PEMFC 연료전지의 과도현상 특성

Dynamic Transient Phenomena of a Proton Exchange Membrane Fuel Cells

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Abstract : The proton exchange membrane fuel cell (PEMFC) is different from the normal power supply, and it is a nonlinear, multi-input, strong coupling, the complex dynamic system with large time delay. At present, many studies on the content of the fuel cell fuel cells focus on a static process, this paper analyzed in subsequent sections of the process of fuel cell dynamic response time of transition, and then it found the method to reduce the response time during the process of load change to ensure that the stability of output power.

Key Words : PEMFC, Transient phenomena, Stability, Output power

1. Introduction

Nowadays, alone with the improving battery performance of PEMFC and market demand, the primary research objective is how to study characteristics of the PEMFC system well and control it effectively. It is necessary to improve the operation of PEMFC performance, protect system security, reliability and keep low cost operation. And if the PEMFCs supply power to certain applications such as vehicles which the power requirement varies rapidly, the transient response of PEMFC is critical [1,2]. And it can find the method to reduce the response time during the process of load change to ensure that the stability of output power.

2. Results and Discussions

In the experiment, solar cell is placed under constant light intensity (100W halogen light), and supply electricity to electrolyzer. Then the electrolyzer electrolyzes the distilled water to produce hydrogen and oxygen. And the hydrogen and oxygen flow into the fuel cell through the plastic tubes to generate electricity. It connected the fuel cell with digital storage-type oscilloscope (Model GW INSTEK GDS-1022). The experiment includes two PEMFCs, firstly, connect one of them FC_1 to the circuit, and also connect with the oscilloscope. The external load changes in accordance with the sequence of 0.3/0.5/1/2/3/5/10/20/50/100[Ω]. 10 groups of charge response waveforms and 10 groups discharge response waveform are obtained.

Compared with the single FC, when the two fuel cells are connected in series, the values of the internal voltage rise larger, but the time constants are shorter. The reason is the capacitance in series is less than the single fuel cell's.

This paper presented the dynamic transient phenomena of PEMFC. Compared with the single FC, when the two fuel cells are connected in series, the values of the internal voltage rise larger, but the time constants are shorter. The reason is the capacitance in series is less than the single fuel cell's. So if it connects the fuel cells in series, the time constant will be shorter than the single fuel cell.

References

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