



# HYPROOF TECHNOLOGY

## Product Brochure

HYPROOF  
汉丞科技

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# COMPANY PROFILE

Hyproof Tech. was founded in 2016. Focus on innovated science and advanced technology, Hyproof Tech. is committed to research, development, production and sales of novel fluorinated materials, reinforced nano-microporous membranes and composite products. It is a high-tech enterprise, which is recognized as "refined innovative enterprise" by government, and won the second prize of Science and Technology Award of China Textile Industry Association.

Headquartered in Shanghai, Hyproof Tech. has five subsidiaries: Hyproof New Energy, Hypem New Energy, Handan Fine Chemicals, Hyproof New Materials, and Hyfertile Environmental Technology, a collection of R&D, production, sales and service enterprises.

Hyproof Tech. takes "scientific and technological innovation" as its core competitiveness, with scientists of many years of experience in the technology of reinforced nano-microporous membrane materials, product design, development and commercialization. The company has about 40 invention patents and utility patents, including nearly 30 invention patents (8 foreign invention patents).



Hyproof Tech. has four business division according to product application fields: Renewable energy, industrial, functional textile and agricultural environmental protection.

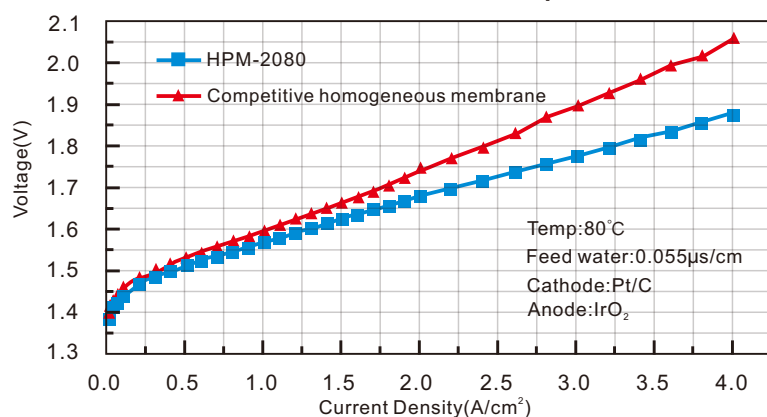
"Membrane Technology, Smart Manufacture", perfectly shows the entrepreneurial spirit of Hyproof people's aggressiveness, innovation in science and technology to serve the world. All Hyproof people will uphold the determination of "powering better Earth with science and technology, and escorting a beautiful environment with new materials", striving to be the leader in the new material industry!

# HYPROOF

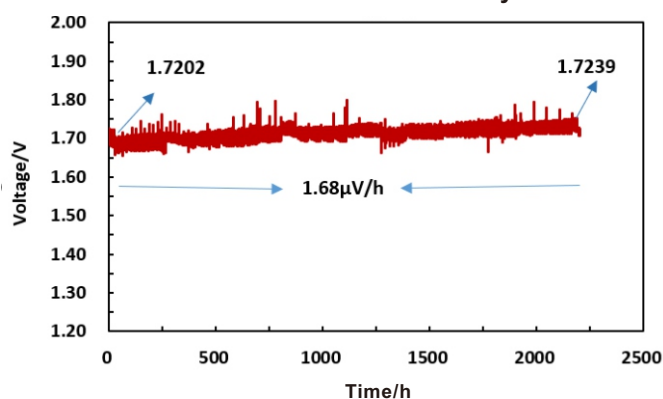


## Comparison of Competitive PEM Products

Polarization Performance Comparison Curves



HPM-2080 durability



Specification	HPM-2080 Reinforced		Competitive Homogeneous Membrane	
Thicknesss, μm	80		182	
Gammage ,g/m <sup>2</sup>	113		360	
Density ,g/cm <sup>3</sup>	2. 05		1.97	
Ionic Exchange Equivalent Weight,g/mol	950-1000		950-1000	
Water Content,%	5		5	
Water Absorption,%	>30		38	
Tensile Strength,Mpa	TD>35	MD>35	TD:32	MD:43
Breaking Elongation,%	TD> 100	MD> 100	TD:225	MD:310
Elastic Modulus,Mpa	TD> 250	MD> 250	249	249
Hydrogen permeability,Barrer (35°C, 5 Bar,H <sub>2</sub> )	5. 65		6. 1	
Membrane Electrode Fabrication/Encapsulation	Dry/Dry		Wet/Wet	
Linear Expansion Coefficent(25°C/24h),%	≤5		10-15	
Linear thermal Expansion Coefficent(100°C/2h),%	≤5		30	



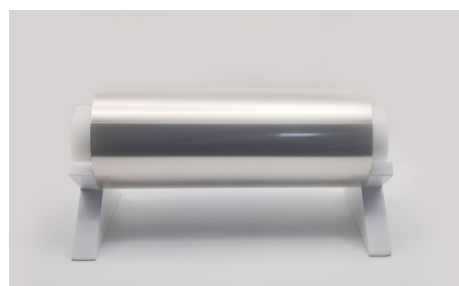
## Product Specification of Proton Exchange Membrane

