



Activity: Hydrogen Production by Electrolysis

Secondary level: 13-14 yrs old

Goal of experiment

Use electrolysis to decompose water into hydrogen and oxygen. Begin to understand the impact of clean energy and the power produced from combining water and electricity. Understand the fundamentals of fuel cells.

Items needed for the experiment (per group):

1. low voltage (0-10 V), high current (2A) supplier
2. a glass (about ½ l) container, possible „rectangular” in shape
3. distilled water + salt (NaCl)
4. voltmeter

Instructions for the experiment:

1. Fill container $\frac{3}{4}$ full of water
2. Attach one test lead from the positive (+) terminal of the supplier to an electrode and attach the second test lead to the negative (-) terminal of the supplier and the second electrode.
3. In-between the supplier and one of the electrodes connect the voltmeter to measure the current (look carefully which connector on the voltmeter is used to measure the electrical current in A)
4. Place the electrodes in the water bath without allowing them to touch. Measure the distance between electrodes.
5. Set the voltage to 0 V and change it every 0,1 V, write down the current value
6. Observe. Do not exceed 3 V on the supplier,
7. Add some (one tea spoon) of salt to water and repeat step 5.
8. Observe
9. If you have still some time left, change the distance between electrodes and repeat point 5.



Electrolysis 2 - worksheet

Name _____

Hypothesis:

1. What will happen when we place the electrodes attached to the battery into the water bath?
2. Why is it important not to allow the electrodes to touch each other?
3. What will happen when we add salt to the water bath?

Observations:

1. What do you see on each electrode? Is it the same on both electrodes? What is the difference? When (under which voltage) you see this?
2. What difference did adding salt make?
3. The chemical formula of water is H_2O : it means that water is composed of hydrogen (a light gas that burns) and of oxygen (a gas needed for breathing and burning). Hydrogen is twice as much as oxygen. Thermodynamics suggests that the threshold value for producing hydrogen should be higher than 1,23 V, but this value does not take into account some processes linked to the temperature.

What is the threshold value you measured for which hydrogen and oxygen are formed?

Which electrode (positive or negative) is producing oxygen? And which is producing hydrogen? How can you tell it?

4. Complete the reaction: $\text{H}_2\text{O} \rightarrow \dots + \dots$

Conclusions:

1. How could we trap the gas being produced at the electrodes?
2. What applications would these trapped gases be useful for?