A STUDY NOTE ON BATTERIES

SHAIK SHAKIRA BEGUM,
Assistant professor
Email:shakira.nazlim55@gmail.com

ABSTRACT -

Batter is an electrochemical cell in which electrochemical changes occurs. Depending upon the Rechargeable capacity. Batteries are classified into two categories like Primary cell & Secondary cell. Now a day's mostly usable cells are belonging to secondary cells, because of their extraordinary rechargeable capacity & reuse fullness. The application of batteries is Flashlights, Toys, Gadgets, Automobiles, Digital cameras, Space applications& Medical devices etc. Examples of Batteries like, Lithium cells, Nickel cadmium cells & Zink Carbon cell.

Keywords-*Batteries, Rechargeable, Primary cell & Secondary cell.*

INTRODUCTION

A device which converts chemical energy to electrical energy is called battery. Battery is an electrochemical source or several electro chemical cells connected in series that can be used have a source of direct electric current at constant voltages.

ADVANTAGES OF BATTERIES

1. Battery act as aportable source of electrical energy
2. The portability of electronic equipment in the form of handsets has been made possible by batteries.
3. For all commercial applications batteries are constructed for their service. For example batteries for automotives and aircrafts, standby batteries etc.

THE PRIMARY CELL

The cells in which the cell reaction is not reversible. Thus when the reactants have been converted to products, no electricity is produced and the cell becomes dead and cannot be used after that. Dry or leclanch cell, a cell without fluid component is a primary cell.

ANODE: Zn
CATHODE: mno2
ELECTROLYTE: NH_4Cl ,$ZnCl_2$

LITHIUM CELL;

The cells having lithium anode are called lithium cells.

Lithium Cells With Solid Cathodes: In this cells solid or liquid electrolytes are used . The cathode manganese dioxide should be heated more than 300 centigrade to remove water, before entering it in the cathode. This is very important to improve the effieciency of the cell.

ANODE; Li (lithium)
CATHODE; manganese dioxide.( )
ELECTROLYTE; propylene carbonate and 1,2 dimethoxy ethane .

CHEMICAL REACTIONS;

At anode; Li ----------> Li+e
At cathode; Li + e + mno_2 --------> $Limno_2$
Total reaction Li + Mno_2 -------> $Limno_2$

APPLICATIONS

These cells are widely used in automatic cameras, calculators, watches etc.

LITHIUM CELLS WITH LIQUID CATHODE

The liquid cathode systems like Li/So_2, $Li/SoCl_2$ and Li/So_2Cl_2 and their derivatives are capable of higher discharge rates than the solid cathode system. Because the solid cathode cell do not support currents as high as the liquid cathode ones. This is due to the liquid cathode undergoes a discharge at the surface of the electrode, where the discharge products are deposited. Otherwise discharging at a solid cathode involves diffusion of Li-ions into the bulk of the cathode, which is a slower process.

ANODIC REACTION;

Li -------> Li + e

CATHODIC REACTION;

$4Li+ \ 4e + \ 2SoCl_2$ ------>$4LiCl+So_2+ S$

NET REACTION;

$4Li+2SoCl_2$------> $4LiCl+ So_2+S$

APPLICATIONS;

1. These cells are used in electronic circuit boards and for military and space applications.
2. These are also used in medical devices such as neuron stimulators and drug delivery systems.

SECONDARY CELLS;

The cells in which the cell reaction is reversed by passing by passing direct current in opposite direction. These batteries have very large capacity and long period discharge.

LEAD ACID CELL;

The lead acid cell consist of lead anode and lead dioxide as cathode, which is made of paste of lead dioxide passed into a grid, made of lead. A number of lead (-Ve) plates are connected in parallel on a number of lead dioxide plates. (+Ve) are also connected in parallel. The plates are separated from adjustment one by insulators like strips of wood, rubber. The entair combination is immersed in 20-21 percent. Dilute sulphuric acid corresponding to a specific gravity of 1.2 to 1.3

The discharging of the cell is operating as a voltaic cell , where the oxidation takes place at anode.

Pb---------> Pb+ 2e

The Pb combines with So_4 ion to produce PbSo4.

$Pb+ So_4$ ---------->. $PbSo_4$

The two electrons released at anode slow to the PbO_2 electrodes and causes reduction of PbO_2 TO produce Pb which finally combines to So_4 to produce $PbSo_4$.

$PbO_2+ 2H + 2e$ ----------> $Pb + 2H_2O$

$Pb+ S0_4$ ----------> PbSo4

NET REACTION;

$Pb + PbO_2 + 4H + 2SO_4$----------> $2PbSO4+ 2H_2O$ + Energy.

During charging

$2Pbso_4+ 2H_2O$ + ENERGY ----------> $Pb+ PbO_2+4H+2SO_4$

APPLICATIONS

These cells are used in electrical vehicles, electrical trains, mines, hospitals and automobiles etc.

ADVANTAGES

1. It is act as volatile cell and electrolytic cell.
2. It is portable and inexpensive.
3. It has relatively constant potential i.e.12 volts.

NICKEL CADMIUM CELL

This battery consists of cadmium anode and a cathode consist of a paste of nickel oxy hydroxide and alkaline potassium hydroxide act as electrolyte

It was invented by waldemar jungnar in 1899.the nickel cadmium batteries are recently loss in the popularity because of environmental impact of cadmium biproducts in used cells and batteries.

WORKING

The chemical reaction in nickel cadmium battery is perfectly reversible. When fully charged the positive plate is nickel hydroxide ($Ni(OH)_{2)}$ and negative plate is Cd(OH)2,while discharging the positive plate converts into $Ni(OH)_3$ and negative plate is converted into pure cadmium. The chemical conversion is reversed when a discharge battery charged again.

CHARGING

$2Ni(OH)_2+2KOH+2Cd(OH)_2$+electrical energy----→$2Ni(OH)_3+2KOH+Cd$

DISCHARGING

2Ni(OH)3+2KOH+Cd---
→$2Ni(OH)_2+2KOH+2Cd(OH)_2$+electrical energy

CHARACTERS

The average emf of Ni-Cd battery IS 1.2 volts/cell. However the emf of the cell can go as high as upto 1.4 volts, when the cell is fully recharged. The self-discharge rate is about 10%/month and energy density is about 40-60 watt hour/kg

ADVANTAGES / DISADVANTAGES

A Ni-Cd battery is superior in most aspects as compared to the lead acid cells. They have low internal resistance, can tolerate deep discharge cycle and can also get charged rapidly. This batteries also have long lifetime and low maintenance cost.

But these batteries also costly than lead acid battery and Cd used in batteries causes severe environmental pollution