FUEL CELL
Chemical Energy to Electrical Energy

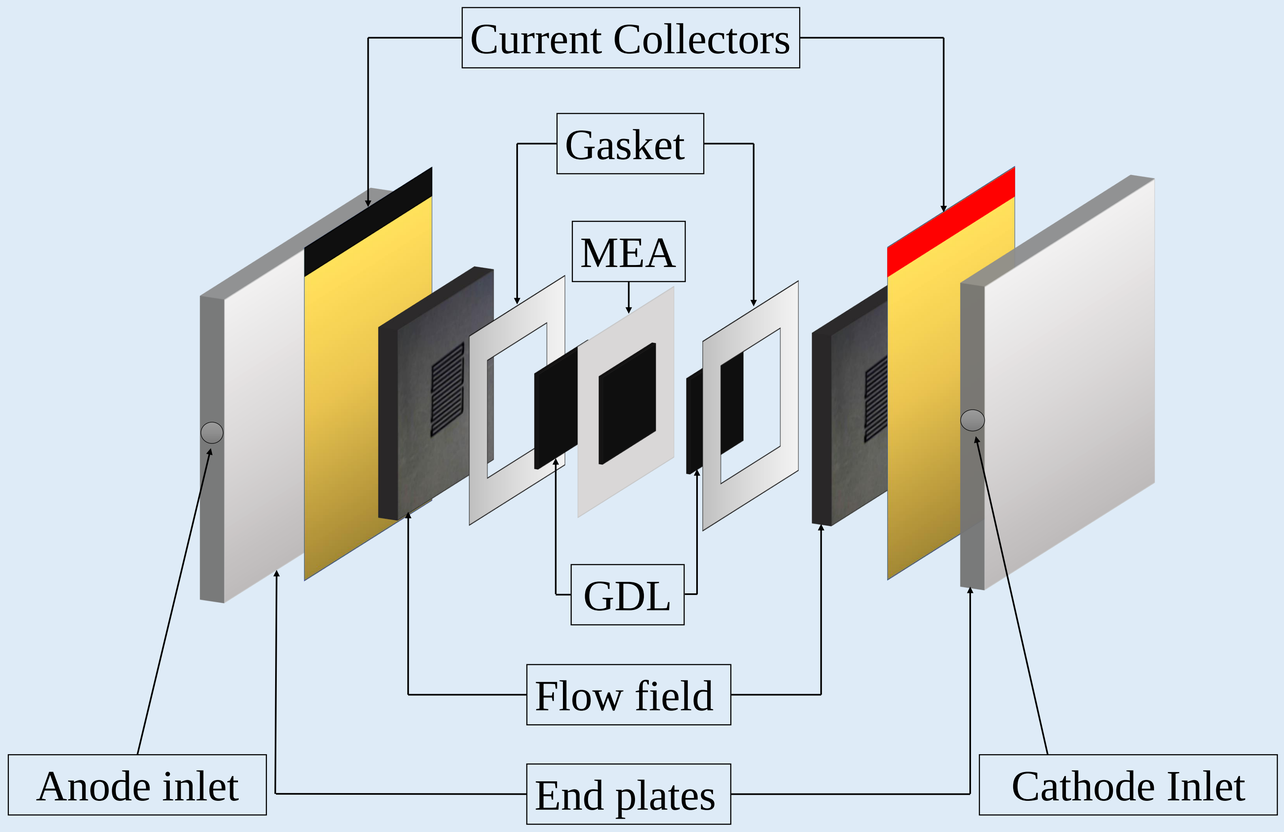
A fuel cell is a device that converts chemical energy stored in hydrogen into electrical energy through an electrochemical reaction at the interface of an anode and a cathode, which are separated by an electrolyte.

TYPES OF FUEL CELLS

Alkaline FC
- KOH electrolyte
- Fuel – Pure H_2
- Space and industrial applications

Solid Oxide FC
- Ceramic electrolyte
- Fuel – H_2 , CO, CH_4
- Industrial, stationary applications

Molten Carbonate FC
- Molten carbonate electrolyte
- Fuel – H_2 , CO, CH_4
- Electrical, industrial & military applications

