

ORGANIC BATTERY

Abstract:

Are you vexed with these power cuts? Here is easy solution. It is organic battery. We now



present a paper how to produce electricity by using organic battery in your house itself from organic materials like leaves, fruits, waste water. This can be done by recapitulating simple mechanism called electrolysis. Based on this idea, the world's first organic battery was invented. The battery can use any liquid even urine to power up. Within 10 seconds of being doused with liquid, the battery starts providing power.

This process doesn't leave us any toxic substances. In fact, it is biodegradable, eco-friendly and cheap. Different types of organic batteries, their working and their advantages to conventional batteries are discussed in this paper.

Fig.1: Organic battery using waste water.

I. History:

Electricity is the movement of tiny negatively-charged particles called electrons. Direct current is produced when electrons are pushed in one general direction. A battery is an example of a direct current. Electricity has a wide range of uses, including turning motors and powering lights.

The history of the development of electrochemical cells is crucial to the scientific study and industrial applications of electricity. Prior to the rise of electrical grids around the end of the 19th century, electro chemical cells were the main source of electricity. Successive improvements in battery technology permitted the rise of major electrical advances, from early scientific study to the rise of telegraphs and portable electronics.

In 1749, Benjamin Franklin first used the term "battery" to describe a set of linked capacitors he used for his experiments with electricity. These capacitors were panels of glass coated with metal on each surface. These capacitors were charged with a static generator and discharged by touching metal to their electrode. Linking them together in a "battery" gave a stronger discharge

II. Reason for choosing organic battery:

Now- a -days battery became a part of our life but the main disadvantage of these metallic batteries is that after their life time their disposal is difficult. If these are buried in earth the acids in them may cause harm to the environment.

In order to overcome these problems man developed rechargeable batteries. But these are expensive. This made the man to step towards Organic Batteries as these are eco-friendly and are of low cost.

III. What is an organic battery?

An organic battery uses organic materials instead of bulk metals such as lithium to form a battery. Formosa University developed an organic battery which uses materials such as leave from the banyan tree and even roadside weeds of chlorophyll extracted into the organic electrolyte. Even waste water can be used.

The organic battery may give up to 1.5 to 3V, current up to 150mA or more. With this we can listen to two days of continuous mp3, 4-cell battery LED lights can be lit to maintain more than 9 days.

This organic battery doesn't contain any toxic materials that may cause harm to environment. Whereas if one metal battery is buried on the earth, one square meter of soil will lose its value. The metals like lithium and lead present in these metal batteries may even penetrate into the ground water and causes great harm. So, these expired metallic batteries causes' great harm to the environment. This invention won the 2008 Taipei International Invention Competition Gold Medal.

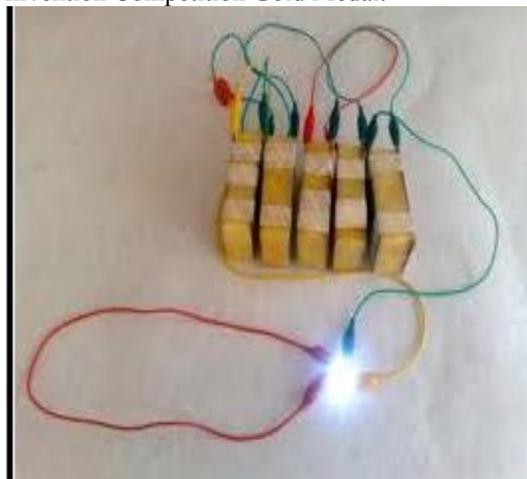


Fig.2 organic battery using potato.

IV. What makes an organic battery?

The organic battery mainly consists of electrodes (cathode and anode) and electrolyte.

Electrolyte:

An electrolyte is a melted or dissolved compound that has broken apart into ions by applying an electric field across it. This causes the anions and cations to move in opposite directions, thereby conducting electrical current while gradually separating the ions.

