How to make your own battery, just like Alessandro Volta

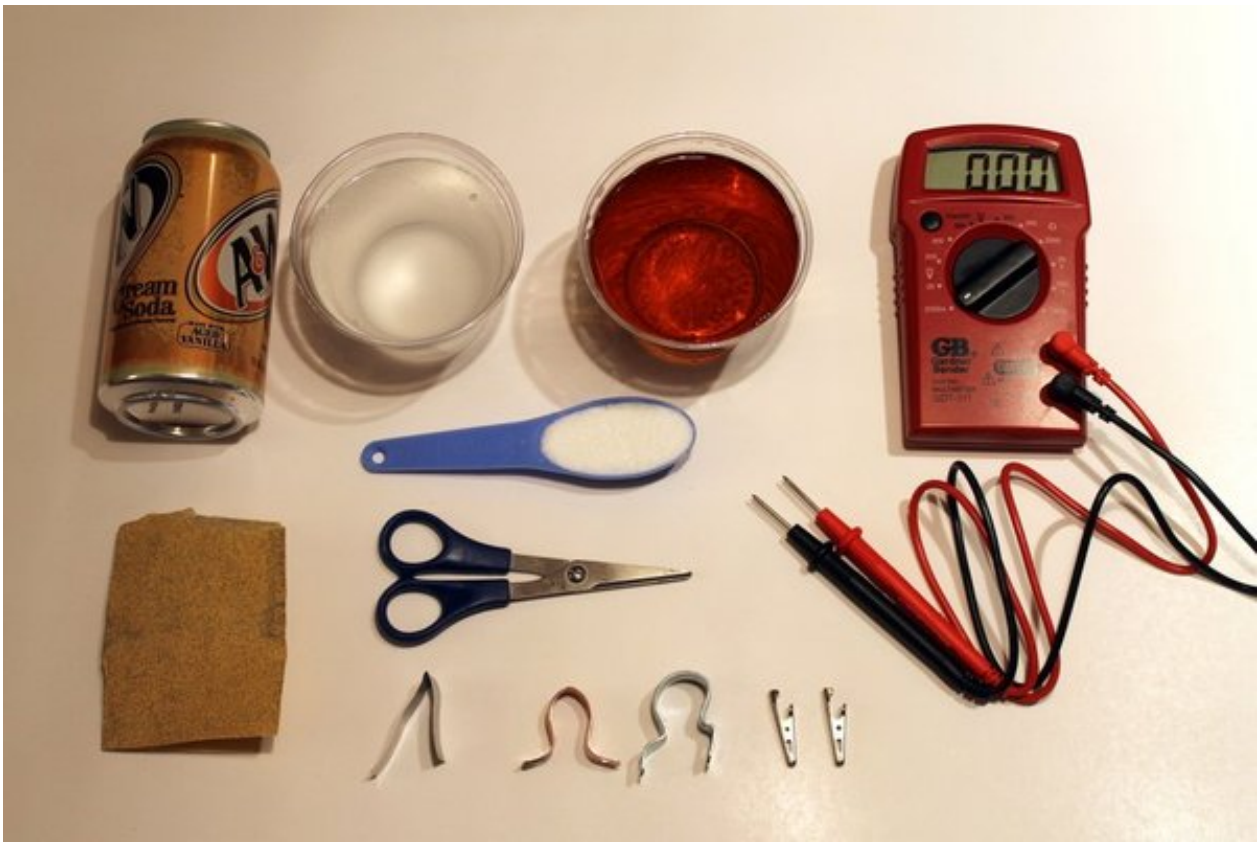
Here's the recipe to two DIY small batteries made from materials you probably have around the house.

When Alessandro Volta, born on this day in 1745, began experimenting with electricity, it was a pretty open field. Scientists experimented with everything from static electricity to frog legs, trying to harness power for later use, but they could not create a consistent source of energy.

Mr. Volta changed all that. He laid the groundwork for batteries by pioneering the use of electrolytes to conduct electricity. His breakthrough came when he stacked discs of copper, zinc, and cardboard soaked in brine into what became known as a “voltaic pile,” and successfully conducted a charge.

Sound simple? You're right. Elements of the first battery can be found in most homes and hardware stores.

Here is everything you need to make two different homemade batteries:



We'll show you two methods: through soda and through salt water.

First up, soda. Here is what you will need:

- Can of soda (We used cream soda)
- Plastic cup
- Sandpaper
- Strip of copper
- Alligator clips
- Multimeter (a device that measures charge)

First, pour the soda into the plastic cup until it almost reaches the top. Cut a strip of the aluminum can, and then sand down both sides so there is no longer a plastic or paint coating on either side (this is important or else you won't get a charge!).

Attach one alligator clip to the aluminum and drape it over one side of the plastic cup, and attach the other alligator clip to the copper strip and drape it over the other side of the cup. Turn on your multimeter and check your voltage. You've just created a simple battery.

Oh wait, you want to do this Volta-style? Try the classic saltwater method. Here is what you will need:

- Plastic cup filled almost to the top with water
- One tablespoon of table salt
- One empty soda can (we used the same can as the first experiment)
- Strip of zinc (note on finding zinc below)
- Alligator clips
- Multimeter

Procedure-wise, you do this one the same way as with the soda. However, certain ingredients are switched out. First, add a tablespoon of salt to the water. Then, keep the aluminum from the first soda can clipped, but switch out the copper for zinc. (Quick note on supplies: I was able to get everything at a local hardware store, but zinc proved to be a bit more difficult to find. The hardware store workers suggested I go with a zinc-coated steel, which made my voltage a little lower, but still worked for the reading. That being said, you can find zinc strips online pretty easily.)

While you're doing these experiments, there are a few things to keep in mind. To find your voltage, turn the dial to the section of the multimeter that has a V with three dots and a line above it—that means it is measuring direct charge, which is what you will see in a battery. The multimeter takes many readings and averages them out, so sometimes it is best to leave the meter for a bit before checking it.

Got a charge? Volta would be proud. But don't hook up the car battery just yet—this level of voltage won't charge that much. To actually do something productive (perhaps illuminate a light bulb or recharge batteries), you need to duplicate the circuit a few times.

Soda and saltwater are the tip of the homemade-battery iceberg. DIY-ers have experimented with everything from tomato pulp to orange juice to conduct a charge. And if you enjoy checking the multimeter, you can use it to check the charge of pretty much anything from an old battery to your tongue (which Volta was known to do to test his theory that the conductor was liquid).

This is a simple battery that can be made in an instant. The more liquid you have, the more power you get. It is perfect for an emergency at any time.

