IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE)
e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 17, Issue 1 Ser. IV (Jan - Feb 2020), PP 25-34
www.iosrjournals.org

Eco Electron Energy Storage Technology

Pandiri Shiva[1], Kondamadugula Shyam Pavan Reddy[2], Manikyam Sandeep[3]
Department of mechanical Engineering, ACE Engineering college, JNTU-H University
Hyderabad, Telangana

Abstract:- *This paper elaborates the innovation of Eco batteries. Batteries are the electrochemical power sources which convert chemical energy into electrical energy. These are also considered as a storehouse for electrical energy. Batteries are a major technological challenge because they are one of the major sources for efficient energy storage in this new era. Li-ion&Lithium batteries are leading today's world because they are more efficient and portable in this electronic world Even though there is still a lot of research going on Li-ion&Lithium batteries. Though different types of batteries exist in the market, they are not Eco-Friendly which means it cannot be decomposed after disposal. I started an experimental-Work on constructing the battery with Eco-Friendly chemical compounds. I referred to some articles for constructing the battery apart from Writing many chemical reactions, referring to the internet and having guidance from professors. Finally, I succeeded in the experiment which is Eco-friendly and giving the better result. Then, I stopped that particular experiment and started working more on improving efficiency.*

Keywords:- Battery, Electrochemical, Eco, Electrical, Energy, Storage.

Date of Submission: 05-02-2020 Date of Acceptance: 20-02-2020

I. Introduction:-

1. Purpose of storage

The storage is a place where we can store anything which can be useful in the future. This storage occupies the space physically but the energy &data or anything that occupies inside the storage, may be physical or may not be physical.

For Example

- Storing of food in the fridge.
- Storing of data in a cloud's.
- Storing of water in a sump/tank.
- Storing of energy in a solar pond.
- Storing electrical energy in the device.

2. Purpose of energy storage

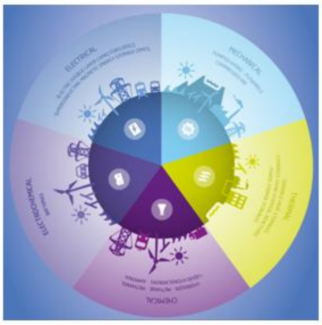
Energy storage is the storage which stores one form of energy that can be drawn into another form for some useful work to operate. Energy exists in many different forms. All forms of energies are **Thermal energy, Mechanical energy, Gravitational energy, Nuclear or Atomic energy, Chemical energy, Electrical energy,** and so on. Thus each form of energy is converted into another form. Although there are some specific types of energy. Those are two major forms, they are kinetic energy and potential energy.

- Kinetic/Motion energy is the energy which is found in moving objects or mass.

For Example- mechanical energy, electrical energy, etc.

- Potential energy is any form of energy which is found in static/no motion that has accumulated potential to be used in the future.

For Example- nuclear power, chemical energy, etc.



Thermal energy: Thermal energy is also called heat energy is produced when a substance or system has related to its temperature causes atoms and molecules to move faster and collide with each other. i.e., the energy of moving or vibrating molecules. The energy that comes from the temperature of the heated substance or system is called thermal energy. For example, we use solar radiation to cook food.
Mechanical energy: Mechanical energy is the sum of potential energy and kinetic energy of a substance or system because of its motion and position. For example- machines utilize mechanical energy to do work.
Gravitational energy: Gravitational energy is that energy held by an object in a gravitational field.
For Example- water flowing down a waterfall.
Nuclear or Atomic energy: Nuclear/Atomic energy is the energy that is trapped inside each atom. Nuclear energy can be produced by a fusion (the combination of atoms) or fission (splitting of atoms) process. The fission process is a widely used method. Especially when used to generate electricity.
Chemical energy: Chemical energy is the energy stored in the bonds of chemical compounds, such as atoms and molecules. This energy is released when a chemical reaction occurs. Usually, once the chemical energy is released from a substance, that substance turns into a completely new substance.
Electrical energy: Electrical energy is the energy carried out by the flow of electrons in an electrical conductor. It is one of the most common and wide useful forms of energy. For Examples - Lightning. Other forms of energy are also converted into electrical energy. For example- thermal power plant converts thermal energy into electrical energy via mechanical energy. Gas power plant/ power plants convert chemical energy stored in fuels into electrical energy like coal, fuels etc through various changes in their forms.some of renewable electrical energy generations are Geothermal energy, Wave energy, Ocean energy, Solar energy, Wind energy etc.

