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Alkaline (AFC)	Aqueous solution of potassium hydroxide soaked in a matrix	90-100 ^oC 194-212 ^oF	10-100 kW	60%	• Military • Space	• Quick start-up • Cathode reaction faster in alkaline electrolyte, leads to high performance • Low cost components	• Sensitive to CO_2 in fuel and air • Electrolyte management
Phosphoric acid (PAFC)	Phosphoric acid soaked in a matrix	150-200 ^oC 302-392 ^oF	400 kW 100 kW module	40%	• Distributed generation	• Higher temperature enables CHP • Increased tolerance to fuel impurities	• Pf catalyst • Long start-up time • Low current and power
Molten carbonate (MCFC)	Solution of lithium, sodium, and/or potassium carbonates, soaked in a matrix	600-700 ^oC 1,112-1,292 ^oF	300 kW-3 MW 300 kW module	45-50%	• Electric utility • Distributed generation	• High efficiency • Fuel flexibility • Can use a variety of catalysts • Suitable for CHP	• High temperature corrosion and breakdown of cell components • Long start-up time • Low power density
Solid oxide (SOFC)	Yttria stabilized zirconia	700-1,000 ^oC 1,202-1,832 ^oF	1 kW-2 MW	60%	• Auxiliary power • Electric utility • Distributed generation	• High efficiency • Fuel flexibility • Can use a variety of catalysts • Solid electrolyte • Suitable for CHP and CHHP • Hybrid/GT cycle	• High temperature corrosion and breakdown of cell components • High temperature operation requires long start-up time and limits

Summary and Conclusion

Acid solutions are good electrolytes in PEM electrolyzers because acidic media show high ionic conductivity and are free from carbonate formation, as compared to alkaline electrolytes. However, the acid needs the use of noble metals as electrocatalysts for OER [28]. On the other hand, potassium hydroxide (KOH), sodium hydroxide (NaOH), as well as sodium chloride (NaCl) are used as electrolytes in alkaline electrolyzers. The use of saltwater as a conducting water solution for electrolysis is discouraged because chloride would be oxidized at the anode to produce chlorine gas [27]. KOH is most commonly used in alkaline water electrolyzers because it has higher ionic conductivity than NaOH. KOH is equally used in water electrolysis, avoiding the huge corrosion loss caused by acid electrolytes, and the use of noble metals as catalysts [28]. Nickel is a popular electrode material due to its high activity and availability as well as low cost. Furthermore, adopting a zero-gap cell configuration for the electrolyzer cell electrodes; this technique was found to increase operating current density, while decreasing parasitic ohmic resistance [12, 16, 23, 40].

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