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HTT29-07 Room:101B Time:May 24 10:30-10:45

# Development and demonstrations of a new mobile power source: Examination and demonstration of DMFC for remote monitoring

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**Abstract**

This work explores the potential of direct methanol fuel cell (DMFC) as power source for off-grid remote monitoring site where commonly battery, solar battery, or generator is applied. In direct methanol fuel cell, methanol and oxygen react catalytically to produce electricity. We have developed a mobile DMFC system with a 5/10L methanol cartridge allowing 5/10kWh of power supply at any locations. For instance, continuous 82 days operation without exchanging any fuel cartridge is possible for a 10L cartridge and average 5W power consumption, and 41 days for 10W likewise. This feature enables us to widen possibility of any kind of off-grid observations where currently available electricity is limited. We will report the operational results of the DMFC system at various environments in both laboratory and field, and proved that the system was applicable to wide range of remote monitoring.

**Introduction of the DMFC system**

Consider the outline of the system shown in **Fig.1**. The DMFC serves as the charger of a lead acid battery that the DMFC always maintaining the battery voltage to be preset range. In this system, the DMFC is activated only the battery voltage reached its lower switching threshold voltage, and then automatically stopped at its higher voltage. Consequently, just the same amount of power consumed by any connected devices is charged up. Therefore, a feature of the DMFC system is quite efficient utilization ratio of fuel, unlike conventional generators, that the fuel is not wasted, elongating operation period. Residual products of the DMFC system are heat and water which are utilized as a means to sustain the system at cold and heat environment.

**Experimental and results**

In order to investigate usability of the DMFC system in remote region, it should sustain even at quite harsh environments. So the DMFC system was tested at the temperature between -20 and 40 degree C, and also in a decompression chamber of 0.7atmosphere of which oxygen partial pressure is similar to that of 3000m altitude. In addition, the DMFC systems were installed at various remote sites such as Yakushima island, Kiyomizu temple, and Tanakami mountain in Japan. At Kiyomizu temple, the DMFC system was connected to the monitoring system of pore water pressure in soil layer running by RITSUMEIKAN UNIVERSITY. **Fig.2** shows its long term operation result of the battery voltage and temperature around the DMFC system. All the data were corrected every 20 minutes. Blue dot lines indicate switch on and off voltage of automatic battery charging. During the 650 days, the DMFC system stably supplied power to the pore water pressure monitoring system except the timing when a few parts were added or exchanged from necessity.

We would discuss more details including other examples of demonstrations. Also, we would discuss potential and limitation of the DMFC system.

Keywords: power supply, fuel cell, remot monitoring, DMFC

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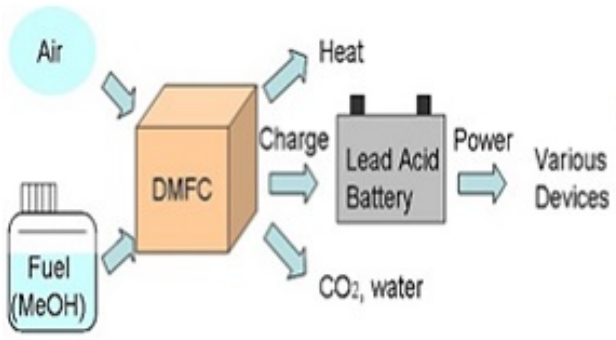


**Fig.1** Outline of the DMFC system

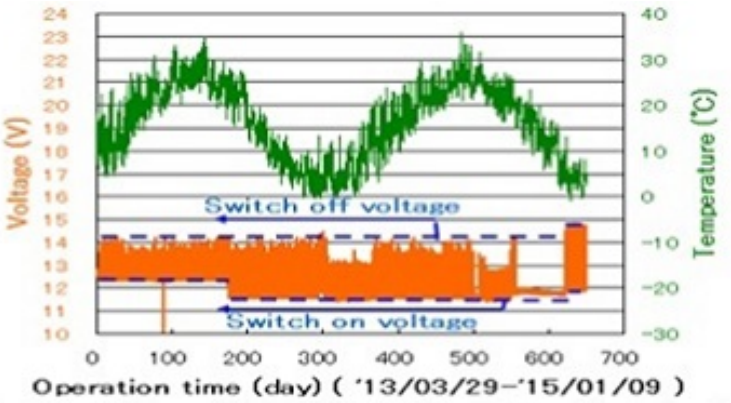


**Fig.2** Long Term DMFC Operation Test