직접메탄올 연료전지의 성능에 미치는 메탄올 연료의 불순물

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Impurities in the methanol fuel on the performance of direct methanol fuel cell

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The impurities in the methanol fuel that is used for direct methanol fuel cell (DMFC) could greatly affect the performance of membrane electrode assemblies (MEA). The most common impurities in the commercial methanol fuel are mainly ethanol, acetone, acetaldehyde, or ammonia. In this study, the effect of impurities in methanol fuel was investigated on the performance of MEA. The MEA for DMFC were prepared using a semi-automatic bar-coating machine, which can prepare the catalyst layer with uniform thickness for MEA. As a result, a single cell supplied with one of the 6 different kinds of methanol fuels showed a significant degradation of the fuel cell performance. The most common impurities in the commercial methanol fuel is mainly ethanol, acetone, acetaldehyde, or ammonia. The effects of the kind and the concentration of impurities in the methanol fuels were investigated on the performance of MEA for DMFC. We will propose the optimum compositions and limit concentration of impurities in methanol fuel for high performance of MEA for DMFC.

Key words : Direct methanol fuel cell(직접메탄올 연료전지), impurities(불순물), methanol fuel(메탄올 연료), performance (성능)

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원자력 발전소의 해수전해설비 폐수소를 활용한 PEM 연료전지 발전 시스템에 관한 연구

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A study on the power plant system combined with PEM fuel cell and the wasted hydrogen from the sea water electrolyzer of nuclear power plants

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Generally, a coolant of the nuclear power plant is manufactured by electrolyzing the sea water near the plant for making the sodium hypochlorite(NaOCl), which is used for sterilizing the bacteria and the shellfishes sticking to the drains or the pumps at the outlet of the cooling system due to 8-10℃ warmer temperature than the inlet sea water. During manufacturing the sodium hypochlorite, the hydrogen with the high purity is also produced at the anode side of the electrolyzer. This paper describes a novel power plant system combined with the polymer electrolyte membrane(PEM) fuel cell, the wasted hydrogen from the sea water electrolyzer and the wasted heat of the nuclear power plant. The present status over the exhausted hydrogen at twenty nuclear power plants in Korea was investigated in this study, from which an available power generation is estimated. Furthermore, the economic feasibility of the PEM fuel cell power plant is also evaluated by a current regulations over the power production and exchange using a renewable energy shown in Korea Power Exchange(KRX).

Key words : PEM fuel cell(고분자 전해질막 연료전지), Nuclear power plant(핵발전소), Sea water electrolyzer(해수전해조), Coolant(냉각수), Sodium hypochlorite(차아염소산 나트륨)

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