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PolyFuel Claims Mobile Fuel Cell Power Boost

By John Walko

Courtesy of [EE Times](#)

LONDON — Fuel cell membrane specialist PolyFuel, Inc., has developed an especially thin membrane for passive direct methanol fuel cells (DMFCs) that it says delivers 33 percent more power density than the previous industry benchmark.

Just 45 micron thick, the membrane is already being utilized or studied worldwide by original equipment manufacturers (OEMs) of hand-held devices, particularly in Japan.

Polyfuel (Mountain View, Calif.) says the significantly reduced thickness increases performance by reducing the resistivity of the membrane, while allowing a higher level of water back diffusion.

"PolyFuel has been working very hard with OEMs to refine its membrane technology to meet their specific needs," said Jim Balcom, president and CEO of PolyFuel.

"Perhaps the most requested feature has been a thinner membrane that retained the methanol crossover, water crossover and durability advantages of our 62 micron membrane, while meeting aggressive, new fuel cell performance targets. We are pleased that we have been able to specifically engineer a membrane to meet these requests."

The 45 micron membrane's peak electrochemical performance in passive hardware at 40C is 80 milliwatts per square centimeter of membrane (80mW/cm²) at 0.28V versus 60mW/cm² for the 62 micron membrane – a 33 percent improvement that results directly from the 27 percent reduction in thickness. Balcom said Polyfuel is working with six major corporations that are developing DMFC systems, including NEC and Sanyo Electric. Of these six, five are already evaluating the 45-micron membrane for "near-term" commercial use, including conducting extensive durability and performance testing.

The new membrane will be available in both a hot-bondable version, and a conventional version.

"With all of the sizzle of new portable applications, such as downloading feature films to a mobile phone, or watching the news, the cold reality of 'where will the power come from?' is being completely under-reported," says Balcom.

"The truth is that, according to our customers, a consumer's daily mobile power requirements in 2007 will be at least four times what the best-available batteries can deliver today, and 2-1/2 times greater than experts believe batteries will ever deliver. As a mature technology, batteries are essentially tapped out."

He maintains that fuel cells, which use refillable or replaceable cartridges of methanol fuel, are on the verge of delivering the necessary continuous power levels that video- and wireless-intensive applications require. They will offer essentially continuous run times as replacement cartridges or refills.

Cell phone maker Samsung, at a recent industry seminar, confirmed that the functional energy requirements of 4G phones will be four times that of existing models.

And market research group NanoMarkets, LC, in a September, 2005 report, predicted that in 2007, 4G phones, which run high-speed multimedia applications, will be able to have less than 30 minutes of talk time using contemporary batteries, and reiterated that today's 3G cell phones in some parts of Asia are already limited to 60 minutes talk time.

They concluded that lithium batteries cannot be safely advanced much further, "...with perhaps only a potential for a 50 percent improvement in battery energy density possible hereafter." One problem has been that the airline industry has raised concerns about passengers being allowed to take or use micro fuel cells and methanol cartridges aboard aircraft. However, the ICAO (International Civil Aviation Organization) voted recently to allow passengers do this.

"This is a critical, non-technical advance towards the commercialization of portable fuel cells," said Balcom. "The rest is up to key component suppliers like PolyFuel and its customers."

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