EXPERIMENT 7   EMPIRICAL FORMULA OF MAGNESIUM OXIDE

Chem 110 Lab

I.   INTRODUCTION

The object of this experiment is to determine the experimental empirical formula of a compound, magnesium oxide, and comparing it to its theoretical empirical formula, MgO.

For today's experiment you will determine what data to record and you will organize it into a table. Before coming to the lab, read the experiment and look at the measurements and calculations you will be making and list the data you will need to record on page 2.

II. EXPERIMENT

CAUTION: 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. (It will not be possible to get a used crucible completely clean.) Dry the crucible and lid with a paper towel. Check the crucible for cracks. Your instructor will tell you how.

2. Place the clean, dry crucible and lid on a clay triangle on a ring on a ring stand and heat strongly with a Bunsen burner for 5 minutes to remove any volatile material.

3. While the crucible is heating, use sandpaper to thoroughly clean a piece of Mg ribbon (approximate mass 0.3 g) to remove any oxide coating. Avoid handling the ribbon with your fingers; this will leave deposits on the Mg ribbon.

4. Using crucible tongs remove the crucible and lid from the clay triangle and place them on your wire gauze to cool.

5. Allow the crucible and lid to cool completely to room temperature an d then weigh them together. Handle the crucible with tongs, so you do not leave any deposits from your fingers.

6. Coil the Mg ribbon very loosely and place it inside the crucible at the bottom. Put the lid on the crucible and then weigh the crucible with Mg.

7. Place the lid on the crucible. Heat the crucible gently for 5 minutes. (Think about which part of the Bunsen burner flame is best for heating gently.) Use your crucible tongs to lift the cover slightly every 30 seconds to admit air. If the Mg starts gl owing brightly when the cover is lifted, quickly cover the crucible, remove the Bunsen burner, and wait one minute before continuing to heat.

8. Heat the covered crucible strongly for 15 minutes, lifting the cover occasionally.

9. Lift the lid and look at the ribbon to see whether it has become a whitish ash. If the ribbon still has its original color, reheat for 10 more minutes. Continue heating, as necessary, to completely react the ribbon, then allow the crucible to cool.

10. To the contents of the cooled crucible, add 10 drops of deionized water.

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

12. Weigh the crucible and contents (magnesium oxide).

13. Reheat strongly (5-10 minutes), cool completely and weigh. Dry the magnesium oxide to a constant mass, repeating the heating until the mass is constant to within ± 0.2 g.

DRYING TO A CONSTANT MASS

You cannot tell by "looking" at the sample whether or not it is really dry. Therefore, you will "dry to a constant mass". To do this you will heat the sample until it looks dry, allow it to cool, and then weigh it. You will then reheat the sample, allow it to co ol, and then reweigh it. If the mass has changed significantly upon reheating, your will heat the sample, cool and weigh a third time. You will continue in this fashion until two consecutive weighings yield similar masses. This is the only way to know that all of the water has been removed.

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*Do not dispose of your sample until you have shown your instructor your results.

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

DATA LIST

Below, list the data you will need to record. Then on page 5 draw your data table.

III. CALCULATIONS

Before coming to lab, write the set-ups, including all units and labels, of the calculations you will be making. Use the following molar masses: magnesium= 24.305 g/mole;   oxygen= 15.999 g/mole

1. Mass of Mg

2. Mass of magnesium oxide.

3.   Mass of oxygen that reacted with Mg.

4.   Moles of Mg

5.   Moles of oxygen

6.   Experimental empirical formula of magnesium oxide

7.   Theoretical empirical formula of magnesium oxide

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Chemistry 110 Lab

Name _____ _____   Date _____
                        (last)   (first)
                                                     Instructor's   Initials_____

I.   DATA TABLE

      Draw your data table below. Be sure to use a ruler to draw the table and use appropriate headings
      for columns and rows.

III. CALCULATIONS

Give complete set-ups including all units and labels. Be sure your significant figures are correct. Use the following molar masses: magnesium= 24.305 g/mole;   oxygen= 15.999 g/mole

1. Mass of Mg.

2. Mass of magnesium oxide.

3.   Mass of oxygen that reacted with Mg.

4.   Moles of Mg.

5.   Moles of oxygen.

6.   Experimental empirical formula of magnesium oxide .

7.   Theoretical empirical formula of magnesium oxide .

IV. QUESTIONS:

Give complete set-ups including all units and labels. Be sure your significant figures are corr ect.

1. The percent by mass composition of a salt was found to be 56.58% potassium, 8.68% carbon, and 34.73% oxygen. What is the empirical formula of this salt?

2. A compound containing iron and sulfur was formed by combining 2.233 g of iron with 1.926 g of sulfur. What is the empirical formula of the compound?

3. Propylene has a molar mass of 42.00 g/mole and is composed of 14.3 % hydrogen and 85.7 % carbon. What is the molecular formula of propylene?

4. Compare the mass of the Mg ribbon with the mass of the magnesium oxide. Notice that the mass of the magnesium oxide is greater than the mass of the Mg. How do you account for this apparent increase in mass?