Build Your Own Hand-held Battery

An electrochemical cell results when an oxidation reaction and a reduction reaction occur, and the resulting electron transfer between the two processes occurs through an external wire. The oxidation and reduction reactions are physically separated from each other and are called half-cell reactions.

A half-cell can be prepared from almost any metal in contact with a solution of its ions. A spontaneous cell (a battery) can be constructed if two half-cells are connected internally using a salt bridge, and externally using a metallic connector.

MATERIALS

Copper (II) sulfate solution, 1 M	Filter paper, 1 cm^2 piece	Weigh boats - 2
Sodium sulfate solution, 1 M	Filter paper, ½ cm^2 piece	Beaker, 50 mL - 2
Copper foil tape, two 2 cm pieces	Magnesium ribbon, 1 cm piece	Forceps
LED	Sand paper	

Safety Precautions

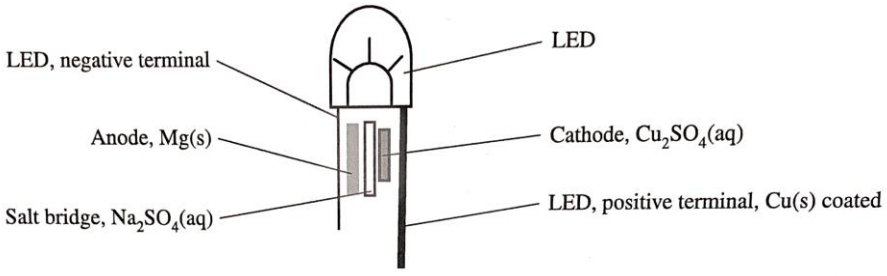
The copper (II) solution is harmful is swallowed and causes serious skin and eye irritation. The sodium sulfate solution may be harmful if in contact with skin. Magnesium ribbon is a flammable solid. Wear chemical splash goggles, chemical-resistant gloves, and a chemical-resistant apron. Wash hands thoroughly with soap and water before leaving the laboratory.

PRE-LAB PREPARATION

1. Gently polish both LED terminals with the sand paper.
2. Cut the copper conductive tape in 2 cm lengths – 2 pieces per group.
3. Cover the positive terminal (the longer terminal) of the LED lengthwise with the 2 cm pieces of the adhesive copper conducive tape.
4. Cut pieces of rectangular shaped filter paper – two sizes
    a. Cut a ½ cm^2 piece to be soaked in copper (II) sulfate – one per group
    b. Cut a 1 cm^2 piece to be soaked in the sodium sulfate solution – one per group

PROCEDURE

1. Measure 2 mL each of the 1 M copper (II) solution and the 1 M sodium sulfate solution and put each in separate 50 mL beakers.
2. Using forceps, dip the **larger** (1 cm^2) filter paper into the sodium sulfate solution. Dip the smaller (½ cm^2) filter paper into the copper (II) sulfate solution. Soak each long enough to completely coat each filter paper (about 10 seconds).
3. Place both onto separate weigh boats to let dry until the filter papers are damp with solution, not dripping. You may hold each with CLEAN forceps and gently wave to decrease drying time.
4. Use the diagram below to correctly assemble the components of your battery. Squeeze the LED between your thumb and index finger on each side of the LED terminals for all the components to come in contact with each other. If it doesn't light, you may need to add a drop of water, but not too much to drown the battery.



5. Darken the room, or cup your hand over the LED to watch it light.
6. For disposal, you may save all materials – rinse the LED leads and magnesium ribbon and return them to the front lab station. Pour excess copper (II) solution and sodium sulfate solution down the drain with excess water.