Construction and working of alkaline battery

Describe the electrochemical reactions that occur at the anode and cathode during the discharge cycle of an alkaline battery.

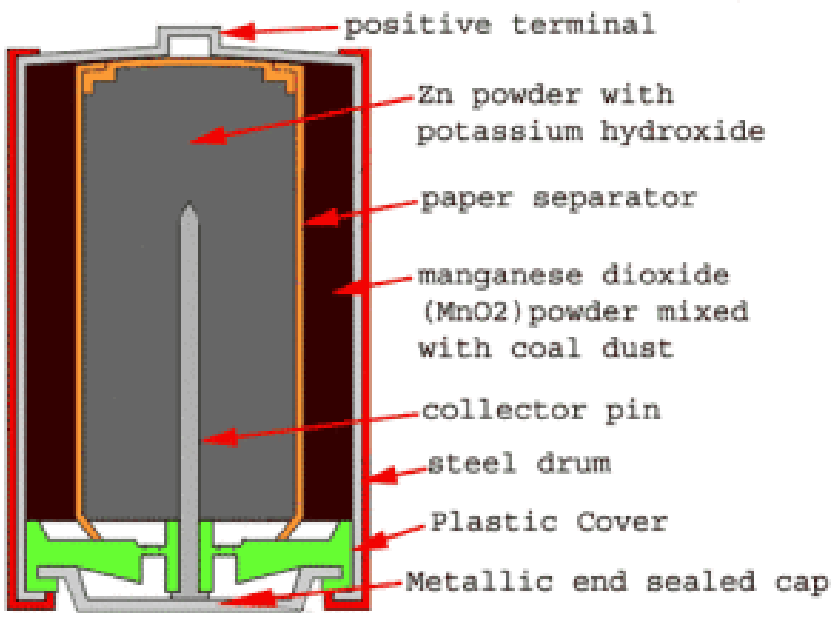
Alkaline batteries

An **alkaline battery** is a type of primary battery which derives its energy from the reaction between zinc metal and manganese dioxide.

Alkaline battery is improved form of dry cell ,in which the electrolyte NH_4Cl is replaced by KOH..

Construction

- A carbon rod (Graphite),acts as cathode .The positive terminal of the battery is projected from the top of this drum.
- the powdered zinc is mixed with KOH & MnO_2 to get a gel.,is immersed in the electrolyte in the centre of the cell
- The outside cylindrical zinc body is made up of Zinc,acts as anode.



Alkaline Battery

Working

The alkaline electrolyte of potassium hydroxide is not part of the reaction, only the zinc and MnO_2 are consumed during discharge.

The half-reactions are:

At Anode

The half-reactions are:

$$Zn \rightarrow Zn^{2+} + 2e^-$$

$$Zn^{2+} + 2OH^- \rightarrow ZnO + H_2O$$

Anode over all: $Zn_{(s)} + 2OH^-_{(aq)} \rightarrow ZnO_{(s)} + H_2O_{(l)} + 2e^-$

At Cathode

$$2MnO_{2(s)} + H_2O_{(l)} + 2e^- \rightarrow Mn_2O_{3(s)} + 2OH^-_{(aq)}$$

Overall reaction:

$$Zn_{(s)} + 2MnO_{2(s)} \rightleftharpoons ZnO_{(s)} + Mn_2O_{3(s)}$$

The alkaline electrolyte of potassium hydroxide always remains in the cell,as there are equal amounts of OH^- consumed and produced. The voltage of alkaline battery cell is 1.5 V.

1. Alkaline batteries have a **shelf life of up to 5-10 years**, compared to about 2-3 years for dry cells.
2. The nominal voltage of an alkaline battery is typically **1.5V**, similar to a dry cell, but alkaline batteries are better at maintaining a stable voltage over time.
3. Zinc does not dissolve in basic medium; there is no corrosion on Zn.

Match the Following

1.	Anode	→	Lithium Battery
2.	Cathode	→	Secondary batteries
3.	Electrolyte	→	Primary batteries
4.	Separator	→	Allows ions to move between anode and cathode
5.	Irreversible chemical reaction	→	KOH
6.	Reversible chemical reaction	→	where reduction occurs
7.	Alkaline battery	→	Motor cycle
8.	Lead Acid Battery	→	prevents short circuits between electrodes
9.	Hearing aids	→	where oxidation occurs
10.	Laptops	→	Zinc Air battery