Identifying Solutions Laboratory: Felix Muhiga

Teacher's Guide

Goals

- To find out what is in the mystery solution
- To learn about real life application of forensic chemistry

The Laboratory

In this laboratory, students identify cations by conducting drop tests with different anions, which yield colorful solutions. They use the array of information to identify an unknown solution, which contains one of the metals. The use of well plates requires the use of very small amounts of solutions.

Materials for Each Group

Procedures and safety issues can be found using the keywords cation, analysis, experiment, or on the following site:

http://intro.chem.okstate.edu/ChemSource/chemsource.html

Comment

The color tests are conducted in a well plate, using very small amounts of solutions, and the grid of the table is matched to the grid of the well plate.

A partial table (as extracted from the video) would be:

	OH^-	**I^-**		
Ag^+		Deep brown		
Cu^{+2}		Pale yellow		
Zn^{+2}	White			
Pb^{+2}		Bright yellow		
unknown				

Lecture Notes

In this forensics laboratory, we are going to find the chemical composition and ionic content of a given solution.

There are many ways to find out the chemical composition of solutions. We will use just one. We have six different solutions. You are encouraged to work as integrally as you can, and see if you can identify only the cations which are in solution.

Each ion gives a different color, and that's how we can tell them apart. We can tell silver and copper apart because when we test them using iodide, one gives us a pale yellow, and the other gives us deep brown.

Any time that we add Iodide to the solution and we get pale yellow, we know that it must be copper.

Now that you have finished your grid, you have to get the secret ingredients and identify ions. This grid will serve as a basis for comparison, and be able to tell whether we have silver or copper in these two solutions.

It may be zinc, so you have to run another test, to confirm whether it is zinc or not. Add the hydroxide, and if it turns white you know that it must be zinc.

You mix Cu^{+2}, Ag^{+}, and Zn^{+2} salts and Pb with these solutions, because each of them will give you a distinct color.

You may not make the distinction between the different shades of yellow; it is better for you to have them, so you can compare.

We now have all the information that we need to identify the cations.

Come over, take one of the unknowns, and test them with all anions that you have. Within your table, ought to be the ion that is contained in the unknown.

This is one of the things that I want you to find out. You have to decide: do you think one test is sufficient, two or three, to help you distinguish between the cations?

We have now seen what lab analysts have to go through to identify different solutions, whether they are looking for trace elements in solutions or if they need to know what different elements are in the solutions.

In this activity, if I needed to find out whether lead is present in drinking water, which of these tests would I have to perform, just one, to decide whether there is lead in the water? Which anion would be most helpful? Why? Iodide, because it turns bright yellow.

We are able to tell the presence of lead only by seeing the bright yellow color.

Why is it that we could conclude that copper was not within the mystery solutions? Because we know that in any circumstances, copper would be colored, and we don't see any color in the solutions.

What did you find the unknown solutions to be?