고분자전해질형 연료전지 가스확산층의 탄소 부식에 관한 실험적 분석

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Experimental Study on Carbon Corrosion of Gas Diffusion Layer in PEM Fuel Cell

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Recently, many efforts to solve the durability problem of PEM fuel cell are carried on constantly. However, despite this attention, durability researches of gas diffusion layer (GDL) are not much reported yet. Generally, GDL of PEM fuel cell experiences three external attacks, which are dissolution of water, erosion of gas flow, corrosion of electric potential. In this study, among these degradation factors, carbon corrosion of electric potential was focused and investigated with accelerated carbon corrosion test. Through the test, it is confirmed that carbon corrosion occurred at GDL, and corroded GDL decreased a performance of operating fuel cell. The property changes of GDL were measured with various methods such as air permeability meter, pore distribution analyzer, thermo gravimetric analyzer, and tensile stress test to discover the effects of carbon corrosion. Carbon corrosion caused not only loss of weight and thickness, but also degradation of mechanical strength of GDL. In addition, to analysis the reason of GDL property changes, a surface and a cross section of GDL were observed with scanning electron microscope. After 100 hours test, the GDL showed serious damage in center of layer.

Key words : PEM fuel cell(고분자전해질형 연료전지), Gas diffusion layer(가스확산층), Durability(내구 성능), Degradation(성능 저하), Carbon corrosion(탄소 부식)

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내구성능저하된 기체확산층이 고분자전해질 연료전지의 과도응답성능에 미치는 영향 연구

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Study on Transient Response of a Unit Proton Exchange Membrane Fuel Cell with an Aged Gas Diffusion Layer

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The gas diffusion layer is the key component of the proton exchange membrane fuel cell because it directly affect to the mass transport mechanism and dynamic behavior of the cell. In this study, the effects of GDL aging on the transient response of the PEM fuel cell is systematically investigated using current step transient response analysis under different stoichiometric ratios and humidity conditions. With GDLs aged by the accelerated stress test, the effects of hydrophobicity and structural changes due to carbon loss in the GDL on the transient response of PEM fuel cells are determined. The degraded GDLs that had uneven hydrophobicity distributions cause local water flooding inside the GDL and induce lower and unstable voltage responses after load changes.

Key words : Proton Exchange Membrane Fuel Cell(고분자전해질형 연료전지), Gas Diffusion Layer(기체확산층), Durabillity(내구성), Transient Response(과도응답)

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