

# Electric cell

Level Elementary, Secondary

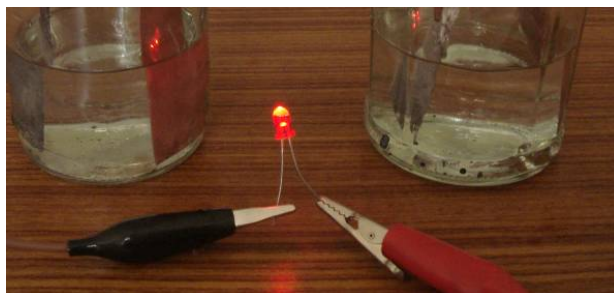
We can make an electric cell by using easy available materials. Let's try it.

## Experiment 1

### Voltaic cell

#### Concept

It is Alessandro Volta in Italy who invented the battery for the first time in 1800. That used the zinc and copper plate in the dilute sulfuric acid. This electric cell is a prototype of a dry battery today. Let's make the voltaic cell.



#### Materials

glass cup or glass bottle, diluted sulphuric acid (battery liquid), zinc plate, copper plate, conducting wire, clip, light emitting diode (LED), and hydrogen peroxide solution

#### Procedure

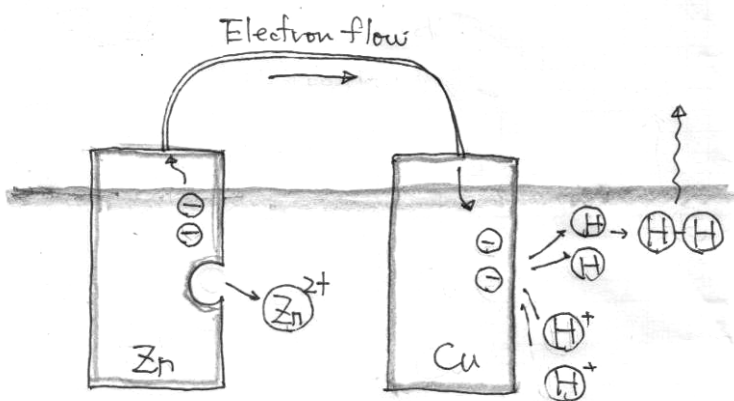
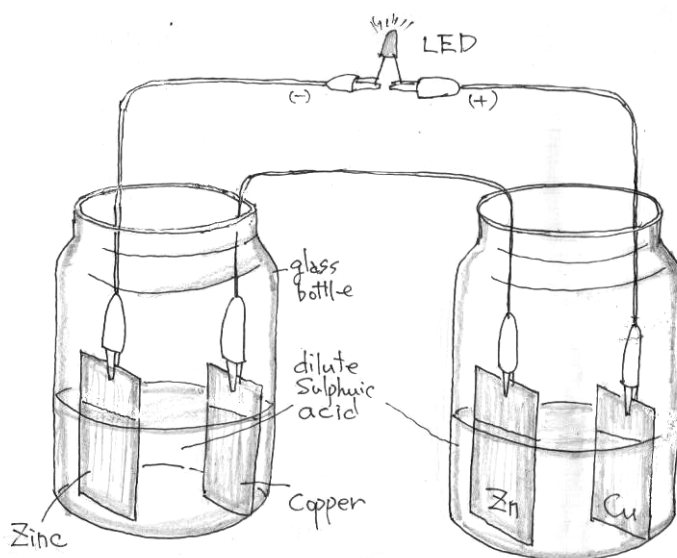
- (1) The zinc plate and the copper plate are put in the glass cup.
- (2) Diluted sulphuric acid is put.
- (3) The zinc plate and the copper plate are connected to the conducting wire.

Because the voltage is low in one, it connects in series by two or more.

- (4) It is connected to LED.

The bubble of hydrogen attach to the surface of the copper plate soon. It becomes the insulator and the electric current is getting weaker.