Vinegar Battery

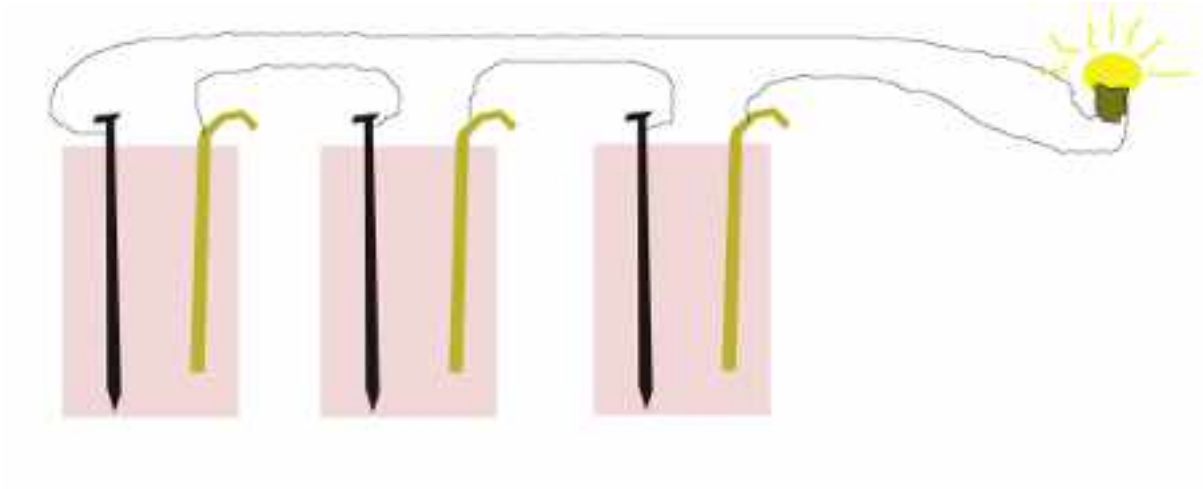
The construction of a vinegar battery is quite simple and easy. The materials you will need are a zinc strip. A galvanized nail works great. Some copper wire and a plastic container with a top of some sort, vinegar and a piece of copper if you have it. If not just strip a bunch of the copper wire and use it.

The copper will serve as the positive terminal of a battery and the zinc/galvanized nail will serve as the negative terminal of a battery.

According to my multimeter, a vinegar battery will producing about 0.8 volts. Keep in mind the amps available will be very small. This isn't a substitute for a cranking battery even if wired up in series to over 12 volts.

These batteries are only suitable for running leds and super small electronics like a calculator etc. And even for these small task you will need to wire up multiple cells in series and parallel.

Again, the more vinegar you use, the more power you get.



Super Simple Zinc Battery

As the title above says we are going to learn how to make a simple Zinc battery, this can also be done with aluminum. Just use whichever you have handy. There are tons of YouTube videos that show you how to make a zinc-copper battery but they do the simplicity of it a disservice. Unlike everything else in life this project is even easier that they say.

First lets gather a few materials. So go hunt up some electric wire. You shouldn't have to pay for this as you or your neighbors probably have this laying around. Do you have a broken electrical device somewhere. Well just take the power cord or speaker wire or whatever you have laying around and cut a short piece. You don't need much a foot should be enough.

Next strip of some of the rubber coating that covers the wire. Do this at each end of the wire. Maybe an inch or so.

Next drink a coke! All you will need is the tab on the top. Most websites will tell you to hunt up a galvanized nail. You can also sand down a 1982 or later penny to expose the zinc. I find the tab from a coke the easiest.

Now you need a plastic cup or glass. Vinegar will work but I made my first battery using straight tap water. I used Orange juice for the second battery. I am beginning to think it doesn't matter what liquid you use to get this to work.

Now simply wrap the end of you wire to the can tab or nail or whatever you found handy. Bend the wire into a U shape and place it so that both ends are in your liquid. That is it. A small amount of electricity is flowing through the wire. Of course you can't tell so let's fix that right now.

Cut the wire in half or if it is too short then simply get another piece of electrical wire. Strip both ends. Place one end in the liquid AND this time place only the tab in of the first wire in the cup of liquid. So now you have two wires sticking out the top of your cup. Take a multimeter and set it to measure DC voltage. Complete the circuit with the prongs on your multimeter and it should read roughly a quarter of a volt.

That isn't much voltage but you can simple add more cups to up the voltage until you have whatever voltage you require.

So there you have it. A super simple battery that can actually be used to power leds.

How to build a battery with pennies

This is a fun little DIY project that can serve you in emergency situations to power up electronic devices. It's also a good one to teach the kids, and a lot of fun to learn. What we will doing is building a working battery out of pennies by using everyday household items.

And what's cool about these penny batteries is that they're actually rechargeable; which can be great to have in dire situations. Below you will learn the simplest way to do all of this with step-by-step video and image instructions. Enjoy!

So here's all the steps in the process, what you will need, and other potential uses, such as increasing amperage, and some easy ways recharge them. Read below for more details:

What You Will Need?

Let's make some penny battery cells. You can do 3-stacks which should produce over 2 volts, and be enough to power a calculator; or 10-stacks which should produce around 6 Volts, and is enough to power an LED for over 2 weeks. Same materials are needed whatever you choose.

– Pennies
– Cardboard
– Zinc Washers
– Electrical Tape
– White Vinegar
– Multi-Meter(optional)
– LED's or Small Calculator – (To Test With)

These items are not set in stone. For example; instead of cardboard, you can use filter paper, or paper towels. instead of zinc washers, you can just sand down one side of the penny. Instead of white vinegar, you can use lemon juice, or salt water.

Step #1 – Prep Pennies or Use Zinc Washers

We need a positive terminal which the copper penny will serve as, and we need zinc to serve as a negative terminal.

We have two options to get zinc. We can either grind down one side of the pennies with 100 grit sandpaper or orbital sander to expose the zinc. Make sure these pennies are dated after 1983, as these are made of 97.5% zinc and plated with a thin copper coating.

Or we can just use zinc washers. Using zinc washers will end up being a lot easier. And If using zinc washers, use pennies dated before 1982, as these are made up of 95% copper.

You probably have some zinc washers in your toolkit. If not, zinc washers are available from most hardware stores. A package of 30 usually costs less than $2.

if you decide to grind the pennies down with an orbital sander, you may have to use adhesive remover such as goo gone to clean them up.

Step #2 – Prep The Cardboard

Line up pennies on top of your sheet of cardboard, and draw a circle around each penny. It is best if we cut out circles and not squares, as we don't want pieces hanging off the side as this can short-circuit the battery.

Once you cut out one circle for each penny, drop them in a cup of the acidic solution which will serve as an electrolyte. You can use vinegar, or lemon juice.

Let soak for a minimum of 3 minutes to ensure it is saturated. Make sure you swoosh around with your finger.

While soaking, start to prepare your battery cell by first laying down a piece of aluminum foil on the table, which will serve as a terminal conductor for testing purposes.

Step #3 – Start Building Battery Cell

If using Zinc washers, lay down on top of aluminum foil in this order: zinc washer on bottom, cardboard in the middle, and the penny on top. This makes up one cell. Continue with this same arrangement until you complete your stack.

Make sure you blot dry the cardboard pieces prior to stacking them on the tower. You don't want liquid dripping all down the tower.

If you have a multimeter, you can test the voltage reading and/or current draw(amps) throughout the stacking process.

If using sanded down pennies, lay down on top of aluminum foil in this order: Penny copper side down/zinc side up, cardboard in middle. This makes up one cell.

Remember, although you are using one penny, there are 2 terminals. The sanded down zinc side is the negative terminal, and the copper side is the positive terminal.

Step #4 – Test And Setup To Device

Once you finished building your battery tower, you can first test the amps and voltage reading with a multimeter.

You can start hooking up any small electrical devices that you think can run, as that's what you should be getting from a stack of ten.

You can set it up with 1 or 2 LED's to see how long it lasts for. Grant set up 1 LED, and his was bright for 2.5 weeks before finally fizzling out. That's pretty impressive.

If attaching other devices, just open up device, and pop out the 2 lead wires that will connect to the bottom and top terminals of battery cell. And then you can

just tape the battery stack to the back of device. Remember, copper is positive, and zinc is negative.

