Experiment 3: Water Splitting Experiment

Electrolysis is a process by which a chemical reaction is carried out using electric current. In water electrolysis, water is oxidized at the anode (negative) to produce oxygen and reduced at the cathode (positive) to produce hydrogen. Hydrogen is used to power fuel cell cars and trucks. Electrolysis is one of the cheapest and cleanest ways to produce pure hydrogen gas. The efficiency of the water electrolysis highly depends on the electrodes and the electrolytes used in this process.

Materials: Copper Wire, Graphite Rods, graduated burette, Battery (1.5VAA/9V PP3), Beaker(250ml), Electrolytes (NaCl, $MgCl_2$).

Experimental Procedure:

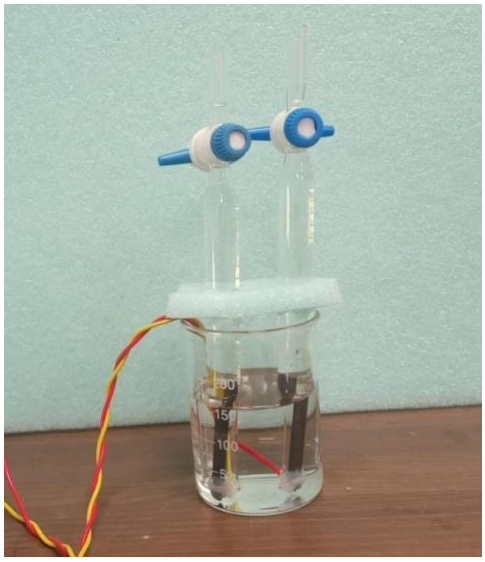
1. Connect the electrodes to the power source.
2. Place the electrodes in a deionized water-filled inverted burette in a Beaker.
3. Apply voltage to initiate electrolysis. Hydrogen gas evolves at the cathode (negative electrode), while oxygen gas evolves at the anode (positive electrode).
4. The chemical reaction is:

$$2H_2O \rightarrow 2H_2 + O_2$$

5. Bubbles should form at each electrode - hydrogen at the cathode and oxygen at the anode collected at the top of the inverted measuring cylinders.
6. Repeat the procedure (step 1-5) with ***tap water***.
7. *Prepare* **NaCl *solution***.
8. Repeat the procedure (step 1-5) with NaCl solution.
9. The Hydrogen gas will start to evolve, and the water level will go down.
10. Start the stopwatch when the water level touches zero.
11. Track and tabulate the level of water level (the volume of Hydrogen gas evolving) in ***every 3 minutes***.
12. *Prepare* **$MgCl_2$ *solution***.
13. Repeat the procedure (step 1-5) with $MgCl_2$ solution.
14. Again, the Hydrogen gas will start to evolve, and the water level will go down. Start the stopwatch when the water level touches zero.
15. Track and tabulate the level of water level (the volume of Hydrogen gas evolving) in ***every minute***.

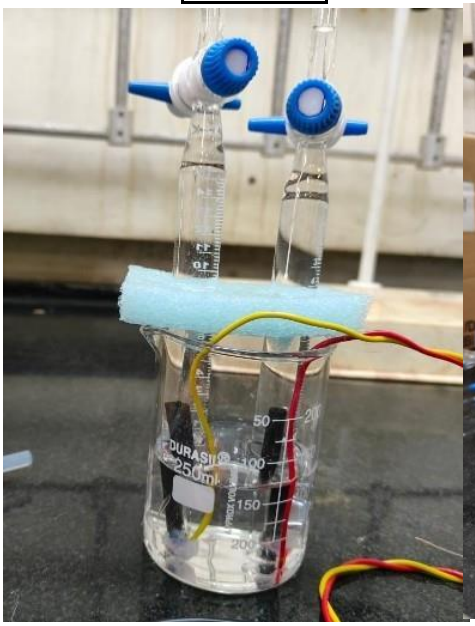
Observations:

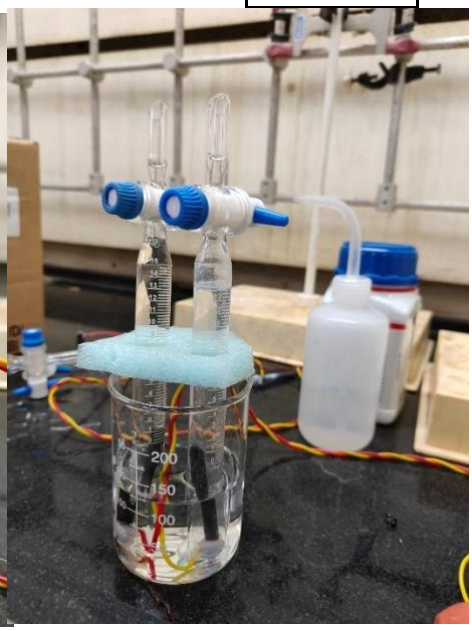
1. A very small amount of hydrogen bubbles will be observed in deionized water, but the amount of hydrogen will increase after addition of electrolytes.



DI water

Tap water





NaCl electrolyte

$MgCl_2$ electrolyte