



19CH101 – ENGINEERING CHEMISTRY

Unit-2 CORROSION AND ITS CONTROL

GALVANIC CORROSION

This type of electrochemical corrosion takes place when two dissimilar metals are joined in the presence of electrolyte. The metal with higher negative electrode potential acts as anode and the remaining parts acts as cathode.

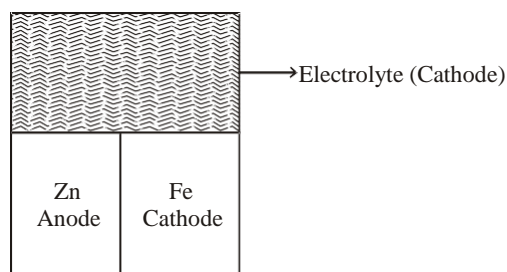


Fig : 3.4 Galvanic corrosion (Zn / Fe)

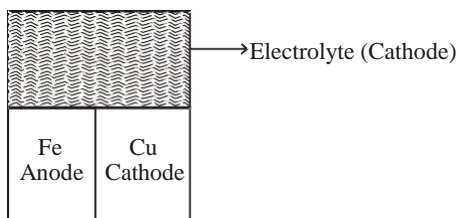
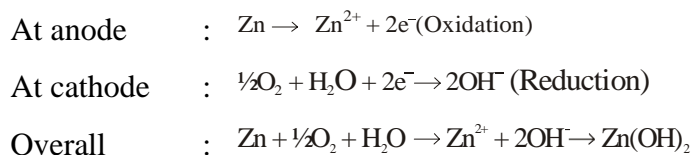
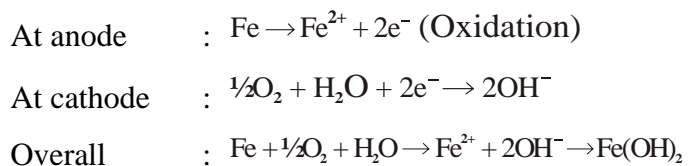


Fig : 3.5 Galvanic corrosion (Fe / Cu)





The galvanic corrosion can be avoided by

1. Coupling of metals very close in the emf series.
2. Providing an insulating material between the two metals.
3. The area of the cathode is always smaller than anodic area.

Concentration Cell Corrosion (or) Differential Aeration Corrosion

This is the most common type of electrochemical corrosion that takes place when the metal is partially dipped in solutions, metals partially covered with dust, sand, water drops etc. The less aerated part act as anode and the more aerated part act as cathode. The anodic part undergo corrosion and the cathodic part is prevented. This type of corrosion called as Concentration Cell Corrosion.

Example : 1

When a metal is partially immersed in a solution it has very poor aeration when compared with the metal that is outside the solution.

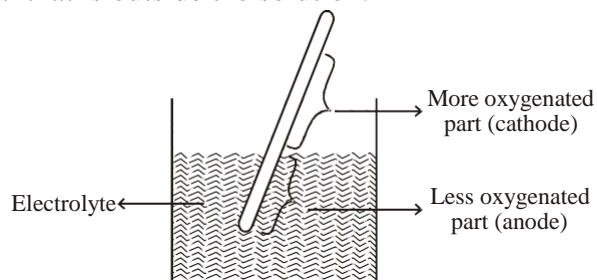


Fig. : 3.6 Concentration cell corrosion (Metal / Electrolyte)

The less aerated part act as anode and the more aerated part act as cathode.

Example: 2

The another example of this type of corrosion is the metal parts partially covered with dust, sand, water drops etc. This type of corrosion is called as *pitting corrosion*.

Pitting Corrosion

Pitting is a localized attack, resulting in the formation of a hole around which the metal is relatively unattached.



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The area covered by the drop of water act as an anode due to less oxygen concentration and suffers corrosion. The uncovered area (freely exposed to air) act as a cathode due to high oxygen concentration.

The rate of corrosion will be more, when the area of cathode is larger and the area of anode is smaller.

At anode : $\text{Fe} \rightarrow \text{Fe}^{2+} + 2e^-$ (Oxidation)

At cathode : $\frac{1}{2}\text{O}_2 + \text{H}_2\text{O} + 2e^- \rightarrow 2\text{OH}^-$

Overall



This type of intense corrosion is called pitting.

Example: 3

Differential aeration corrosion may also occur in different parts of pipeline. The buried pipelines (or) cables passing from one type of soil to another, say, from clay (less aerated) to sand (more aerated) may get corroded due to differential aeration.

Example: 4

This type of corrosion is also takes place in wire fence. In this case the areas where the wires cross are less aerated than the other parts of the fence. The corrosion takes place at the wire crossings because less aerated part act as anode.

