

# Gold Pennies

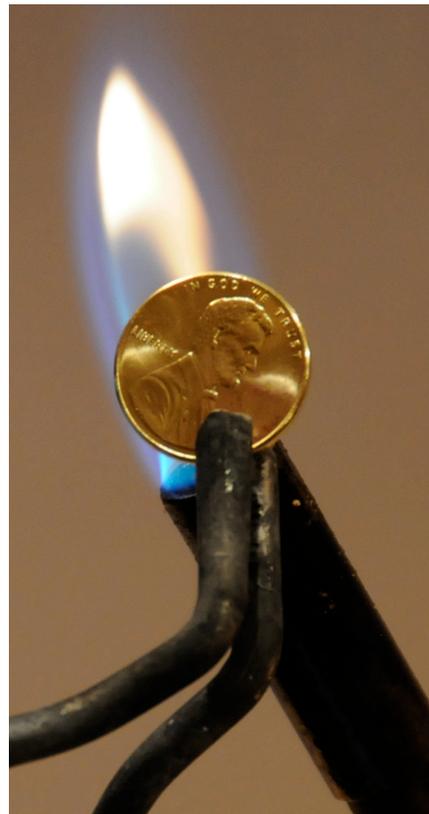
There's just something strange about a gold penny. First of all, gold pennies don't exist... unless you're a 20th-century alchemist who knows something about the science of alloys.

Modern day alchemists, cleverly disguised as chemistry teachers, often share the secret of making gold pennies.

Pennies made after 1983 have a zinc core with a copper coating. Pennies made before 1983 are an alloy of 95% copper and 5% zinc. Modern pennies are lighter than older pennies, and are less expensive to make.

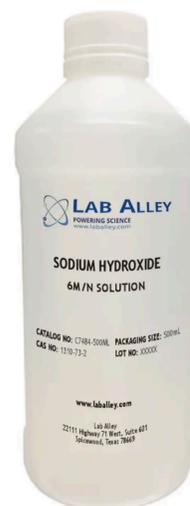
In this activity, you'll form a reaction between the copper on the surface of a penny with zinc hydroxide and heat. Some of the zinc will "dissolve in" the copper of the penny. The penny will change color due to the presence of zinc in the copper.

Then you'll heat your penny. This will allow the copper atoms in the penny to move around, and will result in a mixture of copper and zinc on the surface of the penny. This is an alloy called "yellow brass."



## MATERIALS

- 20 mL of 6 M NaOH
- 0.1 g zinc dust
- Evaporating dish
- Hot plate
- Tongs
- 200 mL beaker of water
- Penny
- Bunsen burner / Propane torch



## SAFETY NOTE

This activity requires adult supervision. NaOH should be handled with great care. It is corrosive and can burn skin. Zinc dust should not be inhaled. Safety goggles should be worn the entire time.

## LET'S TRY IT

1. Place zinc dust in evaporating dish.
2. Add 20 mL of NaOH solution to the dish, on top of the zinc.
3. Set hot plate to medium heat and place the evaporating dish on top.
4. Heat for 5 minutes. Do not boil. When dish is hot, place a penny in it. Heat for two minutes or until the penny is coated and becomes silver in appearance.
5. Remove the penny from the dish with tongs and drop into water. When cool, wipe the penny clean with a cloth to remove excess zinc.
6. Using tongs, hold the penny in the flame of a Bunsen burner and gently heat. The penny should turn "gold" (brass). (Do not overheat the penny.)
7. Dip the penny in the beaker of water and cool to touch.



## WHAT HAPPENED?

Artists often work with alloys like bronze, steel or brass because of their durability and color. Bronze is a mixture of copper and tin; brass, made in the activity below, is a mixture of zinc and copper. Steel is made of iron and carbon. Alloys are used to make coins, jewelry, sculptures and other items.

Soaking the penny in the zinc solution actually coated the surface of the penny with zinc atoms. When the zinc covered penny was heated, the copper atoms of the penny and the zinc atoms coating the penny mixed and turned gold in color, but actually formed the alloy brass.

