

## 7. Corrosion Control (contd.)

20 October 2023 08:04

**USING INHIBITORS** } added in small qty to corrosive environment to decrease corrosion.  
can be used only in confined environment

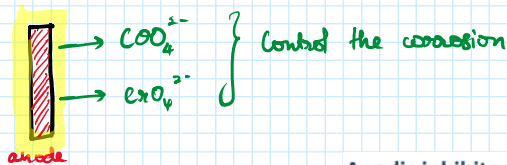
Anodic inhibitors

Cathodic inhibitors

Liberation of  $H_2$

Absorption of  $O_2$

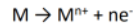
Anodic inhibitors



Disadvantages:

- Some inhibitors are toxic
- Not eco-friendly
- Pitting corrosion takes place

Anodic inhibitors:



- If the formation of  $M^{n+}$  is prevented, the corrosion process is retarded
- This is achieved by the addition of large anions such as chromate ( $CrO_4^{2-}$ ), tungstate ( $WO_4^{2-}$ ), etc.
- These ions combine with  $M^{n+}$  and form a precipitate which covers the surface of the anode

Cathodic inhibitors

Liberation of  $H_2$

Absorption of  $O_2$

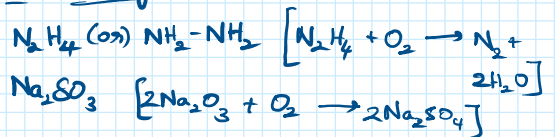
Reduces  $H^+$  ions

Urea, thiourea, aliphatic amines, heterocyclic "N" compounds, mercaptans

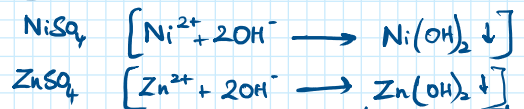
They get adsorbed on the cathodic region forming a protective film, preventing the  $H^+$  ions from coming in contact with the cathodic metal surface

Increases  $H_2$  overvoltage: liberation of  $H_2$  is difficult  
 $As_2O_3$ ,  $Sb_2O_3$ ,  $NaAsO_2$

$O_2$  scavengers



Reduces  $OH^-$  ions



deposited on cathode, blocks  $O_2$  from it

Limitations: of inhibitors

- They contaminate the environment
- Many of the inhibitors are toxic, cannot be used in systems which come in contact with humans
- Can be used only in closed systems in which corrosive environment is either contained or re-circulated

**CATHODIC PROTECTION** } converting the entire thing into cathode and not allowing any part to act as anode

Sacrificial anode

Impressed cathodic

## Sacrificial anodic corrosion

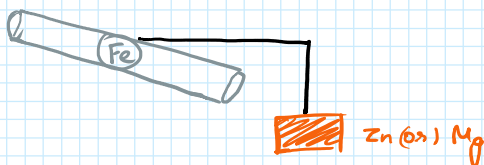
## Impressed cathodic current method

**Sacrificial anodic corrosion** → protected metal connected to more active metal which acts as auxiliary anode

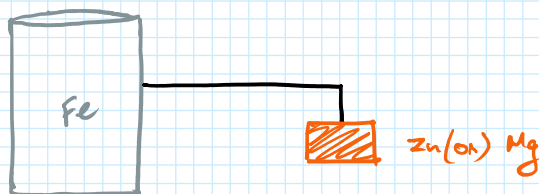
Anode: Zn (or) Mg

Cathode: Pipeline, oil tank, boat

Ex-①: Pipeline connected with sacrificial anode (Zn or Mg)



Ex-②: Oil tank connected with sacrificial anode (Zn or Mg)



### Advantages:

- Simple method
- Low installation cost
- Does not require current

### Disadvantages:

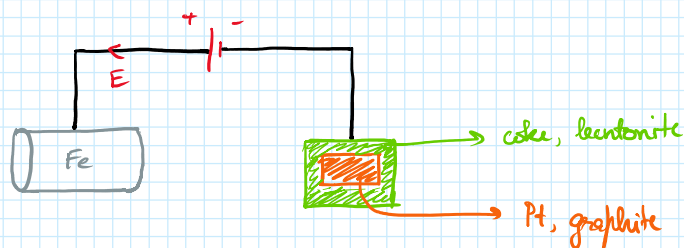
- Frequently changing anode material

**Impressed cathodic current method** → Protected metal made cathodic by connecting to the cathode of external power source

Anode: Inert anode - Pt, graphite  $\xrightarrow{\text{coated with}}$  coke, bentonite → improves efficiency

Cathode: Pipeline

Current required



### Advantages

- Anode does not undergo corrosion (inert)

### Disadvantages

- Expensive since it needs high amount of current
- If impressed current is not uniform on the

- Anode does not undergo corrosion (inert)
- One installation can protect large area of metal

- Expensive since it needs high amount of current
- If impressed current is not uniform on the surface of protected metal, localised corrosion takes place