QuickLAB

Wear safety goggles and an apron.

Redox Reactions

Materials

- aluminum foil
- beaker, 250 mL
- 1 M copper(II) chloride solution, $CuCl_2$
- 3% hydrogen peroxide
- manganese dioxide
- metric ruler
- scissors
- test-tube clamp
- test tube, 16 × 150 mm
- wooden splint

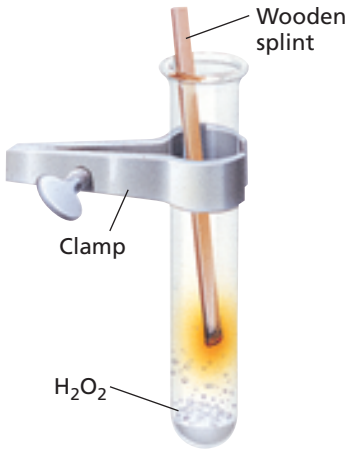
Procedure

Record all of your results in a data table.

1. Put 10 mL of hydrogen peroxide in a test tube, and add a small amount of manganese dioxide (equal to the size of about half a pea). What is the result?
2. Insert a glowing wooden splint into the test tube (see diagram). What is the result? If oxygen is produced, a glowing wooden splint inserted into the test tube will glow brighter.
3. Fill the 250 mL beaker halfway with the copper(II) chloride solution.
4. Cut foil into 2 cm × 12 cm strips.
5. Add the aluminum strips to the copper(II) chloride solution. Use a glass rod to stir the mixture, and observe for 12 to 15 minutes. What is the result?

Discussion

1. Write balanced equations showing what happened in each of the reactions.
2. Write a conclusion for the two experiments.



Disproportionation

Some substances can be both reduced and oxidized easily. For example, peroxide ions, O_2^{2-}, have a relatively unstable covalent bond between the two oxygen atoms. The electron-dot formula is written as follows.

$$\left[:\ddot{O}:\ddot{O}:\right]^{2-}$$

Each oxygen atom has an oxidation number of –1. The peroxide ion structure represents an intermediate oxidation state between O_2 and O^{2-}. Therefore, the peroxide ion is highly reactive.

Hydrogen peroxide, H_2O_2, is a covalent compound. It decomposes into water and molecular oxygen, as shown in the equation below.

$$2\overset{-1}{H_2O_2} \longrightarrow 2\overset{-2}{H_2O} + \overset{0}{O_2}$$