

Try This!

Build a Spectrometer

The colors seen in the flames are a combination of all the colors emitted by the electrons when they are raised to a higher energy level by the heat of the flame and then fall back down. With a spectroscope, you can see these individual colors. For example, the color produced when you heated the boric acid was green. If you looked at the same flame with a spectroscope, you'd see that the green is actually caused by a combination of yellow and blue (with a little bit of red).

The bright lines above show the spectrum of colors given off when the electrons fall down off the "step" they jumped up to when the heat energy was added.

What You Need

- Shoebox
- A CD that you don't need anymore
- Black electrical tape
- Black construction paper
- Scissors

What You Do

1. Use the scissors to cut two pieces from the black construction paper 2 inches by 3 inches (5 x 7.6 cm) in size.

2. On the top of the shoebox, cut a slit that is 2 inches (5 cm) long, about 1/2 inch (1 cm) from the end of the box.

3. Tape the two pieces of black construction paper over the slit so that the papers are almost, but not quite, touching. There should be a very narrow (about 1/16 inch [.16 cm]) slit between the papers for the light to come through.

4. Cut a viewing hole about 1-inch square on the opposite end of the box. This is where you'll look to see the spectra.

5. Tape the CD, shiny side up, inside the box under the slit so that it makes a 60-degree angle with the bottom of the box. The light that enters through the slit will bounce off of the CD and out the viewing hole to your eyes. The grooves in the CD spread the light out into all of its colors so you can see in the spectrometer which colors make up the colors seen in the flames.

6. To use the spectrometer, turn off all of the lights so the room is dark, and have a helper light a cotton swab with one of the chemicals as in step 5 of the experiment. Hold the spectrometer so the flame is in front of the slit. Look through the viewing hole to see the spectrum or colors of the flame. You may need to make adjustments to the angle of the CD to get the best view of the spectrum.

How are the spectra for the different flames similar and how are they different? Do you see just one band of color or several? Try using the spectrometer to view other light sources, like sunlight, fluorescent lights, and neon lights.