IMPORTANT: Make sure that the battery cell is taped up well with electrical tape, and that it's air-tight to prevent the wet cardboard from drying out too quickly. These are wet-cell batteries, so the longer the cardboard stays wet, the longer the battery will last.

These Little Babies Are Easily Rechargeable

The best thing about these little babies is all the hard work is done. You already sanded the pennies down, or bought all the washers. And you already cut out the cardboard.

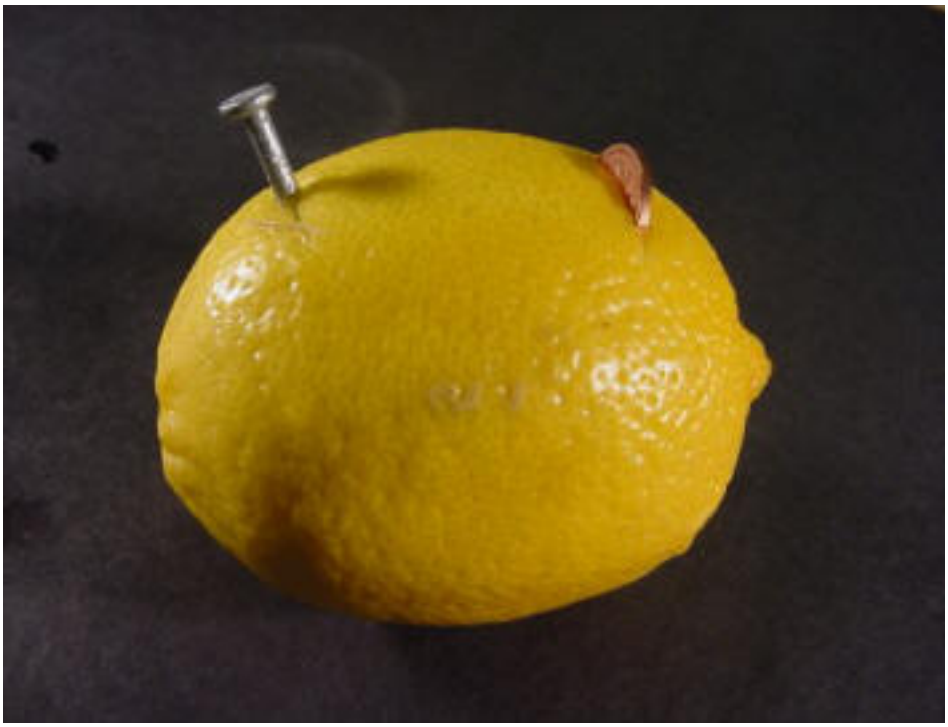
All you have to do is peel open the electrical tape, toss the cardboard in your Lemon juice or vinegar for 3 minutes, and swoosh around with finger. Rebuild back into battery cell. tape back up with new electrical tape. your good to go.

There's More Potential…

We showed you how to build penny batteries up to increase its voltage, but you can also build them side to side(parallel to each other) to increase its amperage. This will actually double the current by adding the same stack of batteries in parallel to it's previous stack. This is the same concept hybrid/electric cars use. This video explains exactly how to do that, starting at 5:55 seconds into the video.

Use this concept in conjunction with what you learned, and scale it up. Try different methods. Split-test. Play around with it — and maybe start charging bigger devices like flashlights, lamps, or even cell phones.

Make Your Own Lemon Battery



Creating a battery from a lemon is a common project in many science text books. Successfully creating one of these devices is not easy. Batteries consist of two different metals suspended in an acidic solution. Copper and Zinc work well as the metals and the citric acid content of a lemon will provide the acidic solution..

The lemon battery is called a **voltaic** battery, which changes chemical energy into electrical energy.

The battery is made up of two different metals (the zinc nail and the copper penny). These are called electrodes, which are the parts of a battery where electric current enters or leaves the battery. The electrodes are placed in a liquid containing an electrolyte, which is a solution that can conduct electricity.

In a solution of water and an electrolyte, like the acid in the lemon, an excess of electrons collects on one end of the electrodes. At the same time, electrons are lost from the other electrode.

Touching the electrodes to your tongue closes the circuit and allows an small electric current to flow. A single lemon produces about 7/10 of a volt of electricity.

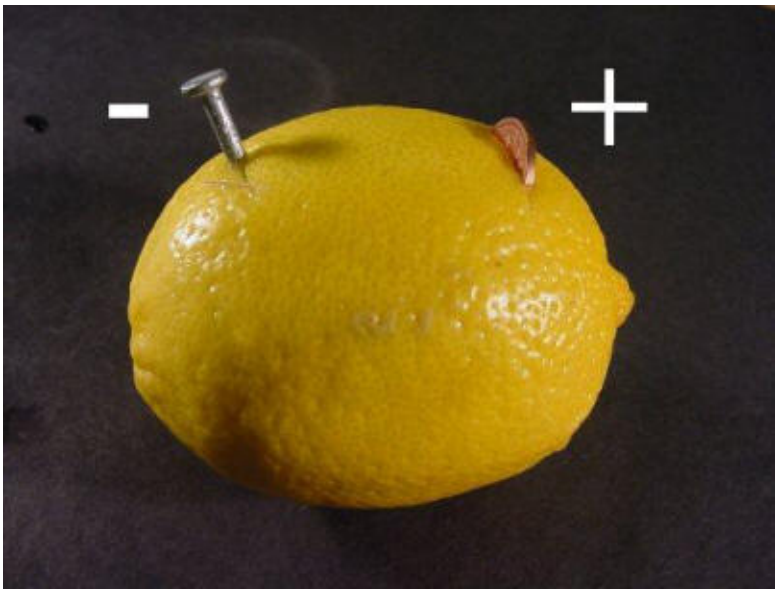
If you connected two lemons together, you can power a digital watch. (Use a length of thin, flexible wire to connect the silver wire of one lemon to the copper wire of the other lemon. Then attach thin wires from the other two wires in the lemons to where a battery's positive and negative poles connect to power the watch.)

The tingle felt in your tongue and the metallic taste is due to the movement of electrons through the saliva on your tongue.

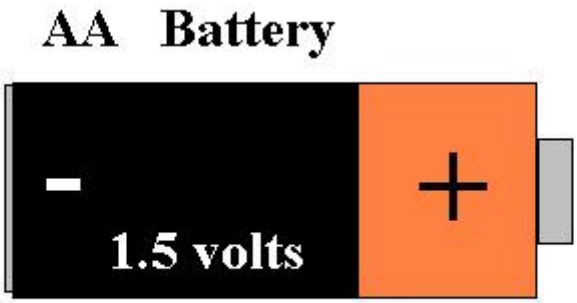
The picture at the top shows a basic lemon battery, a lemon, copper penny and zinc coated nail.