Energy storage became a major predominant factor in economic growth with the widespread proliferation/propagation of electric and refined chemical fuels such as gas, kerosene, and natural gas. Unlike other common energy storage used prior, such as wood or coal, must be used as it is used to generate electricity.

Electricity flows if it is a closed circuit otherwise can't. Practically electrical energy cannot be stored as electrical energy it may be stored as other forms. This means there is a change in its form but that energy cannot be destroyed or wasted it can transform to any other forms could not be accommodated without supply and it results in reductions in storage technology arrangements.

Many modern countries & engineers employ the ways for generation of renewable energy & base-load energy. Many renewable energy technologies such as solar, geothermal, ocean, wave and wind energy cannot be used for produce baseload electricity because their output is too unstable and depends on the behaviour of sun, water or wind.

To store electrical energy the storage technologies comes into the market. Batteries and other energy storage technologies become an important enabler for any change to these technologies. The power storage area typically includes conventional batteries but also includes mechanical technologies such as hydrogen fuel cells and flywheels that are directly replaced by batteries. More and more research is also conducted in the field of batteries as well as nanotechnology as ultra-capacitors (high energy, high power density electrochemical devices that are easy to charge and discharge) and nanomaterials could significantly increase the capacity and lifetime of batteries.

3. Energy storage methods

[1]. Grid energy storage: Grid energy storage (also called large-scale energy storage) is a collection of methods used for large-scale energy storage within an electric energy grid. Electric energy is stored at a time when electricity is plentiful and inexpensive (especially from intermittent power plants such as renewable power sources such as wind power, tidal power, solar power) or when demand is low, and subsequently returned to the grid Goes when demand is high, and electricity prices go up. Also, photovoltaic and wind turbine users can avoid the need for battery storage by connecting to the grid, which effectively becomes a huge battery.
As of 2017, the largest form of grid energy storage damages hydroelectric capacity, both traditional hydroelectric generation as well as storage hydroelectricity.
[2]. Chemical energy storage: Chemical energy storage can be considered the following route: Electricity is generated from a source that does not comply with the demand for electricity, and some constraints may result in an excess of electricity at a particular location.
Chemical fuel has become the ruling form of energy storage in both power generation and energy transportation. Commonly used chemical fuels are coal, gasoline, diesel fuel, natural gas, liquefied petroleum gas (LPG), propane, butane, ethanol, biodiesel, and hydrogen. All these chemicals are easily converted into mechanical energy and then converted into electrical energy using a heat engine used to produce electrical energy.
[3]. Electrochemical energy storage: Electrical energy storage: An initial solution to the problem of energy storage for electrical purposes was the development of a battery, an electrical storage device. It has been of limited use in electric power systems due to its small capacity and high cost.

Electrochemical energy storage covers all types of primary and secondary batteries. Batteries convert the chemical energy contained in its active materials into electric energy by an electrochemical oxidation-reduction reverse reaction.

[4]. Electrical energy storage: Electrical energy storage (other than pumped storage hydropower) is still a peripheral part of the power generation infrastructure. However, the advance use of renewable energy is changing the perception of storage and there is a significant increase in interest in energy storage.