The bubble can be taken by putting the hydrogen peroxide solution and the current revives.



## Science

Volta discovered the ionization tendency while advancing this research. Ionization series to water is below.

Li, K, Ca, Na, Mg, Al, Zn, Fe, Ni, Sn, Pb, (H), Cu, Hg, Ag, Pt, Au

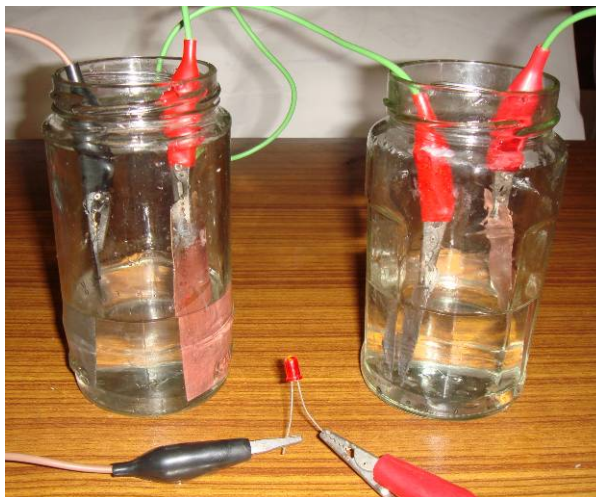
In the voltaic cell, the metal which becomes ion easier than hydrogen is used for negative pole. And the metal which is more difficult to become ion than hydrogen is used positive pole.

In this battery, zinc melts to sulfuric acid and it becomes a zinc ion.

The electron is left for the electrode at this time.

This electron flows in the conducting wire and reaches the copper plate.

The electron is given to the hydrogen ion here, and the hydrogen gas is produced.



## Questions

Q: Let's make sure that each combination will make electric current or not.

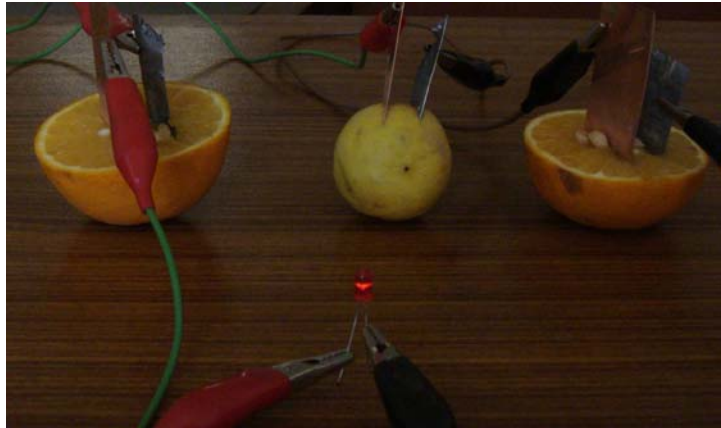
	Positive pole	Negative pole	Water solution	Electric current
1	Copper (Cu)	Zinc (Zn)	Sulphuric acid ( $H_2SO_4$ )	Yes
2	Copper (Cu)	Aluminum (Al)	Sulphuric acid ( $H_2SO_4$ )	
3	Zinc (Zn)	Zinc (Zn)	Sulphuric acid ( $H_2SO_4$ )	
4	Copper (Cu)	Copper (Cu)	Sulphuric acid ( $H_2SO_4$ )	
5	Copper (Cu)	Zinc (Zn)	Salt solution	
6	Copper (Cu)	Zinc (Zn)	Sugar solution	
7	Copper (Cu)	Zinc (Zn)	Lemon	

## Experiment 2

### Fruit electric cell

#### Concept

It is possible to make electricity with the fruit and the vegetable. A small current makes the lighting of blight emitting diode (LED).



