Dynamic Transient Phenomena of Proton Exchange Membrane Fuel Cell

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ABSTRACT: The proton exchange membrane fuel cell (PEMFC) holds great promise of clean power. However, in practical applications which use the PEMFC as the power source, the output voltage from the fuel cell undergoes transient response especially during acceleration and deceleration. This paper presents the relationships between the internal voltage drop, voltage of time constant, time constant of FC1 and FC2 (in series and in parallel) charge curves and discharge curves respectively.

Key Words: Proton Exchange Membrane Fuel Cell, Internal Voltage Drop, Transient Phenomena

1. Introduction

Nowadays, the number of different applications of fuel cell is very extensive and there is an increasing interest in fuel cell technology and fuel cell will reach a high development status [1]. And if the PEMFC (proton exchange membrane fuel cell) supply power to certain applications such as vehicles which the power requirement varies rapidly, the transient response of PEMFC is critical [2].

2. Experiment

In the experiment, it used the digital storage oscilloscope (GW INSTEK GDS-1022) to experiment the transient response of the two fuel cells which are connected in parallel and series in the solar cell and fuel cell hybrid system.

Table...1. Technical Data.

Solar module	
Dimensions (width X height X depth)	200mm X 297mm X 100mm
Terminal voltage	2.2 [V]
Short-circuit current	1200 [mA]
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Dimensions (width X height X depth)	200mm X 310mm X 110mm
Membrane surface area	25 [cm^2]
Normal voltage in continuous operation	1.4-1.8 [V]
Current	0-4000 [mA]
Two-cell fuel cell	
Dimensions (width X height X depth)	200mm X 297mm X 90mm
Membrane surface area	2X10 [cm^2]
Voltage when connected in parallel	0.4-1.0[V]
Voltage when connected in series	0.8-2.0[V]
Load module	
Dimensions (width X height X depth)	100mm X 297mm X 100mm
Selectable resistances	0.3/0.5/1/2/3/5/10/20/50/100 Ω

3. Results

Fig. 1... presents the relationships between the charge curves of internal voltage drop, voltage of time constant Vτ, load and time constant τ of FC1 and FC2 in series.

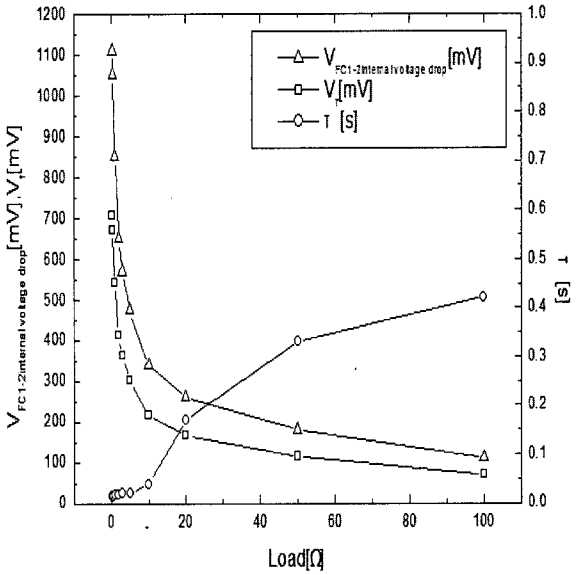

Fig.1... Charge curves of internal voltage drop, voltage of time constant Vτ, load and time constant τ of FC1 and FC2 in series...

4. Conclusion

Throughout this work we experimented and presented the relationships between the charge curves of internal voltage drop, voltage of time constant Vτ, load and time constant τ of FC1 and FC2 in series... When the value of load increases, the internal voltage drop and voltage of time constant Vτ decrease and the time constant τ has the opposite trend, it increases.

References

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