Experiment 8

EMPIRICAL FORMULA OF MAGNESIUM OXIDE

I. INTRODUCTION

The object of this experiment is to determine the empirical formula of a compound. An empirical formula of a compound is the simplest whole number ratio of the various atoms in a compound. In this experiment, you will determine the empirical formula of the compound that results when magnesium and oxygen react.

II. PROCEDURE

Safety goggles must be worn at all times.
If the magnesium flashes during heating, do not look directly at the bright light emitted (it could damage your eyes)

1. Clean a crucible and lid, rinsing thoroughly with deionized water as a last step.

2. Place the clean and dry crucible and cover on a clay triangle and heat strongly for 5 mins. to drive off any volatile material.

3. While the crucible is heating, clean **thoroughly** Mg ribbon weighing approximately **0.3 grams** with sandpaper to remove any oxide coating. Avoid handling the ribbon with your finger; this will leave deposits on the Mg ribbon.

4. Using crucible tongs, remove the crucible and cover from the clay triangle and place them on a wire gauze to cool.

5. Allow the crucible to cool and weigh the crucible . **Handle the crucible with tongs, so you do not leave any deposits from your fingers.** Record the weight.

Mass of empty crucible + lid_____

6. Coil the ribbon **very loosely** and place on the bottom of the crucible. Then, weigh the crucible with the Mg ribbon inside. Record the weight.

Mass of crucible,lid, and Mg ribbon_____

7. Place the cover on the crucible. Heat the crucible gently for 5 mins. while using the tongs to lift the cover slightly every 30 sec. to admit air. Should the Mg start glowing brightly when the cover is lifted, quickly cover the crucible, remove the bunsen burner, and wait one min before continuing to heat.

8. Heat the covered crucible strongly for 15 mins. (lifting the cover occasionally).

9. Lift the cover to determine whether the ribbon has become a whitish ash. If the ribbon still has its original color, reheat for 10 mins. Repeat step 9 until the ribbon has become a whitish ash then, allow the crucible to cool.

10. To a cooled crucible, add 10 drops of **deionized** water.

11. Partially cover the crucible (leave a slight crack) and heat gently for 2 mins., then strongly for 10 mins. Allow the crucible to **cool** to room temperature.

12. Weigh the crucible and weigh the product.

Mass of crucible, lid and end product_____
(1st weighing)

13. Reheat strongly (5-10 mins), cool and weigh. Repeat this process until the mass of the cooled end product is constant to within ± 0.2 g.

Mass of crucible, lid, and end product_____
(2nd weighing)

Mass of crucible, lid, and end product_____
(3rd weighing)

Mass of crucible, lid, and end product_____
(4th weighing)

***Do not dispose of your sample until your instructor approves your calculation of the empirical formula**

* DISPOSAL: Dispose the product in the waste container labelled "waste magnesium oxide"

From the weighings you have collected, you should be able to find the amount of magnesium in the sample. You should also be able to find the mass of the oxygen that has reacted with the magnesium. From these two masses and the molar masses of magnesium and oxygen, you can calculate the number of moles of Mg and O that are present in the final product. Then, you can calculate the formula of the magnesium oxide you made.

Calculations: (Show all your work/set-up)

1. Calculate the mass of Mg .

Answer_____

2. Calculate the mass of the magnesium oxide (end product) using the lowest mass of crucible and end product weight.

Answer_____

3. Calculate the mass of oxygen (Mass of end product - mass of Mg)

Answer_____

4. Calculate the moles of Mg (using g/mole).

Answer_____

5. Calculate the moles of oxygen (using g/mole).

Answer_____

6. Calculate the empirical formula of the magnesium oxide (end product).

Answer_____

Obtain your instructor's approval of your empirical on the <u>report sheet.</u>

Chemistry 110 Lab Report

Name _____ Date _____

Lab Section _____ Initials_____

EXPERIMENT 8

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DATA:

Mass of empty crucible_____

Mass of crucible, lid, and Mg ribbon_____

Mass of crucible, lid and end product_____
(1st weighing)

Mass of crucible, lid, and end product_____
(2nd weighing)

Mass of crucible, lid, and end product_____
(3rd weighing)

Mass of crucible, lid, and end product_____
(4th weighing)

Calculations: (Show all your work/set-up)

1. Calculate the mass of Mg .

Answer_____

2. Calculate the mass of the magnesium oxide (end product) using the lowest mass of crucible and end product weight.

Answer_____

3. Calculate the mass of oxygen (Mass of end product - mass of Mg)

Answer_____

4. Calculate the moles of Mg (using g/mole).

Answer_____

5. Calculate the moles of oxygen (using g/mole).

Answer_____

6. Calculate the empirical formula of the magnesium oxide (end product).

Answer_____

Instructors approval of empirical formula_____

Problems:

1. The analysis of a salt showed that it contained 56.58% potassium, 8.68% carbon, and 34.73% oxygen. Calculate the empirical formula for this salt.
   Set-up:

   Answer_____

2. A sulfide of iron was formed by combining 2.233 g of iron with 1.926 g of sulfur. What is the empirical formula of the compound?
   Set-up:

   Answer _____

3. The hydrocarbon propylene has a molar mass of 42.00 g and contains 14.3 % hydrogen and 85.7 % carbon. What is its molecular formula?

   Answer _____

4. When you heated the magnesium in this experiment, the mass went up. Were you surprised by this? Where did this mass come from?