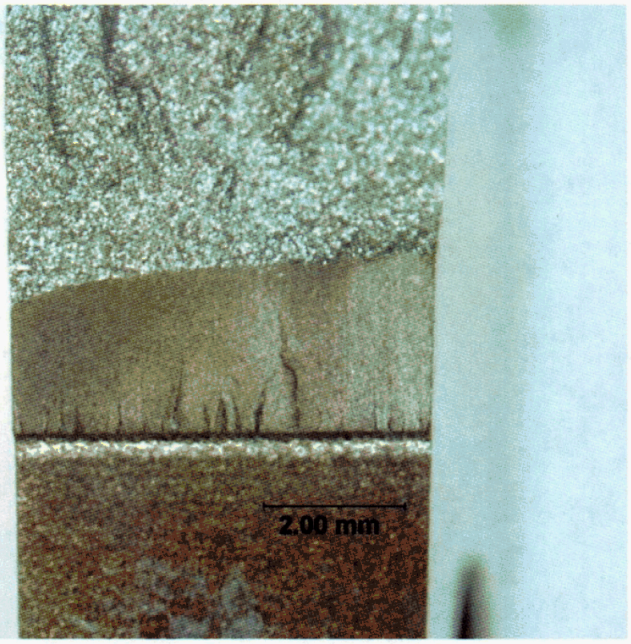


Figure H 20 A post-test photograph of the fracture surface from CT 7 performed in Tank 241-AN-107 end point solution, pH 10, applied stress intensity of 40ksi√in, at OCP.

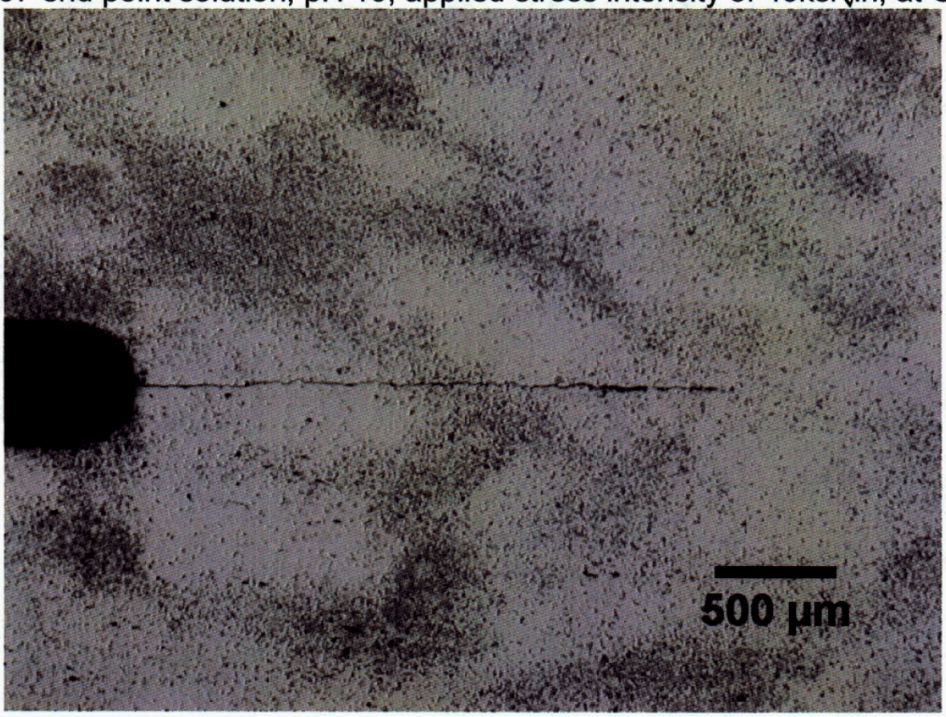


Figure H 21 A post-test micrograph of the cross-section of the specimen from CT 7 performed in Tank 241-AN-107 end point solution, pH 10, applied stress intensity of 40ksi√in, at OCP.

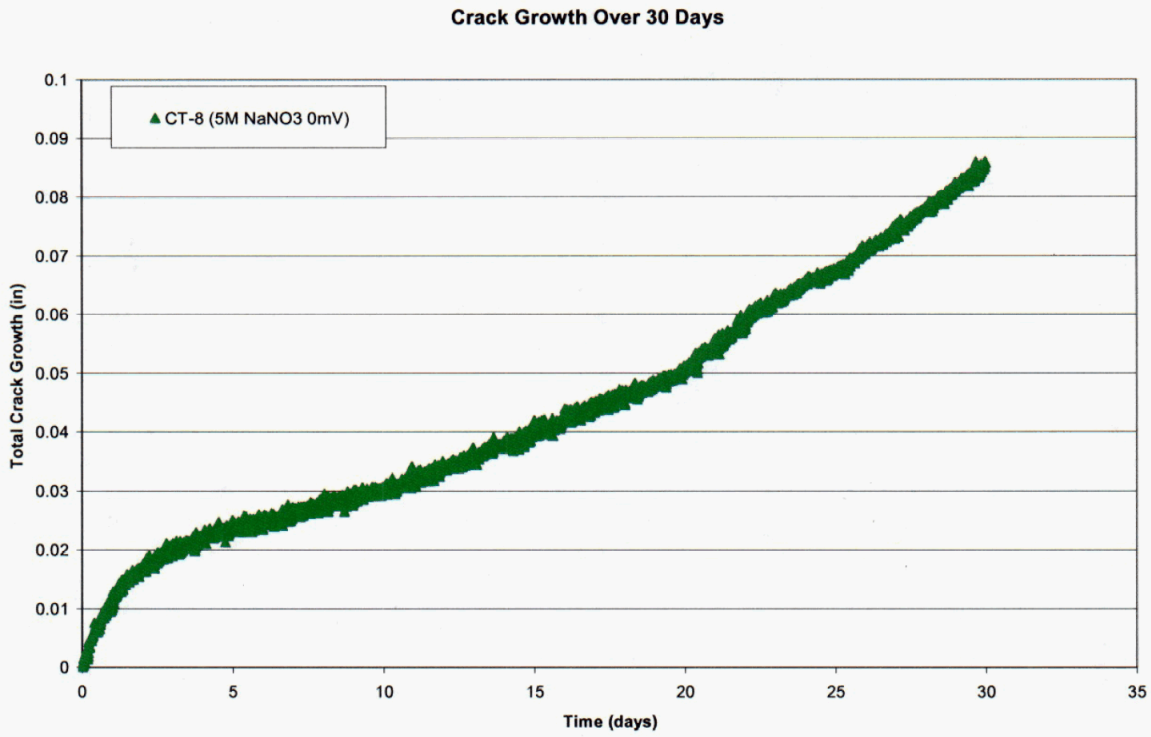


Figure H 22 The crack extension-time curve from CT 8 performed in 5M $NaNO_3$ solution, applied stress intensity of 40ksi$\sqrt{in}$, with applied potential of 0mV vs SCE.

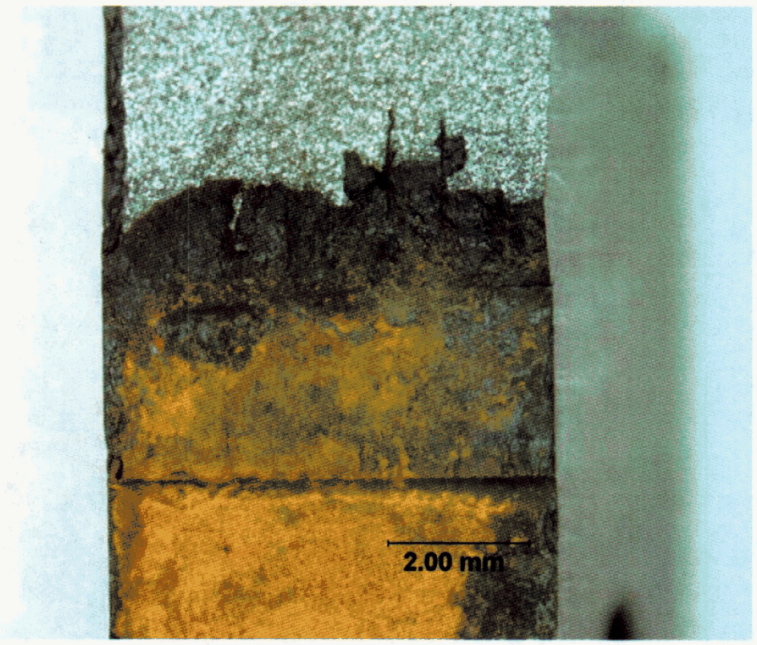


Figure H 23 A post-test photograph of the fracture surface from CT 8 performed in 5M $NaNO_3$ solution, applied stress intensity of 40ksi$\sqrt{in}$, with applied potential of 0mV vs SCE.

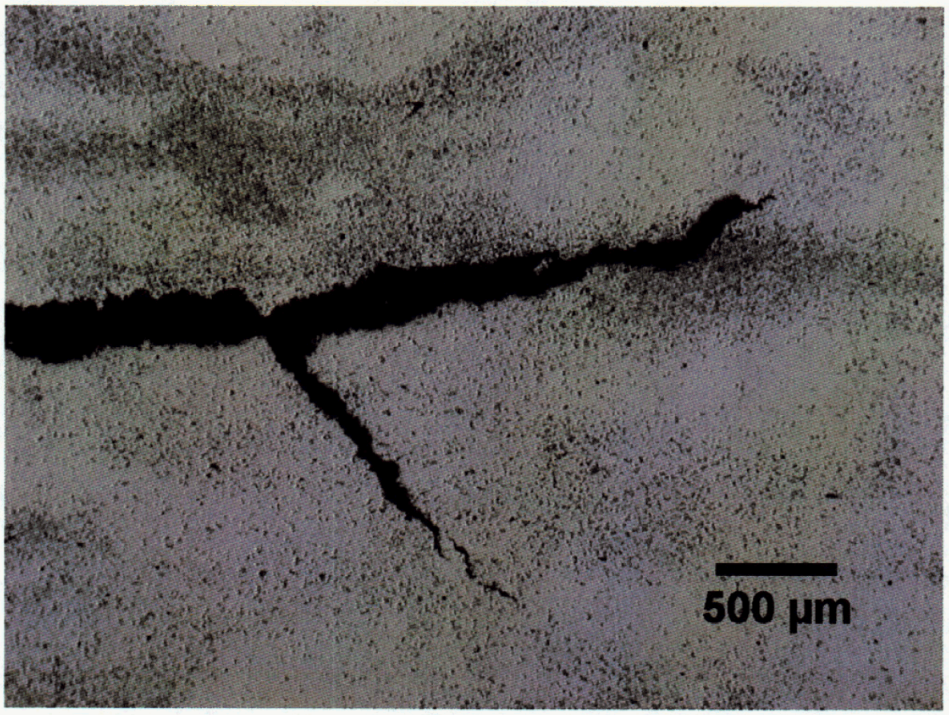


Figure H 24 A post-test micrograph of the cross-section of the specimen from CT 8 performed in 5M $NaNO_3$ solution, applied stress intensity of 40ksi$\sqrt{in}$, with applied potential of 0mV vs SCE.

