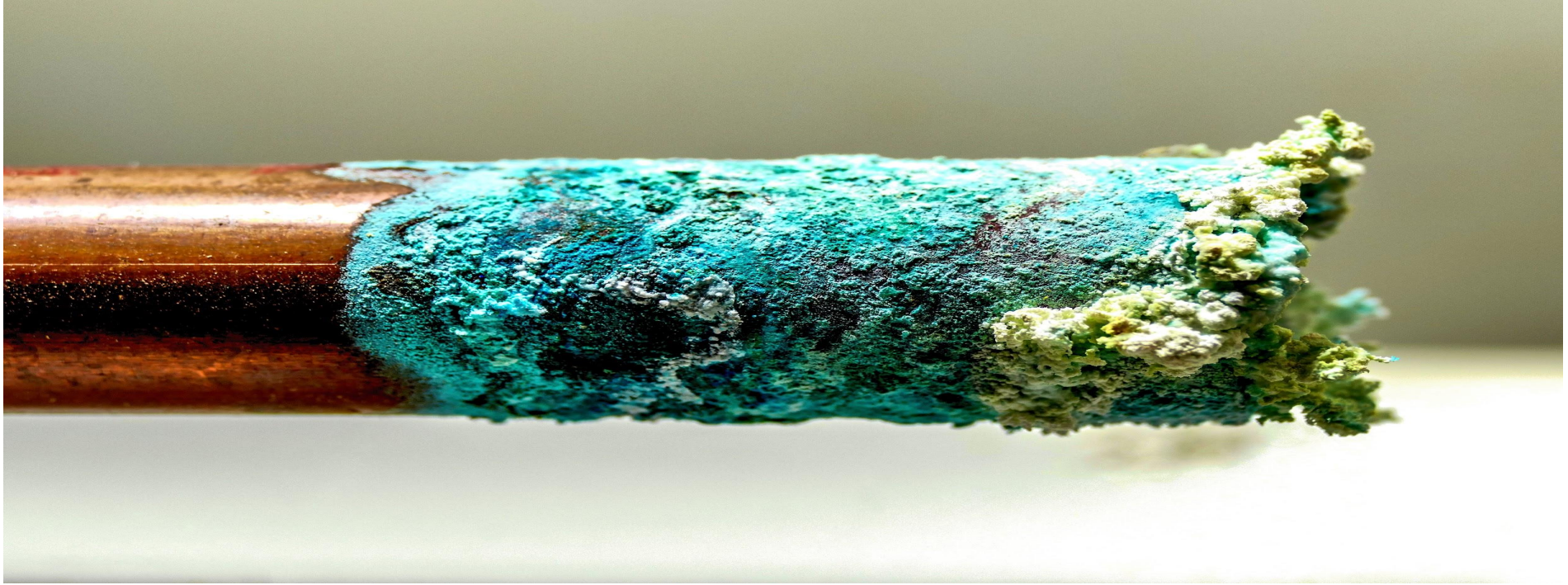


CORROSION

Process of slow conversion of metals into their undesirable compounds by the action of air and moisture.

Condition for rusting

1. Impurity of metal
2. Presence of oxygen
3. Presence of moisture
4. Presence of electrolyte
5. Presence of Cl_2 and SO_2 in the atmosphere
6. Strains of metals

Types of corrosion

1.Dry or chemical corrosion

- Direct action of chemical gases like O_2,H_2S,SO_2 , halogens.
- No water content.

2.Wet or electrochemical corrosion

- Occurs due to anodic and cathodic areas in the system.
- Current flow through conducting liquid and anode get oxidised and wasted.
- Eg- rusting of iron.

Rusting of iron

- A piece of iron get exposed to the atmosphere, it is covered with a reddish brown deposit called rust.
- $Fe_2O_3.xH_2O$
- Hydrated ferric oxide .
- In rusting a galvanic cell setup between two dissimilar part of the same metal.

