

Unit 8 - Week 6

Course outline

How does an NPTEL online course work?

Week 0

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Estimation of Corrosion Rate - I

Estimation of Corrosion Rate - II

Estimation of corrosion Rate - III

Exchange current Density

Exchange current Density and Standard hydrogen electrode

Quiz : Assignment 6

Corrosion - Part I: Week 6 Feedback

Assignment 6 - Solution

Week 7

Week 8

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Assignment 6

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

Due on 2020-03-11, 23:59 IST.

1) Consider that two samples A (20mm x 20mm x 5mm) and B (dia = 5mm and height = 30 mm) were immersed in freely aerated HCl solution under identical conditions. Both the samples were made from same material and in a perfectly annealed condition with same surface condition. Which of the following statements is true for the corrosion rate of both the samples; **1 point**

- corrosion rate of A is more than corrosion rate of B
- corrosion rate of A is less than corrosion rate of B
- corrosion rate of both A and B are same
- total weight loss of A is less than that of B

No, the answer is incorrect.
Score: 0

Accepted Answers:
corrosion rate of both A and B are same

2) A piece of iron is immersed in 3.5% NaCl solution for a period of 200 min. The corrosion rate in mpy is; (Given: $\Delta w = 0.01\text{gm}$, area of iron piece = 0.5 inch^2 and $r_{\text{Fe}} = 7.86\text{ g/cm}^3$) **0 points**

- (50 to 65)
- (12 to 25)
- (0.12 to 0.25)
- (120 to 135)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(50 to 65)

3) Based on Q2, the value of corrosion rate in mm/year is; **0 points**

- (6.5 to 7.5)
- (25 to 35)
- (3.5 to 4.5)
- (1.2 to 2.0)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(1.2 to 2.0)

4) A zinc plate is immersed in 3.5% NaCl solution. The corrosion current density is measured to be $5\mu\text{A/cm}^2$. The corrosion rate in mpy is; (Given: atomic weight of Zn = 65.4 g and $r_{\text{Zn}} = 7.14\text{ g/cm}^3$) **1 point**

- (5.5 to 6.9)
- (2.5 to 3.8)
- (11.4 to 12.8)
- (20.5 to 21.5)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(2.5 to 3.8)

5) Based on Q4, the value of corrosion rate in mdd is; **1 point**

- (4.5 to 5.3)
- (52.5 to 62.8)
- (1.4 to 2.1)
- (14.0 to 15.5)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(14.0 to 15.5)

6) A 316L stainless steel consists of 18 wt% Cr [$n = 1$, $r_{\text{Cr}} = 7.1\text{ g/cm}^3$, At. Wt. = 52 g/mol], 8% Ni [$n = 2$, $r_{\text{Ni}} = 8.9\text{ g/cm}^3$, At. Wt. = 58.7 g/mol], 2% Mo [$n = 1$, $r_{\text{Mo}} = 10.2\text{ g/cm}^3$, At. Wt. = 96 g/mol] and remaining Fe [$n=2$, $r_{\text{Fe}} = 7.8\text{ g/cm}^3$, At. Wt. = 56 g/mol]. Assume dissolution is uniform. Corrosion current density in 3.5% NaCl was measured to be $2\mu\text{A/cm}^2$. The value of corrosion rate in mpy is; **[Hint: use n, ρ and At.Wt. in the expression of rule of mixture]** **1 point**

- (2.5 to 4.0)
- (0.8 to 1.5)
- (7.8 to 8.9)
- (11.2 to 12.8)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(0.8 to 1.5)

7) Which of the following factors affects the exchange current density; **1 point**

- morphology of the metal surface
- temperature
- environment of the sample
- all of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
all of the above

8) Three metals (A, B and C) were dipped in H_2SO_4 solution and the exchange current densities were found to be 10^{-3} , 10^{-11} and 10^{-6} A/cm^2 for A, B and C, respectively. If the equilibrium is disturbed by some means, the quickness of re-establishment of equilibrium for three metals will be in the following order; **1 point**

- A - C - B
- C - B - A
- A - B - C
- C - A - B

No, the answer is incorrect.
Score: 0

Accepted Answers:
A - C - B

9) Which one of the following statements is not correct with reference to standard hydrogen electrode (SHE)? **1 point**

- The partial pressure of hydrogen gas is maintained at 1 atm at the temperature of 25°C
- The hydrogen ion concentration $[\text{H}^+]$ is maintained at 1M
- It is used for knowing unknown electrode potential
- Platinized platinum electrode is used because it has lower effective surface area as compared to platinum electrode

No, the answer is incorrect.
Score: 0

Accepted Answers:
Platinized platinum electrode is used because it has lower effective surface area as compared to platinum electrode

10) A piece of Zn is dipped in ZnSO_4 solution and it is observed that equilibrium is established between Zn and Zn^{2+} ion after time 't' and it behaves as non-corroding system. The anodic current density for the dissolution of Zn at time 't' is 10^{-12} A/cm^2 . The exchange current density (A/cm^2) for Zn at time 't' will be; **1 point**

- 10^{-12}
- 10^{-6}
- 10^{-10}
- 10^{12}

No, the answer is incorrect.
Score: 0

Accepted Answers:
 10^{-12}