



**TechRVL**

HELPING RESEARCH, DISCOVERY & PROCESSING

**Finest Range of Devices  
For  
Research & Production  
Of  
Green Hydrogen /  
Water Electrolysis**

**Innovating Electrochemistry For Lives...**



# Water Electrolysis & Green Hydrogen Research/Production Products

## Electrolyzers (Research & Learning Purpose)

### AEM Electrolyzer

Alkaline anion exchange membrane water electrolyzer hardware

Electrode Area: 5 cm<sup>2</sup>

Electrode Material: corrosion resistant Nickel anode and cathode flow fields

MEA with base metal catalysts

Metal gas diffusion layers

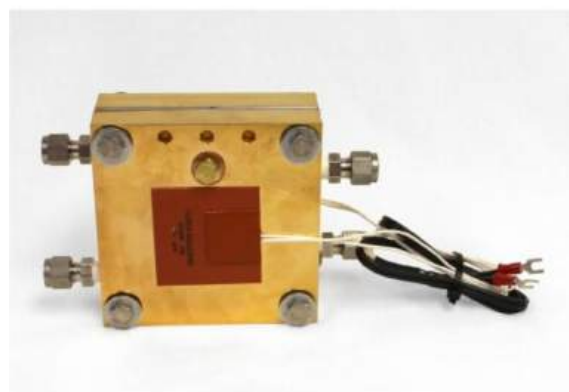
Includes O-ring seals, and Teflon gasketing

Operating conditions: 1 A/cm<sup>2</sup> at about 1.9 V at 60 °C in flowing 1 M KOH

Note that there are no heaters or cables included.



### PEM Electrolyzer Test Hardware



Active Area: 5cm<sup>2</sup> or 50cm<sup>2</sup>

Endplates made from gold plated stainless steel

Adhesive backed heater pads on each endplate to add heat

Intermediate plates: Titanium

MEA Testing Hardware

Includes

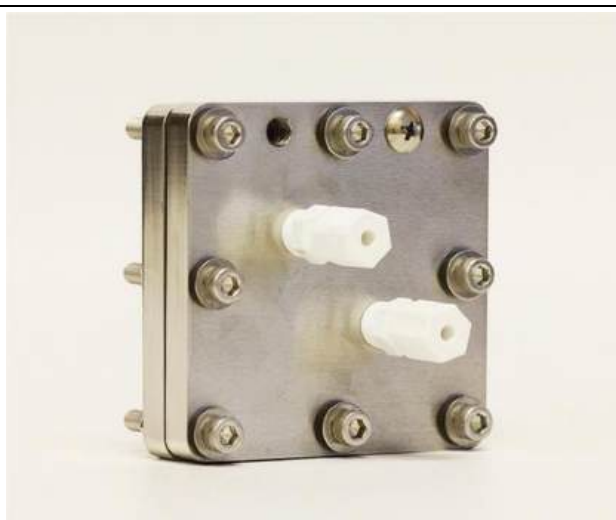
Four 1/8" NPT x 1/4" compression fittings & internal seal O-rings

Grade 5 nuts and bolts, 10-32 truss screws for electrical or thermal

connections, 1/4" -20 brass bolt with copper washer for load connections

### CO<sub>2</sub> Electrolyzer

- Electrode Area: 5 cm<sup>2</sup>
- Titanium anode flow field,
- 904 L Stainless Steel cathode flow field,
- catalyst covered electrodes for anodes and cathodes of 5 cm<sup>2</sup> cell,
- Sustainion® membrane,
- Nuts and bolts,
- o-rings and
- insulating kit and electrolyzer testing service.



