

Thinner Components Aid Micro Fuel Cell Market Development

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In the past 6-18 months, micro fuel cells have continued to gain momentum in the market, both from a technological as well as a market commercialization point of view. Developers are steadily working toward next-generation designs that will ultimately take the market to the next stage in terms of a commercial product.

New technologies often come with market entry challenges that affect or delay commercialization. Micro fuel cells are no different. Battery chemistries that have been commercialized also faced similar market entry challenges in terms of transportation/regulatory issues and lack of standards. The key challenges for micro fuel cells are listed below:

- Ability to be constructed small enough for eventual integration into the device platform
- Lack of standard fuel cell technology
- Direct methanol is challenged by low output power density
- Transportation issues/regulatory environment
- Cost

With the market lacking a uniform standard in terms of both cartridge design and fuel cell composition, commercialization could be hindered due to numerous competing designs vying for market share. This can create distribution issues in addition to incompatibilities with original equipment manufacturers (OEMs). The International Electrotechnical Commission (IEC) has formed the Working Group 10 (WG10) a special task force within the Technical Committee 105 (TC105) to discuss interchangeability standardization. This is a step toward solving the standardization issue, although progress is still needed.

The International Civil Aviation Organization's Dangerous Goods Panel (ICAO DGP) voted to allow passengers and crew to carry and use micro fuel cells and methanol fuel cartridges onboard airplanes to power portable electronic devices. When this vote is formally adopted, the regulation will go into effect on January 1, 2007. The ICAO's action states allowances for micro fuel cells in aircraft cabins only, and not checked baggage. In addition, up to two spare fuel cartridges are allowed per person.

Recent Developments in the Component Arena

To directly address the miniaturization challenge, PolyFuel, Inc. has recently (Dec 2005) announced a new, thinner membrane designed specifically for passive direct methanol fuel cells. This new technology, called the PolyFuel 45-micron DMFC Membrane, can deliver the highest output power levels for passive DMFCs to date, solidifying PolyFuel's dedication to providing the micro fuel cell market with innovative hydrocarbon membranes as an alternative to fluorocarbon membranes.

45-micron Membrane

PolyFuel has introduced a new hydrocarbon DMFC membrane with a thickness of 45 microns. Through independent testing, the membrane has delivered 33 percent more power than the previous industry benchmark, which PolyFuel demonstrated with its own 62-micron membrane. PolyFuel's membranes are being used by 17 fuel cell developers across the globe. These developers range from large consumer electronic manufacturers to niche specialists. NEC and Sanyo Electric are two of the fuel cell developers working with PolyFuel.

PolyFuel's 45-micron membrane offers the following benefits to fuel cell developers, specifically for passive DMFCs:

- Significantly reduced thickness increases performance by reducing resistance through the membrane
- Allows for high level of water back diffusion (30 percent more), which can in turn allow

for an increased methanol concentration

- Power density is 80 mW/cm² at 40 degrees Celsius
- PolyFuel's 62-micron membrane offers 60 mW/cm² at 40 degrees C
- Low methanol crossover (Y2 of compatible fluorocarbon material)
- Available in hot-bondable or non hot-bondable, depending on the developers' requirements

Conclusion

The micro fuel cell market is quickly gaining momentum toward commercialization. Technology innovation in both the component and system arenas is expected to give the industry the tools to succeed. This innovation coupled with the great demand for more power and longer runtime in today's devices has provided the needed drive for the industry.

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