

Name:

Date:

Hour:

Copper, Silver and Gold Pennies

*** GOGGLES ***

PURPOSE: "Transform" copper into silver and gold.

MATERIALS:

zinc, granular	evaporating dish
3.0 M NaOH	Forceps/crucible tongs
shiny pennies	Bunsen burner
250 mL beaker	100 mL beaker

PROCEDURE:

1. Place about 1-2 grams of granular zinc in an evaporating dish.
2. Add enough of the 3 M Na(OH) solution to cover the zinc and fill the dish about half full.
(CAUTION: Na(OH) IS A VERY STRONG BASE AND WILL LEAD TO SEVERE BURNS IF SKIN CONTACT OCCURS AND THE Na(OH) IS NOT WASHED OFF QUICKLY!!!)
3. Put the evaporating dish on a ring stand/wire gauze and heat on a setting until the solution is near boiling. If the solution begins to boil, turn off the heat for a while.
4. Place several shiny new pennies carefully in the solution above the zinc. Do not put them on top of each other. Spread them out. Use forceps or crucible tongs to place them in the solution.
5. Leave the pennies in the dish for 5-10 minutes or until they have a uniform silver coating on both sides of the pennies.
6. Remove the pennies, wash them by dipping them in a beaker of tap water, and then gently blot them dry with paper towels. **Do not rub!** If you want to keep one or two pennies silver, do not perform the next steps.
7. Using forceps or crucible tongs, hold the silver-coated penny by the edge and gently heat the penny near the top of the burner flame. After a few seconds of heating, the "gold" color should appear. Heat the coin uniformly on both sides to give a uniform "gold" color.
8. Set the coin down to cool, wash it again, and blot it dry. Enjoy your new "gold"!!!
9. Be careful not to touch the **HOT** pennies or tongs for a few minutes until they have had an opportunity to cool off.

REACTIONS:

1. The first reaction involves the plating of the penny with a coating of zinc. The granular zinc reacts with the hot sodium hydroxide solution to form soluble sodium zincate, Na_2ZnO_2 . This substance is then converted to metallic zinc when it contacts the surface of the penny. This results in a loosely held zinc coating on the surface of the copper.

2. The second reaction involves the heating of the penny to fuse together the zinc and copper metals to give an alloy (homogeneous metal mixture) known as brass. Brass varies from 60-82% Cu and from 18-40% Zn.

**** CLEAN UP YOUR AREA ~ GOGGLES ON! Raise your hand and show the instructor your "best" result for each type of penny.***

POST-LAB QUESTIONS:

1. What was the function of the sodium hydroxide in the evaporating dish?
2. Why did the penny turn silver after a few minutes in the hot solution?
3. Why did the penny turn gold when heated in the burner flame?
4. How does an alloy meet the definition of a solution?
5. What is the name of the alloy produced in this activity? What two metals are fused together in this gold-colored alloy?
6. EXPLAIN **exactly** what happens in a chemical reaction. Address the common misconception(s) people might have about chemical reactions.
7. Could this be done with other denominations of change? (Nickel, dime, quarter) Explain your answer.
8. Alchemy sought to use transmutation to turn base metals into more valuable metals such as silver or gold. Why is this impossible?

Go VIKINGS!!!