ELECTRODE POTENTIAL

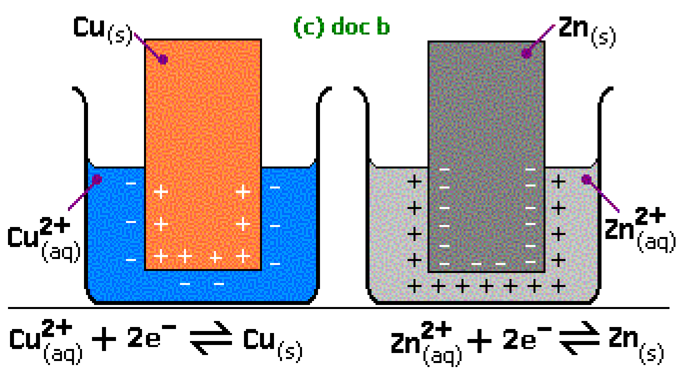
According to Nernst's theory of electrode potential, a metal (M) consists of metal ions (M^{n+}) with valence electrons. When the metal (M)is placed its own salt solution, any one of the following reaction occurs.

(i) Metal passes into the solution as metal ion with the liberation of electrons.

$$M \longrightarrow M^{n+} + ne^- \text{ (oxidation)}$$

(ii) Positive metal ion from the solution may deposit over the metal.

$$M^{n+} + ne^- \longrightarrow M \text{ (reduction)}$$



Examples:

1) When zinc rod is dipped in zinc sulphate solution, due to solution pressure of metal, zinc passes into solution as Zn^{2+} ions.Now, the zinc electrode attains a negative charge, due to the Accumulation of valence electrons on the metal. The negative charge developed on the electrode attracts the positive ions from solution.Due to this attraction; the positive ions remain close to the metal.

2) When copper rod is dipped in copper sulphate solution, due to osmotic pressure of solution, Cu^{2+} ions deposit over the metal. Now, the copper electrode attains a positive charge, due to the Accumulation of Cu^{2+} ions on the metal. The positive charges developed on the electrode attractnegative ions from solution. Due to this attraction, the negative ions remain close to the metal.

Thus, a sort of layer (positive or negative ions) is formed all around the metal. This layer is called Helmholtz electrical double layer. This layer prevents further passing of positive ions from the metal or deposition of positive ion from solution. A difference of potential is consequently set up between metal and solution. At equilibrium, the potential difference becomes a constant value, which is known as the electrode potential of a metal.

Thus, ***the tendency of an electrode to lose electrons is called the oxidation potential and the tendency of an electrode to gain electrons is called the reduction potential.***

Single Electrode Potential (E)

It is the tendency of a metallic electrode to lose or gain the electrons, when it is dipped in its own salt solution.

Standard Electrode Potential (E_o)

It is the tendency of a metallic electrode to lose or gain the electrons, when it is dipped in its one molar own salt solution at 25 ^oC.