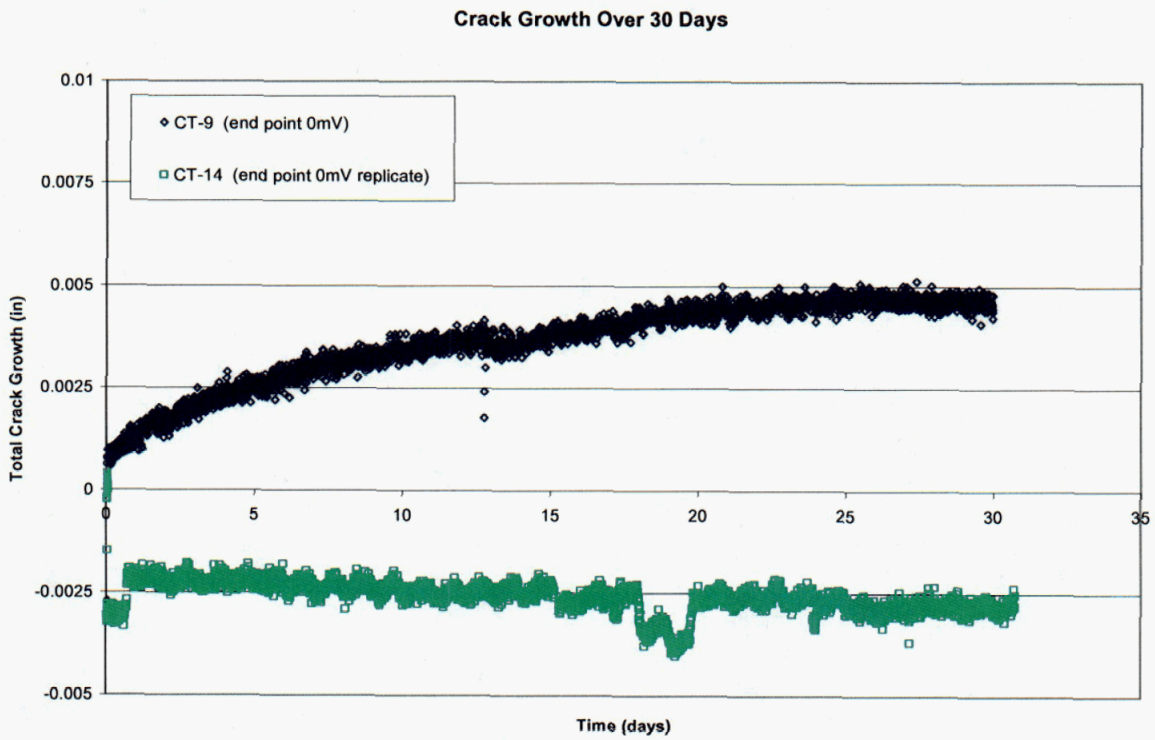


Figure H 25 The crack extension-time curve from CT 9 performed in Tank 241-AN-107 end point solution, pH 10, applied stress intensity of 40ksi$\sqrt{in}$, with applied potential of 0mV vs SCE.

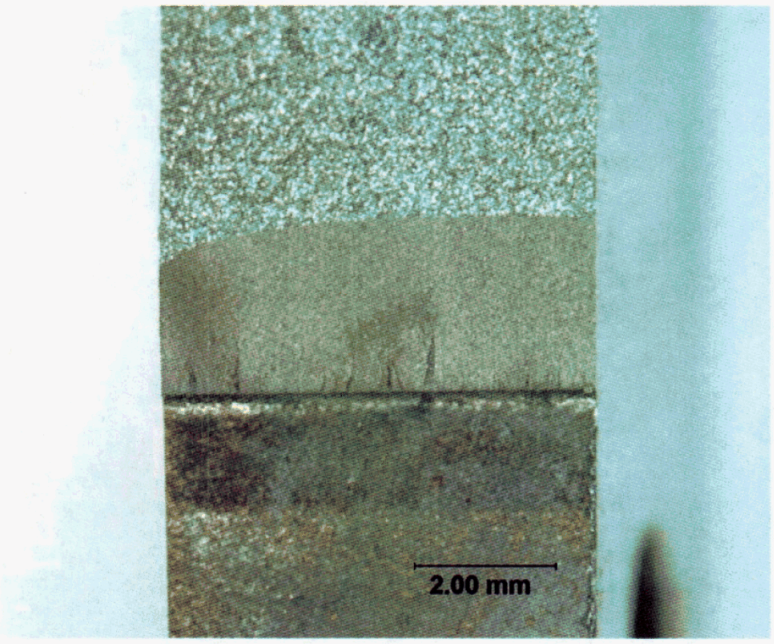


Figure H 26 A post-test photograph of the fracture surface from CT 9 performed in Tank 241-AN-107 end point solution, pH 10, applied stress intensity of 40ksi√in, with applied potential of 0mV vs SCE.

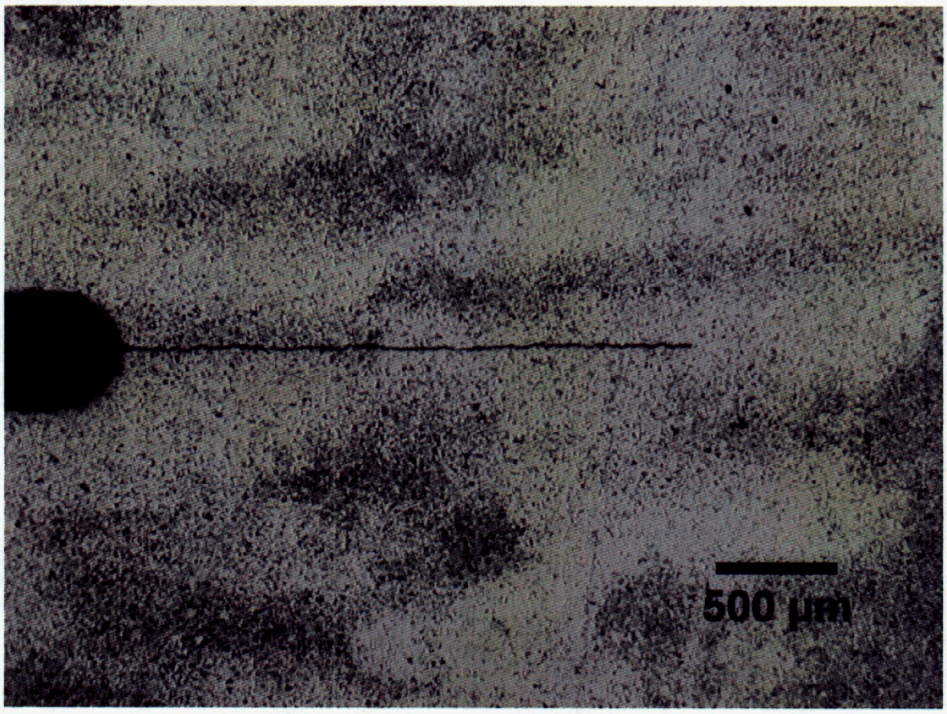


Figure H 27 A post-test micrograph of the cross-section of the specimen from CT 9 performed in Tank 241-AN-107 end point solution, pH 10, applied stress intensity of 40ksi√in, with applied potential of 0mV vs SCE.

For a plot of the crack extension – time curve for CT 10 refer to Figure H7.

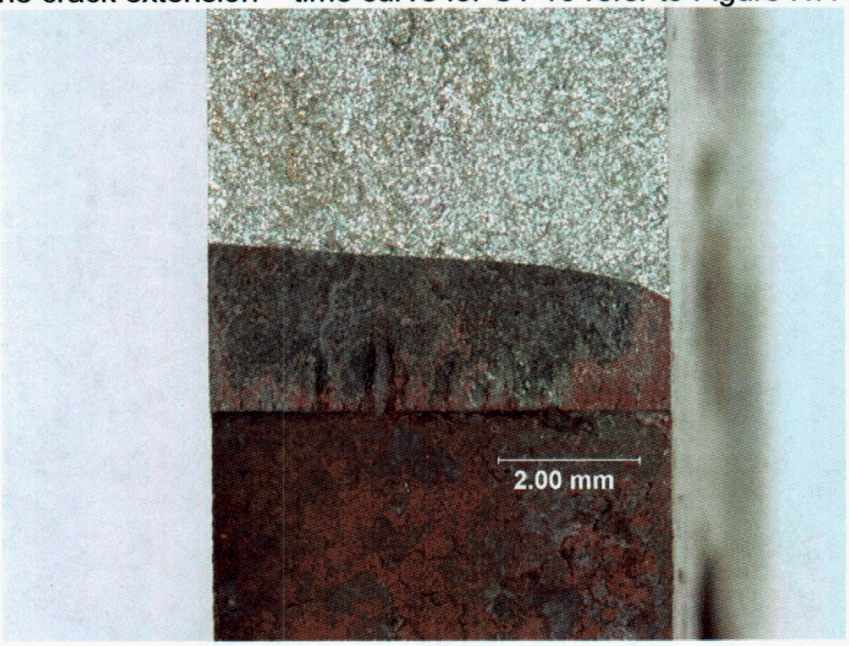


Figure H 28 A post-test photograph of the fracture surface from CT 10 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

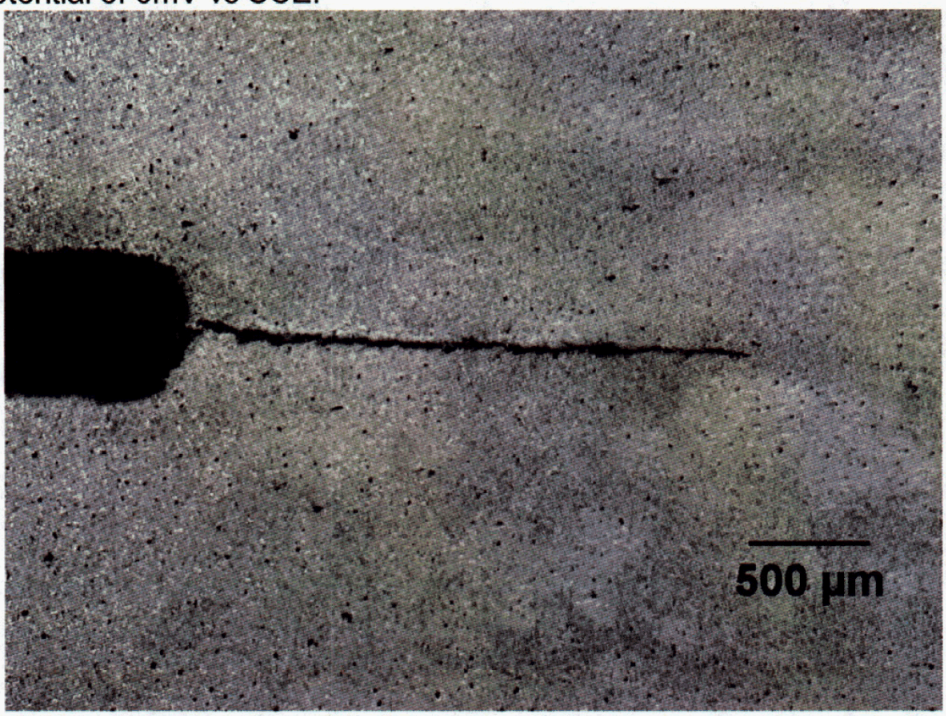


Figure H 29 A post-test micrograph of the cross-section of the specimen from CT 10 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

For a plot of the crack extension – time curve for CT 11 refer to Figure H7.