The lemon: A large, fresh, "juicy" lemon works best. The nail: Galvanized nails are coated in zinc. I used a 2" galvanized common nail. The penny: Any copper coin will work. (Canadian pennies from 1960 - 2001 all worked)

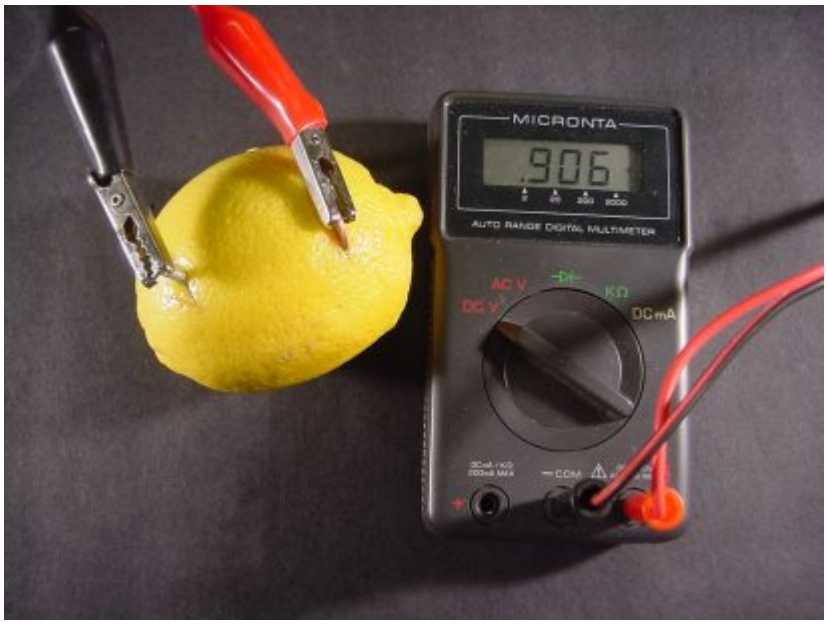
Creating the battery: Insert a penny into a cut on one side of the lemon. Push a galvanized nail into the other side of the lemon. The nail and penny must not touch.



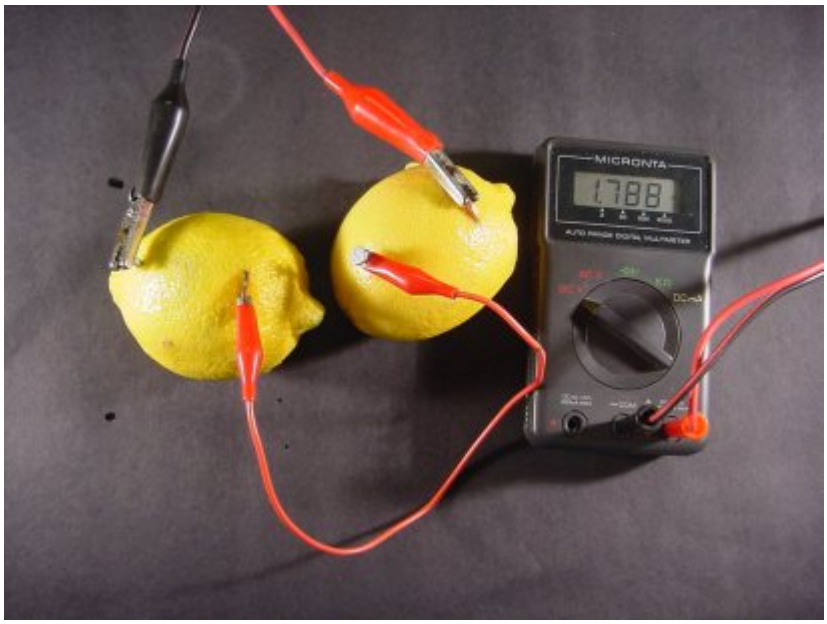
This is a single cell of a battery. The zinc nail and the copper penny are called electrodes. The lemon juice is called electrolyte. All batteries have a "+" and "-" terminal. Electric current is a flow of atomic particles called electrons. Certain materials , called conductors, allow electrons to flow through them. Most metals (copper, iron) are good conductors of electricity. Electrons will flow from the "-" electrode of a battery, through a conductor, towards the "+" electrode of a battery. Volts (voltage) is a measure of the force moving the electrons. (High voltage is dangerous!)



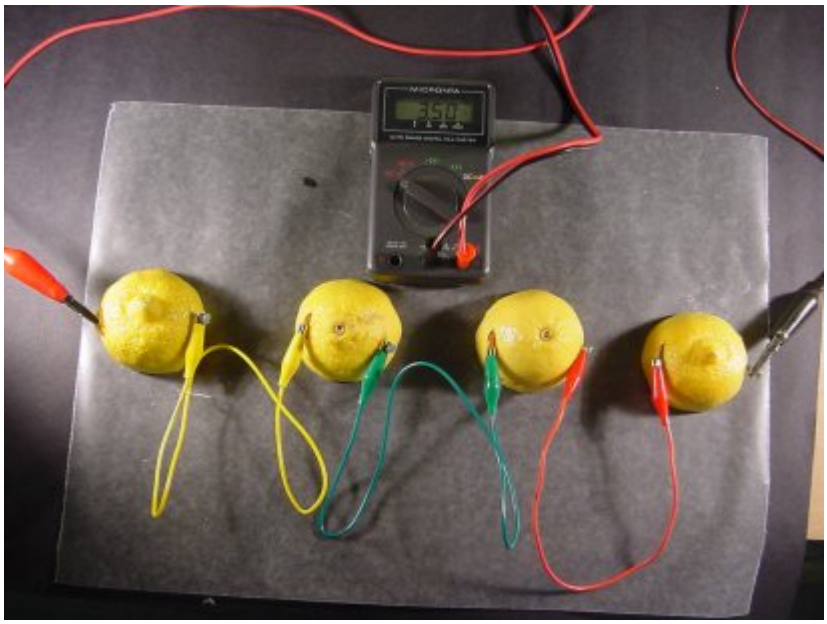
I have connected a volt meter to our single cell lemon battery. The meter tells us this lemon battery is creating a voltage of 0.906 volts. Unfortunately this battery will not produce enough current (flowing electrons) to light a bulb.



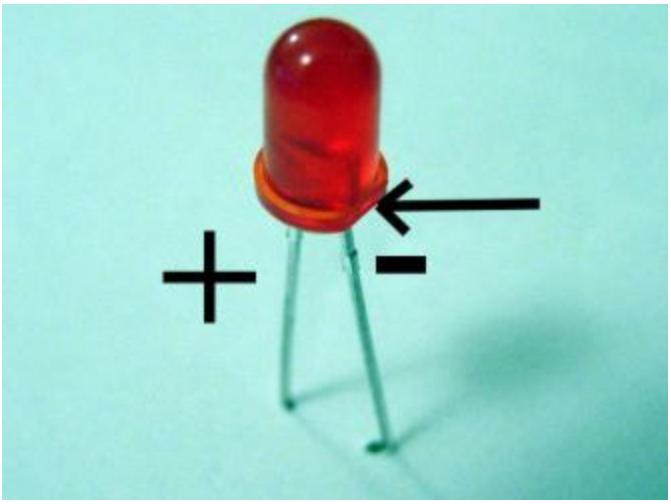
To solve this problem we can combine battery cells to create higher voltages. Building more lemon batteries and connecting them with a metal wire from "+" to "-" adds the voltage from each cell.



The two lemon batteries above, combine to produce a voltage of 1.788 volts. This combination still does not create enough current to light a small bulb. Note the red wire connecting the batteries is joined from "+" (penny) to "-" (galvanized nail).



Four lemon batteries create a voltage of 3.50 volts. We should be able to light up a small device like an LED (Light Emitting Diode). Note the connecting wires go from "+" to "-" on each battery.

