Activity 22

An Unexpected Storage Cell

Materials

GENECON with output cord
Polarity Tester
1 Copper strip
1 Zinc strip
- *Aluminum foil or strip*
- *Clear plastic cup*
- *table salt*
- *Stir stick and sandpaper*
- *Test lead wire*

Procedure

1. Prepare the electrolytic solution by filling the cup about ¾ full of water. Add salt and stir until it will no longer dissolve, creating a saturated solution.

2. Make a strip of aluminum (comparable in size to the copper and zinc strips) by folding aluminum foil several layers thick. Lightly sand the copper and zinc strips to remove oxidation. Connect the **positive** lead from the GENECON (check with Polarity Tester; see Activity #2) to the copper strip and the negative lead to the zinc strip.

3. Insert each metal strip into the solution. Do not let the two strips touch each other. Keep the leads from the GENECON above the solution. You may wish to clip them to the lip of the cup to keep them from moving around.

4. Rotate the handle of the GENECON **clockwise** vigorously for about 30 seconds. Note the bubbles rising from the zinc strip Release the handle. After a very short pause, the handle will begin turning very slowly on its own! In most instances, the handle will rotate spontaneously for about 1 minute.

5. This charging-discharging sequence can be repeated many times. Note any color changes in the solution.

6. Prepare a fresh salt solution. Substitute the aluminum strip for the Zinc strip and repeat the activity. Result?

Key Concepts

1. Electrical energy can be stored in chemical systems.

2. The GENECON is putting electrical energy into the copper-zinc (or aluminum)-salt water system. This **electrochemical** system thus has a higher energy state. The discharge of electrical current back into the GENECON, causing it to behave like a motor, is a restoration of energy equilibrium.

3. While the electrochemistry of this system is more complex than it may appear, it is probable that a difference in concentration at the two electrodes results in a reversal of the reaction.

Teaching Tips

1. Polarity is especially important in this activity.

2. Try a strip made of iron or steel at the negative electrode. How does it compare with the other metal strips?

3. The metal strips which serve as electrodes should be sanded lightly between each use. The aluminum strip will not require sanding, however.

4. You may wish to have more advanced students investigate several variables which would shed light on the properties of this system: (1) what is the relationship between the charging time and the number of handle rotations during discharge? Is there an optimum charging time? (2) Which metal, aluminum or zinc, provides the greater discharge capacity? (3) What is the effect of stirring the solution immediately after charging the system? (4) How long will the electrochemical system retain its charge?