- **Capacitors:** Capacitors use physical charge separation between two electrodes to store charge. They store energy on the surfaces of metalized plastic films or metal electrodes. When batteries and supercapacitors are compared, the energy density of the capacitor is very low - less than 1% of the supercapacitor, but the power density is much higher, often higher than that of the supercapacitor. This means that capacitors are capable of delivering or accepting high currents, but only for a very short time, due to the relatively low capacitance.
- **Supercapacitors:** Supercapacitors are very high surface area activated carbon capacitors that use a molecule-thin layer of electrolyte, rather than as a fabricated sheet of material for a built-in charger, to charge differently. Energy storage is through a static charge rather than an electrochemical process inherent to the battery. Supercapacitors rely on the separation of charge at an electrified interface, measured in nanometer fractions, compared to micropatterns for most polymer film capacitors. The lifespan of supercapacitors is almost indefinite and when kept within their design range their energy efficiency is reduced by 90%. Their power density is higher than that of batteries, while their energy density is generally lower. However, unlike batteries, almost all the energy is available in a reversible process.
- **Superconducting magnetic energy storage:** In a SMES system, energy is stored within a magnet that is capable of releasing megawatts of power within a fraction of the cycle to convert sudden losses inline power. It stores energy in a magnetic field created by the flow of direct current (DC) power in a coil of superconducting material that has been cryogenically cooled. The accumulated energy can be released back into the network by discharging the coil. The power conditioning system uses an inverter/rectifier to convert alternating current (AC) power to direct current or DC to AC power. Inverter/rectifier accounts for about 2-3% energy loss in each direction. SMES loses less power than other methods of storing energy in the energy storage process. SMES systems are highly efficient; The round-trip efficiency is over 95%.

[5]. Mechanical energy storage: Mechanical energy storage often involves a physical connection between a flywheel and driven wheels via a CVT.

- **Compressed Air Energy Storage (CAES):** CAES power plants use wind turbines to drive compressed air into underground aquifers. When needed, air will be released to generate electricity. This is a new twist on the idea of using wind energy in a way that removes the unreliability of nature. If you can use compressed air as a storage medium, you get certainty and dispatch capability, called Bob Haug, executive director of the Iowa Association of Municipal Utilities.
- **Flywheel Energy Storage:** A flywheel is a device for storing energy or accumulation in a rotating mass. The potter's wheel is often cited as early use of a flywheel. Spacecraft have long used the gyroscopic stability inherent in flight flight to control their altitude. Pump-storage hydroelectricity Some regions of the world have used geographic features to store large amounts of water in high reservoirs, then to power, using more electricity at times of low demand to pump water into reservoirs. To reclaim waterfall through turbine generators. Peaks when demand.

[6]. Thermal energy storage: Thermal energy storage (TES) is achieved with widely varying technologies. Depending on the specific technology, it allows additional thermal energy to be stored and used for hours, days, months later, from individual processing to scales, buildings, multipurpose-building, district, city, or region. Examples of use are the balance of energy demand between day and night, summer storage for winter heating, or winter colds for summer air conditioning (seasonal thermal energy storage). Storage media include bedrocks accessed with heat exchanges through water or ice-slush tanks, native earth masses or boreholes, deep aquifers in the middle of impermeable strata; The shallow, lined pits are filled with gravel and water and insulated at the top, as well as utetic solutions and phase-change materials.

- **Molten Salt Battery:** Molten salt batteries are a class of primary cell and secondary cell high-temperature electric batteries that use molten salts as an electrolyte. They provide both a high conductivity through a high conductivity coupled to a reasonable selection of reactive pairs via a high conductivity molten salt electrolyte. They are used in services where high energy density and high power density are required. These features make rechargeable molten salt batteries a promising technology for powering electric vehicles. Operating temperatures of 400 ° C to 700 ° C, however, bring thermal management and safety problems and put more stringent requirements on the rest of the battery components.
- **Solar pond:** A solar pond is simply a pool of water that collects and stores solar energy. It consists of layers of salt solutions with a concentration (and hence density) to a certain depth, below which the solution has an equally high salt concentration. When sunlight is absorbed, the density gradient prevents heat from moving upward by convection in the lower layers and leaving the pond. This means that the temperature at the bottom of

the pond will rise above 90 ° C, while the temperature at the top of the pond is usually around 30 ° C. The heat trapped in the salty floor layer can be used for many different purposes, such as heating buildings or running turbines to generate industrial hot water or electricity.

