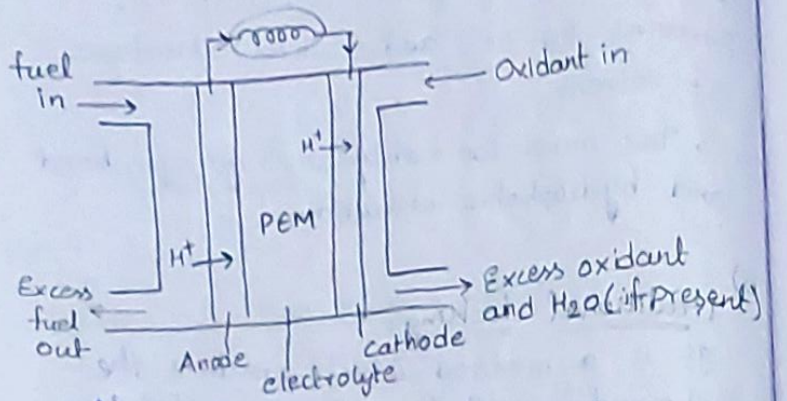
Unit-II

1. a H_2-O_2 fuel cell



Working procedure:

1. The arrangement of fuel cell has 2 inlets and 2 outlets in which one inlet is for fuel in and other is for oxidant in.
2. One outlet for excess fuel out (discharge) and other for discharge of oxidant and water present in it.
3. In the Containers two
3. It Contains two electrodes which are catalytically active which is made of graphite pregrated with finely divided Pt (or) Ni (or) Pd-Ag alloy.
4. Electrolyte (or) fuel in this is taken as hydrogen and Oxidant is oxygen
5. The fuel undergoes oxidation at anode and releases $2e^{\ominus}$ which are passed to Cathode by the Circuit
6. The oxidant products also reaches the Cathode to react with cathode through proton exchange membrane (PEM)
7. The reaction takes place at anode and produces some energy
8. The imp Criteria to get better result is to make sure the fuel is of the pure form.

at anode: $H_2 \longrightarrow 2H^+ + 2e^{\ominus}$

at Cathode: $2H^+ + 2e^{\ominus} + \frac{1}{2}O_2 \longrightarrow H_2O$

Overall cell reaction:

$$H_2 + \frac{1}{2}O_2 \longrightarrow H_2O$$

Cell Emf = 1.23V

16 Alkaline	Zinc Carbon
1. Primary cell which has a basic electrolytes	1. Primary cell which is a modification of Leclanche cell & has a Semi Solid state
2. Electrodes are Zn as Anode, MnO_2 as Cathode	2. Electrodes are Zn as anode & graphite rod covered with MnO_2 as Cathode.
3. Seperators are non-wooven fabrics	3. Separators are Cardboard material
4. Electrolyte used in it is KOH (Potassium Hydroxide)	4. Electrolyte used in it is Ammonium Chloride (NH_4Cl)
5. Emf produced is 1.43 V	5. Emf = 1.5 V

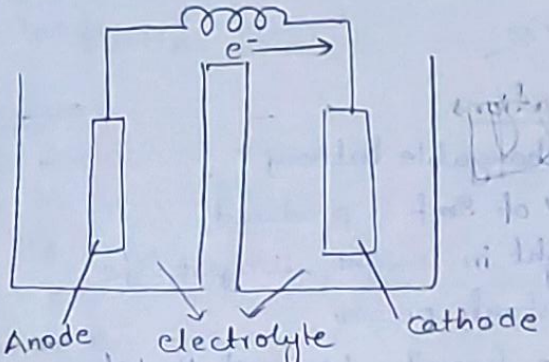
2. Lithium-ion Battery

from notes

working

Incase of Discharging

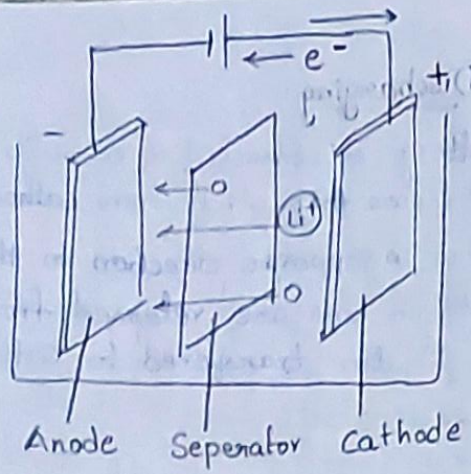
The battery is connected to a bulb then the current flows through it from Cathode And $e^{\ominus}$ flow in opposite direction to them and the Lithium ions are released from anode and $e^{\ominus}$ also transfered to Cathode



Incase of charging:

The electrodes are connected to the Source then it travels toward Cathode which results in Liberation of Cations and electrons.

