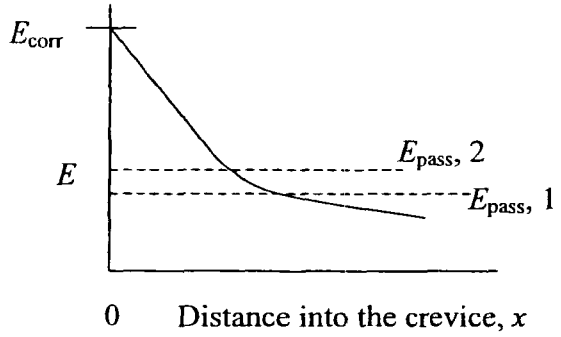
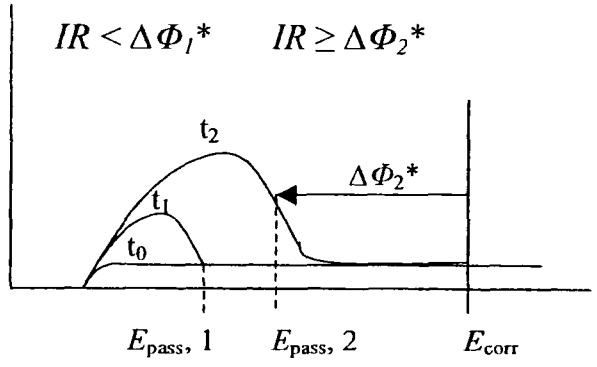
GENERAL NOTE: THESE MAY NOT BE IN THE CORRECT ORDER.

- *Does an active peak form in the polarization curve of a stagnated solution? If so,*

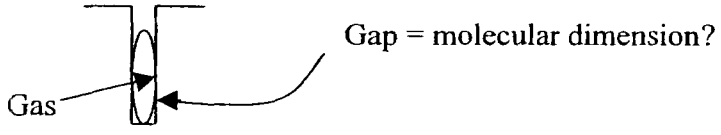
Crevice corrosion is possible when $IR > \Delta\Phi^*$



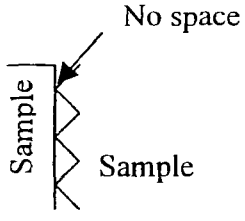


- *How big can IR be?*

Gas Effect:

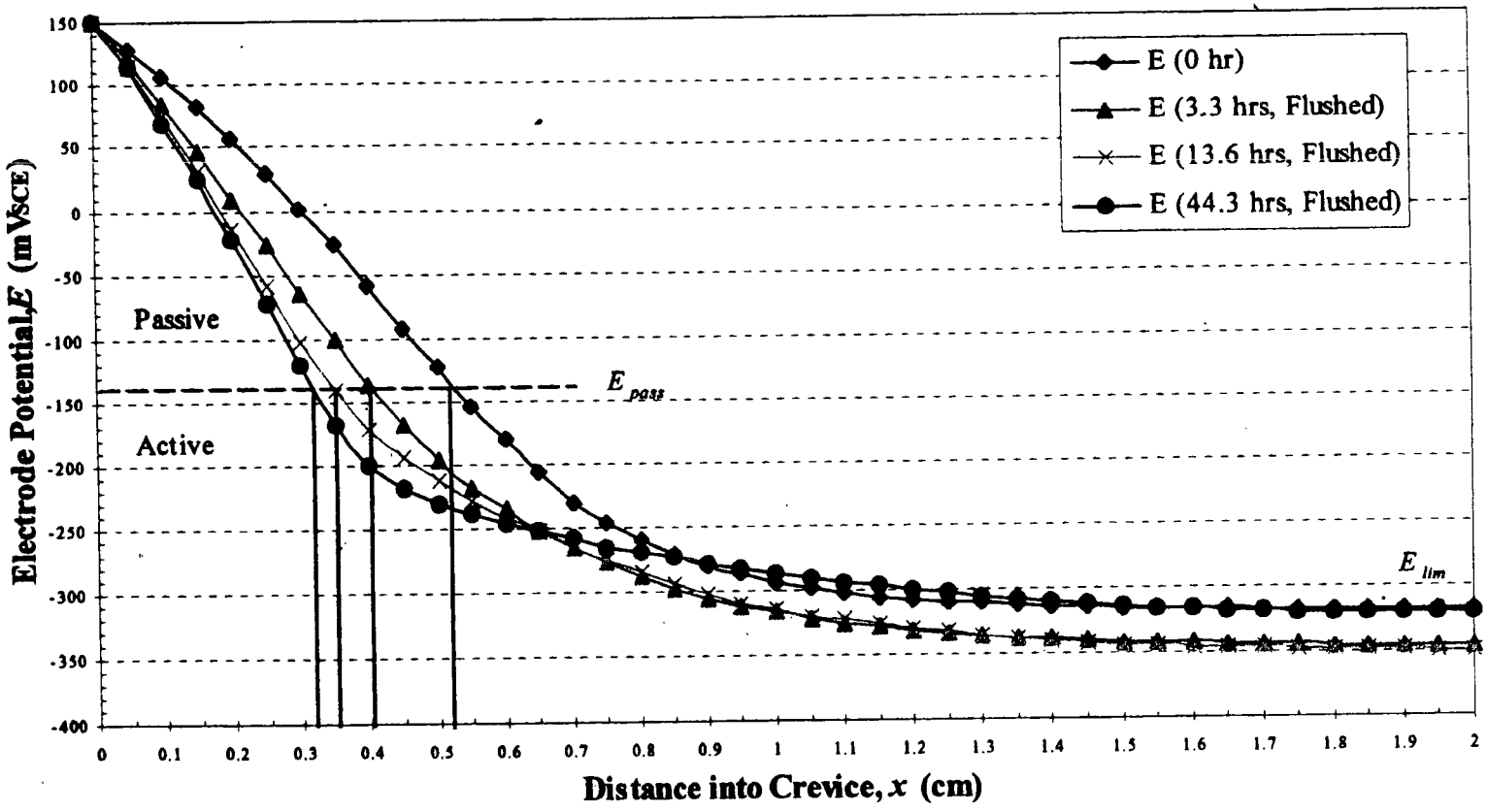


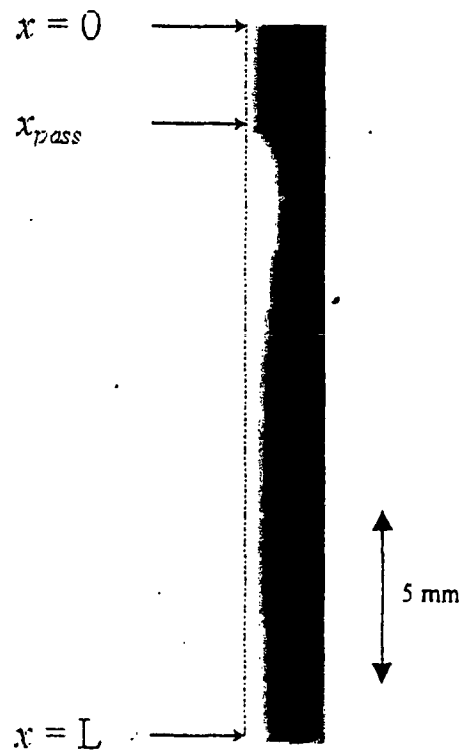
Asperities:



PENNSTATE

Results - Crevice Corrosion





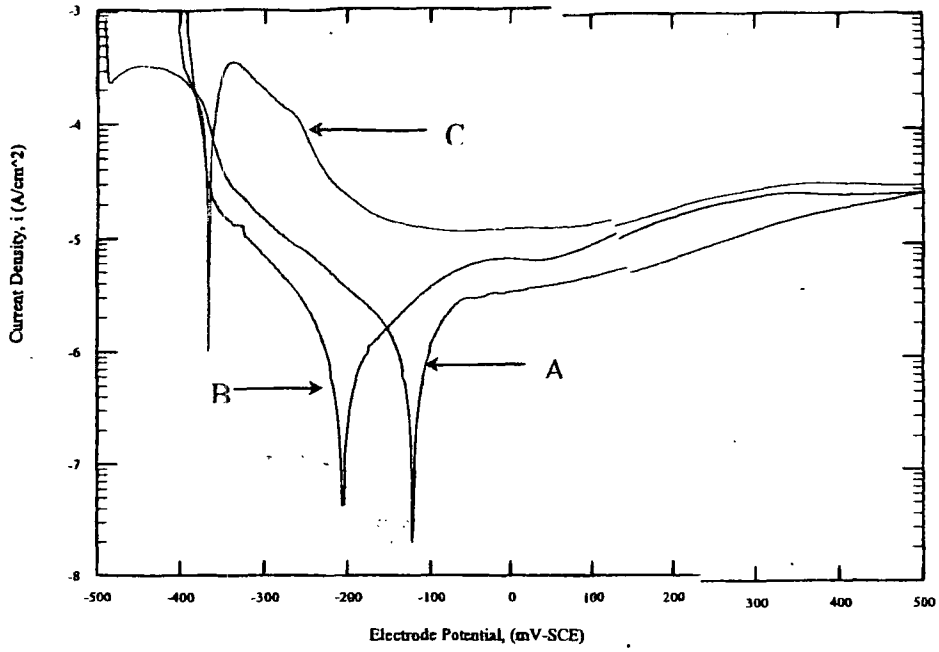
Upside-down orientation

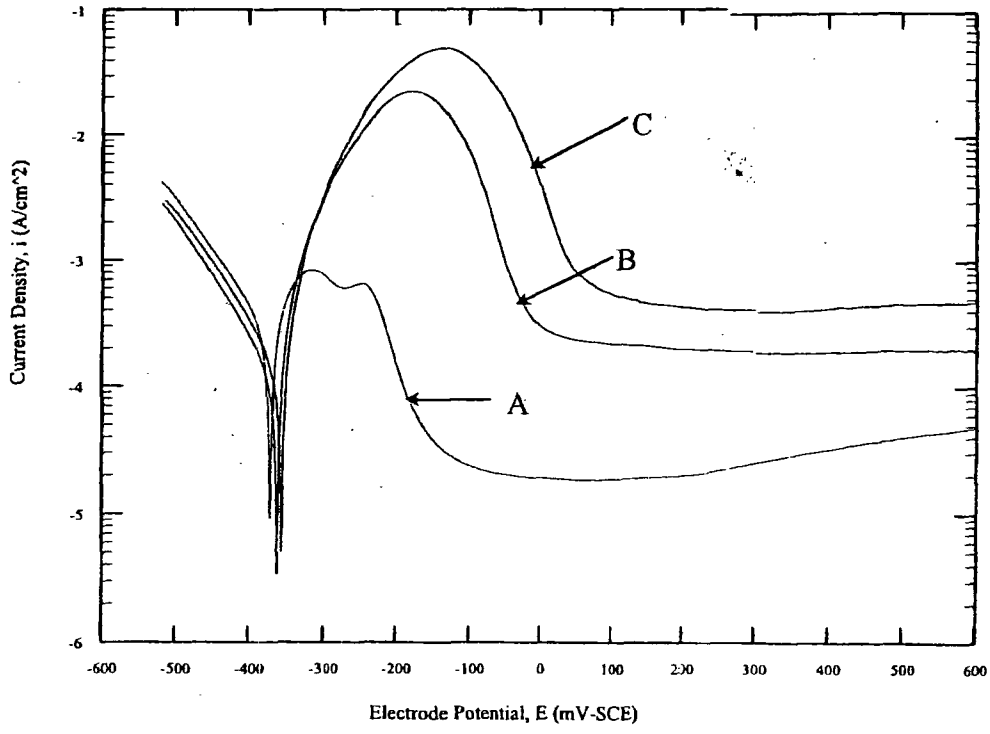
$E_{app} = 150\ mV_{SCE}$

Gap opening = 0.30 mm

Time = 45 hour

PENNSTATE
1855





Polarization curves of alloy T-2205, scanned in the more positive (noble) direction at 1.0 mV s^{-1} in 2.0 M H_2SO_4 + x NaCl. (**a**) Curves A to C: x = 0.0 M, 0.1 M HCl, 0.1 M NaCl. (**b**) Curves A to C: x = 0.5 M HCl, 2.0 M HCl, 2.0 M HCl + 1.0 M NaCl.