[7]. **Batteries energy storage:** A battery is a device that stores energy and then discharges it by converting chemical energy into electricity. Typical batteries produce electricity by chemical means, usually through the use of one or more cells. ... Overall, batteries are extremely important in everyday life

Batteries:

Battery:

A battery is a device that converts chemical energy into electrical energy. The electrons stored in electrolyte(chemical compounds) of battery during charging, and released when the battery is discharging. Each cell of all batteries has three basic components - an anode, a cathode and an electrolyte and their properties are directly related to their individual chemistry. Batteries all come in different sizes, shapes, voltages and capacities (the amount of charge or energy stored). Although they can be made with all types of different chemical electrolytes and electrodes.

Why a battery requires two different materials: It is important to note that the electrodes in a battery are not always made of two dismounted/dissimilar materials (so, both are never from the same metal), which would obviously be electric conductors. Huh. This is a key to know how and why a battery works: one "likes" the material to release electrons, the other likes to get them. If both electrodes are made of the same material, this will not happen and no current will flow.

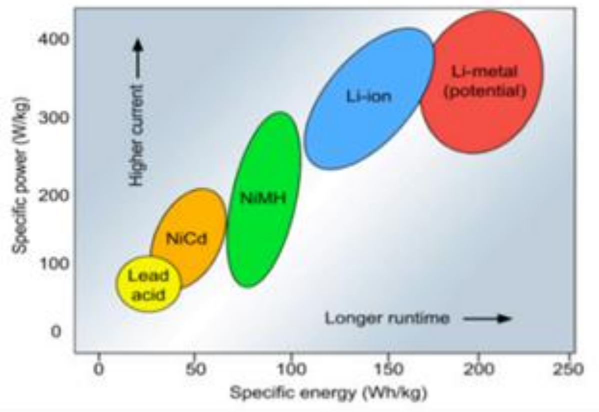
Batteries are broadly classified into primary battery and secondary battery.

Types of batteries:

- **Primary battery:** Primary batteries are disposable because their electrochemical reaction cannot be reversed. Primary batteries are the most common and are designed as single-time use batteries, which are discarded or recycled after they run out. They have very high impedance which results in long life energy storage for low current loads. The most commonly used batteries are carbon-zinc, alkaline, silver oxide, zinc-air and some lithium metal batteries.
- **Secondary battery:** Secondary batteries are rechargeable because their electrochemical reaction can be reversed by applying a certain voltage to the battery in the opposite direction of the discharge. Secondary batteries are designed to be recharged and reusable and can be recharged up to 1,000 times depending on usage and battery type. Very deep discharges result in a shorter cycle life, while shorter discharges result in longer cycles for most batteries. Battery status varies from 1 to 12 hours, depending on other factors. Commonly available secondary batteries are nickel-cadmium (NiCad), lead-acid, nickel-metal-hydride (NiMH) and lithium-ion (Li-Ion) batteries. Some limitations posed by secondary batteries are limited life, limited power efficiency, low energy-efficiency, and disposal concerns.

Fuel cells: Fuel cells were invented about the same time as batteries. However, fuel cells were not well developed until light, non-thermal sources of electricity were required until the arrival of the spacecraft. Fuel cell development has increased in recent years in an effort to increase the conversion efficiency of chemical energy stored in hydrocarbons or hydrogen fuels into electricity.
Like a battery, a fuel cell uses stored chemical energy to generate electricity. Unlike the battery, its energy storage system is separate from the power generator. It produces power from an external fuel supply as opposed to the limited internal energy storage capacity of a battery.

Types of existing batteries:



Specific energy is the total energy a battery can deliver in watt-hours per kilogram (Wh/kg).
Specific power is the battery’s ability to deliver power in watts per kilogram (W/kg).