# Electrolyzers (Commercial & Production Purpose)

## LBE-PSC (PEM Water Electrolyzer Small Stack - 1 Cell)

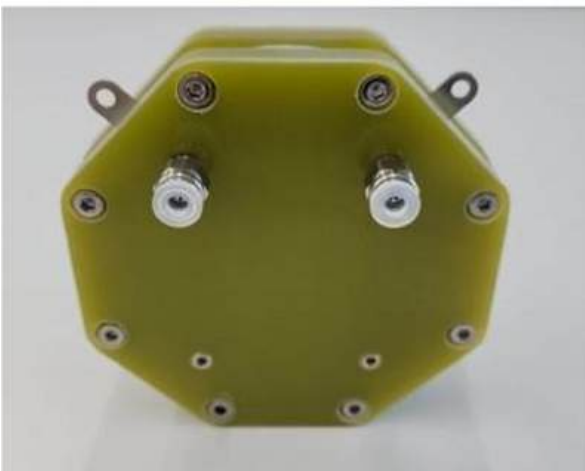
- Material (non-wetted parts): Anodized aluminum as the endplates
- Material (wetted parts): Titanium (as the current collectors and diffusion layers)
- Membrane: Nafion 117
- Current range: 0 -40 Amps (at ~1.8V per cell)
- Voltage range (at the terminal of the stack): 1.7 - 2V
- Number of cells in the stack: 1 cell
- Input power range: 10 - 80 Watts
- Operating temperature range: 15 - 70 °C
- Active area: 25 sq cm
- H<sub>2</sub> generation rate: 0 - 370 mL/min
- O<sub>2</sub> generation rate: 0 - 185 mL/min
- Physical dimensions: 100mm x 100mm x 27mm
- Water supply for anode: Type I DI-water, 16-18 MegaOhms DI-water



## LBE-5C (Alkaline Water Electrolyzer Large Stack - 5 Cell)

Size: 265 X 265 X 61 mm

- Material: FRP, Engineering plastic
- Number of Cells: 5
- Active Area: 177 sq cm
- Membrane: Proprietary porous polymer
- Electrode Material: Proprietary nickel based electrode
- Electrolyzer Current Range: 60 - 100 Amps (at ~1.8V per cell)
- Electrolyzer Power Range: 150 W - 800 W
- Electrolyzer Operating Voltage Range: 8 - 10V
- Electrolyte: Alkali Solution (KOH, 30 wt%)
- Recommended Flow Rate: 1500 mL/min at power; min. rate 1000 mL/min
- Hydrogen Flow Rate Range: 0 - 3.5 L/min
- Oxygen Flow Rate Range: 0 - 1.75 L/min
- Operating Temperature Range: 10 - 80°C



## LBE-SC (Alkaline Water Electrolyzer Small Stack - 1 Cell)

Active Area per Cell: 15.2 cm<sup>2</sup>

- Size: 100 x 100 x 27 mm
- Material: FRP, Engineering plastic
- Number of Cells: 1
- Membrane: Proprietary porous polymer
- Electrolyzer Current Range: 6 - 10A (at ~1.8V)
- Operating Temperature Range: 15 - 70°C
- Electrolyte: Alkali Solution (KOH, 30wt%)
- Recommended Flow Rate: 800 mL/min at power; min. rate 300 mL/min
- H<sub>2</sub> Flow Rate: 70 mL/min
- O<sub>2</sub> Flow Rate: 35 mL/min
- Applied Voltage Range: 1.7 - 2V
- Power Capacity Range: 2.5 - 20W

# Fuel cell (Research & Learning Purpose)

## PEM/Methanol Fuel Cell Hardware

Available active area sizes: 5 and 25 cm<sup>2</sup>

Available Heater control voltage: 110 or 220VAC

- Gold plated current collectors
- Machined graphite separator plates
- Banana plugs for monitoring voltage
- Belleville washer
- Built-in silicon rubber heaters (120 watt) for maintaining cell temperature
- Nylon fittings for gas tight connection to 1/4" tubing
- **Gaskets:** Silicone (standard)
- **Size (H x W x L):** 11cm x 9.5cm x 4.5cm
- **Weight (pounds):** 3
- **Fuel Compatibility:** O<sub>2</sub>, H<sub>2</sub>, air, methanol, ethanol, liquid acid/base electrolyte
- **Normal Operating Temp:** 65 to 75 °C
- **Maximum Temp:** 180 °C
- **Thermocouple Insert Hole:** 0.080" or 0.185"