Specification	HPM-2050		HPM-2080		Test Standards
Thicknesss,μm	50±2		80±3		GB/T20043.2022
Density,g/cm <sup>3</sup>	2.0±0.05		2.0±0.05		GB/T20043.2022
Ionic Exchange Equivalent Weight,g/mol	900-1000		900-1000		GB/T20043.2022
Proton Conductivity, ms/cm 25°C	≥60		≥60		GB/T20043.2022
	TD	MD	TD	MD	
Tensile Strength,Mpa	≥35	≥35	≥35	≥35	GB/T20043.2022
Breaking Elongation,%	≥100	≥100	≥100	≥100	GB/T20043.2022
Elastic Modulus,Mpa	≥250	≥250	≥250	≥250	GB/T20043.2022
Water Swelling Rate (25°C/24h),%	≤5		≤5		GB/T20043.2022
Water Swelling Rate (80°C/24h),%	≤5		≤5		GB/T20043.2022



### Reinforced Perfluorosulfonate Proton Exchange Membrane

Perfluorosulfonic acid proton exchange membrane is a solid polymer electrolyte with excellent heat resistance, mechanical properties, electrochemical properties and chemical stability, which can be used under harsh conditions such as strong acid, strong alkali and strong oxidant medium, and widely used in PEM hydrogen production, fuel cells, liquid flow batteries and many other applications, can be custommade for to meet special requirement.

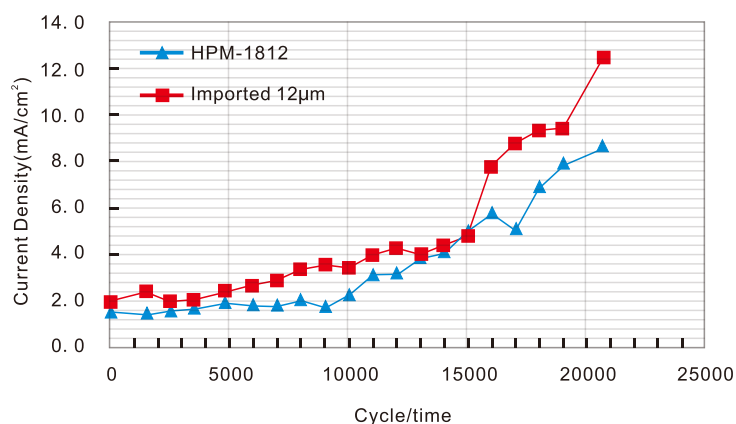




## Product Specification of Proton Exchange Membrane

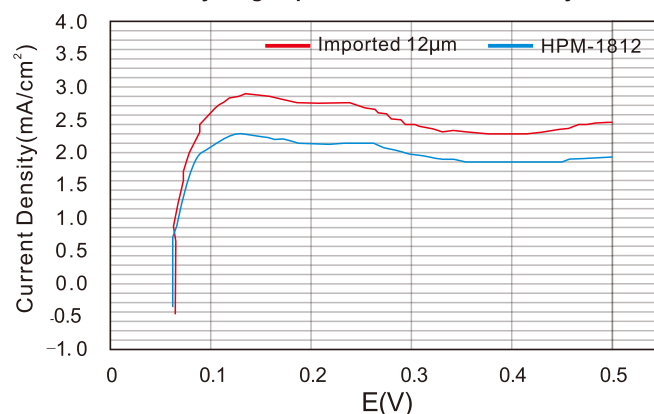
Specification	HPM-1806		HPM-1809		HPM-1812		HPM-1815	
Thicknesss, μm	6±0.5		9±0.5		12±0.5		15±0.5	
Density ,g/cm <sup>3</sup>	2.05±0.05		2.05±0.05		2.05±0.05		2.05±0.05	
Ionic Exchange Equivalent Weight,g/mol	950-1050		950-1050		950-1050		950-1100	
H <sub>2</sub> Crossover Rate, cm <sup>3</sup> /cm <sup>2</sup> *min	<0.01		<0.01		<0.01		<0.01	
	TD	MD	TD	MD	TD	MD	TD	MD
Tensile Strength,Mpa	≥50	≥50	≥40	≥40	≥35	≥35	≥50	≥50
Breaking Elongation,%	≥80	≥80	≥100	≥100	≥100	≥100	≥100	≥100
Elastic Modulus,Mpa	≥250	≥250	≥250	≥250	≥250	≥250	≥250	≥250
Swelling Rate(25℃/24h),%	≤3		≤3		≤3		≤3	
Swelling Rate(80℃/1h),%	≤5		≤5		≤5		≤3	
Test Standards	GB/T20043.2022							

### COCV



Membrane attenuation rate of inlet 12  $\mu\text{m}$  was 539.69% (initial hydrogen charge current 1.94 mA / cm<sup>2</sup>)  
HPM1812 Membrane attenuation rate is 544.03% (initial hydrogen charge current is 1.56 mA / cm<sup>2</sup>)

### Hydrogen permeable current density



Referring to the GB/T20042.5-2009, the test data is entrusted by the third-party test organization.  
The hydrogen transmission current of the inlet 12  $\mu\text{m}$  proton membrane was 2.29 mA / cm<sup>2</sup>, and the HPM1812 hydrogen transmission current was 1.86 mA / cm<sup>2</sup>.