Mechanism of rusting

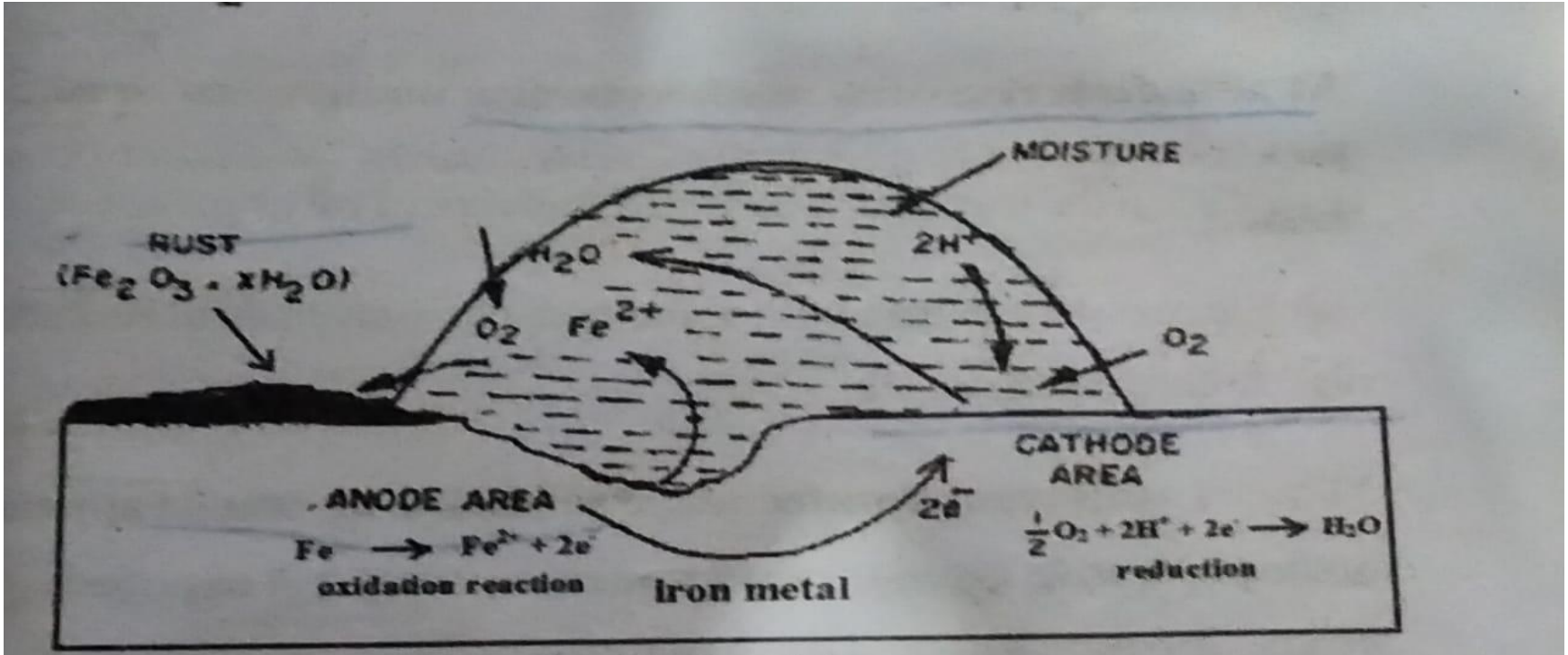


Fig. Rusting of iron.

1. The portion of iron which is in contact with water act as anode , and other portion which is in contact with air act as cathode.
2. Anodic iron get oxidised to Fe^{2+} ion.
   The electron released from the anode move through the metal to cathodic site.
3. The oxygen at the cathode changes to OH^- ion by reduction.
   $\frac{1}{2} O_2 + H_2O + 2e^- \rightarrow 2OH^-$

4.Fe^{2+} and OH^- combine to form $Fe(OH)_2$ which get oxidised to $Fe(OH)_3$

Fe^{2+} + 2 OH^- → $Fe(OH)_2$
2 + 2 H2O →4 $Fe(OH)_3$

The product **4 $Fe(OH)_3$** corresponding to **$Fe_2O_3.xH_2O$**

The overall reaction is

$$2Fe_{(s)} + O_{2(g)} + 4H^{+} \rightarrow 2Fe^{2+}_{(aq)} + 2H_2O_{(l)}$$

Prevention of corrosion / corrosion control

1.maintain the purity of the metal
2.alloying with other metal
3.modification of environment.

4. Barrier protection or protective coating

- Chemically inert physical barrier is created between the metal and environment.
- It may be metallic , non metallic or organic
- Eg-plastic coating, rubber coating, oil or grease or electroplating with some other metal.
- Thus prevent the direct contact with air .

Drawback

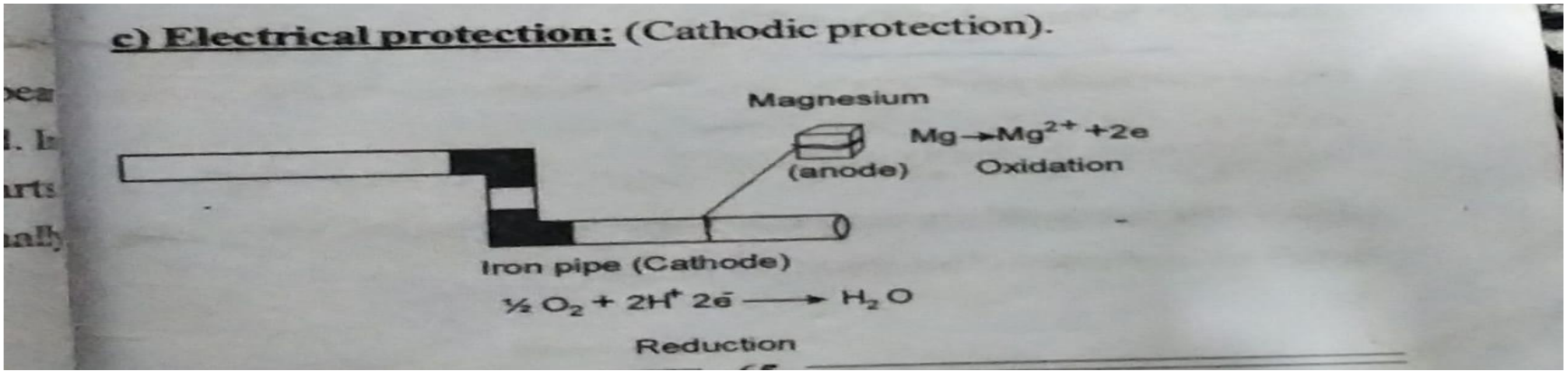
1. If a scratches or cracks appear on the layer , iron get exposed and rusting get started. It extended and eventually peels off the protective layer.

5.Sacrificial protection

- Surface iron covered with more active metal like zinc.
- The active metal get oxidise(act as anode) and protect iron from rusting.
- Method of protecting one metal by more active metal suffering the damages it self.
- Even if covered metal almost exposed but still the iron get protected by act as cathode.
- Galvanisation is an eg for this

6.Cathodic protection /Electrical protection

- Surface of iron connected to more active metal like magnesium through a metal wire .
- Iron metal act as cathode and active metal act as anode (suffer damage)



7. **Using anti rust solution**

Iron articles are dipped into boiling anti rust solution like sodium phosphate . a protective layer is formed.