The Cations and electrons reach the anode through Semi-permeable membrane and wires and undergoes reactions

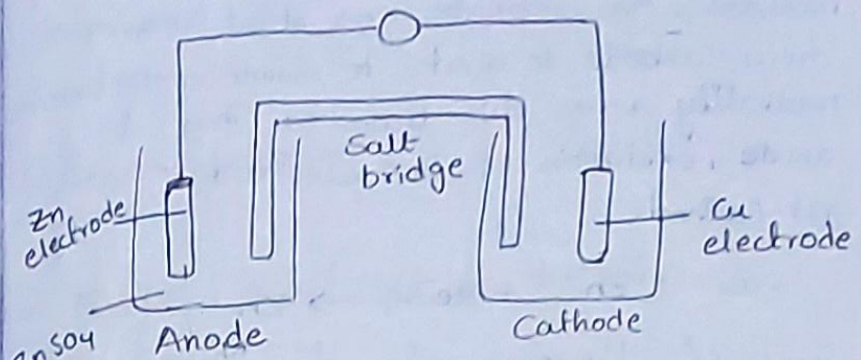


Applications

1. Rechargable battery
2. 4V of Emf is produced
3. Light in weight, Longest life
4. Constant power
5. Eco-friendly, Long shelf Life

3a. Electrochemical Cell

A galvanic cell or a voltic cell which is named after the eminent scientists, Luigi Galvani, Alessandro Volta respectively is an electrochemical cell that derives electrical energy from spontaneous redox reactions taking place within the cell.



Construction:

The Daniel cell has a zinc electrode dipped in a solution of zinc sulphate and forms the anode. It has a copper electrode dipped in a solution of copper sulphate and forms the cathode of the cell. Both the electrodes are connected to eachother by two ways internally and externally the anode is connected to cathode externally with the help of a wire and internally with the help of the salt bridge

Working:

There is a flow of current in the external circuit from anode to cathode and in order to compensate this loss of negative charge the zinc ions in the anode start moving towards the cathode internally with the

help of the Salt bridge. At this potential barriers, the Sulphate ions start moving from cathode to anode to maintain electronic neutrality across this barrier. Thus, at anode, oxidation of Zinc electrode occurs at cathode.

as $Zn^{+2} + 2e^- \longrightarrow Zn$

reduction of Copper ions takes place at anode as

$Cu \longrightarrow Cu^{+2} + 2e^-$

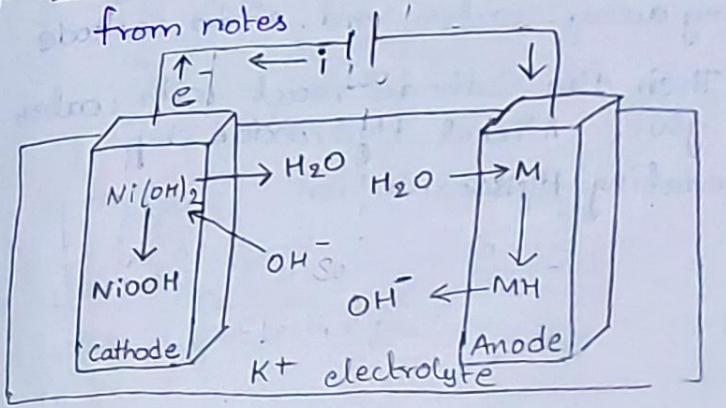
Cell reaction: $Zn^{+2} + Cu \longrightarrow Zn + Cu^{+2}$

3b.

