



FACT SHEET N°3

HOW DOES A FUEL CELL WORK?

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by :



Hydrogen can actually be used in fuel cells to generate electricity; for instance, in a vehicle.
But...

WHAT IS A FUEL CELL?



A FUEL CELL IS:

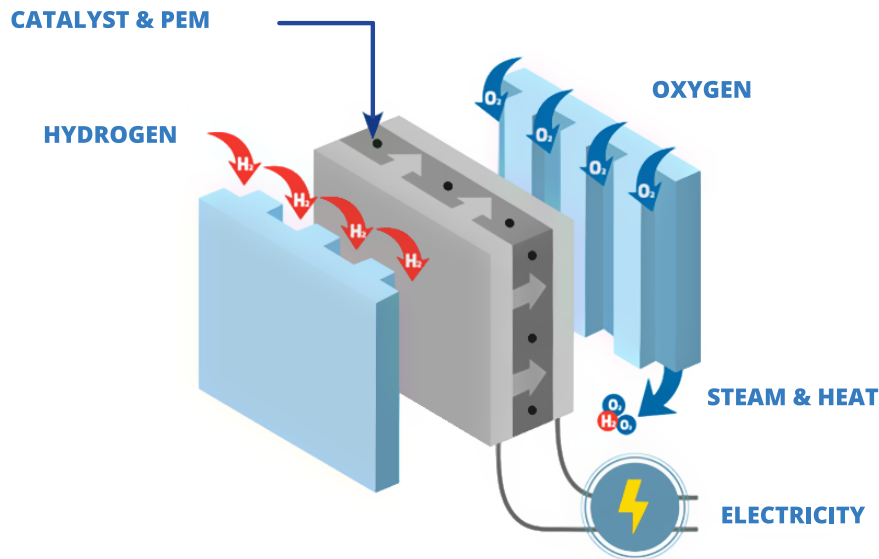
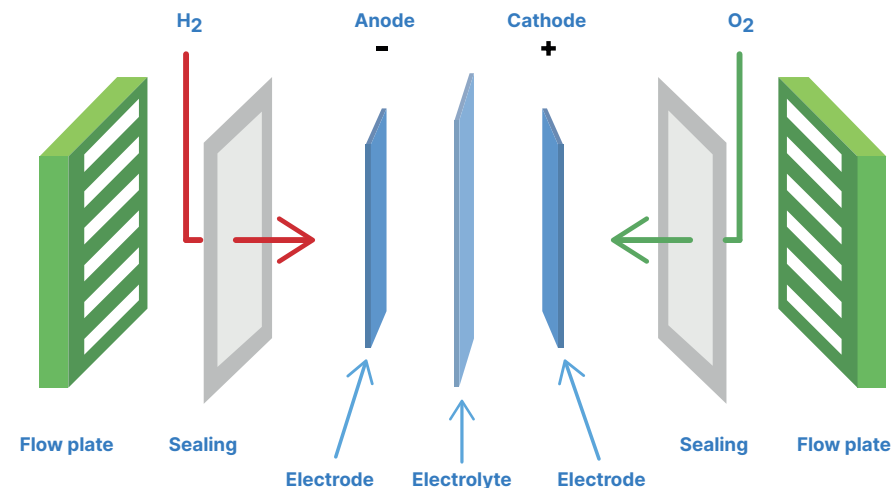
a magic box that turns **hydrogen** and **oxygen** into electricity!



Well, not exactly. A **fuel cell** does in fact allow the production of electricity from **hydrogen** and **oxygen**. However, no magic tricks are involved in the process. Let's see then how a **PEM fuel cell** works!

First, let's see what they're made of. A **fuel cell** is made up of several layers: in the middle we have a membrane or an electrolyte separating the two **electrodes**, the anode and the cathode. The whole thing is then compressed between two flow plates.

Hydrogen travels through the small channels in one plate, and **oxygen** through the other. The membrane in the middle has a secret, it acts as a filter that lets protons through but not electrons.



Gaseous **hydrogen** arrives through small channels in the outer plate. When it reaches the anode, the latter's catalytic power breaks it in two. Two protons and two electrons are formed. The protons travel across the membrane to the other side, where they attach themselves to the **oxygen** to form... water!

The electrons can't get through, remember? They have to take another route to reach the other side. It is this flow of electrons that produces an electricity that can be used to power an electric motor for any other application.

REMEMBER! THERE ARE SEVERAL TYPES OF FUEL CELLS, NAMELY:

PEMFC

Proton **E**xchange **M**embrane
Fuel **C**ells




AFC

Alkaline **F**uel **C**ells

SOFC

Solid **O**xide **F**uel **C**ell

Operating temperature – maturity – deployment:

	60-200°C	60-100°C	700-1000°C
	★★★☆☆	★★★☆☆	★☆☆☆☆
	★★★☆☆	☆☆☆☆☆	★☆☆☆☆

However, these are only the main ones, there is also the **MCFC** (Molten **C**arbonate **F**uel **C**ells), the **PAFC** (Phosphoric **A**cid **F**uel **C**ells) ...

THE MAIN DIFFERENCES

To each technique its advantages and disadvantages.

PEM fuel cells are highly adapted for mobility use. They are light, efficient and reactive.

Alkaline fuel cells are the most mature and are even used by NASA in the Space Shuttle! But they are losing ground to **PEM** fuel cells. The competition is fierce...

SOFCS have excellent efficiency but require high temperatures. They are well suited for high-power applications.





info@hydrogentoday.info



Hydrogen Today



hydrogentoday.info



@h2_today



contact@seiya-consulting.com



Seiya Consulting



seiya-consulting.com