Ongoing Research in the world&New Developments in Battery Technology:

Research and development in Li-Ion batteries, In February 2005, Altairnano, US-based developer of ceramic nanomaterials, announced a nano-sized titanate electrode material for lithium-ion batteries. It is claimed the prototype battery has three times the power output of existing batteries and can be fully charged in six minutes. However, the energy capacity is about half that of normal Li-Ion cells. The company also says the battery can handle approximately 20,000 recharging cycles, so durability and battery life are much longer, estimated to be around 20 years or four times longer than regular lithium-ion batteries.

In March 2005, Toshiba announced another fast charging Li-Ion battery, based on new nano-material technology that provides even faster charge times, greater capacity, and a longer life cycle. In November 2005, A123Systems announced a new Li-Ion battery system based on research licensed from MIT. While the battery has a lower energy density than others competing for Li-Ion technologies, a 2-Ah cell can provide a peak of 70 Amps without damage, and operate at temperatures above 60°C.

In April 2006, scientists at MIT announced a process, which uses viruses to form nano-sized wires. These can be used to build ultra-thin Li-Ion batteries with three times the normal energy density. As of June 2006, researchers in France have created nanostructured battery electrodes with several times the energy capacity, by weight and volume, of conventional electrodes.

All these technological advances involve new electrodes. By increasing the effective electrode area – thus decreasing the internal resistance of the battery – the current can be increased during both use and charging. This is similar to developments in supercapacitors. Therefore, the battery is capable of delivering more power (watts); however, the battery's capacity (ampere-hours) is increased only slightly.

Announcement of a 'Self-Charging' battery:

The Inventions Submission Corporation (ISC), of Pittsburgh PA, has announced that two Fort Wayne IN inventors have created a self-charging replacement for rechargeable batteries. The invention "recharges without the use of special equipment or electrical current and can be produced in all standard battery sizes." Another entry to the "self-charging" field is shown in a US Patent Office Patent Application Publication 2006/0257734. To access these publications it is necessary to go to the USPTO home page and click on the Application Publication database.

Electric Cars: Electric cars discusses the use of batteries as motive power sources in electric vehicles, as well as temporary energy storage in hybrid and solar-powered vehicles.

Lithium-Metal-Polymer Battery with ultra-thin film electrolyte:
This Lithium-Metal-Polymer battery contains no liquid or pastes electrolyte. The electrolyte is in the form of a polymer film, resulting in a lightweight battery that is rugged, required little maintenance, and can tolerate extremes of temperatures in-service lives as long as 10 years.
Battery-operated water purifier: A new development offered by Proctor & Gamble, not yet on the market. It is low-power electrolysis technology that can remove pathogens from small or large quantities of water. The technology is offered for licensing throughyet2.com as a TechPak. Uninterruptible power supply for a city. It takes a huge battery wouldn't it be nice if we didn't have to worry about the power going off suddenly with the loss of what you had been doing at the computer? It is called an uninterruptible power supply. You can buy one for your computer that will keep it going for some dozens of minutes. What if you were trying to provide power to a small city? Could you keep it going for 4 or more hours? Learn how by following the link above.
Valve-regulated Lead-Acid Batteries Valve-regulated Lead-Acid batteries are more user-friendly than the type found in your automobile. They are welcome in the home or office. A new rugged case allows them to be shipped inside electronic equipment, where they can provide energy for uninterruptible power supplies. Read about new advances in energy density and service life.

Environmental impact:
Thousands of tons of zinc-carbon batteries are discarded worldwide every year and are often not recycled. Settlement varies by jurisdiction. For example, the U.S. In California, the state of California considers all batteries to be hazardous waste when discarded, and has banned the disposal of batteries along with other household wastes. In Europe, battery disposal is regulated by the WEEE Directive and Battery Directive regulations, and as such, zinc-carbon batteries should not be thrown out with household waste. In the European Union, most shops selling batteries require legislation to accept old batteries for recycling.

