

Comparison of Fuel Cell Technologies

Fuel Cell Type	Electrolyte	Operating Temperature	Applications	Advantages	Disadvantages
Polymer Electrolyte membrane (PEM)	Solid organic polymer poly-perfluorosulfonic acid	60–100°C 140–212°F	<ul style="list-style-type: none"> • electric utility • portable power • transportation 	<ul style="list-style-type: none"> • Solid electrolyte reduces corrosion & management problems • Low temperature • Quick start-up 	<ul style="list-style-type: none"> • Low temperature requires expensive catalysts • High sensitivity to fuel impurities
Alkaline (AFC)	Aqueous solution of potassium hydroxide soaked in a matrix	90–100°C 194–212°F	<ul style="list-style-type: none"> • military • space 	<ul style="list-style-type: none"> • Cathode reaction faster in alkaline electrolyte so high performance 	<ul style="list-style-type: none"> • Expensive removal of CO₂ from fuel and air streams required
Phosphoric Acid (PAFC)	Liquid phosphoric acid soaked in a matrix	175–200°C 347–392°F	<ul style="list-style-type: none"> • electric utility • transportation 	<ul style="list-style-type: none"> • Up to 85% efficiency in cogeneration of electricity and heat • Can use impure H₂ as fuel 	<ul style="list-style-type: none"> • Requires platinum catalyst • Low current and power • Large size/weight
Molten Carbonate (MCFC)	Liquid solution of lithium, sodium, and/or potassium carbonates, soaked in a matrix	600–1000°C 1112–1832°F	<ul style="list-style-type: none"> • electric utility 	<ul style="list-style-type: none"> • High efficiency • Fuel flexibility • Can use a variety of catalysts 	<ul style="list-style-type: none"> • High temperature enhances corrosion and breakdown of cell components
Solid Oxide (SOFC)	Solid zirconium oxide to which a small amount of yttria is added	600–1000°C 1112–1832°F	<ul style="list-style-type: none"> • electric utility 	<ul style="list-style-type: none"> • High efficiency • Fuel flexibility • Can use a variety of catalysts • Solid electrolyte reduces corrosion & management problems • Low temperature • Quick start-up 	<ul style="list-style-type: none"> • High temperature enhances breakdown of cell components