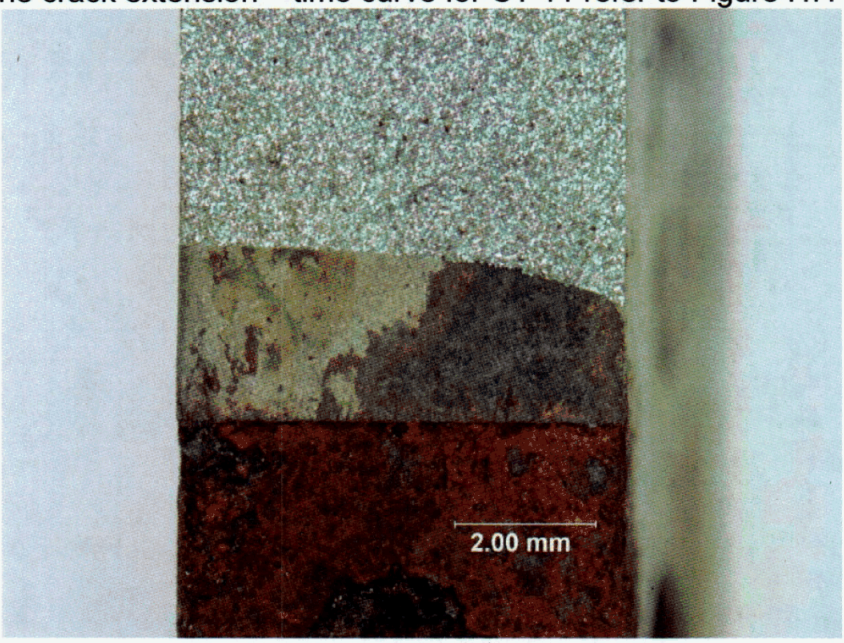


Figure H 30 A post-test photograph of the fracture surface from CT 11 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

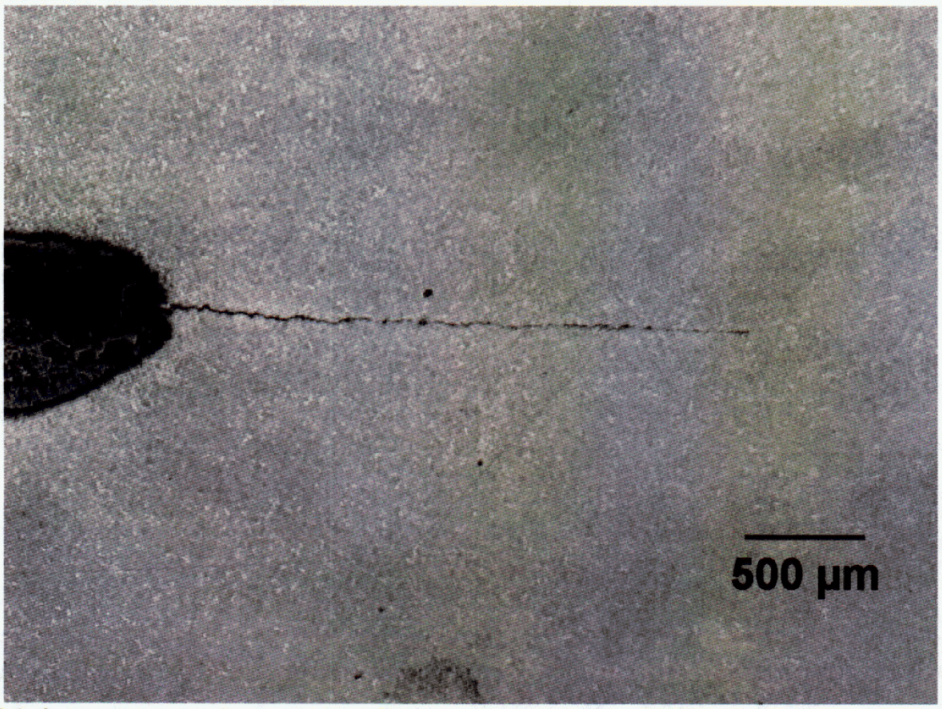


Figure H 31 A post-test micrograph of the cross-section of the specimen from CT 11 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

For a plot of the crack extension – time curve for CT 12 refer to Figure H10.

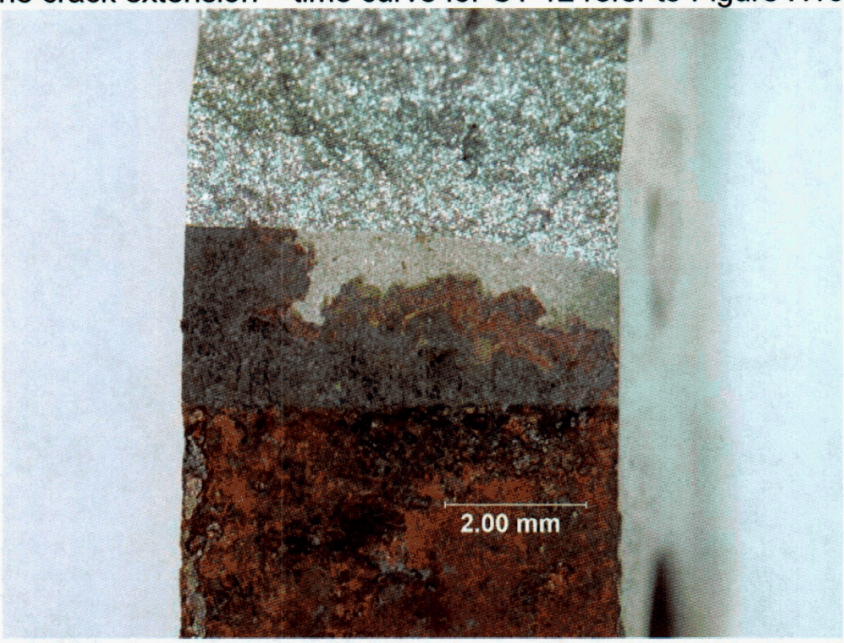


Figure H 32 A post-test photograph of the fracture surface from CT 12 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 30ksi√in, with applied potential of 0mV vs SCE.

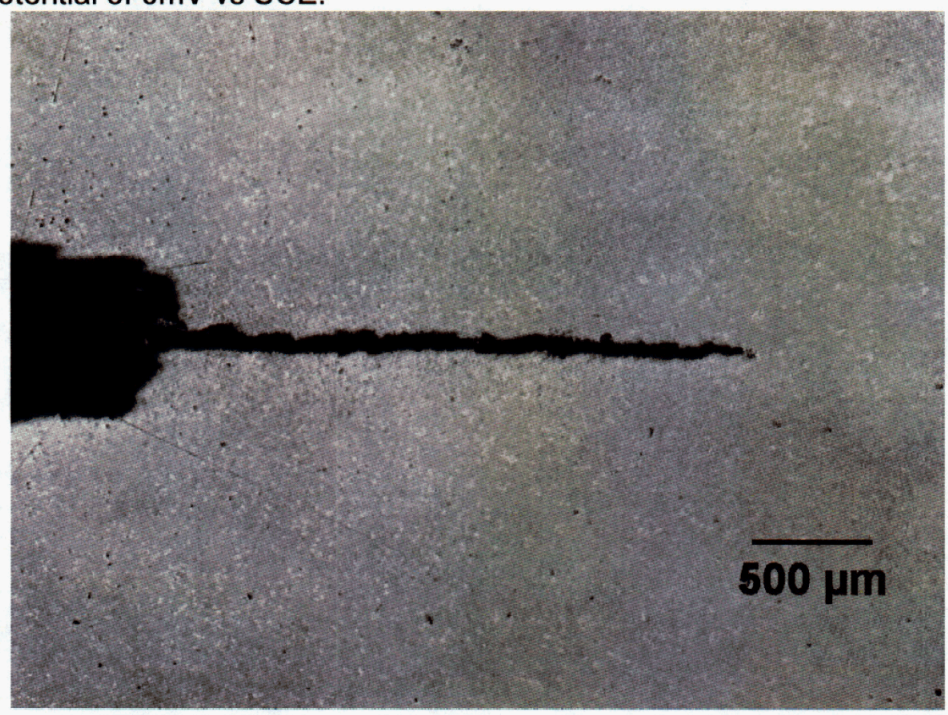


Figure H 33 A post-test micrograph of the cross-section of the specimen from CT 12 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 30ksi√in, with applied potential of 0mV vs SCE.

For a plot of the crack extension – time curve for CT 13 refer to Figure H10.

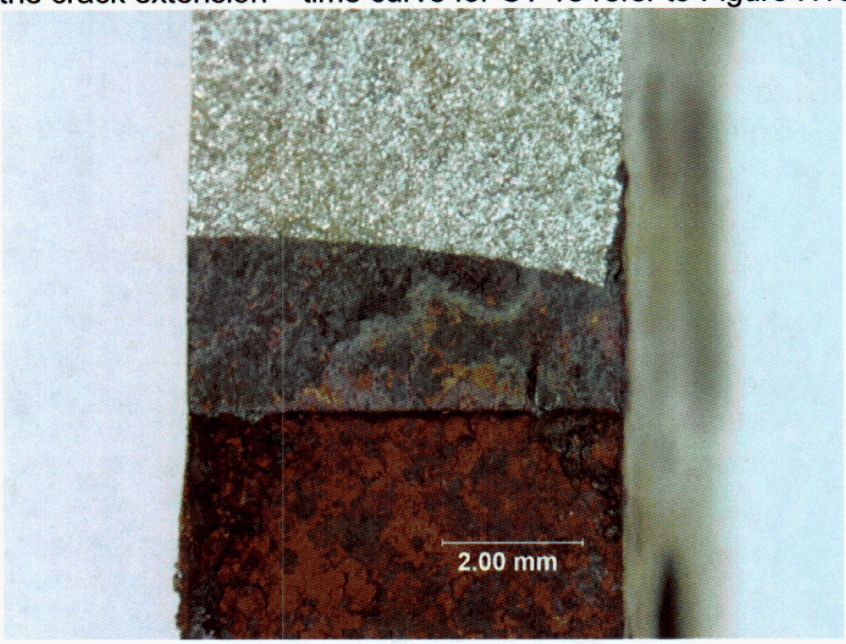


Figure H 34 A post-test photograph of the fracture surface from CT 13 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 30ksi√in, with applied potential of 0mV vs SCE.

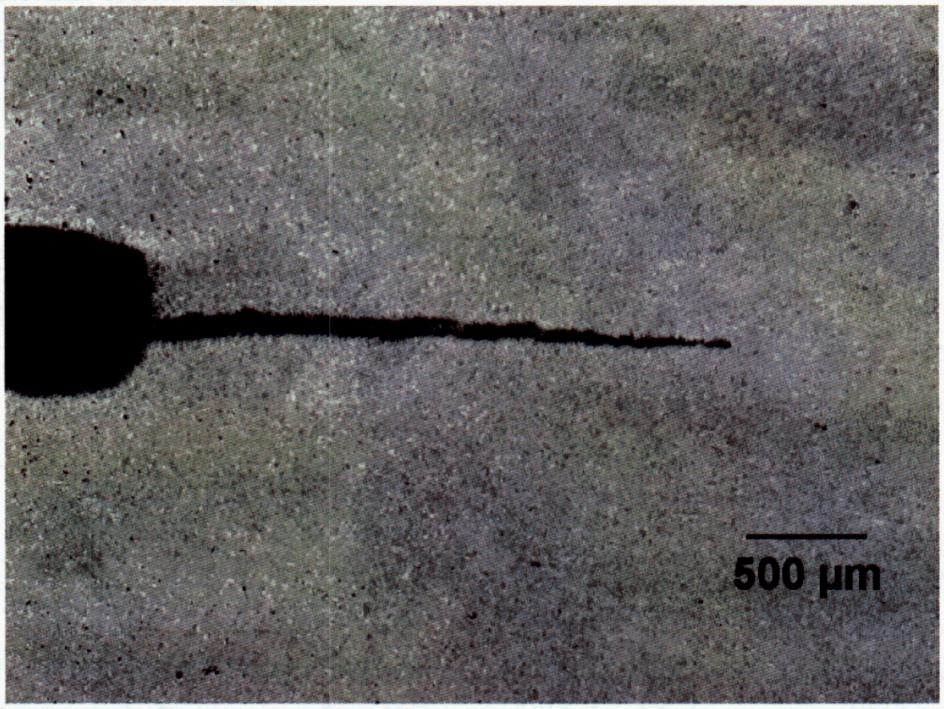


Figure H 35 A post-test micrograph of the cross-section of the specimen from CT 13 performed in Tank 241-AN-107 standard solution, pH 10, applied stress intensity of 30ksi√in, with applied potential of 0mV vs SCE.

For a plot of the crack extension – time curve for CT 14 refer to Figure H25.

