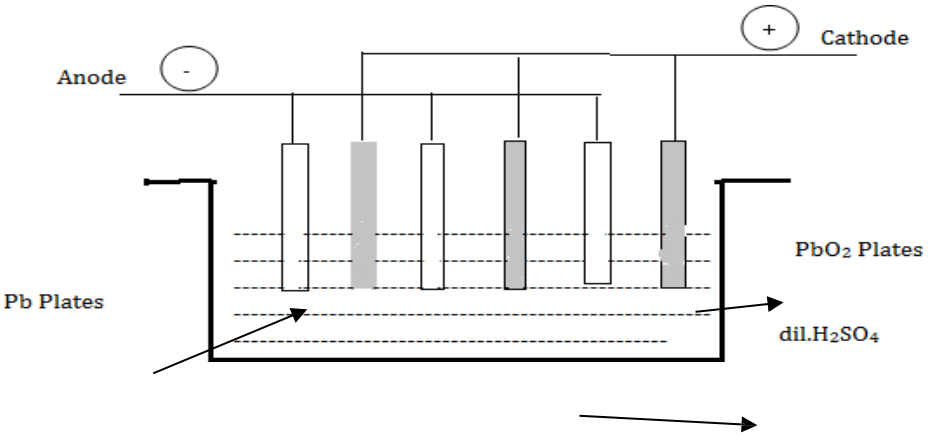
## UNIT III

## ELECTRICAL ENERGY STORAGE

### Lead Acid battery

- It is a $2^o$ battery
- It can act as Voltaic cell and electrolyte cell
- During discharging – voltaic cell
- Recharging –electrolyte cell

**Diagram**




**Description**

Anode – Pb plates

Cathode – $PbO_2$ plates

Electrolyte – dil.$H_2SO_4$

- The electrodes are arranged in alternate pattern.
- The electrodes are separated by insulators like rubber wood etc.
- Single cell produces 2v.

Cell Representation: $Pb/PbSO_4//H_2SO_{4(aq)}//PbO_2/Pb$

**Working: -**

1) **Discharging**

At Anode: $Pb+SO_4^{2-} \longrightarrow PbSO_4+2e^-$

At cathode: $PbO_2+4H^++SO_4^{2-}+2e^- \longrightarrow PbSO_4+2H_2O$

Overall Reaction: $Pb+PbO_2+2H_2SO_4 \xrightarrow{\text{Discharging}} 2PbSO_4+2H_2O+\text{Enery}$

The formation of $PbSO_4$ shows that $H_2SO_4$ is being used up

**Recharging**

- For recharging electric current is passed in the opposite direction.
- During recharging Pb deposits on anode, $PbO_2$ on cathode and concentration of $H_2SO_4$ increased.

$$2PbSO_4 + 2H_2O + Energy \xrightarrow{\text{Recharging}} Pb + PbO_2 + 2H_2SO_4$$

Both discharging and recharging reactions can be shown as,

$$2PbSO_4 + 2H_2O + Energy \underset{\text{discharging}}{\overset{\text{Recharging}}{\rightleftharpoons}} Pb + PbO_2 + 2H_2SO_4$$

**Advantages**

- Low cost
- Recyclable
- High reliability
- High surge current

**Disadvantages**

- Heavy & bulky
- Short lifecycle
- Longer charging times

**Applications**

1) It is used in cars, buses, trucks etc,
2) It is also used in telephone exchanges, hospitals, power stations.