The BATTERY (Dry Cell)

(How They Generate Electrical Power)

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The common battery (dry cell) is a device that changes chemical energy to electrical energy. Dry cells are widely used in toys, flashlights, portable radios, cameras, hearing aids, and other devices in common use. A battery consists of an outer case made of zinc (the negative electrode), a carbon rod in the center of the cell (the positive electrode), and the space between them is filled with an electrolyte paste. In operation the electrolyte, consisting of ground carbon, manganese dioxide, sal ammoniac, and zinc chloride, causes the electrons to flow and produce electricity.

How do batteries work?

Electricity is the flow of electrons through a circuit or conductive path like a wire. Batteries have three parts, an anode (-), a cathode *(+)*, and the electrolyte. The cathode and anode (the positive and negative sides at either end of a smaller battery) are hooked up to an electrical circuit.

Electron Flow

The chemical reactions in the battery causes a build up of electrons at the anode. This results in an electrical difference between the anode and the cathode. You can think of this difference as an unstable build-up of the electrons. The electrons wants to rearrange themselves to get rid of this difference. But they do this in a certain way. Electrons repel each other and try to go to a place with fewer electrons.

In a battery, the only place to go is to the cathode. But, the electrolyte keeps the electrons from going straight from the anode to the cathode within the battery. When the circuit is closed (a wire connects the cathode and the anode) the electrons will be able to get to the cathode. In this example, the electrons go through the wire, lighting the light bulb along the way. This is one way of describing how electrical potential causes electrons to flow through the circuit.

However, these electrochemical processes change the chemicals in anode and cathode to make them stop supplying electrons. So there is a limited amount of power available in a battery. When a battery is *recharged*, the direction of the flow of electrons is changed, The electrochemical processes happen in reverse, and the anode and cathode are restored to their original state and can again provide full power.

Batteries are used in many places such as in flashlights, cars, PCs, laptops, portable MP3 players and cell phones. A battery is essentially a can full of chemicals that cause chemical reactions that produce electrons.

Looking at any battery, there are generally two terminals. One terminal is marked (+), or positive, while the other is marked (-), or negative. In an AA, C or D cell (normal flashlight batteries), the ends of the battery are the terminals. In a large car battery, there are two heavy lead posts that act as the terminals.

Electrons collect on the negative terminal of the battery. If a wire is connected between the negative and positive terminals, the electrons will flow from the negative to the positive terminal as fast as it can wear out the battery quickly and possibly cause an explosion.

Inside the battery, a chemical reaction produces the electrons. The speed of electron production by this chemical reaction (the battery's internal resistance) controls how many electrons can flow between the terminals. Electrons flow from the battery into a wire, and must travel from the negative to the positive terminal for the chemical reaction to take place. That is why a battery can sit on a shelf for a year and still have plenty of power - unless electrons are flowing from the negative to the positive terminal, the chemical reaction does not take place. Once the wire is connected, the chemical reaction begins.

Early Batteries

The first battery recorded was created by Alessandro Volta in 1800. To create the battery, he made a stack by alternating layers of zinc, blotting paper soaked in salt water, and silver.

Titanium Batteries

Batteries containing titanium technology should provide better power in most devices using a lot of power. It is claimed that they work well in high-tech devices such asMP3 & portable CD players, and smoke detectors and flashlights

Disposable Lithium Batteries

Lithium batteries are primary cell batteries that have lithium metal or lithium compounds as an anode. Depending on the design and chemical compounds used, lithium cells can produce voltages from 1.5V to about 3V, twice the voltage of an ordinary zinc-carbon battery or alkaline cell. Lithium batteries are used in many portable consumer electronic devices, and are widely used in industry. They are recommended as a best buy by consumer groups.

Rechargeable Batteries

The nickel-cadmium battery gives the longest cycle life of any currently available battery (over 1,500 cycles), but has low energy density compared with some of the other chemistries. Batteries using older technology suffer from memory effect, but this has been reduced drastically in modern batteries. Cadmium is toxic to most life forms, so it poses environmental concerns. Its chemical composition is nickel for the cathode and cadmium for the anode. It is used in many domestic applications, but is being superseded by Li-ion and Ni-MH types.