#### Materials

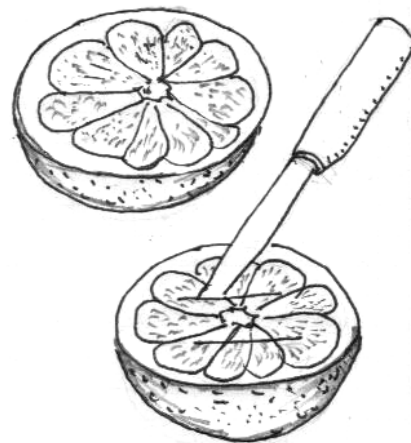
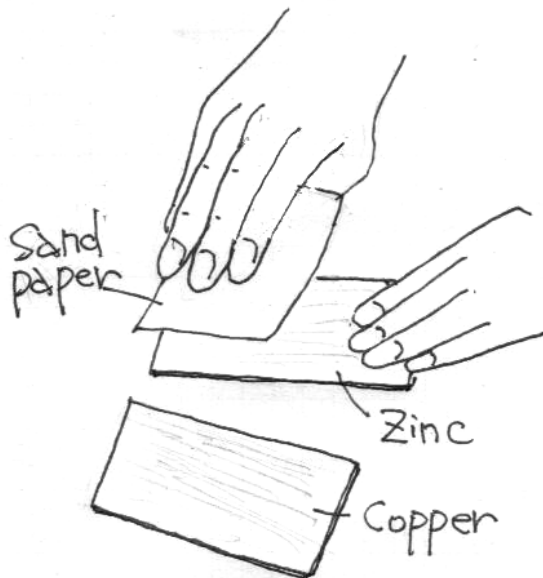
fruit or vegetable (grapefruit, lemon, orange, and radish, etc.), coppers and zinc plates, light emitting diode (LED), conducting wire, clips, and sandpapers

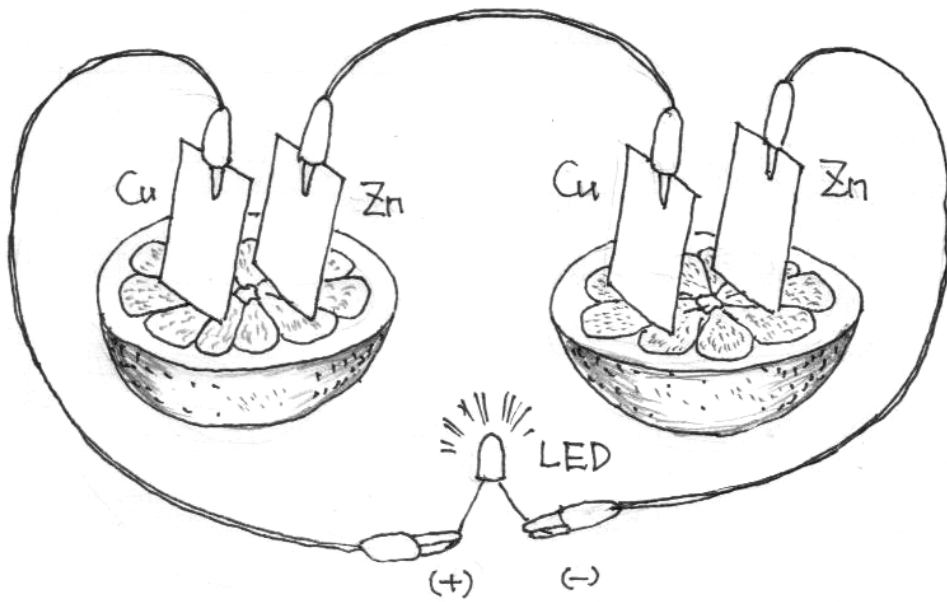
#### Procedure

- (1)The part inserted in fruits of the copper and the zinc plate is sandpapered.
- (2)Two incisions to insert the copper and the zinc plate in the fruit are put.
- (3)The copper and the zinc plate are inserted in the fruit.
- Two fruits or more connect in series because the battery power is weak in one fruit.
- (4)The LED connects to the conducting wire. It connects reversely when not lighting.

