Unit 5 - Week 3

Assignment 3

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-10-07, 23:59 IST.

INSTRUCTIONS:

(A) The marks that each question carries is marked against the question.
(B) There is only one correct answer for a question.
(C) Take the E° values from appropriate sources, when not mentioned
(D) Take: F= 96500 C mol^{-1}

1) Linear polarization study of type 316 stainless steel in tap water shows a polarization resistance of 1500 Ω cm^2. Determine i_{corr} and corrosion rate in mpy. If βa and βc are 70 and 120 mV $decade^{-1}$ respectively, atomic mass of Fe= 55.85 g mol^{-1}, density of Fe= 7.87 g mol^{-1}. *4 points*

- 8.43 µA cm^{-2}, 4.85 mpy
- 14.58 µA cm^{-2}, 8.77 mpy
- 12.79 µA cm^{-2}, 5.90 mpy
- 17.22 µA cm^{-2}, 10.12 mpy

No, the answer is incorrect.
Score: 0
Accepted Answers:
12.79 µA cm^{-2}, 5.90 mpy

Common data for Q2- Q4: In an alloy development program anodic curves were generated for the medium of interest. The following is the summary of relevant results determined from these curves

Sr. No.	Alloy	Epp [V_{SHE})]	i_p (µA cm^{-2})	i_c (µA cm^{-2})
1	Fe	-0.1	500	5000
2	Fe-18Cr	-0.2	30	150
3	Fe-25Cr	-0.3	0.5	130
4	Fe-18Cr-8Ni	-0.4	10	120
5	Fe-18Cr-8Ni-3Mo	-0.5	10	50

2) If the limiting current density for the cathodic reaction is found to be 100 µA cm^{-2} gives the order increasing corrosion resistance of the alloys. *3 points*

- 1 =2 =3 =4 < 5
- 1 = 2 = 3 < 4 = 5
- 1 < 4 < 2 < 5 < 3
- 2 < 3 < 1 < 5 < 4

No, the answer is incorrect.
Score: 0
Accepted Answers:
1 =2 =3 =4 < 5

3) If the velocity V_1 causes an increase in limiting current density of cathodic reaction to 125 µA cm^{-2}, what would be the order of increase in corrosion resistance of the alloys under this condition? *3 points*

- 4 < 2 < 3 < 1 < 5
- 2 < 4 < 1 < 3 < 5
- 1 = 2 = 3 < 4 = 5
- 1 < 3 < 2 < 4 = 5

No, the answer is incorrect.
Score: 0
Accepted Answers:
1 = 2 = 3 < 4 = 5

4) If the velocity V_2 causes an increase in limiting current density of cathodic reaction to 155 µA cm^{-2}, what would be the order of increase in corrosion resistance of the alloys under this condition? *4 points*

- 1 < 2 < 4 = 5 < 3
- 3 < 4 = 5 < 2 < 1
- 2 < 1 < 4 = 5 < 3
- 1 < 3 < 2 < 4 = 5

No, the answer is incorrect.
Score: 0
Accepted Answers:
1 < 2 < 4 = 5 < 3

5) Corrosion current density of the storage tanks made of the alloy 5 given in the above problem having a surface area of 10 m^2 is required to be brought down to 10 µA cm^{-2} using platinum as a cathode. The platinum cathode is shorted. The cathodic reaction on platinum is hydrogen evolution as the solution is 0.5 M sulfuric acid shrouded with hydrogen gas of 1 atmosphere. What is the minimum surface area of the platinum sheet required in such a case to obtain the required corrosion current density. The exchange current density for hydrogen evolution on platinum is 1 mA cm^{-2} and the Tafel slope for hydrogen reduction reaction is 120 mV $decade^{-1}$. *6 points*

- 0.34 cm^2
- 0.78 cm^2
- 0.25 cm^2
- 0.54 cm^2

No, the answer is incorrect.
Score: 0
Accepted Answers:
0.34 cm^2