Problem: Existing batteries are solid batteries and solid waste is increasing day by day because of non-rechargeable cheap cost batteries.
Solution: The main aim of the project is to build a battery with Eco chemicals like potassium, sodium which can work in room temperature and which can recycle biomass for agricultural fields.

II. Methodology & Experimental work:

First of all, I worked on the electric vehicle project in 2017. At that time I concentrated more on the battery part because the battery is the main part of any electric or electronic devices. Firstly, we considered lithium-ion batteries for the project but those batteries were getting more expensive when compared to other types of equipment of that project which was crossing the budget of our project. so, I considered lead-acid battery for the project which came at low cost but not good in terms of efficiency when compared to the lithium-ion battery. Then, I started working on improvisation of a lead-acid batteries . Directly I went through a number of chemical reactions to make electrolyte of a battery. Here you notice that I forgot about the lead-acid battery and started working on constructing a new battery. I wrote many reversible redox chemical reactions to make a strong electrolyte but, it took a long time to construct a battery which gave better results than existing batteries.

I am aware that my battery is a drop in the ocean but it is completely eco-friendly which means it can be decomposed after disposal where as the existing batteries cannot be decomposed into biomass after disposal.

This battery may not have better storage capacity than the existing batteries but it can be improvised if I work on it.

List of some of the Experiments was found good results:

1.The Chemical reaction between potassium hydroxide and sulfuric acid

$$2KOH + H_2SO_4 \xrightarrow{t^\circ C} K_2SO_4 + H_2O$$

Potassium hydroxide reacts with sulfuric acid to produce potassium sulfate and aqueous. Potassium hydroxide - solid. Sulfuric acid - concentrated solution.

2.The Chemical reaction between sodium hydroxide and sulfuric acid

$$2NaOH + H_2SO_4 \xrightarrow{t^\circ C} Na_2SO_4 + H_2O$$

Sodium hydroxide reacts with sulfuric acid to produce Sodium sulfate and aqueous. Sodium hydroxide - solid. Sulfuric acid - concentrated solution.

3.The Chemical reaction between potassium chloride and sulfuric acid

$$2KCl + H_2SO_4 \xrightarrow{t^\circ C} K_2SO_4 + 2HCl$$

Potassium chloride reacts with sulfuric acid to produce potassium sulfate and hydrogen chloride. Potassium chloride - solid. Sulfuric acid - concentrated solution.

4.The Chemical reaction between sodium chloride and sulfuric acid

$$2NaCl + H_2SO_4 \xrightarrow{t^\circ C} Na_2SO_4 + 2HCl$$

Sodium chloride reacts with sulfuric acid to produce Sodium sulfate and hydrogen chloride. Sodium chloride - solid. Sulfuric acid - concentrated solution.

Experimental procedure:

The first experiment, I have done to make electrolyte then I conduct another experiment to make cell/battery.
The procedure for all the list of experiment Is same and quantities are also the same.

H2SO4 : 5 ml.
KOH : 15 ml.
Voltage : 0.515V.
Electrode : carbon as a cathode, stainless steel as a anode.

Procedure:

In this experiment, required components are a beaker of 20-25ml capacity and a carbon&stainless steel electrodes, concentrated sulphuric acid of 5ml, Potassium hydroxide of 10grms is dissolving in distilled water of 10ml, a multimeter to measure the voltage and thermometer to measure the temperature.

1. Take a beaker and wash it with clean distilled water.
2. Now, Pottasium hydroxide crystalline of 10gms taken into beaker.
3. Pour distilled water 10 ml into beaker.
4. Stir it with stirring rod to dissolve crystals in water.
5. Now, take 5ml of sulfuric acid to add to the beaker containing solution.
6. Now, place both electrodes in the beaker.
6. Take the multimeter to measure the voltage.
7. Take the thermometer to measure the temperature.
8. Note the values in a tabular form.

Sl no:	Time Interval (minutes)	Voltage(V)	Temperature(degrees)
1.	0	0.515	40
2.	5	0.512	38
3.	10	0.510	37
4.	15	0.506	33
5.	20	0.503	30

Now make an average to get the voltage of cell/battery.

