Pit Corrosion

It is a highly localized differential aeration corrosion which proceeds at a rapid rate to form "pits" or cavities on the surface of the metal. Under the following situations pits are formed on the metallic surface:

1. When impurities like sand, dust, scale, etc. sat on the surface
2. When there is any breakage of protective oxide film at a localized area

Let us consider that a dust particle is sitting on the surface of an iron metal and the metal is exposed to a neutral humid atmosphere. The rusting of iron will occur as per the following steps:

(i) **At Anode:** $Fe \rightarrow Fe^{2+} + 2e^-$(oxidation)

(ii) **At Cathode:** $1/2O_2$ (oxidant) + $H_2O + 2e^- \rightarrow 2OH^-$ (reduction) (O_2 absorption occurs)

(iii) **Rust formation:** The cations Fe^{2+} and anions OH^- liberated at anode and cathode, respectively combines somewhere at the interface to form ferrous hydroxide $Fe(OH)_2$. As ferrous hydroxide is unstable in nature, in presence of sufficient oxygen it converted into hydrated ferric oxide ($Fe_2O_3.xH_2O$) or ferric hydroxide $Fe(OH)_3$-a brownish product (called rust) and deposited near the cathode.

$Fe^{2+} + 2OH^- \rightarrow Fe(OH)_2 \rightarrow Fe(OH)_3$ or $Fe_2O_3.xH_2O$ (in pr. of excess O_2)

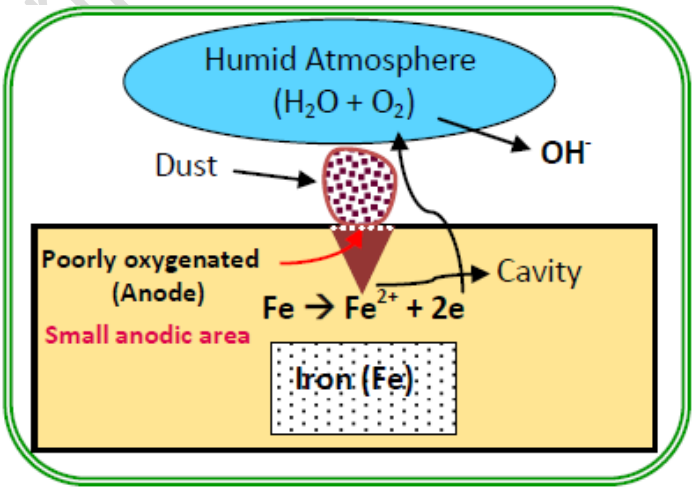

Fig. 7. Mechanism of pitting corrosion.

Q. Iron corrodes faster under drops of salt solution. Give reason.

Ans. This is due to differential aeration corrosion. As part of iron covered by drop is poorly oxygenated part, it acts as anode and undergoes rapid corrosion.

Q. Why deposition of extraneous matter like dirt, sand, dust, etc. on the surface of metal for a long period is unwanted?

Ans. This causes differential aeration corrosion. Deposition of matter on the surfaces restricts the access of O_2 below it; thereby it becomes anode and undergoes localized corrosion.

Q. Why should nickel plated iron articles be free from pores and pin holes?

Ans. Here, Iron acts as anode and Nickel acts as cathode. Presence of pores in Ni-plated articles exposes the anodic Fe-metal to the atmosphere at these points. So, galvanic cell is form and intense localized corrosion occurs.