

Solar water electrolysis using a hydrogen fuel cell

Materials

- Solar fuel cell kit
- 400W lamp or sun
- Voltmeter
- Ammeter

Protocol

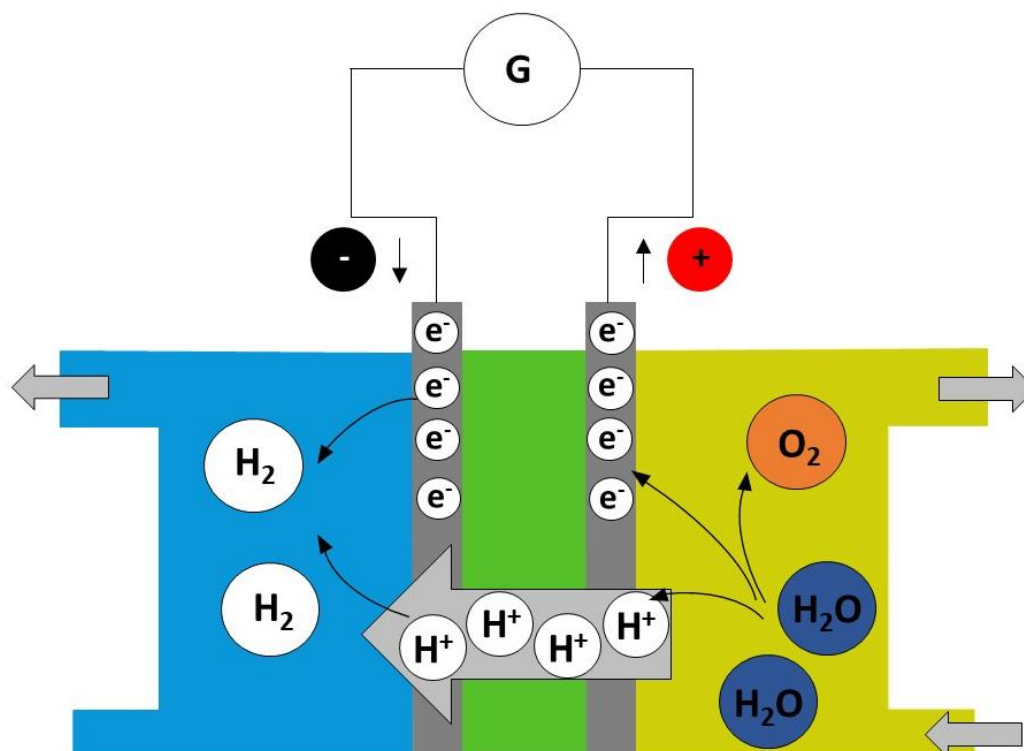
1. To assemble the fuel cell and the solar cell, follow the instructions that came with your solar fuel cell kit.
2. Measure the voltage, current, gas volume every 30 s.
3. Calculate the energy consumption.

At the anode (the positive pole)

Water reacts to form oxygen (O_2) and hydrogen ions H^+ and electrons e^- . The hydrogen ions H^+ pass through the proton exchange membrane (pem) to the cathode. The e^- are blocked by the pem and travel through the electrical circuit.

At the cathode (the negative pole)

Hydrogen ions H^+ and electrons e^- coming from the electrical circuit recombine to form hydrogen (H_2).



Tasks

The reaction observed is an electrochemical reaction, involving the following two redox couples:

$\text{H}^+(\text{aq})/\text{H}_2(\text{g})$ and $\text{O}_2(\text{g})/\text{H}_2\text{O}(\text{l})$.

1. Write down the half-equation at the anode.
Specify whether there is oxidation or reduction.

2. Write down the half-equation at the cathode.
Specify whether there is oxidation or reduction.

3. Write the balance equation for the reaction used to operate the fuel cell.

4. Calculate the energy consumption.