

Effect of Abrupt Changes in Operating Conditions on Direct Methanol Fuel Cell Performance

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Recent researches on direct methanol fuel cells (DMFC) have revealed that the techniques for fabricating DMFC become almost mature and more attentions tend to be paid on DMFC systems recently. In operating the DMFC system, the abrupt changes in one or more operating conditions could affect the DMFC system performance either for a short period of time or permanently. In this work, we focus on the effect of abrupt changes in methanol feed concentration and operating temperature on the performance of DMFC. The transient behavior of DMFC performance will be presented in detail.

We fabricated the liquid feed DMFC unit cell as follows. Nafion 117 was used as a solid electrolyte. In order to fabricate the membrane electrode assembly (MEA), the carbon black was deposited onto the carbon cloth as a diffusion layer and Pt-Ru black catalyst was subsequently coated on the carbon black layer with an amount of $3\text{mg}/\text{cm}^2$ for anode. The Pt black catalyst was used for cathode instead of Pt-Ru black. The catalyst-coated carbon clothes were then hot-pressed with Nafion electrolyte. The parallel-type feed channels were used for both anode and cathode. The operating temperature of DMFC was set to be 90°C . The structure of DMFC unit cell is shown Fig.1. Until now, the maximum power density at a temperature of 90°C of fabricated DMFC has been obtained to be about $170\text{ mW}/\text{cm}^2$ at 0.3V as shown in Fig.2.

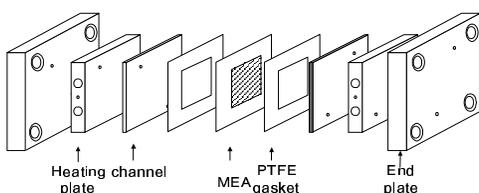


Fig.1. Structure of DMFC unit cell

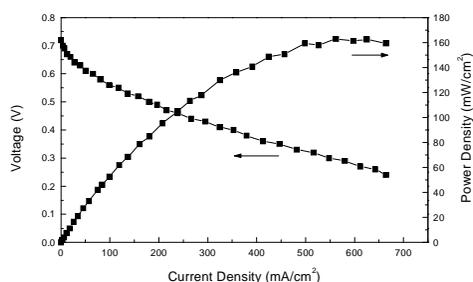


Fig.2. Performance of liquid feed DMFC unit

cell. [Anode ; 2M MeOH , $2\text{ml}/\text{min}$, $0.8\text{kg}/\text{cm}^2$, 47°C , Cathode ; O_2 , $2.4\text{kg}/\text{cm}^2$, room temperature, Cell temperature ; 90°C]

References

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