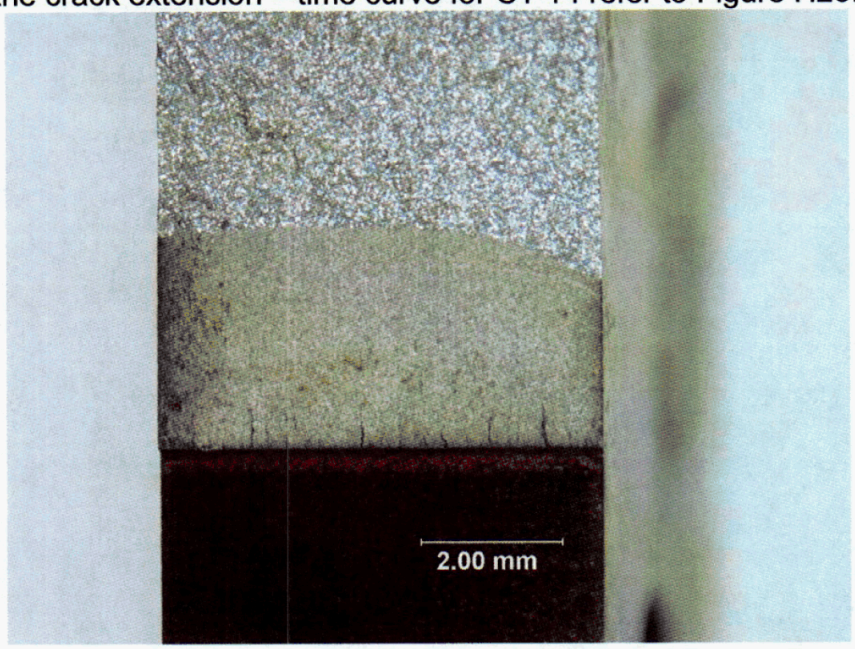


Figure H 36 A post-test photograph of the fracture surface from CT 14 performed in Tank 241-AN-107 end point solution, pH 10, applied stress intensity of 40ksi√in, with applied potential of 0mV vs SCE.

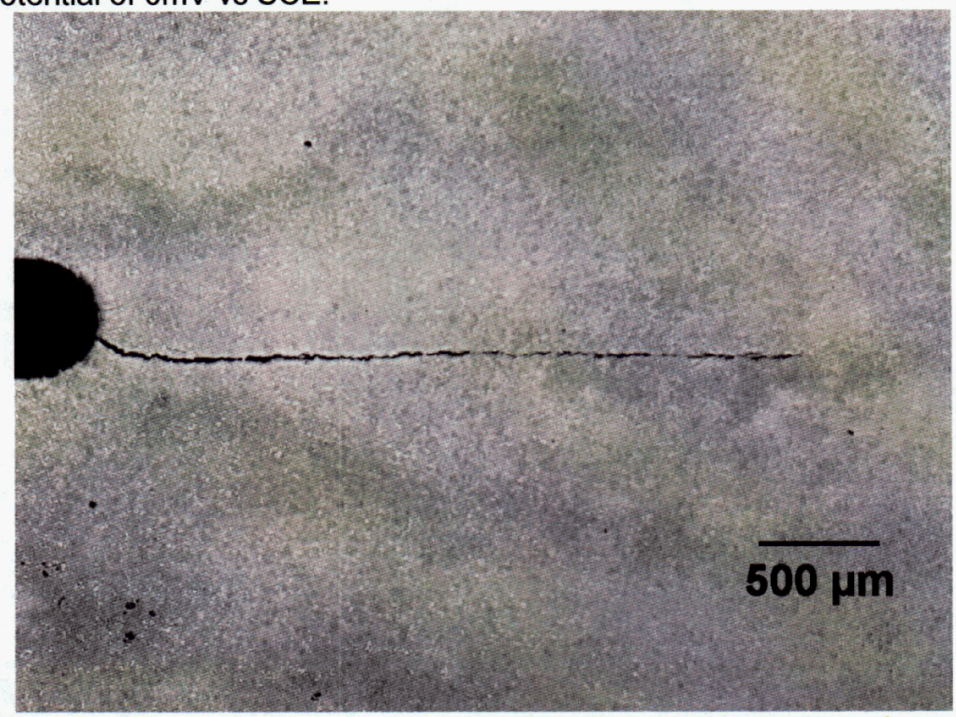


Figure H 37 A post-test micrograph of the cross-section of the specimen from CT 14 performed in Tank 241-AN-107 end point solution, pH 10, applied stress intensity of 40ksi√in, with applied potential of 0mV vs SCE.

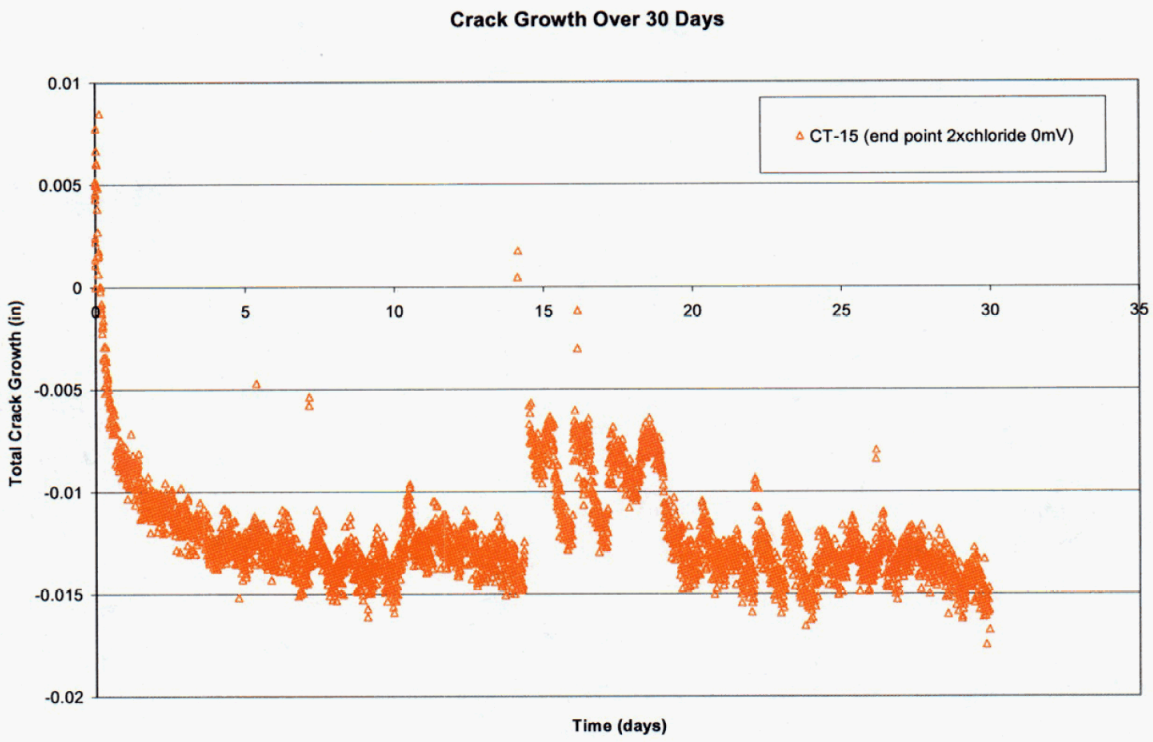


Figure H 38 The crack extension-time curve from CT 15 performed in Tank 241-AN-107 end point 0.2M chloride solution, pH 10, applied stress intensity of 40ksi√in, with applied potential of 0mV vs SCE.

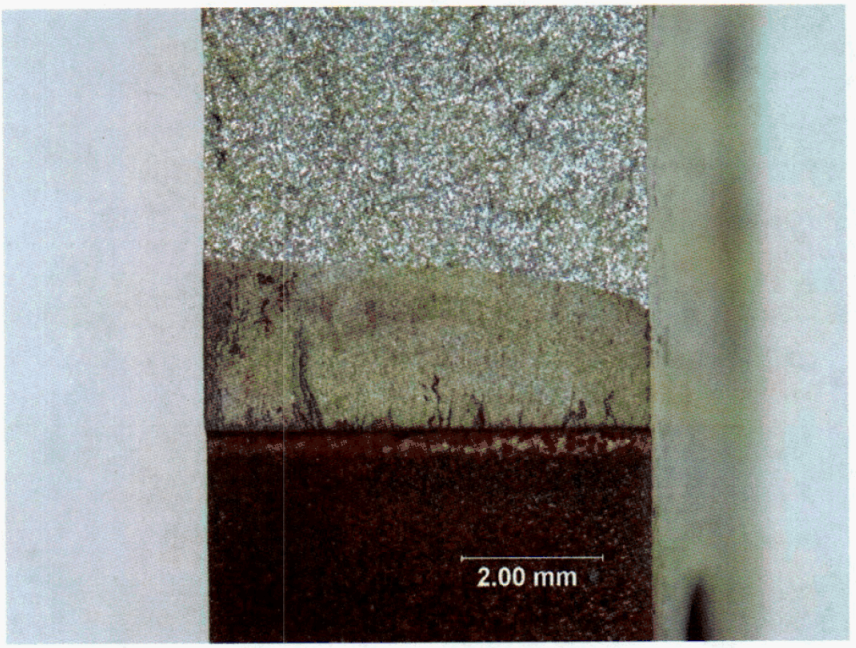


Figure H 39 A post-test photograph of the fracture surface from CT 15 performed in Tank 241-AN-107 end point 0.2M chloride solution, pH 10, applied stress intensity of 40ksi√in, with applied potential of 0mV vs SCE.

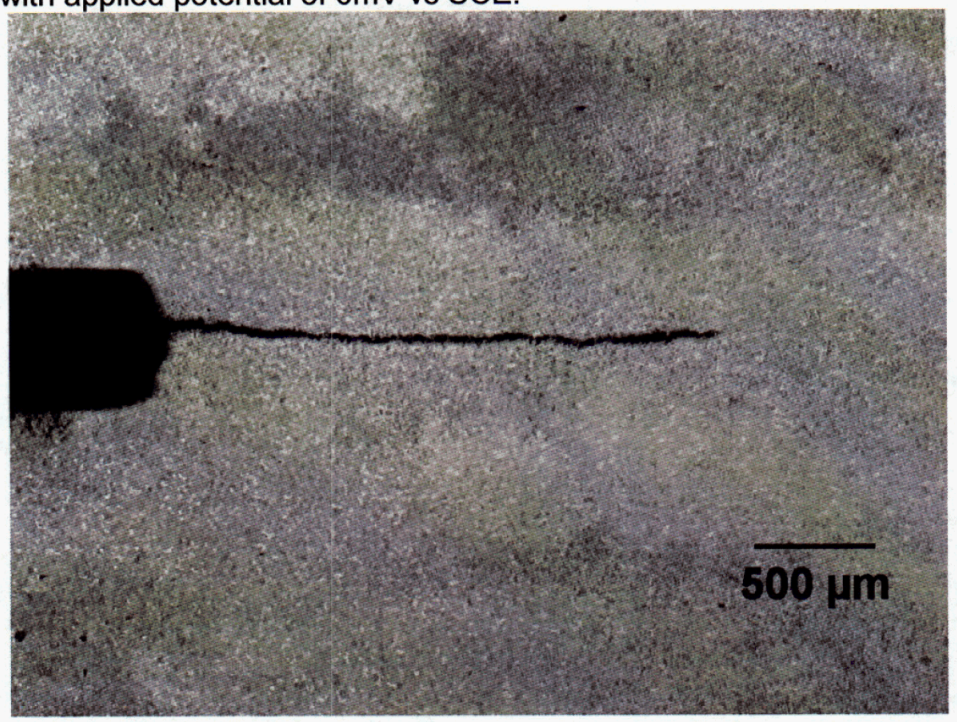


Figure H 40 A post-test micrograph of the cross-section of the specimen from CT 15 performed in Tank 241-AN-107 end point 0.2M chloride solution, pH 10, applied stress intensity of 40ksi√in, with applied potential of 0mV vs SCE.

