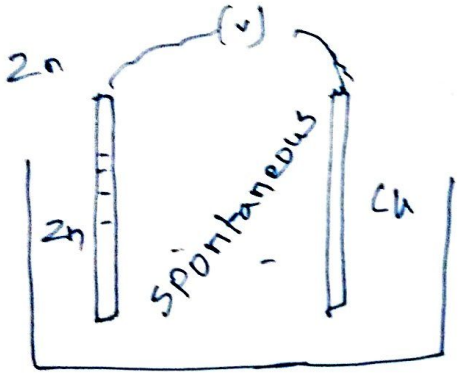
9, 18, 22
25, 28, 32, 34

Electrochem cell

Chem Energy ↘

Electrical Energy

Battery, Daniel cell



Anode

Zn - oxidation → e^-

(-) ve sign

Cathode

Cu - Reduction - (+)

(+) ve sign

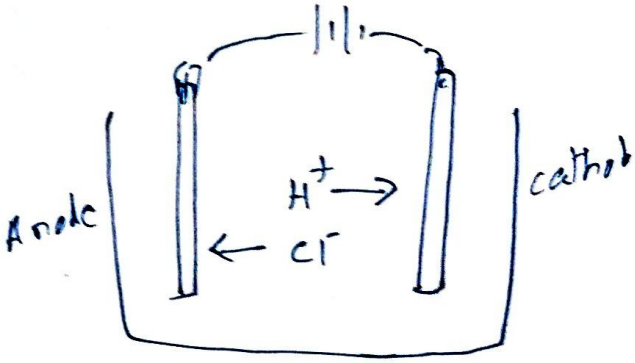
Electrolytic cell

Electrical Energy

↓

Chemical Energy

Electroplating etc..



Anode - oxidation

(+) ve electrode.

$2Cl^- \rightarrow Cl_2 + 2e^-$

cathode - Reduction

e^- - rich

$2H^+ + 2e^- \rightarrow H_2 \uparrow$

Factors influencing corrosion rate

(1) Potential difference between the metals

EMF

Cu

SHE

Cu - Zn - less corrosion

Zn

Cu - Al - More corrosion

Al

(2) Area Effect

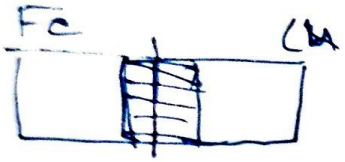
$$\text{Corr. Rate} \propto \frac{\text{Area of cathode}}{\text{Area of Anode}}$$

$$\text{Rate} - \frac{\text{M.I.P. Per Year}}{\text{MPY}}$$

cathode - e^- demanding

Anode - e^- donating

3. Distance Effect



↳ corroded

4. Purity

Homogeneous - Zn → No corrosion

Heterogeneous - Zn + trace Cu

↳ corrosion high

5. Corrosion product

soluble - more corrosion

Insoluble - less corrosion

oxide layer →

Corrosion Control

(1) Material selection

Noble metals, Pure Metals

Suitable Alloy

Al – Fe

↓ corrodes → $\Delta V = 0.8\,V$

Al – Cr – Fe

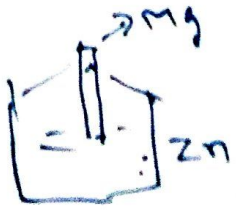
↓ → less difference

less corrosion

(2) Sacrificial Anode

metal – even more oxidative

Zn – corrodes.



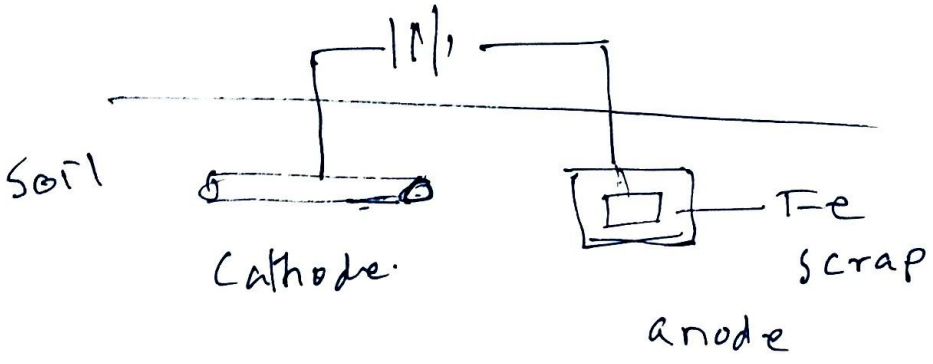
Mg – placed · Zn protected

(2) External current impression

Electrolytic cell approach

Corroding Metal → made as cathode

Scrap iron / graphile → Anode.

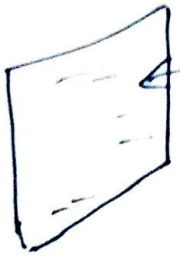


Inhibitors → Anodic → Passive layer (Insoluble)

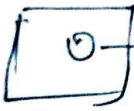
Inhibitors → cathodic → $H_2 \uparrow$ OH^- O_2

Inhibitors → vapor phase - vapor pressnre

Anodic inhibitor



If any breaking

 → aggressive corrosion

entire quantity of e^- would be from smaller area

Cathodic

Acidic

$$2H^+ + e^- \rightarrow H_2\uparrow$$

Diffusion of H^+ - Controlled

Power voltage - increased

Forming layer ← 

Over voltage → H_2 evolution potential

↓

Wary metal to metal

Neutral / Alkaline

$$H_2O + O_2 + e^- \rightarrow OH^-$$

How controled? → elimination

(or)

retarding the diffusion

Elimination

$$2\,Na_2SO_3 + O_2 \rightarrow 2\,Na_2SO_4$$

$$NH_2 - NH_2 + O_2 \rightarrow N_2 + 2H_2O$$

(N_2H_4)

$$Zn^{2+} + 2OH^- \rightarrow Zn(OH)_2 \text{ - layer.}$$