ENGINEERING CHEMISTRY

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Energy storage devices

content:

- ***Batteries***
  - ***Components and working of a battery***
  - ***Classification of battery***
  - ***Battery characteristics***
- ***Modern batteries***
  - ***Zinc Air battery***
  - ***Lithium batteries***
    - ***Li-ion battery ($LiCoO_2$)***
- ***Fuel cells***
  - ***Principle , working and Efficiency of fuel cells***
  - ***Types of Fuel cells***
  - ***H_2-O_2 alkaline fuel cell***
  - **CH_3OH-O_2 polymer electrolyte fuel cell**

- ***Super capacitors***
- ***Ragone plot***
- ***Hydrogen production and Hydrogen storage***
- ***Sensors, Classification of sensors, Types of electrochemical sensors***
- ***Glucose sensor and Oxygen sensor***

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Energy storage devices - Batteries

Class content:

- ***Batteries***
  - ***Components of a battery***
  - ***Working of a battery***

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Energy Storage devices- Batteries

Battery

Device which stores chemical energy and converts it into electrical energy on demand

- **Alternate sources of energy**
- **Variable sizes and shapes**
- **Portable**

- Applications : Consumer goods - mobiles, laptops , calculators, flash lights
  emergency lighting, space vehicles, electric vehicles, pacemakers

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Energy Storage devices- Batteries

Components of a battery

- **Anode :** Oxidation takes place

  Electroactive material : metals which can undergo oxidation easily

  Zn, Pb, Li

- **Cathode :** Reduction takes place

  Electroactive material : compounds which can undergo reduction easily

  PbO_2, MnO_2, O_2

- **Electrolyte:** Substance with good ionic conductivity

  Acid, alkali or salt solutions; solids- doped oxides, polymers

  H_2SO_4, KOH, Nafion

- **Separator:** Insulator which separates anode and cathode compartment

  Role - To prevent internal short circuit

  Transport ions from anode to cathode compartments and vice versa

  Polypropylene, Cellophane

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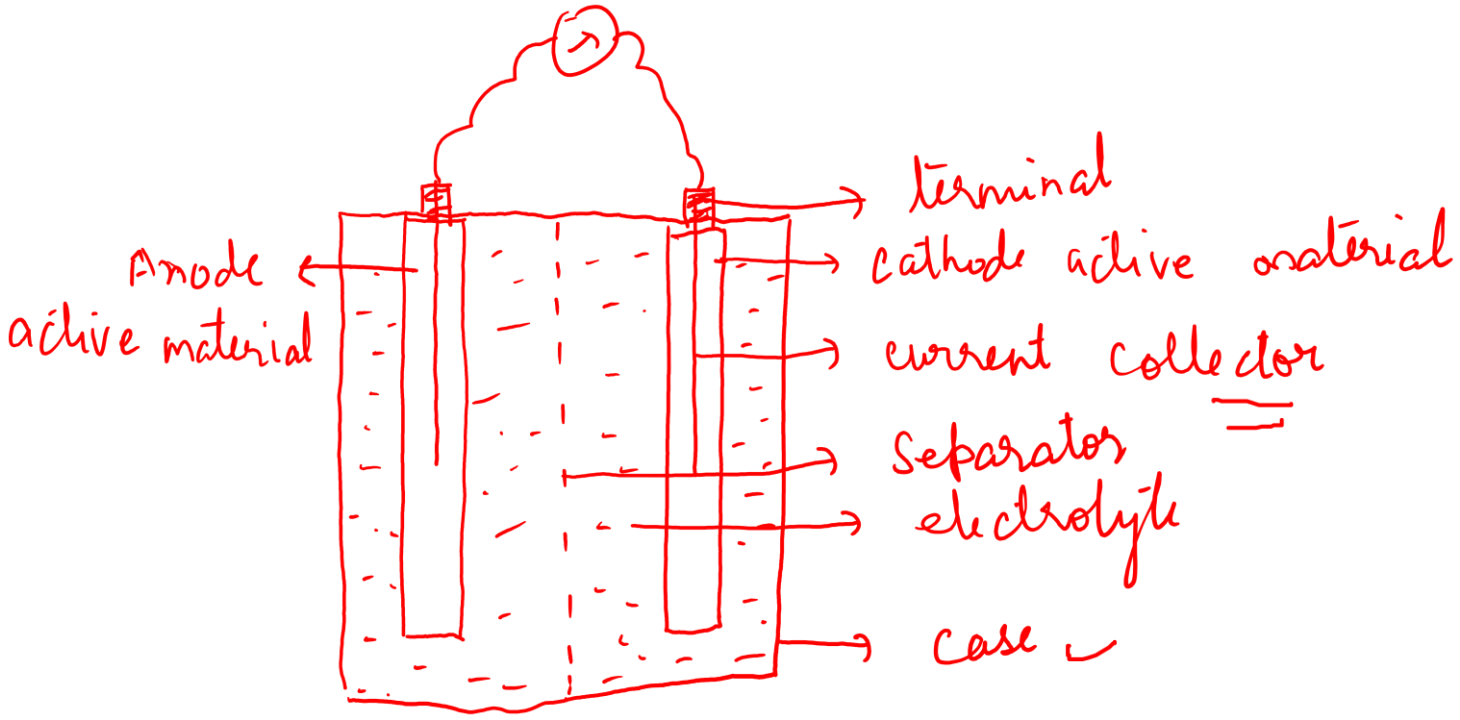
Module 5- Energy Storage devices- Batteries

