

Parameter	Alkaline Electrolyzer	PEM Electrolyzer	SOEC Electrolyzer	AEM Electrolyzer
Electrolyte	20% ~ 30% KOH	Perfluorosulfonic Membrane	Yttria-Stabilized Zirconia	Divinylbenzene Polymer Carrier
Diaphragm	Asbestos/Polyphenylsulfone, etc.	Perfluorosulfonic Membrane	Zirconia-based Ceramic Membrane	Anion Exchange Membrane
Anode Catalyst	Nickel-plated Perforated Stainless Steel	Iridium Oxide	Perovskite-type	High Surface Area Nickel or NiFeCo Alloy
Cathode Catalyst	Nickel-plated Perforated Stainless Steel	Platinum Nanoparticles	Nickel/Zirconia	High Surface Area Nickel
Operating Temperature/°C	70 ~ 90	50 ~ 80	700 ~ 900	40 ~ 60
Working Pressure/MPa	0.1 ~ 3.0	4.0 ~ 7.0	0.1	<3.5
System Efficiency/%	60 ~ 75	70 ~ 90	85 ~ 100	60 ~ 90
Hydrogen Purity	≥99.8%	≥99.99%	≥99.99%	≥99.99%
Current Density (A·cm ⁻²)	0.2 ~ 0.6	1.0 ~ 2.0	1.0 ~ 10	0.2 ~ 0.4
Energy Consumption (kW·h·m ⁻³)	4.2 ~ 5.9	<4.3	>3.7	—
Hydrogen Pressure (MPa)	0.1 ~ 1.0	>2.0	>0.01	—
Lifespan (h)	6000-80000	8000-60000	20000	/
Porous Transport Layer Anode	Nickel Mesh	Platinum-Plated Sintered Porous Titanium	Nickel Mesh or Foam Nickel	Foam Nickel
Porous Transport Layer Cathode	Nickel Mesh	Sintered Porous Titanium or Carbon Cloth	None	Foam Nickel or Carbon Cloth
Bipolar Plate Anode	Nickel-plated Stainless Steel	Platinum-Plated Titanium	None	Nickel-plated Stainless Steel
Bipolar Plate Cathode	Nickel-plated Stainless Steel	Gold-Plated Titanium	Cobalt-plated Stainless Steel	Nickel-plated Stainless Steel
Technical Maturity Level	8 ~ 9	8 ~ 9	5 ~ 6	2 ~ 3
Industrialization Level	Fully Industrialized	Fully Industrialized	Laboratory to Industrial Transition	Laboratory to Industrial Transition
Advantages	Simple, Technologically Mature, High Reliability, Can Operate at Normal Temperature and Pressure	Long Lifecycle, Good Stability, Low Electrolyzer Corrosion, High Electrolysis Efficiency, Simplified System, Compact Device Structure, High Hydrogen Purity	High Electrolysis Efficiency, Can Reach More than 90%, Low Energy Consumption, Low Cost	Combines the Advantages of Alkaline Water Electrolysis and Proton Exchange Membrane Water Electrolysis
Disadvantages	Low Hydrogen Production Efficiency, High Energy Consumption, Alkali Leakage Environmental Pollution Issues	High Cost ; Requires Precious Metal Catalysts	High Operating Temperature of 600~1000°C, High Temperature Requirements, Key Materials Easily Age at High Temperatures	Polymer Membrane has Low Hydroxide Ion Conduction Rate, Poor Stability; Catalyst Easily Poisoned by Metal Ions