

Observing Decomposition Reactions

PROBLEM

What happens during a decomposition reaction?

INTRODUCTION

During a decomposition reaction, a compound breaks down into simpler compounds or into its elements. For example, water can be broken down into hydrogen gas and oxygen gas by electrolysis ($2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$). Decomposition reactions have the following general format: $\text{AB} \rightarrow \text{A} + \text{B}$. In this laboratory investigation, you will observe the following decomposition reactions: [1] Hydrogen peroxide (H_2O_2) decomposes spontaneously; [2] carbonic acid in soda (H_2CO_3) breaks down liberating a gas; and [3] copper II carbonate (CuCO_3) breaks down leaving behind a solid.

MATERIALS (per group)

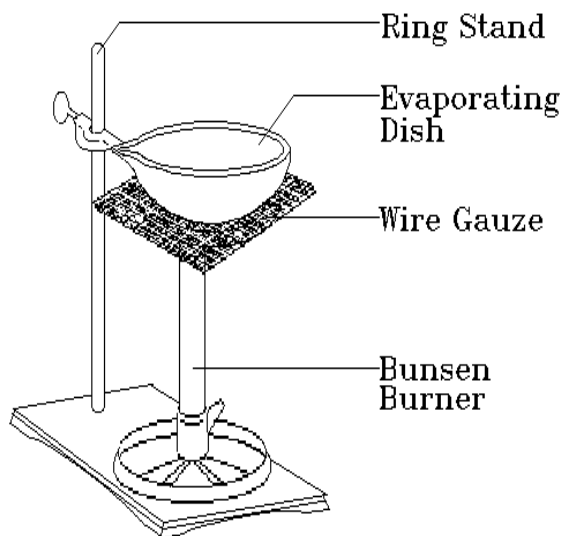
Beaker (50 mL); Bunsen burner; copper II carbonate or malachite; evaporating dish; graduated cylinder; hydrogen peroxide (3 %); manganese dioxide; safety goggles; soda; stirring rod

PROCEDURE

- Using a graduated cylinder, pour 10 mL of hydrogen peroxide into a test tube. With a scoop, add a pinch of manganese dioxide as shown below. Note the following: [a] the color of the manganese dioxide; [b] the color of the mixture of hydrogen peroxide and manganese dioxide; and [c] what happens when manganese dioxide is added to hydrogen peroxide. Record your observations in the data table on the next page.



- Obtain a sample of soda and pour a small amount into a 50 mL beaker. Stir the soda vigorously with a stirring rod. Note what happens. Record your observations on the next page.
- Set up a ring stand and iron ring with a wire gauze as shown in the diagram to the right. Using a scoop, put some copper II carbonate (or malachite) into an evaporating dish. Note the color of the copper II carbonate. Record your observations in the data table on the next page.
- Put on safety goggles and light your Bunsen burner. Place the evaporating dish on the wire gauze.



5. Heat the copper II carbonate while mixing it with a stirring rod. Continue heating until the color changes. After the color changes, compare the appearance of the contents of the evaporating dish to the appearance of copper II oxide. Record your observations below.

OBSERVATIONS

1. Hydrogen peroxide and manganese dioxide:

[a] Appearance of manganese dioxide _____

[b] Appearance of mixture of hydrogen peroxide and manganese dioxide _____

[c] Description of reaction between hydrogen peroxide and manganese dioxide _____

2. Describe what happens when you stir soda vigorously _____

3. Appearance of copper II carbonate after heating _____

4. Appearance of copper II oxide _____

CONCLUSIONS

1. Manganese dioxide is a catalyst. It speeds up the breakdown of hydrogen peroxide but it does not change during the reaction. What evidence is there that the manganese dioxide does not change during the reaction? _____

2. What is the gas that is liberated during the breakdown of hydrogen peroxide? What is the liquid left behind? Write an equation for the decomposition reaction. _____

3. What is the gas that is given off by soda when carbonic acid decomposes? Write an equation for the reaction. _____

4. What is the material left behind in the evaporating dish after the decomposition of copper II carbonate? How do you know? Write an equation for the decomposition of copper II carbonate. _____

5. During a decomposition reaction, how many reactants are present? _____