Factors influencing Corrosion: Nature of Metal

i) Position in Galvanic Series: When two metals or alloys are in electrical contact, the more active metal suffers corrosion. The rate and severity of corrosion depends upon the difference in their positions, and greater is difference, the faster is the corrosion of the anodic metal.

ii) Relative areas of the anodic and cathodic parts: When two dissimilar metals or alloys are in contact, the corrosion of the anodic part is directly proportional to the ratio of areas of the cathodic part and the anodic part. Corrosion is more rapid and severe, if the anodic area is small because of the demand for electrons by large cathode area.

iii) Purity of metal: Impurities in metal cause 'heterogeneity' and form minute electrochemical cells, and the anodic part gets corroded. The rate and extent of corrosion increases with the increasing exposure and extent of the impurities.

iv) Physical state of metal: The rate of corrosion is influenced by physical state of metal. The smaller the grain size of the metal, the greater will be its solubility and hence greater will be its corrosion. Moreover, areas under stress, even in a pure metal tend to be anodic and corrosion takes place at these areas.

excessive corrosion. For ...

product of molybdenum, is volatile.

2. ***Nature of the corroding environment*** : (*i*) **Temperature :** *With increase of temperature of environment, the reaction as well as diffusion rate increase, thereby corrosion rate is generally enhanced.*

(*ii*) **Humidity of air** *is the deciding factor in atmospheric corrosion.* "***Critical humidity***" *is defined as the relative humidity above which the atmospheric corrosion rate of metal increases sharply.* The value of critical humidity depends on the *physical characteristics of the metal* as well as *nature of the corrosion products.* The reason why corrosion of a metal becomes *faster in humid atmosphere* is that *gases* (CO_2, O_2, etc.) and *vapours*, present in atmosphere furnish *water* to the electrolyte, essential for setting up an electrochemical corrosion cell. Moreover, the oxide film on a metal surface, although a solid body, yet possesses the property of absorbing moisture. In presence of this absorbed moisture, all necessary requirements for the occurrence of electrochemical type corrosion exist, and hence, corrosion rate is enhanced. It may be added here that *nature of moisture source* also play an important role. Thus, rain water, apart from supplying the necessary moisture for electrochemical attack, may also *wash away a good part of oxide film from the metal surface.* This leads to an enhanced atmospheric attack, unless the oxide film is exceptionally adherent (*e.g.*, Cr, Al).

(*iii*) **Presence of impurities in atmosphere :** Atmosphere, in the vicinity of industrial areas, contains corrosive gases like CO_2, H_2S, SO_2, and fumes of HCl, H_2SO_4, etc. *In presence of these gases, the acidity of the liquid, adjacent to the metal surfaces, increases and its electrical conductivity also increases.* This consequently, results in an increase of corrosion current flowing in the local electrochemical cells on the exposed metal surfaces. Similarly, in the *marine atmosphere*, the presence of sodium and other chlorides (of sea water) leads to *increased conductivity* of the liquid layer in contact with the metal surface, thereby corrosion in speeded up.

(*iv*) **Presence of suspended particles in atmosphere :** In case of atmospheric corrosion : (*a*) if the suspended particles are *chemically active in nature* [like NaCl, $(NH_4)_2SO_4$], they absorb moisture and act as strong electrolytes, thereby causing *enhanced corrosion* ; (*b*) if the suspended particles are *chemically inactive in nature* (*e.g.*, charcoal), they absorb both sulphur gases, and moisture and *slowly enhance corrosion rate.*

(*v*) **Influence of pH :** *Generally, acidic media* (*i.e.*, $pH < 7$) *are more corrosive than alkaline and neutral media.* However, *amphoteric metals* (like Al, Zd, Pb, etc.) *dissolve in alkaline solutions as complex ions.* The corrosion rate of iron in *oxygen-free water is slow,* until the pH is below 5. The corresponding *corrosion rate in presence of oxygen is much higher. Consequently, corrosion of metals, readily attacked by acid, can be* ***reduced by increasing the pH*** *of the attacking environment, e.g., Zn (which*