Wet corrosion

Wet/immersed/electrochemical corrosion

When two dissimilar metal are dipped completely or partially in any solution then one of the metal will act as anode and other metal act as cathode.The solution in which it is dipped will act as electrolyte .The metal which act as anode will undergo oxidation by losing electron into the conducting medium in which metal is dipped and will get corroded while the metal acting as cathode will be protected from corrosion.

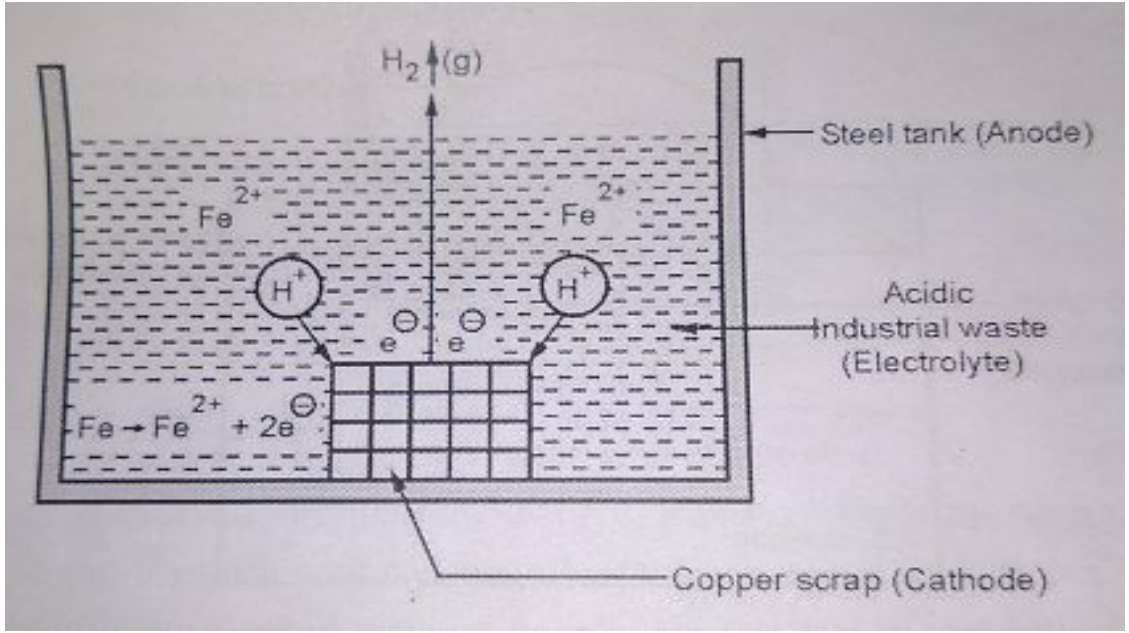
The more active metal will act as anode and less active metal will act as cathode.

Mechanism of immersed corrosion

1)Hydrogen evolution mechanism (occurs in acidic medium)

2) Oxygen absorption Mechanism.(occurs in neutral aqueous medium)

