

## > Different types of fuel cells

### Different electrolytes for different applications

#### What's the difference between high temperature and low temperature fuel cells?

Low temperature fuel cells need a relatively pure supply of hydrogen as a fuel. This often means that a fuel processor is required to convert or 'reform' the primary fuel (such as natural gas) into pure hydrogen. This process consumes additional energy and requires specialised equipment. High temperature fuel cells don't need this additional process because they can 'internally reform' the fuel at elevated temperatures, so it's not necessary to invest money in hydrogen infrastructure.

#### The main groups are:

Description	Operating Temperature	Electrical Efficiency	Fuel Source
<b>Polymer Electrolyte Fuel Cell (PEFC) or Proton Exchange Membrane Fuel Cell (PEMFC)</b> <b>Electrolyte:</b> Polymer ion exchange membrane. Very good at conducting protons often combined with an expensive platinum catalyst. <b>Best suited to:</b> Fast start up and shut down situations such as automotive and portable applications.	~ 80°C	~ 30 to 35 %	Pure Hydrogen
<b>Phosphoric Acid Fuel Cells (PAFC)</b> <b>Electrolyte:</b> Concentrated phosphoric acid. <b>Best suited to:</b> The design and power outputs make them ideal for buses and large stationary applications.	~ 100 – 220°C	~ 35 to 40 %	Pure Hydrogen
<b>Alkaline Fuel Cells (AFC)</b> <b>Electrolyte:</b> Potassium hydroxide solution. <b>Best suited to:</b> Expensive mission critical applications, such as the USA space program.	~ 150 – 200°C	~ 40 %	Pure Hydrogen
<b>Molten Carbonate Fuel Cells (MCFC)</b> <b>Electrolyte:</b> A combination of high temperature alkali carbonates (sodium or potassium). <b>Best suited to:</b> Large stationary power applications.	~ 550 – 700°C	~ 50 to <70 %	Most hydrocarbons
<b>Solid Oxide Fuel Cells (SOFC)</b> <b>Electrolyte:</b> A solid, non-porous ceramic based metal oxide, often Yttria doped Zirconia material. Because SOFCs operate at high temperature, they offer fuel flexibility without having to specially pre-treat the fuel.	~ 450 – 1,000°C	~ 45 to <70 %	Most hydrocarbons

SOFC are best suited to constant power for stationary applications. Ceramic Fuel Cells is developing SOFC systems for homes and businesses using today's existing fuel sources and infrastructure.