

How to Make a Galvanic Cell – Copper and Zinc

Materials

- Safety goggles
- Lab coats
- Gloves
- 2-500 mL beakers
- 250 mL graduated cylinder
- Copper metal and zinc metal electrodes
- 1.0M Copper sulfate solution (CuSO_4)
- 1.0M Zinc sulfate solution (ZnSO_4)
- Salt bridge
 - 50 mL NaCl solution
 - Pipette
 - 20 cm filter paper strip
- Voltmeter
- Alligator clips for connecting wires and loads
- Optional: pH strips
- Data recording sheets
- Paper and Pencils

Description

This activity uses copper sulphate and zinc sulphate solutions with copper and zinc electrodes to create a galvanic cell. Students will measure the voltage created using the standard procedure of creating a galvanic cell. They will use the knowledge gained through this activity to design an efficient battery using different metals and electrolyte solutions later.

Procedure

1. Pour 250mL of copper sulphate solution into a 500 mL beaker.
2. Pour 250 mL of zinc sulphate solution into another 500 mL beaker.
3. Place the copper metal electrode into the copper sulphate solution.
4. Place the zinc metal electrode into the zinc sulphate solution.
5. Make a salt bridge between the two beakers by soaking a piece of filter paper with the NaCl solution. You can use the pipette to soak the filter paper.
6. Position the soaked filter paper so that both ends of it is touching each of the solutions in the beakers.
7. Wait a few minutes for the reaction to begin.
8. Use the alligator clips to attach the metal electrodes to the voltmeter and test the voltage of your galvanic cell.
9. Answer the questions on the Student Worksheet and use those answers to think about the next part of this lesson, Designing a More Efficient Battery System.
10. Cleanup:
 - a. Disconnect the electrodes from the voltmeter.
 - b. Dispose of solutions following proper waste disposal procedures.
 - c. Clean and dry the electrodes for future use.

Suggestions for Data Collection:

Observe any changes in the electrodes and solutions.

- b. Measure and record the voltage produced by the galvanic cell using the voltmeter.
- c. Optionally, use pH paper to test the acidity or basicity of the solutions.

5. Data Analysis and Discussion:

- a. Analyze the recorded data to understand the electron transfer and changes in oxidation numbers.
- b. Discuss the principles behind galvanic cells and relate the observations to redox reactions.
- c. Connect the experimental results to the functioning of commercial batteries.