


COMPOSITE BIPOLAR PLATES DATASHEET

FOR THE NEXT GENERATION OF FUEL CELLS AND REDOX FLOW BATTERIES

HYCCO® has developed a manufacturing process to produce composite bipolar plate for high and low temperature PEMFCs, direct methanol fuel cells and REDOX batteries.


1.6 g/cm³
bipolar plates


Corrosion resistant


180°C - High temperature resistant


0.38mm web thickness


30000+ service life in hours

Plates produced with HYCCO technology are simultaneously light, durable, and compact. Our developments show an excellent resistance to various corrosive chemical environments.

Ageing tests have been realized in LT-PEMFCs application (cyclic voltammetry), HT-PEMFCs (1000h ageing test in FC environment). REDOX ageing tests are ongoing.

TECHNICAL DATA¹

Property	Units	Value
Density ²	g/cm ³	1.6 – 1.8 g.cm ⁻³
Hydrogen permeability	[mol/s/m/MPa]	5 x 10 ⁻⁸ @ 1 bar @ NTP
ASR (Through plane @1.4 MPa)	mΩ·cm ²	10
Constant use temperature	°C	180°C (HT-PEM), 150°C (LT-PEM)
Web thickness (as of today)	mm	0.38
Web thickness (2024 target)	mm	0.12
Corrosion resistance	µA/cm ²	<1 ³

¹On 0.38mm thick plate

²Depends on polymer used

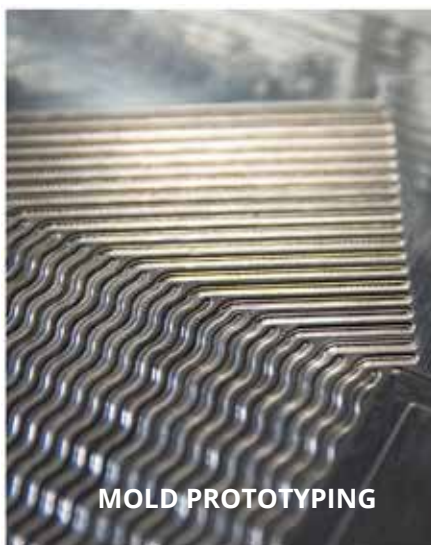
³Accelerated ageing test have been conducted, using cyclic voltammetry on plate samples. Corrosion effect in LT-PEM FC have been quantified and analysed. More information are available on demand.



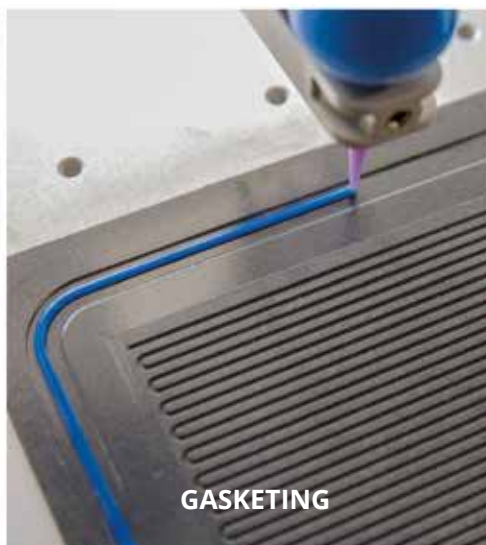
Hydrogen
Carbon
Components

HYCCO

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MOLD PROTOTYPING



GASKETING



PEM TESTING

IMPACT ANALYSIS

HYCCO's material is compared with composite, metallic and soft graphite plates on a typical 120 kW LT-PEMFC.

LT-PEMFC Bipolar Plate type

Parameters	HYCCO® (as of today)	HYCCO® (2024 targets)	SS Metal	Composite	Expanded / Soft Graphite
Stack power P (kW)	120	120	120	120	120
Active area S_a (cm ²)	800	800	800	800	800
BP Web thickness (mm) ⁴	0.38	0.2	0.1	2	0.9
BP Density (g/cm ³)	1.6	1.6	8.2	2	2
Nominal cell voltage (V)	0.7	0.7	0.7	0.7	0.7
Stack voltage (V)	100.5	100	100.4	100.5	100
ASR (mΩ.cm ²) ⁵	10	5	4	20	5
Current density J (A/cm ²)	1.5	1.5	1.5	1.5	1.5
Power per cell (W)	804	822	825.6	768	822
Number of cells needed	150	146	146	157	146
Stack weight (kg) ⁶	26.2 (-17.9%)	17.3 (-45.8%)	31.9 (Ref)	58.9 (+84.5%)	52.6 (+64.8%)
Power density (kW/kg)	4.6 (+17.9%)	6.9 (+82.5%)	3.78 (Ref)	2 (-84.4%)	2.3 (-39.1%)
Volumetric density (kW/L) ⁷	2.5 (-34%)	3.4 (+10.5%)	3.8 (Ref)	1.4 (-63%)	2.1 (-44.7%)

⁴HYCCO uses constant 0.38mm thickness design, like metallic bipolar plate. Composite use variable thickness which makes the exact computation hard to define. For composite design, we used 2mm thick raw plate -33% to take in account channels. For soft graphite, we used constant 0.9mm thick raw plate.

⁵ASR of a single plate (no cooling channel). The final computation is done on assembled bipolar plate: 2x10 mΩ.cm² for HYCCO®, 2x5 mΩ.cm² for graphite and 2x20 mΩ.cm² for composite.

⁶Hypothesis from literature on metallic bipolar plate, where 75% of the total stack weight comes from bipolar plates.

⁷Hypothesis: 0.4mm for MEAs. Assembled BPP thickness: 1.4mm (HYCCO as of today), 1mm (target HYCCO 2024), 0.9mm (metal), 2.6mm (composite), 1.8mm (Graphite)



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