The LED for low voltage is better.

The electric power strengthens if two fruit electric cell or more connect in series.



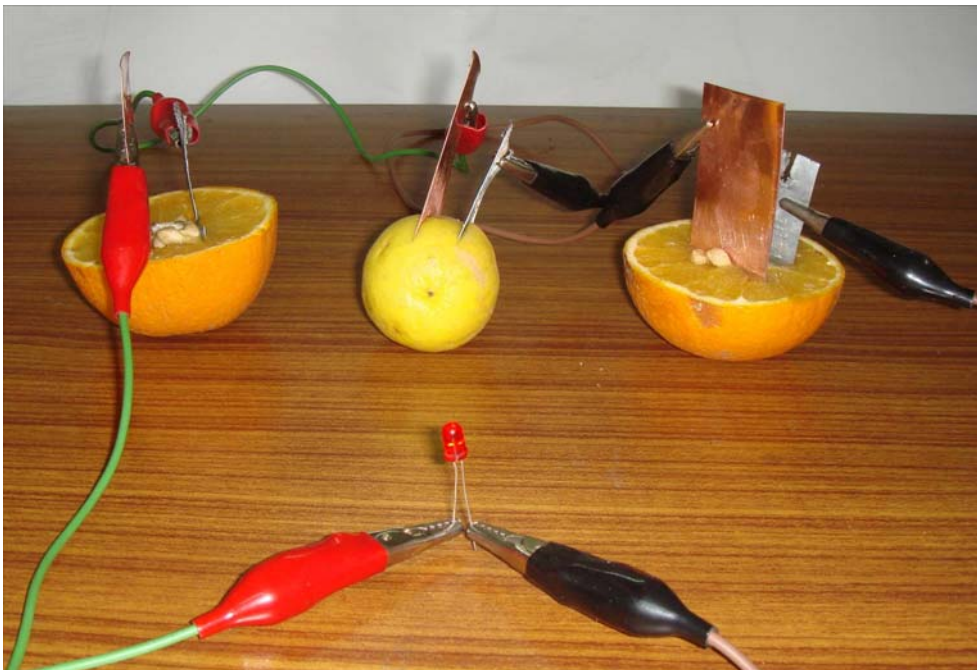


### Science

Why does the fruit electric cell generate an electric current? The reason is the metal and the acid contained in the fruit.

The surface begins to dissolve slightly when the metal touches the acid. The metal that began to dissolve becomes a cation that is the positive electricity. When the metal becomes a cation, the negative electron remains on the metal.

A lot of electrons are transmitted in the conducting wire and flow from the zinc plate to the copper plate because the zinc dissolves easily to the acids more than the copper and the zinc becomes a cation easily in this experiment. The flow of this electron makes the LED shine.



## Experiment 3

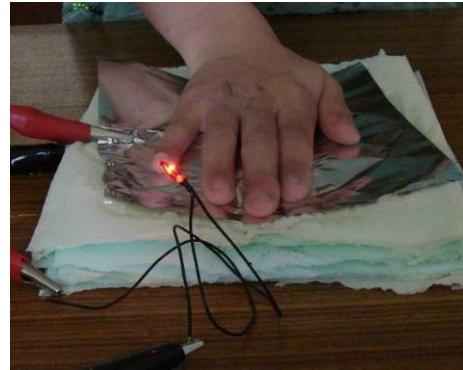
### Activated carbon electric cell

#### Concept

Let's make the electric cell by using the aluminum foil and the activated carbon.