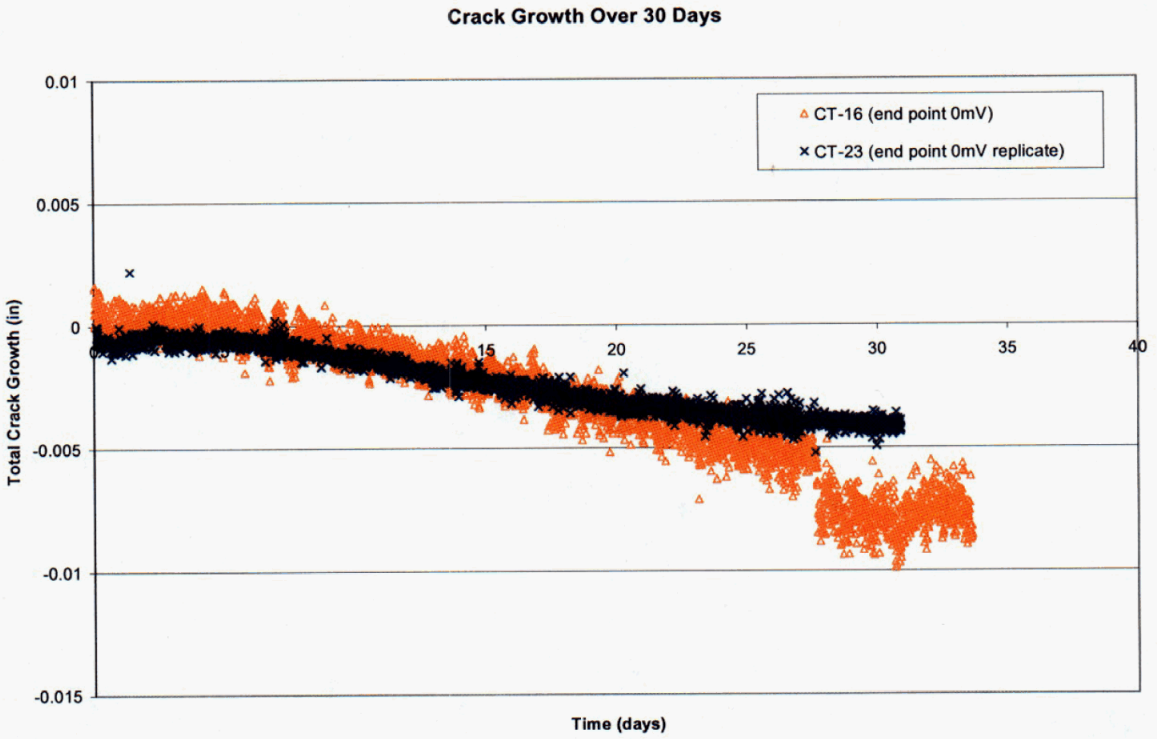


Figure H 41 The crack extension-time curves from CTs 16 and 23 performed in Tank 241-AN-107 end point solution, pH 10, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

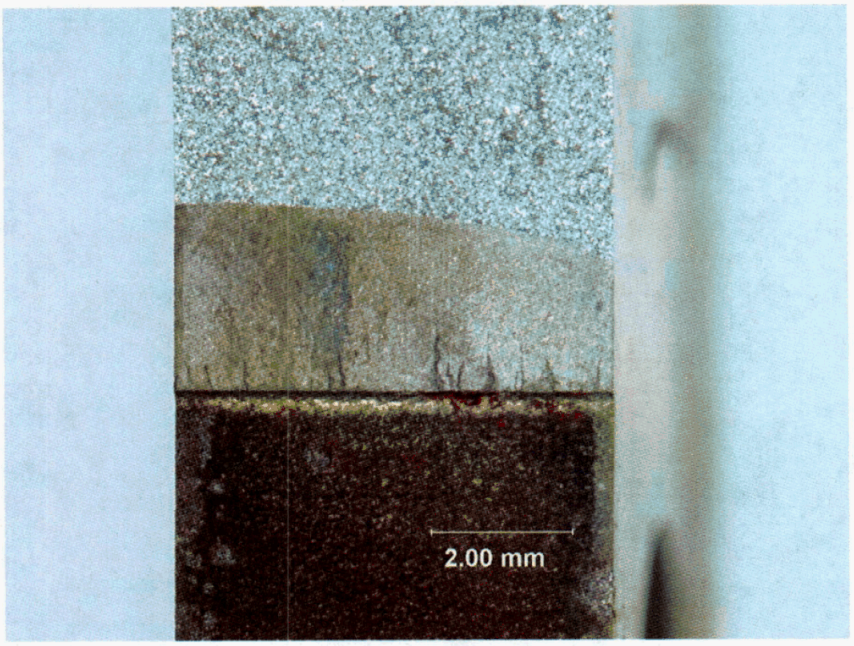


Figure H 42 A post-test photograph of the fracture surface from CT 16 performed in Tank 241-AN-107 end point solution, pH 10, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

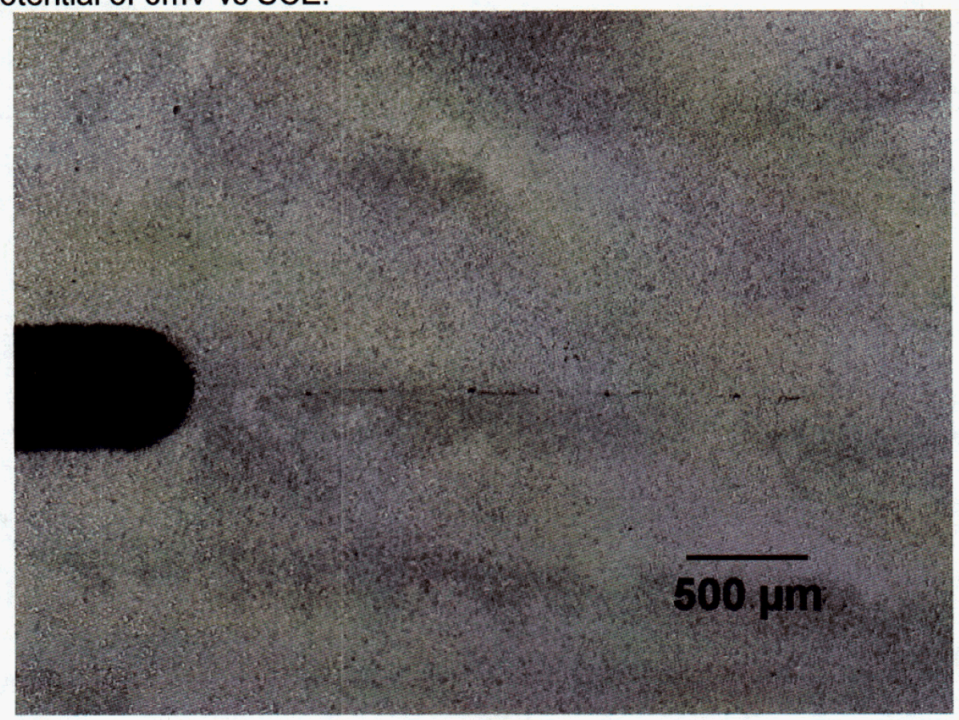


Figure H 43 A post-test micrograph of the cross-section of the specimen from CT 16 performed in Tank 241-AN-107 end point solution, pH 10, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

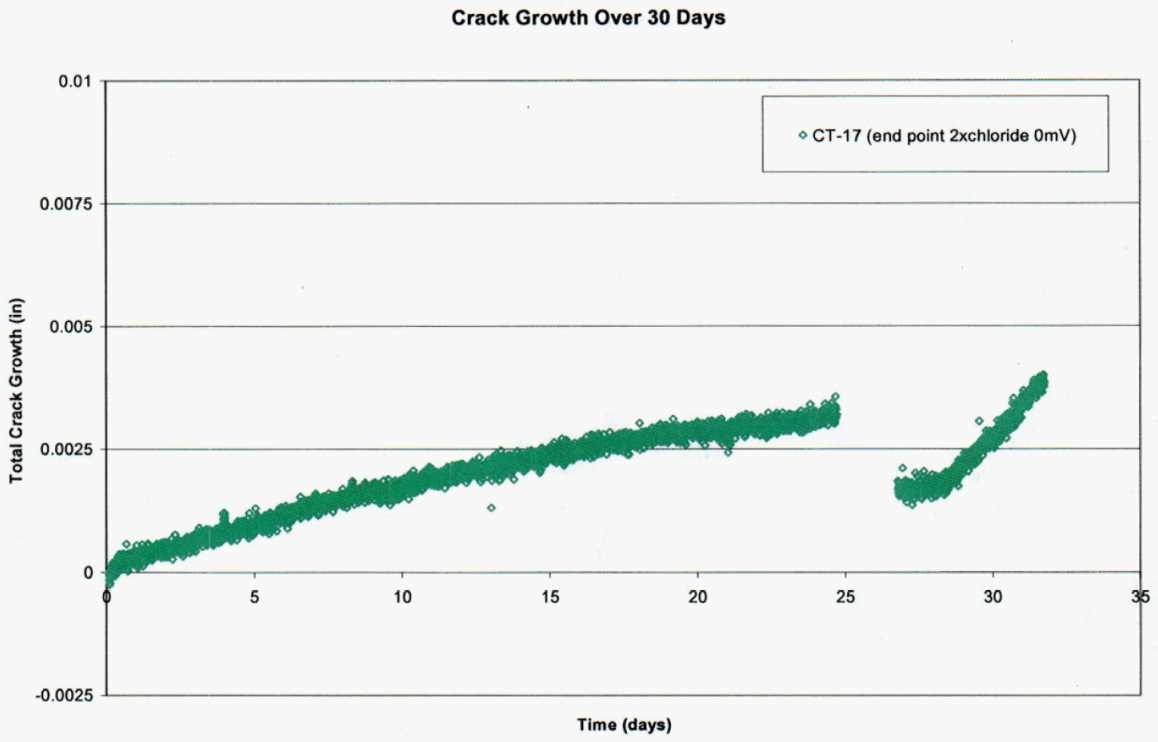


Figure H 44 The crack extension-time curve from CT 17 performed in Tank 241-AN-107 end point 0.2M chloride solution, pH 10, applied stress intensity of 20ksi$\sqrt{in}$, with applied potential of 0mV vs SCE.

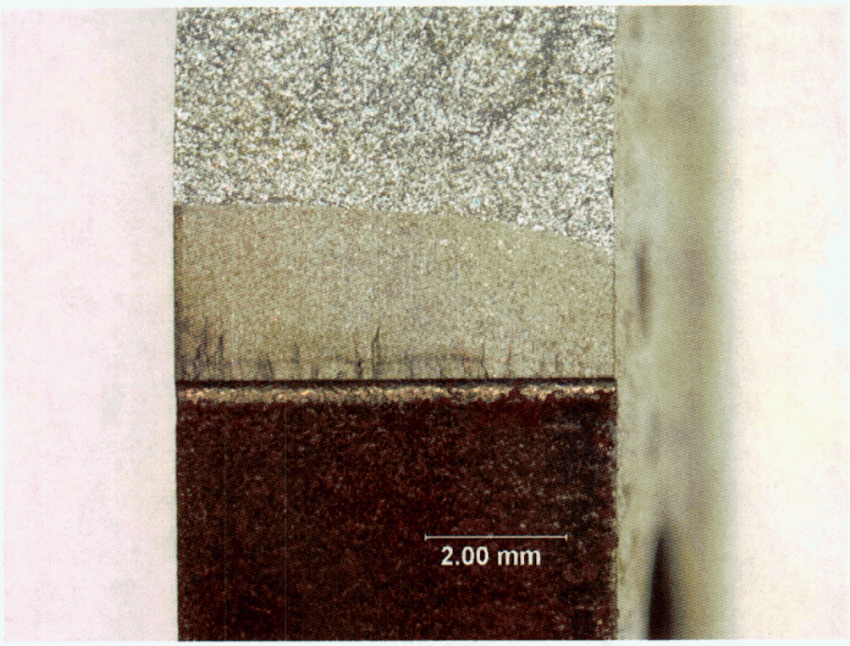


Figure H 45 A post-test photograph of the fracture surface from CT 17 performed in Tank 241-AN-107 end point 0.2M chloride solution, pH 10, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