PENNSTATE

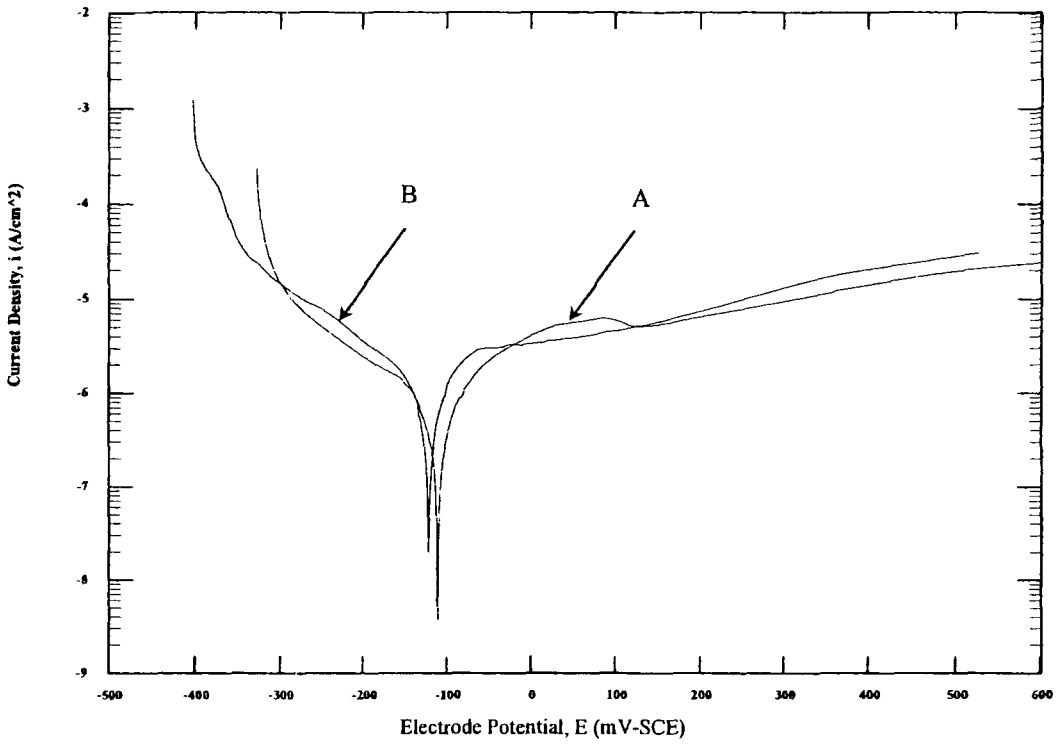
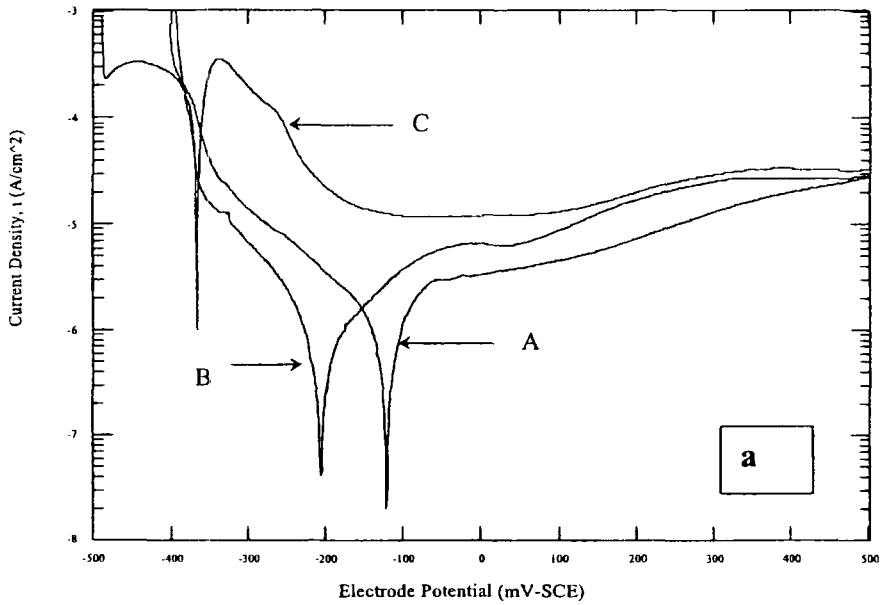


Figure 4: Polarization curve of alloy T-2205, scanned in the more positive (noble) direction at 1.0 mV s^{-1}. (A) 0.5 M H_2SO_4. (B) 2.0 M H_2SO_4.



