**Group 2 Elements: The Alkaline Earth Metals Lab**

**(Mini-Lab Report)**

* **Question:** How can the properties of an element be predicted using a periodic table?
* **Introduction:** The elements in group 2 of the periodic table are called the alkaline earth metals. Why do they have such a strange-sounding name? They were given that name because they were first isolated from compounds in which they were combined with oxygen. These were called earths by early chemists. The *alkaline* part of the name came from the fact that they formed basic, or alkaline, solutions in water. The group is composed of beryllium (Be), magnesium (Mg), calcium (Ca), strontium (Sr), barium (Ba), and radium (Ra).

All alkaline earth metals have two valence electrons, which they tend to give up rather easily, making them quite reactive. In fact, they; are so reactive that they are never found uncombined in nature. In order for these shiny white metals to remain in their unreacted state, they must be protected from air and water. Magnesium and calcium, for example, are obtained in their elemental state by a chemical process called electrolysis, and then stored in airtight container.

In this investigation, you will explore the reactivity of magnesium and calcium, two of the more common alkaline earth metals. You will then compare the reactivity of these metals with that of aluminum, which is a member of group 13.

* **Safety:** Goggles, gloves, aprons and closed-toed shoes are required. Do not look directly at the burning magnesium as it is very bright. Do not get any hydrochloric acid on your skin as it is corrosive. Only touch the calcium with tongs or forceps, never with your fingers as it is very reactive with water. Observe all safety precautions for use of the Bunsen burner.

**Data Table**

*Write your observations directly on this paper.*

|  |  |  |  |
| --- | --- | --- | --- |
| Part 1 | Calcium | Magnesium | Aluminum |
| Unreacted |  |  |  |
| Part 2 | Calcium | Magnesium | Aluminum |
| w/ water |  |  |  |
| w/ phenolphtlalein |  |  |  |
| Part 3 | Calcium | Magnesium | Aluminum |
| w/ Bunsen burner |  |  |  |

* **Procedure:** *(*✓ *each of the steps as you complete them.)*

**Part 1: Unreacted Elements**

* Examine the pieces of calcium, magnesium and aluminum. Record the appearance of each kind of metal on the data table. Do not touch the calcium with your hands.

**Part 2: Reaction with water and phenolphthalein**

* 1. Using your graduated cylinder, measure out ~5mL of tap water and then pour this into one of your test tubes.
* 2. Using your forceps, place ONE of your pieces of calcium, Ca, into this test tube.
* 3. Observe and record.
* 4. Place 1 drop of phenolphthalein into this test tube.
* 5. Observe and record your results.
* 6. Repeat steps #1-5 except use HOT water and one piece of your magnesium instead of calcium. Wait a few minutes and examine the surface of the Mg strip closely.
* 7. Repeat steps #1-5 except use HOT water and one piece of your aluminum, Al instead of calcium.
* 8. Clean-up: Dump the contents of each test tube into their respective waste containers as indicated by your teacher. Bring your three test tubes back to your sink, wash them clean with water and a bottle brush. Invert to drain.

**Part 3: Reaction with burner flame**

* 9. Grasp your last piece of magnesium ribbon with crucible tongs and, while holding it at arm's length, insert it in the burner flame. Place a watch glass on your countertop to catch the ashes. DO NOT look directly into the flame. Record the observations. Dispose of ashes in the trash.
* 10. Repeat the test with your last piece of calcium. Heat your piece until it is glowing red hot. DO NOT touch. Place it onto your watch glass to cool, then observe and record the observations. Dispose of the piece of calcium into the container indicated by your teacher.
* 11. Repeat the test with your last piece of aluminum. Do not let it melt so much as to drop off into the Bunsen burner. Observe and record the observations. Cool piece of aluminum down with running water before disposing it in the trash.
* **Mini-Lab Report Questions:**

1. Predict what the other unreacted members of the alkaline earth metals look like.
2. a. Predict whether the elements below magnesium and calcium – strontium, barium & radium - will react with cold or hot water.

b. Predict whether beryllium will react with cold or hot water.

1. a. Predict the color if phenolphthalein is added to 2a and 2b.

b. What does this color indicate?

1. Why do you think aluminum was included as part of this lab?
2. Predict the result of heating gallium.