CORROSION INHIBITORS

Definition:

Substance which reduces the rate of corrosion of a metal, when added to the corrosive environment.

Types

i) Anodic inhibitors (chemical passivators)

ii) Cathodic inhibitors (adsorption inhibitors)

iii) Vapour phase inhibitors (volatile corrosion inhibitors)

Anodic inhibitors (chemical passivators)

Chemical substance which prevents the corrosion reaction at the anode by the modification of anodic surface as insoluble compound.

These insoluble compounds are adsorbed on the metal surface (anode), forming a protective film and reducing the corrosion rate.

Anodic inhibitors are used to repair the pitting corrosion.

Example: molybdates, chromates, nitrates, phosphates, tungstates, or other ions of transition elements with high oxygen content.

Cathodic inhibitor (adsorption inhibitors)

Chemical substance which prevents the corrosion reaction at the cathode by the modification of cathodic surface.

There are two types depending upon the environment.

a) In acidic solution, the cathodic reaction is evolution of hydrogen.

$$2\,H^+ + 2e^- \longrightarrow H_2$$

It can be controlled either by

1. reducing the rate of diffusion of H+ ions to the cathode

Organic inhibitors like amines, mercaptans, urea and thiourea reduces the H ion diffusion by adsorption

2. by increasing the over voltage of hydrogen evolution.

Mercury, arsenic and antimony deposits films at cathodic area which raise the hydrogen over volume.

b. In a neutral solution: absorption of O2 or formation of OH- ion. corrosion can be controlled either

1.by eliminating oxygen by adding Na2SO3 & hydrazine N2H4 (reducing agents).

$$Na_2SO_3 + O_2 \longrightarrow Na_2SO_4$$

$$N_2H_4 + O_2 \longrightarrow 2H_2O + N_2$$

ii) by eliminating the OH– ions by adding Mg, Zn or Ni salts. These salts react with OH- ion to form insoluble hydroxides

iii) Vapour phase inhibitors (VPI)

- They are easily vaporizable organic substances
- Readily vaporize and form a protective layer on the MS
- Used to prevent corrosion in closed spaces like storage containers, packing materials, sophisticated equipments, etc.

Examples: Dicyclohexylammonium nitrate, dicyclohexyl ammonium chromate, benzotriazole, phenyl thiourea, etc.