## PEM Fuel Cell Stack (Industrial/Production)

**Options:** 12W to 5000W

### 100W Fuel Cell Specifications

**Number of Cells-** 20

**Rated Performance-** 12V @ 8.3A

**Hydrogen Supply Valve Voltage-** 12V

**Purging Valve Voltage-** 12V

**Blower Voltage-** 12V

**Reactants-** Hydrogen and Air

**Ambient Temperature-** 5 - 30 C; (41 - 86 F;)

**Max Stack Temperature-** 65 C (149 F)

**Hydrogen Pressure-** 0.45 - 0.55 Bar

**Humidification-** Self-humidified

**Cooling-** Air (integrated cooling fan)

**Controller Weight-** 400g ± 30g

**Stack Weight (with Fan & Casing)-** 1290g ± 50g

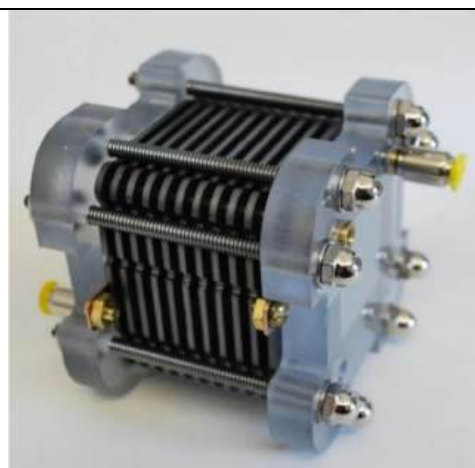
**Hydrogen Flow Rate at Max Output-** 1.3 L/min

**Stack Size-** 118 x 104 x 94mm (4.6" x 4.1" x 3.7")

**Hydrogen Purity Requirement-** ≥ 99.995% (dry H<sub>2</sub>)

**Efficiency of System-** 40% at 12V

**Low Voltage, Over Current, Over Temperature Protection**



## Direct Methanol Fuel Cell Flex-Stack

**Available Flex Stack Cells:** 1, 5, 10 and 20

### Technical Specifications:

- Power: 0 to 20 milliwatts per cell
- Active Area of Cell: 10 cm<sup>2</sup>
- Flow Rate: 10 cc/min per cell
- Operates on 3% by mass of methanol-in-distilled water
- Concentration of Methanol to be Used: 1 molar
- Recommended Torque Value: 8-10 inlbs