## Product Specification of PFSA Dispersion

Specification	HLD-1805	HLD-1820	HLD-1905	HLD-1920
PFSA Content (Long side chain), wt%	5±0.1	20±0.1	5±0.1	20±0.1
1-Propanol, wt%	55±1	45±1	55±1	45±1
Water Content, wt%	40±1	35±1	40±1	35±1
Ionic Exchange Equivalent Weight, g/mol	800-900	800-900	900-1000	900-1000
Viscosity, mPa·s	10-20	50-300	10-20	50-300
Application Scenarios	It is used to prepare ion exchange conductive membranes and fuel cell ion membranes required in various electrolysis units. It is used as a super-acid catalyst and super-stable ion exchanger used in organic synthesis.			

### Product Description

- Hyproof has a unique system of perfluorosulfonic acid resin dispersion methods to efficiently produce wide range of resin dispersions.
- Hyproof's related products are widely used in CCM production, PEM production, specialty electrochemical binders and other fields.
- Hyproof supports custommade with choices of different dispersion systems, solid content and ion exchange equivalent weight to achieve optimal performance.





## Product Specification of PFSA Resin



### Product Description

Perfluorosulfonic acid resin is a special fluorine-containing polymer with extraordinary stability and chemical resistance. It is widely used in perfluorosulfonic acid proton exchange membrane fuel cells, chlor-alkali industry, lithium-ion secondary batteries, other electrolysis devices, sewage treatment, chemical catalysis, photocatalysis, gas separation, functional composite materials, and electroactive polymers for robots.



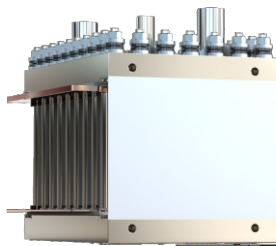
Specification	HMS-18-F	HMS-19-F	HLD-1890	HLD-1990
PFSA Content (Long side chain) , wt%	≥99	≥99	≥90	≥90
Molecular Weight	300K~500K	300K~500K	300K~500K	300K~500K
End group fluorinated	Yes	Yes	Yes	Yes
VOC Content,%	No	No	No	No
Ionic Exchange Equivalent Weight,g/mol	800-900	900-1000	800-900	900-1000
Other Content,%	Water < 1%	Water < 1%	Water < 10%	Water < 10%
MFI	< 5 (g/10min)	< 5 (g/10min)	/	/
Appearance	Particle	Particle	Powder	Powder
Application Scenarios	It is used to prepare ion exchange conductive membranes and fuel cell ion membranes required in various electrolysis units. It is used as a super-acid catalyst and super-stable ion exchanger used in organic synthesis.			



# Four Application Scenarios

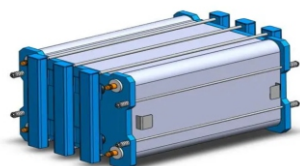
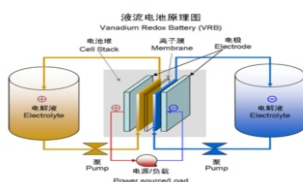
## 01 PEM Electrolyzer

- In view of the current high cost of PEM electrolysis membrane and the pain point of excessive swelling rate of homogeneous membrane, Hyproof Technology pioneered ultra-thin reinforced PEM membrane >100-meter coil and innovated solutions.
- It reduces the thickness and cost of the membrane, and hot water swelling rate improves the proton conductivity, strength of the membrane, and can ensure the dimensional stability and long life of PEM in applications.



## 03 Liquid Flow Battery

- As a new energy storage method, all-vanadium redox flow batteries have been strongly supported by national policies in recent years.
- Provide a proven solution for liquid flow batteries.
- It has excellent characteristics such as high proton conductivity, long lifetime, low deformation, and low vanadium ion permeation.



## 02 Fuel Cell



- With company's core ePTFE high-strength membrane, a variety of reinforced perfluorosulfonic acid proton exchange membranes have been developed with independent intellectual property rights .
- It provides a variety of solutions for different scenarios and can be flexibly adapt to different applications.
- The comprehensive commercialization of raw materials and production equipment provides our products with more flexible local supply chain and more effective cost control.

## 04 Membrane Purification and Reduction of CO<sub>2</sub> by Electrolysis

- The increase in CO<sub>2</sub> concentration has a significant negative impact on the environment, making the heat absorbed by the ground dissipated slower, leading to global warming, which in turn causes the melting of polar glaciers and sea level rise. In view of the needs and pain points of CO<sub>2</sub> reduction, Hyproof Technology Renewable Energy proposes cost effective solutions based on the company's core competence.