Now, I got the electrolyte voltage by an average of tabular values. Now I conduct an experiment to make cell/battery with electrolyte.

H2SO4 : 5 ml.
KOH : 10 ml.
Voltage : 0.515V.
Electrode : carbon as a cathode
Tube : Stainless steel hollow cylindrical tube of inner diameter 10mm.

Procedure:

In this experiment, it is required to make a hollow cylindrical tube whose inner diameter is 10mm and length is 45mm. Where the tube is opened at one end and closed at another end. A carbon electrode of 3mm diameter of length 28mm. A rubber cap is to be made to close the tube at the top surface. concentrated sulphuric acid of 5ml, Potassium hydroxide of 5grms is dissolving in distilled water of 8ml, a multimeter to measure the voltage and thermometer to measure the temperature.

1. Take a hollow cylindrical tube whose one side is opened and another side is closed.
2. Fill the cylindrical tube with 10ml of potassium hydroxide.
3. Add sulfuric acid 5ml to the cylindrical tube.
4. Now take the plastic rubber grip and make a hole to it to dip carbon rod.
5. Now dip the carbon rod with the rubber into the cylinder.
6. Take the multimeter to measure the voltage.
7. Take the thermometer to measure the temperature.
8. Note the values in a tabular form.

Sl no:	Time Interval(minutes)	Voltage(V)	Temperature(degrees)
1.	0	0.511	43
2.	5	0.511	42
3.	10	0.506	39
4.	15	0.504	37
5.	20	0.501	36

Now make an average to get the voltage of cell/battery.

- Now repeat the experiment with sodium hydroxide instead of potassium hydroxide then follow the same procedure to get the values to make tabular forms and to get results.

Sl no.	Time interval(minutes)	Voltage(V)	Temperature(degrees)
1.	0	0.325	42
2.	5	0.323	41
3.	10	0.319	39
4.	15	0.315	36
5.	20	0.309	33

- Now, again repeat the experiment with potassium chloride instead of sodium hydroxide then follow the same procedure to get the values to make tabular forms and to get results.

Sl no.	Time interval(minutes)	Voltage(V)	Temperature(degrees)
1.	0	1.45	45
2.	5	1.42	45
3.	10	1.39	44
4.	15	1.39	44
5.	20	1.35	42

- Now, again repeat the experiment with sodium chloride instead of potassium chloride then follow the same procedure to the values to make tabular forms and to get results.

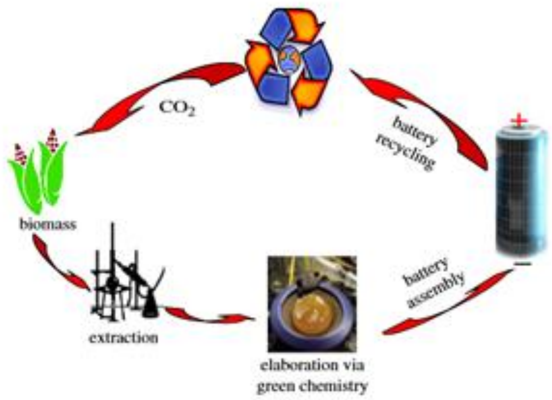
Sl no.	Time interval(minutes)	Voltage(V)	Temperature(degrees)
1.	0	1.35	42
2.	5	1.33	42
3.	10	1.32	41
4.	15	1.30	40
5.	20	1.28	39

Design of the Liquid cell(battery) details:

Cylinder weight	:	46.44 gms
Cylinder inside volume	:	14~15ml
Cylinder inner&outer diameter	:	20mm &23mm
Cylinder length	:	45mm
Cylinder material	:	Stainless steel
Electrode weight	:	6.42 gms
Electrode diameter	:	3mm
Electrode length	:	28mm
Electrode material	:	Carbon/Graphite
KCl with distilled water	:	10ml