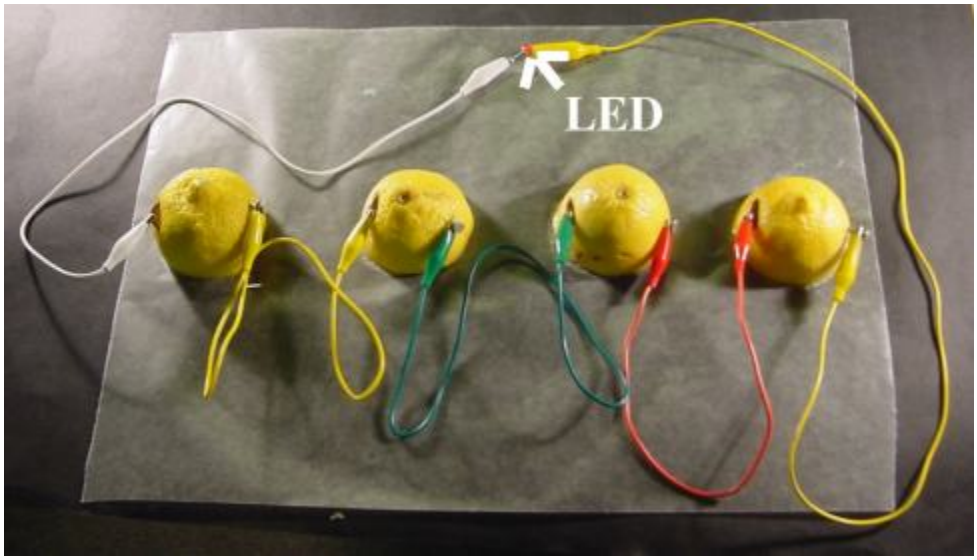


LED

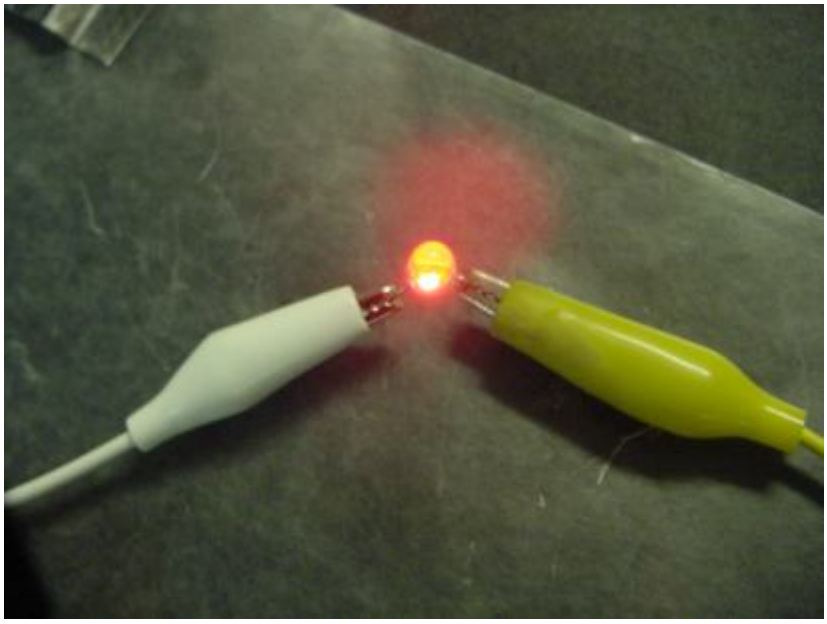
To turn on an LED you must determine the "+" and "-" connections. If you look closely at the red plastic base of an LED you will notice a "flat" spot (indicated by arrow above). The wire that comes out beside the flat spot must connect to the "-" side of a battery, the other wire to the "+" side.

Important information about LEDs: LEDs are designed to work at very low voltages (~ 2V) and low currents. They will be damaged if connected to batteries rated at

over 2 volts. LEDs require resistors to control current when used with batteries rated at over 2 volts. Lemon batteries produce low current. It is OK to connect an LED to a lemon battery.



In the above image, electrons flow from the "-" (nail) end of our lemon battery through the LED (making it glow) then back to the "+" (penny) end of the battery. This is an electronic circuit. The LED glows dimly with this configuration.



Improving your battery. The quality of the copper and zinc can be a problem for a battery like this. Pennies in particular are rarely pure copper. Try substituting a length of 14 gauge copper wire (common house wire) for the penny. Experiment

with different lengths and configurations of electrodes. Other sources of zinc and copper may be found in the plumbing supply department of a hardware store.

Making Ni MH Battery Packs

Introduction

Rechargeable NiMH batteries are widely available from high street retailers and on-line merchants. As raw material for battery packs, they offer a number of advantages over already made battery packs:

- You can tailor the configuration
- Individual cells can be checked for voltage
- Often cheaper

The only slight hurdle is that retail cells are not tagged. Nevertheless, if you're careful with the soldering process, the result is just as good as already made packs.

Choosing a Brand

It's worth sticking with the established brands like GP, Sanyo, Kan and Panasonic and try to get an idea of how long the cells have been lying in stock. Not so

important with the new 'hybrid' (e.g. Eneloop) cells, but older chemistry cells deteriorate if left in storage too long.

Check the Voltage

After removing the cells from the packaging, the first thing to do is check the voltage off load, as this will give an indication of their condition. Around 1.1 - 1.2 V per cell is normal. Anything less will indicate a sub-standard cell due to overlong or inappropriate storage. This is less likely with the latest hybrid cells (e..g Eneloops) which have very low self discharge rates.

Less Heat = More Reliability

Since retail cells are untagged, they have to be soldered. It's important to apply as little heat as possible for as short a time as possible when soldering. Paradoxically perhaps, the secret is to use a hefty 25 Watt soldering iron, so the heat from the iron will transfer quickly to the pads. Conventional wisdom says that soldering paste ('flux') should also be used, but I've found that polishing the terminals with 800 wet/dry alone is OK in conjunction with cored lead-based solder. Your mileage may vary.

Construction Sequence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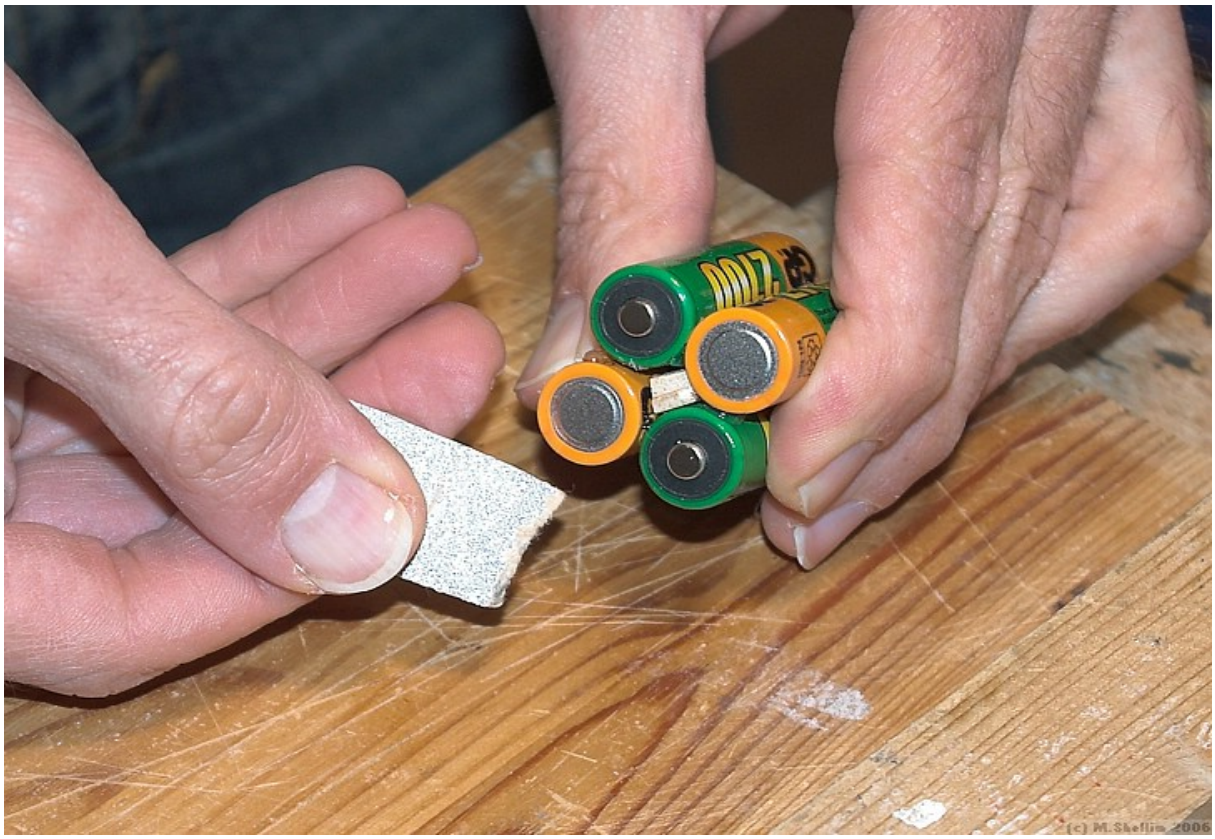
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BICC COMPONENTS LIMITED
BICC
CORALINE
Made in England
JOINTING SYSTEMS DIVISION, P.O. BOX 1, PRESCOT, MERSEYSIDE L34 5SZ
Net Weight 50g
(c) M.Shellim 2006


