PRODUCTS

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- OGP/LPE O_2 Generators
- High Pressure H_2 Generators
- Lightweight H_2 Generators
- Regenerative Fuel Cells
- Direct Methanol Fuel Cells
- Advanced Membranes (DSM™)
- Specialty MEAs
- O_3 and H_2O_2 Generators
- SO_2 Electrolyzers
- Trace Gas Sensors
- Trace Dissolved Species
- Advanced Capacitors
- Transdermal Sensors
- Electrochemical Oxygen Control/ Generation
- Membrane Characterization
- Research & Development

Advanced Membranes (DSM™)

Dimensionally Stable Membrane

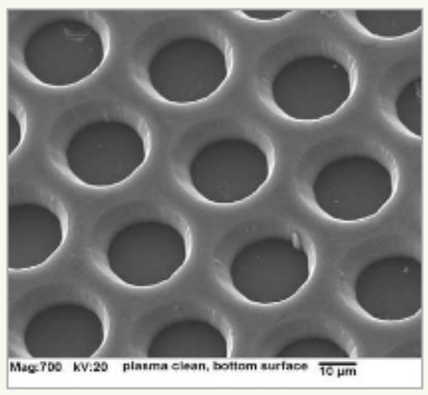
Vehicles, portable devices, and remote or on-site installations employing fuel cell or water electrolyzer technology must tolerate frequent startup, shutdown and power load cycles. Surviving these cycles, occasionally at freezing temperatures, will require the development of cost-effective, high-performance, advanced polymer electrolyte membrane (PEM) materials. Industrial production of ultra-thin membrane electrode assemblies (MEAs) poses the challenge of roll-to-roll continuous production of materials with weak mechanical properties. Thus, a high performance membrane with significantly improved mechanical properties is highly desired.

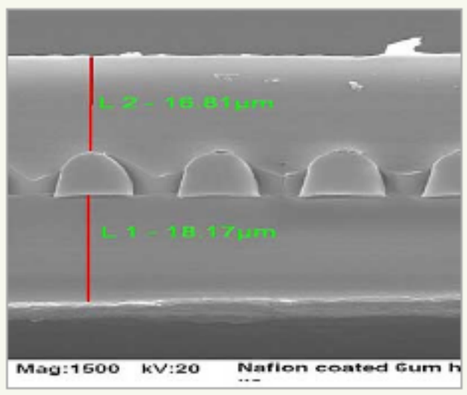
Utilizing a unique structure, a high performance membrane having excellent dimensional stability over a wide range of temperatures and relative humidities has been developed and demonstrated by Giner Electrochemical Systems, LLC (GES). Compared to conventional ionomer membranes, the supported membrane is stronger, more ionically conductive, and can be optimized for specific applications. This will lead to higher reliability, longer life, and wider relative humidity and temperature operating ranges.

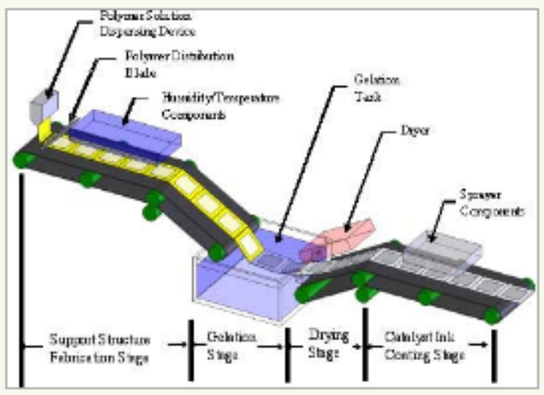
The **D**imensionally **S**table **M**embrane (DSM™ membrane) shows stellar mechanical stability compared to the "gold-standard" DuPont Nafion® 112 (Nafion) with a creep rate, as well as X-Y in-plane swelling at least one order of magnitude lower than Nafion. Our DSMs incorporating low equivalent weight (EW) ionomers (700 EW) have better mechanical properties than Nafion and far superior performance. By employing local reinforcement strategies, the lifetime of DSM is ~ 3X longer than the non-supported Nafion membrane while failures along the membrane/electrode edges have been completely eliminated. Additional optimization of the support pattern can further improve the durability.

A novel fabrication process has been successfully developed by GES that can be readily scaled up for continuous low cost mass production. Due to the mechanical stability of the DSM, direct inking of the membrane can be employed instead of the more cumbersome decal transfer process. Combined with excellent mechanical strength, the DSM can be readily employed for roll-to-roll mass production of MEAs.

Nafion® is a registered trademark of E.I. Du Pont de Nemours & Co..







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Product Summary
Thinner, stronger, higher performing membranes

Product Category
Prototypes/Developmental

Markets
- Energy/Automotive
- Aerospace/Defense
- Life Sciences
- Industrial/Commercial
- Environmental
- Organ/Tissue Transportation
- Gas Production
- Homeland Security/Law Enforcement
- Food and Agriculture

Technologies
- Hydrogen Generation
- Oxygen Generation/Management
- Power Generation
- Electrosynthesis
- Energy Storage
- Membrane Electrode Assembly (MEA) Manufacturing