Schematic diagram of a battery



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Energy Storage devices- Batteries

Working of a battery

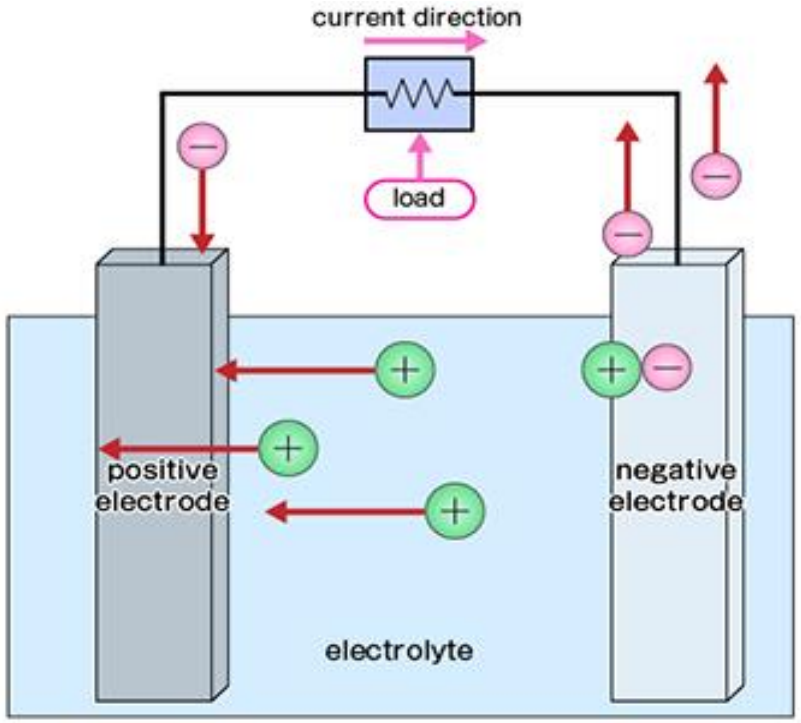
While discharging :

- Delivers power
- Galvanic cell

Anode: $M \rightarrow M^{n+} + ne^-$

Cathode: $A + ne^- \rightarrow A^{n-}$

Overall : $M + A \rightarrow MA$



https://www.matsusada.com/column/secondary-battery.html

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Energy Storage devices- Batteries

Working of a battery

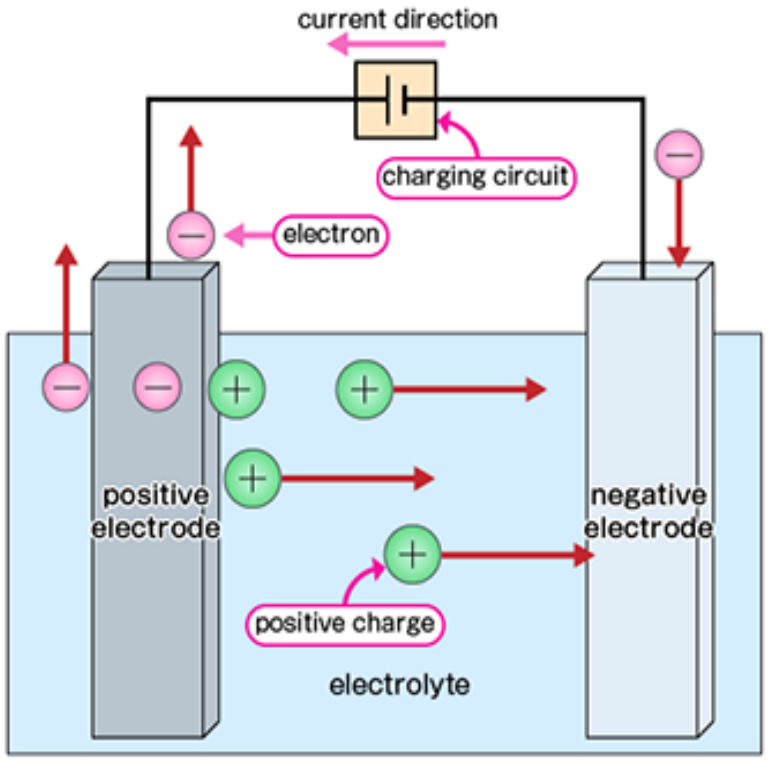
While charging:

- Consumes power
- Electrolytic cell

Anode: $A^{n-} \rightleftharpoons A + ne^-$

Cathode: $M^{n+} + ne^- \rightleftharpoons M$

Overall : MA → M + A



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