The Magnesium Oxide Lab

In a compound the atoms of different elements are present in numbers whose ratio is usually an integer or a simple fraction. The simplest (or empirical) formula of the compound expresses that ratio.

Simplest formulas are determined by establishing the mass of each element present in a sample of the compound. From those masses one finds the number of moles of each element present. The mole ratio is also the atom ratio in the compound and that ratio provides the subscripts for the simple formula.

To find the mass of each element in a compound one must carry out at least one chemical reaction. Sometimes it is possible to form the compound directly from its elements. This is called a synthesis. In this experiment we will synthesize magnesium oxide by heating magnesium in the oxygen in the air:

magnesium + oxygen → magnesium oxide

By weighing the magnesium before the reaction occurs, and the magnesium oxide produced after, one can calculate the mass of the oxygen that reacted with the magnesium. To obtain good results in this experiment you must make each weighing precisely.

Pre Lab Assignment

1. A 0.87 g. sample of silver reacted completely with sulfur and formed 1.00 g of silver sulfide. Find the simplest formula silver sulfide.
2. A 5.00 g sample of aluminum metal is burned in an oxygen atmosphere to provide 9.45 g of aluminum oxide. Determine the simplest formula of aluminum oxide.

Purpose

1. To determine the simplest formula of magnesium oxide.
2. To find the percent magnesium in magnesium oxide.

Procedure

1. Place a clean crucible and cover on a clay triangle on an iron ring (Fig. 5- 2). The crucible cover should be tilted leaving a small opening. Heat the crucible strongly for about 1 minute to drive off any moisture. Allow the crucible and cover to cool to the touch and then weigh them together.

2. Obtain a piece of magnesium ribbon approximately 50 cm long. Coil the magnesium and add it to the crucible. Weigh the crucible, cover and magnesium.

3. With the cover off (Fig 5-1), heat the crucible. Increase the temperature gradually. When the magnesium ribbon glows red, or ignites, cover the crucible quickly and reduce the amount of heat applied. To prevent any loss of product, the crucible must be covered when you observe ignition. After about a minute remove the cover (to let in more oxygen) and heat until you observe the magnesium glowing or igniting. Then replace the cover and reduce the heat. Continue this procedure until no further reaction occurs. Then tilt the cover, and heat strongly for a few minutes. Let the crucible cool.

4. When the crucible is cool, remove the cover. Use a stirring rod to grind the contents of the crucible into small particles. Rinse the particles remaining on the stirring rod into the crucible with about ten drops of distilled water. Replace the cover, leaving a small opening. Heat gently until the water begins to boil. The water is added to convert any magnesium nitride that might have formed during the reaction to magnesium oxide. Remove the burner, and waft the vapor to see if it has any

odor. Then, continue heating until the residue is thoroughly dry. Cool and then weigh the crucible, it's lid and the product, magnesium oxide.

FIGURE 5–1.

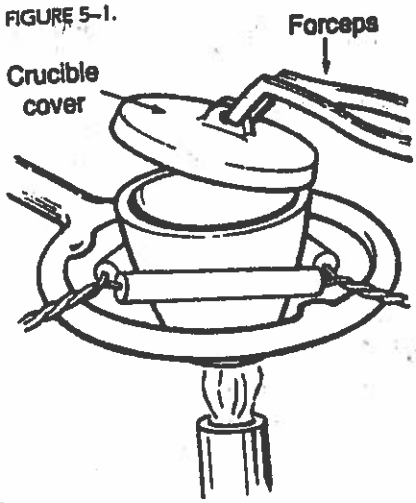
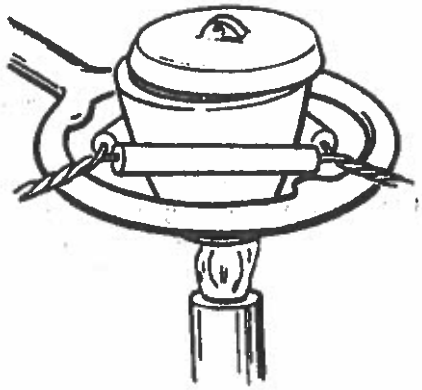


FIGURE 5–2.



Data

Mass of dry crucible and lid	
Mass of crucible, lid and magnesium	
Mass of crucible, lid and product	

Calculations

1. a. Calculate the mass of magnesium used.
b. Calculate the mass of magnesium oxide produced.
c. Calculate the mass of oxygen that reacted with the magnesium sample.
d. Convert the mass of magnesium used to moles of magnesium used.
e. Convert the mass of oxygen used to moles of oxygen used.
f. Calculate the Mg/O mole ratio.
g. What is the Mg/O atom ratio? Round this ratio off to a whole number ratio.(Example 1.23/1.00 would be 1:1 or 1.85/1.00 would be 2:1)
h. Based on your atom ratio, what is the simplest formula for magnesium oxide?

2. Using the masses of magnesium and magnesium oxide obtained experimentally; calculate the % Mg in magnesium oxide. Record you value on the board. Copy all class values.

3. Calculate the class experimental (precision) error for the percent magnesium in magnesium oxide.

Conclusions

Source of Error

Explain the effect on your % Mg (high, low or unchanged) if the following errors had been made.
a. A small amount of magnesium remained unreacted.
b. Some of the product was spilled after heating but before weighing.
c. All of the water was not boiled off before weighing.