

EMISSION SPECTROSCOPY

One method of identification of elements and some compounds is emission spectroscopy. A sample of material is exposed to high heat or electric current which excites the electrons in the atoms and produces light. The color of light produced depends on the electron configuration of the atom. In this lab activity you will observe the spectra of various elements using gas discharge tubes and solid samples heated in a flame. How can this method be used to identify unknown elements or compounds?

PART I - Gas Discharge Tubes

1. Your instructor will show you an incandescent light source. Observe the light through a diffraction grating (or diffraction glasses). Record what you see.

Visual color - _____

Spectrum ..



Red

Violet

What is this type of spectrum called? _____

2. Your instructor will now show you a fluorescent light source. Observe its visual color and the spectrum. Record what you see below. How is this light source different from the incandescent bulb?

Visual color - _____

Spectrum



Red

Violet

3. Your instructor will now set up gas discharge tube of various elements. For each tube, record the element, visual color and spectrum. What are these types of spectrum called? _____

a. Element - _____ Visual color - _____

Spectrum



Red

Violet

b. Element - _____ Visual color - _____

Spectrum



Red

Violet

c. Element - _____ Visual color - _____

Spectrum



Red

Violet

d. Unknown Element - _____ Visual color - _____

Spectrum



Red

Violet

PART 2 - Flame Tests

1. Light a Bunsen burner and adjust it to produce a blue flame.
2. Create a data table in which you will record the element name, visual color and spectrum. (Use your data in part 1 as a guide.)
3. Obtain a canister of solid. Record the element name. (This is actually a compound of the element, not the pure element.)
4. Shake the canister rapidly. Immediately open the lid and place the top of the canister near the air-intake of the Bunsen burner. The flame should produce a color other than blue. Record the color.
5. Put on a pair of diffraction glasses. Repeat step #4 but this time note the spectrum produced by the element. Record this spectrum in your data table. Make sure to note which colors are present and the width of the color bands.
6. Repeat steps #4-5 using all elements provided.
7. ~~Obtain two unknowns from your instructor. (Make sure to record the unknown numbers!) Repeat steps #4-5 with these unknowns. Record all relevant information in your data table including the visual color, the spectrum produced, and the identity of the unknown.~~
8. Repeat steps #4-5 with the canister containing the Na/K mixture. What is the visual color? Now repeat the experiment but this time observe the flame through a piece of cobalt glass. What color is observed?

QUESTIONS

1. Some of the solids were chlorides and some were nitrates. How do you know that the color seen is produced by the element and not the nitrate or chloride?
2. For the Na/K mixture, what color was observed through the cobalt glass? What color was observed without the glass? Explain. Could this method and similar ones be used to identify mixtures of unknowns? Explain what would have to be done for mixtures other than Na/K.

3. Explain what is happening on an atomic level to produce the colors viewed through the diffraction grating.

4. Is emission spectroscopy a qualitative or quantitative analysis? Explain.

5. What three colors were produced by you firework?

6. Which three elements must have produced the colors in your firework?