

Purpose: To synthesize several copper compounds ~~balanced with~~ Starting with elemental copper and recover the original ~~✓~~ copper after i to calculate % recovery of copper.

Procedure: Please refer to the 2009 Chem 1A03/1E03 lab manual for detailed procedure
 → temperature used to boil water was above 100°C to speed up the heating process

Pre-lab:

Observation

Miss?

Bisser

Reaction	Before	During	After
$2\text{HNO}_3(\text{aq}) + \text{Cu}(\text{s}) \rightarrow \text{Cu}(\text{NO}_3)_2(\text{aq}) + \text{NO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$	HNO_3 - colorless, liquid, transparent Cu - bronze, solid, curled up wire, opaque	- brown colored gas were given off - copper started to bubble and turn aqueous blue	- liquid - translucent - teal/green color
$2\text{NaOH}(\text{aq}) + \text{Cu}(\text{NO}_3)_2(\text{aq}) \rightarrow 2\text{NaNO}_3(\text{aq}) + \text{Cu}(\text{OH})_2(\text{s})$	NaOH - colorless liquid, transparent $\text{Cu}(\text{NO}_3)_2$ - teal color, liquid, transparent	- solution turned aqueous blue - while heating and stirring, solution turned darker, from aqueous to dark blue to black	- liquid darker blue/green - liquid - transparent translucent
$\text{Cu}(\text{OH})_2(\text{s}) \rightarrow \text{CuO}(\text{s}) + \text{H}_2\text{O}(\text{l})$	black dark blue/green - liquid - opaque translucent	black - turned darker and darker with stirring and heat - black liquid settling down to bottom of beaker	- black precipitate settled at bottom of beaker (after 5-10 min) - liquid - opaque - layer of liquid on top - clear liquid separated on top
$\text{CuO}(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{Cu}(\text{SO}_4)(\text{aq}) + \text{H}_2\text{O}(\text{l})$	- black precipitate - opaque H_2SO_4 - colorless liquid, transparent	- black bottom of solution turned light blue - black precipitate - black precipitate separates at top - stirring black color precipitate to dissolve	- black precipitate separated on top and light blue liquid at the bottom - light blue liquid - translucent
$\text{Cu}(\text{SO}_4)(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{Zn}(\text{SO}_4)(\text{aq}) + \text{Cu}(\text{s})$	Zn - silver shiny, solid, opaque CuSO_4 - light blue liquid, translucent	- stirring caused solution to turn cloudy (white) - red/brown precipitate started forming	- red/brown precipitate at the bottom of solution - colorless/slightly blue liquid as solution - some excess zinc precipitated was left (grey precipitate)
$\text{Zn}(\text{SO}_4)(\text{aq}) + \text{HCl}(\text{aq}) \rightarrow \text{ZnCl}_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq})$	HCl - colorless, liquid, transparent ZnSO_4 - red/brown, solid, opaque	- bubbles formed - gas given off - beaker felt hot (heat released)	- red/brown precipitate

Distilled water and distilled water were used to rinse Cu solution

More detail

LP 10/10

2. mass of 1.075g of copper \rightarrow produced 1.075g of copper oxide



MR 1 2 1 1
m 1.075g \rightarrow temperature used for this was 120 for 10 min up the heating plate

MM 63.55g/mol

n 0.0169158 mol $\times 1 \rightarrow 0.0169158 \text{ mol}$



MR 1 2 1 2
n 0.0169158 mol $\times 1 \rightarrow 0.0169158 \text{ mol}$



MR 1 1 2

n 0.0169158 mol $\times 1 \rightarrow 0.0169158 \text{ mol}$

MM 79.55g/mol
m 1.34565189g

$$\% \text{ yield} = \left| \frac{\text{actual yield}}{\text{theoretical yield}} \right| \times 100\%$$

$$= \left| \frac{1.075}{1.34565189} \right| \times 100\%$$

$$= 79.89\% \quad \checkmark$$

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mass of copper = 0.2554g

mass of zinc = ~~3.23g~~ 3.23g

mass of copper recovered = 0.1393g

$$\% \text{ recovery} = \frac{\text{mass of copper recovered}}{\text{mass of copper}} \times 100\%$$

$$\% \text{ recovery} = \frac{0.1393 \text{ g}}{0.2554 \text{ g}} \times 100\% = 54.54\% \checkmark$$

Mol ratio?

$$\frac{17}{2}$$

Discussion: Elemental copper went through a series of chemical reactions to synthesize several copper compounds. After undergoing the chemical reactions, the ~~the~~ elemental copper was recovered. Not all of the copper was recovered due to inaccuracies in the ~~the~~ recovery technique. For example when the copper oxide solution was decanted, some of the precipitate ~~was~~ was lost. ~~Also there was still some solid in the beaker. Also when Zn was added to the solution, the copper was boiled and mass.~~ There were inaccuracies in using the balance to measure the mass of copper because the balance is very sensitive so even slight movement of your arms will cause a weight measured fluctuation.

reactions may
not have
gone to completion

To improve, before decanting, the copper and solution should be allowed to settle for longer time so that ~~the~~ decanting the solution can be made easier to avoid losing precipitate.

Conclusion: ~~The~~ ~~After~~ After measuring the mass of copper recovered and comparing it to the initial mass of copper started with, 54.54% of the copper was recovered. Again, some of the copper was lost due to inaccuracies in recovery technique.

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