# Electrolyzer/Fuelcell Accessories

## Catalyst (Fuel cell)

### Platinum based electrodes



**Low Loading Electrodes** (e.g. 0.03mg/cm<sup>2</sup>, 0.3mg/cm<sup>2</sup>, etc.)

**High Loading Electrodes** (e.g. 2.0mg/cm<sup>2</sup>, 4.0mg/cm<sup>2</sup>, etc.)

	Woven Carbon Fiber Cloth (Low cost)	Carbon Fiber Paper - Sigracet 22 BB (High Cost)
Material Type	Woven Carbon Fiber Cloth (Low cost)	Carbon Fiber Paper - Sigracet 22 BB (High Cost)
Available size:	5x5, 10x10, 20x20, 30x30, 40x40	10x10, 20x20, 30x30, 40x40
Products	0.03 mg/cm <sup>2</sup> 20% Platinum on Vulcan - Carbon Cloth Electrode (W1S1011)	0.2 mg/cm <sup>2</sup> 20% Platinum on Vulcan - Carbon Paper Electrode
	0.2 mg/cm <sup>2</sup> 20% Platinum on Vulcan - Carbon Cloth Electrode (W1S1011)	0.3 mg/cm <sup>2</sup> 40% Platinum on Vulcan - Carbon Paper Electrode
	0.3 mg/cm <sup>2</sup> 40% Platinum on Vulcan - Carbon Cloth Electrode (W1S1011)	0.5 mg/cm <sup>2</sup> 60% Platinum on Vulcan - Carbon Paper Electrode
	0.5 mg/cm <sup>2</sup> 60% Platinum on Vulcan - Carbon Cloth Electrode (W1S1011)	2 mg/cm <sup>2</sup> Platinum Black - Carbon Paper Electrode
	2 mg/cm <sup>2</sup> Platinum Black - Carbon Cloth Electrode (W1S1011)	4 mg/cm <sup>2</sup> Platinum Black - Carbon Paper Electrode
	4 mg/cm <sup>2</sup> Platinum Black - Carbon Cloth Electrode (W1S1011)	

### Platinum Ruthenium based electrodes

Platinum / Ruthenium based Gas Diffusion Electrodes (GDE)

Platinum / Ruthenium Loaded Electrodes

Loading range 0.03mg/cm<sup>2</sup> to 4mg/cm<sup>2</sup>

Available material type: Woven Carbon Fiber Cloth (W1S1011) (low cost), and Carbon Fiber Paper - Sigracet 22 BB (high cost)

Available product:

2 mg/cm<sup>2</sup> Platinum Ruthenium Black - Carbon Cloth Electrode (W1S1011),

4 mg/cm<sup>2</sup> Platinum Ruthenium Black - Carbon Cloth Electrode (W1S1011),

2 mg/cm<sup>2</sup> Platinum Ruthenium Black - Carbon Cloth Electrode (W1S1010),

4 mg/cm<sup>2</sup> Platinum Ruthenium Black - Carbon Cloth Electrode (W1S1010).

2 mg/cm<sup>2</sup> Platinum Ruthenium Black - Carbon Paper Electrode (Carbon Fiber Paper),

4 mg/cm<sup>2</sup> Platinum Ruthenium Black - Carbon Paper Electrode (Carbon Fiber Paper),



# Membranes

## Proton (Cation) Exchange Membrane

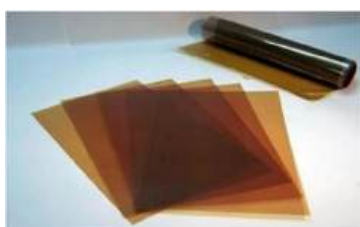
Available size (cm<sup>2</sup>): 10x10, 20x30 s 30x30



Fumasep	Nafion
Fumasep FKS	Nafion N-112
Fumasep FKE	Nafion NE-1135
Fumasep FKS-PET	Nafion N-115
Fumasep FKB-PK	Nafion N-117
Fumasep FAL-PK	Nafion NE-1110
Fumasep FKD-PK	
Fumasep FKE	

## Anion Exchange Membrane

Available size (cm<sup>2</sup>): 10x10, and 20x30



Fumasep	Sustainion
Fumasep FAA-3-PK	Sustainion X37
Fumasep FAB-PK	Sustainion X37 FA
Fumasep FAD-PET	Sustainion E28
Fumasep FAS-PET	Sustainion B22
Fumasep FAS	Sustainion E30
Fumasep FAAM	
Fumasep FAP	

## Bipolar Membrane

Fumasep FBM - Bipolar Membrane Features:

- Application: Salt Splitting
- Bipolar Exchange Membrane
- Stability range (pH) at 25 °C: 1 - 14
- Can withstand high caustic concentrations
- Thickness: 130 - 160 micrometers (5 -6 mil)
- Size: 20cm x 30cm 130 - 160 μm (microns)
- 130 - 160 μm (microns)



