Golden Penny Experiment

Background
Pre-1982 pennies and post-1982 pennies appear to be the same but are they really made of the same material. In this experiment, you will use different properties of matter to help you decide.

Prelab Questions
1. Define physical property and provide three examples.

2. Define chemical property and name one possible example.

3. Define alloy.

Problem
Can a penny be turned into gold?

Materials
- Three pre-82 pennies
- 1M zinc chloride solution, 25 mL
- Zn, granular or mossy, 2.0 - 2.2 g
- Distilled or deionized water
- 150-mL beaker
- Two 250-mL beakers
- 25-mL graduated cylinder
- Balance, 0.1 g
- Hot plate
- Tongs
- Watch glass
- Hot hands or insulated gloves

Safety
- Always wear safety goggles when handling chemicals in the lab.
- Wash your hands thoroughly before leaving the lab.
- Follow the teacher’s instructions for cleanup of materials and disposal of chemicals.
- Exercise caution when using a heat source. Hot plates should be turned off and unplugged as soon as they are no longer needed.

Procedure
1. Obtain three clean pre-1982 pennies. Record the appearance of the untreated penny in the space provided in the data table below.
2. Weigh a sample of granulated zinc or zinc mossy, you will need the mass to be between 2.0-2.2 g. Place it in a 150-mL beaker.
3. Use a graduated cylinder to measure 25 mL of 1M zinc chloride solution. Add the solution to the beaker containing the sample of zinc metal.

**Caution:** Zinc chloride solution can damage skin. If any of it gets on your skin, immediately wash the affected area with cold tap water. Notify your teacher.

4. Place the beaker containing the zinc and zinc chloride solution on a hot plate and set the hot plate to medium. Cover the beaker with a watch glass. Gently heat the solution until it just begins to bubble. DO NOT allow the solution to boil vigorously or become heated to dryness. Carefully remove the watch glass with tongs or insulated gloves.

5. Using forceps or tongs, carefully lower two of the clean pre-1982 pennies into the solution in the beaker. Do not drop the coins into the solution; avoid causing a splash. Put the watch glass back on the beaker and keep the solution at a gentle boil for approximately two or three minutes. You will notice a change in the appearance of the pennies during this time.

6. The third penny is kept out of the solution so that it can act as a control. This is an untreated sample that can be compared with the treated coins.

7. Fill two 250-mL beakers with distilled water.

8. With forceps or tongs, remove the two pennies from the zinc chloride solution. Submerge both of these pennies in the same beaker of distilled water. Turn off the hot plate. Take the pennies out of the beaker and thoroughly rinse each of them with tap water. Dry both with a towel. Set aside one of the two treated coins.

9. Using tongs, place one of the treated penny directly onto the hot plate set to medium heat. With heat resistant gloves or tongs, flip the coin every 30 seconds to prevent burning until you see a change in color.

10. Then use tongs to dip the penny into a fresh beaker of distilled water. The penny will be very hot and this will allow the penny to cool.

11. Observe and compare the appearance of the three pennies. Record your observations on the table.

12. When finished, discard the used zinc chloride solution and the used zinc, as directed by your teacher.

13. Wash your hands thoroughly before leaving the laboratory.

### Data

<table>
<thead>
<tr>
<th>Condition</th>
<th>Appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated penny (control)</td>
<td></td>
</tr>
<tr>
<td>Penny treated with Zn and ZnCl₂</td>
<td></td>
</tr>
<tr>
<td>Penny treated with Zn and ZnCl₂ and heated on hot plate</td>
<td></td>
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</tbody>
</table>
Analysis

1. Identify any physical properties and chemical properties associated with this process.

2. 
   a. Compare the colors of the three coins.
   b. Do the treated coins now look like other metals? If so, explain.

3. Was a different metal or an alloy made in this activity? How can you decide whether it was?