GP 2700
GP 2700
(c) M.Shellim 2006


(c) M.Shellim 2006


ALPHA
RESIN
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GP 2700
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ALPHA
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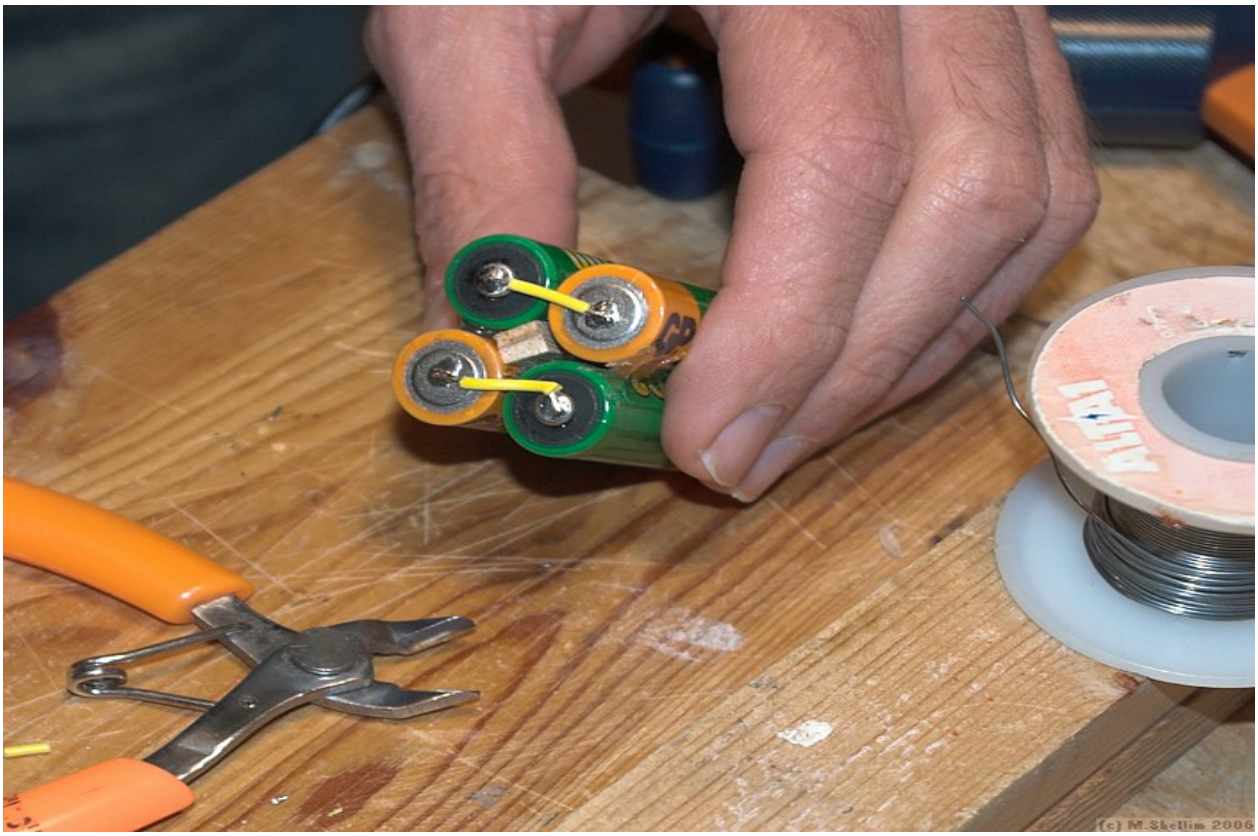