Hydrogen evolution mechanism

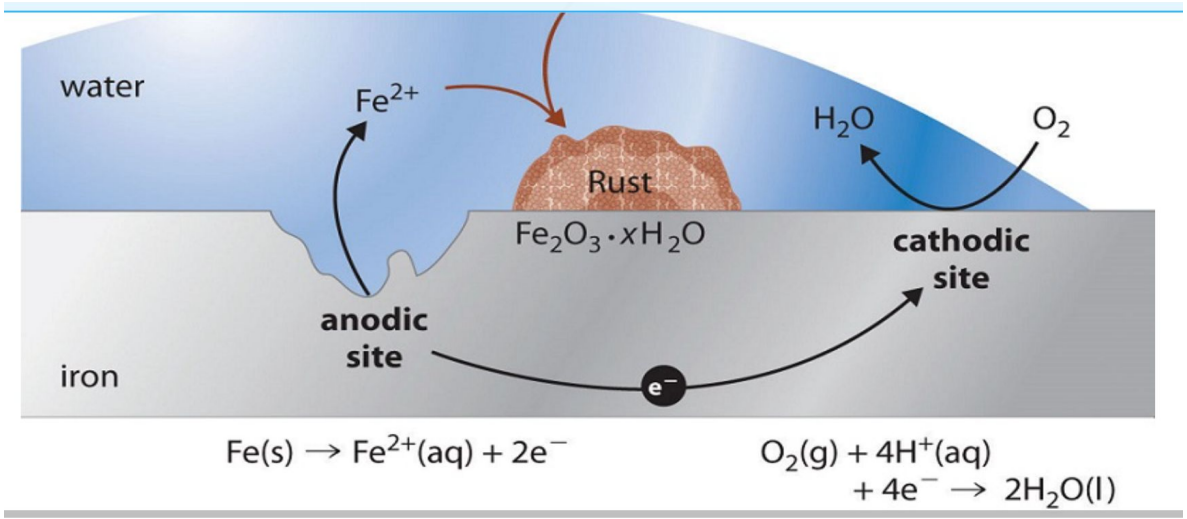


Anodic reaction : $Fe \rightarrow Fe^{2+} + 2e^-$ (oxidation)

Cathodic reaction : $2H^+ + 2e^- \rightarrow H_2 \uparrow$ (Reduction)

Overall Reaction : $Fe + 2H^+ \rightarrow Fe^{2+} + H_2 \uparrow$ (Redox Reaction)

Oxygen absorption Mechanism.



Anodic reaction :$Fe \rightarrow Fe^{2+} + 2e^-$ (oxidation)

Cathodic reaction :$\frac{1}{2} O_2 + H_2O + 2e^- \rightarrow 2OH^-$ (Reduction)

Overall Reaction : $Fe + \frac{1}{2} O_2 + H_2O \rightarrow Fe(OH)_2$

Yellow Rust is $Fe_2O_3.XH_2O$.

Factors affecting immersed corrosion

1. Position of metal
2. Purity of metal
3. Ph of solution
4. Differential aeration
5. Solubility of corrosion product
6. Rough surfaces
7.

Pitting corrosion :small pits on the metal surface due to corrosion as the oxide film breaks

Waterline corrosion occurs due to different water level creating anodic or cathodic area

Crevice corrosion occurs at the gaps

Methods to protect metals from corrosion.

Metals.

Surrounding medium.

Modification in surrounding medium.

1. De-aeration
2. De-activation
3. Dehumidification
4. Alkaline neutralisation

Modification in Metals

1. Refining
2. Alloying
3. Heat treatment

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Use of Protective coating

1 Anodic coating :

Here the base metal (metal to be protected) is less active than the coating metal (anodic)

Eg Fe is coated with Zinc

2.Cathodic coating:

Here the basic metal is more active than the coating metal (cathodic)

Eg:Fe is coated with tin

Methods of application of coating

Hot dipping technique : The base metal with higher melting point is dipped in hot molten solution of coating metal with lower melting point.

Its of two types

Galvanising (Fe is coated with Zn)

Tinning (Fe is coated with Sn)

Difference between in galvanising And Tinning

1. Base metal is coated with Zinc
2. Galvanised containers are not used for storage of food
3. It is less expensive
4. Coating is not shining
5. It is anodic type of coating

1. Base metal is coated with Tin
2. Tinned containers can be used for storage of food
3. It is expensive
4. Coating is Shining
5. It is cathodic type of coating

Cathodic protection technique

1. Sacrificial anodic protection
2. Impressed current cathodic method

- Sacrificial anodic protection

  Protection of buried underground pipeline are done by this method.Fe pipes are attached with Zinc strips at regular interval here the zinc strip metals act as anode with respect to Fe cathode pipes and sacrifices themselves to protect the Fe pipelines by itself becoming anode.

- Impressed current cathodic method

  In this method ,an impressed current is applied in opposite direction to nullify the corrosion current ,and convert the corroding metal from anode to cathode.

  It usually used in large sub marines.