Hydrogen oxygen fuel cell	Methanol - Oxygen fuel cell
1- Hydrogen is the fuel used in this	1. Methanol is the fuel used.
2. Catalytic electrodes are made of graphite impregrated with finely divided Pt (or) Ni (or) Pd-Ag alloy	2. Catalytic electrodes are made up of platinum
3. Voltage produced in this fuel cell is 1.23V	3. 1.21V
4. fuel must be in pure form while Pumping to the cell	4 fuel is pumped into cell along with steam
5. Provision of more energy	5. low energy

4. Nickel - Metal Hydride Battery

from notes



Working

In case of ~~dis~~charging

→ when it is Connected to a power Source then electrolyte is splitted into potassium ion (or) hydroxide ion

→ The hydroxide ion react with Nickel hydroxide to form Nickel oxy hydroxide ($NiOOH$) and electrons, water

→ Then the water and $e^{\ominus}$ reaches anode metal to form metal hydride and

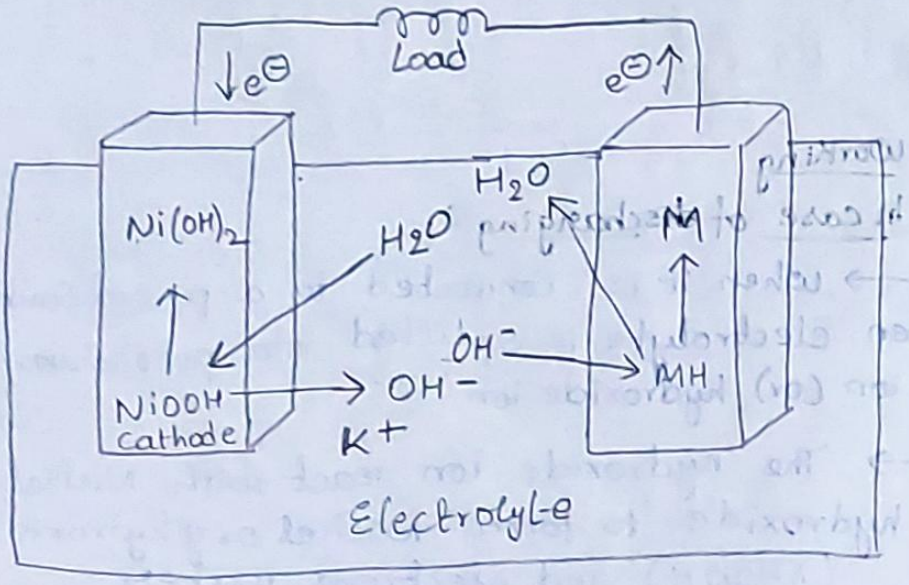
and hydroxide ion

Discharging

→ when it is connected to load the electrolyte splits into potassium ion and hydroxide ion

→ The hydroxide ion react with metal hydride, anode to form metal by giving away water and $e^{\ominus}$ to cathode.

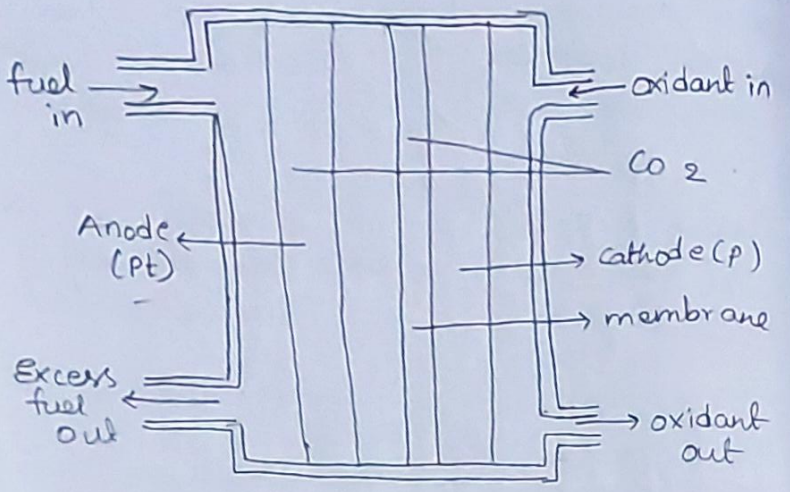
→ Then the cathode react with water to give Nickel Hydroxide by liberating Hydroxide ion.



