Demonstration: Sterno

FOR THE TEACHER

Summary
In this demonstration, students will observe a decomposition reaction that triggers a precipitate reaction that prevents a solution from conducting electricity.

Resource Type: Demonstration
Grade Level: High school

Objectives
By the end of this lesson, students should be able to
- relate electrical conductivity in solutions to the presence of ions.
- see decomposition and precipitation reactions.

Chemistry Topics
This lesson supports students’ understanding of
- Classification of reactions
- Chemical change
- Conductivity

Time
Teacher Preparation: 30 minutes
Lesson: 20 minutes

Materials
- 200 mL of limewater (Ca(OH)₂)
- 250-mL beaker
- Ring stand
- Copper(II) carbonate
- Test tube (18 x 150)
- 1-hole stopper
- 15-cm glass tube
- Glycerin
- Electrical conductivity tester (Flinn AP5355)
- Balance
- Graduated cylinder
- 50-mL beaker
- Calcium acetate
- 1-M NaOH
- Ethanol
- Spatula

Safety
- Always wear safety goggles when working with chemicals.
• When working with base, if any solution gets on your skin, alert your teacher and thoroughly flush your skin with water immediately
• Keep ethanol away from open flames as it is highly flammable.

**Teacher Notes**

**Prepare a test tube with copper(II) carbonate and glass tubing**
1. Place approximately 2.5 grams of copper(II) carbonate in a test tube.
2. Bend the glass tubing to obtain a 90-degree bend: one leg should be about 5 cm and the other leg about 10 cm. Using glycerin, gently push the 5 cm leg of glass tubing through 1-hole stopper. Put the stopper in the test tube.

**Prepare sterno**
3. In a 50-mL beaker, dissolve 1.5 g of calcium acetate in 5 mL of distilled water. Stir to dissolve the entire solid.
4. Add 2 drops of 1-M NaOH to the solution.
5. Measure 19 mL of ethanol and pour it into the beaker with the calcium acetate solution.
6. Record your observations. Product should be a solid. You have just made what is called sterno. Sterno is used as a canned heat product. Use a spatula to put the sterno into an evaporating dish. This will be your heat source.

**Prepare limewater solution with electric conductivity apparatus**
7. Place approximately 200 mL of limewater in a 250-mL beaker and set this on the base of a ring stand.
8. Place an electrical conductivity tester into the limewater using a ring stand to secure it in place. Plug the tester into an electrical outlet. The bulb should light up.

**The demonstration**
9. Raise and lower the conductivity tester to show that limewater is what causes the bulb to light.
10. Light the sterno.
11. Using tongs, hold the test tube so it’s parallel to the table (the glass tubing should be pointed down). The copper(II) carbonate in test tube should be spread out across lower half of test tube. Place the 10-cm glass tubing protruding from stopper into the limewater while you heat the copper(II) carbonate in the test tube using the sterno in the evaporating dish. This takes a little bit of coordination. Continue heating the copper(II) carbonate until the light bulb goes out. Let the sterno burn out on its own.

**What students observe**
The solid in the test tube will turn black because copper(II) carbonate decomposes into copper(II) oxide and carbon dioxide gas. The carbon dioxide gas bubbles into the limewater and causes another reaction producing calcium carbonate (white precipitate) and water. The light bulb will eventually go out when all the Ca(OH)₂ in the limewater reacts.

**Discussion**
Why does limewater cause the bulb to light and why does it eventually go out as reaction proceeds?
How can limewater act as a test for carbon dioxide?
How is what happens to the copper(II) carbonate different than wood burning? Similar?