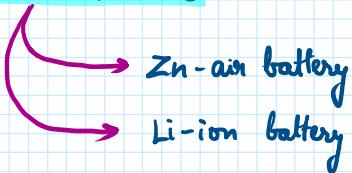


## MODERN BATTERIES



### ZINC - AIR BATTERY

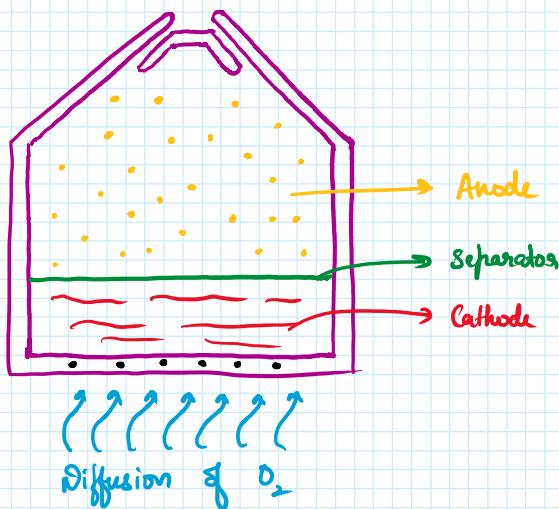
- Metal - air battery
- Depends upon atmospheric oxygen
- High energy density
- long shelf life with sealed condition
- Small size

Anode: Zn granules + 30% KOH paste + gel with electrolyte ] → Doubt

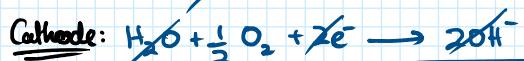
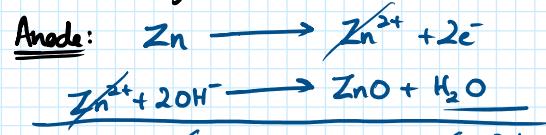
Cathode: C + MnO<sub>2</sub> catalyst + Jefflon layer + permeable gas coated on Ni mesh  
waterproof layer b/w air & electrolyte

Electrolyte: 30% KOH

Separator: Polypropylene soaked with electrolyte



### EQUATIONS



### Disadvantages

- Effect of CO<sub>2</sub>
- $$\text{CO}_2 + \text{KOH} \longrightarrow \text{K}_2\text{CO}_3 + \text{H}_2\text{O}$$

### Applications

- Medical application
- Hearing aids
- Railway signals
- Remote communications

**NOTE: Why Zn-air battery has high energy density**  
Cathode active material (O<sub>2</sub>) is not stored inside the battery. It is collected from the atmosphere.

More O<sub>2</sub> → more cathode reaction

↓  
more anode reaction

↓  
more energy density

## LITHIUM BATTERIES

Why does Li act as an anode?

- Small size
- $E^\circ_{\text{Li}^+/\text{Li}} = -3.05 \text{ V}$  } Highly negative  $E^\circ$  value
- $T_g \text{ Li} \rightarrow \text{IF of charge}$  } Small amount has high charge

- Produces 4V } DOUBT
- Li-ion batteries (-40°C to 70°C)
- Uses only organic, inorganic electrolytes
- Aqueous electrolyte → explosive

### Li - Batteries

#### Primary

- discharging only  
 $\text{CE} \rightarrow \text{EE}$

e.g.:  $\text{Li}-\text{MnO}_2$

#### Secondary

- discharging  
 $\text{CE} \rightarrow \text{EE}$
- charging  
 $\text{EE} \rightarrow \text{CE}$

e.g.: Li-ion battery

### $\text{Li}-\text{MnO}_2$

Anode: Li

Cathode:  $\text{MnO}_2$

Electrolyte: Organic compound w/ acrylonitrile  
[OR]

Polypropylene carbonate w/  $\text{LiClO}_4$

Separator: Polypropylene

### Advantages of Li batteries

- High energy density
- High cycle life

### Disadvantages of Li batteries

- Highly reactive metal

### Li-ION BATTERY

- High energy density
- High cycle life
- High electricity storage density
- High tolerance of service condition

- High electricity storage density
- High tolerance of service condition
- Temp: -40°C to 70°C

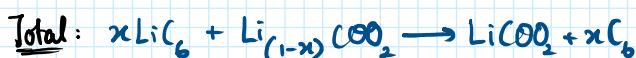
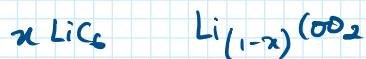
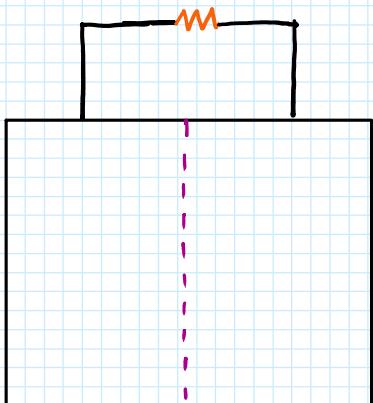
Anode: graphitized Li ( $\text{LiC}_6$ ) coated on Cu plate

Cathode:  $\text{LiCOO}_2$  coated on Al plate

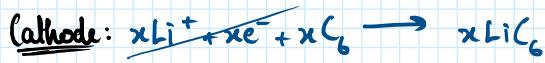
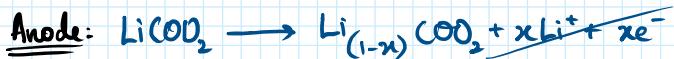
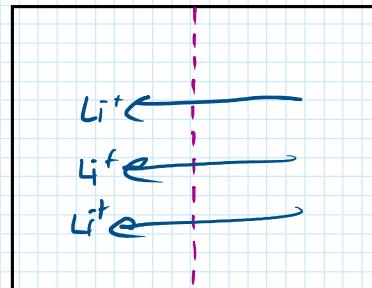
Electrolyte: Propylene carbonate (organic solvent) with  $\text{LiClO}_4$

Separator: Polypropylene

### DISCHARGING



### CHARGING



### APPLICATIONS

- Mobile phones
- Electrical vehicles
- Laptops

### DISADVANTAGES

- More reactive metal
- Explosive in nature
- Transportation is also difficult