

Determination of Metal Cations—Flame Tests

Introduction

Have you ever wondered why a candle flame is yellow? The characteristic yellow of a candle flame come from the glow of burning carbon fragments. The carbon fragments are produced by an incomplete combustion reaction of the wick and candle wax. When elements, such as carbon, are heated to high temperatures, some of their electrons are excited to higher energy levels. When these excited electrons fall back to lower energy levels, they release excess energy in packages of light called photons. The color of the emitted light depends on its energy. Blue light is more energetic than red light, for example. When heated, each element emits a characteristic pattern of light energies, which is useful for identifying the element. The characteristic colors of light produced when substances are heated in the flame of a gas burner are the basis of flame tests for several elements.

Purpose

In this experiment, you will perform the flame tests used to identify several metallic elements.

Procedure

1. Connect the Bunsen burner to the gas line.
2. Turn on the gas line and make sure there are no leaks.
3. Using the striker, light the Bunsen burner.
4. Adjust the flame to show the blue flame.
5. Obtain a wooden splint from the bottle on the table.
6. Record the compound in a data table.
7. Hold the soaked end of the splints in the flame for a short time.
8. Observe and record the color of the flame in the data table.
9. Using the cobalt glass, place in front of the flame and the wooden splint.
10. Observe and record the color of the flame in the data table.

11. Extinguish flame on wooden splint when the flame is no longer colored.
12. Repeat Step 5 through 11.

Results/Conclusions

1. Which elements produced the most easily identified colors? Explain your reasoning.
2. Which element(s) is/are least easily identified? Explain your reasoning.

Final Analysis

1. Explain how you might test an unknown crystalline substance to determine whether it is table salt. A taste test is never recommended for an unknown compound