ALPHA
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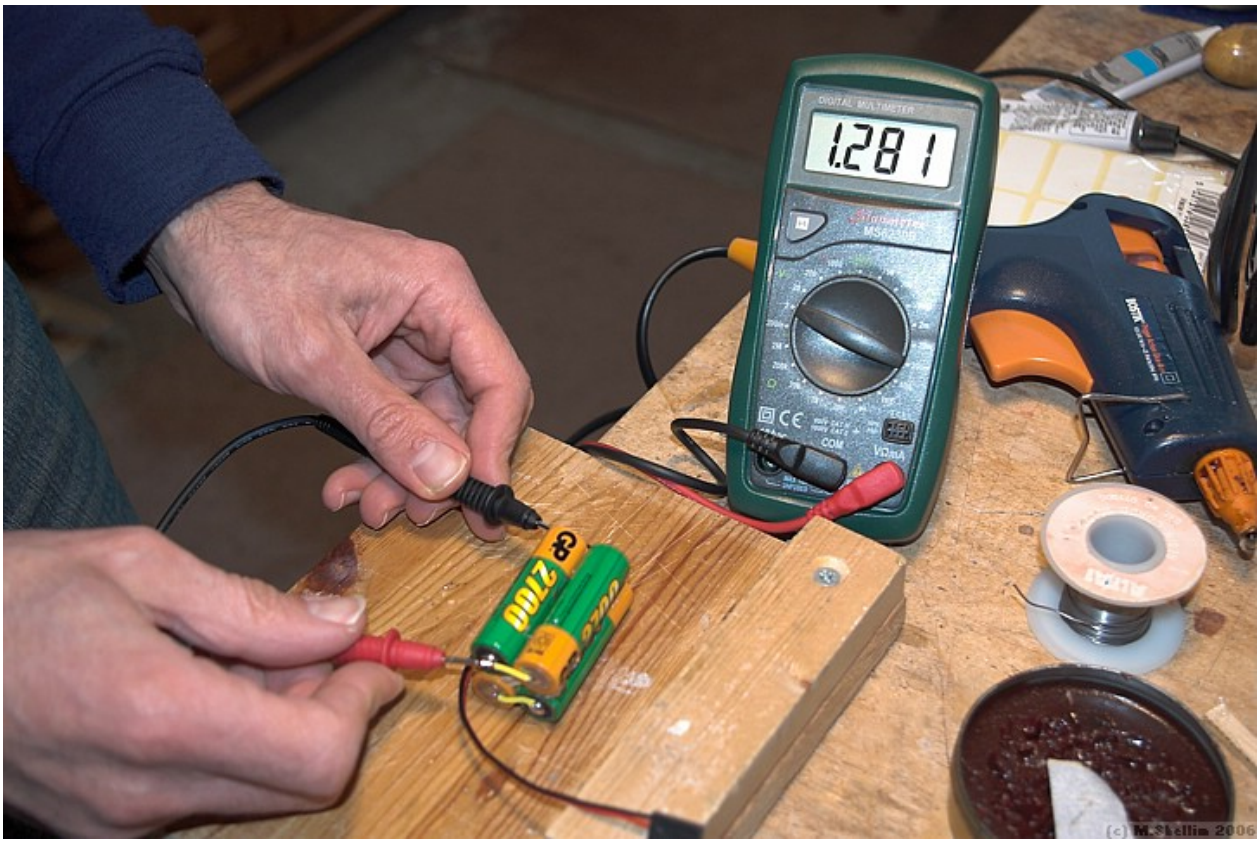
DIGITAL MULTIMETER
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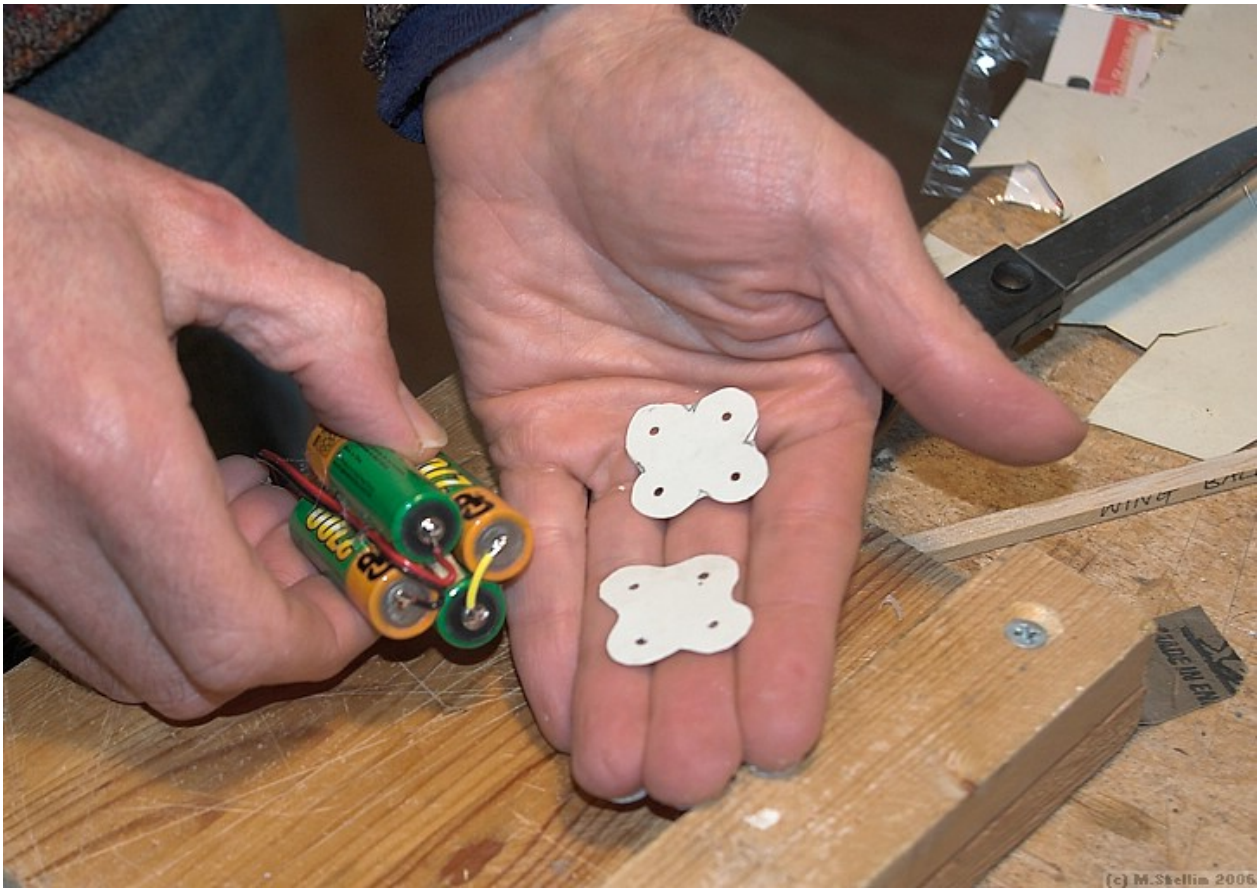
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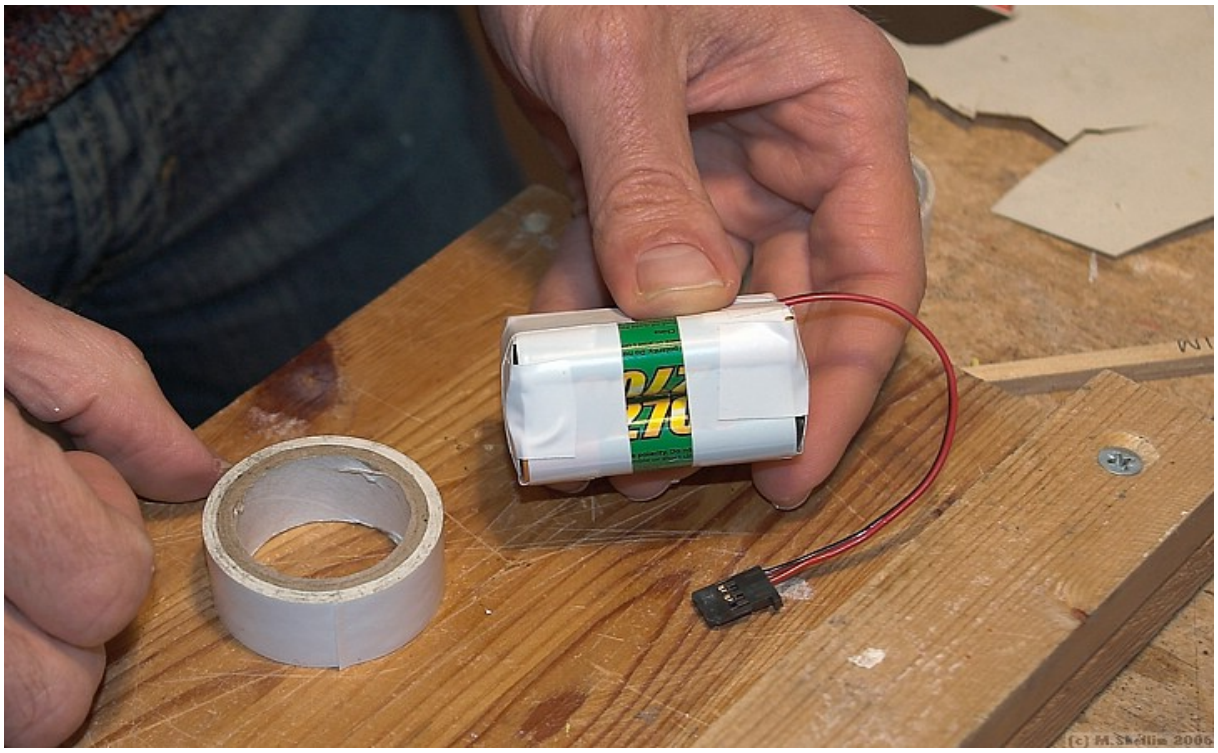