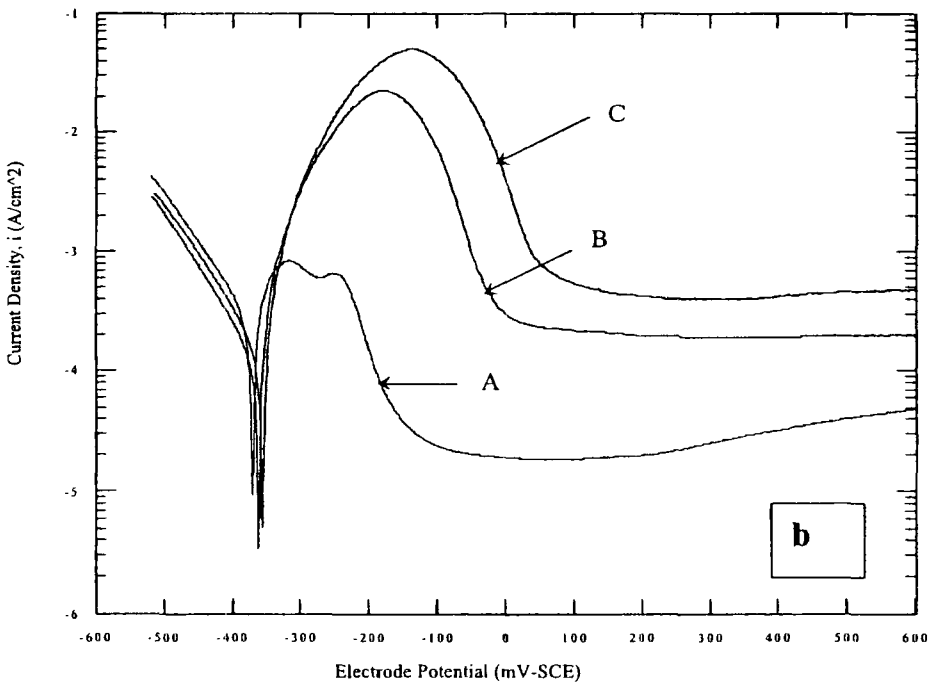
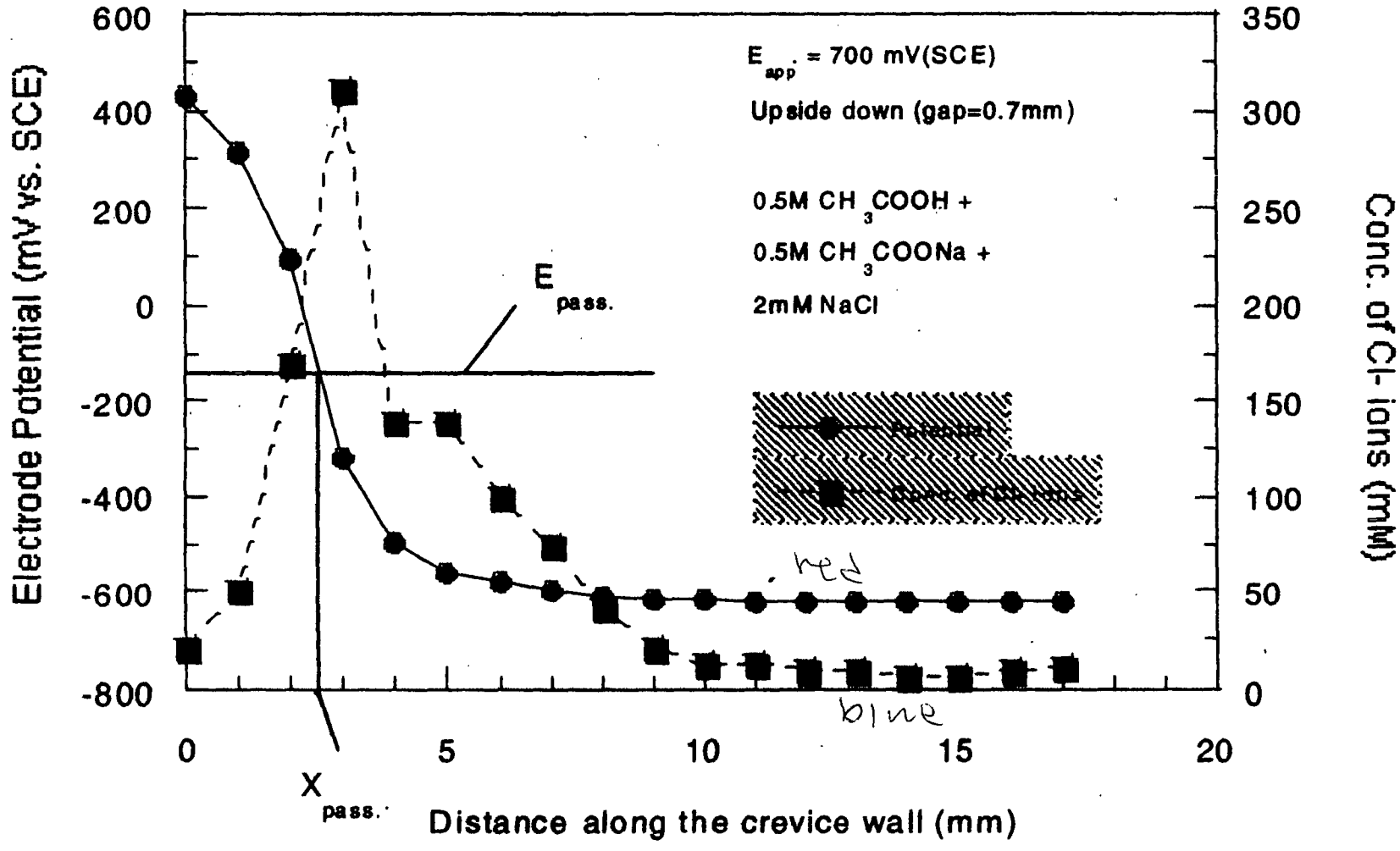
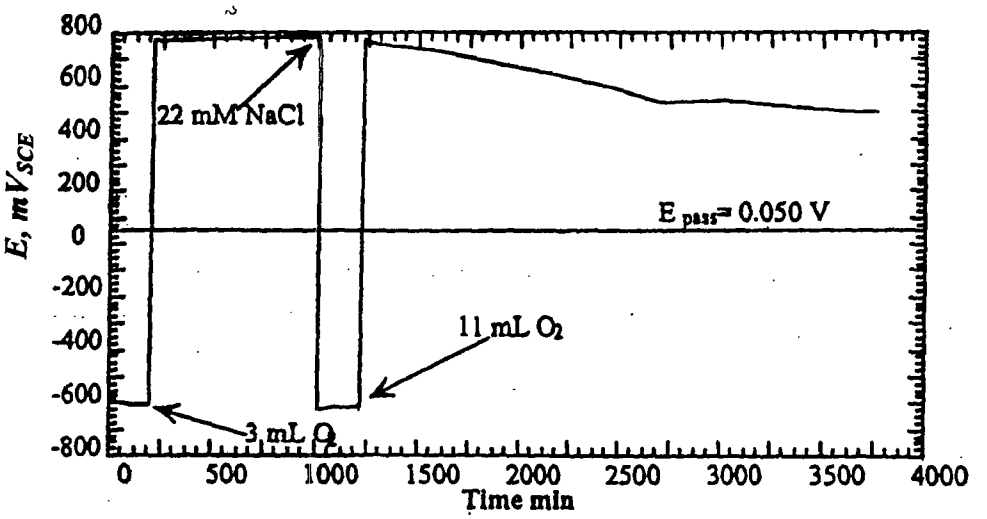


