

Experiment 8: PERIODIC PROPERTIES OF THE ELEMENTS

At the present time, 114 elements have been positively identified. Eighty-three of these elements occur naturally on Earth; the remaining 31 are created by scientists. The diversity of the elements is truly impressive. Some elements are metals, some are nonmetals, and some are metalloids. Some are gases, a few are liquids, but most are solids. Some elements react explosively with water while some are completely nonreactive, and so on.

Although the elements are diverse, nineteenth century chemists realized that many elements show very strong similarities to one another in their physical and chemical properties. This knowledge led to a classification of the elements into groups or families and ultimately to the development of the Periodic Table.

In this experiment, you will investigate some of the similarities and differences in physical and chemical properties of a few elements.

Procedure

A. Group IA: Alkali Metals

1. Obtain a small piece (about half the size of a pea) each of metallic sodium, metallic lithium and metallic potassium (be sure to handle the metals with forceps). The metals are stored under oil or kerosene and it is necessary that you remove these substances by pressing the metal against a piece of paper towel.
2. Place the piece of sodium on your watch glass. Cut the sodium with your spatula and observe what happens as the freshly cut surface is exposed to the atmosphere. The change may be subtle, and it may happen very quickly, so observe closely. Do the same for lithium and potassium.

How do the rates of change compare for the three metals?

3. Drop the small piece of sodium into a small beaker of distilled water kept at arm's length. Observe the reaction. After the reaction has subsided, test the resulting solution with a small piece of pH paper. Perform the same reaction with your piece of lithium and with potassium. Record your observations and write chemical equations showing the reaction between lithium, sodium, and potassium with water.

Why did the pH paper react the way it did?

What would happen if cesium were added to water?

4. Based upon your observations to the above reactions, compare the reactivities of lithium, sodium and potassium.

How does the reactivity of the alkali metals vary within Group IA?

B. Group IIA: Alkaline Earth Metals

1. Obtain a small piece of magnesium and place it in about 1 mL of water contained in a small test tube. Test the resulting solution with pH paper. Repeat the test with a small piece of calcium which has been filed to expose a fresh surface. Place the Mg tube into a rack in a boiling water bath. As always, record your observations.
2. Obtain fresh pieces of magnesium and calcium and add about 1 mL of 6 M HCl to each. Write equations for any reactions you observed.