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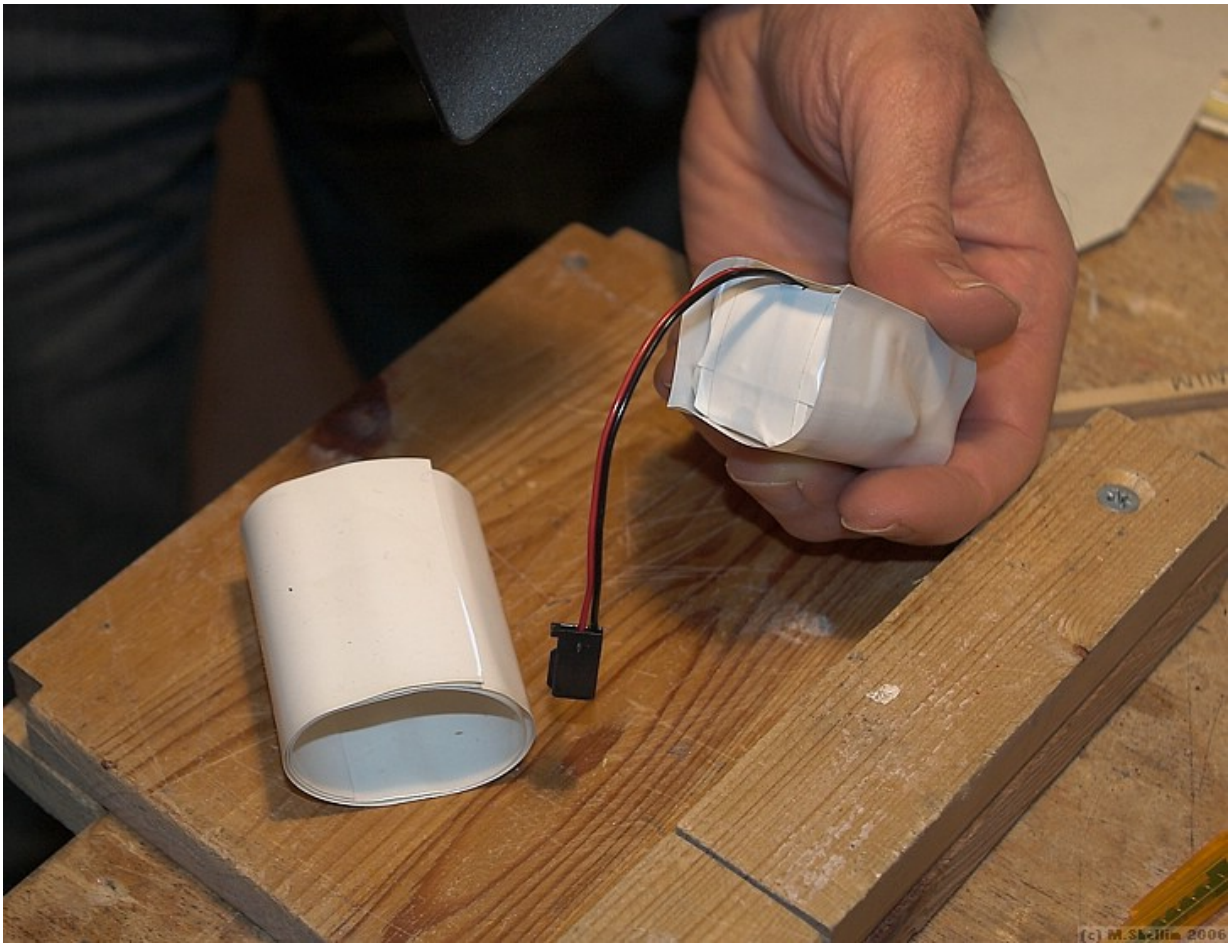
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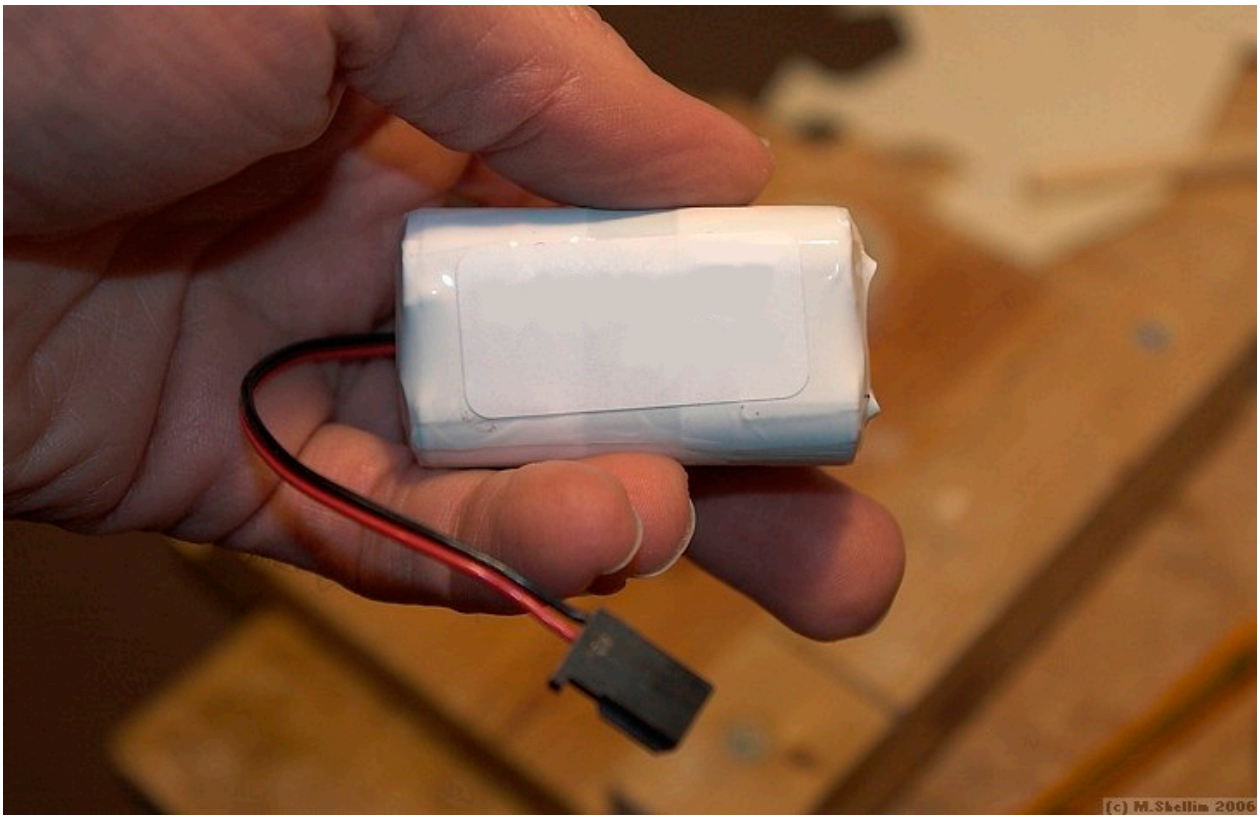
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