Curiosity Guide #310
Electric Batteries

Accompanies Curious Crew, Season 3, Episode 10 (#310)

Ice Tray Solution

Investigation #7

Description

This is one COOL battery!

Materials

- Ice tray
- White vinegar
- At least 5 galvanized 2-and-a-half-inch nails
- Short lengths of bare copper wire
- Wire cutters
- White vinegar
- LED lights of various colors
- Voltmeter

Procedure

1) Cut at least five lengths of wire, each about 3 inches long.
2) Wrap a piece of wire under the head of each of the 5 nails so that the wire is tightly secure and leaves a one-and-a-half-inch tail.
3) Fill 6 wells of the ice tray with white vinegar.
4) Carefully place a nail in each of five wells.
5) Bend the tail of each nail so that the tail goes in the liquid of the next well. Keep the head of each nail above the liquid, but the tail should be bent so that the tail goes into the liquid of the next well.
6) In the 6th well, which has no nail, place a copper wire entering the liquid.

7) Place one LED lead wire into the well with the copper wire, and the other lead wire in a well with a nail.
8) Did the LED light turn on? If not, try turning the bulb around so the lead wires are switched.
9) What would happen if you used more of the wells with more nails?
10) Try taking volt readings at different points in the tray. What do you notice?

My Results

Explanation

Placing two different metals into an acidic solution can make wet cell batteries. In this case, the two metals are the zinc coating on the galvanized nails and the copper wire. These are called electrodes, the two points that contact the acid. Acetic acid in the vinegar serves as an electrolyte.

A chemical reaction happens when two different metals are connected by an electrolyte, which provides a path for electrons to move from one metal to the next. A chemical reaction occurs at the point of contact with the electrolyte. The anode loses electrons and the cathode receives them.

Because the two metals have different voltages, the electrons move from the concentrated negative terminal, the anode, toward the lower concentrated positive terminal, the cathode. Just like a car battery that has multiple cells to increase voltage, you can also add more ice-tray wells and increase voltage.

Still curious? You may want to locate a diagram of a battery's parts and how it works in a book or on the internet. We use batteries every day, but looking at how they work is pretty interesting. Each battery is marked with a minus sign, called the anode, and a plus sign that we call the cathode. Those electrodes are separated by an electrolyte inside the battery. When the battery is inserted into a circuit, like a flashlight, there is a path for the electrons to move from the minus side through the flashlight, into the plus side of the battery, and back through the electrolyte. Batteries sure light up my life!

More to do: Count all the things that use batteries for power. You can make a written list or snap photos with your phone. How many devices did you discover? It's amazing to think about how many things need batteries. No wonder Americans buy 3 billion batteries every year! You'll be happy to know that scientists keep making batteries more efficient. In fact, some batteries will last 20 years in their packages. Here's another tip you can try. Placing your batteries in the freezer can slow down the chemical reactions inside the batteries and make them last longer. Now that's COOL! Stay curious, and keep experimenting!

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