## Chlor-alkali Production Membrane

GI-N417 PTFE Fabric Reinforced Perfluorosulfonic Acid (PFSA) Membrane

Available size: 10x10, 20x20, 30x30, and 60x60 cm



## Dispersions



### Nafion Solution (Teflon)

D-520/521 (5%), D-1020/1021(10%), D-2020/2021(20%)

Available Volume: 10ml, 100ml, 250ml, 500ml

Teflon™ PTFE DISP 30 Fluoropolymer Dispersion  
Teflon™ FEPD 121 Fluoropolymer Dispersion



### Fumion

#### Fumion FAA-3-SOLUT-10

Available Volume: 125ml, 250ml, and 500ml

<b>Ionomer Type</b>	Anion Exchange Polymer
<b>Polymer Type</b>	Polyaromatic Polymer



### Sustainion

Available Volume: 25ml

Sustainion® XA-9 Alkaline Ionomer - 25 mL

Sustainion® XB-7 Alkaline Ionomer - 25 mL

Sustainion® XC-2 Alkaline Ionomer - 25 mL

## Gaskets



### Teflon Gasket

Available Size: 12" x 12"

Available Thickness (in): 0.001'' - 0.125''



### Silicon Gasket

Available Size: 12" x 12"

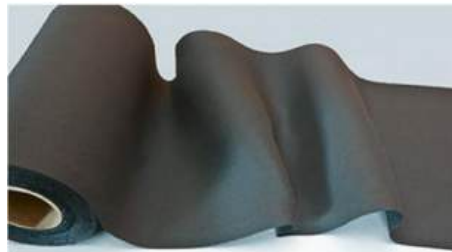
Available Thickness (in): 0.010'', and 0.020''

## Gas Diffusion Layers

### Conducting Carbon Cloth

Available size: 10x10, 20x20, and 40x40cm

Carbon Cloth with MPL  
Carbon Cloth without MPL  
Carbon Cloth with Hydrophilic MPL



### Conducting Carbon Paper

AvCarb EP40, P50, EP55, GDS1120  
Carbon Paper Without Microporous Layer (MPL)  
Sigracet AA



### Wet Proofed Carbon Paper

Toray Carbon Paper 030, 060, 0G0, 120,  
AvCarb EP40T, P50T, P75T, EP55T  
Sigracet BA, BC

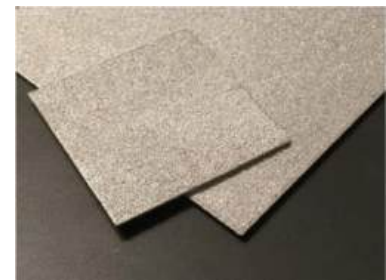
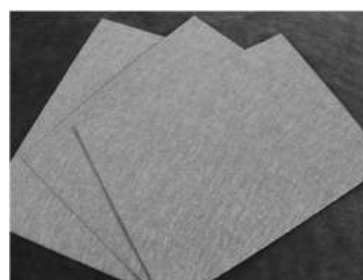
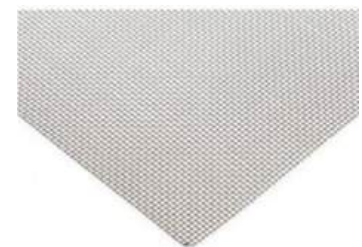
### Carbon s Graphite Felts

AvCarb Soft Carbon/Graphite Battery Felt  
PAN carbon/Graphite felt  
CT carbon/Graphite felt



### Wire Mesh

Nickel Foam (80-120 PPI)  
Stainless Steel Wire Cloth (SS316)  
Electroformed Fine Nickel Wire Mesh  
Platinized Titanium Screen/Fibre felt  
Titanium Screen/Frit/Fibre felt

