Lab #7: What is the percent of copper in brass?

# Purpose

Apply your knowledge of stoichiometry and solutions to determine the percentage of brass that is composed of copper.







This lab will consist of two distinct parts:

Part 1) the part in which we will use a spectrophotometer to determine how the instruments reacts to solution of various concentrations of Copper (II) ion.

Part 2) the part in which we dissolve solid brass into solution to make a copper II ion solution of an unknown concentration that we will determine with the spectrophotometer.

**Part 1: Calibration of the spectroscope**

1. Most spectroscopes have a light source that gets hotter over the first 10 – 15 min of use. This means you will have to turn it on to warm up for that time before using. Copper Ion absorbs well at about **620 nm** so adjust the spec to that.
2. Put a cuvette with just distilled water in it and adjust the spec to 100 % transmittance. The cuvette and water also adsorb light from the source and this effectively removes that problem from your results
3. Prepare 10 solutions with the copper (II) ion that have concentrations from 0.1 to 1.0 M, each successive dilution increasing by 0.1 M.

|  |  |
| --- | --- |
| Molarity (M) | % transmittance |
| 0 | 100 |
| 0.1 |  |
| 0.2 |  |
| 0.3 |  |
| 0.4 |  |
| 0.5 |  |
| 0.6 |  |
| 0.7 |  |
| 0.8 |  |
| 0.9 |  |
| 1.0 |  |

1. Make sure your solutions are thoroughly mixed and place each of the solutions into a cuvette and record % transmittance for each. You need to recalibrate the spectrophotometer in between each cuvette reading.
2. Make a graph of your results (concentration vs. % transmittance) and look for an area that is “interesting”. That is, look for an area where the transmittance changes strongly with concentration fluctuations, this will give you more precision to your results:

| | | | | | | | | |

0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0

| | | | | | | | | |

% transmittance

For example: if this was my graph of results, I’d find the 0 to 0.4 M range to be “interesting” you get a lot of change with concentration fluctuations. Likewise I wouldn’t use 0.5 to 1.0 for the opposite reason. Its changes but the change is so little, I won’t get much precision.

1. Look at your results and try to mix your brass sourced copper ion solution to the top of that range. In my example, my maximum interesting concentration is about 0.4M so I’m going to make my solution 0.4 M or less to keep my results in this range. (Remember that the brass may be half copper so what you think it 0.4 M is actually 0.2 M.

**Part 2 : Dissolve your brass.**

1. Measure and record the mass of the brass that you are dissolving using a precision balance.
2. Dissolve the brass into nitric acid by placing it in a test tube and heating it moderately.
   1. Use a test tube clamp, ring stand and burner but don’t just place the burner under it.
   2. Moderate the heat so that is doesn’t boil over.
   3. Make sure it is vented in a fume hood and that test tube faces away from everyone.
   4. Heating makes it faster and cooling slows the reaction down but it’s exothermic so a little heat keeps it going for a while. Pull the burner away when it gets going.
3. When it has all dissolved, figure out how much water to add to make the concentration fall along the “interesting” part of your graph. In my example, I want to make a 0.4 M solution because that’s good for my graph.
4. Place your solution into the spectrophotometer and measure percent transmittance. (Be sure it reads 100 % with just water.)
5. Calculate the percent of copper in brass using your results.