#### Materials

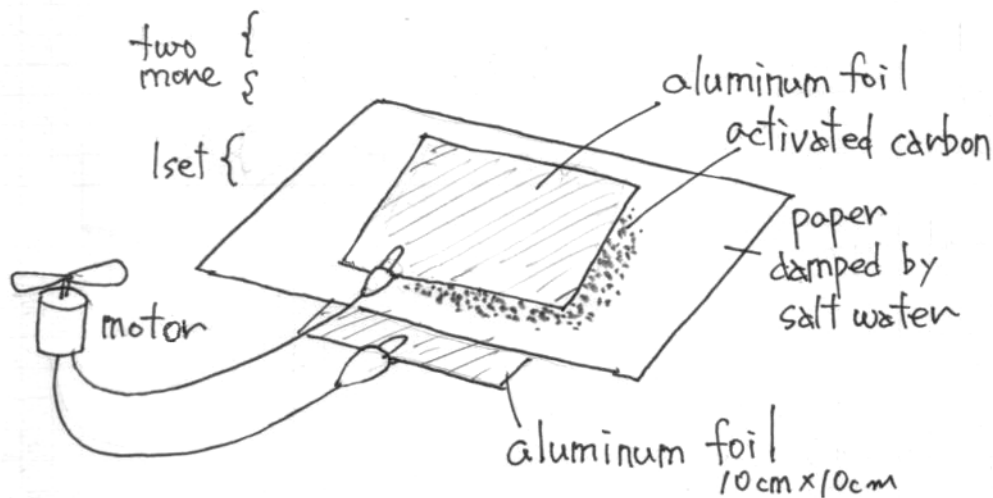
aluminum foil, activated carbon, paper, salt water, conducting wire, clip, LED, and motor



#### Procedure

- (1) Several aluminum foils are cut in 10cm square.
- (2) Paper damp by salt water is put on the aluminum foil.
- (3) The activated carbon is put on next.
- (4) And then the aluminum foil again.
- (5) This is piled up to three sets.

The aluminum foil on the charcoal side is anode and other aluminum foil is cathode. Because activated carbon is separately and contact is bad, it needs pushing from the top by the hand to make electricity.



## Science

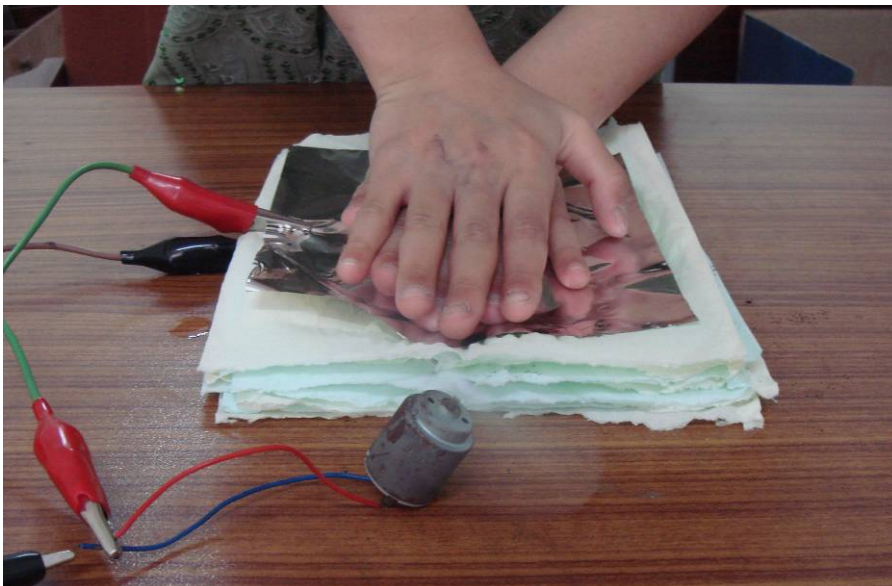
Aluminum dissolves to the salt water and releases the electron.

The electron flows in the circuit and comes to charcoal.

The electron is absorbed by oxygen that was adsorbed by charcoal from the air.

The oxidation and reduction is occurred.

The electric current keeps flowing until the oxygen contained in charcoal is lost or aluminum is dissolved.



The electric current can be taken from aluminum and the motor works.