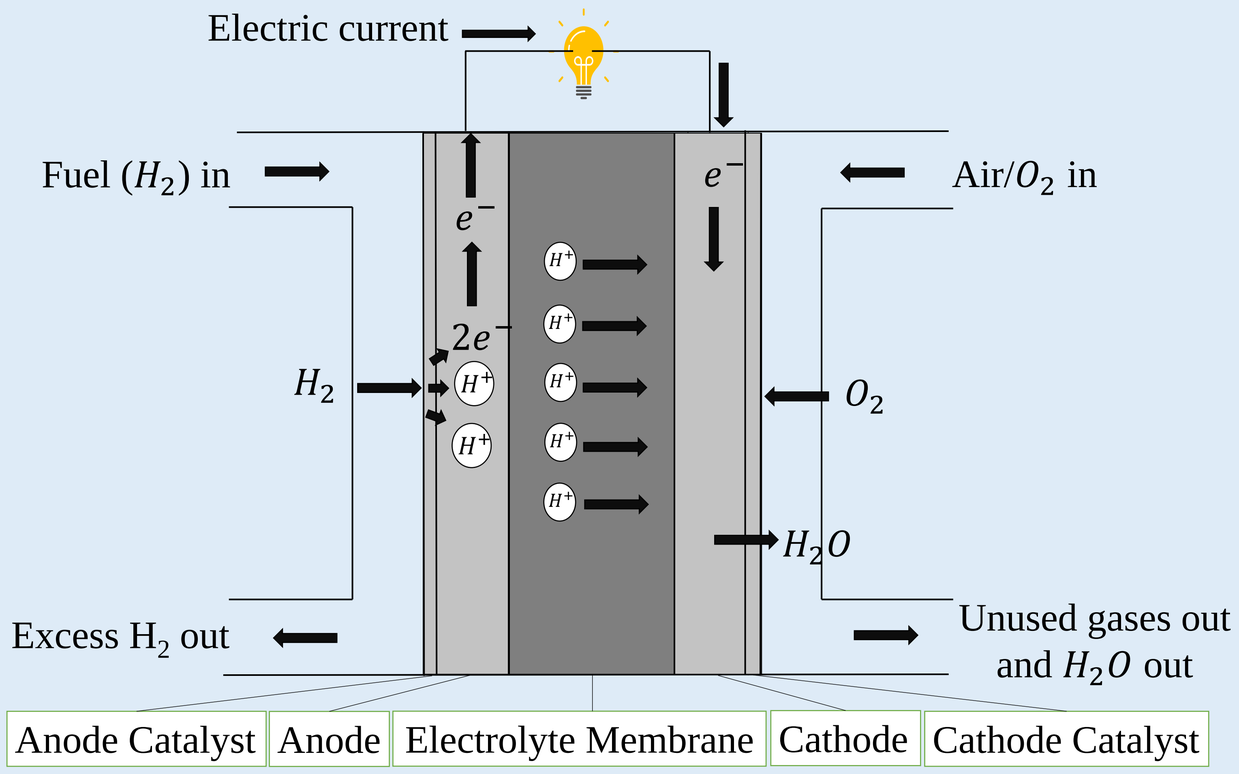


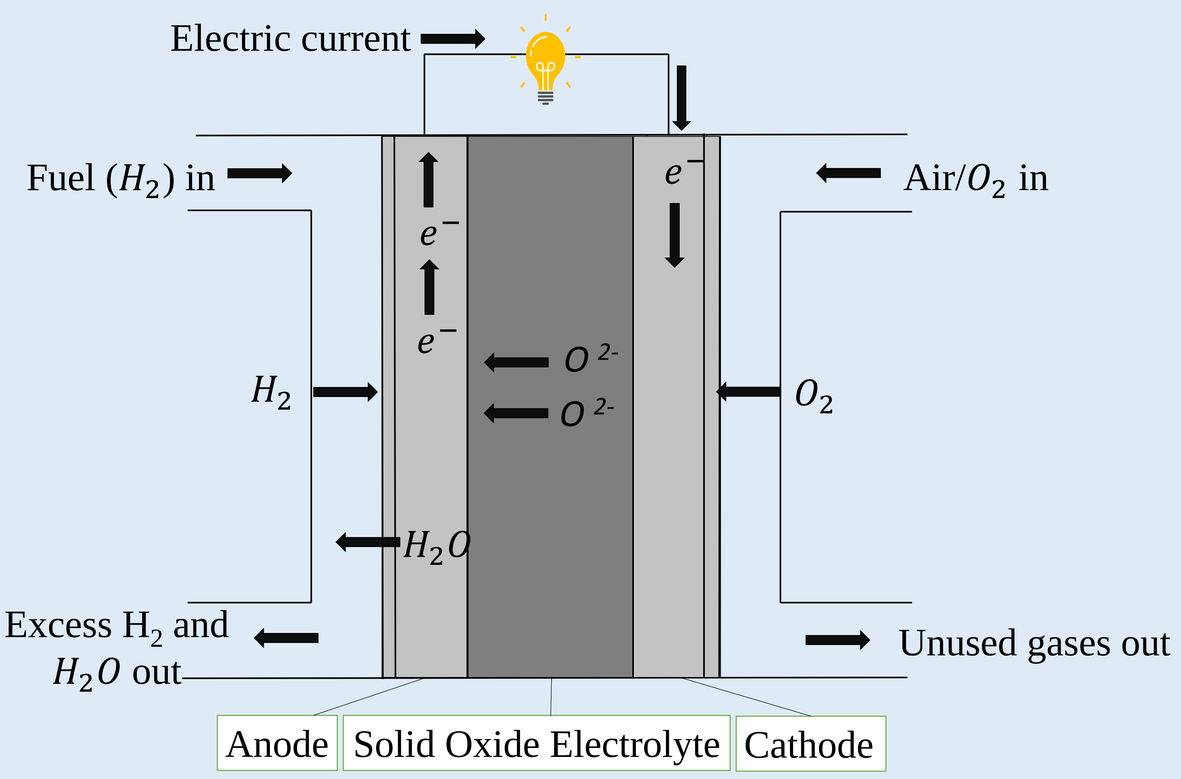
PEMFC
- Polymer electrolyte membrane
- Fuel - Pure H_2
- Space, stationary and transport applications