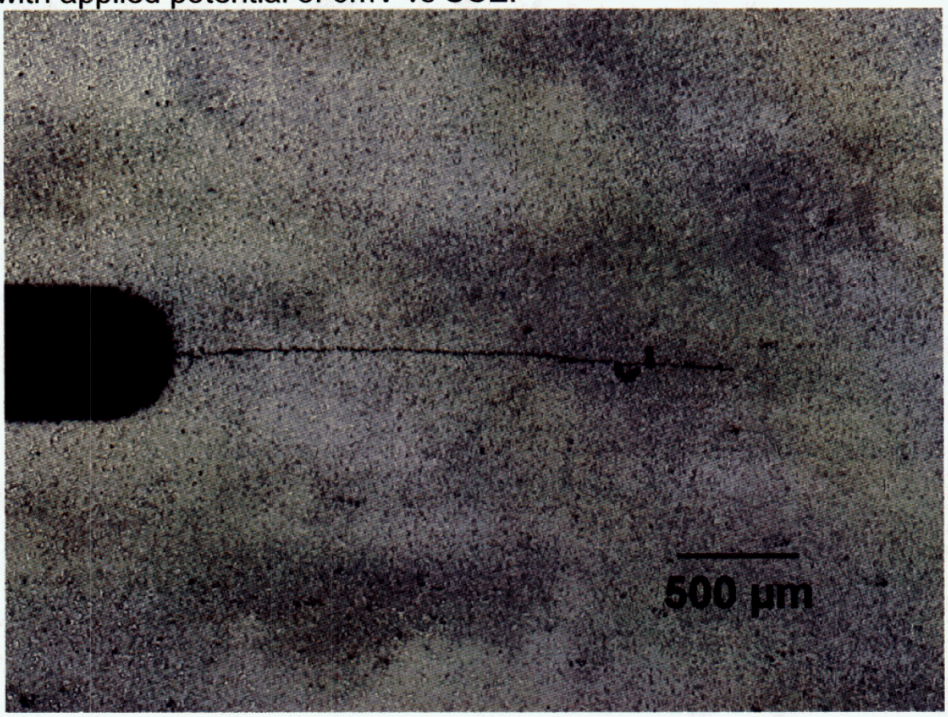


Figure H 46 A post-test micrograph of the cross-section of the specimen from CT 17 performed in Tank 241-AN-107 end point 0.2M chloride solution, pH 10, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

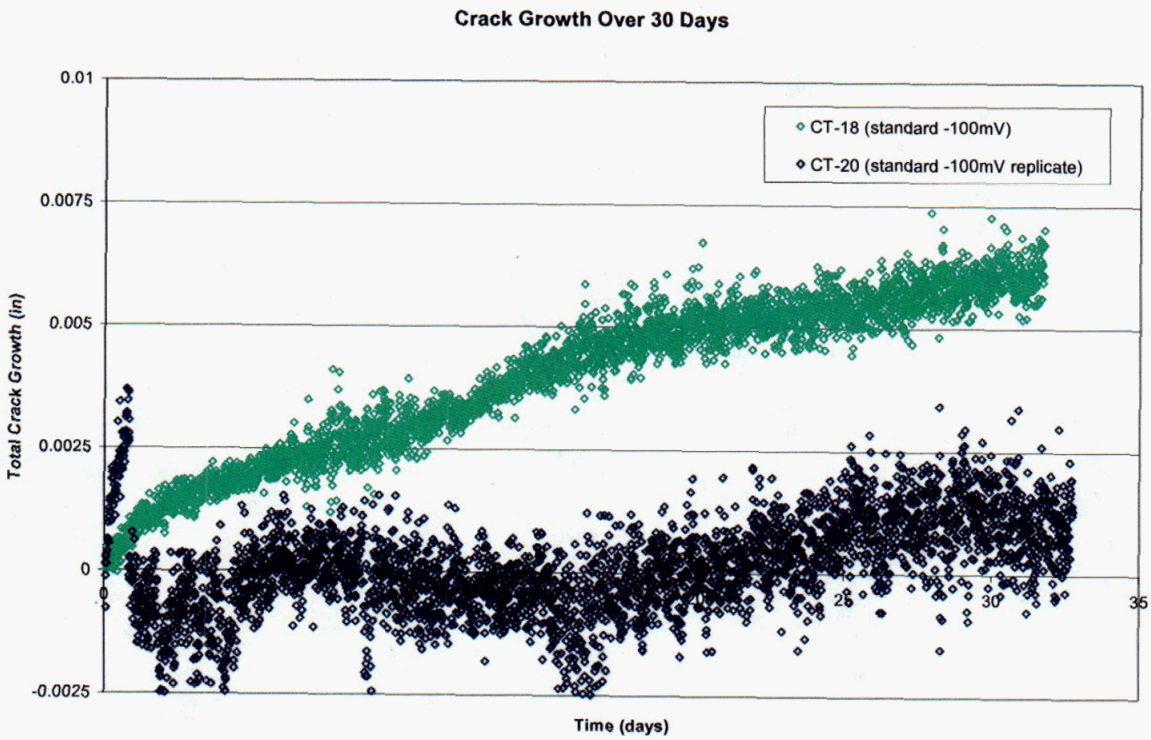


Figure H 47 The crack extension-time curves from CTs 18 and 20 performed in Tank 241-AN-107 standard solution, pH 11, applied stress intensity of 20ksi√in, with applied potential of -100mV vs SCE.

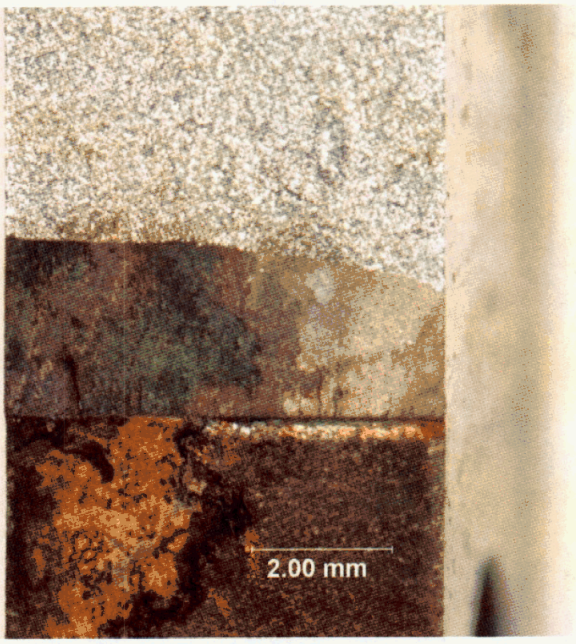


Figure H 48 A post-test photograph of the fracture surface from CT 18 performed in Tank 241-AN-107 standard solution, pH 11, applied stress intensity of 20ksi√in, with applied potential of -100mV vs SCE.

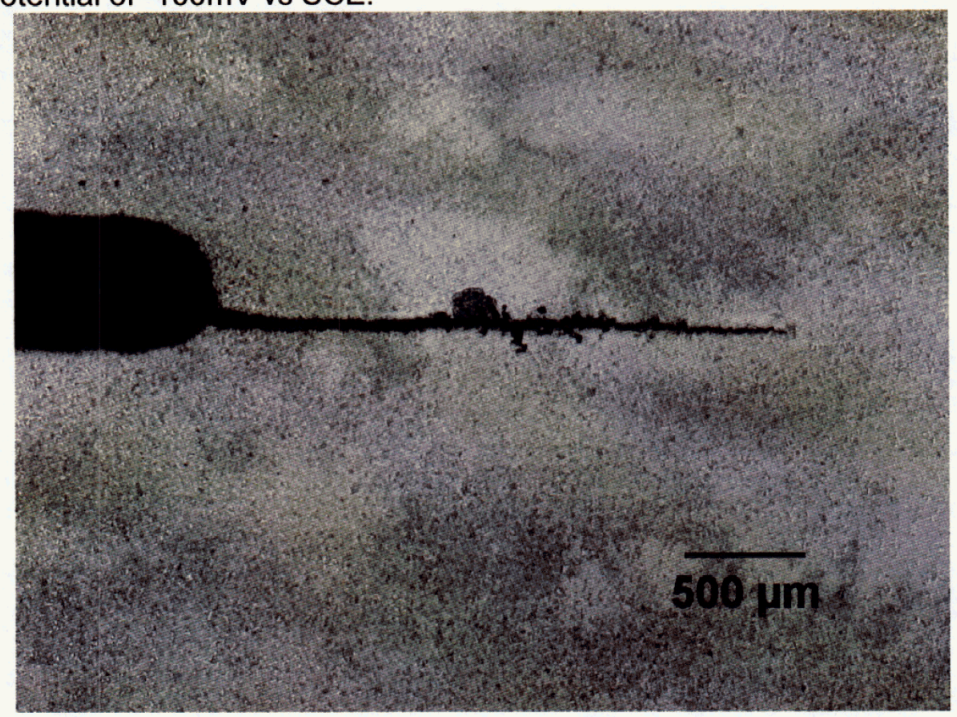


Figure H 49 A post-test micrograph of the cross-section of the specimen from CT 18 performed in Tank 241-AN-107 standard solution, pH 11, applied stress intensity of 20ksi√in, with applied potential of -100mV vs SCE.

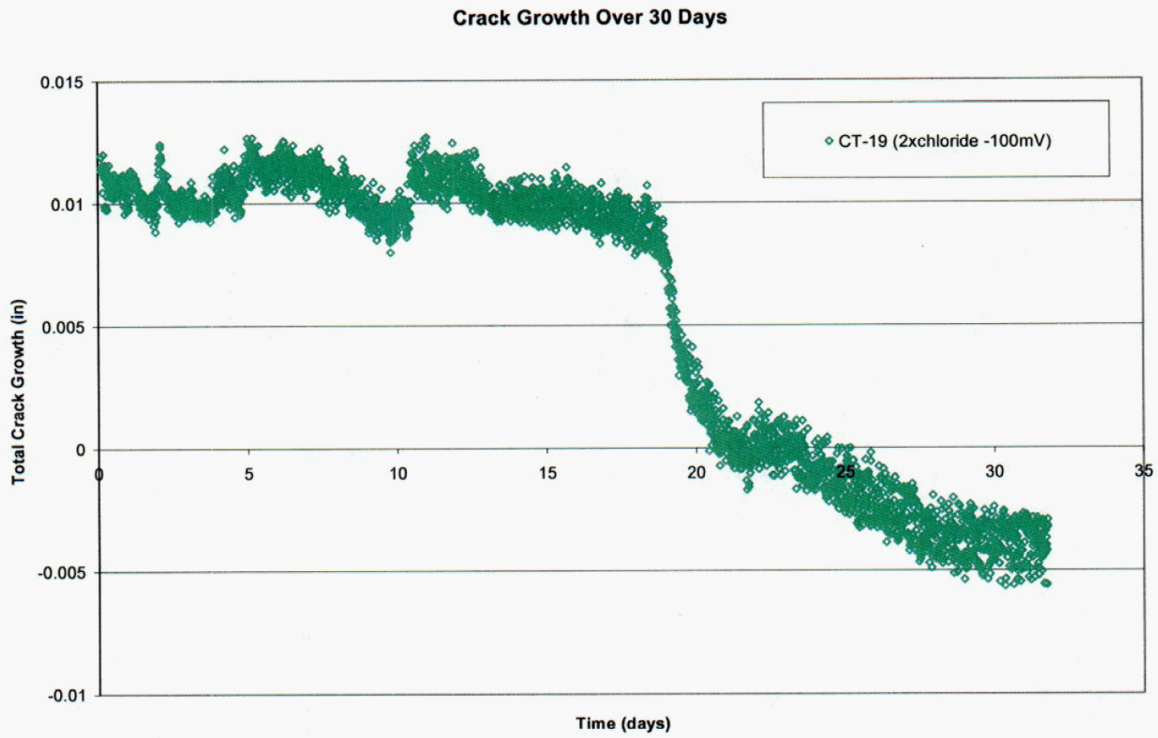


Figure H 50 The crack extension-time curve from CT 19 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

