THE MANY COLORS OF COPPER

In this experiment, a weighed amount of copper metal will be made to undergo a series of chemical reactions and will finally be changed back into copper metal.

These changes can be represented schematically as:

$$Cu \rightarrow Cu(NO_3)_2 \rightarrow Cu(OH)_2 \rightarrow CuO \rightarrow CuCl_2 \rightarrow Cu$$

You will be familiarized with many laboratory techniques and some important descriptive chemistry. Care must be exercised in carrying out these operations to avoid loss of copper.

Procedure

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A. Preparation of Copper(II) Nitrate from Copper and Nitric Acid

SAFETY NOTES

CONCENTRATED NITRIC ACID (HNO₂) CAN CAUSE SEVERE CHEMICAL BURNS - KEEP IT OFF OF YOUR SKIN OR BOOKS AND WASH WELL FOR 10 MINUTES IF YOU SPILL ANY ON YOUR SKIN. NITROGEN DIOXIDE (NO₂) IS A HIGHLY IRRITATING GAS - STEP A MUST BE CARRIED OUT IN THE HOOD! (GTAS and TAS should wear gloves and pour the concentrated HNO₂ for the students.)

Weigh a piece of copper wire (about 1 g) to the nearest 0.01 g and record its weight on the data sheet. Then weigh a piece of filter paper and record its weight. Write your initials in pencil on the spot on your 250 mt beaker and your name in pencil on the filter paper.

Bend the copper wire so it will lie flat on the bottom of your 250 mL beaker. Carry the beaker and the graduated cylinder to the hood and where the GTA or TA for the lab will pour 10 mL of concentrated (CON) nitric acid over the copper in the hood. Let the beaker stand until the copper is completely dissolved (about 5 minutes). The blue color is due to copper(II) ion, the red-brown fumes are nitrogen dioxide. This is an oxidation reduction reaction as indicated by the change in valence of copper and nitrogen. Before you remove the beaker from the hood add 50 mL of distilled water.

$$Cu(s) + 4 HNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2 NO_2(g) + 2 H_2O(l)$$

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