Objective: Determine the percent mass of the copper in a brass screw via gravimetric analysis.

Materials:   
Brass screw  
Nitric acid (make brass screw soluble) (6M-concentrated)  
Precipitating salt (student choice)   
Buchner funnel  
Filter paper

Procedure:

1. Mass out a screw (run 3 separate trials of this lab)   
Release copper from screw.   
1. Take 1 brass screws and react them with approximately 15mL of concentrated nitric acid in the fume hood. This can be done in a smaller (50mL) beaker. Careful, this solution is nasty. Leave in fume hood at all times.

Cu (s) + H+ (aq) + NO3- (aq) —> Cu2+ (aq) + NO (g) + H2O(l)

2. Add NaOH to create Cu(OH)2

NO(g) is a dark brown gas. It is one of the main components of smog in big cities. It is produced at high temperatures between N2 and O2 inside car motors. A catalytic converter reverses oxides of nitrogen back to original N2 and O2.

After the reaction has completed add enough NaOH to neutralize most of the acid. Once you have neutralized most of the nitric acid you can remove the solution from the hood and bring it to your lab table. There using same 6M NaOH fully precipitate all Copper into Cu(OH)2. You will see a blue slushy forming. Blue slushy can turn brown if neutralization produces sufficient heat.

Cu2+ + H+ + OH-1 → Cu2+ + H2O + heat

Cu+2 + OH-1  → Cu(OH)2(s)

Cu(OH)2 → CuO(s) + H2O (heat will drive this reaction)

3. Decompose to CuO with heat

Place beakers on a hot plate. Make sure no dissolved copper remains. Addition of more NaOH will convert to solid. Heat will accelerate decomposition. Only issue with this is over heating of solution causing it to burp or bubble up in jar. At times I have seen this solution leave the beaker causing a mess.

Feel free to grab a stir rod to mix, any copper on this rod should be washed back into the solution with water.

4. Filtering the solution with a Buchner funnel.

There is a video to watch on how to use a Buchner funnel. Place filter paper on paper towel and set aside to dry. QR code should bring you to video.



5. Dry the filter paper over night.

Data:

Mass of filter paper:   
Mass of screw:   
Mass of filter paper after drying:

Calculations.

1. Determine mass of CuO solid.
2. Determine mass of copper in solid sample: (percent mass method/stoichiometric method)
3. Determine percent mass copper in screw.
4. Error Analysis:

How will the following situations affect the percent mass of copper in your screw.

1. Blue color appears in your filtrate.
2. Black residue is left behind in the beaker while filtering.
3. Extra water is added to the solution during filtering.
4. Insufficient NaOH is added to acidified copper solution.
5. Copper oxide solid still has some water present the next day when weighing.
6. The mass of your copper is calculated to more then the mass of your entire screw. What might be your most likely error?