Figure 5: Polarization curves of alloy T-2205, scanned in the more positive (noble) direction at 1.0 mV s^{-1} in 2.0 M H_2SO_4 + x NaCl. (**a**) Curves A to C: x = 0.0 M, 0.1 M HCl, 0.1 M NaCl. (**b**) Curves A to C: x = 0.5 M HCl, 2.0 M HCl, 2.0 M HCl + 1.0 M NaCl.


$E_{app.}$ = 700 mV(SCE)
Upside down (gap=0.7mm)
0.5M CH_3COOH +
0.5M CH_3COONa +
2mM NaCl
Potential
Conc. of Cl- ions
$E_{pass.}$
$X_{pass.}$
red
blue
Electrode Potential (mV vs. SCE)
Conc. of Cl- ions (mM)
Distance along the crevice wall (mm)
600
400
200
0
-200
-400
-600
-800
350
300
250
200
150
100
50
0
0
5
10
15
20



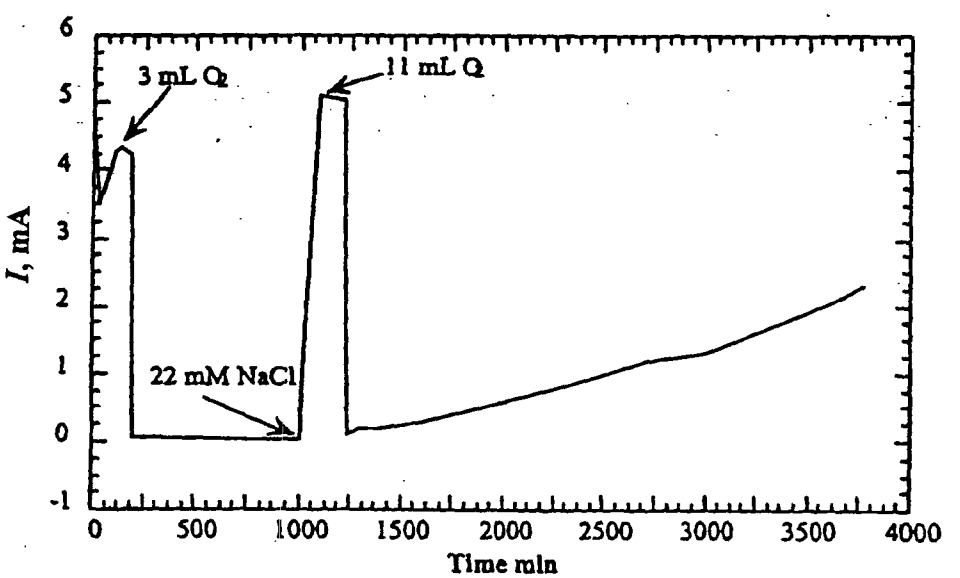
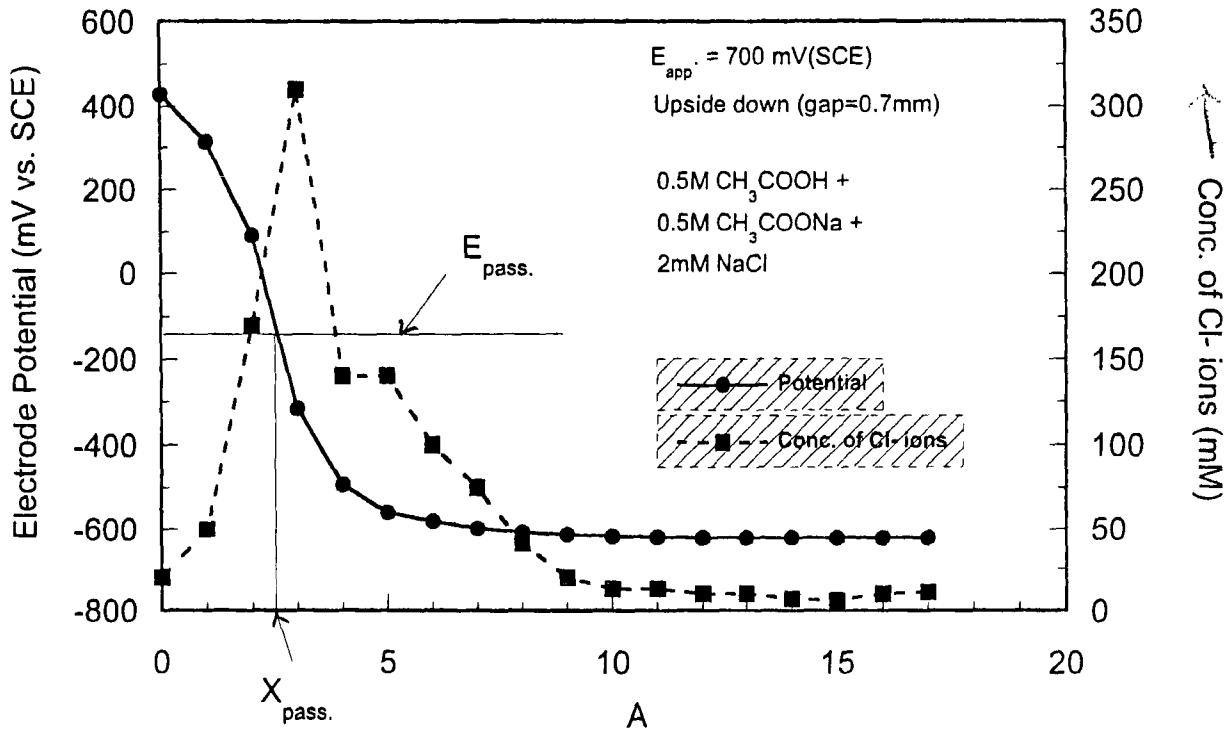
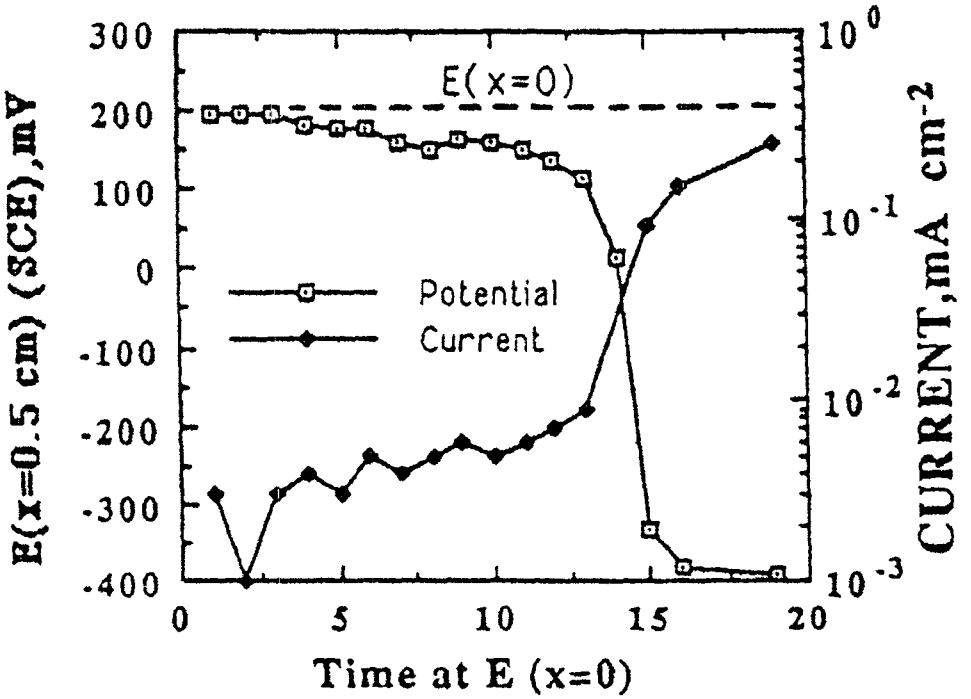


