

# 2<sup>nd</sup> World Congress on **Wind and Renewable Energy** & 5<sup>th</sup> World Congress and Expo on **Green Energy**

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## **An experimental study on durability characteristics of PEMFC vehicle stack driving with operating temperature**

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Proton exchange membrane fuel cell (PEMFC) is well known as the typical renewable energy with the eco-friendly characteristics because the emission is only water. Especially, it is well applied for fuel cell vehicle (FCV), because the operating temperature is low, and energy efficiency is high. Some stack durability problems, however, have been raised to ensure the long life of stack. Therefore, the durability of stack needs to be thoroughly researched to improve the life of stack. It is known that the performance and the durability of fuel cell stack is affected by the many kinds of durability degradation factors. Above all, operating temperature is evaluated as the main factor that significantly influences the durability of stack. The experimental study on fuel cell life with operating temperature, which is conducted under constant current condition has been developed by many academic world. However, it does not reflect the vehicle driving environment that load changes continuously. Changing the vehicle load means that the current density of stack is also changed, and the operating temperature of stack is affected by the heat generated from chemical reaction, and the cooling system. JRC report by EU depicts the experiment methodology using unit cell stack, and made the vehicle driving cycle reflecting the urban driving cycle and extra urban driving cycle. In this study, the three cell stack experiments employing the EU New European Driving Cycle (NEDC) under 55°, 65°, 75° temperature conditions were conducted for respectively 300 hours to evaluate the effects of operating temperature on the stack durability degradation. Polarization curves were obtained every 100 hours, and each curve was compared with others. Then, the electrodes were observed by the scanning electron microscope (SEM). The voltage degradation rate at 75° condition was higher than the results from other condition tests. As the result, it was concluded that the higher temperature is, the higher voltage degradation rate is.

### **Biography**

Jaesu Han is a MS candidate in Mechanical Engineering at Chungnam National University, being currently responsible for "Dynamic modeling of fuel cell system for analysis of system durability" project. He has been majoring Electrical Engineering at Seoul National University of Technology and joined Chungnam National University for more than two years in various capacities, primarily within the area of Mechanical Engineering.

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