

Comparison between Dry and Wet corrosion

Dry

- involves direct attack of atmospheric gases
- Do not need a corrosive medium
- Types include oxidation corrosion, liquid metal corrosion and corrosion by gases
- less prevailing

Wet

- occurs due to the existence of separate anodic and cathodic areas between which current flows through the medium.
- Needs corrosive medium
- Types include galvanic pitting stress and intergranular
- More common.

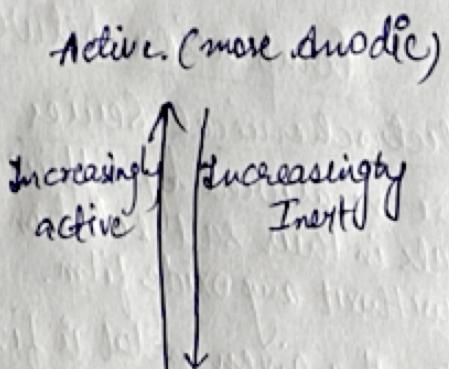
Galvanic Series

Need for Galvanic Series

The electrochemical series does not take passivity into account.
The electrochemical series does not account for corrosion behaviour of alloys.

- The series prepared by studying the corrosion of metals and alloys in a given environment like sea water.

Mg
Mg Alloys
Zn
Al
cd Mild steel
cast iron
stainless steel
:
Nickel
Ag
Ti
graphite
Au, Pt



Passive (more cathodic)

→ Mild steel best steel available.

Mild + stainless → more corrosive attack

Zinc + Cad → rate is less
diff is less.

Zinc + copper → rate is faster
diff is more.

Cad → high ultra potential.

Silver → stable.

more susceptible → free energy is high

less susceptible to corrosive attack → low free energy

Characteristics of Galvanic Series

- Galvanic series include both metals and alloys.
- Metals and alloys are arranged in the increasing order of their corrosion resistance in sea water.
- Metals and alloy having almost same corrosion characteristic are grouped within a square bracket.
- Some metal can occupy two positions in the galvanic series. For eg Al occurs both active and noble region depending upon its active and passive states.

Comparison between ES & GS.

Electrochemical Series

- E_s are measured by dipping pure metals in their salt solution of 1 M conc without any oxide film.
- Position of a given metal is fixed
- gives no information regarding the position of alloys.
- Metals and non-metals are included

Galvanic Series

- series developed by studying corrosion of metals & alloys in unpolluted sea water, without their oxide films.
- the position of a given metal may shift as it takes active & passive states.
- alloys are included based on their corrosion behaviour
- Metals and alloys are included

Similarity: In both, base metals are placed higher & noble metals lower in the series.

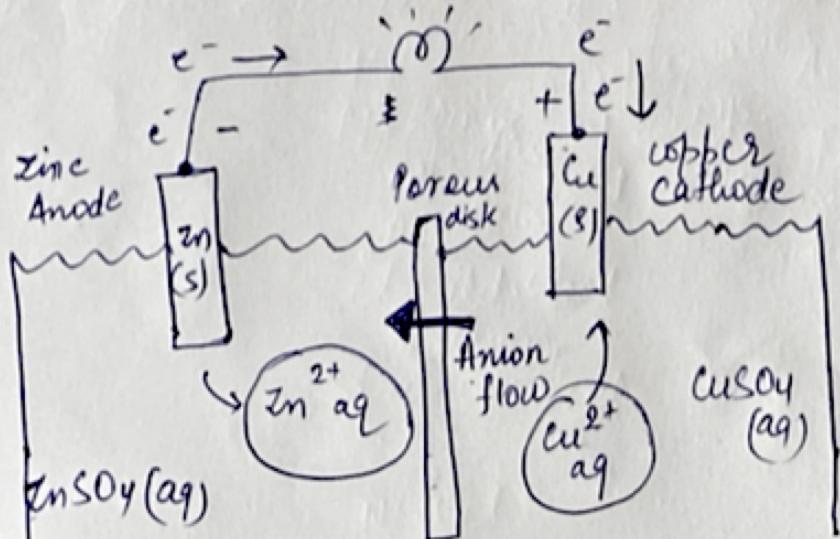
TYPES OF CORROSION

- ① Galvanic corrosion
- ② Pitting corrosion
- ③ Inter-granular corrosion
- ④ Stress corrosion.

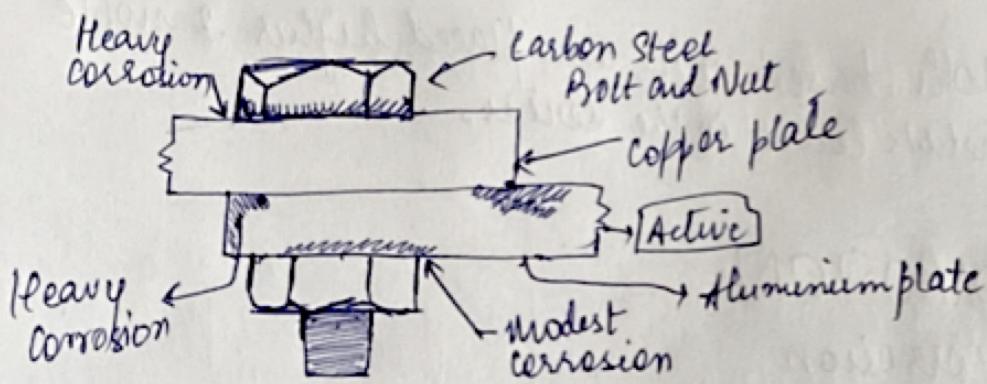
GALVANIC CORROSION

occurs when two dissimilar metals are in contact with an electrolyte.

- Anode: Metal with lower standard electrode potential value
- Cathode: Metal with higher standard electrode potential
- Examples:
 - ① copper piping connected to steel tanks
 - ② Steel screws in a brass marine hardware
 - ③ Lead antimony solder around the copper wire
 - ④ A steel propeller shaft in bronze bearing
 - ⑤ steel pipe connected to copper plumbing



Bolt and Nut should
be of same
material



Effects of Galvanic Corrosion

The rainwater guttering is made of aluminium and would normally resist corrosion well. Someone tied a copper aerial wire around it, and the localised bimetallic cell led to a "knife-cut" effect.

PITTING CORROSION

A pit may be described as a cavity or hole with the surface diameter about the same length as or less than the depth.

Important reasons are:

- Surface roughness or non uniform finish
- Scratches or cut edges
- Local straining of metal, due to non uniform stress
- Depositions of extraneous matters such as sand, scale, water drop, dust etc.