

CHEMLAB AND
MINILAB WORKSHEETS

MINILAB 1.3

Copper to Gold: The Alchemists' Dream

An alchemist was a combination of magician and metallurgist who tried unsuccessfully to convert common metals to gold. The craft flourished from ancient times until the 18th century. Alchemists were not early chemists, as some people believe, but their practical knowledge about elements and compounds contributed to the work of the earliest true chemists. Like the alchemists, you will not turn copper into gold, but by allowing the copper in a penny to react with zinc under certain conditions, you may create an interesting alloy of the two metals.

PROCEDURE



1. Wear an apron and goggles.
2. Clean a pre-1982 penny with steel wool or a pencil eraser.
3. Place 1 g of granular zinc in an evaporating dish and add 20 mL of 1M zinc chloride solution (ZnCl_2). Use tongs to place the penny in the dish, and put the evaporating dish on a hot plate.
4. Heat the mixture until it just starts to boil. This should take about two minutes. Carefully stir the mixture with the tongs and turn the penny. Continue to heat and stir gently until the penny becomes covered with zinc and appears gray in color. This usually takes less than a minute.
5. Use the tongs to remove the penny from the liquid. Rinse the penny in a beaker of cold tap water, then pat it dry with a paper towel.
6. Using tongs to hold the penny, gently heat it in the cooler, outer portion of a Bunsen burner flame until it changes color. Record your observations.
7. Continue heating gently for two or three seconds longer, then immediately immerse the penny in a fresh beaker of cold water.
8. After the penny has cooled for about a minute, remove it from the water and pat it dry. Record your final observations.

ANALYSIS

1. Does the evidence indicate that you created an alloy of copper and zinc?
Explain.

✓ Yes, because copper and zinc have two distinct colors. You could not tell the difference between the two.

2. What is the probable identity of this alloy?

✓ Copper and zinc alloy

3. What do you think you would see if you cut the penny in two and examined the cut edge with a powerful microscope?

✓ Copper and a coat of zinc would be seen if cut and examined with a powerful microscope.