H2SO4	:	5 ml
Overall weight	:	70gms

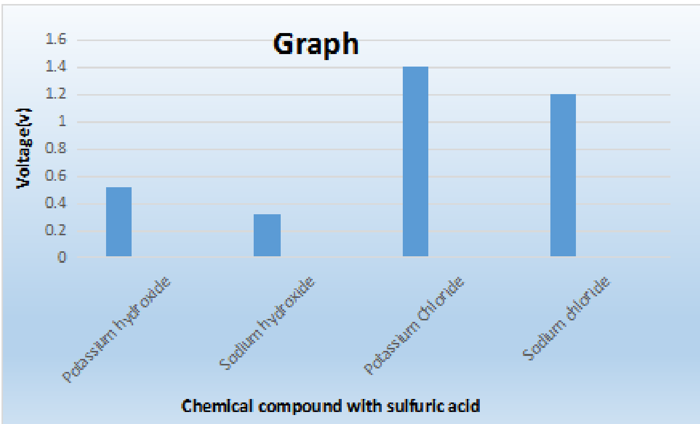
Environmental use of liquid waste:
The bi-products of battery after disposal used as biomass, they are:
Potassium sulfate: Potassium sulfate (K_2SO_4) (in British English potassium sulphate, also called sulphate of potash, arcanite, or archaically known as potash of sulfur) is a non-flammable white crystalline salt which is soluble in water. The chemical compound is commonly used in fertilizers, providing both potassium and sulfur. When potassium sulfate is heated in water and subjected to swirling in a beaker, the crystals form a multi-arm spiral structure when allowed to settle. Potassium sulfate could be used to study spiral structures in the laboratory. It does not form a hydrate, unlike sodium sulfate. The salt is crystallized as a six-way pyramid, classified as rhombic. They are transparent, very harsh and have a bitter, salty taste. Salt is soluble in water but insoluble in a solution of potassium hydroxide (sp. Gr. 1.35) or in absolute ethanol. Two crystalline forms are known. Orthorhombic β-K_2SO_4 is the common form, but it converts to α-K_2SO_4 above 583 °C. These structures are complex, although the sulfate adopts the typical tetrahedral geometry.



Sodium sulfate: Sodium sulfate (Na_2SO_4) is a non-flammable white crystalline salt which is soluble in water. The chemical compound is commonly used in fertilizers, providing both Sodium and sulfur. Sodium sulfate, also known as sulfate of soda, is an inorganic compound that contains the formula Na2SO4 as well as many related hydrates. All forms are white solids that are highly soluble in water. Decahydrate is a major commodity chemical product, with an annual production of 6 million tons. It is mainly used in the manufacture of detergents and the crafting process of paper pulling. [2] Sodium sulfate is very stable, inaccessible to most oxidizing or reducing agents at normal temperatures. At high temperatures, it can be converted into sodium sulfide by the reduction of carbothermal.

III. Results:

1.Potassium hydroxide and sulphuric acid with carbon electrode – 0.515V
2.Sodium hydroxide and sulphuric acid with carbon electrode – 0.325V
3.Potassium chloride and sulfuric acid with carbon electrode – 1.3-1.4v
4.Sodium chloride and sulfuric acid with carbon electrode – 1.25-1.3V



IV. Conclusion:

The following conclusions are drawn from the experiments

- Constructing the new batteries for the complete decomposition after disposal.
- Here, developments in liquid batteries are making it useful in ultimate ways.
- Here, we observe the decrease in the potential of battery due to the formation of aqueous in the electrolyte.
- It concludes that our environment and renewable resources will be preserved.
- It will lead to a new evolution in automobile and storage industry.
- Liquid batteries will help to build our complex industrialized societies.
- Renewable energy sources are becoming feasible and economical.
- The combination of potassium chloride with sulfuric acid and carbon electrode results in higher voltage generation.
- The design of the liquid battery is in safe mode and reduces the wastage of the solid batteries.
- The liquid batteries wastage can be recycled into biomass for fertilizers.

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