Electrode:

An electrode is a conductor through which an electric current enters or leaves a substance. These electrodes are dipped in the electrolyte.

In organic battery the electrolyte and electrodes used are made of organic materials which are eco-friendly and bio-degradable.

V. Types of organic batteries:

Here the electrolyte used is that matters. So, based on the electrolyte, types of organic batteries are classified as.

- Waste water Battery
- Fruit Battery
- Paper Battery

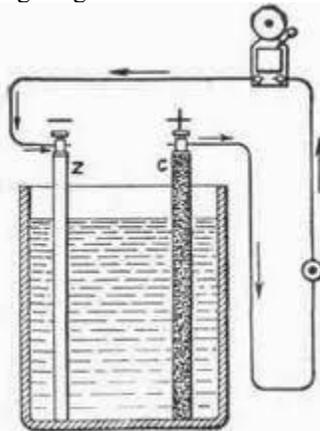
A. Waste water battery:

In the waste water battery, the electrolyte used is wastewater and the electrodes used are zinc and copper. A small bulb is connected to these electrodes.

Fill the container with waste water and place the electrodes in the water. Be care full not to touch the electrodes to each other. We can observe the flow of current as the bulb glows.

Creating a battery from a lemon is a common project in many science text books. Lemon battery consists of two different metals suspended in electrolyte. Zinc and copper works well as the

Fig.3 figure shows waste water battery.



For the waste water battery pH test is done for the electrolyte and the electrodes are chosen according to requirement.

Conductivity of electrolyte should be high.
Turbidity of electrolyte should be low.

B. Fruit battery (lemon):



Fig.4 shows a lemon battery.

electrodes and citric acid content of lemon acts as electrolyte.

Batteries like this may not be able to run a motor or energize bulb. It may possible to produce a dim glow from an LED. This lemon battery delivers a voltage of 0.906V. Unfortunately this is not enough to light a bulb.

To solve this problem we can connect more lemon batteries in series as shown in Fig So that voltage from each cell adds up, to produce high voltage.

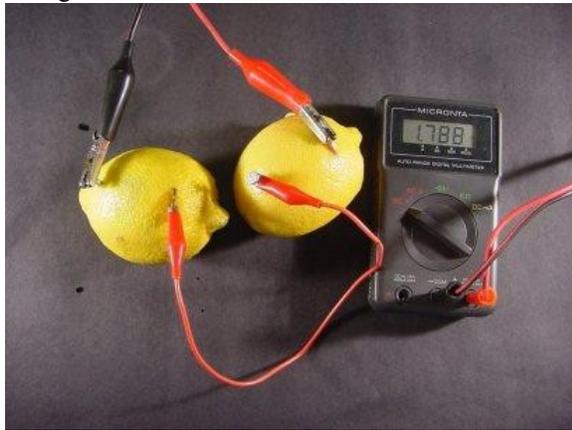
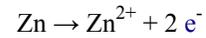


Fig.5 shows two lemons connected in series.

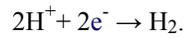
In a lemon battery, both oxidation and reduction occur. This battery is similar to the original

"simple voltaic cells" invented by Alessandro Volta.

When these electrodes are inserted into the lemon the chemical reaction starts. At the anode, metallic zinc is **oxidized**, that means it loses two electrons and forms an ion. This Zn^{2+} ion enters the electrolyte solution.



At the copper **cathode**, **hydrogen** ions are reduced that means gains two electrons to form molecular hydrogen.



The acid in the lemon reacts differently with each of the two electrodes. One of the electrodes contains positive electric charges, while the other contains negative electric charges. These charges create current, which will flow if the battery circuit is complete.

C. Paper battery:

A paper battery is a flexible, ultra-thin energy storage and production device formed by combining carbon nanotubes with a conventional sheet of cellulose-based paper.

A paper battery acts as both high-energy battery and super capacitor, combining two components that are separate in traditional electronics.



Fig.5 shows a paper battery.

