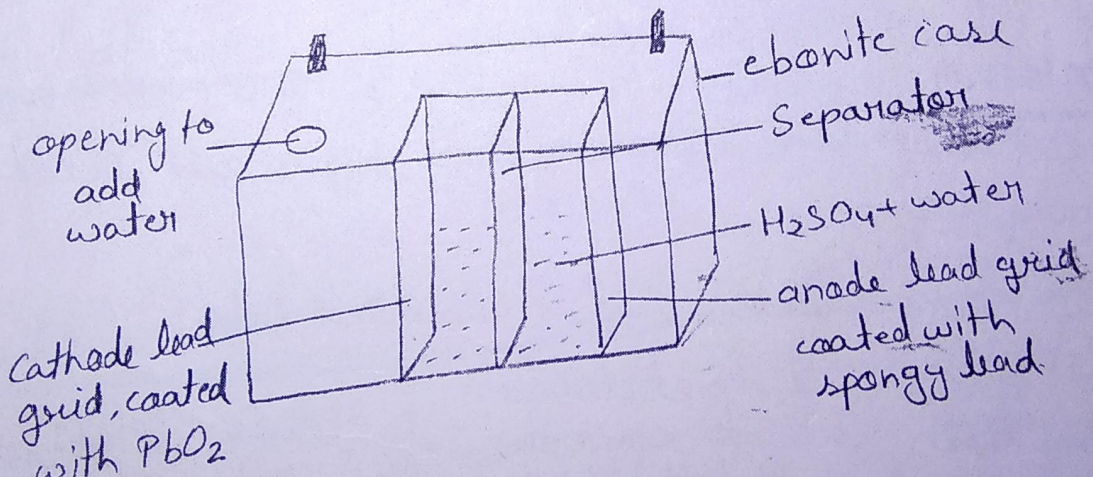
Engineering Chemistry (CKAS-102)

Lecture No - 35 UNIT-III

(Lead Storage Battery)

Construction -

- It is also known as lead-acid battery.
- It is the example of secondary cells, which are rechargable.
- Lead-acid battery consist of a rectangular ebonite (type of natural rubber (very hard)) or polymeric case which contains 5 M sulphuric acid (37%).
- Electrodes are made-up of lead grids, which are separated by microporous polyethylene.
- Anode is coated with spongy lead.
- Cathode is coated with lead dioxide (PbO_2) and spony lead (1:1).
- Six such pairs of anode & cathode are placed in series.



Lead-Acid Battery

- Voltage of each cell is over 2V, hence total voltage in series is nearly 12 V.

Reactions -

Cell can be represented as -

$Pb - PbSO_4 / H_2SO_4 (5M) / Pb - PbSO_4 - PbO_2$

Cell reactions are -

at anode - $Pb(s) + SO_4^{--}(aq) \underset{\text{charging}}{\overset{\text{discharging}}{\rightleftharpoons}} PbSO_4(s) + 2e^-$

at cathode -

$PbO_2(s) + SO_4^{2-}(aq) + 4H^+(aq) + 2e^- \underset{\text{charging}}{\overset{\text{discharging}}{\rightleftharpoons}} 2PbSO_4(s) + 2H_2O(l)$

Net cell reaction -

$Pb(s) + 2SO_4^{2-}(aq) + PbO_2(s) + 4H^+(aq)$

discharging ↓ | charging ↑

$2PbSO_4(s) + 2H_2O(l)$

Working

- Water is formed as a product, hence H_2SO_4 gets diluted during discharging.
- As a battery is used, lead is converted into insoluble lead sulphate at the electrodes.
- When both electrodes converted into lead sulphate, the battery gets totally discharged and cannot be recharged.

→ When electricity is drawn (discharging) from the cell, it behaves as voltaic cell.

→ When car is moving (charging), it acts as an electrolytic cell.