5a. Electrochemical cell	~~Electrolytic~~ fuel cell
1. Redox reacn takes place at anode and Cathode	1. Redox reacn takes places at Catalytically active Cathode & anode
2. No necessary for active reagents like fuel & oxidant	2. Active reagents like fuel & oxidants are used.
3. Salt bridge is req to connect the Components internally	3. No used. we use Semi permeable membrane b/w them for transfer
4. Active reagents are taken in Compartments within its arrangement	4. outside the fuel cell in Containers
5. Not eco-friendly in nature	5. Ecofriendly.
6. Needs charging for working	6. No need because both the fuel & oxidant gives Continuous energy.
7. Toxic products are formed	7. Not formed

5a. Elec

5b Methanol-oxygen fuel cells



Working

→ The fuel cell arrangement contains 2 inlets and 2 outlets in which one inlet is for fuel in & other inlet for oxidant in

→ One outlet for excess fuel out and other for oxidant out.

→ It contains two electrodes which are catalytically active which is made up of platinum.

→ Electrolyte can fuel in this is taken as Methanol and the oxidant is oxygen.

→ fuel react with steam inside at anode and produces six hydrogen ion and electrons

→ These ∞ moves to cathode through the membrane and undergoes reaction

→ The hydrogen ions electrons and oxygen react at cathode to form water molecule

6a. Notes

6b. Types of PCB's:

Based on layer of coating / Conducting they are 3 types

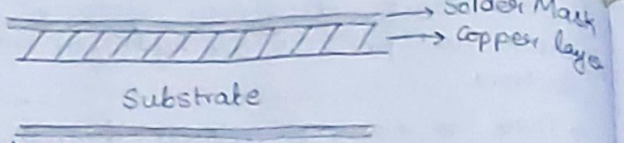
1. Single-Sided & Layered PCB

→ It is a most common type of PCB.

→ It has Single Conductive Cu layer above the Substrate.

→ The electrical components are Soldered on one side of the board and the entire circuit is etched on other side.

→ These boards have only one Conducting layer. The Conductiving paths cannot intersect or overlap so they take up a lot of space.



Applications

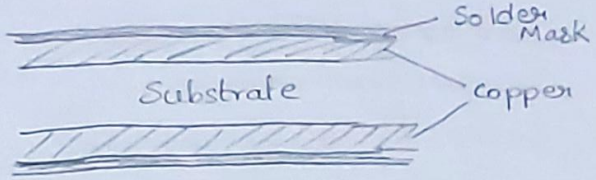
→ It is used for basic and low cost electronic instruments such as calculators, Power Supplies, LED lighting boards, FM radio's timing Circuits etc

Advantages

→ Cost effective
→ Easy to manufacture
→ Suitable for low density designs
→ Easy to repair
→ Easy to design

2. Double Sided

→ A thin layer of conducting material such as Cu is added to both top and bottom sides of the boards.
→ Holes on the Circuit board allow metal Parts to be Connected from one side to the other.



Applications

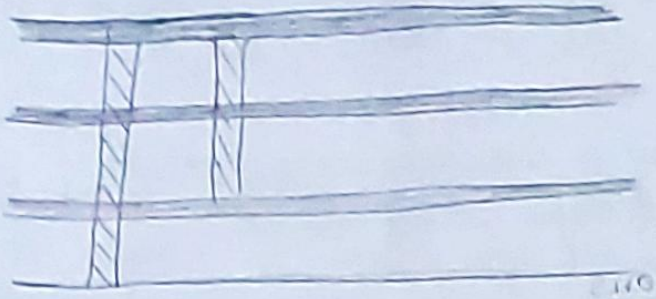
→ Used in cell phone System
→ power monitoring
→ amplifiers
→ HVAC application
→ UPS system

Advantages

→ Reduced size, makes circuit Compact
→ lower relatively low cost
→ more flexible
→ increased circuit density
→ Suitable for advanced electronic system

3. Multilayer PCB

→ They have more than 2 Cu layers
→ They are designed in a Sandwich fashion with several double sided Conductive layers divided by an equal no of insulating material Sheets.



Application

→ Computers, laptops, mobile phones, tabelts, medical equipment, GPS trackers etc

Advantages

→ Compact insize, More robust, High level of design flexebility, Suitable for high Speed Circuits.

7. Notes