This combination allows the battery to provide both long-term, steady power production and bursts of energy.

Non toxic, flexible paper batteries have the potential to power the next generation of electronics, medical devices and hybrid vehicles, allowing for radical new design and medical technology

Paper batteries may be folded, cut or otherwise shaped for different applications without any lose of integrity or efficiency. Cutting one in half, its energy production becomes half. Stacking them multiplies power output. Early prototypes of the device are able to produce 2.5 volts.



Fig.6 shows a paper battery.

The devices are formed by combining 90 percent of cellulose with an infusion of aligned carbon nanotubes of 10 percent that are each approximately one millionth of a centimeter thick.

The carbon imparts black colour to the paper battery. These tiny filaments acts like the electrodes found in a traditional battery, conducting electricity when the paper comes into contact with an ionic liquids contain no water. This means that there is nothing to freeze or evaporate in extreme environmental conditions.

As a result, paper batteries can function between -75 and 150 degree Celsius.

VI. Working of organic battery?

In order to understand the working of an organic battery let us connect a small bulb across the electrodes with the help of wires. Organic battery working is similar to voltaic cell. Pure Water does not act as electrolyte. When you insert the metal electrodes in the pure water, there is no observable reaction. No gas bubbles appear, and the bulb does not light.

Let us consider the waste water, this contains salts which acts as electrolyte. So in waste water the chemical reaction occurs. In this reaction cations and anions are formed. Cations move towards cathode and anions move towards anode.

This causes electron to be pushed through the wires, flowing in one direction from one electrode to other. This creates a direct current which lights up the bulb when the electrons pass through it.

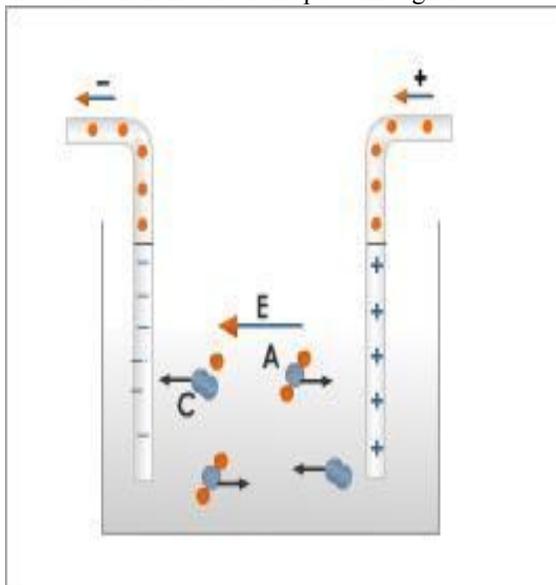


Fig.6 shows the movement of cations and anions.

IX. Conclusion:

VII. What makes organic battery so special?

- 9 Organic batteries are eco-friendly. They don't contain any toxic materials as that in other conventional batteries.
- 9 These are ease to handle as they are small in size and lighter in weight.
- 9 These are safer than other batteries.
- 9 These are cheaper to produce electricity than current lithium batteries.
- 9 The substances formed in this battery are bio-degradable and they don't cause any harm to environment.
- 9 The flexible shape of the paper battery will allow them to be used in irregular shaped electronics.

A. Drawbacks:

- 8 Power generated by organic batteries is very less.

VIII. Applications:

Non toxic, flexible paper batteries have their applications in the fields of

- Electronics
- Medical sciences to prepare pacemaker
- Automobiles etc.,

Organic batteries are an alternative to the metal reaction battery technologies. Thus, without depending on conventional sources of power we can power simple appliances which are widely used like bulb. By using this idea a battery which can store more energy can be developed. This reduces our electrical consumption and saves the EARTH. Just like organic foods are important to keep us healthy, organic batteries are important to make our Earth healthy.

After one look at this planet any visitor from outer space would say 'I want to see the manager.'

-William S. Burroughs.

Let's give him a chance only for appreciation.

X. References :

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