Direct Methanol FC
- Polymer electrolyte membrane
- Fuel - $CH_3OH + H_2O$
- Portable and some transport applications

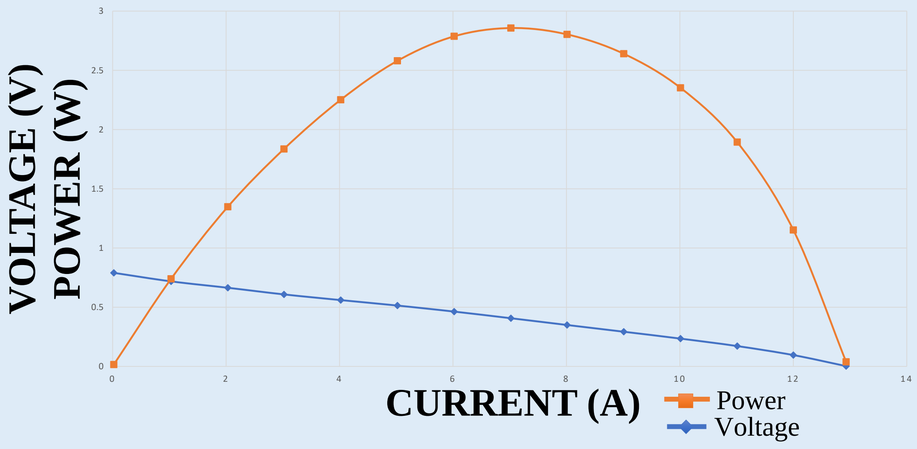
Phosphoric Acid FC
- H_3PO_4 electrolyte
- Fuel- H_2 , CO, CH_3OH
- Transport, stationary applications

	PEMFC	SOFC
Fuel cell reactions	**Anode:** $H_2 \rightarrow 2H^+ + 2e^-$ **Cathode:** $\frac{1}{2}O_2 + 2H^+ + 2e^- \rightarrow H_2O$	**Anode:** $H_2 + O^{2-} \rightarrow H_2O + 2e^-$ **Cathode:** $\frac{1}{2}O_2 + 2e^- \rightarrow O^{2-}$

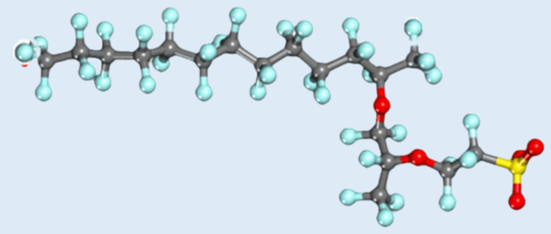




POLARIZATION CURVE



Characteristics	Peak performance at 0.8V
2015 Status	240 mA/cm^2
2020 Target	300 mA/cm^2



$Nafion^{TM}$ membrane structure

Combustion, Gasification and Propulsion Laboratory
Interdisciplinary Centre for Energy Research