Figure 7. (a) Potential and (b) current transients showing the effect of an enhanced Cl^- concentration to the stability of crevice corrosion.

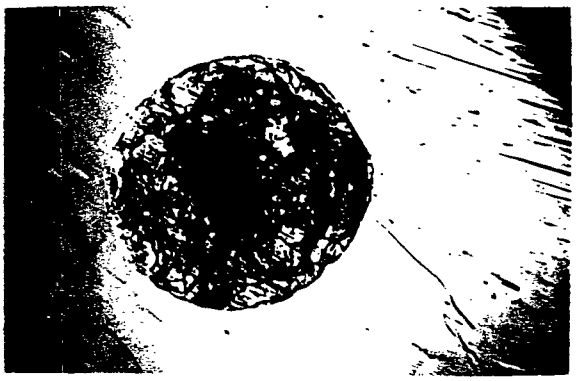

Electrode Potential (mV vs. SCE)
600
400
200
0
-200
-400
-600
-800
0
5
10
15
20
A
350
300
250
200
150
100
50
0
Conc. of Cl- ions (mM)
E app. = 700 mV(SCE)
Upside down (gap=0.7mm)
0.5M CH3COOH +
0.5M CH3COONa +
2mM NaCl
E pass.
X pass.
Potential
Conc. of Cl- ions



E(x = 0.5 cm) and current flowing out of crevice as a function of time.

PENNSTATE
1855

looking thru plexiglass



(a)

gas bubbles

(b)

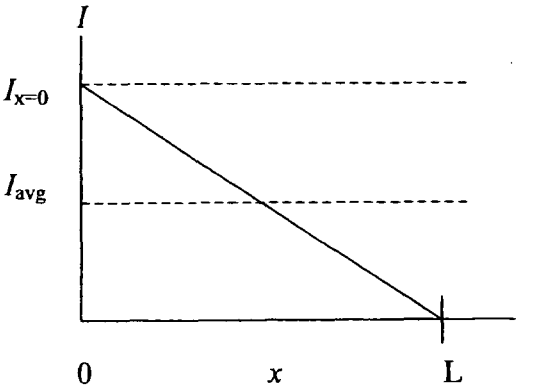
Fig 13

Harold Pickering

A Conservative Calculation of IR Voltage in a Crevice for the Passive Case

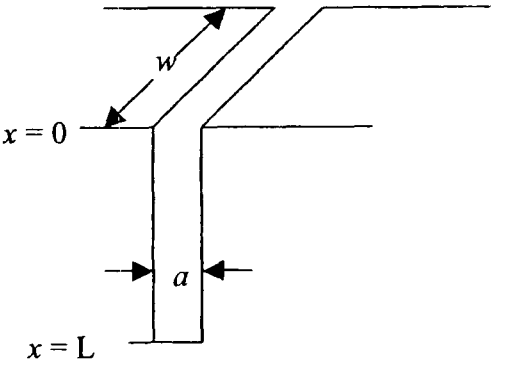
<u>Assume:</u> $\rho = 23$ ohm cm (0.01M H_2SO_4 + 4M $NiSO_4$) saturated pH 2 solution in crevice.

$I_{avg} = I_{x=0}/2$



<u>Given:</u> $\Delta\Phi_L = I_{avg}\,\rho\,L/\,a\,w = I_{avg}R$ volts; $R = \rho\,L/\,a\,w$

<u>Consider</u>: $I_{pass} = 10^{-8}$ A cm^{-2} ; $a = 10^{-6}$ cm; L = 1 cm



$$I_{avg} = I_{x=0} / 2 = 10^{-8} \bullet 2 / 2 = 10^{-8}$$
$$R = (23 \bullet 1) / (10^{-6} \bullet 1) = 23 \bullet 10^{6}$$
$$\Delta\Phi_L = IR = 10^{-8} \bullet 23 \bullet 10^{6} = 230 \text{ mV}$$

PENNSTATE