CASE

Engineering Process Template

Name: Blake and Mike

Title

Build a Better Battery 5.1.2

Problem

What metals produce the most energy in a wet cell battery?

Requirements

Using sample metals to create more effective battery.

Solution

Use 2 strips of Mg and 1 strip of Cu to power the motor at the highest RPM's

Materials for Prototype

- 3% hydrogen peroxide
- Wet cell chamber and stand
- Electric motor
- 2 copper strips
- 2 magnesium strips
- 2 iron strips
- 2 zinc strips
- Salt (sodium chloride)
- Electronic balance
- Weigh dish
- Distilled water
- Red lead with alligator clips
- Black lead with alligator clips
- 30ml graduated cup
- 50ml beaker
- Glass stirring rod
- Sandpaper
- Masking tape
- Stopwatch
- Paper towels
- Pencil

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- Agriscience Notebook
- Engineering Process Template
- Project 5.1.2 Evaluation Rubric
- Safety glasses
- Lab apron
- Vinyl gloves

Procedure for Building Prototype

1. Put on your safety glasses, vinyl gloves, and lab coat. Tie back any long hair.
2. Gather the materials as instructed by your teacher.
3. Measure 25ml of distilled water using a 30ml graduated cup.
4. Pour the 25ml of distilled water into a 50ml beaker.
5. Mass 2.5g of salt using an electronic balance and weigh dish.
6. Pour the salt into the 50ml beaker with the water.
7. Add 25 drops of hydrogen peroxide to the solution in the 50ml beaker.
8. Stir the mixture with a glass stirring rod.
9. Attach the wet cell chamber to the stand as seen in Figure 1.
10. Slowly pour the mixture into the wet cell chamber.
11. Clean the zinc strip and copper strip with sandpaper to remove any oxidation.
12. Place a zinc strip in the far right slot of the chamber as seen in Figure 2.
13. Place a copper strip in the far left slot of the chamber.
14. Reflect back to Activity 3.1.2 Highly Reactive and Activity 3.1.3 One Metal to Another.

1. Attach a small piece of masking tape to the shaft of the electric motor to make a flag.
2. Attach one end of the black lead to the zinc strip and the other end to the black lead on the motor.
3. Attach one end of the red lead to the copper strip and the other end to the red lead on the motor.
4. Use a stopwatch to count the number of revolutions the flag on the motor makes in 15 seconds.
5. Multiply the number of revolutions per 15 seconds by four to find the number of revolutions per minute (RPM).
6. Place the metals in cells closer together.
7. Observe the electrolyte solution and metals in the battery chambers.

1. Try different materials to produce a better battery. Attempt 3 different batteries.
2. Use the same solution and copper in the camber and test other materials.

3a. Use 1 Mg and 1 Copper in chamber

3b. Use 2 Mg and Copper Strips in chamber

3c. Use 2 Mg, 2 Zn and 1 Copper Strip in chamber

4. Count the RPM’s of the motor for each test.

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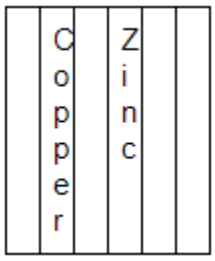
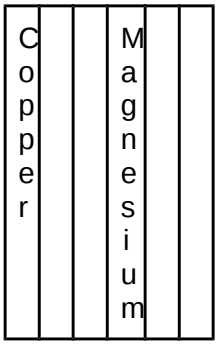
Test and Evaluation

Copper and Zinc findings:



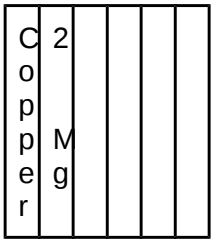
104 RPMs
The RPMs or our motor was fairly slow until we moved the copper and zinc closer together where we were able to get a RPM of 104.

Copper and Magnesium findings:



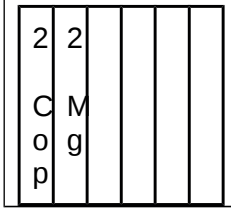
288 RPMs
The RPMs of our Magnesium and Copper battery was better than our Zinc. As we moved the metals together, we were able to get higher RPMs.

Copper and 2 Magnesium findings:



392 RPMs
The RPMs of our 2 Mg strips was even faster than our 1 Mg strip. The RPMs was very fast even with our solution beginning to be used for a while.

2 Copper, 2 Mg and 2 Zinc findings:



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per	2 Zn				

0 RPMs
Were were unable to get the motor to operate.

Analysis and Results of Tests

The best battery was working when we used 1 copper and 2 Mg strips. We continually saw increased RPMs as the materials were placed closer together. We thought the 2 Mg, 2 Zn and 2 Cu was going to be the best but did not create any RPMs.

MAX RPMs Recorded

2 Cu, 2 Zn, and 2 Mg - 0 RPM
2 Mg and 1 Cu - 392 RPM
1 Mg and 1 Cu - 288 RPM
1 Zn and 1 Cu - 104 RPM

Conclusion

Based on our findings, the best combination was 2 Mg and 1 Cu. It produced the most amount of RPMs and had the greatest reaction. Though there was other reactions, we thought 2 Cu, 2 Zn, and 2 Mg strips was going to be the best but it ended up not working. The amount of resistance was too great to gain any power from this battery type. With all of our tests, other than the 6 strip combination, the closer the materials were together, the faster the reaction which allowed for higher RPMs on the motor.