

### 3. Electrolyzer

Have you ever looked at the ocean and thought about it as a source of fuel? If we have an abundant source of electricity such as nuclear, wind, solar and geothermal power source, we can convert water to hydrogen fuel. Remember that hydrogen is the second most abundant element in nature.

In our kit, the electricity produced from the solar cells is then used for water electrolysis. Water electrolysis is an electrochemical reaction in which water splits into oxygen and hydrogen. An electrolyzer is a very efficient system to split water to hydrogen fuel and oxygen.

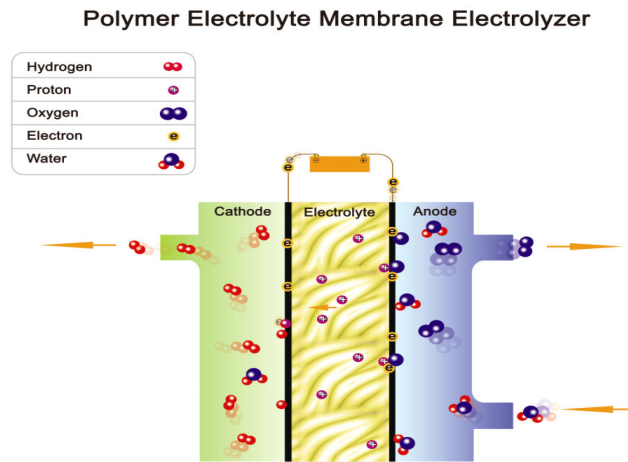
An electrolyzer consists of these components (Figure 5):

1. Anode (positive pole)
2. Cathode (negative pole)
3. Electrolyte
4. Electric supply

Based upon the form and type of electrolytes, different types of electrolyzers exist. Our electrolyzer uses a polymeric electrolyte, which is very similar to the other types with the primary difference being that ours uses a solid polymeric electrolyte membrane to conduct positive ions.

With polar groups in the membrane, water is easily absorbed, but diffusion and the transport of oxygen and hydrogen gases into the membrane are very rare.

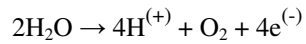
There is a potential difference applied to anode and cathode electrodes.



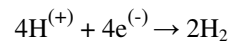
**Figure 5**

## How does a polymeric electrolyzer work?

1. Within the anode, water splits into hydrogen ions, electrons and oxygen gas.

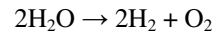


2. Hydrogen ions migrate through the polymeric membrane to the cathode.
3. In the cathode, hydrogen ions take electrons and reduce them to produce hydrogen gas.



The total reaction in the anode and cathode is simply splitting two water molecules into one oxygen and two hydrogen molecules.

General reaction is:



Finally, hydrogen and oxygen molecules that are released from cathode and anode then enter the fuel cell to react and produce energy.