Testing With Sodium Hydroxide

Topic

Using sodium hydroxide to test for different metals

Introduction

Many compounds containing metal ions do not produce colored flames when they burn, so criminalists cannot use the flame test (see Experiment: 4.05 Firework Colors) to identify them. The test you will be performing in this experiment relies on the fact that many metal hydroxide salts have different colors. Therefore, if a solution containing unidentified metal ions reacts with sodium hydroxide solution to form a precipitate, the color of that precipitate identifies the metal ion in the compound. In this experiment, you will add a solution of sodium hydroxide to solutions of various compounds which contain metal ions. You will then see how the color of the metal hydroxide identifies the compound.

Time required

45 minutes

Materials

10 g sodium hydroxide pellets
500 ml water
600 ml beaker
glass rod
2 test tubes with stoppers for each compound to be tested
test tube rack
25 ml graduated cylinder
spatula
eyedropper
beaker containing approximately 500 ml water
stopwatch or clock
solutions containing the following metal ions:*
- chromium (III)
- cobalt (II)
- copper (II)
- iron (II)
- iron (III)
- magnesium
- manganese (II)
- nickel (II)
- zinc

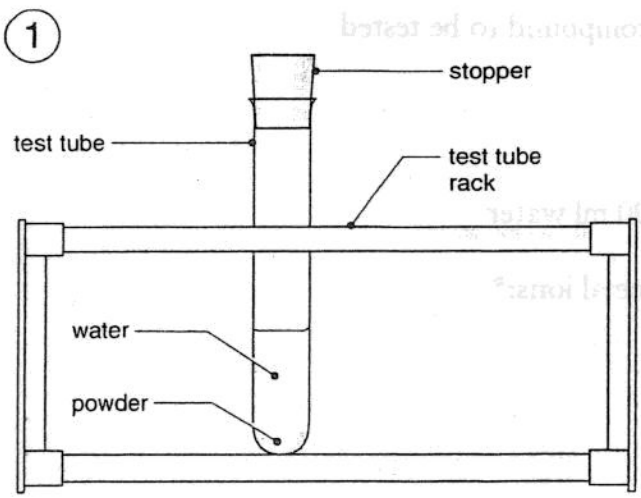
*Approximately 0.5M solutions of the chloride or nitrate salts of these metals are suitable.

Safety note

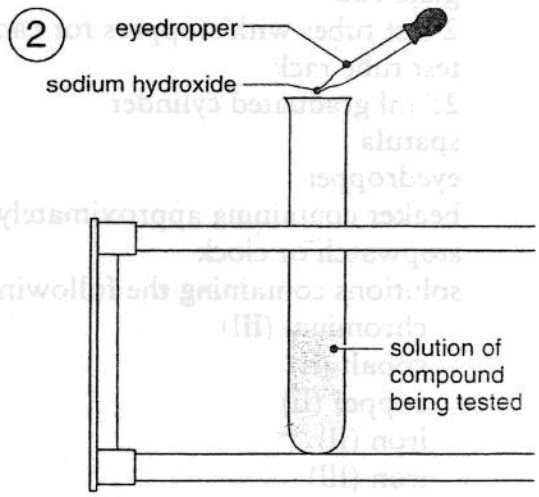
Treat all solutions as harmful. Sodium hydroxide is corrosive. A solution containing chromium (III) ions is an irritant. Solutions containing copper (II) or nickel (II) are harmful if swallowed. Be careful when pouring the solutions and wear safety glasses at all times. Wash your hands thoroughly at the end of the experiment. Dispose of the chemicals in the approved fashion.

Procedure

1. To make the sodium hydroxide solution, weigh 10 g sodium hydroxide pellets and put them in the beaker. Add 500 ml water to the beaker and stir with the glass rod until the pellets have dissolved.
2. Write the name of the compound being tested in the data table on the next page.
3. Place about half a spatula of the compound being tested in a test tube supported in a test tube rack. Use the graduated cylinder to add about 20 ml water to the test tube. Place a stopper in the test tube (see diagram 1 below) and shake the tube to mix the contents.
4. Allow the liquid to settle for about 5 minutes.
5. If some of the compound has not dissolved in the first test tube, decant the solution into a second test tube. Perform the test on the solution in the second test tube.
6. Use the eyedropper to add sodium hydroxide solution drop-by-drop to the solution in the test tube (see diagram 2 below). Observe any color changes. Record your observations in the data table for the compound being tested.
7. Repeat steps 2 to 6 for the other compounds being tested.



Water and compound in the test tube



Adding drops of sodium hydroxide

DATA TABLE	
Name of compound being tested	Color change observed

Analysis

1. What color changes did you observe?
2. Why is this test useful for forensic scientists?
3. How could this test be used to distinguish an antacid pill from an iron pill?

Want to know more?

See Section 10: Our Findings