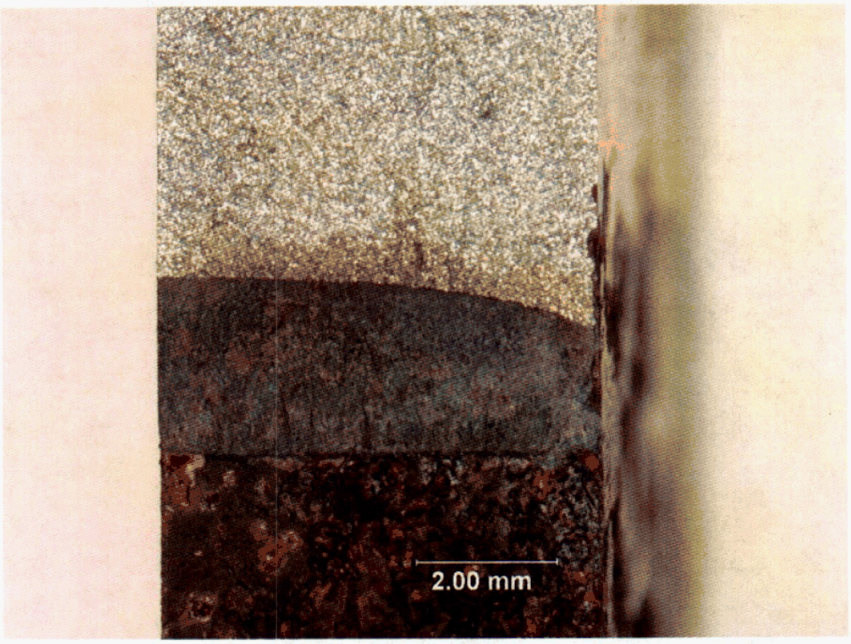


Figure H 51 A post-test photograph of the fracture surface from CT 19 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

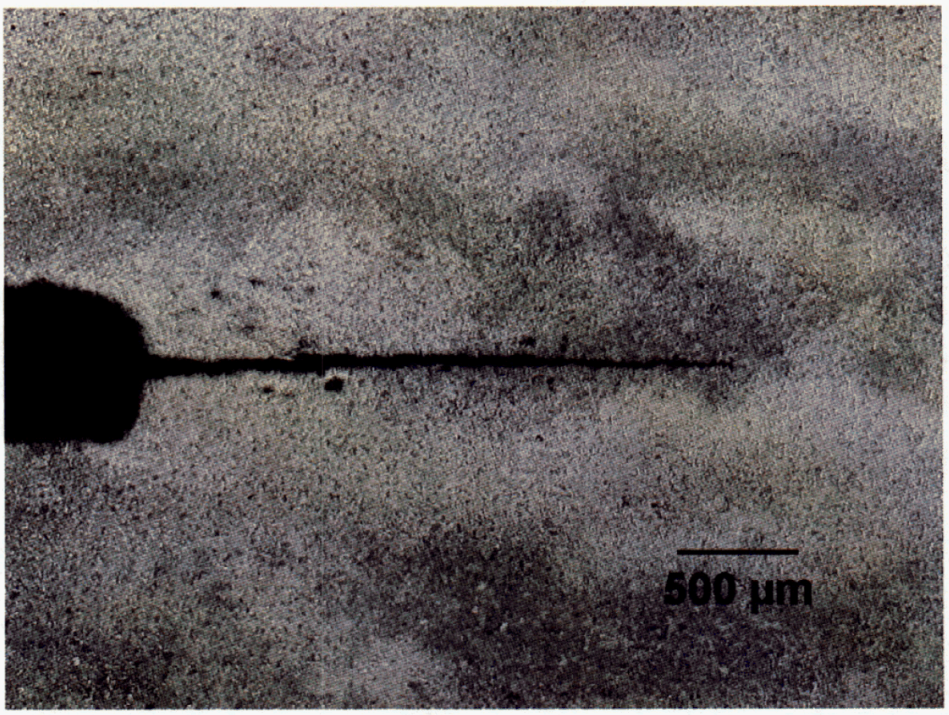


Figure H 52 A post-test micrograph of the cross-section of the specimen from CT 19 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

For a plot of the crack extension – time curve for CT 20 refer to Figure H50.

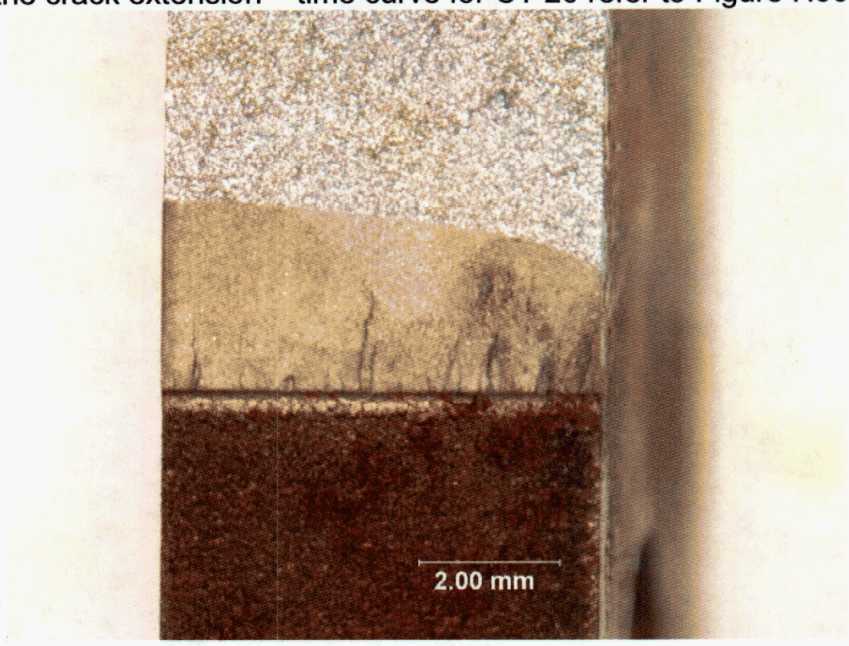


Figure H 53 A post-test photograph of the fracture surface from CT 20 performed in Tank 241-AN-107 standard solution, pH 11, applied stress intensity of 20ksi√in, with applied potential of -100mV vs SCE.

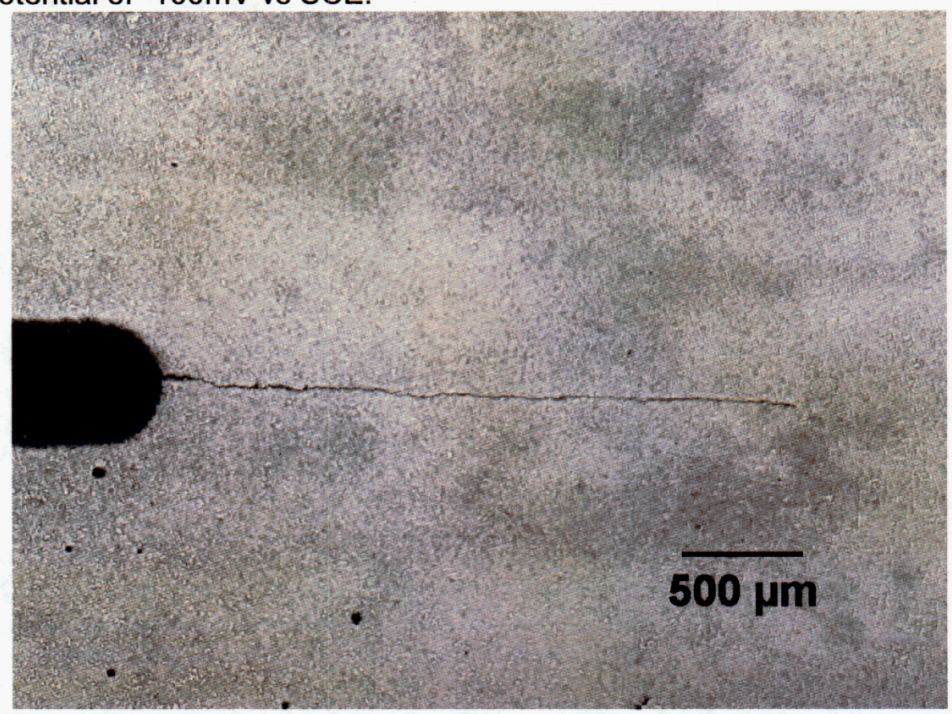


Figure H 54 A post-test micrograph of the cross-section of the specimen from CT 20 performed in Tank 241-AN-107 standard solution, pH 11, applied stress intensity of 20ksi√in, with applied potential of -100mV vs SCE.

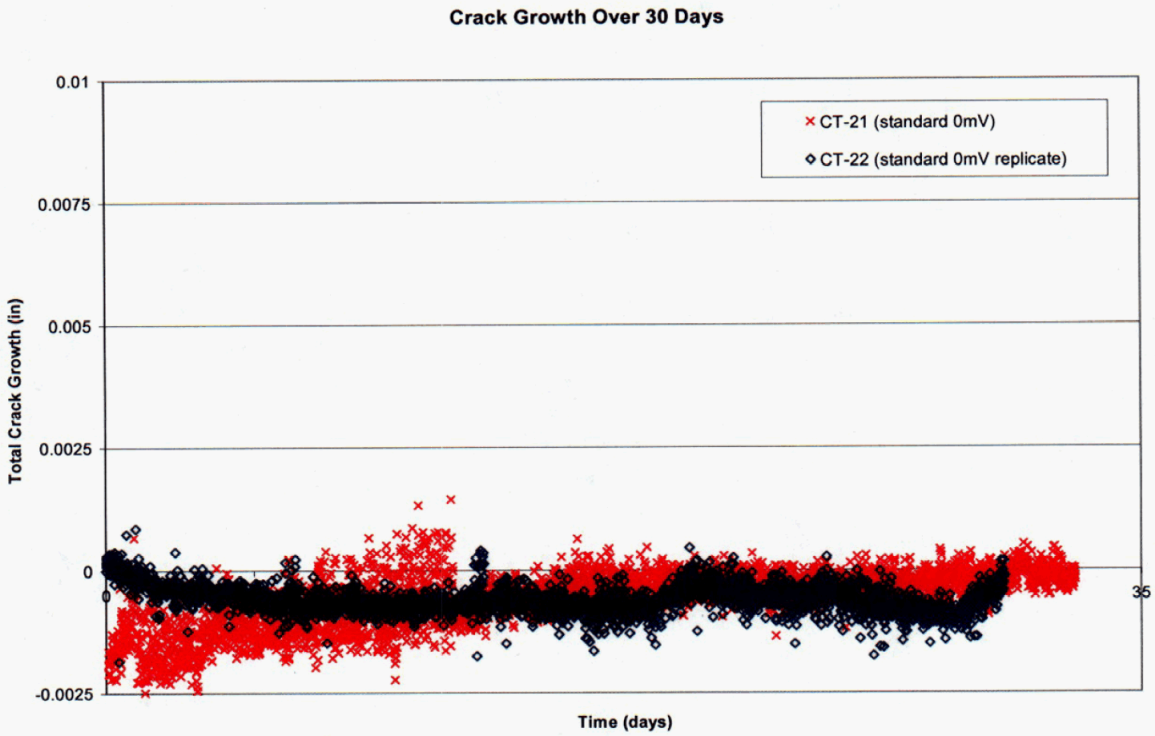


Figure H 55 The crack extension-time curves from CT 21 and 22 performed in Tank 241-AN-107 standard solution, pH 11, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

