



## Lead – Acid Storage Cell

- A Lead-acid storage cell is a secondary battery, which can operate as a voltaic cell and as an electrolytic cell.
- When it acts as a voltaic cell, it supplies electrical energy and becomes run down.
- When it is recharged, the cell operates as an electrochemical cell.



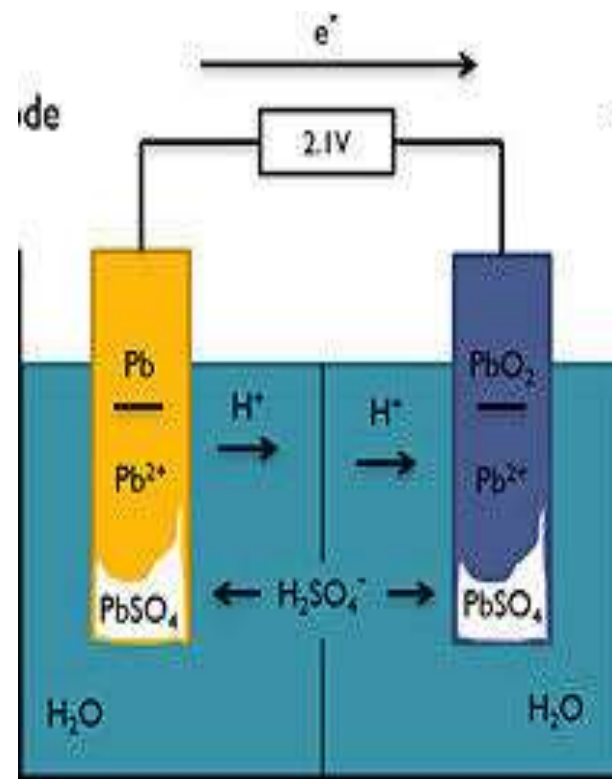
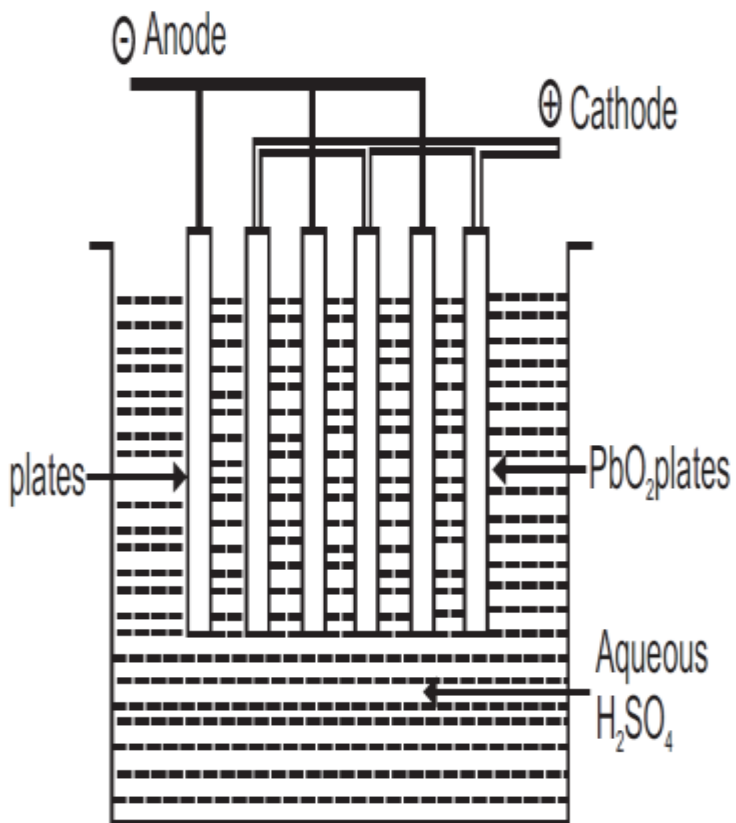


### ***Construction and Working:***

- A lead – acid storage cell consists of a number of voltaic cells (3 to 6) connected in series to get 6 to 12 V battery.
- In each cell, a number of Pb plates, used as anodes are connected in parallel
- A number of PbO<sub>2</sub> plates, used as cathodes are connected in parallel. The plates are separated by insulators like rubber or glass fibre.
- The entire combination is immersed in dil.H<sub>2</sub>SO<sub>4</sub>. (38% by mass) having a density of 1.30 gm/ml.

The cell is represented as:





## Lead Storage Cell

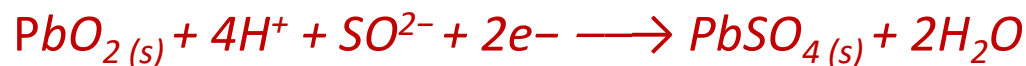


## Working (Discharging)

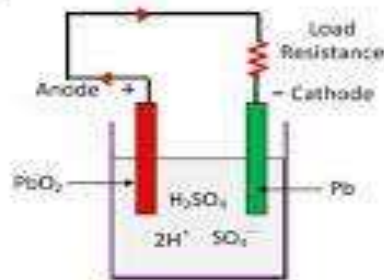
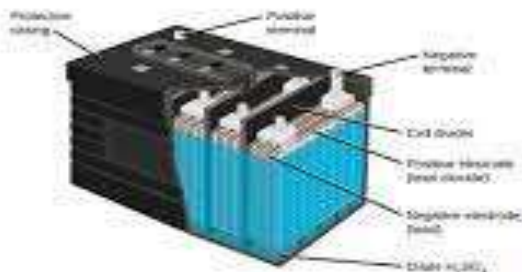
**Anodic reaction:** Lead is oxidized to  $Pb^{2+}$  ions and gives two electron, which further combines with  $SO_4^{2-}$  to form insoluble  $PbSO_4$ .




**Cathodic Reaction:**  $PbO_2$  is reduced to  $Pb^{2+}$  ions, which further combines with  $SO_4^{2-}$  to form insoluble  $PbSO_4$ .



### How does a Lead Acid Battery Work?



 **Electrical 4 U**



### **Overall cell reaction during (discharging)**



From the above cell reactions, it is clear that PbSO<sub>4</sub> is precipitated at both the electrodes and the concentration of H<sub>2</sub>SO<sub>4</sub> decreases. So, the battery needs recharging.

### **Overall cell reaction during recharging**

The cell can be recharged by passing electric current in the opposite direction. The electrode reaction gets reversed. As a result, *Pb is deposited on anode and PbO<sub>2</sub> on the cathode*. The concentration of H<sub>2</sub>SO<sub>4</sub> also increases.





## Advantages of Lead–Acid batteries

1. It is made easily.
2. It produces very high current.
3. The self discharging rate is low.
4. It works effectively even at low temperatures.

## Disadvantages :

1. Recycling of this battery causes environmental hazards.
2. Mechanical strain and normal bumping reduces battery capacity.

## Uses

1. Lead – acid batteries are used in cars, buses, trucks etc.
2. It is used in gas engine ignition, telephone exchanges, and power stations hospitals.
3. IT industry, educational institutions, laboratories etc.