

Experiment 13

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 min to drive off any volatile material.
3. While the crucible is heating, clean **thoroughly** a piece of 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.
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.
7. Place the cover on the crucible. Heat the crucible gently for 5 min 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 another 10 min. Repeat step 9 until the ribbon has become a whitish ash, then allow the crucible to cool.

II. PROCEDURE (cont'd)

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 min, then strongly for 10 min. Allow the crucible to **cool** to room temperature
 12. Weigh the crucible and weigh the product.
 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.
- ❖ **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"

III. CALCULATIONS

From the masses 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. The following step-wise process details these calculations:

1. Calculate the mass of magnesium metal.
2. Calculate the mass of the magnesium oxide (end product) using the lowest mass of crucible and end product weight.
3. Calculate the mass of oxygen from the mass of end product and the mass of magnesium metal.
4. Calculate the moles of magnesium.
5. Calculate the moles of oxygen (using g/mole).
6. Calculate the empirical formula of the magnesium oxide (end product).