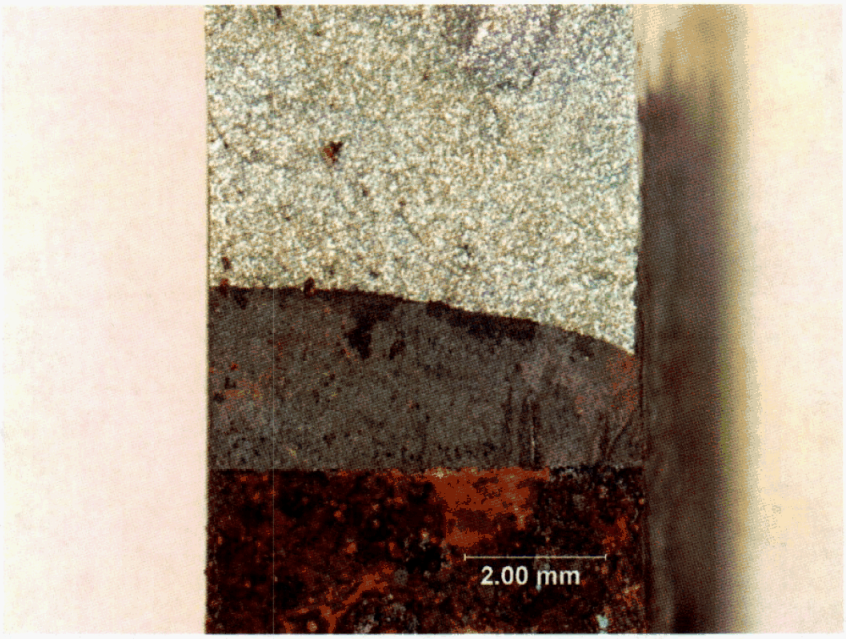


Figure H 56 A post-test photograph of the fracture surface from CT 21 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

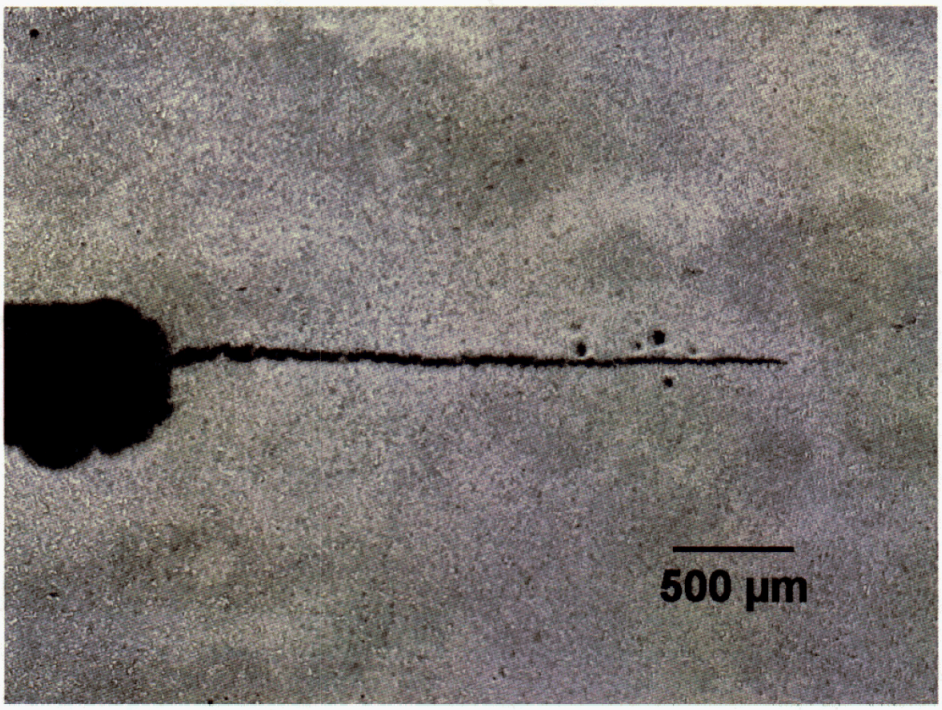


Figure H 57 A post-test micrograph of the cross-section of the specimen from CT 21 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

For a plot of the crack extension – time curve for CT 22 refer to Figure H55.

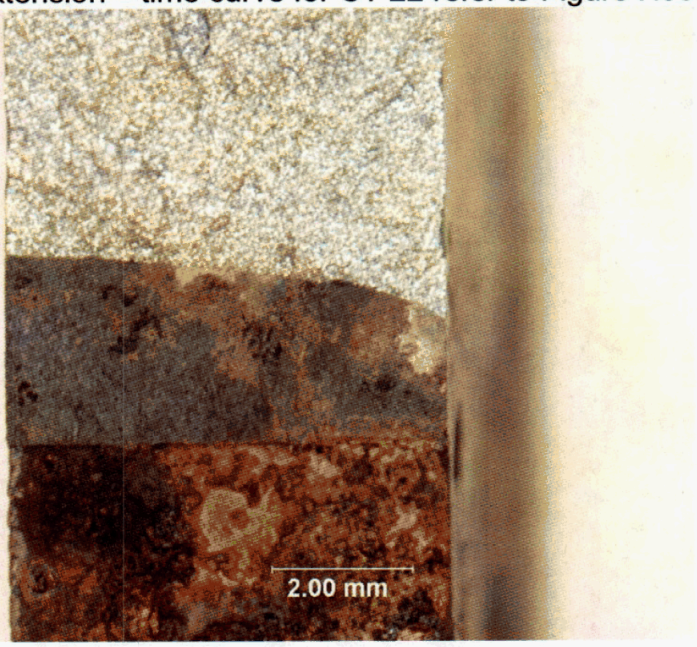


Figure H 58 A post-test photograph of the fracture surface from CT 22 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

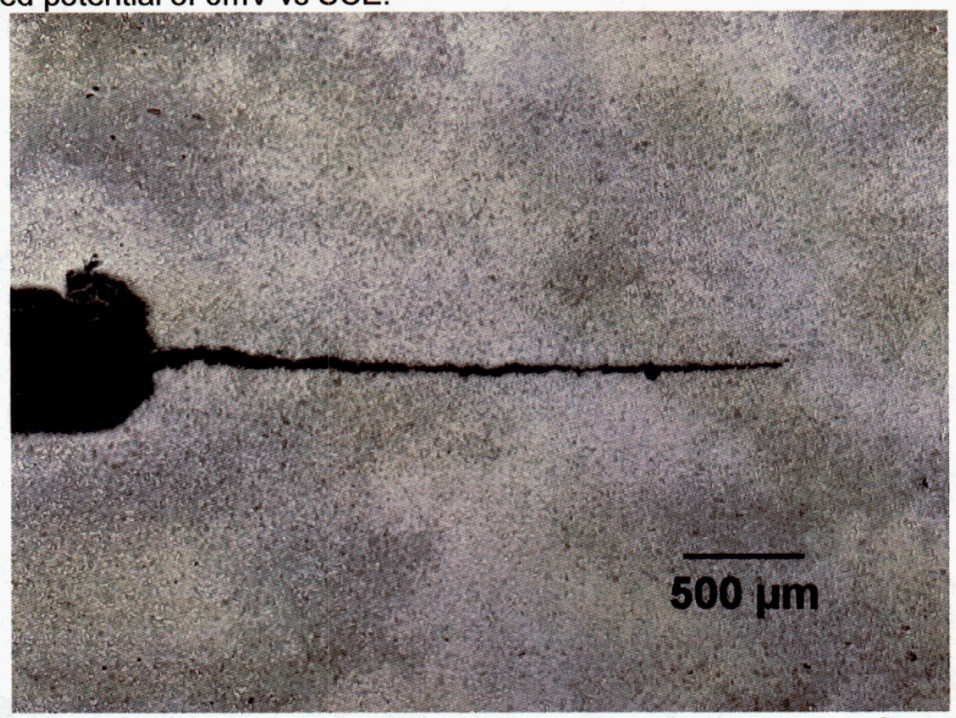


Figure H 59 A post-test micrograph of the cross-section of the specimen from CT 22 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

For a plot of the crack extension – time curve for CT 23 refer to Figure H41.

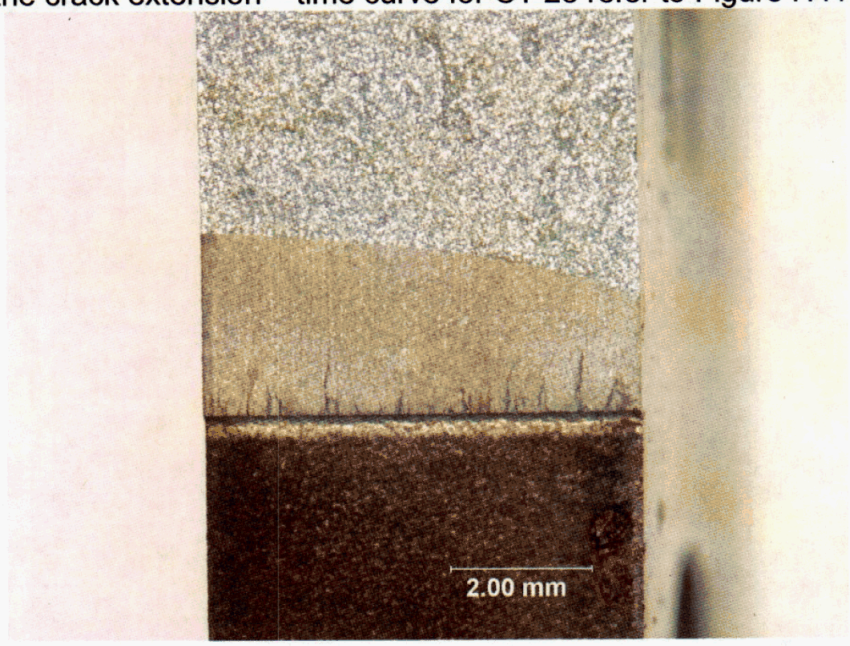


Figure H 60 A post-test photograph of the fracture surface from CT 23 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.

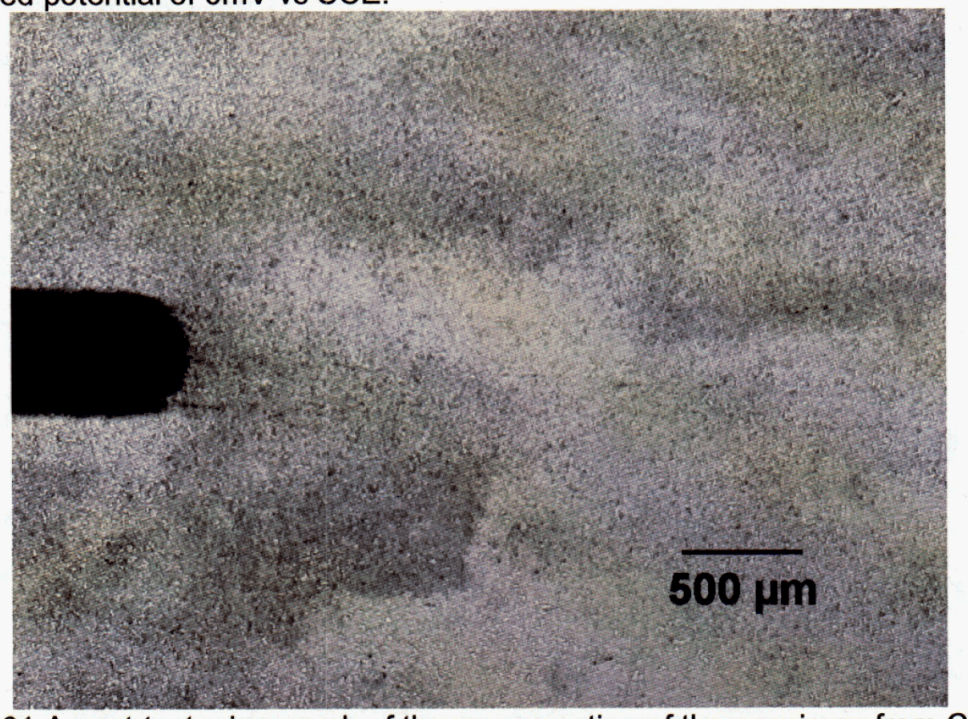


Figure H 61 A post-test micrograph of the cross-section of the specimen from CT 23 performed in Tank 241-AN-107 0.2M chloride solution, pH 11, applied stress intensity of 20ksi√in, with applied potential of 0mV vs SCE.