Lower Merion High School Chemistry

Cu/Ag Single Replacement

Lab #12

Based on their chemical activity, certain cations can replace others in a reaction. This lab will examine one such single replacement reaction involving copper and silver.

Materials:

Test Tube	Copper Wire approximately 30 cm long		Balance
150 mL Beaker	Wash Bottle filled with De-ionized Water		Oven
De-ionized Water	Silver Nitrate (Crystals)	Stirring Rod	Acetone

Procedure:

Obtain a piece of copper wire. Wrap the wire around the stirring rod tightly to form a coil. Slide the wire off the stirring rod. Obtain and record the mass of the wire.

Place the test tube on the balance and re-zero the balance. **CAREFULLY, AND I MEAN CAREFULLY,** add approximately 1.5 g $AgNO_{3(s)}$ to the test tube. Record the exact mass of the $AgNO_3$. Fill the test tube about 3/4 full with de-ionized water and stir until all of the $AgNO_3$ is dissolved.

Make a hook at one end of the copper wire. Stretch the wire until it is about 1 cm shorter than the length of the test tube. Place the wire into the test tube and hang it onto the test tube with the hook. Allow the reaction to take place for about 15 minutes.

Clean and dry the 150 mL beaker. Mark the beaker with the names of the lab partners. Mass the beaker and record its mass.

Shake the crystals from the wire to the bottom of the test tube and allow the reaction to continue for another 5 minutes until no more silver crystals are produced. Shake the remaining crystals from the wire to the bottom of the test tube.

Remove the wire from the test tube and, holding it over the 150 mL beaker, wash any remaining crystals from the wire into the beaker.

Dip the wire into a graduated cylinder filled with acetone. This will help to dry the wire. After removing the wire from the acetone, allow it to dry for about 20 seconds and mass it. Record this mass.

Pour the material from the test tube into the 150 mL beaker. You may need to use the wash bottle to get all of the silver out of the test tube. Once all of the silver is in the beaker, carefully decant the liquid into the sink using the stirring rod. You must try to keep as much silver as possible in the beaker. Wash the silver in the beaker with de-ionized water and decant the liquid into the sink. Repeat this washing procedure twice more. It is important to wash any impurities off of the silver. Place the beaker into the oven for drying.

(Next day) Mass the beaker and dried silver. Clean up.

Calculations:

Determine the mass of copper reacted, and the mass of silver produced.

Calculate the theoretical mass of silver that should have been produced based on copper reacted.

Calculate the theoretical mass of silver that should have been produced based on $AgNO_3$ reacted.

Calculate the % yield.