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Easy Microscale Electrolysis of Water

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EASY MICROSCALE ELECTROLYSIS OF WATER

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The following is a quick, easy, visible demonstration which makes an eye-catching introduction to electrochemistry and electrolysis.

Materials

9-volt battery
400 mL beaker
350 mL distilled water
5-8 g (1 teaspoon) Na_2SO_4 or $MgSO_4 \bullet 7H_2O$
2 glass test tubes (13 x 100 mm)
Universal Indicator (Fisher)

Procedure

1. Dissolve the salt (Na_2SO_4 or $MgSO_4 \bullet 7H_2O$) in the water.
2. Add sufficient Universal Indicator to give the solution a strong green color.

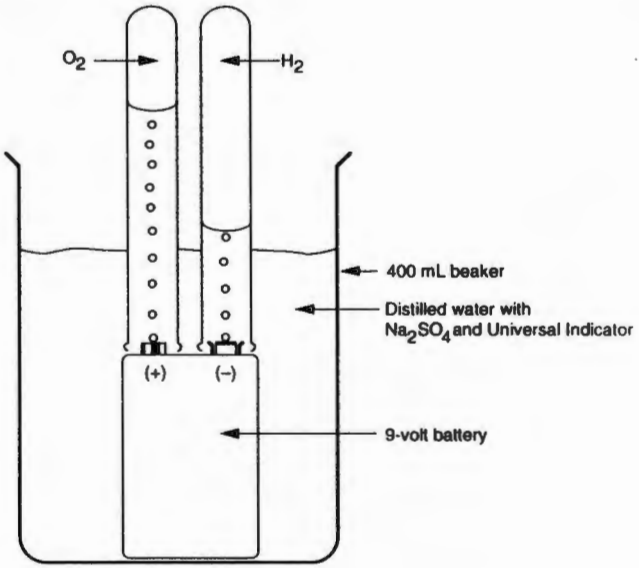

Figure 1

3. Fill the test tubes completely with the solution and invert them in the beaker in such a way that no air is trapped in the tubes.

4. Carefully lower the battery into the solution and stand it against the side of the beaker.

5. Maneuver the test tubes so that each one covers a terminal of the battery. They may lean against the side of the beaker (see Figure 1).

6. Observe for 5-10 minutes. The test tube over the (-) terminal will show a blue color as hydrogen gas is formed while the tube over the (+) terminal will show pink as oxygen gas is formed.

7. When sufficient gas has been collected, one may demonstrate the pop test with the hydrogen and the glowing splint test with the oxygen.

Variations and Questions

1. Utilize NaCl as the salt (rather than Na_2SO_4 or $MgSO_4 \bullet 7H_2O$) in the procedure. What are the products this time? Compare the gas volumes and explain. Are the indicator colors the same? Explain what you see.

2. Utilize KI or NaBr as the salt. Explain all of your observations.

3. Replace the Universal Indicator with red cabbage juice or bromethymol blue. Explain your observations.

4. If you had used H_2SO_4 instead of the salt, how would the results have been different?

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