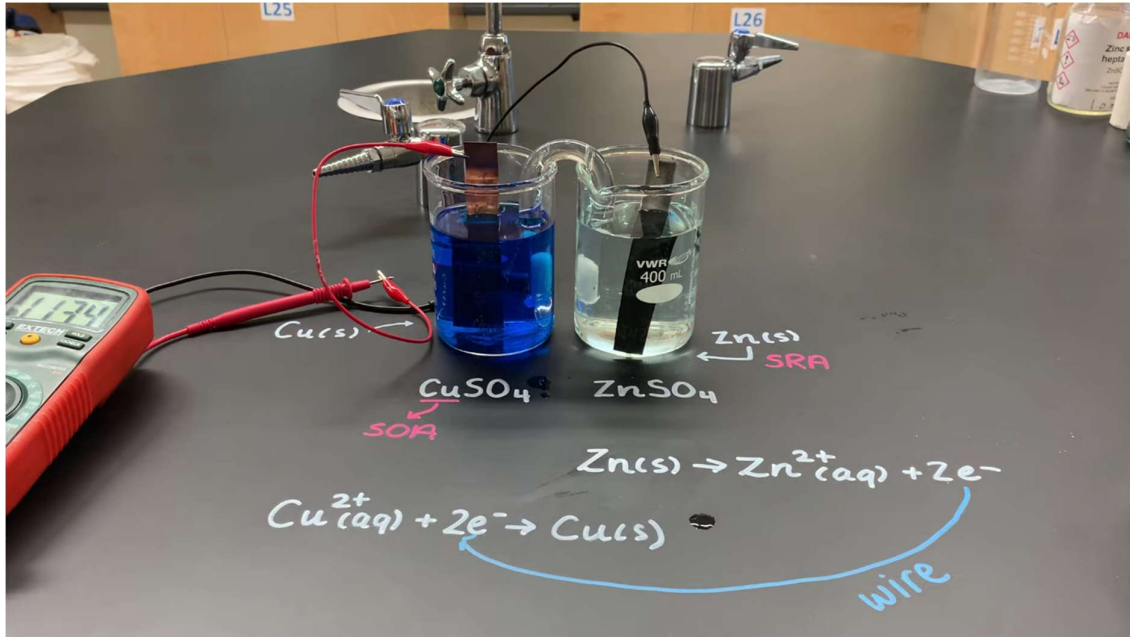


If we want to understand the core process going behind corrosion. Then we have to look back towards the electrochemistry. What is it? **Electrochemistry** is the branch of physical chemistry concerned with the relationship between electrical potential difference and identifiable chemical change. These reactions involve electrons moving via an electronically conducting phase (we will see later as salt bridge). The typical redox reaction is involved. The anode and cathode are based on electrode potential. The standard reduction potential (SRP value) of commonly used metal and non-metal or gases are listed as electro-chemical series.



Also, from the law of thermodynamics we know that for the process to be established. The Gibbs free energy should be negative. It implies reaction or phenomenon to be spontaneous.

$$\Delta G_0 = -nfE_{0_{cel}}$$

$$\text{For } \Delta G_0 < 0 ; E_{0_{cell}} > 0$$

$$E_{0_{cell}} = E_{0_{srp,catho}} - E_{0_{srp,anode}}$$

The components which have more negative SRP value will act as anode. Then only from the above equation (iii) we can justify that  $E_{0_{cell}}$  will be positive.

We all know the reinforced concrete system has steels bar embedded inside the plain concrete system. Steels bars are typically Fe250 or Fe450 but for sure its iron rod of different grades.

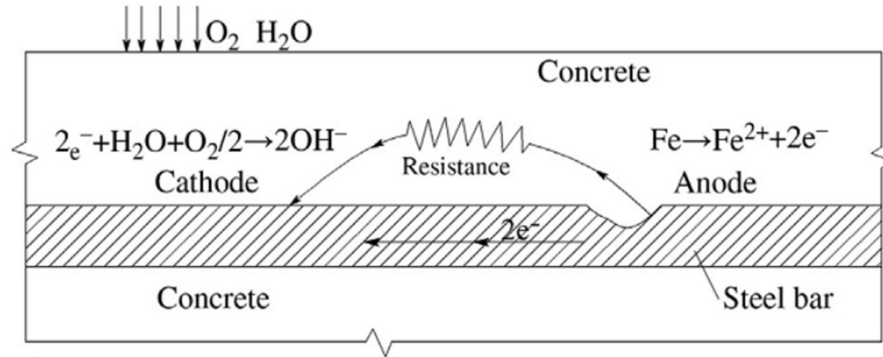
And concrete system is porous in nature. And interconnected void makes the concrete the permeable thorough with fluids can be passes. So, when concrete is exposed in extreme exposure condition or any kind of exposure. Then there are chances that embedded steel bars will definitely interacted with permeable fluid.

There are different gases and fluid are responsible for corrosion but chloride and oxygen are most important. What if we inhibit the intrusion of these gases? Is there any process? Simplest way to use the clear cover as specified in the IS 456:2000. Or any other methods available!

## Corrosion of reinforcement bar in Concrete: An Electrochemical View

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In concrete system, when oxygen from the atmosphere got entered through the pores or interconnected void. Water is already present in system because of relative humidity of the environment and iron rods are present as reinforcement bar. So, all these systems, (i.e. oxygen, water and iron rod) makes the components of the electrolytic cell. Oxygen act as cathode (electron receiver), iron rod act as the anode (electron provider) and water itself acts as the electrolyte to complete the circuit.



The reaction at anode:  $2Fe \rightarrow 2Fe^{+2} + 4e^-$

The reaction at cathode:  $O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$

Until oxygen is supplied the solid iron got transformed to aqueous iron  $Fe^{+2}(aq)$  and decay will continue on.

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