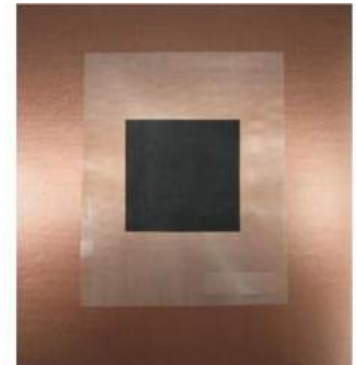




## Membrane Electrode Assembly (MEA)

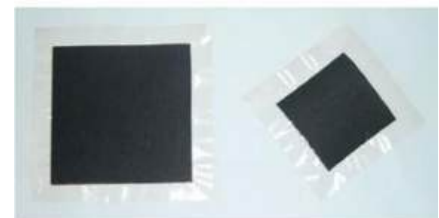
### Direct Methanol Fuel Cell MEA - 3 Layer/Direct Methanol Fuel Cell MEA - 5 Layer

Active Area	Membrane Area
2.2cm x 2.2cm	10.0cm x 10.0cm
5.0cm x 5.0cm	10.0cm x 10.0cm
7.1cm x 7.1cm	13.0cm x 13.0cm
10.0cm x 10.0cm	13.0cm x 13.0cm



### Hydrogen Oxygen MEA - 3 Layer/Hydrogen Oxygen MEA - 5 Layer

Active Area	Membrane Area
2.2cm x 2.2cm	10.0cm x 10.0cm
5.0cm x 5.0cm	10.0cm x 10.0cm
7.1cm x 7.1cm	13.0cm x 13.0cm
10.0cm x 10.0cm	13.0cm x 13.0cm

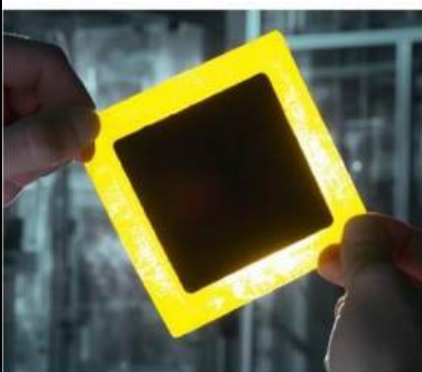
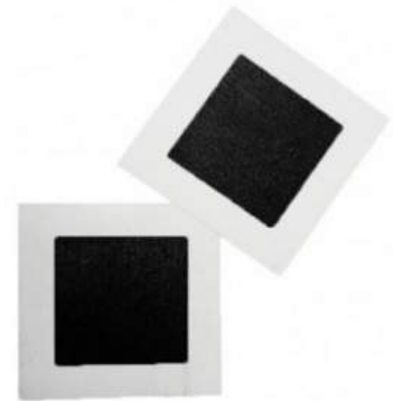


### MEA for PEM Research Test Cell

- Active Area: 256.5 x 97.5 mm
- Membrane Area: 310 x 115 mm

#### Specifications:

- Membrane Type: Nafion™ 212
- Anode Loading & Catalyst: 0.3 mg/cm<sup>2</sup> Platinum on Carbon 40%
- Cathode Loading & Catalyst: 0.3 mg/cm<sup>2</sup> Platinum on Carbon 40%
- Gas Diffusion Layer: Sigracet 28BC
- Gas Diffusion Layer Type : Carbon Paper



### High Temperature PEM Fuel Cell MEA

Available Size: 25, 45, 165cm<sup>2</sup>

Temperatures between 120 and 180 °C

It can tolerate large concentrations of carbon monoxide as well as being able to run independently of humidification.



**OUR VALUABLE CUSTOMER LIST**



**TechRVL**  
HELPING RESEARCH, DISCOVERY & PROCESSING



**RVL Scientific & Engineering Private Limited**  
An ISO 9001:2008 Manufacturing Company.

B - 1289, Indira Nagar, Lucknow - 226016.

Tel : +91 522 2340473

Cell : +91 9935506873, 9335908173

E-mail : info@rvltech.com

Web : www.rvltech.com

Authorised Dealer

