EXP. NUMBER	EXPERIMENT/SUBJECT	DATE
2	Cycles of Copper	[redacted]

NAME	LAB PARTNER	LOCKER/DESK NO.	COURSE & SECTION NO.
[redacted]			Chem 1A03

Pre-Lab Questions

1. (See Observations Table)

2. $Cu_{(s)} + 4HNO_{3(aq)} \rightarrow 2NO_{2(g)} + Cu(NO_3)_{2(aq)} + 2H_2O_{(l)}$

$Cu(NO_3)_{2(aq)} + 2NaOH \rightarrow CuO_{(s)} + 2NaNO_{3(aq)} + H_2O_{(l)}$

$n_{Cu} = \frac{m_{Cu}}{M_{Cu}} = \frac{1.065\,g}{63.55\,g/mol} = 0.0167\,mol$

$n_{theo\,CuO} = \frac{m_{CuO}}{M_{CuO}} = \frac{1.095\,g}{79.55\,g/mol}$

$\%\,Yield = \frac{n_{actual}}{n_{theoretical}} \times 100\% = \frac{n_{theo\,CuO}}{n_{Cu}} \times 100\% = \frac{0.01376\,mol}{0.01676\,mol} \times 100\% = 82.10\%$

∴ The percent yield of this process is 82.10%.

Purpose

To synthesize several copper compounds from elemental copper and later recover the original copper to compare its initial mass to its final mass. Also, to introduce performing simple chemical reactions to the experiments.

Procedure

Please refer to 2011-2012 1A03/1E03/1AA3 Lab Manual for Detailed procedure of "Cycles of Copper".

Observations

mass of elemental Cu = 0.2534 g

Reaction #	Chemical Equation for Reaction Qualitative Observations
1	$Cu_{(s)} + 4HNO_{3(aq)} \rightarrow 2NO_{2(g)} + Cu(NO_3)_{2(aq)} + 2H_2O_{(l)}$ - Added nitric acid and copper fizzled immediately and solution turned a greenish-blue colour. Copper dissolved completely leaving a greenish-blue liquid. A brown gas was emmited.
2	$Cu(NO_3)_{2(aq)} + 2NaOH_{(aq)} \rightarrow Cu(OH)_{2(aq)} + 2NaNO_{3(aq)}$ - Added NaOH and solution turned light blue and after sitting a few seconds, a ~~black precipitate~~ formed. Litmus paper green solution turned blue and after stirring for a few minutes continuously, solution turned from green to black on hot plate
3	$Cu(OH)_{2(aq)} \xrightarrow{heat} CuO_{(s)} + H_2O_{(l)}$ While placed on the hot plate, solution turned from green to black while being stirred. A black percipitate began forming on the base of the beaker while the solution turned clear near the surface (above percipitate). Black percipitate pieces dissolved into finer granules that are dark brown and settled at bottom.
4	$CuO_{(s)} + H_2SO_{4(aq)} \rightarrow CuSO_{4(aq)} + H_2O_{(l)}$ After adding sulfuric acid and stirring, the solution turned a light blue and the percipitate dissolved completely to produce a clear blue solution.
5	$CuSO_{4(aq)} + Zn_{(s)} \rightarrow Cu_{(s)} + ZnSO_{4(aq)}$ After adding zinc (gray/silver in colour) the zinc fizzed and gas was produced in the beaker. The liquid became cloudy while as the zinc reacted. Eventually the liquid became clear (blue disappeared and colourless). Percipitate that was copper in colour floated on bottom.
6	$Zn_{(s)} + 2HCl_{(aq)} \rightarrow ZnCl_{2(aq)} + H_{2(g)}$ - After adding HCl and water, a yellow coloured gas began to show, and the copper coloured solution remained at the bottom of the solution.

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