

Chemistry Lab – “THE GOLD RUSH”

Name _____

Period _____

PURPOSE: Get rich by turning pennies into “gold”.

MATERIALS NEEDED:

Copper pennies dated 1982 or earlier, Zn, NaCl, Vinegar or dilute acetic acid, 3M NaOH solution.

INTRODUCTION:

In this reaction, sodium zincate (Na_2ZnO_2) is formed by heating elemental zinc with sodium hydroxide solution.



When a copper penny is added to the solution, the zincate ions (ZnO_2^{-2}) migrate to the copper where they are decomposed and reduced to metallic zinc. The silver color produced is due to the metallic zinc coating the penny.

When the zinc-coated penny is heated, the penny becomes gold in color. The gold color is due to the zinc and copper combining to form brass.

Brass is a copper-zinc alloy. An alloy is a mixture of two or more metals (or a metal and a non-metal fused together) dissolved in each other when molten. The percentages of copper and zinc in brass vary depending on the type of brass, and there are many kinds of brass. Low zinc brasses contain 20% zinc and are easy to form. Yellow brasses contain 34-37% zinc. Some brasses contain small percentages of other elements like aluminum, tin, and silicon.

SAFETY PRECAUTIONS:

Wear aprons and goggles. NaOH solution is extremely corrosive and can cause skin burns and severe eye damage.

PROCEDURE:

1. Mix together 3.0 g of NaCl and 15 mL of vinegar in a clean, 150 mL beaker.
2. To clean the copper pennies, place them in the solution until they are shiny.
3. Remove the pennies with forceps and rinse them thoroughly with water. Dry with a towel. Do not handle the clean pennies with your hands. The oils from your skin can interfere with the reaction.
4. Mix together 1.0 g of zinc and 25 mL of 3M NaOH solution in a clean evaporating dish. Chemical splash goggles **must be worn**.
5. Using a hot plate, carefully and gently heat the mixture to steaming. Do not allow the solution to boil or spatter.
6. Using forceps, immerse the penny in the mixture until it is completely coated with “silver”.

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7. Use forceps to remove the penny. CAUTION: The penny is very hot. Carefully dip the penny into a beaker of distilled water. Shine with a towel. The penny should now appear silver.
8. Using tongs, heat the penny in a burner flame just until the penny turns gold. Overheating the penny will cause the gold color to darken. Immediately dip the penny into the beaker of distilled water. The penny will be extremely hot and should be handled with tongs until it has cooled for several minutes. It may be cooled in running water from the faucet.

QUESTIONS: (Answer in complete sentences)

1. Did you really make "silver" and "gold" ? Explain what you did make.
2. Why will a 1982 or older penny work best?
3. **Compare** the color and mass of pennies dated 1982 or older with newer pennies.