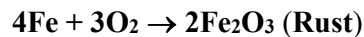


Corrosion

- **Corrosion can be defined as destruction and deterioration of metals and metal structure with its environment.**
 - Occurs by chemical or electrochemically attacked on the metal and metal surface.
 - It is a Slow Process
 - Measured in weight loss per unit time.

Examples: The most common example of corrosion is, of course, **rust**. The reddish-brown compound referred to as rust is actually **Iron Oxide (Fe₂O₃)**, a result of reactions between oxygen and iron.



Corrosion can be classified into two types

- **Dry or Chemical Corrosion**
- **Wet or Electro-chemical Corrosion**

Dry or Chemical Corrosion

- Occurs through the chemical attack of metal by the environment such as dry gas.
- Occurs at high temperature and without liquid phase.

It is of Two Types:

- (a) **Oxidation corrosion**
- (b) **Corrosion by other gases**

(a) Oxidation Corrosion:

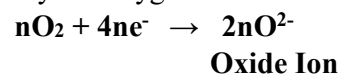
- It is due to direct attack of oxygen on metals.
- Oxygen molecules are attracted to the surface by **Vander Wall Force**

Mechanism:-

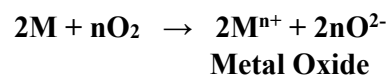
1. When temp increases the metal undergoes oxidation and losses e⁻



2. Electron are gained by the oxygen molecules forms oxide ions



3. Scale of metal oxide formed



- **Stable Corrosion:** Aluminium, Tin, Lead, Copper : The oxide films on Al, Sn, Pb and Cu are stable and stops further oxidation
- **Non-stable corrosion:** Silver, Gold, Platinum: oxide layers formed on these metals are unstable and decomposes back into the metal and oxygen
- In Molybdenum, MoO₃ is volatile, so it volatilizes as soon as it is formed, leaving the metal surface exposed for further attack.

Pilling – Bed Worth Ratio

- If the oxide formed due to corrosion has a volume equal or greater than that of the metal used, the oxide layer is protective. If the volume of oxide is less than the volume of the metal used, the film is non-protective.
- The ratio of the volume of oxide formed to the volume of the metal consumed is called Pilling – Bedworth ratio

(b) Corrosion by other Gases

- Carbon di-oxide, Chlorine, Hydrogen Sulphide, Sulphur di-oxide, Flourine will also attack the surface of the metals and lead to corrosion.
- Depends on chemical affinity b/w metal and the gas.

Wet or Electrochemical Corrosion

- Occurs when aqueous solution or liquid electrolytes are present.
- When a metal is in contact with a conducting liquid or when two different metal surfaces come into contact with each other in the presence of a liquid, electrochemical corrosion takes place.
- Wet corrosion is most efficient in waters containing salts, such as NaCl (e.g. marine conditions), due to the high conductivity of the solution.

Mechanism of Electrochemical Corrosion

Anodic Reaction:

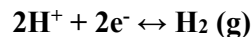
Dissolution of metal takes place.

- As result metal ions are formed with the liberation of free electrons.



Cathodic Reaction

(i) Hydrogen Evolution :- Occurs usually in acidic medium



(ii) Oxygen Absorption: - occurs when solution is aerated sufficiently.

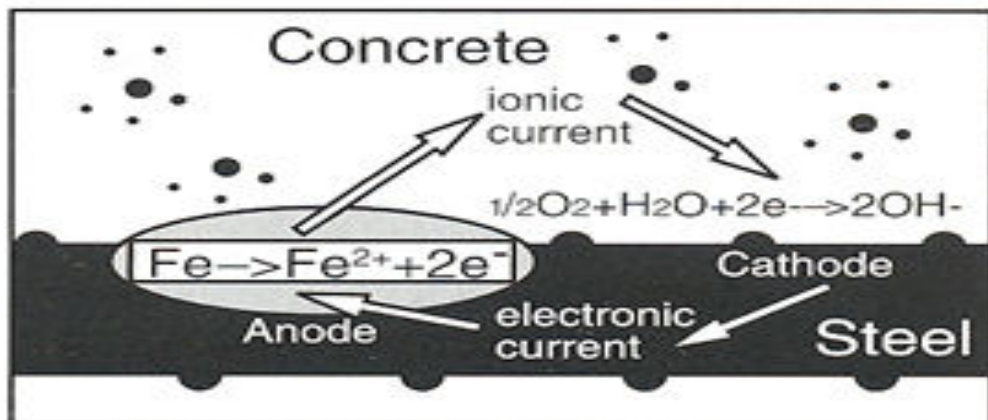


Figure 1: The anodic and cathodic reactions