저가습 환경에서의 고분자 전해질 연료전지 on/off 사이클에 관한 연구

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Proton exchange membrane fuel cells (PEMFCs) are highly efficient and low polluting power sources for transportation and also stationary applications. Inadequate reliability is one of the primary factors that impede the large-scale commercialization of proton exchange membrane fuel cells. Its durability is affected by both its physical properties and the fuel cell operating conditions. Endoh et al. (2004) attributed the deteriorated performance of the PEMFCs for the repetitive on/off cycles to the chemical attack of catalyst layer and membrane by hydrogen peroxide. Hydrogen peroxide is formed at high cell voltages or open circuit voltage (OCV) that the cell is exposed to during the shut down period without any special treatment to remove residual hydrogen from anode gas channel, because at OCV, large difference in oxygen concentration between anode and cathode facilitates oxygen transport through the membrane, resulting the formation of hydrogen peroxide. The produced hydrogen peroxide not only damage the catalyst layer but also attack the polymer structure of the membrane. The damaged membrane allows faster oxygen transport from cathode to anode that leads to accelerated degradation.